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Specialist Knowledge.
Practical Solutions.

Transitional Technologies - Future Fuel Mix

DPI – Exploring beyond diesel



A Carbon Neutral Future

“By 2050 the carbon market could provide income of \$40 billion to the land sector (with particular opportunities for agriculture).”

CSIRO

100% renewables powered electricity

- Electric farm vehicles
- Renewable hydrogen generated on farm
- Zero reliance on grid power, farm anywhere that has water and sunlight

We can make small steps towards this right now.



Existing Problems

- Cost of importing diesel
- Missed opportunities with waste



[Source](#)

Biofuels as a solution

- Common Biomass
- Biodiesel
- Bioethanol
- Biogas



[Source](#)

Biomass

Products	Machines types	Diameter	Raw material	Applications
Pellet	Ring/flat die pellet mills	<10 mm	Agricultural/ forestry residues	Small- and medium-scale distributed heating/exporting
Briquette	Ring/flat die briquette machine	10–25 mm	Agricultural/ forestry residues	Small- and medium-scale distributed heating
Rod	Piston presses machine/ screw extruder	>30 mm	Forestry residues	Large scale biomass boilers/ exporting



(a)



(b)



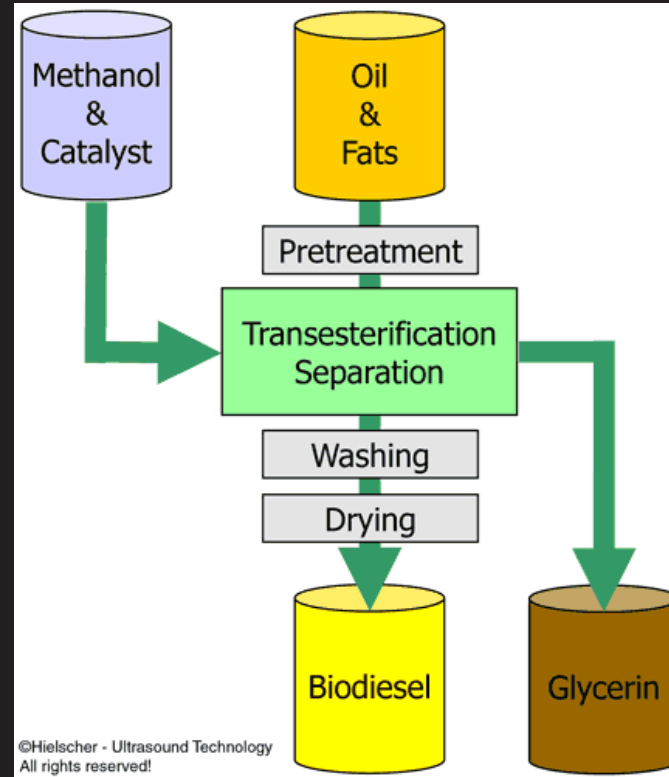
(c)



(d)

Biodiesel

- A fuel with similar properties to regular diesel
- Produced from vegetable oils
- Requires large amounts of fats



[Source](#)

Biodiesel

- Can be fed into existing diesel engines (blended with diesel)
- Viable solution in the short term
- Prominent biofuel in Australia



Source

Biogas

- Benefits include fertiliser, reduced odor, and GHG reduction
- Suitable for piggeries, dairies, horticulture communities, or farms with neighbours who has organic waste issues.



Bioethanol

- Produced through fermentation of sugars
- Fuel is largely a petrol replacement
- Used extensively in Brazil, USA, and the EU



Adding Renewables to the Fuel Mix

Solar Systems

- Mounted or portable
- Prices have reduced dramatically (evidence)
- Efficiency of 33% once the limit but now $> 50\%$
- Free energy source



Wind Energy

- 50% typical efficiency
- Clean and free energy source
- High capital cost



Planting Wind Energy on Farms May Help Crops, Say Researchers

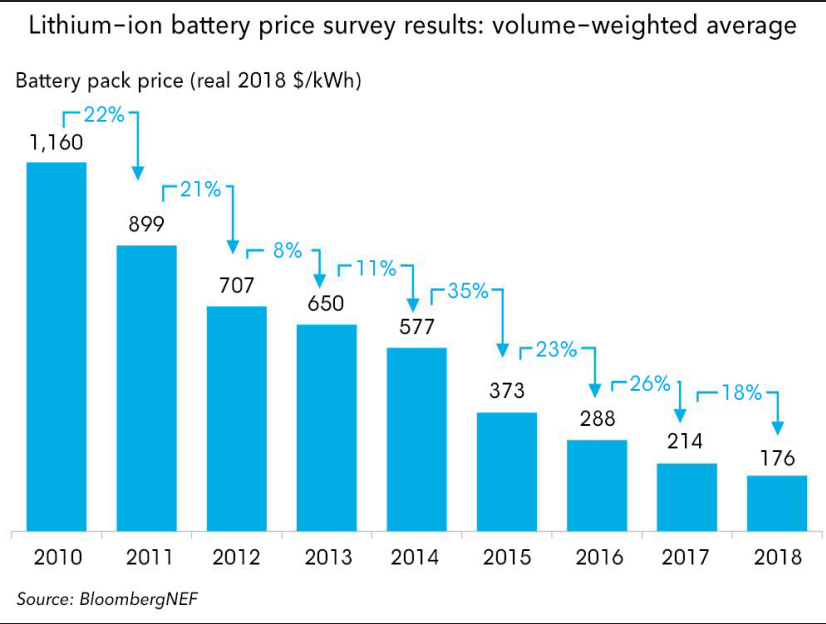
Wind energy may do more than improve farm income. When sited in agricultural fields, turbines' churning of air may help crops to grow, new research indicates.

[Source](#)

Renewables Require Energy Storage

Batteries

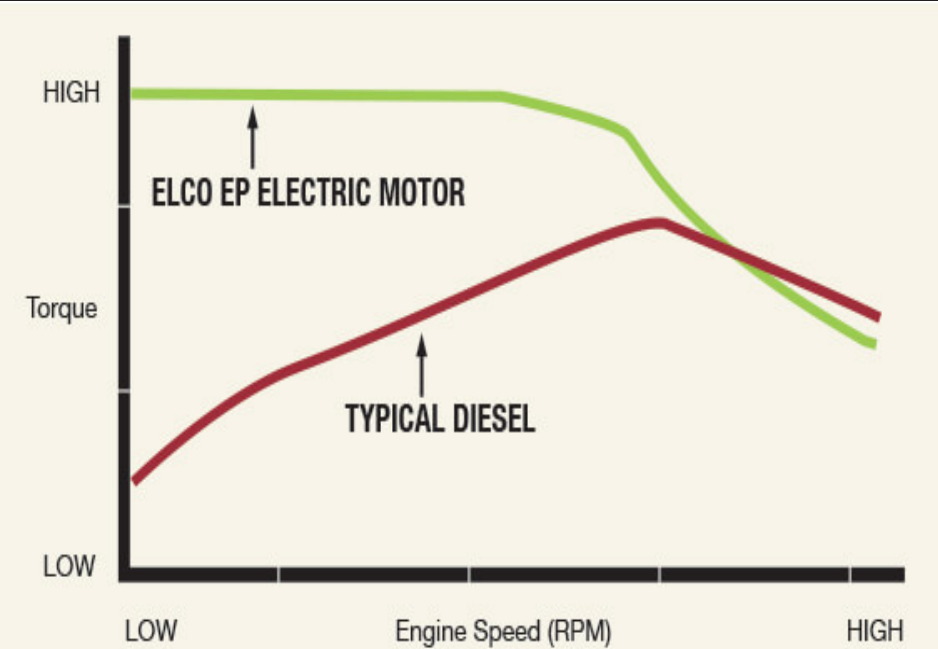
- High demand over last decade
- Cheaper, safer and more reliable than ever.



Batteries for Tractors



Electric Motors vs Diesel Engines



Source

Fuel	Cost of mechanical energy delivered
Diesel	\$0.217/kWh
Electricity	\$0.294/kWh

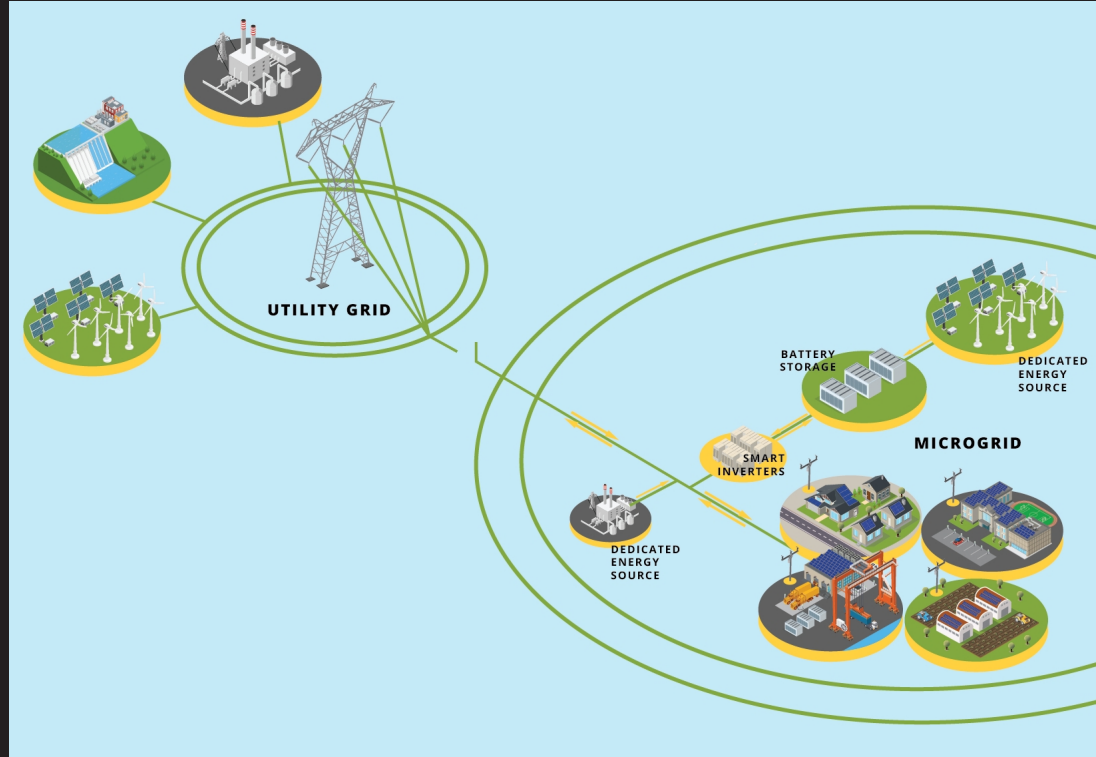
Green Hydrogen

- Zero emissions
- High energy density
- Only water and electricity used to produce it
- Highly compatible with solar and wind energy



[Source](#)

Integrating all these technologies - Microgrids



Integrating all these technologies

- All these technologies can be used to produce a fuel or electricity
- How you choose to use these technologies will depend on the assets you have on the farm



Relying on the Unreliable

- Weak electricity grid
- Dwindling fossil fuel resources

The Sydney Morning Herald

NATIONAL EXTREME WEATHER

Australia's summer of extremes pushed grid to the limit, AEMO says

What can you do?

- Can any waste streams be turned into energy?
 - A community based approach is usually more effective, more waste streams and access to more capital
- Start thinking of electrification
 - Understand your grid constraints. What is possible?
 - Consider new technologies when purchasing new equipment
- Start planning on when you would like to go on the journey to carbon neutrality.

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Thank you!

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