Solar grazing used to reduce project operating costs in Australia

Agrivoltaics | Many companies working in the Australian utility-scale solar sector are exploring opportunities to integrate agricultural production into projects, writes Lucinda Tonge, a senior policy officer at the Clean Energy Council.

Since the mid-2010s, Australia has seen the development of many solar farms, reflecting the sharp fall in the cost of solar PV technology, which is now the lowest-cost form of electricity. As the sector grows, there is increasing interest in exploring and promoting new models for complementary solar energy and agricultural production. This coupling is commonly known as 'agrisolar' or 'agrivoltaics'.

Utility-scale solar (generally considered to be greater than 5MW) typically requires access to relatively flat or gently sloping land in sunny areas within proximity to electricity transmission networks, where biodiversity impacts can be avoided or minimised. This often means that land which has been previously cleared or zoned for agricultural use is well suited to host solar farm developments.

The cumulative risk caused by large-scale solar development to Australian agricultural land and productivity is very low. For example, the Australian Energy Market Operator estimates that New South Wales (NSW) will need approximately 20,000MW of large-scale solar generation to replace coal-fired power stations by 2050. This would require approximately 40,000 hectares of land or only 0.06% of rural land in NSW. Even in the highly unlikely scenario that all of NSW's solar generation was located on important agricultural land (which covers 13.8% of the state) only 0.4% of this important agricultural land would be required.[1]

Regardless, many companies working in the Australian utility-scale solar sector have committed to minimising the impacts on highly productive agricultural land (see the Clean Energy Council's Best Practice Charter for Renewable Energy Developments) and exploring opportunities to integrate continued agricultural production into projects.

With the deployment of large utility-scale solar farms commencing in Australia from around 2015, the local experience of agrivoltaics practices is still developing and currently dominated by the practice of sheep grazing on solar farms. The first Australian solar farm to implement agrivoltaics practice was the Royalla Solar Farm, which began grazing sheep in 2015. Since then, there have been over a dozen solar farms that have introduced grazing, and it has proved to be an effective partnership for both solar farm proponents and graziers.

'Solar grazing', as it is known, is the most prevalent form of complementary land use for utility-scale solar farms due to the compatibility with ground-mounted solar PV panels.

In Australia, we've seen solar panels and solar farm fences improve the sheep's welfare by providing protection from the elements and predators. While these results are generally anecdotal in Australia, one recent Australian study found that the reduced windspeeds recorded within a solar farm could reduce the wind-chill index for newborn lambs. For winter 2022, this had the potential to reduce twin merino lamb average mortality rate from 20% in open paddock to 12% within the panel field. Furthermore, preliminary results from a wool analysis of the sheep at the Parkes Solar Farm indicated that the quality was high, even during drought conditions.[2]

Ground-mounted solar PV panels are also compatible with biodiversity and bees, as well as some types of horticulture. According to the National Renewable Energy Laboratory in the US, the partial shade conditions of solar installations can create favourable conditions for plants grown under or around the panels, including creating cooler conditions during the day and warmer conditions at night, and increased soil moisture levels.[3] In an Australian context, research has been conducted at Enel Green's Cohuna Solar Farm by Agriculture Victoria to understand pasture growing conditions under the panels.

Besides ground-mounted solar PV, other forms of agrivoltaics include:

- Elevated PV panels where the panels are raised on stilts or reinforced structures from 2.5-5 metres high to allow for crops and trees to be grown underneath
- PV greenhouses and rooftops, including innovations such as semi-transparent panels
- Floating PV systems which are compatible with acquaculture

At present, these forms of agrivoltaics are typically deployed at a much smaller (i.e. non-utility) scale. This is largely due to the necessity for taller and more complex structures, as well as the larger area of land required and increased equipment costs. One example of a trial using elevated panels in Australia is the Tatura Smart Farm in Victoria, which has grown pears under several long panel arrays.[4]

An agrivoltaics approach may not be suited to all solar farms, but optional support will help more industry players adopt these practices where possible. This not only provides potential co-benefits for both solar and agriculture, but also helps to bring the community along the renewable energy journey that is happening in their local areas. ■

References

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