Before the Decision-Making Committee of the

Environmental Protection Authority

Application for Marine Consent for

Shell Todd Oil Services Limited

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

AND An application by Shell Todd Oil Services Limited for a marine consent for existing and planned future activities relating to the extraction, production and transport of natural gas and condensate at Maui Platform A and B, natural gas field.

Submission of Lyndon DeVantier, PhD

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Introduction

1. I thank EPA and the DMC for providing this opportunity to speak to my submission. As you know, my written submission was brief and wide-ranging, and I appreciate this opportunity to expand on some key aspects here today.
2. Having reviewed some, although by no means all, of the voluminous evidence provided to date, I maintain my opposition to the proposed drilling of 22 side-track wells, or any new wells from Maui A and B.
3. I submit that if a permit is issued by EPA to STOS on this application, it should be limited in duration to five years. This should allow time for completion of STOS' current operations at Maui, and for STOS to develop an appropriate decommissioning plan for subsequent assessment by EPA and other relevant government agencies.
4. The rationale for my submission to decline the application for expansion of drilling at the Maui Field is based on adoption of a cautionary approach in respect of the cumulative impacts of continued mining of fossil fuels on the environment and economy. I also contend that the Applicant has not provided 'best available information' required under Section 61(5) of the Act, on which a properly informed decision can be made. Of particular relevance are the lack of baseline and monitoring data as these pertain to:
    - Section 6(1d) and Section 59(2a(i) dealing with cumulative effects, specifically "*any cumulative effect that arises over time or in combination with other effects";*
    - Section 10 Purpose of the EEZ Act, dealing with 'sustainable management', and specifically Clause 2(b) on '*safeguarding the life supporting capacity of the environment'*;
    - Section 11 regarding international obligations to treaties and conventions, notably UNCLOS, UNCBD, and also the Noumea Convention and London Convention on Dumping;
    - Section 59(2d) requiring protection of biodiversity, ecosystems and processes.

(http://www.legislation.govt.nz/act/public/2012/0072/latest/DLM4670826.html)

5. I understand that the Committee has sought information from other government departments and ministries on related legislation that may impinge upon this application.
6. In this respect I bring to the Committee's attention another piece of legislation that is currently under consideration, the Trans Pacific Partnership Agreement (TPPA), which may impinge on their decision, if New Zealand joins the Agreement.

7. Although TTPA negotiations are not subject to public scrutiny, leaked documents indicate that the draft Investor State Dispute Settlement (ISDS) clauses in TPPA have the potential to restrict future decision-making options.
8. This could potentially become a major issue with rapidly growing investor divestment from fossil fuels, removal of perverse subsidies, attribution of real environmental costs, and reductions in cost of renewable energy sources all gaining pace, and as fossil fuel assets become stranded in future decades.

Rationale

9. Herein I take a broad view of the definitions of 'cumulative effects', and of 'environment', to encompass not just the immediate vicinity of the STOS Maui application, but the larger area of New Zealand, particularly our coastal waters and foreshore.
10. As highlighted by STOS (Transcript of Proceedings Day 1, page 22), Section 59(5b) of the EEZ Act specifically requires that: *The EPA must not have regard to the effects on climate change of discharging greenhouse gases into the air.*
11. The Act does not as yet specifically restrict EPA from consideration of the cumulative effects of emissions on ocean acidification, which is categorically different to climate change *per se.* Acidification is increasingly impacting the *'life supporting capacity of the environment'* and is driven by the combustion of fossil fuels, an activity directly enabled by the present application (a brief explanation is provided in Annex 1).
12. I submit that many of the minutiae of deliberations undertaken as part of this assessment, although clearly important in respect of satisfying the requirements of the EEZ Act, do not adequately consider this, and other overarching issues on New Zealand's environment and economy of the STOS application in continuing fossil fuel 'business as usual' for another 35 years.
13. Specifically section 59(2)(m) of the Act allows the Committee to take into account any other matter that it considers relevant and reasonably necessary.
14. My presentation is based upon the clear scientific evidence that the cumulative effect of continuing mining and combustion of fossil fuels is rapidly acidifying the oceans.
15. These cumulative effects will increasingly impact the economic viability of fisheries, among a wide array of other impacts. In these respects, I contend that the present STOS application is in direct conflict with the requirements of the EEZ Act sections 6, 10, 11 and 59.

16. I do not consider that STOS has provided best available information in respect of economic and opportunity losses to other industries, particularly fisheries and aquaculture from these cumulative effects.
17. While it is true that the Maui operation is a minor contributor to acidification, this is not the case for the partners, with Shell in particular being a major contributor. And the ancient proverb about straws and camels is entirely relevant here, as every such activity is a direct contributor of acidification and the resulting degradation of the 'life-supporting capacity of the environment'. Each such application contributes directly to the 'tragedy of the global commons' (Hardin 1968, *Science*, see http://www.garretthardinsociety.org/articles/art_tragedy_of_the_commons.html) through release of pollutants to ocean and atmosphere. In these crucial respects, 'dilution is not the solution to pollution'.
18. Yesterday there was some discussion of fugitive emissions of methane escaping from the Maui field. This will directly contribute to ocean acidification. I would like to elaborate on this.
19. Some of the methane will be broken down by bacteria as it rises through sediments and through the water column before reaching the ocean surface. Decomposition of methane occurs as the result of anaerobic oxidation by bacteria in the sediments, and aerobic oxidation by water column bacteria. When methane is broken down aerobically, bacteria use oxygen and produce carbon dioxide which can dissolve in seawater, promoting acidification. Aerobic oxidation may result in the expansion of oxygen depleted zones, resulting in mass mortalities of marine species.
20. I submit that this is one important reason why assessment of 'cumulative effects' is explicitly required in the EEZ Act.

21. Research by University of Otago, NIWA and others has identified numerous looming impacts of ocean acidification to New Zealand. These include, for deep sea biodiversity, *"shoaling of the Aragonite Saturation Horizon over the next century to as shallow as 500 m in the New Zealand region. This could result in the loss of 50% of the habitat forming scleractinian [corals]. It is likely that the high Mg calcite gorgonian corals will also be significantly affected by this reduction in carbonate saturation states"* (Bostock et al. 2013 6th New Zealand Ocean Acidification workshop Southern contributions to a second decade of OA research, http://www.otago.ac.nz/oceanacidification/otago066026.pdf).

22. As the Committee will be aware, the risks of negative impacts to Chatham Rise coral communities from seabed mining were an important consideration for EPA in that recent decision. Yet these same deep coral communities, and indeed all others, are at great risk from acidification.
23. Significant impacts to commercial seafood production from acidification have also been identified, as will be outlined here below.

Projected Economic Costs: 'the have your cake and eat it too' economy.

24. STOS, as indeed some departments of the New Zealand government, make much of the perceived economic benefits of the application; yet do not consider the projected losses by other industries.
25. A recent international acidification workshop (Ministry of Primary Industries 2014 New Zealand Aquatic Environment and Biodiversity Report No. 136) noted: *"Revenue from mussels, oysters and salmon was in excess of NZD $300M in 2011 with shellfish representing the majority by volume (89%) and revenue (79% aquaculture export value)."*
26. I note that this revenue is significantly greater than that derived in royalties and other revenue from the STOS Maui operations (totalling $550 million between 2008 and 2013). I also note that the industry employs more workers, the recent loss of 232 jobs from Sanford, through reduction in supply of of mussel spat from 'recent weather patterns' notwithstanding.
27. Export revenue from aquaculture, of which mussels, salmon and oysters are the major components, had been increasingly consistently since 1989. This growing, sustainable revenue stream, which could continue indefinitely if environmental conditions remain amenable, is being placed at increasing risk.
28. It is also at risk from invasive species such as *Didemnum vexillum*, which may (or may not) be present on the Maui platforms. The World Register of Marine Species: notes "… *Didemnum vexillum* is considered a major threat to New Zealand's mussel industry because of its demonstrated invasiveness on artificial structures, and its ability to over-grow and smother mussels (Coutts and Forrest 2007)." http://www.marinespecies.org/aphia.php?p=taxdetails&id=250126
29. The MPI (2014) acidification report continued: *"Seawater analysed in the on-going … monitoring off the coast of Otago, southern New Zealand, shows that the open ocean waters off New Zealand are acidifying at rates comparable to average global trends. … Ocean acidification will impact a range of marine species, food webs, and marine ecosystems."*

And: *"These changes affect us now; our trade, our climate, and the security of our food sources - it's not a future problem, it's a problem now."* Marie Damour, Deputy Chief of Mission, U.S. Embassy Wellington, New Zealand.

30. The 2014 MPI Acidification report concluded: *"The carbonate chemistry of the oceans is changing globally, including in New Zealand waters. …Worrisome oyster larvae declines (mortalities up to 80%) have occurred in the U.S. Pacific Northwest that were directly attributable to ocean acidification. New Zealand will not be immune from these changes in ocean chemistry … Ocean acidification will persist for centuries due to time lags in the carbon system and the amount of CO2 currently in the atmosphere. … Many species of shellfish (i.e. Pacific oyster) are particularly vulnerable".*

Carbon cycle, tipping points and mass extinctions

31. Of the previous five mass extinctions recorded in the fossil record, the largest (end-Permian) is attributed to an abrupt disruption of the carbon cycle, with feedbacks driving ocean chemistry past irreversible tipping points. A recent report in Science magazine by Clarkson et al. (2015) titled Ocean acidification and the Permo-Triassic mass extinction (www.sciencemag.org/content/348/6231/229.short) concluded: *"… a rapid and large injection of carbon caused an abrupt acidification event that drove the preferential loss of heavily calcified marine biota."*

32. The most recent credible global extinction estimate indicates a particularly grim future for New Zealand's biodiversity under fossil fuel 'business as usual'. Another recent report in Science magazine by Urban (2015) http://www.sciencemag.org/content/348/6234/571) concluded that globally *"Extinction risks were highest in South America, Australia, and New Zealand"*.

33. It simply cannot be overemphasized how serious this situation is, and how large is the responsibility placed on governments at this critical juncture. As has been widely stated by specialists, including the head of IPCC, our present energy supply is increasingly threatening the life support systems of our planet, particularly as they pertain to the future of humanity. No doubt Earth's biosphere will 'recover' from the present extinction, as indeed it has from previous such events. But it is the next decades and centuries that concern us. In this regard, the respected economist Lord Nicolas Stern said: *"…If delay did not matter, then we might have time to wait but delay is dangerous"*.

Alarmism vs Realism

34. It is critically important to understand that none of the reports cited above are by radical groups with a ‘deep green’ alarmist agenda. Rather these are the work of highly respected, independent, conservative organizations and individuals.
35. Given all of the above, it is clear that continued mining for fossil fuels, and its subsequent use as an energy source, needs to be phased out as a matter of the utmost urgency. To ignore this reality is to abrogate the solemn responsibility given by the public to government for the sustainable management of New Zealand now and for future generations.
36. In respect of the EEZ Act and your pending decision, I submit that a holistic assessment of the economic, societal and environmental costs of permitting the STOS Maui application for a further 35 years, particularly the cumulative effects, and the precedent that could set for yet more fossil fuel exploration, mining and combustion in the EEZ, far outweigh the perceived economic benefits.

Concluding remarks

37. STOS, in their own self-interest, argue that this application to continue Maui gas and condensate production for decades into the future will have negligible to minor environmental impact, outweighed by the economic benefits. This is not the point. The point is that this application is an incremental part of a process causing the rapid degradation of our environment, with cascading impacts on other industries and infrastructure, and escalating associated costs.
38. In these overarching respects, to be permitting, for 35 years, continued production of fossil fuels in the face of the scientific evidence of its massive negative impacts is clearly contrary to the EEZ Act Purpose criterion 10.2b of ‘safeguarding the life-supporting capacity of the environment’.
39. Such a permit would also fail to address issues of intergenerational equity on which responsible governance should be built.
40. If the Committee is unable to take a holistic approach to the cumulative effects of this, and similar such applications in future, we will find ourselves, decades from now, regretting our inability to act in a timely manner on the most serious threat humanity faces. Once again I thank the Committee for this opportunity to present my views.

References and further reading

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Annex 1. 5.4.2.3 Ocean Acidification by Carbon Dioxide

(https://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch5s5-4-2-3.html)

The uptake of anthropogenic carbon by the ocean changes the chemical equilibrium of the ocean. Dissolved CO2 forms a weak acid.[1] As CO2 increases, pH decreases, that is, the ocean becomes more acidic. Ocean pH can be computed from measurements of DIC and alkalinity. A decrease in surface pH of 0.1 over the global ocean was calculated from the estimated uptake of anthropogenic carbon between 1750 and 1994 (Sabine et al., 2004b; Raven et al., 2005), with the lowest decrease (0.06) in the tropics and subtropics, and the highest decrease (0.12) at high latitudes, consistent with the lower buffer capacity of the high latitudes compared to the low latitudes. The mean pH of surface waters ranges between 7.9 and 8.3 in the open ocean, so the ocean remains alkaline (pH > 7) even after these decreases. For comparison, pH was higher by 0.1 unit during glaciations, and there is no evidence of pH values more than 0.6 units below the pre-industrial pH during the past 300 million years (Caldeira and Wickett, 2003). A decrease in ocean pH of 0.1 units corresponds to a 30% increase in the concentration of H+ in seawater, assuming that alkalinity and temperature remain constant. Changes in surface temperature may have induced an additional decrease in pH of <0.01.

The calculated anthropogenic impact on pH is consistent with results from time series stations where a decrease in pH of 0.02 per decade was observed (Figure 5.9). Results from time series stations include not only the increase in anthropogenic carbon, but also other changes due to local physical and biological variability. The consequences of changes in pH on marine organisms are poorly known (see Section 7.3.4 and Box 7.3).

5.4.2.4 Change in Carbonate Species

The uptake of anthropogenic carbon occurs through the injection of CO2 and causes a shift in the distribution of carbon species (i.e., the balance between CO2, carbonate and bicarbonate). The availability of carbonate is particularly important because it controls the maximum amount of CO2 that the ocean is able to absorb. Marine organisms use carbonate to produce shells of calcite and aragonite (both consisting of calcium carbonate; CaCO3). Currently, the surface ocean is super-saturated with respect to both calcite and aragonite, but undersaturated below a depth called the 'saturation horizon'. The undersaturation starts at a depth varying between 200 m in parts of the high-latitude and the Indian Ocean and 3,500 m in the Atlantic. Calcium carbonate dissolves either when it sinks below the calcite or aragonite saturation horizons or under the action of biological activity.

Shoaling of the aragonite saturation horizon has been observed in all ocean basins based on alkalinity, DIC and oxygen measurements (Feely and Chen, 1982; Feely et al., 2002; Sabine et al., 2002; Sarma et al., 2002). The amplitude and direction of the signal was everywhere consistent with the uptake of anthropogenic carbon, with potentially smaller contributions from changes in circulation, temperature and biology. Feely et al. (2004) calculated that the uptake of anthropogenic carbon alone has caused a shoaling of the aragonite saturation horizon between 1750 and 1994 by 30 to 200 m in the eastern Atlantic (50°S–15°N), the North Pacific and the North Indian Ocean, and a shoaling of the calcite saturation horizon by 40 to 100 m in the Pacific (north of 20°N). This calculation is based on the anthropogenic DIC increase estimated by Sabine et al. (2004a), on a global compilation of biogeochemical data and on carbonate chemistry equations. Furthermore, an increase in total alkalinity (primarily controlled by carbonate and bicarbonate) at the depth of the aragonite saturation horizon between 1970 and 1990 has been reported (Sarma et al., 2002). These results are consistent with the calculated increase in CaCO3 dissolution as a result of the shoaling of the aragonite saturation horizon, but with large uncertainty. Carbonate decreases at high latitudes and particularly in the Southern Ocean may have consequences for marine ecosystems because the current saturation horizon is closer to the surface than in other basins (Orr et al., 2005…).