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SOLAR GENERATION OF ELECTRICITY IN THE MDB

Committee Secretary
House of Representatives Standing Committee on
Regional Australia
PO Box 6021
Parliament House
CANBERRA ACT 2600
AUSTRALIA

Dear Sir,

Submission Proposing the Partial Diversion of Farm Land for Solar Power Generation

This proposal sits squarely within the terms of reference, in particular:

- Options for water return;
- Opportunities for economic growth and diversification within regional communities;
- The role of governments, the agricultural industry and the research sector in developing and delivering infrastructure and technologies aimed at supporting water efficiency within the Murray-Darling Basin.

SUMMARY

[001] This paper proposes the option of farmers in the MDB allocating a portion of their land to solar generation of electricity to meet the requirement for a reduction in water allocations. Solar electricity generation has the potential to produce substantial drought proof income per acre, and has the added benefit of not producing any carbon. It also offers a new industry for the local community.

Water Allocation in the MDB and Solar Energy

[002] Taking as a starting point that the Murray-Darling flow has been over-allocated, and that drought is the norm rather than the exception, some of the options are :

- maximizing efficiency of water usage;
- water creation projects;
- reduction of the water allocation.

[003] Assuming that water efficiency is at or near maximum or is unable to deliver the required level of reduction in allocations, and that water production (desalination plus pipeline/Lake Eyre - Spencer Gulf canal/diversion of coastal rivers) is improbable, a significant reduction in water allocation is inevitable.

[004] Clearly, reduction of allocations has the potential to do economic damage to farmers and the broader local communities. This is not unlike the necessity to impose fishing limits on endangered species. In Australia, governments bought out fishing licences.

[005] However, there is one option which offers the potential to put a portion of irrigated land to an alternative, drought-proof, income-generating use. This option is solar generation of electricity.

SOLAR GENERATION OF ELECTRICITY IN THE MDB

[006] Australia was, until the last decade, a leader in developing both solar thermal electricity generation and solar photovoltaic cells.

[007] This paper discusses the option of farmers diverting part of their land to solar electricity generation as a trade off for water allocations. Individual farmers could contribute part of their land to a corporation or cooperative in exchange for a share of the profit.

The Technology - Concentrated Solar Thermal (CST)

[008] A particularly effective technology is Concentrated Solar Thermal (CST) electricity generation, which uses mirrors to focus sunlight onto a water container. This produces steam, which can be used to drive a turbine to power an electricity generator.

[009] AUSRA is a company which produces CST equipment employing technology developed by Australian universities. A field trial unit was installed at Liddell in NSW. California has adopted the technology, and AUSRA is now an expatriate company, due to the greater support available for clean technology overseas.

[010] NASA has a map of Concentrated Solar Energy at

http://www.nrel.gov/gis/solar.html

[011] Sunlight is not in short supply in the MDB. Using NASA figures[1], about 820 Watts of solar energy fall on each square meter of land at 37° south.

[012] Assuming a conservative average of 4 hours of sunlight at 820 w/m^2, and taking 1 acre = 4000 m^2, this results in 12 MWH per acre per day, or 4380 MWH per acre per year.

[013] Assuming that this is converted to electricity at 50% efficiency, this results in just under 2200 MWHrs of electricity per acre per year. At $170 per MWH, this is about $374,000 per acre per year.

[014] The collected soar energy can be stored in a thermal store for use during the night to generate electricity. AUSRA uses this process.

[015] The conversion of part of the farm land to an alternative, drought-proof incoming use would strengthen the local economy. Solar generation will put Australia in a stronger position in meeting its carbon reduction goals.

[016] Britain prospered during the years when it produced North Sea oil in quantity. Solar generated electricity can provide Australia with an endless supply of clean electricity, and form the basis for a hydrogen economy.

[017] While this paper is primarily directed to CST, primarily as a preferred option of the author, photovoltaic is an obvious alternative, and technical and economic analysis would be required to determine the optimal technology.

[1] *http://edmall.gsfc.nasa.gov/inv99Project.Site/Pages/science-briefs/ed-stickler/ed-irradiance.html

The Market for Electricity

[018] In addition to the traditional electricity market, surplus electricity can be converted to hydrogen and stored. This can be used for power generation, transport, export, all as carbon neutral energy. As the technologies for storage of hydrogen continue to develop, hydrogen will become a viable energy source for transport.

[019] A further use of the electricity could be for desalination for coastal cities. This could reduce the diversion of rural water for urban use.

The Environment

[020] Not only is solar thermal carbon neutral (except for the initial manufacture of the equipment), it actually reduces global warming by absorbing heat from the environment – the more you use, the cooler it gets.

[021] Unlike some other renewable sources, such as alcohol from crops, it does not require intermediate processing which requires further energy inputs. Nor does it produce waste heat and combustion products such as carbon dioxide.

Patrick Conrick

Three steps to the hydrogen economy

Three Steps to the Free Hydrogen Economy

Sun + Water = Steam
Steam + Magnetism = Electricity
Electricity + Water = Hydrogen