# A Sunburnt Country and a Great Green Fleet

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**05 February 2012**

In the midst of 14,000 trade delegates to the *Pacific 2012* International Maritime Exposition in Sydney Australia held over three days from 31st January (http://www.pacific2012.com.au/), a discriminating group of 100 or so people attended the inaugural Sustainable Maritime Fuels Forum. The presentations are available on the website ((http://ussc.edu.au/events/past/Pacific-2012-International-Maritime-Conference).

I was instigator and Chair of the Forum because I saw the maritime sector as being relatively neglected in the world of advanced biofuels. As Bo Ellehave from Maersk told the Forum "things used to be simple. Fuel costs used to be low and predictable. Environmental regulation for shipping used to be limited and manageable. CO2 emissions used to be a non-issue for shipping. One size fits all used to be the paradigm for marine fuels."

Not any more.

The Forum was timely because shipping faces increasing pressure to reduce energy and emissions intensities. It aimed to discuss the innovative approaches being taken by international and national policy makers and by the commercial and military maritime sectors, their logistics and supply chains to respond to these challenges and opportunities.

Tom Hicks and Chris Tindal from the Office of the Assistant Secretary of the Navy, bookends for the Program, outlined the U.S. Navy's aspirations and achievements thus far in moving towards the goal of deriving 50% of total Department energy consumption from alternative (to fossil fuel) sources by 2020.

Even though the main ambition is to achieve independence from foreign oil, there are many other spillover benefits, including to the environment.

Non-negotiable constraints are that the fuels must seamlessly "drop-in" to and be interchangeable with petroleum in existing supply lines, ships, aircraft and all other vehicles, have price parity to petroleum, and have "ground to tail pipe" green house gas emissions no greater than petroleum and preferably much less. Allies intending to obtain fuel from or supply fuel to the U.S. Navy tankers will need to be interoperable.

The Great Green Fleet, the emblematic plank of the Navy's strategy, is due to set sail in 2016 and re-fuel with 50:50 blends of advanced biofuels in ports around the world, including Australia. The Great Green Fleet will need 8 million barrels of advanced biofuels, approximate half for its planes and half for its ships.

In August and September 1908, the U.S. Navy sailed sixteen Atlantic Fleet battleships, their hulls painted white, into Sydney, Melbourne and Albany as a

symbol of U.S. maritime power and shared geopolitical interests with Australia. The Great White Fleet, as it became known, paved the way for strong and enduring relationships between the two countries.

Albany in Western Australia was not chosen for its 3600 population but because the Fleet needed its port facilities to bunker with steaming coal before sailing to the Philippines. The Navy recognized that availability of sufficient quantities of suitable coal was the biggest strategic risk for the long journey. Sydney and Melbourne were unable to fill the orders.

Will this same problem arise when U.S. Navy's Great Green Fleet sails to Australia and elsewhere in 2016? If so, does it matter?

Aside from military purposes, shipping is the life blood of the global economy, accounting for 90% of goods transported internationally. Shipping transportation is especially critical to island nations such as Australia. Ships carry more than 70% of Australia's exported and imported goods, which collectively represent a value to the national economy in excess of $300 billion a year.

Australian and global seaborne trade will grow dramatically during the next few years as the increasing population demands more and more goods. The maritime sector has recognized that it cannot continue to develop and grow under a business as usual scenario with strong dependence on fossil oil and a low utilization of renewable energy.

It will not be possible for ocean-going bulk, tanker and container ships, which use most of the energy, continue to burn high-sulphur heavy fuel oil. These ships contribute about 3% of global green house gas emissions and 20% of NOx, 15 % SOx emissions. The negative impact of these gaseous and particulate emissions on air quality and environmental and human health have been well documented.

Bunker fuel accounts for a disproportionate percentage of GHG emissions compared to other forms of transport. In Australia, marine transport accounts for less than 1% of national greenhouse gas emissions but 5% of transport emissions.

The U.S. Navy has 285 ships; the commercial shipping company, Maersk, has 600 ships. Bo Ellehave outlined the voyage that Maersk is taking to achieve 25% reduction in relative CO2 emissions by 2020 (compared to 2007) efficiency improvements and to drive SOx emissions towards zero. They include alternatives to current bunker fuels. Maersk has an active testing program with companies developing advanced biofuels.

Laurie Goldsworthy, from the Australian Maritime College, reviewed in detail the adopted significant and mandatory energy efficiency and pollution control measures for international shipping already taken by the International Maritime Organization, governments and Industry. There are more to come.

As one of the speakers, Thomas Maschmeyer from the University of Sydney said, “it’s all about the sulphur.” Advanced biofuels have no sulphur. Thomas discussed low sulphur options, including on-board desulphurization on large ships and pathways to produce low sulphur green crude from biomass. He estimated that to produce the advanced marine biofuels in the volume used globally, 82 barrels per second will require 10% of current world agricultural production per annum.

Jim Rekoske from UOP added that it’s also all about integrating production and supply of low sulphur fuels into existing infrastructure. The $19 trillion asset value of global refining and distribution infrastructure must be part of the solution. Integration of advanced biofuels into this infrastructure will not be easy. Issues

such as handling the water content of green crude need to be overcome. There are solutions.

As Dennis Leong (Chemtex) pointed out, countries such as China and India, which are the world's second and fourth largest consumers of petroleum, see biofuels as good business opportunities and part of their emissions reduction strategies. There are numerous opportunities for strategic partnerships with international companies.

Barrie Leay, from Aquaflow Bionomics, gave a visionary presentation about distributed production of fuels for New Zealand ferries, produced independently from oil refineries. He noted that long before the Portuguese caravel, Polynesians had deployed sailing ships and sophisticated navigation tools to explore his country and its environs. His work continues to put New Zealand on the map, even though it was left off by some who spoke before him at the Forum.

Barry stressed the impending problem of scarcity of fresh water in some countries. These countries will need to import more food and possibly fresh water by ship.

Rich Altman, CAAFI, reminded us of successful collaboration of all components of the commercial aviation industry, in the U.S. and internationally. In six short years since the formation of CAAFI, two new processes to produce jet fuel from renewable sources have been certified and commercial operations using fuels so-produced have commenced. Rich also reminded us of the importance of rigorous measures and standards to validate claims of life cycle emissions and sustainability. These are being developed by bodies such as the Global Bioenergy Partnership, the Roundtable on Sustainable Biofuels and ICAO.

CEOs from two Australian advanced biofuels companies demonstrated innovative approaches being taken down under.

Andrew Lawson, CEO MBD Energy, is leading a company using micro and macro algae to produce fuel and other products while at the same time solving several environmental problems. These solutions include remediation of contaminated water, collection of nutrient run off and capturing CO2 streams from point sources of pollution.

Steve Rogers, CEO, described how Licella's novel catalytic hydrothermal processing of waste biomass produces green crude with zero sulphur and low oxygen (water) content. Licella opened its demonstration-scale plant just north of Sydney in December 2011.

Bob McCarthy, University of Queensland, took a State-based approach. He outlined Queensland's biofuels strategy and plans to utilize sub-tropical and tropical biomass at its disposal, including sugar cane, to produce advanced biofuels.

Ed Dutton, National Biofuels Limited, provided insights from the perspective of a company making the difficult transition from first to second generation biofuels. In a similar vein, Jack Huttner told the Gevo story about turning starch into four carbon fragments, rather than two. In other words, we need to replace our beer with scotch whiskey.

Several speakers discussed the successive policy announcements by the U.S. Government. These have led to opportunities for leveraged funding and public private partnerships to build scale up plants. They have led to the alignment of relevant Departments, such as Defence, Energy, Agriculture and Transport and

acceleration of the commercial-scale production of advanced biofuels technologies.

Jordan Groeneveld, Rare Consulting, reviewed the Australian Government's Alternative Transport Fuels Strategy which was released on 13 December 2011. The Strategic Framework and three accompanying papers can be found at http://www.ret.gov.au/resources/fuels/alternative_transport_fuels/strategy/Pages/AlternativeTransportFuelsStrategy.aspx.

Mary O'Kane, NSW Chief Scientist and Engineer and Chair of the Australian Centre for Renewable Energy (ACRE), highlighted some of the policy and funding initiatives announced by the Australian Government during 2011.

One of the roles of the Australian Biofuels Research Institute Establishment Council, convened by the Minister for Resources, Energy and Tourism, Martin Ferguson, and established under the auspices of the ACRE Board, was to oversee the development of an advanced biofuels study. The Report "Advanced Biofuels Study Strategic Directions for Australia and its Technical Appendix were released on 14 December 2011 (http://www.ret.gov.au/energy/clean/acre/Australian-Biofuels-Research-Institute/Pages/abri.aspx.

The $200 million Southern Cross Renewable Energy Fund was launched on 15 December 2011 by Minister Ferguson. This is a13-year co-investment by the Australian Government, Southern Cross Venture Partners (SXVP) and Softbank China Venture Capital (SBCVC) (http://minister2.ret.gov.au/MediaCentre/MediaReleases/Pages/200mRenewableEnergyVentureCapitalFundLaunched.aspx).

From 01 July 2012, renewable energy initiatives with the Department of Resources Energy and Tourism will become part of a new authority, ARENA (Australian Renewable Energy Agency). Arena will have $3.2 billion in renewable energy investment, about half of which is uncommitted.

The Australian Government Draft Energy White Paper was released for public consultation – http://www.ret.gov.au/energy/facts/white_paper/Pages/energy_white_paper.aspx

Australia's move to a National Emissions Trading Scheme that will introduce a carbon price of $23 per tonne of pollution beginning on 01 July 2012 is outlined at www.cleanenergyfuture.gov.au. The package also establishes the Clean Energy Finance Corporation, or green investment bank, with a $10 billion, five-year budget. An Expert Review Panel has been appointed to give advice about its design (http://www.cefcexpertreview.gov.au/content/Content.aspx?doc=home.htm).

Australia is open for business.

The economic drivers for moving to alternative fuels were not overlooked at the Forum. Tom Hicks and Rich Altman spoke about the impact of oil price volatility on top and bottom lines. In the case of the U.S. Navy, the fuel budget in any year from range from $4 – 5 billion. This creates budget uncertainty. Any over-expenditure must be offset by reductions elsewhere.

Will advanced biofuels pricing be more certain and less volatile?

No R&D Company can become a start-up; no start-up can become a profitable business without aggregating capital. We talk about reaching a billion tons or biomass or a billion gallons of advanced biofuels. Cindy Thyfault, Westar Trading

Resources, is closing in on being the billion dollar woman, having assisted clients to raise nearly $800 million in financing. Her presentation reviewed challenges in obtaining financing for the alternative energy sector, to which banks do not lend, and her successful approaches to putting together successful financing structures nonetheless.

Just when we thought we had all the answers, Arnauld Filancia, Wartsila Corporation, blew us out of the water with tranche of new questions.

Wartsila is looking forward and describing “alternative, plausible futures” through company’s Shipping Scenarios 2030 (http://www.wartsila.com/shippingscenarios).

Why should ships need any liquid fuel? Why not have ships powered by Flettner rotors to harness wind energy? Why not have ocean-going, unmanned ships running on solar power and biogas continuously harvesting algae into barges? Why not have ships offload fresh water produced during en route by desalination?

The world needs more economically and environmentally efficient shipping. We have many viable solutions which also make good business sense. Now it’s time to set sail for the new horizon.