"Snowy 1.5" - The potential for floating solar panels on Lake Eucumbene and other water reservoirs in New South Wales

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In 2014 the World Bank issued a report "Where Sun Meets Water - Floating Solar Market Report". That report described the potential for photo-voltaic solar farms to be installed on lakes and reservoirs. The report noted the extra potential and benefits of hybrid systems where a floating solar farm is combined with hydropower.

These notes describe a brief analysis of the potential for Lake Eucumbene, in the Australian Snowy Mountains, to be used in this way.

The World Bank report lists examples of hydropower dams around the world and the percentage of the reservoir surface area required for floating solar to match the dam's hydropower capacity. Australia is not included in the analysis but a typical case is 3%. The analysis assumes that 1 square kilometres of floating solar panels will generate 100MW of electricity under optimal conditions.

Lake Eucumbene has a total surface area of 145 square kilometres so its solar potential is about 14GW but 100% coverage is unrealistic.

It is understood that the Snowy 2.0 proposal will have a peak capacity of 2000MW. The equivalent solar farm area would be 20 square kilometres or 14% of the surface area of Lake Eucumbene.

Benefits of a floating solar farm on Lake Eucumbene are:`

- the connection to the national energy grid is already in place
- surplus solar-generated electricity (not needed for the national grid) could be used to pump water into the Snowy storage reservoirs for generating hydropower at other times (the key advantage is close proximity to the pumps, thereby avoiding the transmission losses from using electricity generated in other localities for this pumping)
- substantial solar-energy generation without taking up land
- better solar panel efficiency (around 5% improvement) due to the cooling effect of the water (hot solar panels are less efficient)
- reduced evaporative losses for the lake it is estimated that Lake Eucumbene loses about 1.2 metres of water per year due to evaporation, with half of this occurring in summer. These losses are reduced by about 80% for the area covered by floating solar panels.
- reduced algal growth (e.g. less water treatment needed for water supply reservoirs)

Challenges

- Lack of global experience with these technologies including costs, reliability and effects on water ecology
- Objections from recreational users of Lake Eucumbene (although the percentage of the total surface area affected would be relatively small)

• Water birds may find the pontoons attractive and there could be increased soiling of the panels

The World Bank recently published its "Floating Solar Handbook for Practitioners" to encourage the development of this technology:

http://documents.worldbank.org/curated/en/418961572293438109/Where-Sun-Meets-Water-Floating-Solar-Handbook-for-Practitioners

Disclaimer

This document represents the views of the author and is based mainly on information published by the World Bank, Wikipedia and SnowyHydro. It is intended to start the conversation about floating solar farms in Australia.

| | | Est | Est | | | | | | | | |
|---------------|---------|---------|---------|---------|---------|----------|--------------|--------|-----------|-----------|--------|
| | Surface | useable | Useable | | | PV | | Nearby | | Reduced | % of |
| | Area | depth | Volume | Assumed | PV area | Capacity | Nearby | power | Evap loss | evap loss | volume |
| Location | (sq km) | (m) | (dl) | %Solar | (sq km) | (MM) | power type | (MM) | (m/year) | (m) | saved |
| Lake | | | | | | | Snowy 2.0 | | | | |
| Eucumbene | 145 | 5 | 725 | 15% | 21.75 | 2175 | (proposed) | 2000 | 1.2 | 0.14 | 3.6% |
| | | | | | | | Liddel coal- | | | | |
| Lake Liddel | 10 | 2 | 20 | 20% | 7 | 700 | fired | 2000 | 1.6 | 0.90 | 56.0% |
| Prospect | | | | | | | | | | | |
| reservoir | 4 | 5 | 20 | 70% | 2.8 | 280 | N/A | 1 | 1.6 | 0.90 | 22.4% |
| Lake | | | | | | | | | | | |
| Burragorang | | | | | | | Warragamba | | | | |
| (Warragamba) | 75 | 20 | 1500 | 15% | 11.25 | 1125 | Hydro | 50 | 1.6 | 0.19 | 1.2% |
| Lake Wallace | | | | | | | Wallerawang | | | | |
| (Wallerawang) | 1 | 2 | 2 | 70% | 0.7 | 70 | coal-fired | 1000 | 1.6 | 0.90 | 56.0% |
| Lake | | | | | | | | | | | |
| Grahamstown | | | | | | | | | | | |
| (Newcastle) | 23 | 5 | 115 | 70% | 16.1 | 1610 | N/A | 1 | 1.6 | 0.90 | 22.4% |
| | | | | | | | | | | | |

Table of Potential Floating Solar locations in New South Wales

Assumptions PV capacity per sq km (MW) Reduced evap loss from PV

100 80% × F

x PV area