SUBMISSION FOR

THE CASE STUDY INTO SELECTED

RENEWABLE ENERGY SECTORS

PREPARED BY

SUNENGY PTY LIMITED

OWNER OF THE

LSA SOLAR POWER GENERATOR

PATENT AU2004243336

www.sunengy.com.au

SUBMISSION FOR A SEMI-RENEWABLE POWER INDUSTRY

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1. INTRODUCTION

The movement towards developing a short to medium term, semi-renewable power industry needs to be undertaken based on specific and expert information on potential renewable power sources and their integration into Australia's present power grids.

There is a lot of general information and political lines influencing the decision making process at the moment and we commend the Commission for drawing on a broader information base, which will undoubtedly bring forward specific and relevant information.

In Brief:

- We present a new, patented Australian solar electricity technology: the Liquid Solar Array.
- The LSA has potential to make power at 5 Australian cents per kilowatt-hour in a medium term timeframe, or 10 cents shorter term.
- The technology is available and small prototypes have been built to show its effectiveness and efficiency.
- All its components have been mass produced for other applications.
- The extreme simplicity of the technology makes it very suitable for use in new and developing economies- an export opportunity of considerable dimensions.

2. ABOUT SUNENGY

Sunengy is an Australian Company that owns the Intellectual Property for the Liquid Solar Array (LSA) solar powered generator.

Current shareholders are:

Phil Connor – Director and Inventor; Phil works in the Exploration & Mining division of the CSIRO, working on optical spectroscopy technology for the mining industry. Phil has personally studied and conducted experiments on solar technology for the past 38 years.

Bruce Robinson – Technical Advisor; Bruce is an instrumental scientist, recently retired from CSIRO Exploration and Mining. He is a Convener of ASPO Australia, the Australian Association for the Study of Peak Oil & Gas. ASPO-Australia is a network of professionals working to reduce our oil vulnerability.

Peter Wakeman – Business Management; Peter has 10 years experience as a Partner and General Manager of a business that employs 55 people with an annual turnover of $36M; he specailises in business analysis & management and human resources.

3. AUSTRALIAN COAL INDUSTRY

There needs to be a balanced approach to the Australian Coal Industry and its contribution to both our Power Industry and our Greenhouse gas emissions.

The cost of coal fired electricity in Australia at less than AU4c per kW hour is artificially cheap by global standards; the main contributor to this being the older age of our power stations and the non-amortisation of capital for their replacement in the future.

The contribution to total, global coal burning emissions of Australian-produced coal used both domestically and overseas, is less than 3%.

Therefore given the Australian Coal Industry's contribution to our economy and our current power infrastructure, there is no logic in downsizing the industry in the short to medium term.

4. WHY SEMI-RENEWABLE?

There is an enormous amount of electricity generated in Australia that is not sourced by burning coal. Diesel powered generation is widespread for both domestic and industrial use; and even factoring in the Government excise rebate, can cost in excess of AU22c per kW hour, it is an extreme burden on the economy – especially the mining and transport sectors. If you consider on top of this the significant greenhouse emissions from diesel and the rapid depletion of this non-renewable resource; this is an area that needs to be addressed immediately.

Renewable energy should initially be used to supplement current sources of power generation. This can begin immediately with current available technology; whilst future advances in renewable technology will move towards long term independent systems.

5. A RENEWABLE ECONOMY BASIS

Strong drivers for a move towards renewable energy sources are:

a. Climate change and air pollution; it's no surprise that the air is clogging up, if you consider the atmosphere would only be 12m deep as a liquid.
b. Forecast future oil shortages.

Renewables are essential, but to be accepted globally the costs must be inherently low; they need good strategies and economical technology.

Renewables must be economically attractive especially in developing countries, if they are to be globally effective in reducing emissions. Emerging economies will soon dominate CO2 emissions on present trends.

A 'Moral Imperative' is not sufficient – renewables cannot be imposed effectively through Carbon Taxes.

Can you tell an Indian laborer that he and his children must remain trapped in poverty indefinitely, whilst prosperity in the developed countries has been based on cheap but polluting energy sources?

6. THE TARGET

Low cost, clean electricity is a key to the dilemma – used directly in industry and also to make hydrogen fuel.

The ultimate target must be clean power at a cost lower than that from the cheapest source, coal at US4c per kW hour.

Renewables need to reach US3c per kW hour and use low embodied energy methods to gain the support required to eventually swing away from traditional methods.

This target corresponds to US60c per Watt of capacity if a solar method is used 8hours per day.

7. CLIMATE-EFFECTIVE R&D

If climate change is to be effectively addressed, we must take a very ambitious approach to the technical development of renewable energy; to achieve US3c per kW hour from renewables for at least a large fraction of industrial energy supply.

Australia's investments in renewable energy R&D are far from reasonable levels. Government efforts are so far missing the mark, as they are not supporting the opportunities at hand comprehensively.

Australia has already lost some valuable and pertinent solar technologies overseas. This loss must be stemmed if Australia is to harness its

homegrown expertise and play a meaningful role in addressing the global dilemma.

8. PRESENT RENEWABLES

- **Wind:**
  - Mature technology already at large scale, 50GW installed.
  - Min. cost achieved is US$1/W, 5c per kW hour.
  - Limited high grade availability, high embodied energy, but good for high latitudes.
- **Biomass:** (crop derived ethanol, bio-diesel, wood)
  - Limited by available agricultural land.
- **Hot Rock/ Geothermal:**
  - Very limited in availability predominately in remote sites.
  - Unproven technology
  - Ongoing mining costs
- **Wave Power:**
  - Good potential, limited availability
  - Unproven technology (weather damage problems)

- **Solar Energy is the primary source of power:**

  - It is essentially unlimited in size and scope, available +/- 40 degrees latitude. 120,000TW is hitting the earth continuously! Mankind uses 14TW.
  - A fifth of Western Australia could supply all mankind's power needs.
  - Reduced availability at high latitudes.
  - Present flat plate silicon photovoltaics are not nearly good enough at US$4-5/W after 40 years development, presently 24c per kW hour.

9. SOLAR BASICS

The fundamental issue in the economics of solar energy is the efficiency in relation to the area cost of each system. Thus, if the efficiency is low the cost per square metre must be very low

On the other hand, it is no use making a very high efficiency system if the costs are too high as solar energy input per square metre is fixed.

The high cost of solar power has been the main restriction preventing its acceptance in mainstream power generation.

10. LIQUID SOLAR ARRAY (LSA)

Consider the possibility.....

What would happen if solar power were cheaper than nuclear & diesel and on par with coal as a supplementary electricity generating source?

Here we will describe a technique that could credibly achieve that goal in a very short period – the Liquid Solar Array

LSA produces medium to high efficiency AND has a low area cost. It uses simple plastic structures, existing components and off-the-shelf technologies, especially 20 cent per Watt Silicon PV concentrator cells.

The enormous cost saving comes from the way that the LSA employs water for cooling and as a 'free' structural component to greatly reduce mass. The LSA system resolves most of the practical economic difficulties of PV concentrator systems.

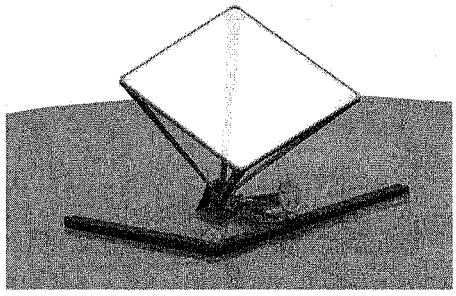
The Method

The LSA is a bank of plastic solar collectors floating in water; sunlight is focused by a thin lens into a sealed well containing photovoltaic cells, which are cooled by the surrounding water.

Modular Collectors are linked together to form an anchored floating raft with a drive to track the sun.

The one metre square concentrator lens can rotate under the water to protect it against bad weather conditions. As wind speed increases, force per square metre on the collector lens increases as the square of the velocity, so that loads above 20kg/m2 require heavy structures and thick lenses; hence the need for protection above 60km/hr by immersion of the lens.

The lens is covered by an envelope of easily cleaned, super durable & water repellent plastic. It comes out dry and clean, even in salt, muddy or caustic water.



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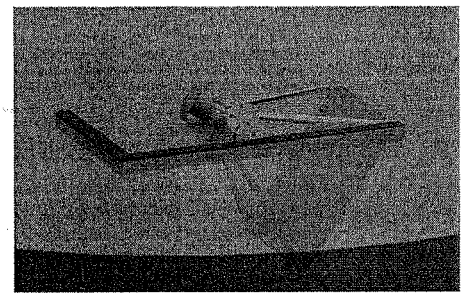

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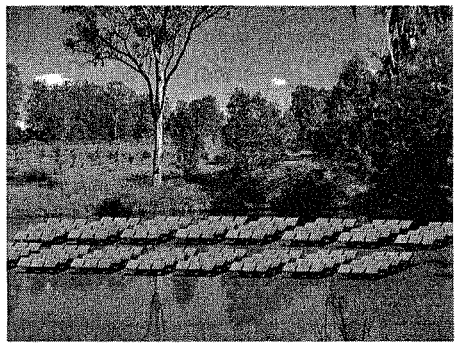
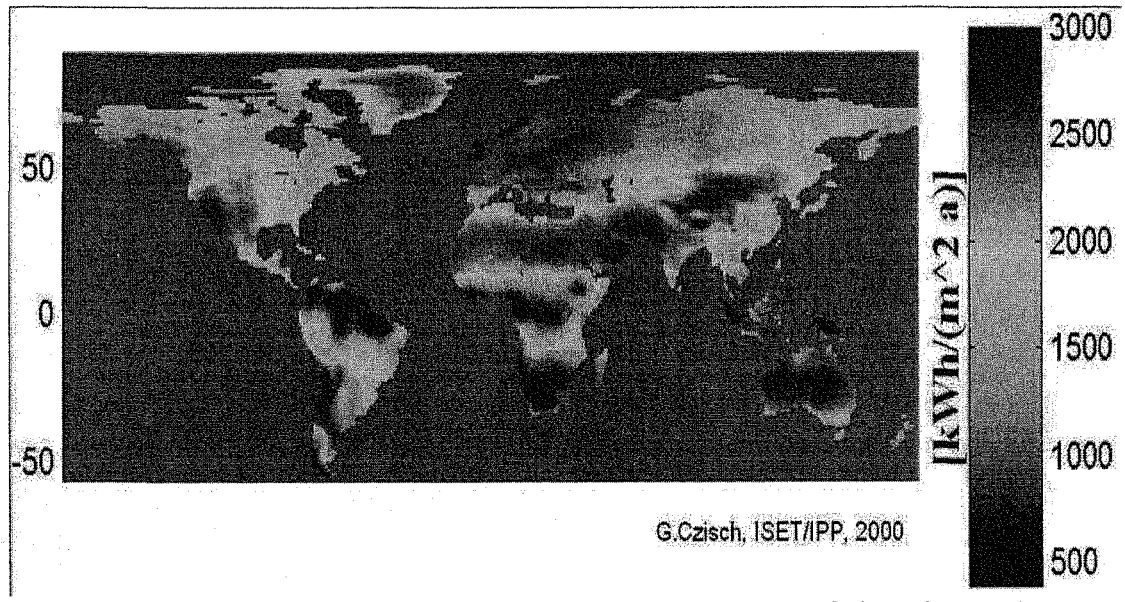


The LSA can use existing dams, reservoirs, mining pits, lagoons or specifically built ponds while reducing evaporation

Market Overview

There are many and varied market applications for the LSA. The essential elements required are:

- An average of 2000 - 2,400 hours of bright sunshine per year i.e. 6.5 hours per day is ideal. Longer average hrs yield lower costs per kW hour, less hour's higher costs.
- A water surface area of 25 sq m x 1.2m deep - per 1 Kilowatt of electricity required.



You can see by the yellow, orange and red sections of the above diagram there is a vast area of the populated globe that has ample sunshine to operate the LSA very efficiently.

It should also be noted that many of these regions have surface water that could house small or large LSA systems.

What will an LSA unit cost?

Due to the materials and technique used to construct the LSA, the higher the production, the lower the cost.

Estimated mass-production cost for a one square meter unit is approx. US$130 with labor. Each M2 produces about 130W, so the capital cost is US$1 per Watt, at medium scale mass-production; this is approximately US5c per kW hour.

In low volume production, costs would be around 10-15c per kW hour BUT with the right mass production technology, the longer term target of US3c per kW hour is quite likely.

LSA advantages

- Photovoltaic cells used are naturally cooled by convection of the water to give top silicon efficiency.
- Structure & Concentrator lens can be made from very light-weight, low cost plastics as they are protected from extreme weather forces.
- Technologies used are all 'off the shelf'.
- Minimal land & setup cost (dual use of water).
- Modular: any scale from 1kW to Giga-watts.

- Leverages any improvements in PV cells.
- Small quantity of silicon means rapid deployment of large capacity possible (to 40 GW p.a. with current Silicon refining capacity).
- Minimal mass ~ 14 kg per sq. m of collector all up.
- Long life (20 yrs should be achievable).
- Gives near constant output all day.

LSA potential

- Economical US3-4c/kWhr (AU4-5c)
- Achievable 'now'
- Global Impact
- Modest capital required: AU$5.4M to market
- Australian innovation

COMBINING RENEWABLE TECHNOLOGIES

There are real advantages and opportunities for combining renewable technologies. For example wind and solar can potentially work well together particularly when combined with "low-load" diesel generators (on small to medium applications); or into existing power grids (on large scale applications).

Sunengy Pty Limited has already explored this opportunity utilising current Australian technology.

SOLAR BASELOAD

None of the lowest cost solar generators are ideal for baseload or overnight power.

Solar thermal & chemical systems are much more suitable for this purpose (or conventional gas turbines using natural gas). Such systems are inherently slightly more expensive than coal power.

For the long term: The cost of stored/ overnight solar power is considerably higher, so solar thermal and Photovoltaics are likely to coexist, with concentrated PV providing the lowest cost daytime industrial power while solar thermal provides uninterruptible baseload power at a slightly higher cost.

CONCLUSION

Sunengy Pty Limited is a classic example of where so much specific renewable technology information is contained, but largely untapped.

Phil Connor, the inventor of LSA, has delivered discourses on the LSA renewable energy technology in: Washington DC to a nuclear vs. renewable summit in Nov 05; Sunengy website in Nov 05; several business groups in Sydney and Perth in 06; brief publication in New Scientist June 06; Technical presentation to CFMEU Executive Sydney 5/2/07; Science Meets Parliament 28/3/07; ANZSES information evening 3/4/07; Alternative Technology Association 21/4/06; Australian Conservation Fund 15/5/07; GREX renewables exhibition 2/6/07.

Getting specific information through to the 'decision makers' in Australia can be very difficult; and therefore we applaud this Government initiative to encourage informed, meaningful and very worthwhile dialogue on renewable potentials within Australia.

Gaining private investment within Australia, when the Government is not seen to be doing enough to keep our technology on our shores, is difficult.

Sunengy currently gets 400 visits per month to our website, mostly from overseas and often from potential customers for LSA; some of enormous scale.

We have detailed technical information, prototypes and a comprehensive business plan relating to the LSA and where it fits into the Australian and Global renewable sector.

A detailed, technical presentation of LSA was given to the National Executive and the National Research Director of the Mining and Energy Division of the CFMEU.

We are now preparing to put a funding application to the Government, an application that is endorsed by the CMFEU.

Thank you for taking the time to read our submission.

Contacts:
Phil Connor pmc@sunengy.com
Ph: 61 417 231 395
Peter Wakeman peterw@heritagemotor.com.au
Ph: 0418489186