Submission to

The House of Representatives Industry and Resources Committee

Renewable Energy in Australia – Inquiry into Developing Australia's Non-Fossil Fuel Energy Industry

Introduction

IT MDI – *Energy* Pty Ltd (IT MDI – *Energy*) welcomes this opportunity to communicate with the Committee regarding some of the recent trends in renewable energy generation. It congratulates the Committee for addressing the very important issue of renewable energy and the relative state of development of the renewable energy sector,

As you will see from our submission, the prospects in these sectors for economically viable electricity generation, storage and transmission are real and deliverable. The pressure on Governments worldwide to come up with viable solutions is great. There are technologies available today that can alleviate the pressure on traditional fossil fuel based electricity generation systems.

Outline

IT MDI – *Energy* Pty Limited

Europe: 9 Bd Rossillon, 83000 Toulon, France; Ph/Fax: +33 4 94 92 65 52, Mobile: +33 6 19 20 25 64
Australia – Melbourne: P.O. Box 295, Warburton, Victoria, 3799; + 61 3 59 64 85 69, Mobile: + 61 415 66 68 80
New Zealand: 2-242 Ferry Road (P.O. Box 13 – 483), Christchurch, New Zealand; Ph: +63 3 365 6485, Fax: +64 3 365 6486
Registered Office: Walker Partners (Vic) Pty Ltd, 64 Oakover Road, Preston, Victoria 3072, Australia
Email: The.Future@IndraNet.co.nz Web: http://www.IndraNet-Technologies.com

MDI Overview

In early 1991 Mr Guy Nègre established MDI s.a., of Luxemburg and France, the sole purpose of which was to design and engineer clean and environmentally friendly engines for personal transport vehicles and for generating clean power.

Over the past 15 years Mr Nègre has refined and perfected his designs through many prototypes and enormous personal effort which has been well documented in many science journals and programs and as recently as 2005 and 2006 in Australia on Beyond Tomorrow.

Mr Nègre has now engineered his designs to a level where he is satisfied they are ready for sale and distribution worldwide.

This decision by Mr Nègre has seen the recent signing of a joint venture agreement between MDI and Tata Motors, India's leading manufacturer of trucks and cars, to utilise Mr Nègre's clean engine designs in the production of future Tata Motors vehicles.

It is expected that in the near future Tata Motors will manufacture approximately 1 million vehicles per year utilising MDI clean engine technology once the production capacity has been built.

Mr Nègre and his joint venture partner Dr Louis Arnoux are now preparing to bring their technology and expertise to Australia to further establish and develop their business model that will then be used as a template for worldwide distribution.

Accordingly **IT MDI - *Energy* Pty Ltd** has been incorporated and duly registered in Melbourne, Victoria.

Mr Guy Nègre – Profile

Guy Nègre, Managing Directeur, Moteur Development International s.a. (MDI)

Inventor of the MDI Technology and Founder of the MDI Company, Guy Nègre is a 66 year old engineer who has over 100 engine patents to his name, including 3 key patents co-owned with the French oil company ELF and 2 jointly with Institut Français du Pétrole (French Petroleum Institute).

Guy has created over 100 engines including Formula 1 and light aircraft engines. He is now world known for his compressed air engine and the new thermodynamic cycle he invented.

From 1970 to 1975 Guy worked with the RENAULT car manufacturer. From 1976 to 1983, he then managed the SACMA Company that produced aircraft engines (financed by the French Government). He then moved on to produce Formula 2 engines. From 1987 to 1991, this led him to manage the MGN Company focused on the design of Formula 1 engines. This is when he acquired international notoriety.

His work on Formula 1 engines led him to the concept of compressed air engines. In 1991 he incorporated MDI with the aim of designing clean and efficient engines. The initial pioneering

work led to the first trials in 1992 of cars running on compressed air. Since then he has produced a series of compressed air engine models to arrive at the present designs that are being readied for commercial release late 2007 and early 2008.

Guy is also the inventor and developer of the MDI distributed manufacturing process for all applications of the MDI Technology that enables reducing vehicle manufacturing costs by 75%.

i Power Clean Power Systems – Overview

The MDI engines powering the *i*Power system runs on compressed air. The combustion of a fuel used to provide a primary energy source to produce the compressed air takes place outside the engine in an extremely efficient and clean way.

The external combustion enables the use of a wide variety of fuels (petrol and diesel, LPG, CNG, as well as a very wide range of biofuels and/or direct and indirect thermal solar energy) without changing the engine or its specifications. In the case of biofuels no costly transformation into biodiesel or cumbersome blending is required. This considerably reduces cost and makes for ease and speed of deployment.

Overall energy efficiencies of the engines range from 45% to over 70% depending on the versions and models. Integrated with technology enabling re-use of waste heat, this translates into overall energy efficiencies of over 90% from primary source to end-use (instead of less than 20% and often less than 10% efficiency in current legacy systems).

In financial terms this means providing on premises customer environmentally sound energy, including electricity, air conditioning, and hot water for an estimated 25% less than current retail costs while providing a sustainable environmentally sound solution to Climate Change and related fossil fuel issues.

The *i*Power system also offers the opportunity to recycle grey waters to spring water quality levels at affordable costs.

The *i*Power units are scalable in size and rack mountable either in series or parallel. At present specification and rack mounted, these *i*Power units can produce over 1MW per location. Future generation up-scaled 100 kW *i*Power units will conceivably supply constant 7500 kW per location utilising rack mounting systems.

The iPower units have also the ability to feedback excess clean green electricity to power grids to be utilised in other locations.

As these engines do not have any internal combustion like a conventional engine they generate very little heat and accordingly their life expectancy is greatly enhanced with the added benefit of extended service requirements and substantially reduced maintenance cost compared with current technology.

i Transport Vehicles – Overview

The initial *i*Transport vehicle, which is anticipated to be built in Australia soon, is called the MDI OneCAT. CAT stands for Compressed Air Transport.

This vehicle will be configured to seat three or five people and is designed for urban environment use. The MDI OneCAT will have a top speed of approximately 110 Km per hour (set at that level to fit within speed limit regulations) and a driving range of over 2,000km.

The MDI OneCAT will be offered with a range of safety and luxury equipment.

The MDI CityCAT and MiniCAT series will be offered shortly after.

These vehicles will be marketed in two series, personal and family transport versions on the one hand and commercial vehicles series on the other hand, configured to accommodate Taxi operators, Couriers, tradesmen and small business operators.

The MDI engines powering these vehicles are the same as that powering the *i*Power units presented earlier.

As for the *i*Power units, the external combustion enables the use of a wide variety of fuels (petrol and diesel, LPG, CNG, as well as biofuels like ethanol from sugar cane or a wide range of vegetable oils or oils derived from waste animal products). Such fuels can be used without changing the engine or its specifications. In the case of biofuels no costly transformation into biodiesel or cumbersome blending is required. This considerably reduces cost and makes for ease and speed of deployment.

Overall energy efficiencies of the engines range from 45% to over 70% depending on the versions and models. This translates into vehicles running on 2 litres per 100km or less versus current vehicles of comparable size running on over 10 litres per 100km under same driving conditions.

In other words the running costs are divided approximately by five while the MDI manufacturing costs are only 25% of current manufacturing costs enabling to market these vehicles extremely competitively.

On delivery of the first of these vehicles in Australia the impact will have worldwide global significance. The MDI OneCAT will be the first genuine highly affordable alternative clean

green vehicle offered for public use and the beginning of the end for vehicles utilising fossil fuels for everyday transport requirements.

Benefits

- **Simply – Clean Green Energy For Less.**
- Offering the Australian public a clean green alternative for their power and transport with significant out of pocket savings.
- Significantly increased employment – attractive, high quality jobs in environmentally sound plants close to workers place of residence – required training provided by MDI.
- Export of product and IP from Australia.
- Reduction in power costs to industry whilst reducing impact of global warming.
- Presents the opportunity, if well implemented to create alternative clean power supply without the need to use nuclear or fossil fuels.
- Significant savings to current government expenditure on power supplied to government buildings and facilities.
- Meets the general public pressing demands for viable clean power alternatives.
- Moral and correct decision to make.

The First MDI Manufacturing Plant in the Nice Industrial Park of Carros, France

Clean Energy the Way Ahead[1]

Dr Louis Arnoux, Managing Director, IT MDI – *Energy* Pty Ltd.

I am delighted to be able to contribute to the debate surrounding renewable energy and welcome the opportunity to discuss further our technologies with members of the Committee.

The Committee has undertaken a comparative study of the following renewable energy sectors. The case study will examine *the relative state of development of these sectors and their prospects for economically viable electricity generation, storage and transmission.*

This catch phrase, *"Deal with reality or reality will deal with you",* is now colloquial amongst the community of people studying and researching oil and peak oil. I find it very appropriate as a starting point for this briefing. As I see it currently, reading the headlines of the media, the world is very much in what I call *"a possum in the headlight syndrome."* In other terms, while the pressing issues of Climate Change are being recognised, there is a sense of paralysis concerning what best action to take. In this respect it is important not to confuse the fever, global warming, with the disease, in other terms the rate of fossil energy use, which has taken place over the last one hundred years, and which is ongoing. Instead of attempting to deal only with Climate Change, I advocate focusing on solutions that are aimed at the disease, the unnecessary use of fossil fuels. By dealing effectively and decisively with the latter one also go a long way toward solving the former.

Faced with this global situation, I wish to stress that **it doesn't have to cost the earth to save the planet**, to use a colloquial expression. To put it another way, **there are ways of addressing climate change and related energy use through a set of affordable, competitive, and environmentally sound solutions for the post-oil era we have now entered into.**

Solutions

We are at the end of the oil era. We are at the peak of oil production. The peak for conventional oil was passed around 2005, and even if we add unconventional oil, that is to say tar sands, oil shale, arctic oil, etc., the peak is likely to take place around 2010, give or take a few years.

Effectively, currently, the world is running on empty. In other terms, the known proven and accessible oil reserves are not being replenished as fast as consumption is increasing. Oil discoveries peaked in the 60s, and the prospect for new discoveries is fast diminishing. This is not a financial matter; investing more funds won't change the pattern – it's simply that the tank is running dry.

However, this is not quite yet going to the heart of the issues. What is much more significant is how much oil and natural gas there is for all of us per head of global population. **Oil and natural gas combined peaked at around eight barrels per head per year in 1979,** and we are now at about seven barrels per head per year, and hydrocarbon availability per head is starting to decline. However, considering per capita deliveries still does not quite go to the heart of the matter.

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1 Based on a briefing given by the author in Parliament House March, 2007.

What matters is net energy. In other terms, *"there is no such thing as a free lunch"*. It takes energy to get energy. So net energy is what's left when one has deducted the energy used to get energy. This is the notion of EROI, that is, Energy Return on Energy Investment.

Based on the work of Prof. Charles Hall of New York State University and colleagues, The world is fast running out of net energy from oil and gas, and, if the trend continues, will hit zero between 2015 and 2020. Time is short, and some action, some new approach, is urgently required. **This is far more pressing and immediate than mere Climate Change.**

I submit to you that while the 1990's where touted as the decade of Information and Communication Technology, ICT, we are now entering a new decade focusing on net energy, energy return on investment, and what I call **ICET, another term a renewed focus on the convergence of Information, Communication and Energy Technologies.** I suspect that this is going to be a new focus for investment, massive investments, over the next decade.

Net Energy

What tends to be missed in current debates about Climate Change, sustainability and renewable energy alternatives is that net energy is key. **To address meaningfully and cost-effectively all the other environmental, social and economic factors, climate change and everything else, one must first look at turning around present net energy trends over the next ten years. And this is a very tight constraint.**

Effectively what we are faced with is eliminating the technologies which are not fit to address the problem. The ten-year time frame is very, very demanding. Many candidate technologies do not apply because of that time frame. Because their implementation time cycle is too long – for example nuclear to be implemented significantly takes more than ten years, so it's out of range. Or the net energy yield is too low. Or the release of greenhouse gases is too high. Or these technologies compete too much with food or fibre production, or simply they are too expensive. So the criteria to cope with the current situation globally are extremely demanding.

Scenarios

In response to that, there are, in my view, two main scenarios. One is what I will call Plan A, which is what the world is doing at the moment, in other terms much hot air debate about how to address Climate Change. With some parties advocating or instead fearing massive government intervention, and what some of my colleagues call *"cold baths by candlelight"*, in other terms drastic conservation policies, which nobody really likes. Things like high carbon taxes, or the illusory trading of carbon credits, which are very hard to prove, and demand very bureaucratic systems to establish and guarantee. And obviously there is a strong business resistance to anything that is capable of potentially wrecking economic growth. For everybody there is a prevailing fear of losing our hard won lifestyles.

And as a result of the above concerns, the prospect is that of very slow and limited action on the real issues, which have to do with net energy. So ten years later along that scenario, and this is the scenario basically we are in at the moment, we have a collapse of EROI from oil and gas, in other terms collapsed net energy returns from our energy investments in oil and gas. Which means a global economic crash, which means drastic reduction in greenhouse gases. So in terms of global warming, in about ten years time, we could say that *"the operation has been successful but unfortunately the patient died"*… as the colloquial joke goes.

The other approach is to go for Plan B. Plan B means that we stop flying blind into the ground at zero net energy. The present global situation is like flying a plane when the automatic system says *"pull up, pull up"*. We are now far, far too close to the zero net energy ground, we have to pull up very quickly. The point is to focus on currently emerging high EROI solar based technologies.

By solar I mean direct thermal solar, photovoltaic, wind, hydro, and biomass. The earth receives every year orders of magnitude more energy from the sun than all the oil reserves that ever were in the ground, i.e. well over 8,000 time humankind's energy requirements. We must now tap into this abundant solar flux. This means to shift from thinking in terms of millions of barrels per day of oil or gas at the well-head, or tons of coal at the mine, to megawatt of solar energy per square kilometre. In other terms, we must achieve a shift from centralised infrastructures to networked ones harvesting energy over wide areas.

The only way to do this competitively, effectively, is to think in terms of mesh broadband networking. Why I bring broadband here into the picture is because **the only way to competitively harvest solar energy over wide areas means distributed energy networks and managing those networks requires specific types of advanced communications networks call mesh networks.**

If one looks at the challenges in this fashion, one can move fully commercially from substantially less than twenty percent efficiency in mine-to-power-plug, or well-to-wheel, centralised, hierarchical technologies, to well over eighty percent efficiency in distributed, non-hierarchical solar based technologies. This technology shift translates into the prospect of huge national and global markets. There is currently a potential for ninety percent growth in global markets for advanced broadband, which is totally unexploited. There are fourteen terawatts of power generation capacity to be redeployed globally away from fossil and nuclear and towards solar-based resources. And over eight hundred million vehicles to be substituted with solar powered vehicles.

Now, the question is, how do we do Plan B? The message I want to convey in this submission, as I hve stressed in introduction, is that **saving the planet is actually cheap**. The price tag is not very high. **Plan B, the way I am describing it, is feasible for about half the cost of the current Iraq war.** Within a global perspective this is not all that expensive. The required technology and knowledge are commercially available. They can be implemented competitively without massive government intervention. That approach offers a prospect of high returns, sustainable growth, and high quality rewarding employment prospects. In two main phases – the focus of the first phase is to pull up towards significantly higher level of net energy, well above zero, and then the focus of the second phase is to consolidate over the ensuing thirty years into a full solar energy economy.

Now, we can say we have Plan B. We've been working on this matter for the best part of three decades. IndraNet Technologies Limited and Moteur Development International sa, th Joint venture Partner in IT MDI – *Energy* have three core technologies that are capable of enabling a Plan B.

The first one is the IndraNet advanced wireless broadband FraMe Network that enables networking of new energy technologies in a distributed fashion to harvest and distribute solar energy over wide areas. The second one is the IT MDI Intelligent Power Network (*i*Power). And the third one is the MDI zero (or near zero) emission vehicles. Ultimately these vehicles are to be networked and managed with the IndraNet FraMe networks. That portfolio of three

technologies can serve as anchors for numerous complementary solar based technologies, like advanced photovoltaics, new biomass processing, new biomass harvesting and so on.

Those three high energy return on investment technologies in my view open the way to a smooth affordable transition away from the current near total dependence on fossil fuels and towards full sustainability. Those technologies combined can move from the present less than twenty percent energy efficiency to over eighty percent energy efficiency. This translates into extremely low capital, operation and maintenance costs. The energy efficient gain translates into competitiveness.

Broadband

Currently we have essentially largely hierarchical communication systems, which require very heavy expensive infrastructure and high energy use (the average Internet user apparently burns over 150 kg of coal per week, i.e. close to 8 tonnes of coal or coal equivalent per year).

What we are proposing with the IndraNet FraMe is a mesh network that has high capacity and very light capital expenditure foot-print, which is an easy to deploy and maintain infrastructure. It's a mesh network where the communication devices, called minders, are at the customer's premises. What the IndraNet is designed to deliver is what we call real broadband. In other terms, very affordable, guaranteed end-user symmetrical bandwidth well above 1Mbps, low latency, scaleable, with no limit practically to the number of supply points in a network, no shared bandwidth, highly secure, no data transfer cap, no extra payments, no limit to monthly use. The FraMe enables a multiplicity of use, in other terms the one infrastructure provides a number of infrastructure services currently delivered by a multiplicity of expensive parallel communication infrastructures. In short, the FraMe enables providing at retail level real broadband at low cost, wholesale prices, and in an environmentally sound way. We estimate that it enables dividing the overall cost by a factor of ten.

The MDI Engine

The primary energy input is taking place outside the engine, in an external heating unit at significantly lower temperatures than in an internal combustion engine, which means very, very little, if at all, production of pollution. The engine itself runs purely on compressed air. In other terms, we have an engine, which not only is very efficient, but also very clean, in fact, it can be run with zero emission.

That engine can be used in a stationary way to produce electricity. The commercial units are planned to range from six kilowatt and into the megawatts. The small units for domestic use will be a small unit about the size of a small suitcase, or an air conditioning unit, about five hundred by six hundred by eight hundred millimetres. The unit can be used stand alone, for example on a farm, or as an emergency back up in an office building, or integrated to the grid to form IT MDI *i*Power Intelligent Power Networks, managed and regulated through IndraNet broadband FraMe networks.

The interesting point is the cost of electricity through that system. Currently we can achieve about six cents per kilowatt-hour at the point of use. Year one, after we have launched manufacturing in Australia and New Zealand, we are confident to achieve four cents, and three years later about two cents, in other terms extremely competitive electricity, but run clean and green.

The units can run, of course, on diesel or natural gas, or LPG, but also solar, on gasified biomass, wood waste, ethanol, coconut oil, tallows, rape seed oil, and so on. In other terms, they can facilitate a very smooth and very competitive transition to renewable energy resources.

The MDI Vehicles

The same engine is the core to a new class of vehicles called CATs, for Compressed Air Transport. The initial release we are working on at the moment includes the OneCAT, which is a small car, a three to five seater, which we estimate we will be able to release in Australia for about eight thousand dollars or less. And then larger vehicles for urban driving and for family driving, country cruising and so on, leading to trucks, buses, industry, farm, marine and light aircraft applications.

What is important here is that this new technology translates into very high efficiency. Currently the cars achieve about two litres per one hundred kilometres. Nobody else worldwide can presently achieve that level of efficiency with normal driving performances. In other terms, we are dividing the cost of running those vehicles by a factor of five or more. We are confident we can achieve around one litre per one hundred kilometre. In other terms, again, slashing the cost of running vehicles by probably of a factor of about ten compared with cars currently on the road today. In proportion to larger engine sizes, such gains apply to trucks and buses as well. Given that those vehicles are also a significantly cheaper to manufacture and to acquire, the technology is not only green and clean, but also very competitive.

So we have clear advantages compared to existing internal combustion based vehicles, and alternative designs based on electric batteries, hydrogen, fuel cells, and so on. The technology is substantially lower in capital, operating maintenance cost, with high energy efficiency.

Conclusion

MDI and IndraNet are together acting as catalytic change agents. Our initiative parallels and emulates the earlier shifts from mainframe computing to myriad distributed PCs and other computing devices like PDAs cellular phones, etc., and the advent and global expansion of the Internet as a now dominant distributed and mesh networked form of communication.

We are using the convergence of information, communication, and energy technologies to shift from a paradigm of *"bigger, more centralised is better"*, to a paradigm of *"smaller, de-centralised networks, is more performing, more resilient, more sustainable, and much more profitable."* Thus we are effectively replacing traditional forms of competition within an existing market, with the substitution of new markets.

Appendix – The Company

IT MDI - *Energy* Pty Ltd (ACN 119 964 000) is a joint venture that includes IT-*Mondial* Pty Ltd (ACN 109 947 462), which is the commercial arm of IndraNet Technologies Limited of New Zealand (ARBN 097 079 064) and Moteur Development International s.a. (MDI), of Europe.

IndraNet was originally based in New Zealand. We are now moving to Australia and Europe, and MDI is based in Europe, in Luxemburg and in France. In recent months, a number of business people and investors have joined us to assist in the development of this new initiative. They have seen the commercial potential of that technology package, and they have taken the initiative to seed fund IT MDI - *Energy*.

IndraNet was created in 1998. It is the developer of the advanced IndraNet *i*Broadband mesh communication technology, which is enabling revolutionary network infrastructures for communication, energy and transport, transport of data through FraMe broadband networks, transport of energy through Intelligent Power Networks, enabled by the IndraNet FraMes, and incorporating the *i*Power generation technology, and *i*Transport of goods and people through networked advanced MDI zero emission vehicles.

The second parent is MDI, created in 1991. MDI is the developer of a new thermodynamic cycle and a wide range of applications of that cycle for high efficiency power generation and transport.

Authors and Contacts:

Dr. Louis Arnoux
Managing Director - IndraNet Group of Companies
IT-Mondial Pty Ltd (ACN 109 947 462)
IndraNet Technologies Ltd.
http: //www.indranet-technologies.com/
Europe
Address & Mail: 9 Bd Rossillon, 8300 TOULON, France
Ph: +33 (0)4 94 92 65 52
Mobile: +33 (0)6 19 20 25 64
Email: lara@it-mondial.com

Australia
Richard Hutchinson
IT-*Mondial*, and IT MDI – *Energy* Business Development Manager
P.O. Box 295, Warburton, Melbourne, Victoria, 3799, Australia.
Ph: + 61 3 5964 8569
Mobile: + 61 415 66 68 80
Email: richard@it-mondial.com
New Zealand
Mail: P.O. Box 13 483, Christchurch, 8001, New Zealand
Ph: +64 3 365 6485
Fax: +64 3 365 6486
Mobile NZ: +64 21 429 249


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