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Sun to Surface: Solar-Powered Surface Irrigation



Can solar powered automation reduce energy costs and labour while maintaining reliable surface irrigation performance?

Surface irrigation needs high, stable flow rates to get water on and off bays as quickly as possible and facilitate better water use efficiency and automation. This demonstration tests whether solar generation, automated outlets and intelligent pump control can work together to meet the requirements of best practice surface irrigation while reducing reliance on mains electricity and labour.

Hosts: Wilco Droppert and Sandra Jefford, Wilandra Farms
Trial location: Airly, Gippsland
Farming System: Dairy

Background

Wilandra Farms is integrating a solar array with Rubicon outlet automation and an AEI SmartBox to operate approximately 22 ha of pipe-and-riser surface irrigation. Unlike spray irrigation, a surface irrigation event cannot simply slow down or stop whenever solar output falls. Once a bay starts, the system needs to maintain a practical flow and complete the irrigation of that bay. The demonstration will assess how solar generation, mains electricity and automation can be coordinated to maintain reliable irrigation performance while maximising energy cost and labour reductions.

Key focus areas

This project will investigate whether automated solar surface irrigation can:

- Maintain high and stable bay flow rates
- Reduce electricity costs through greater solar utilisation
- Maintain irrigation performance during variable solar conditions
- Automatically manage bay sequencing and irrigation intervals
- Reduce labour required for irrigation management.



Wilco Droppert and Sandra Jefford

Method

The demonstration integrates solar power generation, automated pump control and automated irrigation bay outlets to create a smart irrigation system.
Key components include:

- a 50 kW solar array
- an AEI SmartBox energy management system
- variable-speed pump controls and
- Rubicon automated outlets serving the pipe-and-riser bays.

The farmer sets the desired irrigation interval and the control system monitors the irrigation rotation to determine when each bay is due to be watered. When sufficient solar energy is available, the system starts the next irrigation event. Mains electricity can buffer any shortfall so the bay is completed with a stable flow.

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Project monitoring will assess irrigation performance, solar energy utilisation, grid electricity consumption and labour requirements across multiple irrigation events.

Flow stability
Flow and pressure will be monitored to determine whether the automated system maintains the high, stable delivery required for effective surface irrigation.

Solar and grid energy
Energy data will be used to assess the proportion of pumping demand supplied by solar generation and identify when supplementary mains electricity is required to maintain irrigation operations.

Irrigation timing
Outlet operation and bay irrigation times will be recorded to assess sequencing, completion and the ability to maintain the nominated irrigation interval.



Steve Souter from Alternate Energy Innovations and Agriculture Victoria Irrigation Extension Officer, Caelan McIntosh programming the smartbox.

Soil moisture
Soil moisture monitoring will be used to assess irrigation timing, pasture root-zone recharge and the effectiveness of irrigation events under automated operation.

Labour and operation
Farmer observations will document labour requirements, interventions and any operational issues as the automation is refined.

Economic analysis
Capital and operating costs will be considered alongside energy and labour savings to inform a practical return-on-investment assessment.



Pipe and Riser Flood Irrigation

Potential benefits for irrigators

The project will provide practical information to help irrigators:

- Understand the requirements for implementing solar-powered surface irrigation
- Assess whether automation can maintain stable flows and reliably complete irrigation events.
- Reduce labour requirements and simplify bay sequencing
- Increase the use of on-farm renewable energy
- Understand when mains power is still required
- Evaluate likely costs, savings and return on investment

Contact: Caelan McIntosh – Irrigation Extension Officer Agriculture Victoria - PH 0476 885 716 or email caelan.mcintosh@agriculture.vic.gov.au

This farmer-led demonstration is part of the Learn.Irrigate.Grow program, delivered in partnership by Agriculture Victoria and WGCMA.

The program uses on-farm trials to help local farmers explore new ways to irrigate smarter, improve productivity and protect our waterways.

The Program is funded through the Victorian Government's Sustainable Irrigation Program.

We acknowledge and pay our respects to the Traditional Owners of the region, the Gunaikurnai, the Bunurong, the Boonwurrung and the Wurundjeri Peoples and pay respects to Elders, past, present and emerging.

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