

NOTICE OF FILING

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Details of Filing

Document Lodged:	Affidavit - Form 59 - Rule 29.02(1)
File Number:	NSD758/2021
File Title:	THE ENVIRONMENT CENTRE NT INC v MINISTER FOR RESOURCES AND WATER & ANOR
Registry:	NEW SOUTH WALES REGISTRY - FEDERAL COURT OF AUSTRALIA



A handwritten signature in blue ink, reading "Sia Lagos".

Dated: 10/09/2021 9:10:15 PM AEST

Registrar

Important Information

As required by the Court's Rules, this Notice has been inserted as the first page of the document which has been accepted for electronic filing. It is now taken to be part of that document for the purposes of the proceeding in the Court and contains important information for all parties to that proceeding. It must be included in the document served on each of those parties.

The date and time of lodgment also shown above are the date and time that the document was received by the Court. Under the Court's Rules the date of filing of the document is the day it was lodged (if that is a business day for the Registry which accepts it and the document was received by 4.30 pm local time at that Registry) or otherwise the next working day for that Registry.



Form 59
Rule 29.02(1)

Affidavit

No. NSD758 of 2021

Federal Court of Australia
District Registry: New South Wales
Division: General

The Environment Centre NT Inc

Applicant

The Minister for Resources and Water and another
Respondents

Affidavit of: **Dr Hugh Saddler**
Address: 14/50 Peter Cullen Way, Wright ACT 2611
Occupation: Independent consultant
Date: 10 September 2020

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Filed on behalf of (name & role of party) The Environment Centre NT Inc
 Prepared by (name of person/lawyer) Anna Gudkov
 Law firm (if applicable) Environmental Defenders Office Ltd (our ref: S1952)
 Tel (02) 9262 6989 Fax (02) 9264 2414
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 Address for service Level 5, 263 Clarence Street Sydney NSW 2000
 (include state and postcode)

I, Dr Hugh Saddler, of 14/50 Peter Cullen Way Wright ACT 2611, affirm:

1. I am an expert witness retained by the Applicant in these Federal Court proceedings to prepare an expert report regarding the potential total greenhouse gas emissions arising from the exploration and exploitation of gas fields in the Beetaloo sub-basin.
2. All of the information in this affidavit is true and correct to the best of my knowledge or belief. Where information is not within my direct knowledge, I have stated the source of that information.

Training, experience and qualifications

3. My general experience arises from working professionally as an expert and as a consultant in the general fields of energy policy, economics and technology assessment, including, but not restricted to, work on the effects of energy production and use on the environment. My first professional engagement with the relationship between energy and greenhouse gas emissions was in 1988.
4. I am an independent consultant and have been an Honorary Associate Professor of the Crawford School of Public Policy in Australian National University since 2016.
5. In 1996 I was contracted, through my majority owned company, by the Commonwealth Government, to prepare the first complete inventory of Australia's greenhouse gas emissions arising from energy combustion, other than for transport. I continued to be engaged by the government to carry out this task every year from 1990 to 1995. I was subsequently contracted to prepare similar inventories for every subsequent year up to and including 2003. Over this period (being 1990 to 2003), I was also contracted, jointly with two other consultants, to prepare the first Australian workbooks to assist businesses to compile corporate emissions inventories.
6. In 2001, on the recommendation of the Commonwealth Government, I was appointed to the United Nations Convention on Climate Change (**UNFCCC**) Roster of Experts, as an energy sector inventory specialist. In that role I was a member on several occasions international teams tasked with reviewing the national greenhouse gas inventories of a number of other countries.
7. Over the years I have also been a member of other expert committees and review panels in Australia. A selection of these includes:
 - (a) **2011 – to date**: Member, User Reference Group for the National Greenhouse Gas Inventory
 - (b) **2013 – to date**: CRC Committee nominated member, Performance Review Panel, CRC for Greenhouse Gas Technologies.2002-05 : Member, ACT Sustainability Expert Reference Group

(c) **2001-02:** Member, Committee EV/15 – Carbon Accounting, Standards Association of Australia.

(d) **2001:** Member, Technical Panel, Second year review of CRC for Greenhouse Accounting.

Engagement as an expert in these Proceedings

8. On 27 August 2021, I was briefed by the solicitors for the Applicant, the Environmental Defenders Office Ltd, to prepare a written report addressing the following questions:

(a) In your opinion, what are the potential total greenhouse gas emissions arising from the exploration and exploitation of gas fields in the Beetaloo sub-basin? Please provide your opinion assuming each of the following scenarios and using emissions factors developed under the National Greenhouse Accounts Factors 2021 or an appropriate equivalent:

- i. That the Beetaloo sub-basin holds more than 200,000 PJ of gas, all of which is recovered;*
- ii. That the Beetaloo sub-basin holds more than 200,000 PJ of gas, 10% of which is recovered; and*
- iii. That EP187 has a best estimate prospective gas resource 3,446 BCF and a best estimate of prospective condensate resource of 27 MMBL, all of which will be recovered.*

Please provide reasoning for your answer.

(b) In your opinion, what are the potential annual total greenhouse gas emissions arising from the exploration and exploitation of a new shale gasfield or gasfields in the Beetaloo sub-basin producing 1,240 PJ/y? Please provide reasoning for your answer.

9. Annexed to this Affidavit and marked “**HS1**” is a true copy of the Letter of Instruction.

10. I have prepared a short report in response to the questions asked of me. Annexed to this Affidavit and marked “**HS2**” is a true copy of that report.

11. In preparing this Affidavit, I acknowledge that I have read and complied with the Federal Court of Australia Expert Evidence Practice Note (GPN-EXPT) General Practice Note and agree to be bound by it.

12. Annexed to this Affidavit and marked “**HS3**” is a true copy of my curriculum vitae.

Affirmed in counterpart and witnessed over
audio visual link in accordance with section
14G of the *Electronic Transactions Act*
2000 (NSW)

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)
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Signature of deponent

Before me:

Signature of witness

Name: Ruby Hamilton
Date: 10 September 2021

Qualification: Solicitor

Certificate of Annexure HS-1

No. NSD758 of 2021

Federal Court of Australia

District Registry: New South Wales

Division: General

Environment Centre NT Inc

Applicant

Minister for Resources and Water and another

Respondents

This and the following 26 pages form Annexure HS-1 to the Affidavit of Dr Hugh Saddler affirmed on 10 September 2021 before me.

Signature of witness

Name: Ruby Hamilton

Qualification: Solicitor



Environmental Defenders Office

27 August 2021

Dr Hugh Saddler
Honorary Associate Professor
Crawford School of Public Policy
Australian National University

By email: hugh.saddler@strategypolicyresearch.com.au

CONFIDENTIAL AND SUBJECT TO LEGAL PROFESSIONAL PRIVILEGE

Dear Dr Hugh Saddler

Environment Centre NT Inc v Minister for Resources and Water & Anor Federal Court of Australia Proceedings no. NSD758/2021

1. We act for the Environmental Centre NT Inc (**ECNT**), who is the peak community sector environmental organisation in the Northern Territory. ECNT engages in activities aimed at protecting and conserving the environment of the NT, including in relation to climate change.
2. Our client, ECNT, has commenced proceedings in the Federal Court of Australia (**Proceedings**) against the Minister for Resources and Water (**Minister**) and the Commonwealth of Australia (**Commonwealth**) alleging that:
 - a. the Minister's making of the *Industry Research and Development (Beetaloo Cooperative Drilling Program) Instrument 2021* (Cth) (the **Instrument**); and
 - b. the Minister's decision to award up to \$21 million in grants to Imperial Oil and Gas (**Imperial**) pursuant to the Beetaloo Cooperative Drilling Program (**the Program**) (the **Decision**)

were unlawful in circumstances where the Minister:

- a. breached s 71 (1) of the *Public Governance, Performance and Accountability Act 2013* (Cth) (**the PGPA Act**) by failing to make reasonable inquiries in respect of climate change risks. S 71(1) requires that the Minister must not approve a proposed expenditure of relevant money unless the Minister is satisfied, after making reasonable inquiries, that the expenditure is a "proper use" of relevant money, where "proper" is defined as a use that is "efficient, effective, economical and ethical"; and
- b. acted in a way that was legally unreasonable and/or illogical and/or irrational, by failing to have regard to and/or failing to have adequate regard to, climate change risks.

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3. We are instructed to engage you to act as an expert witness under Part 23 (rules 23.01-23.15) of the *Federal Court Rules 2011* (Cth) (**FC Rules**) and the Expert Evidence Practice Note (GPN-EXPT) (**Expert Evidence Practice Note**), including the Harmonised Expert Witness Code of Conduct (**Code of Conduct**). Part 23 of the FC Rules and the Expert Evidence Practice Note is set out in **Annexure A** to this letter.
4. Your role as an expert witness is to assist the Court impartially on matters relevant to your area of expertise. You are not to act as an advocate for our clients and any opinion expressed must be genuinely held by you based on your professional training, knowledge, or experience.
5. Please read those documents carefully before you commence the work requested. **Your expert report must contain an acknowledgment that you have read the Code of Conduct and that you agree to be bound by it.** Otherwise your report will be inadmissible as evidence. Your role as an expert witness is to assist the Court impartially on matters relevant to your area of expertise. You are not to act as an advocate for our clients and any opinion expressed must be genuinely held by you based on your professional training, knowledge, or experience.

Overview of the Work Required

6. The work we require involves the following:
 - a. reviewing the relevant documentation;
 - b. preparing a written expert report that conforms with the Code of Conduct and addresses our questions (questions located at **Annexure B**);
 - c. reviewing the Respondent's expert report(s) (if necessary);
 - d. conferring with the Respondent's expert(s) at a joint conference(s) and prepare a joint report, which sets out the matters agreed, matters disagreed, and the reasons for agreement and disagreement as a result of the joint conference(s) (if necessary); and
 - e. appearance as an expert witness in the Court (if required).
7. We request that you provide us with a draft of your expert report for review before finalising it. The purpose of this is not to influence the conclusions or recommendations you make but to ensure that the report is clear and addresses the issues adequately to inform the Court.

Background

8. The following information is provided to assist your consideration of the matters on which are you asked to provide expert advice. Please note that you are not permitted to express an opinion on any question of law in your report and your report should confine itself to the relevant issues of fact within your area of expertise.
9. The independent *Scientific Inquiry into Hydraulic Fracturing of Onshore Unconventional Reservoirs in the Northern Territory* (**Fracking Inquiry**) was commissioned by the Northern Territory Government under the *Inquires Act 1945* (NT) and its Terms of Reference required it to investigate the environmental, social and economic risks and impacts of hydraulic fracturing (commonly known as fracking) of onshore unconventional gas reservoirs and associated activities in the Northern Territory.

10. The Fracking Inquiry handed down its Final Report to the Northern Territory Government on Tuesday 27 March 2018. Amongst other things, the Fracking Inquiry identified that a best estimate indicative later development scenario for the exploitation of a new shale gasfield or gasfields in the Beetaloo sub-basin would equate to gas production of 1,240 petajoules per year (**PJ/y**).¹
11. The Fracking Inquiry further noted that in this later development scenario, it is assumed that 2,740 TJ/day is used for liquid natural gas (**LNG**) export and 660 terajoules per day (**TJ/day**) is used for domestic gas consumption.²
12. On 15 September 2020, the Prime Minister of Australia, the Minister for Energy and Emissions Reduction, and the Minister for Resources and Water (**Minister**) announced that Australia will be pursuing a “Gas-led recovery.”³ One of the elements of the Gas-led Recovery was the unlocking of five key gas basins, starting with the Beetaloo basin in the Northern Territory.⁴
13. On 17 December 2020, the Minister announced a \$50 million subsidy program for Beetaloo exploration to “fast-track drilling by providing grants to cover 25% of eligible exploration costs, capped at \$7.5 million per well and 3 wells per exploration venture.”⁵ The Minister further announced that it was estimated that the Beetaloo sub-basin could hold more than 200,000 petajoules of gas.⁶
14. In or about January 2021, the Minister issued the Beetaloo Strategic Basin Plan entitled ‘Unlocking the Beetaloo,’ which set out some details of the Program.
15. On 22 February 2021, Empire Energy Group Ltd (**Empire**), the Australian Stock Exchange (**ASX**) listed parent company of Imperial, published an announcement to the ASX relating to a Material Beetaloo Resource Upgrade. This statement included, amongst other things, the information that Empire has:
 - a. a best estimate prospective gas resource of 3,446 billion cubic feet (**BCF**); and
 - b. a best estimate of prospective condensate resource of 27 million barrels of petroleum liquids (**MMBL**).
16. On 18 March 2021, the Department of Industry, Science, Energy and Resources (**DISER**) issued the ‘Beetaloo Cooperative Drilling Program – Grant Opportunity Guidelines’ (**Guidelines**) and a standard Grant Agreement (**Standard Grant Agreement**). The Guidelines govern the provision of grants under the Program.
17. On 7 April 2021 Imperial submitted three applications seeking a total of \$21,806,453 of funding under the Program, comprising of:
 - a. Application BCD000001, seeking \$7,314,081 in funding in respect of a project entitled ‘Carpentaria-2 Horizontal Well’;

¹ Fracking Inquiry, p 227.

² Fracking Inquiry, p 227.

³ <https://www.pm.gov.au/media/gas-fired-recovery>

⁴ Ibid.

⁵ <https://www.minister.industry.gov.au/ministers/pitt/media-releases/beetaloo-strategic-plan-will-unlock-gas-jobs-and-development>

⁶ Ibid.

- b. Application BCDP000002, seeking \$6,992,372 in funding in respect of a project entitled 'Carpentaria-3 Horizontal Well'; and
- c. Application BCDP000003, seeking \$7,500,000 in funding in respect of a project entitled 'Carpentaria-4 and 3D Seismic'

(together, **the Applications**).

- 18. Between 7 May and 8 May 2021 the Applications were the subject of DISER review.
- 19. On 11 May 2021, the Minister made the Instrument and purported to prescribe the Program as a program under s 33 of the *Industry Research and Development Act 1986* (Cth) (the **IRD Act**).
- 20. On 28 May 2021 and 1 June 2021 an Assessment Committee in respect of the Program (**Assessment Committee**) met to consider the Applications.
- 21. On 1 June 2021 the Assessment Committee resolved that the Applications were satisfactory (subject to some limitations/conditions ⁷) and resolved to recommend to the Minister that they be approved for funding under the Program.
- 22. On 17 June 2021, following receipt of a DISER brief recommending that the Minister approve the three Applications (subject to the conditions set out by the Assessment Committee⁸), the Minister approved the Applications. On 7 July 2021, the Minister announced the Decision, by way of publication of a Media Release (**Announcement**).
- 23. On 8 July 2021, Empire Energy Group Ltd, the Australian Stock Exchange (**ASX**) listed parent company of Imperial, published an announcement to the ASX relating to the Decision and Announcement.

Expert Brief

- 24. We will provide, by way of separate email, a link to an electronic a brief of documents for your review. **Annexure C** contains an index to these documents.

Timeframe

- 25. Under the current Court orders, your expert report will be due to be filed and served by 10 September 2021. We therefore request a draft of your advice by no later than Monday **6 September 2021**.
- 26. We will notify you of further relevant dates in the Proceedings as they become available.

Fees and Terms

- 27. Thank you for agreeing to provide this advice on a pro bono basis.
- 28. Please note the following terms:
 - a. Your work will only be used by EDO in relation to this matter;

⁷ Conditions set out on page 5 to 7 of the Meeting Minutes of the Beetaloo Cooperative Drilling Program Assessment Committee (**Assessment Committee**) Meeting on 1 June 2021 – At tab 19 of the Brief.

⁸See Annexure A to Ministerial Recommendation – BCDP Recommended Projects – At tab 29 of the Brief.

- b. EDO will take all reasonable steps to prevent your work being used for purposes other than that mentioned above, but we accept no responsibility for the actions of third parties;
- c. Regardless of the above points, EDO may choose not to use your work;
- d. You will not be covered by EDO's insurance while undertaking the above tasks.

Duty of Confidentiality

29. Please treat your work as strictly confidential, unless authorised by us.

If you would like to discuss this retainer further, please contact us at anna.gudkov@edo.org.au.

Yours sincerely,

Environmental Defenders Office

Anna Gudkov

Senior Lawyer (Gas/Corporate)

Ref: s1952

Part 23—Experts

Division 23.1—Court experts

23.01 Appointment of Court expert

- (1) A party may apply to the Court for an order:
 - (a) that an expert be appointed (a ***Court expert***) to inquire into and report on any question or on any facts relevant to any question arising in a proceeding; and
 - (b) fixing the Court expert's remuneration, including the cost of preparing the expert's report; and
 - (c) for the Court expert's attendance before the Court; and
 - (d) terminating the liability to pay the Court expert's remuneration.

Note 1: ***Expert*** is defined in the Dictionary.

Note 2: The Court may give instructions relating to the inquiry and report including the carrying out of an experiment or test.

Note 3: The Court may make an order of its own motion—see rule 1.40.

- (2) If the Court makes an order under paragraph (1)(b), the expert's remuneration is payable jointly and severally by the parties.

23.02 Court expert's report

- (1) The Court expert must provide the report to the Court within the time fixed by the Court.

Note: A Registrar will provide a copy of the report to any party interested in the question.
- (2) The Court expert's report must:
 - (a) be signed by the Court expert; and
 - (b) contain particulars of the training, study or experience by which the Court expert has acquired specialised knowledge; and
 - (c) identify the questions that the Court expert was asked to address; and
 - (d) set out separately each of the factual findings or assumptions on which the Court expert's opinion is based; and
 - (e) set out separately from the factual findings or assumptions each of the Court expert's opinions; and
 - (f) set out the reasons for those opinions; and
 - (g) contain an acknowledgement that the opinions are based wholly or substantially on the specialised knowledge mentioned in paragraph (b).

23.03 Court expert's report—use at trial

- (1) A report that complies with rule 23.02 will be admissible at trial as the evidence of the Court expert.

Rule 23.04

Note: Section 177 of the *Evidence Act 1995* deals with the tender of an expert's report.

- (2) A party may apply to the Court for an order:
- (a) to cross-examine a Court expert before or at trial; and
 - (b) if the cross-examination is to take place before trial—that the cross-examination take place before a Registrar or an examiner.

Note: *Examiner* is defined in the Dictionary.

23.04 Other expert's reports on the question

A party who has delivered to another party interested in the question a copy of another expert's report that complies with Division 23.2 may apply to the Court for leave to adduce the evidence of the other expert on the question.

Note: The question is referred to in rule 23.02.

Rules 23.05–23.10 left blank

Rule 23.11

Division 23.2—Parties' expert witnesses and expert reports

23.11 Calling expert evidence at trial

A party may call an expert to give expert evidence at a trial only if the party has:

- (a) delivered an expert report that complies with rule 23.13 to all other parties; and
- (b) otherwise complied with this Division.

Note: *Expert* and *expert report* are defined in the Dictionary.

23.12 Provision of guidelines to an expert

If a party intends to retain an expert to give an expert report or to give expert evidence, the party must first give the expert any practice note dealing with guidelines for expert witnesses in proceedings in the Court (the *Practice Note*).

Note: A copy of any practice notes may be obtained from the District Registry or downloaded from the Court's website at <http://www.fedcourt.gov.au>.

23.13 Contents of an expert report

- (1) An expert report must:
 - (a) be signed by the expert who prepared the report; and
 - (b) contain an acknowledgement at the beginning of the report that the expert has read, understood and complied with the Practice Note; and
 - (c) contain particulars of the training, study or experience by which the expert has acquired specialised knowledge; and
 - (d) identify the questions that the expert was asked to address; and
 - (e) set out separately each of the factual findings or assumptions on which the expert's opinion is based; and
 - (f) set out separately from the factual findings or assumptions each of the expert's opinions; and
 - (g) set out the reasons for each of the expert's opinions; and
 - (ga) contain an acknowledgement that the expert's opinions are based wholly or substantially on the specialised knowledge mentioned in paragraph (c); and
 - (h) comply with the Practice Note.
- (2) Any subsequent expert report of the same expert on the same question need not contain the information in paragraphs (1)(b) and (c).

23.14 Application for expert report

A party may apply to the Court for an order that another party provide copies of that other party's expert report.

23.15 Evidence of experts

If 2 or more parties to a proceeding intend to call experts to give opinion evidence about a similar question, any of those parties may apply to the Court for one or more of the following orders:

- (a) that the experts confer, either before or after writing their expert reports;
- (b) that the experts produce to the Court a document identifying where the expert opinions agree or differ;
- (c) that the expert's evidence in chief be limited to the contents of the expert's expert report;
- (d) that all factual evidence relevant to any expert's opinions be adduced before the expert is called to give evidence;
- (e) that on the completion of the factual evidence mentioned in paragraph (d), each expert swear an affidavit stating:
 - (i) whether the expert adheres to the previously expressed opinion; or
 - (ii) if the expert holds a different opinion;
 - (A) the opinion; and
 - (B) the factual evidence on which the opinion is based.
- (f) that the experts give evidence one after another;
- (g) that each expert be sworn at the same time and that the cross-examination and re-examination be conducted by putting to each expert in turn each question relevant to one subject or issue at a time, until the cross-examination or re-examination is completed;
- (h) that each expert gives an opinion about the other expert's opinion;
- (i) that the experts be cross-examined and re-examined in any particular manner or sequence.

Note 1: For the directions a Court may make before trial about expert reports and expert evidence, see rule 5.04 (items 14 to 19).

Note 2: The Court may dispense with compliance with the Rules and may make orders inconsistent with the Rules—see rules 1.34 and 1.35.



EXPERT EVIDENCE PRACTICE NOTE (GPN-EXPT)

General Practice Note

1. INTRODUCTION

- 1.1 This practice note, including the *Harmonised Expert Witness Code of Conduct* (“**Code**”) (see **Annexure A**) and the *Concurrent Expert Evidence Guidelines* (“**Concurrent Evidence Guidelines**”) (see **Annexure B**), applies to any proceeding involving the use of expert evidence and must be read together with:
- (a) the Central Practice Note (CPN-1), which sets out the fundamental principles concerning the National Court Framework (“**NCF**”) of the Federal Court and key principles of case management procedure;
 - (b) the Federal Court of Australia Act 1976 (Cth) (“**Federal Court Act**”);
 - (c) the *Evidence Act 1995* (Cth) (“**Evidence Act**”), including Part 3.3 of the Evidence Act;
 - (d) Part 23 of the *Federal Court Rules 2011* (Cth) (“**Federal Court Rules**”); and
 - (e) where applicable, the Survey Evidence Practice Note (GPN-SURV).
- 1.2 This practice note takes effect from the date it is issued and, to the extent practicable, applies to proceedings whether filed before, or after, the date of issuing.

2. APPROACH TO EXPERT EVIDENCE

- 2.1 An expert witness may be retained to give opinion evidence in the proceeding, or, in certain circumstances, to express an opinion that may be relied upon in alternative dispute resolution procedures such as mediation or a conference of experts. In some circumstances an expert may be appointed as an independent adviser to the Court.
- 2.2 The purpose of the use of expert evidence in proceedings, often in relation to complex subject matter, is for the Court to receive the benefit of the objective and impartial assessment of an issue from a witness with specialised knowledge (based on training, study or experience - see generally s 79 of the *Evidence Act*).
- 2.3 However, the use or admissibility of expert evidence remains subject to the overriding requirements that:
- (a) to be admissible in a proceeding, any such evidence must be relevant (s 56 of the *Evidence Act*); and
 - (b) even if relevant, any such evidence, may be refused to be admitted by the Court if its probative value is outweighed by other considerations such as the evidence

being unfairly prejudicial, misleading or will result in an undue waste of time (s 135 of the Evidence Act).

- 2.4 An expert witness' opinion evidence may have little or no value unless the assumptions adopted by the expert (ie. the facts or grounds relied upon) and his or her reasoning are expressly stated in any written report or oral evidence given.
- 2.5 The Court will ensure that, in the interests of justice, parties are given a reasonable opportunity to adduce and test relevant expert opinion evidence. However, the Court expects parties and any legal representatives acting on their behalf, when dealing with expert witnesses and expert evidence, to at all times comply with their duties associated with the overarching purpose in the Federal Court Act (see ss 37M and 37N).

3. INTERACTION WITH EXPERT WITNESSES

- 3.1 Parties and their legal representatives should never view an expert witness retained (or partly retained) by them as that party's advocate or "hired gun". Equally, they should never attempt to pressure or influence an expert into conforming his or her views with the party's interests.
- 3.2 A party or legal representative should be cautious not to have inappropriate communications when retaining or instructing an independent expert, or assisting an independent expert in the preparation of his or her evidence. However, it is important to note that there is no principle of law or practice and there is nothing in this practice note that obliges a party to embark on the costly task of engaging a "consulting expert" in order to avoid "contamination" of the expert who will give evidence. Indeed the Court would generally discourage such costly duplication.
- 3.3 Any witness retained by a party for the purpose of preparing a report or giving evidence in a proceeding as to an opinion held by the witness that is wholly or substantially based in the specialised knowledge of the witness¹ should, at the earliest opportunity, be provided with:
 - (a) a copy of this practice note, including the Code (see Annexure A); and
 - (b) all relevant information (whether helpful or harmful to that party's case) so as to enable the expert to prepare a report of a truly independent nature.
- 3.4 Any questions or assumptions provided to an expert should be provided in an unbiased manner and in such a way that the expert is not confined to addressing selective, irrelevant or immaterial issues.

¹ Such a witness includes a "Court expert" as defined in r 23.01 of the Federal Court Rules. For the definition of "expert", "expert evidence" and "expert report" see the Dictionary, in Schedule 1 of the Federal Court Rules.

4. ROLE AND DUTIES OF THE EXPERT WITNESS

- 4.1 The role of the expert witness is to provide relevant and impartial evidence in his or her area of expertise. An expert should never mislead the Court or become an advocate for the cause of the party that has retained the expert.
- 4.2 It should be emphasised that there is nothing inherently wrong with experts disagreeing or failing to reach the same conclusion. The Court will, with the assistance of the evidence of the experts, reach its own conclusion.
- 4.3 However, experts should willingly be prepared to change their opinion or make concessions when it is necessary or appropriate to do so, even if doing so would be contrary to any previously held or expressed view of that expert.

Harmonised Expert Witness Code of Conduct

- 4.4 Every expert witness giving evidence in this Court must read the *Harmonised Expert Witness Code of Conduct* (attached in Annexure A) and agree to be bound by it.
- 4.5 The Code is not intended to address all aspects of an expert witness' duties, but is intended to facilitate the admission of opinion evidence, and to assist experts to understand in general terms what the Court expects of them. Additionally, it is expected that compliance with the Code will assist individual expert witnesses to avoid criticism (rightly or wrongly) that they lack objectivity or are partisan.

5. CONTENTS OF AN EXPERT'S REPORT AND RELATED MATERIAL

- 5.1 The contents of an expert's report must conform with the requirements set out in the Code (including clauses 3 to 5 of the Code).
- 5.2 In addition, the contents of such a report must also comply with r 23.13 of the *Federal Court Rules*. Given that the requirements of that rule significantly overlap with the requirements in the Code, an expert, unless otherwise directed by the Court, will be taken to have complied with the requirements of r 23.13 if that expert has complied with the requirements in the Code and has complied with the additional following requirements. The expert shall:
 - (a) acknowledge in the report that:
 - (i) the expert has read and complied with this practice note and agrees to be bound by it; and
 - (ii) the expert's opinions are based wholly or substantially on specialised knowledge arising from the expert's training, study or experience;
 - (b) identify in the report the questions that the expert was asked to address;
 - (c) sign the report and attach or exhibit to it copies of:
 - (i) documents that record any instructions given to the expert; and

- (ii) documents and other materials that the expert has been instructed to consider.

5.3 Where an expert's report refers to photographs, plans, calculations, analyses, measurements, survey reports or other extrinsic matter, these must be provided to the other parties at the same time as the expert's report.

6. CASE MANAGEMENT CONSIDERATIONS

6.1 Parties intending to rely on expert evidence at trial are expected to consider between them and inform the Court at the earliest opportunity of their views on the following:

- (a) whether a party should adduce evidence from more than one expert in any single discipline;
- (b) whether a common expert is appropriate for all or any part of the evidence;
- (c) the nature and extent of expert reports, including any in reply;
- (d) the identity of each expert witness that a party intends to call, their area(s) of expertise and availability during the proposed hearing;
- (e) the issues that it is proposed each expert will address;
- (f) the arrangements for a conference of experts to prepare a joint-report (see Part 7 of this practice note);
- (g) whether the evidence is to be given concurrently and, if so, how (see Part 8 of this practice note); and
- (h) whether any of the evidence in chief can be given orally.

6.2 It will often be desirable, before any expert is retained, for the parties to attempt to agree on the question or questions proposed to be the subject of expert evidence as well as the relevant facts and assumptions. The Court may make orders to that effect where it considers it appropriate to do so.

7. CONFERENCE OF EXPERTS AND JOINT-REPORT

7.1 Parties, their legal representatives and experts should be familiar with aspects of the Code relating to conferences of experts and joint-reports (see clauses 6 and 7 of the Code attached in [Annexure A](#)).

7.2 In order to facilitate the proper understanding of issues arising in expert evidence and to manage expert evidence in accordance with the overarching purpose, the Court may require experts who are to give evidence or who have produced reports to meet for the purpose of identifying and addressing the issues not agreed between them with a view to reaching agreement where this is possible ("**conference of experts**"). In an appropriate case, the Court may appoint a registrar of the Court or some other suitably qualified person ("**Conference Facilitator**") to act as a facilitator at the conference of experts.

- 7.3 It is expected that where expert evidence may be relied on in any proceeding, at the earliest opportunity, parties will discuss and then inform the Court whether a conference of experts and/or a joint-report by the experts may be desirable to assist with or simplify the giving of expert evidence in the proceeding. The parties should discuss the necessary arrangements for any conference and/or joint-report. The arrangements discussed between the parties should address:
- (a) who should prepare any joint-report;
 - (b) whether a list of issues is needed to assist the experts in the conference and, if so, whether the Court, the parties or the experts should assist in preparing such a list;
 - (c) the agenda for the conference of experts; and
 - (d) arrangements for the provision, to the parties and the Court, of any joint-report or any other report as to the outcomes of the conference ("**conference report**").

Conference of Experts

- 7.4 The purpose of the conference of experts is for the experts to have a comprehensive discussion of issues relating to their field of expertise, with a view to identifying matters and issues in a proceeding about which the experts agree, partly agree or disagree and why. For this reason the conference is attended only by the experts and any Conference Facilitator. Unless the Court orders otherwise, the parties' lawyers will not attend the conference but will be provided with a copy of any conference report.
- 7.5 The Court may order that a conference of experts occur in a variety of circumstances, depending on the views of the judge and the parties and the needs of the case, including:
- (a) while a case is in mediation. When this occurs the Court may also order that the outcome of the conference or any document disclosing or summarising the experts' opinions be confidential to the parties while the mediation is occurring;
 - (b) before the experts have reached a final opinion on a relevant question or the facts involved in a case. When this occurs the Court may order that the parties exchange draft expert reports and that a conference report be prepared for the use of the experts in finalising their reports;
 - (c) after the experts' reports have been provided to the Court but before the hearing of the experts' evidence. When this occurs the Court may also order that a conference report be prepared (jointly or otherwise) to ensure the efficient hearing of the experts' evidence.
- 7.6 Subject to any other order or direction of the Court, the parties and their lawyers must not involve themselves in the conference of experts process. In particular, they must not seek to encourage an expert not to agree with another expert or otherwise seek to influence the outcome of the conference of experts. The experts should raise any queries they may have in relation to the process with the Conference Facilitator (if one has been appointed) or in

accordance with a protocol agreed between the lawyers prior to the conference of experts taking place (if no Conference Facilitator has been appointed).

- 7.7 Any list of issues prepared for the consideration of the experts as part of the conference of experts process should be prepared using non-tendentious language.
- 7.8 The timing and location of the conference of experts will be decided by the judge or a registrar who will take into account the location and availability of the experts and the Court's case management timetable. The conference may take place at the Court and will usually be conducted in-person. However, if not considered a hindrance to the process, the conference may also be conducted with the assistance of visual or audio technology (such as via the internet, video link and/or by telephone).
- 7.9 Experts should prepare for a conference of experts by ensuring that they are familiar with all of the material upon which they base their opinions. Where expert reports in draft or final form have been exchanged prior to the conference, experts should attend the conference familiar with the reports of the other experts. Prior to the conference, experts should also consider where they believe the differences of opinion lie between them and what processes and discussions may assist to identify and refine those areas of difference.

Joint-report

- 7.10 At the conclusion of the conference of experts, unless the Court considers it unnecessary to do so, it is expected that the experts will have narrowed the issues in respect of which they agree, partly agree or disagree in a joint-report. The joint-report should be clear, plain and concise and should summarise the views of the experts on the identified issues, including a succinct explanation for any differences of opinion, and otherwise be structured in the manner requested by the judge or registrar.
- 7.11 In some cases (and most particularly in some native title cases), depending on the nature, volume and complexity of the expert evidence a judge may direct a registrar to draft part, or all, of a conference report. If so, the registrar will usually provide the draft conference report to the relevant experts and seek their confirmation that the conference report accurately reflects the opinions of the experts expressed at the conference. Once that confirmation has been received the registrar will finalise the conference report and provide it to the intended recipient(s).

8. CONCURRENT EXPERT EVIDENCE

- 8.1 The Court may determine that it is appropriate, depending on the nature of the expert evidence and the proceeding generally, for experts to give some or all of their evidence concurrently at the final (or other) hearing.
- 8.2 Parties should familiarise themselves with the *Concurrent Expert Evidence Guidelines* (attached in Annexure B). The Concurrent Evidence Guidelines are not intended to be exhaustive but indicate the circumstances when the Court might consider it appropriate for

concurrent expert evidence to take place, outline how that process may be undertaken, and assist experts to understand in general terms what the Court expects of them.

- 8.3 If an order is made for concurrent expert evidence to be given at a hearing, any expert to give such evidence should be provided with the Concurrent Evidence Guidelines well in advance of the hearing and should be familiar with those guidelines before giving evidence.

9. FURTHER PRACTICE INFORMATION AND RESOURCES

- 9.1 Further information regarding Expert Evidence and Expert Witnesses is available on the Court's website.
- 9.2 Further information to assist litigants, including a range of helpful guides, is also available on the Court's website. This information may be particularly helpful for litigants who are representing themselves.

J L B ALLSOP
Chief Justice
25 October 2016

HARMONISED EXPERT WITNESS CODE OF CONDUCT²

APPLICATION OF CODE

1. This Code of Conduct applies to any expert witness engaged or appointed:
 - (a) to provide an expert's report for use as evidence in proceedings or proposed proceedings; or
 - (b) to give opinion evidence in proceedings or proposed proceedings.

GENERAL DUTIES TO THE COURT

2. An expert witness is not an advocate for a party and has a paramount duty, overriding any duty to the party to the proceedings or other person retaining the expert witness, to assist the Court impartially on matters relevant to the area of expertise of the witness.

CONTENT OF REPORT

3. Every report prepared by an expert witness for use in Court shall clearly state the opinion or opinions of the expert and shall state, specify or provide:
 - (a) the name and address of the expert;
 - (b) an acknowledgment that the expert has read this code and agrees to be bound by it;
 - (c) the qualifications of the expert to prepare the report;
 - (d) the assumptions and material facts on which each opinion expressed in the report is based [a letter of instructions may be annexed];
 - (e) the reasons for and any literature or other materials utilised in support of such opinion;
 - (f) (if applicable) that a particular question, issue or matter falls outside the expert's field of expertise;
 - (g) any examinations, tests or other investigations on which the expert has relied, identifying the person who carried them out and that person's qualifications;
 - (h) the extent to which any opinion which the expert has expressed involves the acceptance of another person's opinion, the identification of that other person and the opinion expressed by that other person;
 - (i) a declaration that the expert has made all the inquiries which the expert believes are desirable and appropriate (save for any matters identified explicitly in the report), and that no matters of significance which the expert regards as relevant have, to the

² Approved by the Council of Chief Justices' Rules Harmonisation Committee

- knowledge of the expert, been withheld from the Court;
- (j) any qualifications on an opinion expressed in the report without which the report is or may be incomplete or inaccurate;
 - (k) whether any opinion expressed in the report is not a concluded opinion because of insufficient research or insufficient data or for any other reason; and
 - (l) where the report is lengthy or complex, a brief summary of the report at the beginning of the report.

SUPPLEMENTARY REPORT FOLLOWING CHANGE OF OPINION

- 4. Where an expert witness has provided to a party (or that party's legal representative) a report for use in Court, and the expert thereafter changes his or her opinion on a material matter, the expert shall forthwith provide to the party (or that party's legal representative) a supplementary report which shall state, specify or provide the information referred to in paragraphs (a), (d), (e), (g), (h), (i), (j), (k) and (l) of clause 3 of this code and, if applicable, paragraph (f) of that clause.
- 5. In any subsequent report (whether prepared in accordance with clause 4 or not) the expert may refer to material contained in the earlier report without repeating it.

DUTY TO COMPLY WITH THE COURT'S DIRECTIONS

- 6. If directed to do so by the Court, an expert witness shall:
 - (a) confer with any other expert witness;
 - (b) provide the Court with a joint-report specifying (as the case requires) matters agreed and matters not agreed and the reasons for the experts not agreeing; and
 - (c) abide in a timely way by any direction of the Court.

CONFERENCE OF EXPERTS

- 7. Each expert witness shall:
 - (a) exercise his or her independent judgment in relation to every conference in which the expert participates pursuant to a direction of the Court and in relation to each report thereafter provided, and shall not act on any instruction or request to withhold or avoid agreement; and
 - (b) endeavour to reach agreement with the other expert witness (or witnesses) on any issue in dispute between them, or failing agreement, endeavour to identify and clarify the basis of disagreement on the issues which are in dispute.

ANNEXURE B

CONCURRENT EXPERT EVIDENCE GUIDELINES

APPLICATION OF THE COURT'S GUIDELINES

1. The Court's Concurrent Expert Evidence Guidelines ("**Concurrent Evidence Guidelines**") are intended to inform parties, practitioners and experts of the Court's general approach to concurrent expert evidence, the circumstances in which the Court might consider expert witnesses giving evidence concurrently and, if so, the procedures by which their evidence may be taken.

OBJECTIVES OF CONCURRENT EXPERT EVIDENCE TECHNIQUE

2. The use of concurrent evidence for the giving of expert evidence at hearings as a case management technique³ will be utilised by the Court in appropriate circumstances (see r 23.15 of the *Federal Court Rules 2011* (Cth)). Not all cases will suit the process. For instance, in some patent cases, where the entire case revolves around conflicts within fields of expertise, concurrent evidence may not assist a judge. However, patent cases should not be excluded from concurrent expert evidence processes.
3. In many cases the use of concurrent expert evidence is a technique that can reduce the partisan or confrontational nature of conventional hearing processes and minimises the risk that experts become "opposing experts" rather than independent experts assisting the Court. It can elicit more precise and accurate expert evidence with greater input and assistance from the experts themselves.
4. When properly and flexibly applied, with efficiency and discipline during the hearing process, the technique may also allow the experts to more effectively focus on the critical points of disagreement between them, identify or resolve those issues more quickly, and narrow the issues in dispute. This can also allow for the key evidence to be given at the same time (rather than being spread across many days of hearing); permit the judge to assess an expert more readily, whilst allowing each party a genuine opportunity to put and test expert evidence. This can reduce the chance of the experts, lawyers and the judge misunderstanding the opinions being expressed by the experts.
5. It is essential that such a process has the full cooperation and support of all of the individuals involved, including the experts and counsel involved in the questioning process. Without that cooperation and support the process may fail in its objectives and even hinder the case management process.

³ Also known as the "hot tub" or as "expert panels".

CASE MANAGEMENT

6. Parties should expect that, the Court will give careful consideration to whether concurrent evidence is appropriate in circumstances where there is more than one expert witness having the same expertise who is to give evidence on the same or related topics. Whether experts should give evidence concurrently is a matter for the Court, and will depend on the circumstances of each individual case, including the character of the proceeding, the nature of the expert evidence, and the views of the parties.
7. Although this consideration may take place at any time, including the commencement of the hearing, if not raised earlier, parties should raise the issue of concurrent evidence at the first appropriate case management hearing, and no later than any pre-trial case management hearing, so that orders can be made in advance, if necessary. To that end, prior to the hearing at which expert evidence may be given concurrently, parties and their lawyers should confer and give general consideration as to:
 - (a) the agenda;
 - (b) the order and manner in which questions will be asked; and
 - (c) whether cross-examination will take place within the context of the concurrent evidence or after its conclusion.
8. At the same time, and before any hearing date is fixed, the identity of all experts proposed to be called and their areas of expertise is to be notified to the Court by all parties.
9. The lack of any concurrent evidence orders does not mean that the Court will not consider using concurrent evidence without prior notice to the parties, if appropriate.

CONFERENCE OF EXPERTS & JOINT-REPORT OR LIST OF ISSUES

10. The process of giving concurrent evidence at hearings may be assisted by the preparation of a joint-report or list of issues prepared as part of a conference of experts.
11. Parties should expect that, where concurrent evidence is appropriate, the Court may make orders requiring a conference of experts to take place or for documents such as a joint-report to be prepared to facilitate the concurrent expert evidence process at a hearing (see Part 7 of the Expert Evidence Practice Note).

PROCEDURE AT HEARING

12. Concurrent expert evidence may be taken at any convenient time during the hearing, although it will often occur at the conclusion of both parties' lay evidence.
13. At the hearing itself, the way in which concurrent expert evidence is taken must be applied flexibly and having regard to the characteristics of the case and the nature of the evidence to be given.
14. Without intending to be prescriptive of the procedure, parties should expect that, when evidence is given by experts in concurrent session:

- (a) the judge will explain to the experts the procedure that will be followed and that the nature of the process may be different to their previous experiences of giving expert evidence;
- (b) the experts will be grouped and called to give evidence together in their respective fields of expertise;
- (c) the experts will take the oath or affirmation together, as appropriate;
- (d) the experts will sit together with convenient access to their materials for their ease of reference, either in the witness box or in some other location in the courtroom, including (if necessary) at the bar table;
- (e) each expert may be given the opportunity to provide a summary overview of their current opinions and explain what they consider to be the principal issues of disagreement between the experts, as they see them, in their own words;
- (f) the judge will guide the process by which evidence is given, including, where appropriate:
 - (i) using any joint-report or list of issues as a guide for all the experts to be asked questions by the judge and counsel, about each issue on an issue-by-issue basis;
 - (ii) ensuring that each expert is given an adequate opportunity to deal with each issue and the exposition given by other experts including, where considered appropriate, each expert asking questions of other experts or supplementing the evidence given by other experts;
 - (iii) inviting legal representatives to identify the topics upon which they will cross-examine;
 - (iv) ensuring that legal representatives have an adequate opportunity to ask all experts questions about each issue. Legal representatives may also seek responses or contributions from one or more experts in response to the evidence given by a different expert; and
 - (v) allowing the experts an opportunity to summarise their views at the end of the process where opinions may have been changed or clarifications are needed.

15. The fact that the experts may have been provided with a list of issues for consideration does not confine the scope of any cross-examination of any expert. The process of cross-examination remains subject to the overall control of the judge.
16. The concurrent session should allow for a sensible and orderly series of exchanges between expert and expert, and between expert and lawyer. Where appropriate, the judge may allow for more traditional cross-examination to be pursued by a legal representative on a particular issue exclusively with one expert. Where that occurs, other experts may be asked to comment on the evidence given.
17. Where any issue involves only one expert, the party wishing to ask questions about that issue should let the judge know in advance so that consideration can be given to whether

arrangements should be made for that issue to be dealt with after the completion of the concurrent session. Otherwise, as far as practicable, questions (including in the form of cross-examination) will usually be dealt with in the concurrent session.

18. Throughout the concurrent evidence process the judge will ensure that the process is fair and effective (for the parties and the experts), balanced (including not permitting one expert to overwhelm or overshadow any other expert), and does not become a protracted or inefficient process.

ANNEXURE B- QUESTIONS TO EXPERT

1. In your opinion, what are the potential total greenhouse gas emissions arising from the exploration and exploitation of gas fields in the Beetaloo sub-basin? Please provide your opinion assuming each of the following scenarios and using emissions factors developed under the *National Greenhouse Accounts Factors 2021* or an appropriate equivalent:
 - a. That the Beetaloo sub-basin holds more than 200,000 PJ of gas, all of which is recovered;
 - b. That the Beetaloo sub-basin holds more than 200,000 PJ of gas, 10% of which is recovered; and
 - c. That EP187 has a best estimate prospective gas resource 3,446 BCF and a best estimate of prospective condensate resource of 27 MMBL, all of which will be recovered.

Please provide reasoning for your answer.

2. In your opinion, what are the potential annual total greenhouse gas emissions arising from the exploration and exploitation of a new shale gasfield or gasfields in the Beetaloo sub-basin producing 1,240 PJ/y? Please provide reasoning for your answer.

ANNEXURE C – INDEX TO BRIEF

No.	Document	Date
PLEADINGS		
1.	Originating Application	28 July 2021
2.	Concise Statement	16 August 2021
LEGISLATION		
3.	<i>Industry Research and Development (Beetaloo Cooperative Drilling Program) Instrument 2021 (the Instrument)</i>	11 May 2021
4.	Explanatory Statement to the Instrument	13 May 2021
DOCUMENTS BEFORE THE MINISTER WHEN MAKING THE INSTRUMENT		
5.	Ministerial Submission issued by the Department of Industry of Industry, Science, Energy and Resources to the Minister for Resources, Water and Northern Australia making recommendations in respect of the making of the Instrument (Ministerial Recommendation)– MLO version	23 April 2021
6.	Attachment A to the Ministerial Recommendation – <i>Industry Research and Development (Beetaloo Cooperative Drilling Program) Instrument 2021</i> (Draft)	23 April 2021
7.	Attachment B to the Ministerial Recommendation – Explanatory Statement	23 April 2021
8.	Attachment C to the Ministerial Recommendation – Background Brief	23 April 2021
9.	Signed Ministerial Recommendation approving the making of the Instrument	11 May 2021
EMPIRE APPLICATION FOR FUNDING		
10.	Imperial Application for Beetaloo Grant – Empire Beetaloo Acceleration Program Carpentaria-2 Horizontal Well (BCP00001)	7 April 2021
11.	BCP00001 Application Annexure A – Project Budget	7 April 2021
12.	Imperial Application for Beetaloo Grant – Empire Beetaloo Acceleration Program Carpentaria-3 Horizontal Well' (BCP00002)	7 April 2021
13.	BCP00002 Application Annexure A – Project Budget	7 April 2021
14.	Imperial Application for Beetaloo Grant – Empire Beetaloo Acceleration Program Carpentaria-4 and 3D Seismic (BCP00003)	7 April 2021
15.	BCP00003 Application Annexure A – Project Budget	7 April 2021
DOCUMENTS RELATING TO APPROVAL OF THE APPLICATIONS		
16.	DISER Eligibility and Completeness Checklist for BCP00001 completed by Mario Pricone (Assessor) and Janet Lau (QA Officer)	7-8 May 2021
17.	DISER Eligibility and Completeness Checklist for BCP00002 completed by Mario Pricone (Assessor) and Janet Lau (QA Officer)	7-8 May 2021

18.	DISER Eligibility and Completeness Checklist for BCP00003 completed by Mario Pricone (Assessor) and Janet Lau (QA Officer)	7 -8 May 2021
19.	Meeting Minutes of the Beetaloo Cooperative Drilling Program Assessment Committee (Assessment Committee) Meeting on 27 May 2021 and 1 June 2021	1 June 2021 and 7 June 2021
20.	Attachment A to the Meeting Minutes of Assessment Committee Meeting- Excel spreadsheet of all Program applications	27 May 2021
21.	Attachment C to the Meeting Minutes of the Assessment Committee Meeting – Questions from Committee to Imperial and Imperial's responses	1 June 2021
22.	Scorecard (Summary)- Assessment Committee member Daniel Quin	
23.	Scorecard (Summary)- Assessment Committee member Merrie-Ellen Gunning	
24.	Scorecard for BCDP000001 - Assessment Committee member Louis Gomatos	
25.	Scorecard for BCDP000002 - Assessment Committee member Louis Gomatos	
26.	Scorecard for BCDP000003 - Assessment Committee member Louis Gomatos	
DOCUMENTS BEFORE THE MINISTER WHEN MAKING THE DECISION		
27.	Ministerial Submission issued by the Department of Industry of Industry, Science, Energy and Resources to the Minister for Resources, Water and Northern Australia making recommendations in respect of the Decision (Ministerial Recommendation)- MLO version	16 June 2021
28.	Minister's signed Decision approving Ministerial Recommendation	17 June 2021
29.	Annexure A to Ministerial Recommendation – BCDP Recommended Projects	17 June 2021
30.	Annexure B to Ministerial Recommendation – Program Guidelines	17 June 2021
31.	Annexure C to Ministerial Recommendation – Governance and Program Background	17 June 2021
32.	Annexure D to Ministerial Recommendation – Legal Advice (Redacted – Subject to LPP)	17 June 2021
DECISION ANNOUNCEMENTS		
33.	Minister's Media Release on the Decision	7 July 2021
34.	Empire Energy ASX Announcement on the Decision	8 July 2021
RELEVANT OTHER DOCUMENTS		
35.	'Unlocking the Beetaloo – The Beetaloo Strategic Basin Plan'	Jan 2021
36.	Commonwealth Grants Rules and Guidelines 2017	Current

37.	Final Report of the Scientific Inquiry into Hydraulic Fracturing in the Northern Territory	April 2018
RELEVANT IMPERIAL DOCUMENTS		
38.	Empire Energy ASX announcement entitled "Material Beetaloo Resource Upgrade"	22 February 2021
39.	Morgans report entitled "Backing the Beetaloo" published on Empire Energy's 'Investors' section of website	26 November 2020
ENVIRONMENTAL MANAGEMENT PLANS (EMPS) FOR EP187		
IMP2-04 – Imperial 2019 Drilling Program NT Exploration Permit 187 - APPROVED		
40.	Imperial Environmental Management Plan IMP2-04	Submitted 22 August 2019
41.	Attachment to Imperial EMP IMP2-04 – Emergency Response Plan	Submitted 22 August 2019
42.	NT Government EPA advice in respect of IMP2-04	6 January 2020
43.	NT Government – Approval Notice and Statement of Reasons	2 March 2020
IMP2-6.1 – Imperial 2020-21 Drilling Program NT Exploration Permit 187 - APPROVED		
44.	Imperial Environmental Management Plan IMP2-6.1	Submitted 30 June 2020
45.	Attachments to EMP IMP2-6.1	Submitted 30 June 2020
46.	NT Government EPA advice in respect of IMP2-6.1	9 September 2020
47.	NT Government – Approval Notice and Statement of Reasons	30 September 2020
48.	EP187 Groundwater monitoring results	25 March - 22 October 2020
49.	Imperial Drilling Fluid waste water analysis from the Carpentaria-1 Well site	28 October 2020
IMP3-4 – Hydraulic fracturing and extended production testing of the existing Carpentaria-1 Vertical exploration well on EP187 – APPROVED		
50.	Imperial Environmental Management Plan IMP3-4	Submitted 17 November 2020
51.	Appendices to IMP3-4	Submitted 17 November 2020
52.	NT Government EPA advice in respect of IMP3-4	5 February 2021
53.	NT Government – Approval Notice and Statement of Reasons	15 February 2021

Certificate of Annexure HS-2

No. NSD758 of 2021

Federal Court of Australia

District Registry: New South Wales

Division: General

Environment Centre NT Inc

Applicant

Minister for Resources and Water and another

Respondents

This and the following 41 pages form Annexure HS-2 to the Affidavit of Dr Hugh Saddler affirmed on 10 September 2021 before me.

Signature of witness

Name: Ruby Hamilton

Qualification: Solicitor

POTENTIAL GREENHOUSE GAS EMISSIONS FROM ESTIMATED GAS RESOURCES IN THE BEETALOO BASIN

Dr Hugh Saddler

Executive Summary

1. I have been asked to provide estimates of the potential total greenhouse gas emissions arising from the exploration and exploitation of gas fields in the Beetaloo Basin (**Basin**).
2. I provide the following estimates (rounded to two significant figures) of greenhouse gas emissions:
 - a. Combustion of 200,000 petajoules (PJ) of gas will cause emissions of 10,000 megatonnes of carbon dioxide equivalent (Mt CO₂-e).
 - b. Combustion of 10% of 200,000 PJ of gas will release 1,000 Mt CO₂-e, assuming that “recovered” means the total volume of gas extracted from the gas field, prior to gathering and processing.
 - c. Combustion of 3,447 billion cubic feet (BCF) of gas will cause emissions of 190 Mt CO₂-e, and combustion of 27 million barrels of oil (mmbbl) of condensate will cause emissions of 8.7 Mt CO₂-e, making total emissions of 200 Mt CO₂-e.
 - d. Combustion of 1,240 PJ of gas per annum from a new Beetaloo Basin shale gas field will result in the annual emission of approximately 64 Mt CO₂-e.

Introduction

3. This report was prepared in response to an expert brief dated 27 August 2021 provided to me by the Environmental Defenders Office Ltd (EDO), acting on behalf of the Environment Centre Northern Territory (ECNT). A copy of my expert letter of instruction is at **Appendix A** to this report.

Acknowledgment

4. I have read, understood and agree to be bound by all provisions of the Expert Evidence Practice Note, of the Federal Court, including the Harmonised Expert Witness Code of Conduct and the Concurrent Expert Evidence Guidelines.
5. I confirm that the opinions expressed in this report are based wholly or substantially on specialised knowledge arising from my training, study or experience.

Training, study and experience

6. My formal qualifications are a Bachelor of Science Degree, with Honours from the University of Adelaide, and a PhD from Cambridge University, where I was awarded a prize for my thesis. A copy of my curriculum vitae is provided as **Appendix B** to this report
7. My general experience arises from working professionally as an expert and as a consultant in the general fields of energy policy, economics and technology assessment, including, but not restricted to, work on the effects of energy production and use on the environment. My first professional engagement with the relationship between energy and greenhouse gas emissions was in 1988.

8. In 1996 I was contracted, through my majority owned company, by the Commonwealth Government to prepare the first complete inventory of Australia's greenhouse gas emissions arising from energy combustion, other than for transport, for every year from 1990 to 1995, and was subsequently contracted to prepare similar inventories for every subsequent year up to and including 2003. Over this period I was also contracted, jointly with two other contents, to prepare the first Australian workbooks to assist businesses to compile corporate emissions inventories.
9. In 2001, on the recommendation of the Commonwealth Government, I was appointed to the UNFCCC Roster of Experts, as an energy sector inventory specialist, in which role I was a member of international teams reviewing the national greenhouse gas inventories of a number of other countries. Over the years I have also been a member of other expert committees, review panels and similar in Australia. A selection of these includes:
 - a. 2011 -Date : Member, User Reference Group for the National Greenhouse Gas Inventory
 - b. 2013 - CRC Committee nominated member, Performance Review Panel, CRC for Greenhouse Gas Technologies.2002-05 : Member, ACT Sustainability Expert Reference Group
 - c. 2001-02: Member, Committee EV/15 – Carbon Accounting, Standards Association of Australia.
 - d. 2001: Member, Technical Panel, Second year review of CRC for Greenhouse Accounting.
10. For the past six years I have been an Honorary Associate Professor in the Crawford School of Public Policy, at the Australian National University, and prior to that had a similar honorary position at the Fenner School of Environment and Society. In this capacity I have published several research papers through the Crawford School's Centre for Climate Economics and Policy, and from time to time am invited to present seminars, lectures and the like.

Questions

11. I have been asked to provide estimates of the potential total greenhouse gas emissions arising from the exploration and exploitation of gas fields in the Beetaloo Basin (**Basin**), under the following scenarios:
 - a. that 200,000 petajoules (**PJ**) of gas will eventually be recovered,
 - b. that only 10% of this quantity will eventually be recovered,
 - c. from EP187 within the Basin, if it contains a total resource of 3.447 billion cubic feet (**BCF**) of gas and 27 million barrels of oil (**mmbbl**) of condensate.
12. I was also asked to estimate the annual greenhouse gas emissions resulting from the production of a new shale gas field in the Basin production gas at the rate of 1,240 PJ/year.

Basis of estimations

13. The estimation process I have followed involves three distinct steps.
14. *The first step* is to convert imperial units (BCF, mmbbl) to metric. Reflecting its foundational strength in the USA, the use of imperial units continues to be widespread in the oil and gas industry, but, outside the USA, use of metric units is universal in Australia and internationally.
15. *The second step* is to convert these volumes of gas and condensate into units of energy content, because emission factors for hydrocarbons (step 3) are commonly defined in terms of energy content. This second step therefore requires that values are selected for key physical

characteristics of the gas and condensate referred to in the questions. The relevant characteristics are density and energy content (often termed heat or calorific value). These parameter values vary across a range because they depend on the precise chemical composition of the gas and condensate. In both cases this composition can vary, both between oil and gas fields and, to some extent, within fields. This variation is much wider in the case of condensate than in the case of gas. In the absence of more detailed data in the statement provided by Empire to the ASX, on which this expert statement relies, it has been necessary to use representative values, based on relevant technical literature. Wherever possible I have used official Commonwealth Government publications for this purpose. While this approach necessarily introduces some uncertainty into the results of the calculation, these uncertainties are small - they are most unlikely to be more than a few per cent.

16. *The third step* is to calculate the emissions which would arise when the specified quantities of gas and condensate undergo combustion. For this purpose, what are called energy combustion emission factors are used. The values of these factors depend on the carbon content of the fuels and also, to some extent, the type of combustion equipment in which they are used. I have used what are called the National Greenhouse Accounts Factors. These factors are published each year by the Commonwealth Government, based on the most recent National Greenhouse Gas Inventory. They are default emission factors which, in the words of the government website where they are found “.....provide method[s] that help companies and individuals estimate greenhouse emissions”. The website goes on to state “*The methods we use at the national level, reflected in the factors, are consistent with international guidelines. They are subject to international expert review each year*”.
17. The three steps described here result in estimates of greenhouse gas emissions arising from the combustion of the specified quantities of gas and condensate. Exploitation of these resources will also result in what are called fugitive emissions of methane, which is a powerful greenhouse gas. Assuming that exploitation proceeds on the basis of best oil and gas field practice, I consider that fugitive emissions are most likely to be small, but not zero. This means that the emission estimates provided below are most likely to be a small under-estimate of actual emissions which could occur.

Estimations of greenhouse gas emissions

18. My estimations have been made using the following assumptions and parameter values,
19. For natural gas:
 - 1 BCF is equal to 28.3 million cubic metres (m³).
 - The average energy content of Australian natural gas is 37.9 MJ/m³ (*Guide to Australian energy statistics 2020*, Table 5.5).
 - Combustion emission factor for gas produced is 0.0515 kg CO₂-e/MJ (*National greenhouse accounts factors 2021*, Table 2).
20. For condensate:
 - 1 bbl is equal to 159 litres (L).
 - The average energy content of condensate is 33 MJ/L.
 - Combustion emission factor for condensate is 0.0613 t CO₂-e/GJ (*National greenhouse accounts factors 2021*, Table 3).

Overall emission factors

21. Using the assumptions and accepted conversion factors specified above, the combustion emission factors for the Beetaloo Basin commodities are:

- a. for gas 55.2 kt CO₂-e per BCF and
 51.5 kt CO₂-e per PJ
- b. for condensate 322 kt CO₂-e per mmbbl.

Answers to questions

22. Note that all estimates have been rounded to two significant figures:

- a. Combustion of 200,000 PJ of gas will cause emissions of 10,000 Mt CO₂-e.
- b. Combustion of 10% of 200,000 PJ of gas will release 1,000 Mt CO₂-e, assuming that “recovered” means the total volume of gas extracted from the gas field, prior to gathering and processing.
- c. Combustion of 3,447 BCF of gas will cause emissions of 190 Mt CO₂-e, and combustion of 27 mmbbl of condensate will cause emissions of 8.7 Mt CO₂-e, making total emissions of 200 Mt CO₂-e.
- d. Combustion of 1,240 PJ of gas per annum from a new Beetaloo Basin shale gas field will result in the annual emission of approximately 64 Mt CO₂-e.

.....
4 September 2021

References

Guide to the Australian Energy Statistics 2020. <https://www.energy.gov.au/publications/australian-energy-update-2020>

National Greenhouse Accounts Factors 2021. <https://www.industry.gov.au/data-and-publications/national-greenhouse-accounts-factors-2021>



27 August 2021

Dr Hugh Saddler
Honorary Associate Professor
Crawford School of Public Policy
Australian National University

By email: hugh.saddler@strategypolicyresearch.com.au

CONFIDENTIAL AND SUBJECT TO LEGAL PROFESSIONAL PRIVILEGE

Dear Dr Hugh Saddler

**Environment Centre NT Inc v Minister for Resources and Water & Anor
Federal Court of Australia Proceedings no. NSD758/2021**

1. We act for the Environmental Centre NT Inc (**ECNT**), who is the peak community sector environmental organisation in the Northern Territory. ECNT engages in activities aimed at protecting and conserving the environment of the NT, including in relation to climate change.
2. Our client, ECNT, has commenced proceedings in the Federal Court of Australia (**Proceedings**) against the Minister for Resources and Water (**Minister**) and the Commonwealth of Australia (**Commonwealth**) alleging that:
 - a. the Minister's making of the *Industry Research and Development (Beetaloo Cooperative Drilling Program) Instrument 2021* (Cth) (the **Instrument**); and
 - b. the Minister's decision to award up to \$21 million in grants to Imperial Oil and Gas (**Imperial**) pursuant to the Beetaloo Cooperative Drilling Program (**the Program**) (the **Decision**)

were unlawful in circumstances where the Minister:

- a. breached s 71 (1) of the *Public Governance, Performance and Accountability Act 2013* (Cth) (**the PGPA Act**) by failing to make reasonable inquiries in respect of climate change risks. S 71(1) requires that the Minister must not approve a proposed expenditure of relevant money unless the Minister is satisfied, after making reasonable inquiries, that the expenditure is a "proper use" of relevant money, where "proper" is defined as a use that is "efficient, effective, economical and ethical"; and
- b. acted in a way that was legally unreasonable and/or illogical and/or irrational, by failing to have regard to and/or failing to have adequate regard to, climate change risks.

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3. We are instructed to engage you to act as an expert witness under Part 23 (rules 23.01-23.15) of the *Federal Court Rules 2011* (Cth) (**FC Rules**) and the Expert Evidence Practice Note (GPN-EXPT) (**Expert Evidence Practice Note**), including the Harmonised Expert Witness Code of Conduct (**Code of Conduct**). Part 23 of the FC Rules and the Expert Evidence Practice Note is set out in **Annexure A** to this letter.
4. Your role as an expert witness is to assist the Court impartially on matters relevant to your area of expertise. You are not to act as an advocate for our clients and any opinion expressed must be genuinely held by you based on your professional training, knowledge, or experience.
5. Please read those documents carefully before you commence the work requested. **Your expert report must contain an acknowledgment that you have read the Code of Conduct and that you agree to be bound by it.** Otherwise your report will be inadmissible as evidence. Your role as an expert witness is to assist the Court impartially on matters relevant to your area of expertise. You are not to act as an advocate for our clients and any opinion expressed must be genuinely held by you based on your professional training, knowledge, or experience.

Overview of the Work Required

6. The work we require involves the following:
 - a. reviewing the relevant documentation;
 - b. preparing a written expert report that conforms with the Code of Conduct and addresses our questions (questions located at **Annexure B**);
 - c. reviewing the Respondent's expert report(s) (if necessary);
 - d. conferring with the Respondent's expert(s) at a joint conference(s) and prepare a joint report, which sets out the matters agreed, matters disagreed, and the reasons for agreement and disagreement as a result of the joint conference(s) (if necessary); and
 - e. appearance as an expert witness in the Court (if required).
7. We request that you provide us with a draft of your expert report for review before finalising it. The purpose of this is not to influence the conclusions or recommendations you make but to ensure that the report is clear and addresses the issues adequately to inform the Court.

Background

8. The following information is provided to assist your consideration of the matters on which are you asked to provide expert advice. Please note that you are not permitted to express an opinion on any question of law in your report and your report should confine itself to the relevant issues of fact within your area of expertise.
9. The independent *Scientific Inquiry into Hydraulic Fracturing of Onshore Unconventional Reservoirs in the Northern Territory* (**Fracking Inquiry**) was commissioned by the Northern Territory Government under the *Inquires Act 1945* (NT) and its Terms of Reference required it to investigate the environmental, social and economic risks and impacts of hydraulic fracturing (commonly known as fracking) of onshore unconventional gas reservoirs and associated activities in the Northern Territory.

10. The Fracking Inquiry handed down its Final Report to the Northern Territory Government on Tuesday 27 March 2018. Amongst other things, the Fracking Inquiry identified that a best estimate indicative later development scenario for the exploitation of a new shale gasfield or gasfields in the Beetaloo sub-basin would equate to gas production of 1,240 petajoules per year (**PJ/y**).¹
11. The Fracking Inquiry further noted that in this later development scenario, it is assumed that 2,740 TJ/day is used for liquid natural gas (**LNG**) export and 660 terajoules per day (**TJ/day**) is used for domestic gas consumption.²
12. On 15 September 2020, the Prime Minister of Australia, the Minister for Energy and Emissions Reduction, and the Minister for Resources and Water (**Minister**) announced that Australia will be pursuing a “Gas-led recovery.”³ One of the elements of the Gas-led Recovery was the unlocking of five key gas basins, starting with the Beetaloo basin in the Northern Territory.⁴
13. On 17 December 2020, the Minister announced a \$50 million subsidy program for Beetaloo exploration to “fast-track drilling by providing grants to cover 25% of eligible exploration costs, capped at \$7.5 million per well and 3 wells per exploration venture.”⁵ The Minister further announced that it was estimated that the Beetaloo sub-basin could hold more than 200,000 petajoules of gas.⁶
14. In or about January 2021, the Minister issued the Beetaloo Strategic Basin Plan entitled ‘Unlocking the Beetaloo,’ which set out some details of the Program.
15. On 22 February 2021, Empire Energy Group Ltd (**Empire**), the Australian Stock Exchange (**ASX**) listed parent company of Imperial, published an announcement to the ASX relating to a Material Beetaloo Resource Upgrade. This statement included, amongst other things, the information that Empire has:
 - a. a best estimate prospective gas resource of 3,446 billion cubic feet (**BCF**); and
 - b. a best estimate of prospective condensate resource of 27 million barrels of petroleum liquids (**MMBL**).
16. On 18 March 2021, the Department of Industry, Science, Energy and Resources (**DISER**) issued the ‘Beetaloo Cooperative Drilling Program – Grant Opportunity Guidelines’ (**Guidelines**) and a standard Grant Agreement (**Standard Grant Agreement**). The Guidelines govern the provision of grants under the Program.
17. On 7 April 2021 Imperial submitted three applications seeking a total of \$21,806,453 of funding under the Program, comprising of:
 - a. Application BCD000001, seeking \$7,314,081 in funding in respect of a project entitled ‘Carpentaria-2 Horizontal Well’;

¹ Fracking Inquiry, p 227.

² Fracking Inquiry, p 227.

³ <https://www.pm.gov.au/media/gas-fired-recovery>

⁴ Ibid.

⁵ <https://www.minister.industry.gov.au/ministers/pitt/media-releases/beetaloo-strategic-plan-will-unlock-gas-jobs-and-development>

⁶ Ibid.

- b. Application BCDP000002, seeking \$6,992,372 in funding in respect of a project entitled 'Carpentaria-3 Horizontal Well'; and
- c. Application BCDP000003, seeking \$7,500,000 in funding in respect of a project entitled 'Carpentaria-4 and 3D Seismic'

(together, **the Applications**).

- 18. Between 7 May and 8 May 2021 the Applications were the subject of DISER review.
- 19. On 11 May 2021, the Minister made the Instrument and purported to prescribe the Program as a program under s 33 of the *Industry Research and Development Act 1986* (Cth) (the **IRD Act**).
- 20. On 28 May 2021 and 1 June 2021 an Assessment Committee in respect of the Program (**Assessment Committee**) met to consider the Applications.
- 21. On 1 June 2021 the Assessment Committee resolved that the Applications were satisfactory (subject to some limitations/conditions ⁷) and resolved to recommend to the Minister that they be approved for funding under the Program.
- 22. On 17 June 2021, following receipt of a DISER brief recommending that the Minister approve the three Applications (subject to the conditions set out by the Assessment Committee⁸), the Minister approved the Applications. On 7 July 2021, the Minister announced the Decision, by way of publication of a Media Release (**Announcement**).
- 23. On 8 July 2021, Empire Energy Group Ltd, the Australian Stock Exchange (**ASX**) listed parent company of Imperial, published an announcement to the ASX relating to the Decision and Announcement.

Expert Brief

- 24. We will provide, by way of separate email, a link to an electronic a brief of documents for your review. **Annexure C** contains an index to these documents.

Timeframe

- 25. Under the current Court orders, your expert report will be due to be filed and served by 10 September 2021. We therefore request a draft of your advice by no later than Monday **6 September 2021**.
- 26. We will notify you of further relevant dates in the Proceedings as they become available.

Fees and Terms

- 27. Thank you for agreeing to provide this advice on a pro bono basis.
- 28. Please note the following terms:
 - a. Your work will only be used by EDO in relation to this matter;

⁷ Conditions set out on page 5 to 7 of the Meeting Minutes of the Beetaloo Cooperative Drilling Program Assessment Committee (**Assessment Committee**) Meeting on 1 June 2021 – At tab 19 of the Brief.

⁸See Annexure A to Ministerial Recommendation – BCDP Recommended Projects – At tab 29 of the Brief.

- b. EDO will take all reasonable steps to prevent your work being used for purposes other than that mentioned above, but we accept no responsibility for the actions of third parties;
- c. Regardless of the above points, EDO may choose not to use your work;
- d. You will not be covered by EDO's insurance while undertaking the above tasks.

Duty of Confidentiality

29. Please treat your work as strictly confidential, unless authorised by us.

If you would like to discuss this retainer further, please contact us at anna.gudkov@edo.org.au.

Yours sincerely,

Environmental Defenders Office

Anna Gudkov

Senior Lawyer (Gas/Corporate)

Ref: s1952

Part 23—Experts

Division 23.1—Court experts

23.01 Appointment of Court expert

- (1) A party may apply to the Court for an order:
 - (a) that an expert be appointed (a ***Court expert***) to inquire into and report on any question or on any facts relevant to any question arising in a proceeding; and
 - (b) fixing the Court expert's remuneration, including the cost of preparing the expert's report; and
 - (c) for the Court expert's attendance before the Court; and
 - (d) terminating the liability to pay the Court expert's remuneration.

Note 1: ***Expert*** is defined in the Dictionary.

Note 2: The Court may give instructions relating to the inquiry and report including the carrying out of an experiment or test.

Note 3: The Court may make an order of its own motion—see rule 1.40.

- (2) If the Court makes an order under paragraph (1)(b), the expert's remuneration is payable jointly and severally by the parties.

23.02 Court expert's report

- (1) The Court expert must provide the report to the Court within the time fixed by the Court.

Note: A Registrar will provide a copy of the report to any party interested in the question.
- (2) The Court expert's report must:
 - (a) be signed by the Court expert; and
 - (b) contain particulars of the training, study or experience by which the Court expert has acquired specialised knowledge; and
 - (c) identify the questions that the Court expert was asked to address; and
 - (d) set out separately each of the factual findings or assumptions on which the Court expert's opinion is based; and
 - (e) set out separately from the factual findings or assumptions each of the Court expert's opinions; and
 - (f) set out the reasons for those opinions; and
 - (g) contain an acknowledgement that the opinions are based wholly or substantially on the specialised knowledge mentioned in paragraph (b).

23.03 Court expert's report—use at trial

- (1) A report that complies with rule 23.02 will be admissible at trial as the evidence of the Court expert.

Note: Section 177 of the *Evidence Act 1995* deals with the tender of an expert's report.

- (2) A party may apply to the Court for an order:
- (a) to cross-examine a Court expert before or at trial; and
 - (b) if the cross-examination is to take place before trial—that the cross-examination take place before a Registrar or an examiner.

Note: *Examiner* is defined in the Dictionary.

23.04 Other expert's reports on the question

A party who has delivered to another party interested in the question a copy of another expert's report that complies with Division 23.2 may apply to the Court for leave to adduce the evidence of the other expert on the question.

Note: The question is referred to in rule 23.02.

Rules 23.05–23.10 left blank

Rule 23.11

Division 23.2—Parties' expert witnesses and expert reports

23.11 Calling expert evidence at trial

A party may call an expert to give expert evidence at a trial only if the party has:

- (a) delivered an expert report that complies with rule 23.13 to all other parties; and
- (b) otherwise complied with this Division.

Note: *Expert* and *expert report* are defined in the Dictionary.

23.12 Provision of guidelines to an expert

If a party intends to retain an expert to give an expert report or to give expert evidence, the party must first give the expert any practice note dealing with guidelines for expert witnesses in proceedings in the Court (the *Practice Note*).

Note: A copy of any practice notes may be obtained from the District Registry or downloaded from the Court's website at <http://www.fedcourt.gov.au>.

23.13 Contents of an expert report

- (1) An expert report must:
 - (a) be signed by the expert who prepared the report; and
 - (b) contain an acknowledgement at the beginning of the report that the expert has read, understood and complied with the Practice Note; and
 - (c) contain particulars of the training, study or experience by which the expert has acquired specialised knowledge; and
 - (d) identify the questions that the expert was asked to address; and
 - (e) set out separately each of the factual findings or assumptions on which the expert's opinion is based; and
 - (f) set out separately from the factual findings or assumptions each of the expert's opinions; and
 - (g) set out the reasons for each of the expert's opinions; and
 - (ga) contain an acknowledgement that the expert's opinions are based wholly or substantially on the specialised knowledge mentioned in paragraph (c); and
 - (h) comply with the Practice Note.
- (2) Any subsequent expert report of the same expert on the same question need not contain the information in paragraphs (1)(b) and (c).

23.14 Application for expert report

A party may apply to the Court for an order that another party provide copies of that other party's expert report.

23.15 Evidence of experts

If 2 or more parties to a proceeding intend to call experts to give opinion evidence about a similar question, any of those parties may apply to the Court for one or more of the following orders:

- (a) that the experts confer, either before or after writing their expert reports;
- (b) that the experts produce to the Court a document identifying where the expert opinions agree or differ;
- (c) that the expert's evidence in chief be limited to the contents of the expert's expert report;
- (d) that all factual evidence relevant to any expert's opinions be adduced before the expert is called to give evidence;
- (e) that on the completion of the factual evidence mentioned in paragraph (d), each expert swear an affidavit stating:
 - (i) whether the expert adheres to the previously expressed opinion; or
 - (ii) if the expert holds a different opinion;
 - (A) the opinion; and
 - (B) the factual evidence on which the opinion is based.
- (f) that the experts give evidence one after another;
- (g) that each expert be sworn at the same time and that the cross-examination and re-examination be conducted by putting to each expert in turn each question relevant to one subject or issue at a time, until the cross-examination or re-examination is completed;
- (h) that each expert gives an opinion about the other expert's opinion;
- (i) that the experts be cross-examined and re-examined in any particular manner or sequence.

Note 1: For the directions a Court may make before trial about expert reports and expert evidence, see rule 5.04 (items 14 to 19).

Note 2: The Court may dispense with compliance with the Rules and may make orders inconsistent with the Rules—see rules 1.34 and 1.35.



EXPERT EVIDENCE PRACTICE NOTE (GPN-EXPT)

General Practice Note

1. INTRODUCTION

- 1.1 This practice note, including the *Harmonised Expert Witness Code of Conduct* (“**Code**”) (see **Annexure A**) and the *Concurrent Expert Evidence Guidelines* (“**Concurrent Evidence Guidelines**”) (see **Annexure B**), applies to any proceeding involving the use of expert evidence and must be read together with:
- (a) the Central Practice Note (CPN-1), which sets out the fundamental principles concerning the National Court Framework (“**NCF**”) of the Federal Court and key principles of case management procedure;
 - (b) the Federal Court of Australia Act 1976 (Cth) (“**Federal Court Act**”);
 - (c) the *Evidence Act 1995* (Cth) (“**Evidence Act**”), including Part 3.3 of the Evidence Act;
 - (d) Part 23 of the *Federal Court Rules 2011* (Cth) (“**Federal Court Rules**”); and
 - (e) where applicable, the Survey Evidence Practice Note (GPN-SURV).
- 1.2 This practice note takes effect from the date it is issued and, to the extent practicable, applies to proceedings whether filed before, or after, the date of issuing.

2. APPROACH TO EXPERT EVIDENCE

- 2.1 An expert witness may be retained to give opinion evidence in the proceeding, or, in certain circumstances, to express an opinion that may be relied upon in alternative dispute resolution procedures such as mediation or a conference of experts. In some circumstances an expert may be appointed as an independent adviser to the Court.
- 2.2 The purpose of the use of expert evidence in proceedings, often in relation to complex subject matter, is for the Court to receive the benefit of the objective and impartial assessment of an issue from a witness with specialised knowledge (based on training, study or experience - see generally s 79 of the *Evidence Act*).
- 2.3 However, the use or admissibility of expert evidence remains subject to the overriding requirements that:
- (a) to be admissible in a proceeding, any such evidence must be relevant (s 56 of the *Evidence Act*); and
 - (b) even if relevant, any such evidence, may be refused to be admitted by the Court if its probative value is outweighed by other considerations such as the evidence

being unfairly prejudicial, misleading or will result in an undue waste of time (s 135 of the Evidence Act).

- 2.4 An expert witness' opinion evidence may have little or no value unless the assumptions adopted by the expert (ie. the facts or grounds relied upon) and his or her reasoning are expressly stated in any written report or oral evidence given.
- 2.5 The Court will ensure that, in the interests of justice, parties are given a reasonable opportunity to adduce and test relevant expert opinion evidence. However, the Court expects parties and any legal representatives acting on their behalf, when dealing with expert witnesses and expert evidence, to at all times comply with their duties associated with the overarching purpose in the Federal Court Act (see ss 37M and 37N).

3. INTERACTION WITH EXPERT WITNESSES

- 3.1 Parties and their legal representatives should never view an expert witness retained (or partly retained) by them as that party's advocate or "hired gun". Equally, they should never attempt to pressure or influence an expert into conforming his or her views with the party's interests.
- 3.2 A party or legal representative should be cautious not to have inappropriate communications when retaining or instructing an independent expert, or assisting an independent expert in the preparation of his or her evidence. However, it is important to note that there is no principle of law or practice and there is nothing in this practice note that obliges a party to embark on the costly task of engaging a "consulting expert" in order to avoid "contamination" of the expert who will give evidence. Indeed the Court would generally discourage such costly duplication.
- 3.3 Any witness retained by a party for the purpose of preparing a report or giving evidence in a proceeding as to an opinion held by the witness that is wholly or substantially based in the specialised knowledge of the witness¹ should, at the earliest opportunity, be provided with:
 - (a) a copy of this practice note, including the Code (see Annexure A); and
 - (b) all relevant information (whether helpful or harmful to that party's case) so as to enable the expert to prepare a report of a truly independent nature.
- 3.4 Any questions or assumptions provided to an expert should be provided in an unbiased manner and in such a way that the expert is not confined to addressing selective, irrelevant or immaterial issues.

¹ Such a witness includes a "Court expert" as defined in r 23.01 of the Federal Court Rules. For the definition of "expert", "expert evidence" and "expert report" see the Dictionary, in Schedule 1 of the Federal Court Rules.

4. ROLE AND DUTIES OF THE EXPERT WITNESS

- 4.1 The role of the expert witness is to provide relevant and impartial evidence in his or her area of expertise. An expert should never mislead the Court or become an advocate for the cause of the party that has retained the expert.
- 4.2 It should be emphasised that there is nothing inherently wrong with experts disagreeing or failing to reach the same conclusion. The Court will, with the assistance of the evidence of the experts, reach its own conclusion.
- 4.3 However, experts should willingly be prepared to change their opinion or make concessions when it is necessary or appropriate to do so, even if doing so would be contrary to any previously held or expressed view of that expert.

Harmonised Expert Witness Code of Conduct

- 4.4 Every expert witness giving evidence in this Court must read the *Harmonised Expert Witness Code of Conduct* (attached in Annexure A) and agree to be bound by it.
- 4.5 The Code is not intended to address all aspects of an expert witness' duties, but is intended to facilitate the admission of opinion evidence, and to assist experts to understand in general terms what the Court expects of them. Additionally, it is expected that compliance with the Code will assist individual expert witnesses to avoid criticism (rightly or wrongly) that they lack objectivity or are partisan.

5. CONTENTS OF AN EXPERT'S REPORT AND RELATED MATERIAL

- 5.1 The contents of an expert's report must conform with the requirements set out in the Code (including clauses 3 to 5 of the Code).
- 5.2 In addition, the contents of such a report must also comply with r 23.13 of the *Federal Court Rules*. Given that the requirements of that rule significantly overlap with the requirements in the Code, an expert, unless otherwise directed by the Court, will be taken to have complied with the requirements of r 23.13 if that expert has complied with the requirements in the Code and has complied with the additional following requirements. The expert shall:
 - (a) acknowledge in the report that:
 - (i) the expert has read and complied with this practice note and agrees to be bound by it; and
 - (ii) the expert's opinions are based wholly or substantially on specialised knowledge arising from the expert's training, study or experience;
 - (b) identify in the report the questions that the expert was asked to address;
 - (c) sign the report and attach or exhibit to it copies of:
 - (i) documents that record any instructions given to the expert; and

- (ii) documents and other materials that the expert has been instructed to consider.

5.3 Where an expert's report refers to photographs, plans, calculations, analyses, measurements, survey reports or other extrinsic matter, these must be provided to the other parties at the same time as the expert's report.

6. CASE MANAGEMENT CONSIDERATIONS

6.1 Parties intending to rely on expert evidence at trial are expected to consider between them and inform the Court at the earliest opportunity of their views on the following:

- (a) whether a party should adduce evidence from more than one expert in any single discipline;
- (b) whether a common expert is appropriate for all or any part of the evidence;
- (c) the nature and extent of expert reports, including any in reply;
- (d) the identity of each expert witness that a party intends to call, their area(s) of expertise and availability during the proposed hearing;
- (e) the issues that it is proposed each expert will address;
- (f) the arrangements for a conference of experts to prepare a joint-report (see Part 7 of this practice note);
- (g) whether the evidence is to be given concurrently and, if so, how (see Part 8 of this practice note); and
- (h) whether any of the evidence in chief can be given orally.

6.2 It will often be desirable, before any expert is retained, for the parties to attempt to agree on the question or questions proposed to be the subject of expert evidence as well as the relevant facts and assumptions. The Court may make orders to that effect where it considers it appropriate to do so.

7. CONFERENCE OF EXPERTS AND JOINT-REPORT

7.1 Parties, their legal representatives and experts should be familiar with aspects of the Code relating to conferences of experts and joint-reports (see clauses 6 and 7 of the Code attached in [Annexure A](#)).

7.2 In order to facilitate the proper understanding of issues arising in expert evidence and to manage expert evidence in accordance with the overarching purpose, the Court may require experts who are to give evidence or who have produced reports to meet for the purpose of identifying and addressing the issues not agreed between them with a view to reaching agreement where this is possible ("**conference of experts**"). In an appropriate case, the Court may appoint a registrar of the Court or some other suitably qualified person ("**Conference Facilitator**") to act as a facilitator at the conference of experts.

- 7.3 It is expected that where expert evidence may be relied on in any proceeding, at the earliest opportunity, parties will discuss and then inform the Court whether a conference of experts and/or a joint-report by the experts may be desirable to assist with or simplify the giving of expert evidence in the proceeding. The parties should discuss the necessary arrangements for any conference and/or joint-report. The arrangements discussed between the parties should address:
- (a) who should prepare any joint-report;
 - (b) whether a list of issues is needed to assist the experts in the conference and, if so, whether the Court, the parties or the experts should assist in preparing such a list;
 - (c) the agenda for the conference of experts; and
 - (d) arrangements for the provision, to the parties and the Court, of any joint-report or any other report as to the outcomes of the conference ("**conference report**").

Conference of Experts

- 7.4 The purpose of the conference of experts is for the experts to have a comprehensive discussion of issues relating to their field of expertise, with a view to identifying matters and issues in a proceeding about which the experts agree, partly agree or disagree and why. For this reason the conference is attended only by the experts and any Conference Facilitator. Unless the Court orders otherwise, the parties' lawyers will not attend the conference but will be provided with a copy of any conference report.
- 7.5 The Court may order that a conference of experts occur in a variety of circumstances, depending on the views of the judge and the parties and the needs of the case, including:
- (a) while a case is in mediation. When this occurs the Court may also order that the outcome of the conference or any document disclosing or summarising the experts' opinions be confidential to the parties while the mediation is occurring;
 - (b) before the experts have reached a final opinion on a relevant question or the facts involved in a case. When this occurs the Court may order that the parties exchange draft expert reports and that a conference report be prepared for the use of the experts in finalising their reports;
 - (c) after the experts' reports have been provided to the Court but before the hearing of the experts' evidence. When this occurs the Court may also order that a conference report be prepared (jointly or otherwise) to ensure the efficient hearing of the experts' evidence.
- 7.6 Subject to any other order or direction of the Court, the parties and their lawyers must not involve themselves in the conference of experts process. In particular, they must not seek to encourage an expert not to agree with another expert or otherwise seek to influence the outcome of the conference of experts. The experts should raise any queries they may have in relation to the process with the Conference Facilitator (if one has been appointed) or in

accordance with a protocol agreed between the lawyers prior to the conference of experts taking place (if no Conference Facilitator has been appointed).

- 7.7 Any list of issues prepared for the consideration of the experts as part of the conference of experts process should be prepared using non-tendentious language.
- 7.8 The timing and location of the conference of experts will be decided by the judge or a registrar who will take into account the location and availability of the experts and the Court's case management timetable. The conference may take place at the Court and will usually be conducted in-person. However, if not considered a hindrance to the process, the conference may also be conducted with the assistance of visual or audio technology (such as via the internet, video link and/or by telephone).
- 7.9 Experts should prepare for a conference of experts by ensuring that they are familiar with all of the material upon which they base their opinions. Where expert reports in draft or final form have been exchanged prior to the conference, experts should attend the conference familiar with the reports of the other experts. Prior to the conference, experts should also consider where they believe the differences of opinion lie between them and what processes and discussions may assist to identify and refine those areas of difference.

Joint-report

- 7.10 At the conclusion of the conference of experts, unless the Court considers it unnecessary to do so, it is expected that the experts will have narrowed the issues in respect of which they agree, partly agree or disagree in a joint-report. The joint-report should be clear, plain and concise and should summarise the views of the experts on the identified issues, including a succinct explanation for any differences of opinion, and otherwise be structured in the manner requested by the judge or registrar.
- 7.11 In some cases (and most particularly in some native title cases), depending on the nature, volume and complexity of the expert evidence a judge may direct a registrar to draft part, or all, of a conference report. If so, the registrar will usually provide the draft conference report to the relevant experts and seek their confirmation that the conference report accurately reflects the opinions of the experts expressed at the conference. Once that confirmation has been received the registrar will finalise the conference report and provide it to the intended recipient(s).

8. CONCURRENT EXPERT EVIDENCE

- 8.1 The Court may determine that it is appropriate, depending on the nature of the expert evidence and the proceeding generally, for experts to give some or all of their evidence concurrently at the final (or other) hearing.
- 8.2 Parties should familiarise themselves with the *Concurrent Expert Evidence Guidelines* (attached in Annexure B). The Concurrent Evidence Guidelines are not intended to be exhaustive but indicate the circumstances when the Court might consider it appropriate for

concurrent expert evidence to take place, outline how that process may be undertaken, and assist experts to understand in general terms what the Court expects of them.

- 8.3 If an order is made for concurrent expert evidence to be given at a hearing, any expert to give such evidence should be provided with the Concurrent Evidence Guidelines well in advance of the hearing and should be familiar with those guidelines before giving evidence.

9. FURTHER PRACTICE INFORMATION AND RESOURCES

- 9.1 Further information regarding Expert Evidence and Expert Witnesses is available on the Court's website.
- 9.2 Further information to assist litigants, including a range of helpful guides, is also available on the Court's website. This information may be particularly helpful for litigants who are representing themselves.

J L B ALLSOP
Chief Justice
25 October 2016

HARMONISED EXPERT WITNESS CODE OF CONDUCT²

APPLICATION OF CODE

1. This Code of Conduct applies to any expert witness engaged or appointed:
 - (a) to provide an expert's report for use as evidence in proceedings or proposed proceedings; or
 - (b) to give opinion evidence in proceedings or proposed proceedings.

GENERAL DUTIES TO THE COURT

2. An expert witness is not an advocate for a party and has a paramount duty, overriding any duty to the party to the proceedings or other person retaining the expert witness, to assist the Court impartially on matters relevant to the area of expertise of the witness.

CONTENT OF REPORT

3. Every report prepared by an expert witness for use in Court shall clearly state the opinion or opinions of the expert and shall state, specify or provide:
 - (a) the name and address of the expert;
 - (b) an acknowledgment that the expert has read this code and agrees to be bound by it;
 - (c) the qualifications of the expert to prepare the report;
 - (d) the assumptions and material facts on which each opinion expressed in the report is based [a letter of instructions may be annexed];
 - (e) the reasons for and any literature or other materials utilised in support of such opinion;
 - (f) (if applicable) that a particular question, issue or matter falls outside the expert's field of expertise;
 - (g) any examinations, tests or other investigations on which the expert has relied, identifying the person who carried them out and that person's qualifications;
 - (h) the extent to which any opinion which the expert has expressed involves the acceptance of another person's opinion, the identification of that other person and the opinion expressed by that other person;
 - (i) a declaration that the expert has made all the inquiries which the expert believes are desirable and appropriate (save for any matters identified explicitly in the report), and that no matters of significance which the expert regards as relevant have, to the

² Approved by the Council of Chief Justices' Rules Harmonisation Committee

- knowledge of the expert, been withheld from the Court;
- (j) any qualifications on an opinion expressed in the report without which the report is or may be incomplete or inaccurate;
 - (k) whether any opinion expressed in the report is not a concluded opinion because of insufficient research or insufficient data or for any other reason; and
 - (l) where the report is lengthy or complex, a brief summary of the report at the beginning of the report.

SUPPLEMENTARY REPORT FOLLOWING CHANGE OF OPINION

- 4. Where an expert witness has provided to a party (or that party's legal representative) a report for use in Court, and the expert thereafter changes his or her opinion on a material matter, the expert shall forthwith provide to the party (or that party's legal representative) a supplementary report which shall state, specify or provide the information referred to in paragraphs (a), (d), (e), (g), (h), (i), (j), (k) and (l) of clause 3 of this code and, if applicable, paragraph (f) of that clause.
- 5. In any subsequent report (whether prepared in accordance with clause 4 or not) the expert may refer to material contained in the earlier report without repeating it.

DUTY TO COMPLY WITH THE COURT'S DIRECTIONS

- 6. If directed to do so by the Court, an expert witness shall:
 - (a) confer with any other expert witness;
 - (b) provide the Court with a joint-report specifying (as the case requires) matters agreed and matters not agreed and the reasons for the experts not agreeing; and
 - (c) abide in a timely way by any direction of the Court.

CONFERENCE OF EXPERTS

- 7. Each expert witness shall:
 - (a) exercise his or her independent judgment in relation to every conference in which the expert participates pursuant to a direction of the Court and in relation to each report thereafter provided, and shall not act on any instruction or request to withhold or avoid agreement; and
 - (b) endeavour to reach agreement with the other expert witness (or witnesses) on any issue in dispute between them, or failing agreement, endeavour to identify and clarify the basis of disagreement on the issues which are in dispute.

ANNEXURE B

CONCURRENT EXPERT EVIDENCE GUIDELINES

APPLICATION OF THE COURT'S GUIDELINES

1. The Court's Concurrent Expert Evidence Guidelines ("**Concurrent Evidence Guidelines**") are intended to inform parties, practitioners and experts of the Court's general approach to concurrent expert evidence, the circumstances in which the Court might consider expert witnesses giving evidence concurrently and, if so, the procedures by which their evidence may be taken.

OBJECTIVES OF CONCURRENT EXPERT EVIDENCE TECHNIQUE

2. The use of concurrent evidence for the giving of expert evidence at hearings as a case management technique³ will be utilised by the Court in appropriate circumstances (see r 23.15 of the *Federal Court Rules 2011* (Cth)). Not all cases will suit the process. For instance, in some patent cases, where the entire case revolves around conflicts within fields of expertise, concurrent evidence may not assist a judge. However, patent cases should not be excluded from concurrent expert evidence processes.
3. In many cases the use of concurrent expert evidence is a technique that can reduce the partisan or confrontational nature of conventional hearing processes and minimises the risk that experts become "opposing experts" rather than independent experts assisting the Court. It can elicit more precise and accurate expert evidence with greater input and assistance from the experts themselves.
4. When properly and flexibly applied, with efficiency and discipline during the hearing process, the technique may also allow the experts to more effectively focus on the critical points of disagreement between them, identify or resolve those issues more quickly, and narrow the issues in dispute. This can also allow for the key evidence to be given at the same time (rather than being spread across many days of hearing); permit the judge to assess an expert more readily, whilst allowing each party a genuine opportunity to put and test expert evidence. This can reduce the chance of the experts, lawyers and the judge misunderstanding the opinions being expressed by the experts.
5. It is essential that such a process has the full cooperation and support of all of the individuals involved, including the experts and counsel involved in the questioning process. Without that cooperation and support the process may fail in its objectives and even hinder the case management process.

³ Also known as the "hot tub" or as "expert panels".

CASE MANAGEMENT

6. Parties should expect that, the Court will give careful consideration to whether concurrent evidence is appropriate in circumstances where there is more than one expert witness having the same expertise who is to give evidence on the same or related topics. Whether experts should give evidence concurrently is a matter for the Court, and will depend on the circumstances of each individual case, including the character of the proceeding, the nature of the expert evidence, and the views of the parties.
7. Although this consideration may take place at any time, including the commencement of the hearing, if not raised earlier, parties should raise the issue of concurrent evidence at the first appropriate case management hearing, and no later than any pre-trial case management hearing, so that orders can be made in advance, if necessary. To that end, prior to the hearing at which expert evidence may be given concurrently, parties and their lawyers should confer and give general consideration as to:
 - (a) the agenda;
 - (b) the order and manner in which questions will be asked; and
 - (c) whether cross-examination will take place within the context of the concurrent evidence or after its conclusion.
8. At the same time, and before any hearing date is fixed, the identity of all experts proposed to be called and their areas of expertise is to be notified to the Court by all parties.
9. The lack of any concurrent evidence orders does not mean that the Court will not consider using concurrent evidence without prior notice to the parties, if appropriate.

CONFERENCE OF EXPERTS & JOINT-REPORT OR LIST OF ISSUES

10. The process of giving concurrent evidence at hearings may be assisted by the preparation of a joint-report or list of issues prepared as part of a conference of experts.
11. Parties should expect that, where concurrent evidence is appropriate, the Court may make orders requiring a conference of experts to take place or for documents such as a joint-report to be prepared to facilitate the concurrent expert evidence process at a hearing (see Part 7 of the Expert Evidence Practice Note).

PROCEDURE AT HEARING

12. Concurrent expert evidence may be taken at any convenient time during the hearing, although it will often occur at the conclusion of both parties' lay evidence.
13. At the hearing itself, the way in which concurrent expert evidence is taken must be applied flexibly and having regard to the characteristics of the case and the nature of the evidence to be given.
14. Without intending to be prescriptive of the procedure, parties should expect that, when evidence is given by experts in concurrent session:

- (a) the judge will explain to the experts the procedure that will be followed and that the nature of the process may be different to their previous experiences of giving expert evidence;
- (b) the experts will be grouped and called to give evidence together in their respective fields of expertise;
- (c) the experts will take the oath or affirmation together, as appropriate;
- (d) the experts will sit together with convenient access to their materials for their ease of reference, either in the witness box or in some other location in the courtroom, including (if necessary) at the bar table;
- (e) each expert may be given the opportunity to provide a summary overview of their current opinions and explain what they consider to be the principal issues of disagreement between the experts, as they see them, in their own words;
- (f) the judge will guide the process by which evidence is given, including, where appropriate:
 - (i) using any joint-report or list of issues as a guide for all the experts to be asked questions by the judge and counsel, about each issue on an issue-by-issue basis;
 - (ii) ensuring that each expert is given an adequate opportunity to deal with each issue and the exposition given by other experts including, where considered appropriate, each expert asking questions of other experts or supplementing the evidence given by other experts;
 - (iii) inviting legal representatives to identify the topics upon which they will cross-examine;
 - (iv) ensuring that legal representatives have an adequate opportunity to ask all experts questions about each issue. Legal representatives may also seek responses or contributions from one or more experts in response to the evidence given by a different expert; and
 - (v) allowing the experts an opportunity to summarise their views at the end of the process where opinions may have been changed or clarifications are needed.

15. The fact that the experts may have been provided with a list of issues for consideration does not confine the scope of any cross-examination of any expert. The process of cross-examination remains subject to the overall control of the judge.
16. The concurrent session should allow for a sensible and orderly series of exchanges between expert and expert, and between expert and lawyer. Where appropriate, the judge may allow for more traditional cross-examination to be pursued by a legal representative on a particular issue exclusively with one expert. Where that occurs, other experts may be asked to comment on the evidence given.
17. Where any issue involves only one expert, the party wishing to ask questions about that issue should let the judge know in advance so that consideration can be given to whether

arrangements should be made for that issue to be dealt with after the completion of the concurrent session. Otherwise, as far as practicable, questions (including in the form of cross-examination) will usually be dealt with in the concurrent session.

18. Throughout the concurrent evidence process the judge will ensure that the process is fair and effective (for the parties and the experts), balanced (including not permitting one expert to overwhelm or overshadow any other expert), and does not become a protracted or inefficient process.

ANNEXURE B- QUESTIONS TO EXPERT

1. In your opinion, what are the potential total greenhouse gas emissions arising from the exploration and exploitation of gas fields in the Beetaloo sub-basin? Please provide your opinion assuming each of the following scenarios and using emissions factors developed under the *National Greenhouse Accounts Factors 2021* or an appropriate equivalent:
 - a. That the Beetaloo sub-basin holds more than 200,000 PJ of gas, all of which is recovered;
 - b. That the Beetaloo sub-basin holds more than 200,000 PJ of gas, 10% of which is recovered; and
 - c. That EP187 has a best estimate prospective gas resource 3,446 BCF and a best estimate of prospective condensate resource of 27 MMBL, all of which will be recovered.

Please provide reasoning for your answer.

2. In your opinion, what are the potential annual total greenhouse gas emissions arising from the exploration and exploitation of a new shale gasfield or gasfields in the Beetaloo sub-basin producing 1,240 PJ/y? Please provide reasoning for your answer.

ANNEXURE C – INDEX TO BRIEF

No.	Document	Date
PLEADINGS		
1.	Originating Application	28 July 2021
2.	Concise Statement	16 August 2021
LEGISLATION		
3.	<i>Industry Research and Development (Beetaloo Cooperative Drilling Program) Instrument 2021 (the Instrument)</i>	11 May 2021
4.	Explanatory Statement to the Instrument	13 May 2021
DOCUMENTS BEFORE THE MINISTER WHEN MAKING THE INSTRUMENT		
5.	Ministerial Submission issued by the Department of Industry of Industry, Science, Energy and Resources to the Minister for Resources, Water and Northern Australia making recommendations in respect of the making of the Instrument (Ministerial Recommendation)– MLO version	23 April 2021
6.	Attachment A to the Ministerial Recommendation – <i>Industry Research and Development (Beetaloo Cooperative Drilling Program) Instrument 2021</i> (Draft)	23 April 2021
7.	Attachment B to the Ministerial Recommendation – Explanatory Statement	23 April 2021
8.	Attachment C to the Ministerial Recommendation – Background Brief	23 April 2021
9.	Signed Ministerial Recommendation approving the making of the Instrument	11 May 2021
EMPIRE APPLICATION FOR FUNDING		
10.	Imperial Application for Beetaloo Grant – Empire Beetaloo Acceleration Program Carpentaria-2 Horizontal Well (BCP00001)	7 April 2021
11.	BCP00001 Application Annexure A – Project Budget	7 April 2021
12.	Imperial Application for Beetaloo Grant – Empire Beetaloo Acceleration Program Carpentaria-3 Horizontal Well' (BCP00002)	7 April 2021
13.	BCP00002 Application Annexure A – Project Budget	7 April 2021
14.	Imperial Application for Beetaloo Grant – Empire Beetaloo Acceleration Program Carpentaria-4 and 3D Seismic (BCP00003)	7 April 2021
15.	BCP00003 Application Annexure A – Project Budget	7 April 2021
DOCUMENTS RELATING TO APPROVAL OF THE APPLICATIONS		
16.	DISER Eligibility and Completeness Checklist for BCP00001 completed by Mario Pricone (Assessor) and Janet Lau (QA Officer)	7-8 May 2021
17.	DISER Eligibility and Completeness Checklist for BCP00002 completed by Mario Pricone (Assessor) and Janet Lau (QA Officer)	7-8 May 2021

18.	DISER Eligibility and Completeness Checklist for BCP00003 completed by Mario Pricone (Assessor) and Janet Lau (QA Officer)	7 -8 May 2021
19.	Meeting Minutes of the Beetaloo Cooperative Drilling Program Assessment Committee (Assessment Committee) Meeting on 27 May 2021 and 1 June 2021	1 June 2021 and 7 June 2021
20.	Attachment A to the Meeting Minutes of Assessment Committee Meeting- Excel spreadsheet of all Program applications	27 May 2021
21.	Attachment C to the Meeting Minutes of the Assessment Committee Meeting – Questions from Committee to Imperial and Imperial's responses	1 June 2021
22.	Scorecard (Summary)- Assessment Committee member Daniel Quin	
23.	Scorecard (Summary)- Assessment Committee member Merrie-Ellen Gunning	
24.	Scorecard for BCDP000001 - Assessment Committee member Louis Gomatos	
25.	Scorecard for BCDP000002 - Assessment Committee member Louis Gomatos	
26.	Scorecard for BCDP000003 - Assessment Committee member Louis Gomatos	
DOCUMENTS BEFORE THE MINISTER WHEN MAKING THE DECISION		
27.	Ministerial Submission issued by the Department of Industry of Industry, Science, Energy and Resources to the Minister for Resources, Water and Northern Australia making recommendations in respect of the Decision (Ministerial Recommendation)- MLO version	16 June 2021
28.	Minister's signed Decision approving Ministerial Recommendation	17 June 2021
29.	Annexure A to Ministerial Recommendation – BCDP Recommended Projects	17 June 2021
30.	Annexure B to Ministerial Recommendation – Program Guidelines	17 June 2021
31.	Annexure C to Ministerial Recommendation – Governance and Program Background	17 June 2021
32.	Annexure D to Ministerial Recommendation – Legal Advice (Redacted – Subject to LPP)	17 June 2021
DECISION ANNOUNCEMENTS		
33.	Minister's Media Release on the Decision	7 July 2021
34.	Empire Energy ASX Announcement on the Decision	8 July 2021
RELEVANT OTHER DOCUMENTS		
35.	'Unlocking the Beetaloo – The Beetaloo Strategic Basin Plan'	Jan 2021
36.	Commonwealth Grants Rules and Guidelines 2017	Current

37.	Final Report of the Scientific Inquiry into Hydraulic Fracturing in the Northern Territory	April 2018
RELEVANT IMPERIAL DOCUMENTS		
38.	Empire Energy ASX announcement entitled "Material Beetaloo Resource Upgrade"	22 February 2021
39.	Morgans report entitled "Backing the Beetaloo" published on Empire Energy's 'Investors' section of website	26 November 2020
ENVIRONMENTAL MANAGEMENT PLANS (EMPS) FOR EP187		
IMP2-04 – Imperial 2019 Drilling Program NT Exploration Permit 187 - APPROVED		
40.	Imperial Environmental Management Plan IMP2-04	Submitted 22 August 2019
41.	Attachment to Imperial EMP IMP2-04 – Emergency Response Plan	Submitted 22 August 2019
42.	NT Government EPA advice in respect of IMP2-04	6 January 2020
43.	NT Government – Approval Notice and Statement of Reasons	2 March 2020
IMP2-6.1 – Imperial 2020-21 Drilling Program NT Exploration Permit 187 - APPROVED		
44.	Imperial Environmental Management Plan IMP2-6.1	Submitted 30 June 2020
45.	Attachments to EMP IMP2-6.1	Submitted 30 June 2020
46.	NT Government EPA advice in respect of IMP2-6.1	9 September 2020
47.	NT Government – Approval Notice and Statement of Reasons	30 September 2020
48.	EP187 Groundwater monitoring results	25 March - 22 October 2020
49.	Imperial Drilling Fluid waste water analysis from the Carpentaria-1 Well site	28 October 2020
IMP3-4 – Hydraulic fracturing and extended production testing of the existing Carpentaria-1 Vertical exploration well on EP187 – APPROVED		
50.	Imperial Environmental Management Plan IMP3-4	Submitted 17 November 2020
51.	Appendices to IMP3-4	Submitted 17 November 2020
52.	NT Government EPA advice in respect of IMP3-4	5 February 2021
53.	NT Government – Approval Notice and Statement of Reasons	15 February 2021

CURRICULUM VITAE

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NATIONALITY: Australian

FORMAL QUALIFICATIONS: BSc(Hons) Adelaide, 1965; PhD Cantab., 1969

CURRENT EMPLOYMENT

Par time independent consultant

PREVIOUS CAREER

2009-2016 : Principal Consultant – Energy Strategies, **pitt&sherry** (part time)

1996- 2008: Managing Director, Energy Strategies Pty Ltd

1982-97 Director, Economic and Energy Analysis Pty Ltd

1982-83: Visiting Fellow, Centre for Resource and Environmental Studies, Australian National University (part time).

1977-82: Research Fellow, Resource Economics Group, Centre for Resource and Environmental Studies, Australian National University.

1975-77: Seconded to the Commonwealth Department of Environment, Housing and Community Development as Research Officer, Ranger Uranium Environmental Inquiry.

1974-77: Research Fellow, School of Biological Sciences and Energy Research Centre, University of Sydney.

1972-74: General Secretary, British Society for Social Responsibility in Science, London; part time independent consultant on energy and environment issues.

1969-72: Consultant, Scientific Planning Division, Metra Consulting Group, London.

1965-66: Research Assistant, Botany Department, University of Adelaide.

OTHER POSITIONS HELD

2016 - Honorary Associate Professor, Crawford School of Public Policy, Australian National University

2011 - 16: Member, Grattan Institute Energy Reference Group

2010 - : Associate, Energy Change Institute and Centre for Climate Economics and Policy, Australian National University.

2009 -10 : Adjunct Professor, Crawford School of Economics and Government and Fenner School of Environment and Society jointly, Australian National University.

2005 - 2017: Director, The Climate Institute

1994 - 2013 : Director, The Australia Institute

1991-95: Member of the Board, ACT Electricity and Water Authority.

PROFESSIONAL AFFILIATIONS AND MEMBERSHIPS

Fellow of the Australian Institute of Company Directors, 2003-11

Fellow of the Australian Institute of Energy; Canberra Group Committee member, 1982-83, 1995-; Canberra Group representative on National Council, 1983.

Member, International Association for Energy Economics, 1990-.

OFFICIAL APPOINTMENTS

2013 CRC Committee nominated member, Performance Review Panel, CRC for Greenhouse Gas Technologies.

2011 - : Member, User Reference Group for the National Greenhouse Gas Inventory

2009. Member, NSW Green Skills Taskforce

2005- 13: Member, Advisory Board, ARC Centre of Excellence for Solar Energy Systems, Centre for Sustainable Energy Systems, Australian National University

2002- 05: Member, ACT Environment Protection Technical Advisory Committee

2002-05 : Member, ACT Sustainability Expert Reference Group

2001 - : Member, UNFCCC Roster of Experts

2001- : Member, Committee EV/15 – Carbon Accounting, Standards Association of Australia.

2001: Member, Technical Panel, Second year review of CRC for Greenhouse Accounting.

1999-2003: Member, Australian CRC for Renewable Energy (ACRE) Energy Policy Group

1998-2002: Member, ACT Environment Advisory Committee

1998-2002 : Member, Experts Group on Emissions Trading

1998- 2005: Member, ABS Environmental Statistics Advisory Group

1998-99: Adjunct Professor, Murdoch University

1995: Member of the Expert Selection Panel for the 1995 Special Round of the Cooperative Research Centres Program (renewable energy)

1984-87: Member of Technical Standing Committee 7 (subsequently 4) (Economic, Social and Environmental Aspects of Energy), National Energy Research, Development and Demonstration Council.

1983: Member of Prices Advisory Committee under the Western Australian Prevention of Excessive Prices Act.

1979-83: Member, Committee EN/1 - Energy Auditing, Standards Association of Australia.

AWARDS

1969 Henry Humphrys Prize, St John's College, Cambridge, for the best PhD thesis by a College member in the year.

RESEARCH EXPERIENCE

2013-

Analysis of Australia's performance in reducing emissions from energy combustion, relative to other high income countries.

Design and population with data of indicators of Australia's energy transition progress.

Analysis of energy productivity trends in Australia.

Examination of electricity consumption by low income households, using ABS survey CURF data.

Analysis of factors which could explain the slowing growth and eventual absolute fall in the level of electricity demand in Australia.

1977-82. Research on various aspects of energy policy and related topics, including the following.

Analysis of the types of energy using processes employed by the major energy intensive industries in Australia

Study of various project aspects of petroleum industry policy in Australia at the Commonwealth and State Government level, including:

- the overall policy framework,

- policies relating to petroleum exploration and production,

- the process of technological change in oil refining from 1970;

A study of the costs and benefits of using lead in petrol in Australia;

Examination of the evolution of energy research and development policy in Australia;

Study of political decision making and policy development relating to uranium mining in Australia;

Review of the effectiveness of public inquiries on issues relating to technology and to the energy-environment interface.

Analysis of the retail demand for electricity in Tasmania and the projection of future demand.

Assessment of the costs and benefits of the proposed lower Gordon and Franklin Rivers hydro-electric power development.

A study of the economics of electricity supply in Tasmania.

Analysis of factors responsible for changes in costs experienced by the Australian electricity supply industry over the decade 1973-83.

Research for and writing of a book on Australian energy policy.

1974-75. Study of the economic and technical feasibility of converting biomass material (crops and wastes) to synthetic liquid and gaseous fuels in Australia.

1966-69. Study of ionic regulation in the marine alga *Acetabularia*, involving measurement of radio-isotope tracer fluxes, membrane potential and resistance under various conditions.

1965-66. Study of ionic regulation in beetroot and barley root cells, using radio-isotope tracer flux and electric potential measurements.

1965. Design, construction and use of apparatus using the heat gradient method to measure the rate of flow of sap in plant stems.

TEACHING EXPERIENCE

2010 - Occasional guest lectures in energy policy and energy economics for coursework Masters degree and professional short course programs at the Australian National University.

1977-83. Occasional lectures on energy, technology and environmental topics to undergraduate courses in Biochemistry, Human Sciences, Zoology, Engineering and Politics and postgraduate courses in Resource and Environmental Studies, Administrative Studies and Public Policy at the Australian National University, to the undergraduate courses in Physics and Natural Resources at Canberra C.A.E. and to the undergraduate course in Government at Sydney University.

1975-76. A course on Economic Botany for second year biology students at Sydney University, dealing with physical and social factors influencing crop production and the nature of the world food crisis.

1969-. Numerous talks, lectures and research seminars to community groups, professional bodies, trades unions, school students, university students and scientific conferences in Australia, the U.K., the U.S.A., France, Brazil and Papua New Guinea.

OTHER ACADEMIC ACTIVITIES

In recent years I have been an external examiner of PhD theses of students at UNSW, QUT, and the university of Tasmania, and other degree theses at ANU and UNSW. I have also refereed a number of journal submissions.

PUBLICATIONS

Refereed journal papers, book chapters and a book

Saddler, H., 2018. System security in the National Electricity Market, in Downie, C. (ed.) *Securing our energy*, Paradigm Shift, spring 2018, ANU College of Asia & the Pacific.

Saddler, H., 2011. 'National energy security in a world where use of fossil fuels is constrained', in Anceschi, L. and Symons, J., *Energy Security in the Era of Climate Change - The Asia Pacific Experience*, London.

Saddler H, Diesendorf M, Denniss R 2007, 'Clean energy scenarios for Australia', *Energy Policy* 35 (2): 1245–56

Saddler, H. 1996. "Greenhouse policies and the Australian energy supply industries", in W. Bouma, G. Pearman and M. Manning (eds.), *Greenhouse: coping with climate change*. CSIRO, Melbourne.

Saddler, H., 1994. "Using energy efficiently in buildings and industry", in S. Dovers (ed.), *Sustainable energy systems: pathways for Australian energy reform*. Cambridge University Press, Melbourne.

Saddler, H., 1993. "Greenhouse gas emission abatement in Australia", in P. Hayes and K. Smith (eds.), *The global greenhouse regime: Who pays?*. United Nations University Press, Tokyo and Earthscan, London.

Contributor to Tolba, M. and O. El-Kholy (eds.), 1993, *The world environment 1972-93: Two decades of challenge*. Chapman and Hall and United Nations Environment Program, London.

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Donnelly, W. and H. Saddler, 1984. "The retail demand for electricity in Tasmania". *Australian Economic Papers* 23 (No. 42), 52-60.

Saddler H., 1983, 1988, 1995. Articles on "Electrical Energy", "Energy", "Oil and Gas", "North West Shelf" in the fourth, fifth and sixth editions of the *Australian Encyclopaedia*.

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- Saddler, H., 1980. "The implications of the battle for the Alligator Rivers: land use planning and environmental protection", in R. Jones (ed.) *Northern Australia: Options and Implications*, Canberra, Research School of Pacific Studies, ANU.
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- Saddler, H., 1971. "Spontaneous and induced changes in the membrane potential and resistance of *Acetabularia mediterranea*". *J. Membrane Biol.* **5**, 250-60.
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- Pitman, M. and Saddler, H., 1967. "Active sodium and potassium transport in cells of barley roots". *Proc. Nat. Acad. Sc.* **57**, 44-49.

Other published papers

- Saddler, H., 2021. *Back of the pack: An assessment of Australia's energy transition*. The Australia Institute, Discussion paper
- Muller, F., Saddler, H., and Melville-Reay, H., 2021. *Carbon border adjustments: What are they and how will they impact Australia?*. The Australia Institute, Discussion paper.
- Saddler, H., 2021. *Australian energy transition indicators*. CCEP Working Paper 2106, Centre for Climate Economics and Policy, Crawford School of Public Policy, Australian National University.
- Saddler, H., 2020. *Energy productivity, gas consumption and employment: trends in the Australian economy 2008-09 to 2018-19*. CCEP Working Paper 1903, Centre for Climate Economics and Policy, Crawford School of Public Policy, Australian National University.

- Saddler, H., 2019. *South Australia blackout: lessons learned*. Energy Daily, 13 December 2019.
- Saddler, H., 2019. *Joining up climate policy*. ARENA, Issue no. 158,
- Mountain, B. R., Percy, S., Kars, A., Saddler, H., and Billimoria, F., 2018. *Does renewable electricity generation reduce electricity prices?* Victoria Energy Policy Centre, Victoria University, Melbourne, Australia.
- Saddler, H., 2018. *How low income households use electricity*. The Australia Institute.
- Saddler, H., 2017. *High price events in the NEM: Queensland January 2017 and SA September 2016*. The Australia Institute.
- Saddler, H., 2017. *Is electricity demand growth returning in Australia?* The Australia Institute.
- Saddler, H., 2015. *Power Down II: The continuing decline of Australia's electricity demand*. The Australia Institute.
- Saddler, H., 2013. *Power Down: Why is electricity consumption decreasing*. Institute Paper no. 14, The Australia Institute.
- Saddler, H., 2012. 'Carbon Trading – And the Future of Energy Policies in Australia', in Hezri, A.A. and Hofmeister, W., eds., 2012. *Towards a Green Economy: In search of sustainable energy policies for the future*, Konrad Adenauer Stiftung.
- Saddler, H., 2012. *Review of literature on international best practice for estimating greenhouse gas emissions from coal seam gas production*. Report by pitt&sherry for the Department of Climate Change and Energy Efficiency. <http://www.climatechange.gov.au/media/whats-new/pitt-sherry-review-greenhouse-gas-emissions-from-gas-production.aspx>
- Saddler, H. and H. King, 2008. *Agriculture and emissions trading: the impossible dream?* Australian Institute Discussion Paper Number 102, Canberra.
- Saddler, H., 2008. *Energy security: the real story – Australia's options: Setting the scene*. Whitlam Institute within the University of Western Sydney. Public lecture, Parramatta Riverside Theatre, 13 May 2008.
- Saddler, H., F. Muller and C. Cuevas, 2006. *Competitiveness and carbon pricing: border adjustments for greenhouse policies*. Australian Institute Discussion Paper Number 86, Canberra.
- Saddler, H. 2005. "Sustainable energy" in *Sustainability for the ACT: the future's in our hands*, Canberra, Office of Sustainability, ACT Government.
- Saddler, H. 2005. *National Academies Forum: Internet forum on integrated sustainability assessment Response to Energy Systems paper by Ian Lowe*. <http://www.naf-forum.org.au/papers.asp>.
- Saddler, H., C. Riedy and R. Passey, 2004. *Geosequestration: what is it and how much can it contribute to a sustainable energy policy for Australia*. Australian Institute Discussion Paper Number 72, Canberra.
- Saddler, H. 2003. "Greenhouse policy – Implications for buildings and building designers". *Environment Design Guide*, May 2003, Royal Australian Institute of Architects, Melbourne.
- Saddler, H., 2003. "Australia's energy choices", *Dissent* 13 (Summer 2003/2004), 41-42
- Saddler, H., 2003. "What happens to oil during war", *The Diplomat* 1 (6), 36-37.
- Saddler, H., 2002. "Australia and greenhouse emissions", *Dissent* 10 (Summer 2002/2003), 51-54.

- Turton H., J. Ma, H. Saddler and C. Hamilton, 2002. *Long-term greenhouse gas scenarios*. Australia Institute Discussion Paper Number 48, Canberra.
- Saddler, H. 2001 “Greenhouse gas emissions trading: a way forward”, *ASX Perspective, Australian Stock Exchange magazine*, 1st Quarter 2001, Sydney.
- Quiggin, J., H. Saddler, M. Neutze, C. Hamilton & H. Turton, 1998. The privatization of ACTEW. Australian Institute Discussion Paper Number 20, Canberra.
- Saddler, H. 1998. “Emissions trading – you can trade only what you can measure”, *Engineering World*, August/September 1998 Sydney, 12-17.
- Hamilton, C. and H. Saddler, 1997. *The genuine progress indicator: a new index of changes in well-being in Australia*. Australian Institute Discussion Paper Number 14, Canberra.
- Wilkenfeld, G., C. Hamilton and H. Saddler, 1995. *Australia’s greenhouse strategy: can the future be rescued?* Australian Institute Discussion Paper Number 3, Canberra.
- Saddler, H., 1990. *Toward Toronto: Australian technological innovations for efficient energy futures*. Commission for the Future, Melbourne.
- Saddler, H., 1990. “Energy”, in *Moving towards global sustainability: policies and implications for Australia*. Centre for Continuing Education, Australian National University, Canberra.
- Saddler, H., 1984. *Recent trends in the cost of electricity supply in Australia*, CRES Working Paper 1984/2, Australian National University, Canberra.
- Saddler, H. and W. Donnelly, 1983. *Electricity in Tasmania: pricing, demand, compensation*, CRES Working Paper 1983/24, Australian National University, Canberra.
- Saddler, H., 1982. *The plunder down under*. The Progressive, January 1982.
- Saddler, H., 1981. *Energy research and development in Australia*, CRES Working Paper R/WP 55 Australian National University, Canberra.
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- Saddler, H., 1980. *A critique of Commonwealth Government energy policy as it relates to petroleum*. Petroleum Industry Research Project, CRES, Australian National University, Canberra.
- Saddler, H. and Davies, D. 1979. *Patterns of energy use in Australian manufacturing industry*, CRES Working Paper R/WP 38 Australian National University, Canberra.
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- McCann, R. and Saddler, H., 1975. “Photobiological energy conversion”, in Society for Social Responsibility in Science (A.C.T.), *Feasibility of alternative renewable resources: Solar energy*. Canberra.
- Saddler, H., 1975. *Organic wastes and energy crops as potential sources of fuel in Australia*. Energy Research Centre and School of Biological Sciences, University of Sydney.
- McCann, R. and Saddler, H., 1975. “A cassava-based agro-industrial complex - a new industry for Australia?”, *Process and Chemical Engineering*, April/May 1975.
- Saddler, H. and Aarons, B., 1975. *The political economy of ecology*. Australian Left Review. #47. 24-32.
- Saddler, H., 1973. *A flight of fancy*. Science for People, #21, April-May 1973.

Saddler, H., 1972. *A political strategy for environmental action*, in Schwab, M. (ed.) Teach-in for survival, London, Robinson and Watkins Books.

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Harrington, P. and Saddler, H., 2019. *Calculating the market-based emissions intensity of electricity consumed in Australia*. CRC for Low Carbon Living.

Saddler, H., M. Diesendorf and R. Denniss. 2004. *A clean energy future for Australia*. World Wide Fund for Nature and the Clean Energy Future Group. www.wwf.org.au.

2000. *Workbook: Electricity and heat generation from Renewables*. International Greenhouse Partnerships Office, Canberra.

2000. *Workbook: Electricity and Heat Generation from Fossil Fuels*. International Greenhouse Partnerships Office, Canberra.

1999. *Workbook: Reducing Fugitive Emissions from Primary Energy Production, Transmission and Distribution*. International Greenhouse Partnerships Office, Canberra.

1997. *Greenhouse Challenge Workbook: Electricity supply business*. Greenhouse Challenge Program, Canberra.

1997. *Workbook: the Greenhouse Challenge, a six step guide to developing your cooperative agreement*. Greenhouse Challenge Program, Canberra.

1996. *Australian methodology for the estimation of greenhouse gas emissions and sinks, Workbook 1.1: Workbook for fuel combustion activities (stationary sources)*. National Greenhouse Gas Inventory Committee, Canberra.

1996. *Australian methodology for the estimation of greenhouse gas emissions and sinks, Workbook 2.1: Workbook for fugitive fuel emissions (fuel production, transmission, storage and distribution)*. National Greenhouse Gas Inventory Committee, Canberra.

1994. *Coal and climate change: opportunities for Australian industry to contribute to reducing international greenhouse gas emissions*. Department of Primary Industries and Energy, Canberra.

1994. *Solar and heat pump hot water systems: considerations for proposed financing program*. Energy Research and Development Corporation, ERDC 94/215, Canberra.

1990. *Evaluation of national energy research, development and demonstration program*. Department of Primary Industries and Energy, Canberra.

1983. *Petrol pricing and related matters in Western Australia*. Department of Consumer Affairs, Perth.

1980. *An oil strategy for Australia*. TNC Energy Group, Oil Industry Project Reportback No. 2, TNC, Sydney.

Conference papers

Saddler, H., 2019. *Australia's emissions trajectory: past and future*. Presentation for 100% Renewables Workshop, ANU, 13-15 February 2019.

Saddler, H., 2018. *Will the NEG transform Australia's energy landscape?* Presentation to ANU Energy Change Institute Forum, 31 July 2018.

Saddler, H., 2013. *Electricity demand: what has it been doing; where might it go?* Australian Alliance to Save Energy, Third Australian Summer Study on Energy Efficiency, Sydney.

Saddler, H., 2012. *The need for better data to assess and design energy efficiency policy.* Australian Alliance to Save Energy, First Australian Summer Study on Energy Efficiency, Sydney.

Saddler, H., 2011. *The Australian energy system: Is it moving towards sustainability? Can it move faster?* Rio+20: Towards sustainable development Forum, Canberra, November 2011

Saddler, H. and Harrington, P., 2011. "Regulatory measures as a complement to carbon pricing: role in achieving energy efficiency". Paper delivered at Workshop *Beyond a carbon price: a framework for climate change regulation in Australia*, University of Melbourne Law School, August 2011.

Saddler, H., 2010. "Reducing the emissions intensity of electricity supply: implementation of Australia's expanded Mandatory Renewable Energy Target. Paper delivered at Workshop *Renewable energy law and policy*, Australian National University, November 2010.

Saddler, H., 2008. "Energy Security: Australia's options - setting the scene", Public Lecture series *Energy Security: The Real Story*, the Whitlam Institute at the University of Western Sydney, May 2008.

Saddler, H., 2008. *Changes in the energy system and the role of workplace skills.* Climate Change @ Work: Managing the challenge, Workplace Research Centre, University of Sydney, April 2008.

Saddler, H., 2007. *What will be the Impact on Trade Exposed Energy Intensive Industry?* 3rd CEEM Annual Conference, Centre for Energy and Environmental Markets, University of New South Wales, November 2008.

Saddler, H., 2006. *Energy policy: how to choose a low emission energy future.* Caring for Australia and Australia's energy needs, Edgeworth David Day Symposium, Earth Resources Foundation, University of Sydney, October 2006.

Saddler, H., F. Muller and C. Cuevas, 2005. *Providing a carbon price signal while preserving economic competitiveness; practical options for Australia.* Greenhouse 2005 Conference, Melbourne, November 2005.

Saddler, H. 2003. *National emissions trading: constraints and requirements.* Presentation to National Emissions Trading Policy Workshop, sponsored by the Victorian Department of Sustainability and Environment, Melbourne, April 2003.

Saddler, H. and J. Ma 2002. *Industrial sector.* Paper presented to invited workshop on Energy efficiency: the potential for improvements and policy options, Canberra, December 2002.

Saddler, H. 2000 *Future directions for measuring and reporting greenhouse gas emissions.* Environmental Management in Oil and Gas conference, Fremantle September 2000.

Saddler, H. 1999 *Projections for the world population, economy and energy demand to 2050: implications for greenhouse gas emissions.* Seminar presented by the Australian Academy of Technological Sciences and Engineering, Western Australian Division, Curtin University November 1999.

Saddler, H. 1999 *Greenhouse gas emission trading: an introduction.* National Environmental Law Association Conference, Sydney September 1999.

Saddler, H. 1999 *Greenhouse gas emissions trading: options for issuing permits.* Emissions Trading Forum, Sydney August 1999.

Saddler, H. 1999 *The impact of greenhouse policies in the electricity supply industry – challenges and opportunities*. Third Annual Queensland Power Conference, Brisbane May 1999.

Saddler, H. 1999 *How can generators benefit from emissions trading?* National Summit on Power Generation, Surfers Paradise, February 1999.

Saddler, H., 1998. *Emission measurement requirements to support emissions trading*. Emissions Trading, IBC Conferences, Sydney, June 1998.

Saddler, H., 1992. *Sustainability of the Australian energy system: What should we do about it?* Australian Institute of Energy Annual Conference, Canberra.

Saddler, H., 1991. *Environment and energy: friends or foes?* National Energy Management Forum, Melbourne.

Saddler, H. 1991. *The Gulf War and the world oil market*. National Agricultural and Resources Outlook Conference, Canberra.

Saddler, H. and W. Donnelly, 1983. *Investment, prices and demand in the Tasmanian electricity supply system*. Conference on the economics of electric power systems, University of New South Wales, Sydney.

Smith, B. and H. Saddler, 1982. *Substitution of non-exhaustible resources for fossil fuel energy and industrial raw material resources*. Proceedings of 12th Pacific Trade and Development Conference, Vancouver, 1981.

Richards, W. and H. Saddler, 1981. *Petroleum pricing: equity versus efficiency?* Economics Section, ANZAAS Congress, Brisbane.

Saddler, H. and J. Saw, 1980. *Environmental evaluation to assist the formulation of energy policies and programs*. Environmental Studies Section, ANZAAS Congress, Adelaide.

Saddler, H., 1978. *Public participation in technology assessment with particular reference to public inquiries*. Workshop on Technology Assessment, Department of Science, Canberra.

Saddler, H., 1977. *Photosynthetic materials for energy conversion - an Australian study*. European Seminar on biological energy conversion, Grenoble-Autrans, France.

McCann, R., Saddler, H. and Prince, R., 1976. *The efficient processing of photobiological material*. Annual Engineering Conference, Engineering 1976-2001, Institution of Engineers, Australia, Canberra.

Other

National Energy Emissions Audit and *National Energy Emissions Audit Electricity Update*. 2010-Newsletter conceived, developed and written respectively quarterly and monthly, until 2016 under the name *CEDEX*[®], now published by The Australia Institute.

The Conversation. Regular contributor of articles as an associate of the Centre for Climate Economics and Policy. Currently author or co-author of 23 articles.

The following list does not include numerous articles and opinion pieces published in newspapers and magazines, including the *Sydney Morning Herald*, the *Australian Financial Review* and the *Canberra Times*.

Refereed journal papers, book chapters, journal articles and books

Saddler, H.

CONSULTANCY EXPERIENCE WITH ENERGY STRATEGIES AND PITT&SHERRY

Numerous projects undertaken covering the following broad fields, among others.

Strategies and pathways to achieve deep greenhouse gas emissions reductions for sub-national governments, including the ACT.

Development of methodology for energy related components of the National Greenhouse Gas Inventory and compilation of inventories for successive years.

Estimation of emissions abatement achieved by a wide variety of national and state energy efficiency programs and policies.

Participation as an energy sector member of expert teams undertaking desk, centralised and comprehensive in-country reviews of national greenhouse gas inventories on behalf of the UNFCCC Secretariat.

Detailed analysis of the energy efficiency and emissions performance of various categories of electricity and gas household appliances.

Analysis of various aspects of the design of what became the National Greenhouse and Energy Reporting Scheme.

Analysis of design options for policies to support renewable energy deployment.

Examination and analysis of various aspects of the design of an Australian emissions trading scheme

Preparation of *A Clean Energy Future for Australia*, a major back-casting scenario study of demand, supply and greenhouse gas emissions from the stationary energy sector in 2040.

Projections of future demand for electricity and of fugitive emissions from coal, petroleum and natural gas activities

CONSULTANCY EXPERIENCE WITH ECONOMIC AND ENERGY ANALYSIS

Responsible for developing the company's expertise and undertaking consultancies in three broad areas.

(1) Energy, environmental and industry economics and policy: Electricity economics, mining and the environment, energy and the environment (including the greenhouse effect – first report on this issue in 1989), efficient supply and use of energy, national energy policy, energy RD&D, new energy technologies, development assistance projects in the energy and minerals sector, including evaluation of government programs in many of these fields.

(2) Petroleum policy and pricing: Public policy development and implementation in relation to the petroleum product market and the pricing, supply and distribution of petroleum products in Australia and in Pacific Island countries.

(3) Fuel procurement and management for major transport operators and other large participants in the oil market: Comprehensive services including monitoring market developments, preparation of fuel tender documents, appraisal of tenders, client support in contract negotiations, contract administration and implementation of fuel management information systems.

EARLIER CONSULTANCY EXPERIENCE

While working in Europe, studies on the environmental and social costs of transport in Britain, of the costs and benefits of alternative sites for the third London airport, of the impact of a Channel tunnel on demand for cross-Channel car ferry services, of the effects of regional airports in stimulating industrial development in Europe, and of factors affecting the location of heavy process industries in north west Europe, with special reference to environmental pollution and implications for the further development of Rotterdam.

Certificate of Annexure HS-3

No. NSD758 of 2021

Federal Court of Australia

District Registry: New South Wales

Division: General

Environment Centre NT Inc

Applicant

Minister for Resources and Water and another

Respondents

This and the following 11 pages form Annexure HS-3 to the Affidavit of Dr Hugh Saddler affirmed on 10 September 2021 before me.

Signature of witness

Name: Ruby Hamilton

Qualification: Solicitor

CURRICULUM VITAE

HUGH SADDLER

14/50 Peter Cullen Way
Wright
ACT 2611

Phone: 02 6282 3861
Mob.: 0407 624 304
E-mail: hsaddler@pittsh.com.au

NATIONALITY: Australian

FORMAL QUALIFICATIONS: BSc(Hons) Adelaide, 1965; PhD Cantab., 1969

CURRENT EMPLOYMENT

Par time independent consultant

PREVIOUS CAREER

2009-2016 : Principal Consultant – Energy Strategies, **pitt&sherry** (part time)

1996- 2008: Managing Director, Energy Strategies Pty Ltd

1982-97 Director, Economic and Energy Analysis Pty Ltd

1982-83: Visiting Fellow, Centre for Resource and Environmental Studies, Australian National University (part time).

1977-82: Research Fellow, Resource Economics Group, Centre for Resource and Environmental Studies, Australian National University.

1975-77: Seconded to the Commonwealth Department of Environment, Housing and Community Development as Research Officer, Ranger Uranium Environmental Inquiry.

1974-77: Research Fellow, School of Biological Sciences and Energy Research Centre, University of Sydney.

1972-74: General Secretary, British Society for Social Responsibility in Science, London; part time independent consultant on energy and environment issues.

1969-72: Consultant, Scientific Planning Division, Metra Consulting Group, London.

1965-66: Research Assistant, Botany Department, University of Adelaide.

OTHER POSITIONS HELD

2016 - Honorary Associate Professor, Crawford School of Public Policy, Australian National University

2011 - 16: Member, Grattan Institute Energy Reference Group

2010 - : Associate, Energy Change Institute and Centre for Climate Economics and Policy, Australian National University.

2009 -10 : Adjunct Professor, Crawford School of Economics and Government and Fenner School of Environment and Society jointly, Australian National University.

2005 - 2017: Director, The Climate Institute

1994 - 2013 : Director, The Australia Institute

1991-95: Member of the Board, ACT Electricity and Water Authority.

PROFESSIONAL AFFILIATIONS AND MEMBERSHIPS

Fellow of the Australian Institute of Company Directors, 2003-11

Fellow of the Australian Institute of Energy; Canberra Group Committee member, 1982-83, 1995-; Canberra Group representative on National Council, 1983.

Member, International Association for Energy Economics, 1990-.

OFFICIAL APPOINTMENTS

2013 CRC Committee nominated member, Performance Review Panel, CRC for Greenhouse Gas Technologies.

2011 - : Member, User Reference Group for the National Greenhouse Gas Inventory

2009. Member, NSW Green Skills Taskforce

2005- 13: Member, Advisory Board, ARC Centre of Excellence for Solar Energy Systems, Centre for Sustainable Energy Systems, Australian National University

2002- 05: Member, ACT Environment Protection Technical Advisory Committee

2002-05 : Member, ACT Sustainability Expert Reference Group

2001 - : Member, UNFCCC Roster of Experts

2001- : Member, Committee EV/15 – Carbon Accounting, Standards Association of Australia.

2001: Member, Technical Panel, Second year review of CRC for Greenhouse Accounting.

1999-2003: Member, Australian CRC for Renewable Energy (ACRE) Energy Policy Group

1998-2002: Member, ACT Environment Advisory Committee

1998-2002 : Member, Experts Group on Emissions Trading

1998- 2005: Member, ABS Environmental Statistics Advisory Group

1998-99: Adjunct Professor, Murdoch University

1995: Member of the Expert Selection Panel for the 1995 Special Round of the Cooperative Research Centres Program (renewable energy)

1984-87: Member of Technical Standing Committee 7 (subsequently 4) (Economic, Social and Environmental Aspects of Energy), National Energy Research, Development and Demonstration Council.

1983: Member of Prices Advisory Committee under the Western Australian Prevention of Excessive Prices Act.

1979-83: Member, Committee EN/1 - Energy Auditing, Standards Association of Australia.

AWARDS

1969 Henry Humphrys Prize, St John's College, Cambridge, for the best PhD thesis by a College member in the year.

RESEARCH EXPERIENCE

2013-

Analysis of Australia's performance in reducing emissions from energy combustion, relative to other high income countries.

Design and population with data of indicators of Australia's energy transition progress.

Analysis of energy productivity trends in Australia.

Examination of electricity consumption by low income households, using ABS survey CURF data.

Analysis of factors which could explain the slowing growth and eventual absolute fall in the level of electricity demand in Australia.

1977-82. Research on various aspects of energy policy and related topics, including the following.

Analysis of the types of energy using processes employed by the major energy intensive industries in Australia

Study of various project aspects of petroleum industry policy in Australia at the Commonwealth and State Government level, including:

- the overall policy framework,

- policies relating to petroleum exploration and production,

- the process of technological change in oil refining from 1970;

A study of the costs and benefits of using lead in petrol in Australia;

Examination of the evolution of energy research and development policy in Australia;

Study of political decision making and policy development relating to uranium mining in Australia;

Review of the effectiveness of public inquiries on issues relating to technology and to the energy-environment interface.

Analysis of the retail demand for electricity in Tasmania and the projection of future demand.

Assessment of the costs and benefits of the proposed lower Gordon and Franklin Rivers hydro-electric power development.

A study of the economics of electricity supply in Tasmania.

Analysis of factors responsible for changes in costs experienced by the Australian electricity supply industry over the decade 1973-83.

Research for and writing of a book on Australian energy policy.

1974-75. Study of the economic and technical feasibility of converting biomass material (crops and wastes) to synthetic liquid and gaseous fuels in Australia.

1966-69. Study of ionic regulation in the marine alga *Acetabularia*, involving measurement of radio-isotope tracer fluxes, membrane potential and resistance under various conditions.

1965-66. Study of ionic regulation in beetroot and barley root cells, using radio-isotope tracer flux and electric potential measurements.

1965. Design, construction and use of apparatus using the heat gradient method to measure the rate of flow of sap in plant stems.

TEACHING EXPERIENCE

2010 - Occasional guest lectures in energy policy and energy economics for coursework Masters degree and professional short course programs at the Australian National University.

1977-83. Occasional lectures on energy, technology and environmental topics to undergraduate courses in Biochemistry, Human Sciences, Zoology, Engineering and Politics and postgraduate courses in Resource and Environmental Studies, Administrative Studies and Public Policy at the Australian National University, to the undergraduate courses in Physics and Natural Resources at Canberra C.A.E. and to the undergraduate course in Government at Sydney University.

1975-76. A course on Economic Botany for second year biology students at Sydney University, dealing with physical and social factors influencing crop production and the nature of the world food crisis.

1969-. Numerous talks, lectures and research seminars to community groups, professional bodies, trades unions, school students, university students and scientific conferences in Australia, the U.K., the U.S.A., France, Brazil and Papua New Guinea.

OTHER ACADEMIC ACTIVITIES

In recent years I have been an external examiner of PhD theses of students at UNSW, QUT, and the university of Tasmania, and other degree theses at ANU and UNSW. I have also refereed a number of journal submissions.

PUBLICATIONS

Refereed journal papers, book chapters and a book

Saddler, H., 2018. System security in the National Electricity Market, in Downie, C. (ed.) *Securing our energy*, Paradigm Shift, spring 2018, ANU College of Asia & the Pacific.

Saddler, H., 2011. 'National energy security in a world where use of fossil fuels is constrained', in Anceschi, L. and Symons, J., *Energy Security in the Era of Climate Change - The Asia Pacific Experience*, London.

Saddler H, Diesendorf M, Denniss R 2007, 'Clean energy scenarios for Australia', *Energy Policy* 35 (2): 1245–56

Saddler, H. 1996. "Greenhouse policies and the Australian energy supply industries", in W. Bouma, G. Pearman and M. Manning (eds.), *Greenhouse: coping with climate change*. CSIRO, Melbourne.

Saddler, H., 1994. "Using energy efficiently in buildings and industry", in S. Dovers (ed.), *Sustainable energy systems: pathways for Australian energy reform*. Cambridge University Press, Melbourne.

Saddler, H., 1993. "Greenhouse gas emission abatement in Australia", in P. Hayes and K. Smith (eds.), *The global greenhouse regime: Who pays?*. United Nations University Press, Tokyo and Earthscan, London.

Contributor to Tolba, M. and O. El-Kholy (eds.), 1993, *The world environment 1972-93: Two decades of challenge*. Chapman and Hall and United Nations Environment Program, London.

Saddler, H. 1987. "Minerals and Energy Statistics", in Vamplew, W. (ed.), *Australian Historical Statistics*, Volume X of *Australians: A historical library*. Fairfax, Syme and Weldon, Sydney.

Donnelly, W. and H. Saddler, 1984. "The retail demand for electricity in Tasmania". *Australian Economic Papers* 23 (No. 42), 52-60.

Saddler H., 1983, 1988, 1995. Articles on "Electrical Energy", "Energy", "Oil and Gas", "North West Shelf" in the fourth, fifth and sixth editions of the *Australian Encyclopaedia*.

Saddler, H. and J. Kelly, 1983. "Australia's uranium decision: a case study in the politics of mining", in W. Richmond and P. Sharma (eds.) *Essays on mining in Australia*, Brisbane, University of Queensland Press.

- Saddler, H., 1981. *Energy in Australia: politics and economics*. Sydney, George Allen & Unwin Australia.
- Saddler, H., J. Bennett, I. Reynolds and B. Smith, 1980. *Public choice in Tasmania: aspects of the Lower Gordon River hydro-electric development proposal*. Canberra, Centre for Resource and Environmental Studies, ANU.
- Saddler, H. and A. Ulph, 1980. "Liquid fuels: present situation and future prospects for Australia", in T. Van Dugteren (ed.) *Oil and Australia's future*, Sydney, Hodder and Stoughton.
- Saddler, H., 1980. "The implications of the battle for the Alligator Rivers: land use planning and environmental protection", in R. Jones (ed.) *Northern Australia: Options and Implications*, Canberra, Research School of Pacific Studies, ANU.
- Saddler, H., 1980. "Australian uranium: the environmental issues", in S. Harris and K. Oshima (eds.) *Australia and Japan: nuclear energy issues in the Pacific*, Canberra and Tokyo, Australia-Japan Economic Relations Project.
- McCann, R. and H. Saddler, 1976. "Photobiological energy conversion in Australia", *Search* **7**, 17-23.
- McCann, R. and H. Saddler, 1976. "The utilisation of cereal straw: a scenario evaluation", *J. Aust. Inst. Ag. Sci.*, March 1976, 41-47.
- Saddler, H., R. McCann and M. Pitman, 1976. "An assessment of crop production for energy in Australia", *Aust. Forestry* **39**, 5-15.
- Saddler, H., 1971. "Spontaneous and induced changes in the membrane potential and resistance of *Acetabularia mediterranea*". *J. Membrane Biol.* **5**, 250-60.
- Saddler, H. and Pitman, M., 1970. "An apparatus for the measurement of sap flow in unexcised leafy shoots". *J. Exp. Bot.* **21**, 1048-59.
- Saddler, H., 1970. "Fluxes of sodium and potassium in *Acetabularia mediterranea*", *J. Exp. Bot.* **21**, 605-16.
- Saddler, H., 1970. "The membrane potential of *Acetabularia mediterranea*", *J. Gen. Physiol.* **55**, 802-21.
- Saddler, H., 1970. "The ionic relations of *Acetabularia mediterranea*", *J. Exp. Bot.* **21**, 345-59.
- Atkinson, M., Findlay, G., Hope, A., Pitman, M., Saddler, H. and West, K., 1967. "Salt regulation in the mangroves *Rhizophora mucronata* Lam. and *Aegialitis annulata* R. Br." *Aust. J. biol. Sci.* **20**, 589-99.
- Pitman, M. and Saddler, H., 1967. "Active sodium and potassium transport in cells of barley roots". *Proc. Nat. Acad. Sc.* **57**, 44-49.

Other published papers

- Saddler, H., 2021. *Back of the pack: An assessment of Australia's energy transition*. The Australia Institute, Discussion paper
- Muller, F., Saddler, H., and Melville-Reay, H., 2021. *Carbon border adjustments: What are they and how will they impact Australia?*. The Australia Institute, Discussion paper.
- Saddler, H., 2021. *Australian energy transition indicators*. CCEP Working Paper 2106, Centre for Climate Economics and Policy, Crawford School of Public Policy, Australian National University.
- Saddler, H., 2020. *Energy productivity, gas consumption and employment: trends in the Australian economy 2008-09 to 2018-19*. CCEP Working Paper 1903, Centre for Climate Economics and Policy, Crawford School of Public Policy, Australian National University.

- Saddler, H., 2019. *South Australia blackout: lessons learned*. Energy Daily, 13 December 2019.
- Saddler, H., 2019. *Joining up climate policy*. ARENA, Issue no. 158,
- Mountain, B. R., Percy, S., Kars, A., Saddler, H., and Billimoria, F., 2018. *Does renewable electricity generation reduce electricity prices?* Victoria Energy Policy Centre, Victoria University, Melbourne, Australia.
- Saddler, H., 2018. *How low income households use electricity*. The Australia Institute.
- Saddler, H., 2017. *High price events in the NEM: Queensland January 2017 and SA September 2016*. The Australia Institute.
- Saddler, H., 2017. *Is electricity demand growth returning in Australia?* The Australia Institute.
- Saddler, H., 2015. *Power Down II: The continuing decline of Australia's electricity demand*. The Australia Institute.
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Other

National Energy Emissions Audit and *National Energy Emissions Audit Electricity Update*. 2010-Newsletter conceived, developed and written respectively quarterly and monthly, until 2016 under the name *CEDEX*®, now published by The Australia Institute.

The Conversation. Regular contributor of articles as an associate of the Centre for Climate Economics and Policy. Currently author or co-author of 23 articles.

The following list does not include numerous articles and opinion pieces published in newspapers and magazines, including the *Sydney Morning Herald*, the *Australian Financial Review* and the *Canberra Times*.

Refereed journal papers, book chapters, journal articles and books

Saddler, H.

CONSULTANCY EXPERIENCE WITH ENERGY STRATEGIES AND PITT&SHERRY

Numerous projects undertaken covering the following broad fields, among others.

- Strategies and pathways to achieve deep greenhouse gas emissions reductions for sub-national governments, including the ACT.
- Development of methodology for energy related components of the National Greenhouse Gas Inventory and compilation of inventories for successive years.
- Estimation of emissions abatement achieved by a wide variety of national and state energy efficiency programs and policies.
- Participation as an energy sector member of expert teams undertaking desk, centralised and comprehensive in-country reviews of national greenhouse gas inventories on behalf of the UNFCCC Secretariat.
- Detailed analysis of the energy efficiency and emissions performance of various categories of electricity and gas household appliances.
- Analysis of various aspects of the design of what became the National Greenhouse and Energy Reporting Scheme.
- Analysis of design options for policies to support renewable energy deployment.
- Examination and analysis of various aspects of the design of an Australian emissions trading scheme
- Preparation of *A Clean Energy Future for Australia*, a major back-casting scenario study of demand, supply and greenhouse gas emissions from the stationary energy sector in 2040.
- Projections of future demand for electricity and of fugitive emissions from coal, petroleum and natural gas activities

CONSULTANCY EXPERIENCE WITH ECONOMIC AND ENERGY ANALYSIS

Responsible for developing the company's expertise and undertaking consultancies in three broad areas.

- (1) Energy, environmental and industry economics and policy:* Electricity economics, mining and the environment, energy and the environment (including the greenhouse effect – first report on this issue in 1989), efficient supply and use of energy, national energy policy, energy RD&D, new energy technologies, development assistance projects in the energy and minerals sector, including evaluation of government programs in many of these fields.
- (2) Petroleum policy and pricing:* Public policy development and implementation in relation to the petroleum product market and the pricing, supply and distribution of petroleum products in Australia and in Pacific Island countries.
- (3) Fuel procurement and management for major transport operators and other large participants in the oil market:* Comprehensive services including monitoring market developments, preparation of fuel tender documents, appraisal of tenders, client support in contract negotiations, contract administration and implementation of fuel management information systems.

EARLIER CONSULTANCY EXPERIENCE

While working in Europe, studies on the environmental and social costs of transport in Britain, of the costs and benefits of alternative sites for the third London airport, of the impact of a Channel tunnel on demand for cross-Channel car ferry services, of the effects of regional airports in stimulating industrial development in Europe, and of factors affecting the location of heavy process industries in north west Europe, with special reference to environmental pollution and implications for the further development of Rotterdam.