

## Emerging power generation technology

A multitude of national and international factors are changing the face of current power generation methodologies in Australia. Pressure from climate change and environmental factors, to perceived limitations in resource supply for existing generation, enormous investments in new technology are in train which are now beginning to bear fruit. These recent developments in Europe and the US are so advanced and leading edge that they are mostly unknown to the public and press in Australia.

In line with this new age of generation, transmission security is now also seen as being of utmost importance. Governments are now openly discussing de-centralised generation, effectively putting a use by date on the old style grid.

This article provides a snippet of upcoming and proven generation methods now available.

### **Solar greenhouse, South Australia, Sundried Tomatoes**

Saltwater from the nearby Spencer Gulf is pumped 2 km to this 20 hectare arid site in South Australia. A solar powered desalination plant removes the sea salt, creating enough fresh water to irrigate the 180,000 greenhouse tomato plants. Cooling is via seawater and heating is via solar, providing temperature control year round. Solar power is produced from the site's 23,000 mirrors reflecting sunlight to the 115 m high receiver tower, producing up to 39 MW of power per day.

### **Algae power**

Micro algae convert sunlight into energy to store in the form of oil (biofuel). These purpose built algae farms grow specialised algae in ponds that is harvested and replicated every few weeks. Oil is extracted from the algae using various chemical technologies. The end

result being a renewable alternative to oil and petrol for existing internal combustion engines. In pilot and demonstration phase mostly, commercialisation and mass production is yet to become mainstream.

### **Waste heat to power**

Heat as a by-product, such as from a timber kiln or diesel generator radiator, or even solar, can be plumbed to a traditional boiler to produce steam, or a similar incarnation, an organic Rankine cycle (ORC). The ORC uses organic refrigerant liquid (instead of water) that converts to vapour, with the high pressure vapour turning the turbine to produce electricity. Vapour is cooled via ponds or cooling towers and returned to liquid, before the cycle starts again. Though the technology is long-standing, constant improvements such as mobile bolt-on ORC's are available, with customers now increasing their own internal power output with no additional fuel demand or costs from their existing heat sources.

### **Solid Oxide Fuel Cell**

Through a combination of multiple ceramic Anode and Cathode plates enclosed within a metal box, a gas fuel such as methane, natural gas or biogas is introduced together with oxygen to produce an electrochemical conversion that produces electricity directly from oxidising a fuel. Although not mainstream at this time, as existing models are used for higher levels of demand such as commercial and industrial buildings, smaller types are in plan for application such as residential use. Advantages are long term stability, high efficiency, and low emissions and all with a stable fuel supply. Downside is a high operating temperature and mechanical and electrical compatibility issues.

### **Business interruption**

Whilst new technologies bode well for an exciting new future, these and the myriad of

other upcoming power generation systems and fuels will come with inherent risks associated with all new technologies, which can only be solved with the luxury of time. However, consideration should be given to;

- ▼ product spare parts and around the clock product support, local and overseas access
- ▼ local expertise with new technologies,
- ▼ compatibility with existing and future downstream equipment
- ▼ catastrophic failure, fire, immediate equipment replacement
- ▼ available redundancy, dual systems providing change-over.

Business should conduct their own internal *cost-benefit analysis*, taking into account future savings versus possible outages and failures. Some businesses are remaining on the existing grid, and using the grid as a secondary back-up supply for any internal outage, perhaps until these new technologies are established.

### **Summary**

With this snapshot of new technologies now coming through, the traditional world is changing. Historically Australia has lagged in implementation of technological change, although this has benefited us in waiting for the other countries to 'iron out the bugs'. Potential business interruption must also be addressed within business operational and insurance policies going forward.

These technological changes are coming, with future opportunity for gains, albeit with additional risks.

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