Green Energy from Brown Water

The Opportunities for Hydrogen

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The Interest in Hydrogen
The Concept

- Biofuels
  - Internal use
  - Battery Storage for Demand Response
- Generate Hydrogen from Solar and Wastewater
- Sell into Electricity Grid
- Sell into Gas Grid
- Export / NH₃
- Offset Energy Cost
- Generate income
- Energy Neutral
- De-Carbonise
Euroa Abattoir Overview

- Proponent: Asia Pacific Agri-Corp (Projects) Pty Ltd (APAC).
- Located in the Gladstone State Development Area.
- Zoned High Impact Industry Precinct.
- DA approved
State-of-the-art abattoir capable of processing up to 2,400 head per day (at peak).

Beef for export to China and possibly other Asian countries.

Associated beef and hide processing plants, packing, freezing and storage rooms together with ancillary Service Areas.

12 holding pens, with the ability to house 375 animals.

12 lairage corrals with a total capacity of 840 animals.
Euroa Abattoir Overview (cont.)

Will set a new international benchmark for integrated sustainable industrial development:

- Methane capture (used for boiler heating);
- Solar farm (78 MW) (used to power abattoir and electrolyser);
- 33MW hydrogen electrolyser (used to power abattoir, trucks, commercial sale);
- Effluent irrigation; and
- Aim to have zero waste leaving the facility.
The energy mix
Site profile

- 6 MW Peak
- 44GWh electricity - expensive and constrained grid power
- 350,000 GJ p.a. – no natural gas connection

793,650
Swap’n’go bottles
Where are the additional energy opportunities?

- Biogas opportunity – methane capture back to site as gas
  - up to ~ 100 – 120,000 GJ possible

- Approx. 440,000 kL of waste water per annum
  - costly off-site treatment

- Abundant solar opportunity
  - client wants to use the space
  - 75MWp ground mount system
  - can generate up to 153GWh electricity per year
Excess electricity – what options are there?

Solar generation – 153GWh

Site consumption – 45GWh but only 22GWh from solar

Available excess = ~ 131GWh

Battery Storage? Consider 20MW battery – 80MWh (cost is a factor)

Hydrogen production - ~100GWh available – is there a business case?

If so, How do we realise it?
Value Flows
Integrating energy / Optimising energy

A diverse energy mix that provides additional opportunity

Diversifies business
Creates an economy
Establishing the business case

1. Abattoir needs to buy electricity - typical grid price – say $0.10 per kWh
2. The solar farm can produce electricity at a LCOE – $0.035
3. Solar farm supplies additional battery power – LCOE - $0.085
5. Abattoir can produce bio-gas – 100,000 GJ p.a. - BG cost - $8.00
6. Electrolyser - produces HT heat (turbine added value) + H₂ income
Business case for Hydrogen

- Install 33MW ITM Power PEM Electrolyser (largest in the world)
- Production = Max 550kgs per hour / Min production 110kgs per hour
- Potential production – 24/7 = 4.8m kgs per year (not all green)
- Early calculations indicate production of Green H2 of 1.8m kgs per year at only 37% utilisation of the electrolyser (behind the meter PV only)
- Current LCOH = <$3.5 per kg (inline with CSIRO projections)
- Cash flow positive – Positive NPV and IRR 6%
- Increase electrolyser utilisation – LCOH decreases
Future Opportunities

Domestic
- Reliable, secure, cheap energy supply (e.g. industry)
- Back to base transport (e.g. buses, garbage trucks)
- “Cleaner” ag production
- Electricity spot market (use of existing electricity infrastructure)
- Distributed production – regional & capital cities

Export
- Existing and growing high demand
  - Japan/SE Asia
- Use of existing LNG network.