

ENERGY EFFICIENCY

This factsheet is a joint initiative between Cotton Australia, NSW Irrigators' Council and the NSW Office of Environment and Heritage

For more information

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DIESEL VERSUS ELECTRIC VERSUS SOLAR

The majority of pumps in irrigated agriculture operate on diesel. Cyclical fluctuations in energy costs and improvements in pumping technology means that options around what is the most cost effective energy source for your irrigation enterprise should be assessed. This is typically determined on a \$/ML basis and should be considered holistically in relation to your irrigation system. These assessments are particularly important when pumps are reaching their end of life and an opportunity exists to make a more substantial infrastructure or design change.

Across the board, and with any irrigation pump design, it is critical that the pump aligns with the system water delivery requirements. Oversized pumps will use more energy than required to meet your water delivery requirements, impacting on fuel use / electricity efficiency, maintenance requirements and pump life.

A new pumping system can offer considerable labour savings through remote monitoring and precise measurement of water resources, pump performance and pumping inputs. However it is rare that a complete change in pump infrastructure will prove to be cost effective e.g. shifting from a diesel based pump system to an electric pump system. An alternative approach may involve diversification of your energy mix through a hybrid system upgrade e.g. a diesel/solar pumping system will reduce your reliance on any singular energy source. The high initial capital cost can be offset via the reduced use of diesel and may provide a competitive payback period.

This factsheet aims to highlight the major features / considerations for each of the major pump irrigation energy options – diesel, electric, solar or a hybrid of these.

ELECTRIC PUMPS

Electric pumps have a reduced labour requirement for servicing and maintenance when compared with diesel systems.

Allows for a reliability energy back up fall back energy source – can operate pumps via electricity with a diesel generator to fall back on in the event of a grid outage.

- Electric pumps are more efficient (50–85%) than diesel pumps (20–35%)¹
- Electric pump integrate more easily with automation functions
- Electric pumps face significantly higher costs where existing infrastructure is not in place – you will need to apply to connect and pay for network connection costs, infrastructure (e.g. poles, wires and transformers). These costs can be excessive in most rural locations
- Future electricity costs are uncertain however there is significant risk of future electricity price increases which should be factored in to any system changes

DIESEL PUMPS

- Diesel pumps become more cost competitive (in terms of maintenance costs) as the size of the pump increases – fuel efficiency increases as engine horsepower increases
- The largest fixed costs associated with diesel systems are depreciation. Variable costs for pump servicing requirements are proportionally the same for small and large diesel pumps
- Depreciation cost is less per mega litre pumped over a year if spread over more hours of use
- Irrigators can potentially be exposed higher costs with fluctuations in the world crude oil prices, exchange rates and removal of the diesel fuel rebate
- Diesel pumps produce more direct greenhouse gas emissions – however this may not be representative of the entire energy efficiency picture, as the majority of Australia's electricity is produced using coal

SOLAR PUMPS

- Australia has the highest irradiance per metre squared, more than any other country in the world. Coupled with affordable Photovoltaic (PV) technology, solar is a realistic alternative energy source in some water pumping scenarios

- On average throughout the year there will be 8 available pumping hours for a potential solar driven pump. As such, some form of water storage or complimentary energy source will be required to buffer water supply with irrigation demand
- Satisfactory commercial payback occurs on solar only irrigation projects where water extraction rates are high and an earthen water storage dam is nearby to maximise available solar pumping hours through the year. These generally occur in shallow to medium depth groundwater irrigation bores
- Matching solar powered irrigation pumping with sporadic or seasonal demand of surface water has proven challenging with analysis showing standalone PV investments are not viable under this scenario at this stage
- Publications on consumer protection, warranties and PV purchasing can be found on the NSW Farmers website

HYBRID PUMPS

- Recent improvements in variable speed drive technology have enabled a combination of energy sources to operate irrigation pumping systems. Solar PV technology (direct voltage) and both grid power and diesel generation (alternating current) pumping systems have been installed successfully within the cotton industry
- Hybrid systems allow a pricing hedge of different energy sources and can reduce the reliance on fossil fuels and grid power
- Installation returns of PV hybrid systems have shown acceptable project payback where year-round or out-of-season generation can be utilised. This may occur through pumping into storage in cooler months, operating grain drying equipment or potentially charging electric vehicles
- Research is currently underway to include batteries into hybrid irrigation pumping systems to provide economic alternatives to store the cheapest available energy source from grid, diesel or renewable sources to use at times of peak demand
- Battery storage has been used successfully on an industrial scale but has not been applied irrigation pumping infrastructure at the current time

Please contact NSW Irrigators' Council or Cotton Australia for further information.

¹ NSW Farmers. Diesel versus electric pumps. Farm Energy Innovation Program – Energy and Irrigation

