**BEFORE THE EPA**
**SHELL TODD OIL SERVICES LIMITED MARINE CONSENT APPLICATION**

**IN THE MATTER** of the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012

**AND**

**IN THE MATTER** of a decision-making committee appointed to consider a marine consent application made by Shell Todd Oil Services Limited to continue natural gas extraction and associated activities at the existing structures known as Māui Platform A and Māui Platform B in the Māui natural gas field

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# STATEMENT OF EVIDENCE OF FRASER JAMES COLEGRAVE FOR SHELL TODD OIL SERVICES LIMITED

**DATED 17 MARCH 2015**

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**MAY IT PLEASE THE COMMITTEE**

**Executive summary**

1. This evidence analyses the likely financial and economic impacts of Māui future life, including the potential adverse effects of unplanned activities, such as vessel strike or a hydrocarbon spill.

2. It starts by describing the unique characteristics of New Zealand's gas market to provide context. For example, it notes that gas is used mostly for electricity generation and industrial processes, and that there are no imports or exports to help balance supply and demand. As a result, the market has had to devise its own way to maintain equilibrium by reducing the quantity supplied to very large users during times of scarcity, and vice versa.

3. Next, I describe the model that I built to analyse the likely financial effects of future life, including fiscal effects. I summarise my projections of future production levels, revenues and expenses before presenting my estimates of fiscal impacts, which total nearly $1.2 billion over future field life.

4. Having analysed financial impacts, I then turn my attention to the corresponding economic impacts, including contributions to national GDP, incomes and employment.

5. I note that these depend critically on extent to which New Zealand firms undertake future field activities, such as operations and maintenance, rather than international firms. While New Zealand firms typically capture only small shares of such activity, I estimated that over 80% of future Māui activity would accrue domestically. Accordingly, the national economic impacts will be significant.

6. In fact, I estimated that Māui future life would boost national GDP by $350 million per annum, employment by 1,150 people, and household incomes by $66 million per annum (during an average year and including flow-on effects).

7. In addition to these quantifiable impacts, I conclude that Māui future life would also (i) improve security of energy supply, (ii) support regional economic development, (iii) help attract and retain skilled labour and (iv) have positive reputation effects by showing that New Zealand is "open for business."

8. Next, I analyse the likely impacts of consent denial relative to approval. To begin, I note that not only would this forego all the benefits of production outlined above, but that there would also be significant and enduring economic losses from the foregone *consumption* of Māui gas. Overall, I identify three demand-side impacts likely to be associated with consent denial.

9. First, there would be significant and sustained economic losses for major contracted buyers of Māui gas, such as Methanex and Fonterra, who are heavily reliant on Māui gas for their productive processes. Second, there would be significant impacts on the electricity sector due to losses of gas-fired generation capacity. If sustained, these could lead to long-term increases in wholesale and retail electricity prices which, in turn, could undermine the viability of major electricity users such as the Tiwai smelter.

10. Third, in addition to direct impacts on contracted buyers of Māui gas, there would also be long-term impacts on the wider gas market via higher prices (than would have occurred if consent was approved). Finally, I turn my attention to the potential impacts of unplanned adverse events, such as vessel strike or a hydrocarbon spill.

11. Overall, I conclude that these would not have enduring adverse economic effects because:

    (a) STOS is a world-class operator, which has developed a range of measures aimed at mitigating or avoiding problems at their source.

    (b) Most unplanned events are likely to be minor and short-lived anyway.

    (c) More serious unplanned events are extremely unlikely to occur;

    (d) Even the worst feasible hydrocarbon spill would not cause significant damage, with none of the modelled scenarios reaching even the lowest exposure threshold established for the protection of 99% of species.

12. Hence, not only would the granting of consent have significant financial and economic benefits for New Zealand, but the risks of adverse events would be relatively minor. Accordingly, I submit that marine consent should be granted on financial and economic grounds.

**Introduction**

13. My full name is Fraser James Colegrave.

14. I hold a first-class honours degree in economics from the University of Auckland (1996).

15. I have 20 years' commercial experience, the last 15 of which I have worked as an economics consultant.

16. I am the managing director of Insight Economics Limited, an economics consultancy based in Auckland. Prior to that, I was a founding director of another economics consultancy – Covec Limited – for 12 years.

17. I have led and completed over 200 consulting projects, mostly related to resource management. I have worked on a number of major resource management issues across New Zealand, and regularly present evidence at hearings before Councils, the Environment Court, and the EPA.

18. My role has been to analyse the likely financial and economic impacts of Māui future life, including the effects of unplanned events, such as vessel strike or a hydrocarbon spill.

**Code of conduct**

19. I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court of New Zealand Practice Note 2014 and that I have complied with it when preparing my evidence. Other than when I state I am relying on the advice of another person, this evidence is entirely within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

**Scope of evidence**

20. The rest of my evidence is structured as follows:

    (a) First, I briefly describe the unique features and characteristics of New Zealand's gas market to provide important context.

    (b) Second, I analyse the likely financial impacts of Māui future life, including fiscal effects.

(c) Third, I estimate the economic impacts of Māui future life, including contributions to GDP, incomes and employment.

(d) Fourth, I analyse the costs and benefits of consent denial relative to consent approval.

(e) Fifth, I address the potential adverse effects of unplanned activities.

(f) Sixth, I briefly address economic issues raised in submissions.

(g) Finally, I offer some concluding remarks.

21. I confirm that I have adequate information before me to comment on, and draw conclusions about, the matters above.

**A brief introduction to New Zealand's gas industry**

22. The extraction and use of natural gas has a long history in New Zealand, with the first seeps observed on New Plymouth's coastline 150 years ago.[1] While early exploration efforts produced mixed results, persistence paid off. Nearly 100 years later, New Zealand's first major field – Kapuni – was discovered, marking the start of a new chapter in our energy history.

23. In 1969 – ten years after the discovery of Kapuni – the Māui Field was discovered. It went into production ten years later in 1979 and, as one of the largest fields in the world at the time, provided an abundant supply for around 25 years before its reserves started to decline.

24. As Māui's reserves started to decline, a number of new discoveries were made, all in Taranaki. While some of these discoveries are likely to reflect encouragement by the Government[2], the accelerated discovery of new supply in the wake of declining Māui reserves was no coincidence. The economic rationale is simple.

25. Put simply: the depletion of Māui's reserves significantly reduced market supply, causing the price of gas to rise. As the price rose, so too did the

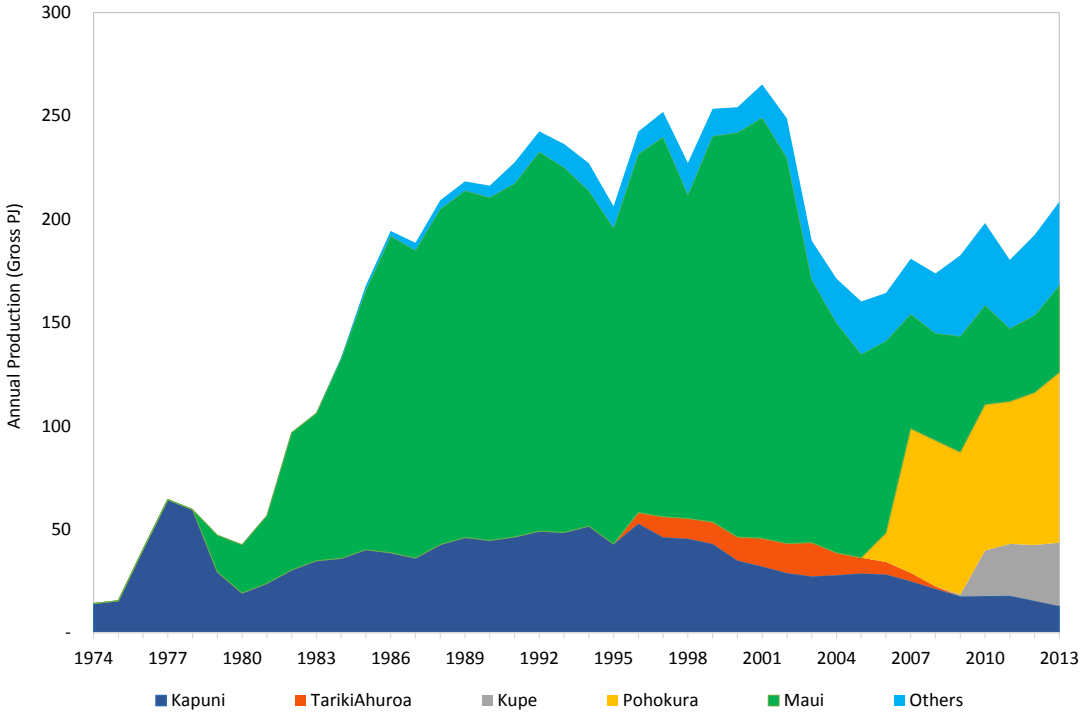
[1] Retrieved from: http://www.stos.co.nz/faq.asp.

[2] For example, the Government negotiated a number of discounted royalty payments in the 2000s to encourage greater exploration.

potential gains of new supply, which led to increased exploration.[3] As exploration activity increased, new fields were found.

26. Seen in this way, the industry can be thought of as partially self-regulating, at least over the longer term. However, as shown in the chart below, production has yet to return to the peak levels of the late 1990s before Māui started to ramp down.

**FIGURE 1: ANNUAL GAS PRODUCTION (GROSS PJs)**




27. Once extracted and processed, gas is distributed to a wide range of users across the North Island of New Zealand. Although consumption patterns vary from one year to the next, the majority of gas is used to generate electricity. In fact, as shown in the chart below, electricity generation accounted for 43% of total gas demand in 2013.[4]

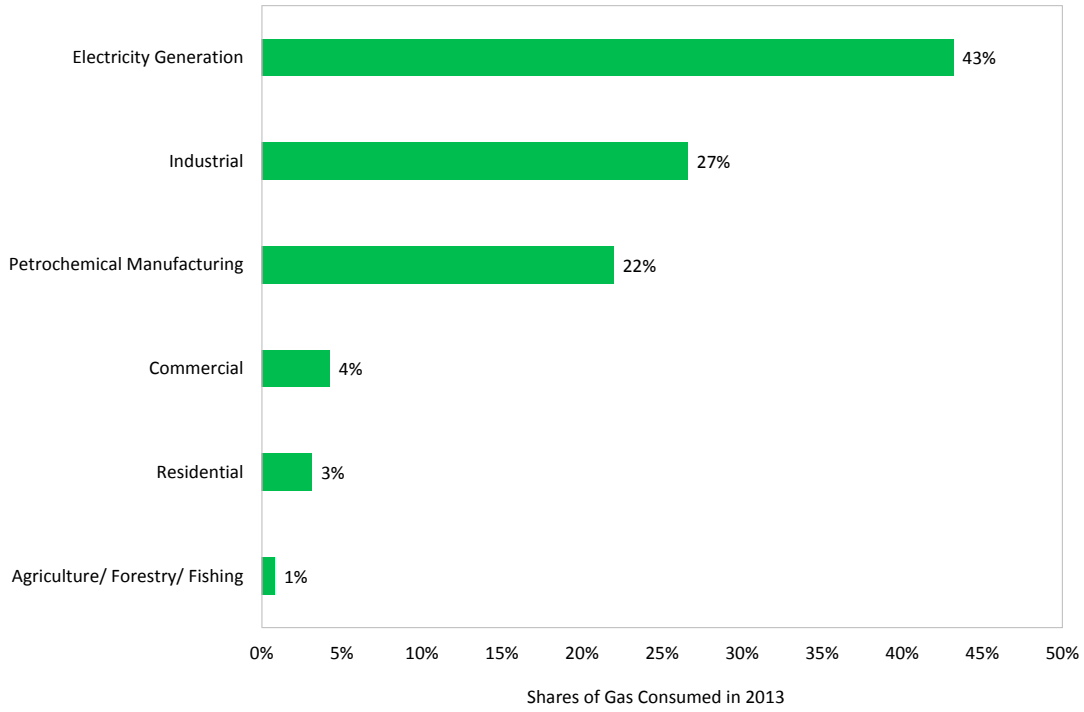
28. Other major gas users include (i) industrial, such as Fonterra and the Glenbrook Steel Mill, and (ii) petrochemical manufacturing – which refers to the use of gas as a feedstock in the production of methanol and urea.

[3] This inextricable link between wholesale gas supply and prices is widely recognised in the sector, and even underpins the formal definition of field reserves.

[4] As discussed later, the use of gas to generate electricity plays an important part in New Zealand's security of energy supply, specifically by helping meet demand when poor hydrology limits hydro generation. In fact, gas-fired generation accounts for around 25% of New Zealand's electricity generation, second only to hydro.

29. Minor gas users include commercial (such as restaurants) and residents, who mainly use it for water- and space-heating.

**FIGURE 2: SHARES OF GAS CONSUMED IN 2013**




30. Another defining characteristic of New Zealand's gas market is that it operates in isolation, with no imports or exports to help address supply/demand imbalances.

31. With no easy way to store gas in times of excess supply[5], the market has had to devise its own way to maintain equilibrium. It does so quite effectively by reducing the quantity supplied to very large users during times of scarcity, and vice versa.

32. Of these large, flexible users, Methanex's methanol plant in Taranaki stands out as the most significant. Its production levels have varied markedly over the last 20 years in direct response to supply variations. Accordingly, it is often viewed as a key enabler of upstream exploration and production in New Zealand.[6] I return to this point shortly.

[5] I acknowledge that the Ahuroa storage plant has recently provided New Zealand with its first formal gas storage facility and that gas may also be re-injected as required. However, it is still widely recognised that our gas system has only a limited ability to balance supply and demand over time.

[6] Concept, Long Term Gas Supply and Demand Scenarios, September 2012, page 5.

33. Finally, it is important to note that gas is not the only product extracted from the Māui gas field. In addition, like most other gas fields, Māui also produces significant quantities of condensate – a low-density mix of hydrocarbons that condenses at low temperatures and is thus extracted as a liquid.[7] In contrast to Māui's natural gas, which is all sold domestically, condensate is all exported directly for sale on the world market.

34. Accordingly, while condensate extraction generates financial and economic benefits just like gas, there are no corresponding local benefits from consumption. As a result, in the initial parts of my evidence that deal with the productive impacts of the field I include both products. However, in latter sections dealing with wider effects, I focus mainly on gas.

**Estimated financial impacts of future field life**

35. The granting of marine consent, as sought by this application, will significantly extend Māui's productive life, and thus enable any remaining commercially-viable reserves to be extracted and sold over time.

36. To estimate the financial impacts of Māui future life I built a model that traced all financial likely flows from now until 2030 – a notional end of extended field life. However, I am clear that consent has been sought for a 35 year period because expectations such as these can change over time. For example, due to technology improvements, understandings of reservoirs and changes in the market. I appreciate that Shell Todd Oil Services Limited (**STOS**) will operate the Māui Field as long as it can and that the longer it operates the more economic benefits are likely to flow.

37. While my analysis is comprehensive, it excludes the financial and economic effects of decommissioning because this will occur regardless of the consenting outcome; only the timing will vary. Accordingly, it cancels out when assessing the relative impacts of consent approval or denial.[8]

38. As most readers will be aware, the Māui facilities are owned by a joint venture (**JV**) that comprises Shell Petroleum Mining Limited, Todd Petroleum

[7] According to the Impact Assessment, current production from the Māui field is in the order of 1 to 5 $Mm^3$/day of gas and 250 to 1,500 $m^3$/day of condensate.

[8] Technically, the omission of decommissioning is likely to understate the financial merits of consent approval, because decommissioning costs are likely to be lower in NPV terms if done in 15 years' time (say) than if done fairly soon as they would be in the case of consent denial.

Mining Limited and OMV New Zealand Limited. This significantly complicated my analysis, because each JV partner has its own approach to the marketing and sale of products, and each pays its own taxes, levies and royalties. As a result, there is no single set of publically available accounts that covered the JV in its entirety.

39. To overcome this, I pegged my analysis to the operating structure and key parameters of one of the JV partners, then scaled the results up accordingly to yield estimates of financial and economic impacts for the JV as a whole.

40. With these issues addressed, I started to build the model up from first principles by first identifying the likely rates of future production.

41. My analysis showed that gas and condensate production are both predicted to grow steadily from 2016 to around 2027, before rapidly dropping off. All up, I estimated total future production to be around 620 PJs of gas, and 30 million barrels of condensate.

42. To convert these production estimates to projections of future revenues, I needed to first project wholesale gas and condensate prices. To that end, I used a wholesale gas price of NZ$6 per GJ for 2015 and a long-run condensate price of US$80 per barrel, both growing at 2% per annum. To convert the condensate prices to New Zealand dollar terms, I also applied an assumption about the future exchange rate.[9]

43. Applying the price assumptions above to my estimates of future production yielded a revenue estimate of $8.4 billion from 2015 to 2030.

44. As one might expect, significant expenditure will be required to earn the projected revenues above, particularly now that the field is in its twilight years. This situation was described in the Impact Assessment as follows:[10]

> *"STOS' focus has shifted from running and maintaining the asset for maximum reliable production, to finding new and innovative ways to economically unlock more difficult remaining volumes from the existing reservoirs by applying evolving technology solutions."*

[9] The assumed exchange rate for 2015 is the 2014 average, which then follows a linear trend to reach the 15-year historic average by 2030.

[10] Shell Todd Oil Services Limited, Māui Impact Assessment, December 2014, page 205.

45. At the highest level, these future expenditures can be split into three main types:

(a) Operating expenditures – which cover the day-to-day operations of the platforms and various associated structures;

(b) Capital expenditures – which cover the maintenance, repair, upgrade, and replacement of the physical structures; and

(c) Exploration costs – which cover the costs of future exploration.

46. The following table shows total estimated project costs to 2030 by type.

**TABLE 1: SUMMARY OF PROJECT COSTS**

| **Project Expenditures** | **$m** | **Shares** |
|---|---|---|
| Operating | $4,830 | 78% |
| Capital | $1,300 | 21% |
| Exploration | $40 | 1% |
| **Total** | **$6,170** | **100%** |

47. As shown above, project costs are estimated to be $6.2 billion to the end of (notional) field life. These are dominated by operating costs, which account for 78%, followed by capital expenditures at 21%. Exploration costs comprises the final 1% of project expenditures.

48. In addition to the specific costs described above, the JV will also incur significant taxes, levies and royalties. Specifically, it will be required to pay:

(a) Royalties – which equal the greater of (i) 5% of net sales revenues, or (ii) 20% of accounting profits;[11]

(b) Emissions Trading Scheme (**ETS**) payments – which are levied per tonne of $CO_2$ in relation to gas, but not condensate as it is exported. For the purpose of this exercise, I modelled the payments assuming a long-run average payment of $10 per tonne of $CO_2$.

[11] Net revenues equal gross revenues minus the cost of transporting and processing raw product. For the purpose of this assessment, I have assumed that net sales = 76% of gross sales. Then, I calculated royalties on the AVR basis. To the extent that the APR calculation would deliver a higher royalty payment, my estimates of Crown fiscal benefits will be understated.

(c) Energy Resource Levy (**ERL**) – which equals $0.45 per GJ of gas;

(d) Company tax – which equals 28% of net profits.

49. Each of these was incorporated into the model so that fiscal impacts could be assessed. These are summarised in the table below, which shows the estimated returns to the Crown over the remaining notional field life (i.e. to 2030).

**TABLE 2: ESTIMATED FISCAL IMPACTS**

| **Fiscal Effects** | **$m** | **Shares** |
|---|---|---|
| Royalties | $320 | 27% |
| ETS Payments | $320 | 27% |
| ERL | $280 | 24% |
| Company Tax | $250 | 21% |
| **Total** | **$1,170** | **100%** |

50. According to my calculations, the JV could pay around $1.2 billion to the Crown over Māui's (notional) remaining field life. This is split fairly evenly between royalties, ETS payments, the ERL and company tax.

51. In summary, if consented, significant financial impacts will be associated with the extension of Māui Field life, including major financial windfalls to the Crown.

**Estimated national economic impacts**

52. I now turn my attention to the corresponding economic impacts of Māui future life. These comprise two parts:

(a) Quantifiable impacts – which include the contributions that Māui future life would make to national GDP, incomes and employment.

(b) Intangible impacts – which include a range of other economic effects that are more difficult to quantify, but which are important nonetheless.

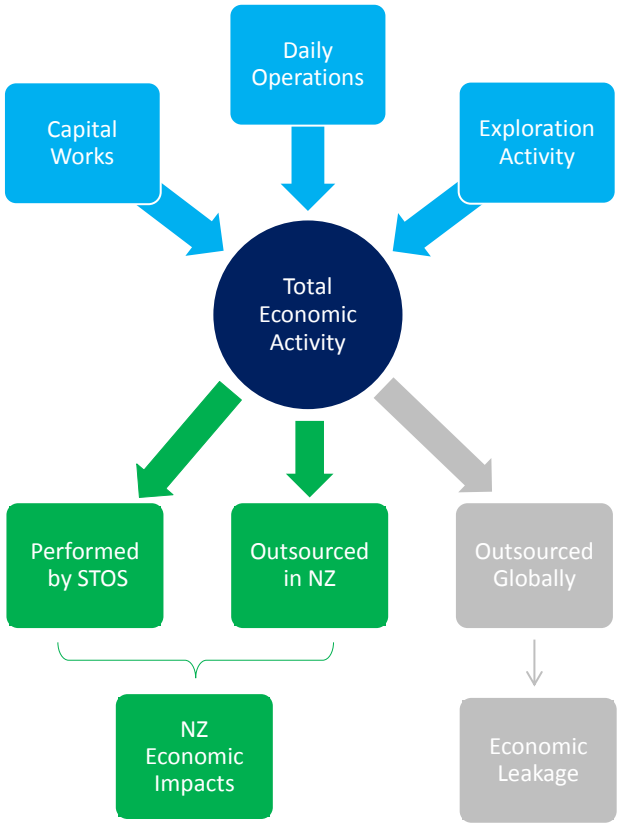
53. I start with the quantifiable impacts and then move on to intangibles.

*Quantifiable economic impacts*

54. The granting of consent will enable a significant amount of economic activity to occur, including daily operations, regular capital works, and exploration.

55. As shown in the stylised figure below, the resulting economic impacts depend on how these activities are resourced. Thus, the more work done by New Zealand firms, the greater the national impacts, and vice versa.

**FIGURE 3: THE LINK BETWEEN RESOURCING AND ECONOMIC IMPACTS**




56. A recent detailed analysis by Venture Taranaki estimated that New Zealand typically captures 45% of total activity for offshore gas projects (like Māui) because the project teams are usually based overseas.[12]

57. However, since STOS is New Zealand based, Māui's work-streams historically, particularly operating expenses, incorporate more local content. In fact, I have estimated that New Zealand firms will capture over 80% of total future activity – nearly double the industry average.

[12] Venture Taranaki, The Wealth Beneath our Feet: the value of the oil and gas industry to New Zealand and the Taranaki Region, 2010.

58. The resulting increase in domestic economic activity will give rise to two types of economic impacts, which I quantify below. They are:

(a) Direct Effects – which capture the direct economic effects of STOS;

(b) Flow-on Effects – which capture downstream impacts, including the impacts of STOS' supply chain spending, plus additional spending by supply chain employees.

59. To estimate these, I first calculated the direct effects of Māui. Then, I traced its supply-chain spending through the national economy – using a technique called multiplier analysis – to estimate the corresponding flow-on effects.

60. Table 3 summarises the annual impacts of Māui future life using the latest multiplier (input-output) tables produced by Insight Economics for 2011.[13] To smooth out significant variations in total economic activity from one year to the next, the results below are based on a hypothetical 'average' year.

**TABLE 3: ESTIMATED ANNUAL NATIONAL IMPACTS**

| Economic Impacts | Direct | Flow-On | Total |
|---|---|---|---|
| Value Added /GDP ($m) | $260 | $90 | $350 |
| Employment (FTEs) | 360 | 790 | 1,150 |
| Household Incomes ($m) | $36 | $30 | $66 |

61. Table 3 shows that, in an average year and including flow on effects, Māui future life will boost national GDP by $350 million, employment by 1,150 people, and household incomes by $66 million.[14]

62. Also of particular note is the $90 million of GDP generated for downstream suppliers. This confirms the findings of other studies, namely that many local firms exist largely because of significant regional oil and gas activity.

63. For example, the 2012 report "The Wealth Beneath our Feet" noted:

[13] Multiplier analyses incorporate highly detailed matrices – called input output tables – which show how the various sectors of an economy are interrelated. Using this table, it is possible to estimate the wider impacts of increased activity in one sector (i.e. gas extraction) on the rest of the national economy. To ensure that the analysis was as up-to-date and robust as possible, it incorporates the latest (2011) input output tables derived by my company last year. These are a considerable improvement on the previously-available 2007 tables, which are now out of date. For more information, please see here. http://insighteconomics.co.nz/input-output-tables/.

[14] These figures include the 360 employees that are expected to be employed by STOS, which show up as the direct effects. Similarly, the $36 million of direct incomes also relate to STOS employees.

*"Many Taranaki companies presently hold significant ongoing contracts with the major oil and gas companies for the maintenance of platforms, processing plants and other significant infrastructure. The contracts typically underwrite local companies as their core business."*

64. Of course, suppliers to the industry are not the only ones that have benefitted from its presence. In addition, significant, gas-consuming companies have also established locally as a result, giving rise to further economic impacts. However, these relate to the consumption of gas, not its production, which I address later.

65. Finally, while this analysis is focused on national economic impacts, it seems useful to briefly consider the extent to which the Taranaki region itself will benefit from Māui future life.

66. Unfortunately, it has not been possible to directly identify Taranaki-based STOS contractors and suppliers within the time available. However, STOS estimates that 90% of total employment associated with the field occurs in the region. This means that, including flow-on effects, Māui future life is estimated to boost annual regional:

    (a) Employment by 1,030 full-time equivalents, and

    (b) Incomes by $60 million.

67. Again, these apply only to production impacts, with actual regional impacts also being bolstered by a range of consumption-related benefits.

*Intangible economic impacts*

68. In addition to the readily quantifiable impacts above, Māui future life will also have a range of intangible impacts. These include:

    (a) Security of energy supply, with respect to both gas and electricity.

    (b) Support for the region's economic development strategy, a key objective of which is to *"position Taranaki as New Zealand's centre of oil and gas."*[15]

[15] Taranaki Regional Economic Development Strategy 2010-2035.

(c) The attraction and retention of skilled labour, which has positive impacts for the wider regional and national economies.

(d) Reputation effects, by signaling to other prospective investors that "New Zealand is open for business."

**Potential financial and economic effects of consent denial**

69. I now analyse the potential financial and economic effects of consent denial relative to the impacts of consent approval.

70. To begin, I first note that consent denial would forego all the financial and economic benefits of production outlined above. Thus, it would cause:

(a) The Crown to forego up to $1.2 billion in taxes, royalties and levies.

(b) The country to forego $350 million of annual GDP, $66 million of annual household incomes and 1,150 full time jobs, and

(c) Many of the intangible benefits above to be lost also.

71. However, this is only half the story. In addition, consent denial would trigger a number of economic losses due to the foregone *consumption* of Māui gas.

72. Indeed, while Māui has now come off its peak, it is still a major gas producer. In 2013, it produced 20% of total supply and held 18% of remaining (p50) reserves.[16] As a result, the closure of Māui would cause a significant and sustained loss of market supply with serious and enduring consequences.

73. Although it is difficult to predict – with absolute precision – the impacts of consent denial, a number of recent studies provide useful insights. For example, a 2014 report by Worley Parsons analysed the impacts of various **hypothetical** major gas disruptions, one of which was an extended supply disruption at Pohokura.[17]

74. While this hypothetical scenario is not a perfect proxy for the loss of Māui, it does provide some valuable lessons. For example, the authors correctly

[16] MBIE, Energy in New Zealand 2014: comprehensive information on and analysis of New Zealand's energy supply, demand and prices.

[17] WorleyParsons, Gas Disruption Study: report on the potential impacts on the New Zealand gas market, January 2014.

note that the initial effects would be felt through contracts held with buyers, most of which are confidential and long-term. Those contracts would be defaulted by the declaration of a Force Majeure event, with a critical contingency event invoked to curtail demand across the bands according to the Gas Governance (Critical Contingency Management) Regulations 2008.

75. Beyond that, there would be flow-on effects as curtailment slowed or halted the production processes of major users. For example, Methanex would shut down one methanol train at Motonui, Fonterra would assess which North Island processing plants to close, and Genesis would likely fire-up its Huntly coal units to preserve gas for major industrial users. However, small users (such as residential) would largely be unaffected.

76. In another 2014 report, this time by Concept Consulting, the impacts of various long-term supply scenarios were analysed.[18] One of these was a "tight supply" outlook where insufficient gas was discovered or 'proven up' to meet demand.

77. Its findings were similar to those of the WorleyParsons report, where major users were curtailed until supply matched demand. However, it predicts that some major users – like Methanex – could be curtailed to the point that operations are no longer viable and hence production ceases indefinitely.

78. Based on a thorough review of the reports above (and others like it), and based on my own research and analysis, I expect consent denial to have the following broad impacts relative to consent approval:

    (a) Significant, sustained economic losses for major, contracted buyers of Māui gas.

    (b) Prolonged flow-on effects for the electricity sector, with reduced generation capacity, reduced security of supply and potentially higher prices.

    (c) An overall loss of wholesale gas supply, leading to higher gas prices for most users.

79. I work through each of these further below.

[18] Concept, Long Term Gas Supply and Demand Scenarios, September 2012.

*Significant, sustained economic losses for major direct users of Māui gas*

80. As New Zealand's leading gas supplier since the late 1970s, Māui is likely to hold ongoing contracts with a number of major gas users. Of these, one of the most significant is Methanex.

81. While Methanex's contractual relationship with Māui is seldom mentioned publicly, it has appeared in some publicly-available documents[19] and is regularly alluded to in studies of the sector. Accordingly, it is safe to conclude that a loss of Māui gas will directly affect Methanex.

82. As mentioned earlier, Methanex has played a special role in balancing gas supply and demand by adjusting its production levels to suit. In 2014, it returned to full capacity for the first time since 2004[20], and produced two million tonnes of methanol for the first time in 10 years.[21]

83. If Māui closed due to consent denial, Methanex's gas supply would be curtailed immediately leading to major reductions in output. As its output fell, so too would the associated economic benefits.

84. For example, a recent report by BERL estimated that Methanex generated $650 million of national GDP and employed 1,200 people (including flow-on effects) when operating at full capacity.[22] Thus, if Māui caused Methanex production to fall by (say) a third, this would lead to the loss of $215 million in annual GDP and 400 full-time jobs.

85. In the worst case scenario, where Methanex is heavily reliant on Māui gas, production levels could drop to the point that operations are no longer viable, causing it to permanently close one or more of its Taranaki plants. This recently occurred at one of Methanex's Chile plants, which has since been relocated to the United States to take advantage of more advantageous operating conditions.[23]

[19] http://www.contactenergy.co.nz/aboutus/pdf/financial/2004_maui_gas_june.pdf.

[20] MBIE, Energy in New Zealand 2014.

[21] https://www.methanex.com/sites/default/files/locations/new-zealand/news/Methanex-NZ-Our-News-2014-12.pdf.

[22] http://www.stuff.co.nz/taranaki-daily-news/news/9259205/Full-steam-ahead-for-methanol-industry.

[23] https://www.methanex.com/news/methanex-planning-relocate-methanol-plant-us-gulf-coast.

86. Fonterra is another major user that is likely to be directly affected by the loss of Māui gas. It has 21 processing plants that are dependent on gas and which collectively require around 4.5 PJ of gas per year.

87. In its submission on the WorleyParsons report mentioned earlier, Fonterra noted that a significant loss of gas would cause major problems, especially if they occurred during peak season. Further, it noted that these issues would not be transient and would remain long after supply was restored.[24]

88. It noted that current diesel infrastructure would be sufficient to support dual-fuelled sites for only 7-10 days, beyond which herds would have to be dried leading to immense economic and environmental costs.

89. Overall, it estimates that the cost of unserved energy to the dairy industry is around $580/GJ. Thus, if the loss of Māui caused Fonterra to lose (say) 10% of its annual supply, this could lead to annual losses of $260 million.[25]

90. Other major users that are likely to face significant economic detriments include Carter Holt Harvey and New Zealand Steel.[26] While I do not have the necessary information to estimate their potential losses, both recently noted that it is often technically infeasible to retrofit older plants to be dual-fuelled, which limits their ability to mitigate the risk of future gas supply failures. As a result, they would likely also face prolonged and significant economic losses from the closure of Māui, as would many other major industrial gas users.

*Prolonged flow-on effects for the electricity sector*

91. In addition to the companies identified above, the loss of Māui gas would also have significant direct impacts on gas-fired electricity generators. For example, Contact Energy recently signed an agreement to continue purchasing Māui gas, and noted that *"Māui alone now supplies about 80 per cent of our total gas requirements."*[27]

[24] http://www.med.govt.nz/sectors-industries/energy/gas-market/gas-disruption-study/Fonterra.pdf.

[25] Fonterra's annual gas demand is 4.5PJ = 4.5 million GJ. Thus, the loss of 10% equals a loss of 450,000 GJ, which equals $260 million @ $580/GJ.

[26] Ballance is another major user of gas. However, according to the 2014 WorleyParsons report, it sources gas exclusively from Greymouth Petroleum via the Turangi and Kowhai fields. Accordingly, it may be unaffected by the closure of Māui, at least in the short term before wider impacts on the wholesale gas market kicked in.

[27] http://www.contactenergy.co.nz/aboutus/aboutus/nzgasindustry.

92. If consent is denied, this contract (and others like it) will be immediately cancelled under Force Majeure provisions, leaving Contact Energy with a significant gas shortfall for generation purposes. Over the short-term, it is highly unlikely that it will be able to find alternative supply, causing generation to ramp down considerably for an extended period of time.

93. As Contact Energy – and other gas-fired generators – curtail production, wholesale electricity prices will rise as other, higher-cost thermal generators set the price. If this persists, then retail electricity prices may also eventually rise, which would increase the cost of living and the cost of doing business for many New Zealand residents and businesses, respectively.

94. One possibility, however, is that the loss of gas-fired generation is offset by an increase in the use of coal at dual-fired plants such as Huntly. While this would help stabilise electricity supply, and hence potentially avoid electricity price increases, I understand that there would likely be environmental consequences. This is because coal is commonly acknowledged as a 'dirtier' feedstock than natural gas, so its use in lieu of gas would likely cause increased harmful emissions.

95. To the extent that coal-fired generation *does not* fill the gap and there are prolonged reductions in generation capacity, wholesale electricity prices are likely to be higher than they would have otherwise. Over time, this may cause some major electricity users to eventually become unviable.

96. For example, the Tiwai aluminium smelter currently has an agreement to purchase electricity from Meridian until January 2017.[28] If gas-fired generation is still muted when the contract needs to be renewed, the smelter may be unable to secure future electricity supply at an economic rate, which could lead to possible closure. According to its website, the smelter provides $525m in GDP, generates 3,200 jobs, and earns approximately $1m in exports every year, all of which would be lost if it closed.[29]

*An overall loss of wholesale gas supply, leading to higher gas prices*

97. In addition to direct impacts on organisations contracted to buy Māui gas, there would also be long-term impacts on the wider gas market. For

[28] http://www.nbr.co.nz/article/tiwai-pt-smelter-safe-jan-2017-under-new-meridian-deal-wb-143996.

[29] http://www.riotintoalcan.com/ENG/ourproducts/1804_nzas.asp.

example, firms that hold contracts with other fields will eventually need to renegotiate them as their terms expire. If Māui is no longer in production, those other fields will have a higher degree of market power than they would have otherwise, enabling them to charge higher prices. Hence, over the medium to longer term, most gas-using organisations will likely pay more for gas than they would have if Māui was consented to continue operating.

98. Finally, while new fields may eventually be discovered and 'proven up' to replace Māui – particularly to the extent that wholesale gas prices increase – that process will take a long time.[30] In addition, the willingness of operators to undertake further exploration may be undermined if major users such as Methanex have closed.

99. Accordingly, I conclude that the closure of Māui would cause significant and sustained losses of gas supply with serious and enduring consequences for the national and regional economies.

**Potential financial and economic effects of unplanned activities**

100. I now consider the potential impacts of unplanned adverse events, such as vessel strike or a hydrocarbon spill.

101. As most readers will be aware, such unplanned events formed a major focus of the Impact Assessment submitted by STOS to the EPA with its application for marine consent, which not only identified a number of potential unplanned events, but also outlined detailed methods to remedy, mitigate or avoid related adverse effects.

102. I acknowledge that there are a number of individuals and entities who may be affected by unplanned events, particularly a hydrocarbon spill, and that potential effects on these entities must be taken into account.

103. However, having carefully reviewed the Impact Assessment, and based on discussions with the wider project team, I am satisfied that any unplanned events would be extremely unlikely to have enduring adverse economic effects for the following reasons.

[30] For example, both Kapuni and Māui took 10 years from discovery to production.

104. First, most unplanned events are likely to be relatively minor, with any adverse effects also being relatively minor and short-lived.

105. Second, any unplanned events with greater potential for harm are extremely unlikely to occur. For example, the 8-12 week loss of well control modelled in the WorleyParsons report was described as a 1-in-5000 year event.

106. The odds of a major spill at Māui will be similar, particularly since it is operated by STOS who has successfully operated gas fields in New Zealand for several decades without significant issues. Indeed, as set out in the Statements of Evidence of Mr Bridge, Mr Hey and Dr Lane, STOS has developed a range of measures that are aimed at mitigating or avoiding problems at their source, which further ensures that adverse effects are highly unlikely to occur, let alone for any extended period of time.

107. Third, as described in the evidence of Dr Brian King, spill modelling conducted on behalf of STOS shows that even the worst feasible hydrocarbon spill is unlikely to cause significant and enduring damage. This is because gas would quickly evaporate, and so too would a significant proportion of condensate. In fact, the spill modelling shows that around 75% of condensate would evaporate within 96 hours of spilling, and that the remaining waxy substance would not be toxic.

108. Further, the spill modelling showed that condensate "weathering" would mean that only a fraction (up to 3.6%) of the total spill volume would reach the shore and that none of the modelled scenarios reached even the lowest exposure threshold established for the protection of 99% of species.

109. While I acknowledge that the evidence of Ms Nici Gibbs states that a hydrocarbon spill could have moderate to serious economic effects on particular sectors of the fishing or aquaculture industry, this needs to be put in context of the underlying risk. Indeed, as noted just above, the probability of a severe and prolonged hydrocarbon spill is about 1-in-5000, so the risk-weighted impacts on these industries will be minor.

110. For example, if the worst feasible hydrocarbon spill had a hypothetical economic impact of (say) $5 billion, the risk-weighted impact of that event is only $5 billion x 1/5,000 = $1 million.

111. As a result, I do not believe that unplanned events represent significant potential economic risks and should therefore be treated accordingly when evaluating the consent application.

**Submissions**

112. I now briefly comment on economic issues raised by three submitters: MBIE, Venture Taranaki, and Te Korowai o Ngāruahine Trust.

113. MBIE's submission outlines the importance of New Zealand's natural resources to achieving the Government's Business Growth Agenda and to meeting ambitious future export targets. Then, it comments on the economic contribution made by the sector before quantifying the likely fiscal impacts of Māui future life.

114. I agree entirely with this submission and also note that its calculations of future royalties and taxes are very similar to mine. For example, I calculate a total fiscal impact of $1.2 billion, while the MBIE submission estimates it to be "over $1 billion."

115. Venture Taranaki outlines a number of economic benefits associated with the Māui facilities and also the sector more generally. I agree with these conclusions and note that they coincide with the key findings of my analysis.

116. Finally, Te Korowai o Ngāruahine Trust expresses concern that the Impact Assessment submitted by STOS fails to consider the potential economic costs to other sectors, and that it also fails to properly consider the spatial distribution of economic costs and benefits.

117. While I agree that the Impact Assessment did not include a lot of detail on potential economic costs, this evidence and the evidence of others seeks to address this matter. For example, the evidence of Ms Nici Gibbs provides a detailed analysis of the potential effects of a hydrocarbon spill on the fishing and aquaculture industries.

118. Further, while I understand Te Korowai o Ngāruahine Trust's wish to better understand distributional effects, these will be difficult to assess with any confidence and are not requirements of the legislation. Accordingly, I do not believe that they are relevant issues for these proceedings.

**Conclusion**

119. This evidence has carefully considered the potential financial and economic impacts of Māui's future life, as enabled by this consent application. It has found that future life is likely to deliver a host of benefits, including a potential windfall of up to $1.2 billion to the Crown.

120. In addition, it has considered the likely impacts of consent denial relative to consent approval. It found that not only would all the financial and economic benefits of production be foregone, but that there would also be significant and enduring economic losses due to the foregone *consumption* of Māui gas.

121. Finally, my evidence has considered the potential financial and economic effects of unplanned events, such as vessel strike or a hydrocarbon spill. While I acknowledge that a number of entities and individuals have interests that could be affected by such unplanned events, these are extremely low risk and should therefore be treated accordingly.

122. Consequently, I believe that consent should be granted on financial and economic grounds.

Fraser James Colegrave

17 March 2014