



## MOVING TOWARDS A ZERO ENVIRONMENTAL FOOTPRINT DAIRY PLANT

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# New Zealand Dairy Industry

- 1/3 of NZ export goods
- NZ\$16.7B in 2018 (Dairy Companies Association of NZ, 2018)
- Opportunity to invest in long term sustainable outcomes to benefit NZ economically whilst minimising environmental externalities
- Vision and long term commitment required from the industry



# Challenges for New Zealand Dairy Industry

- High water usage
- Increasing nutrients in waterways
- High energy consumption/carbon emissions
- Stricter controls on discharge limits
- Low levels of resource recovery
- \$\$\$ - water reuse technology
- Risk - food safety and reputation to our product

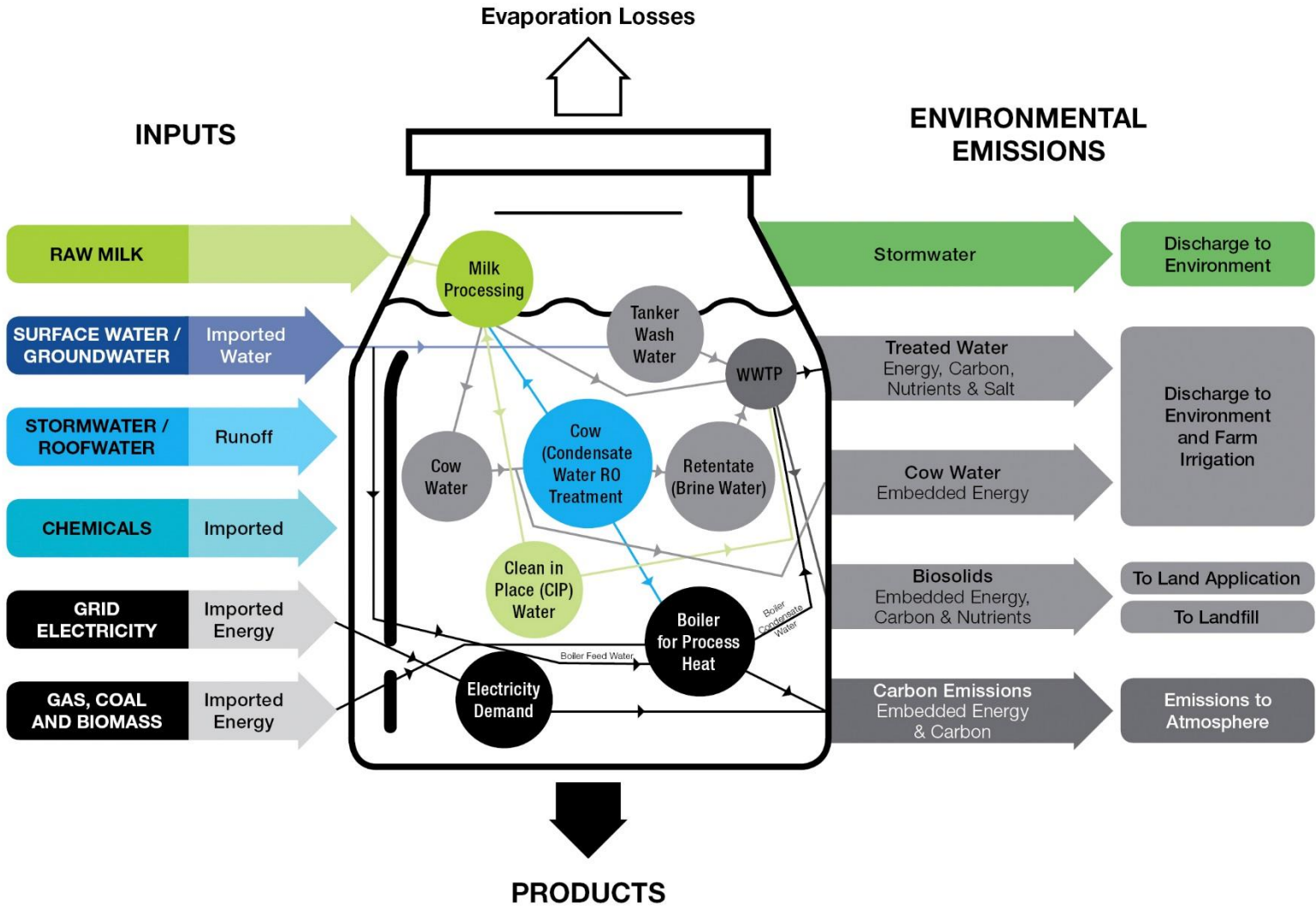


# Moving to a Circular Economy

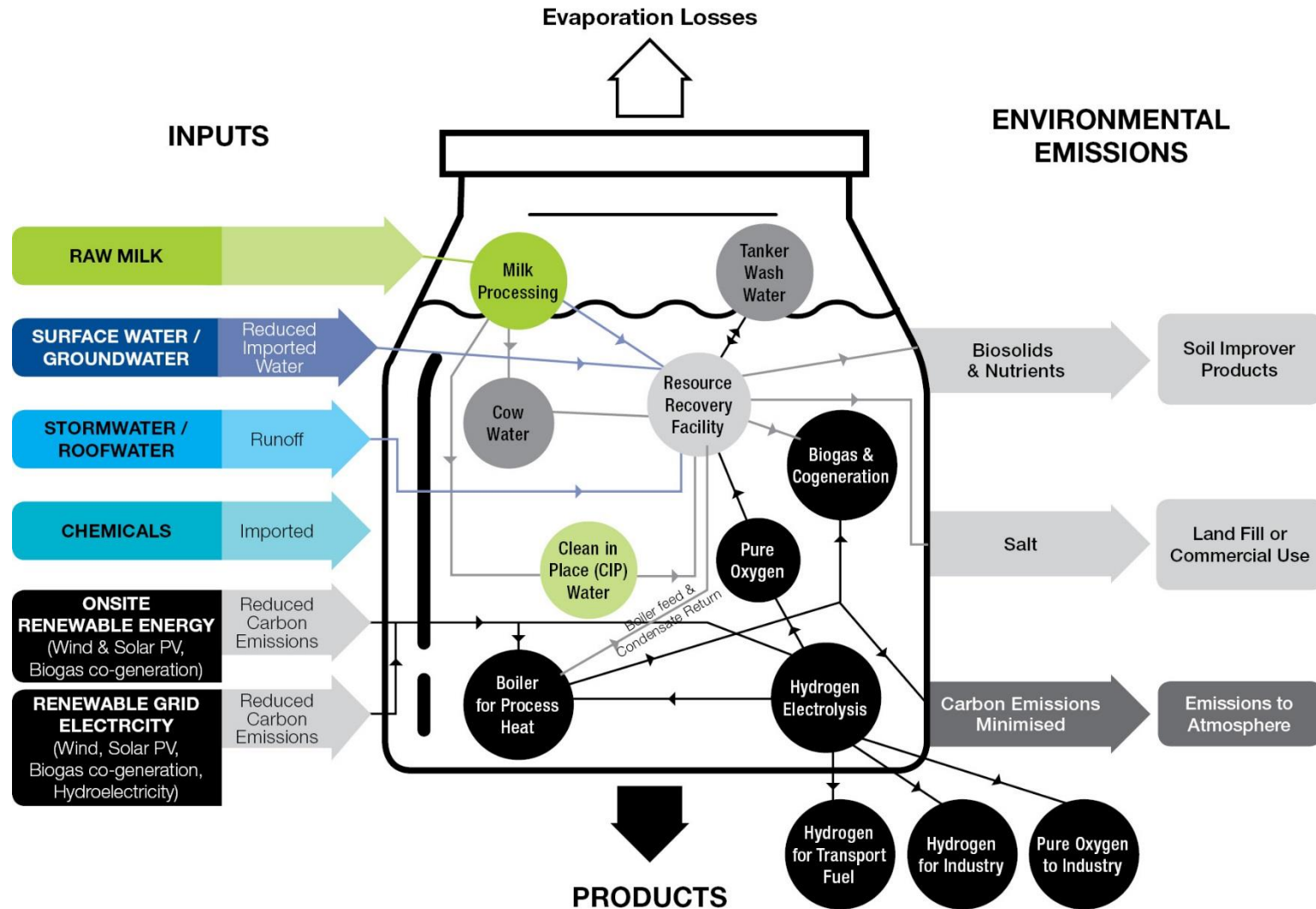


Source: MFE (2018)

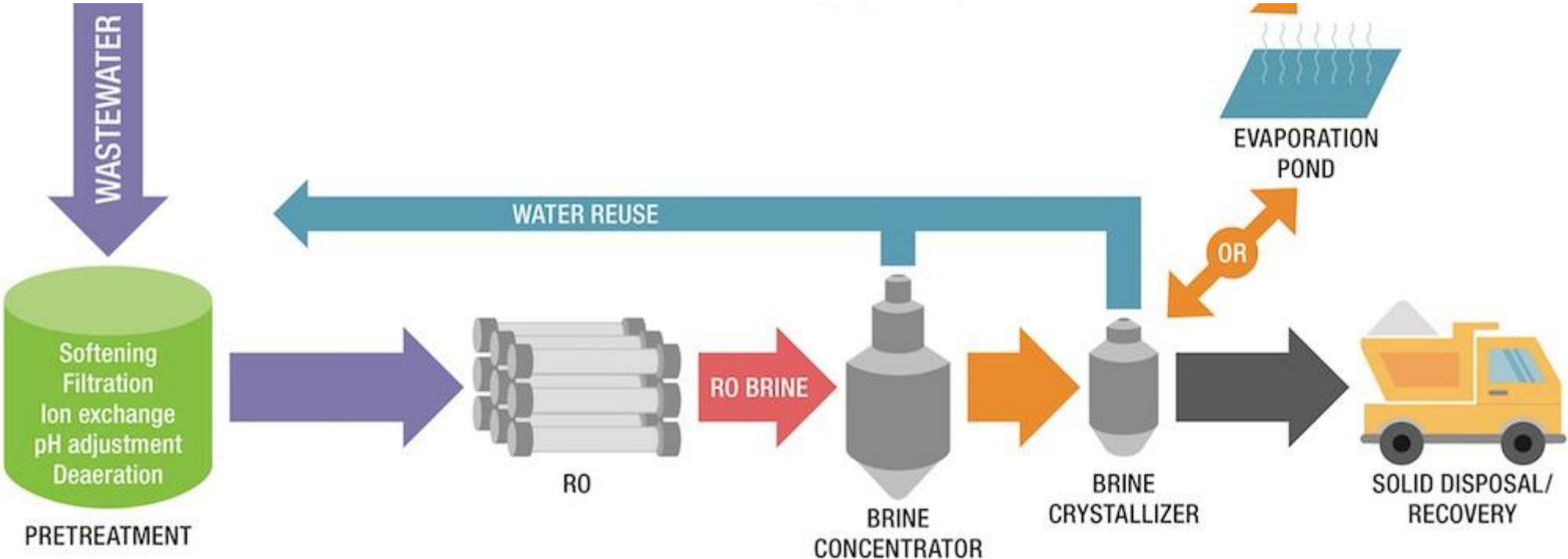
# CURRENT DAIRY PLANT



# ZERO ENVIRONMENTAL FOOTPRINT PLANT



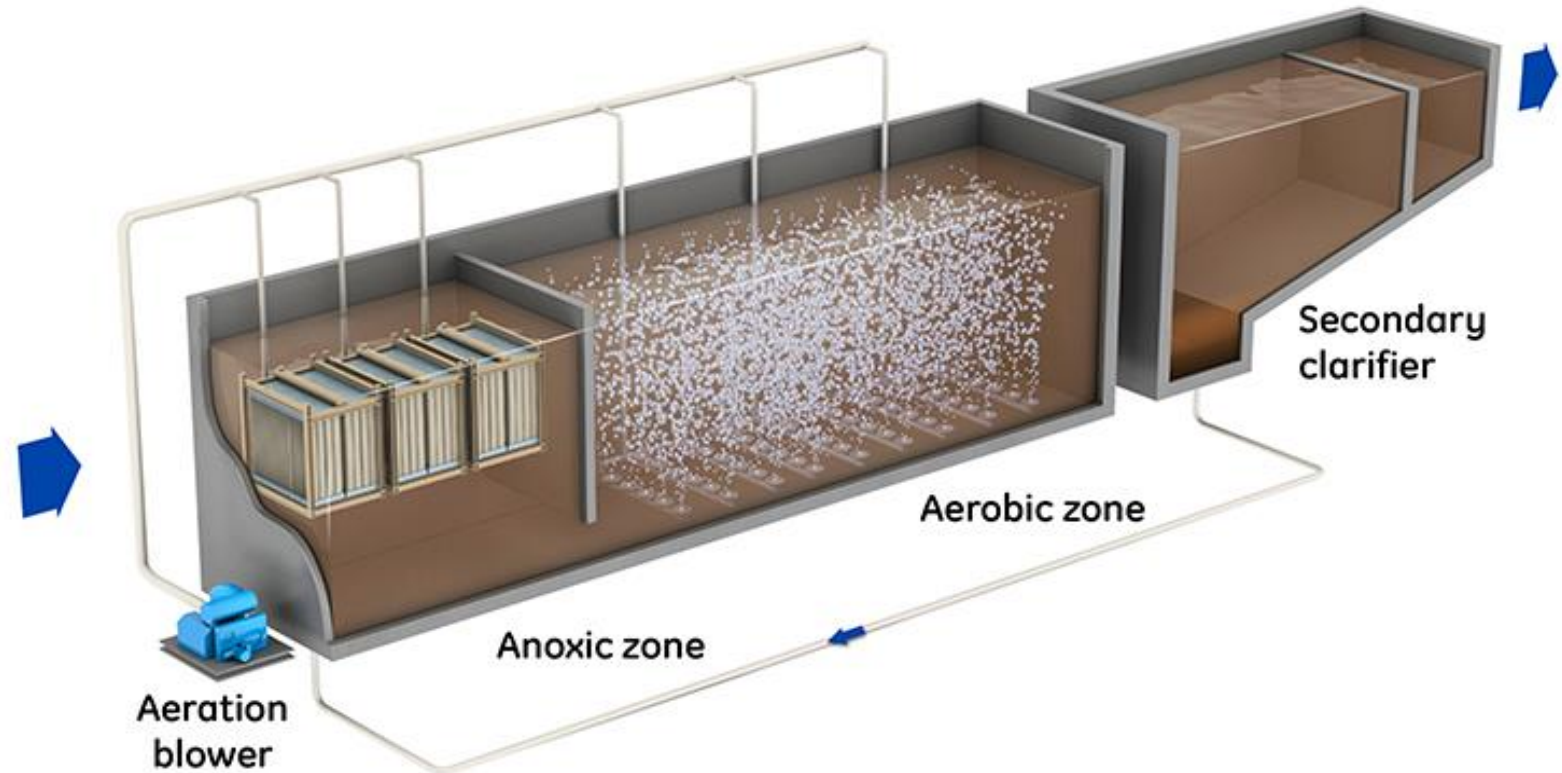
# Available Technologies Example: Zero Liquid Discharge



Source: Crossen & Baltas, 2017 (WWD MAG)

# Available Technologies Example: MABR

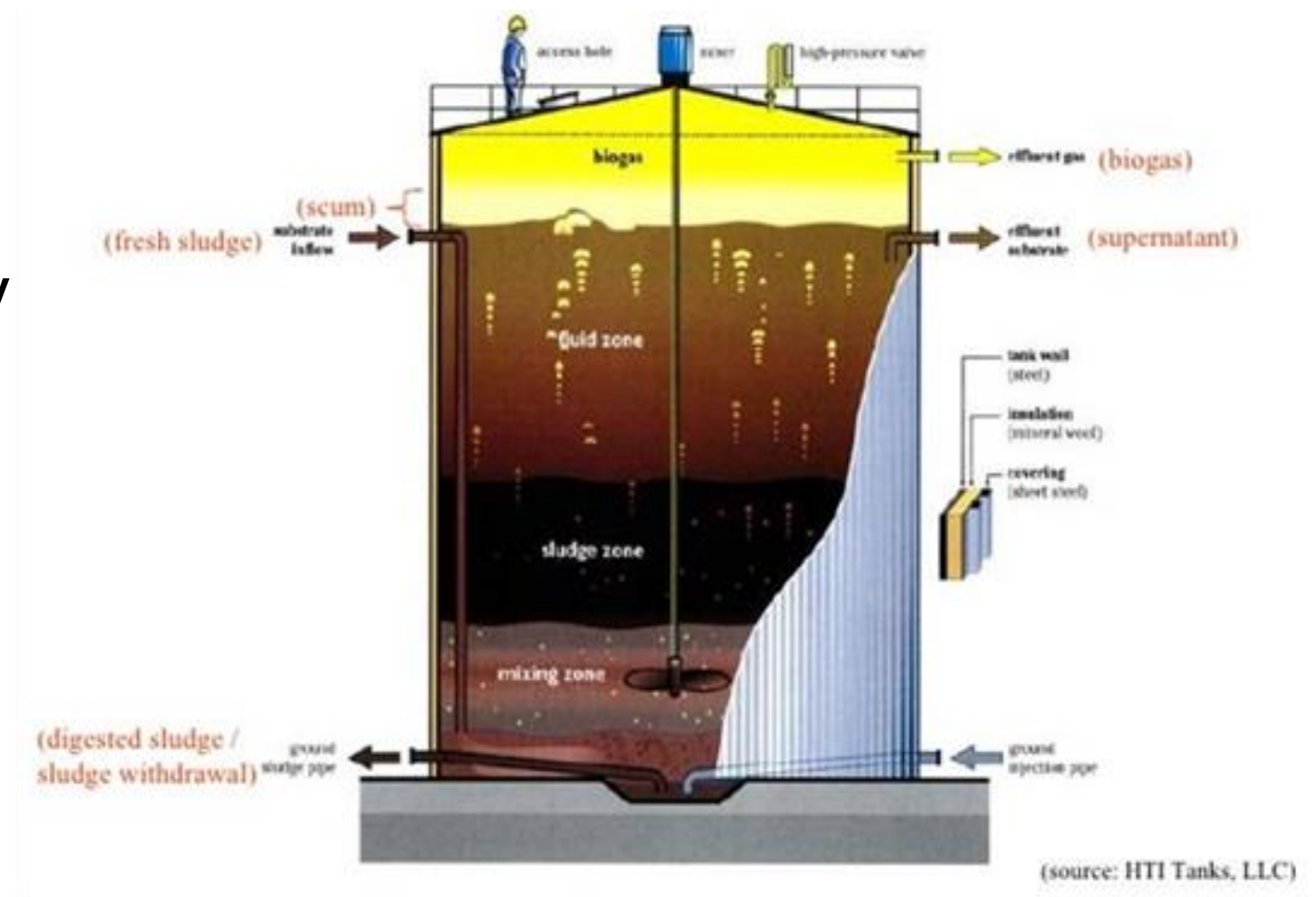
- Membrane Aerated Bioreactor
- N removal
- Highly efficient mass transfer 3-4 times
- Ideal for pure O<sub>2</sub> a by-product of hydrogen production
- Reduced energy and reduced Carbon





# Potential Technology: Co-generation of biosolids

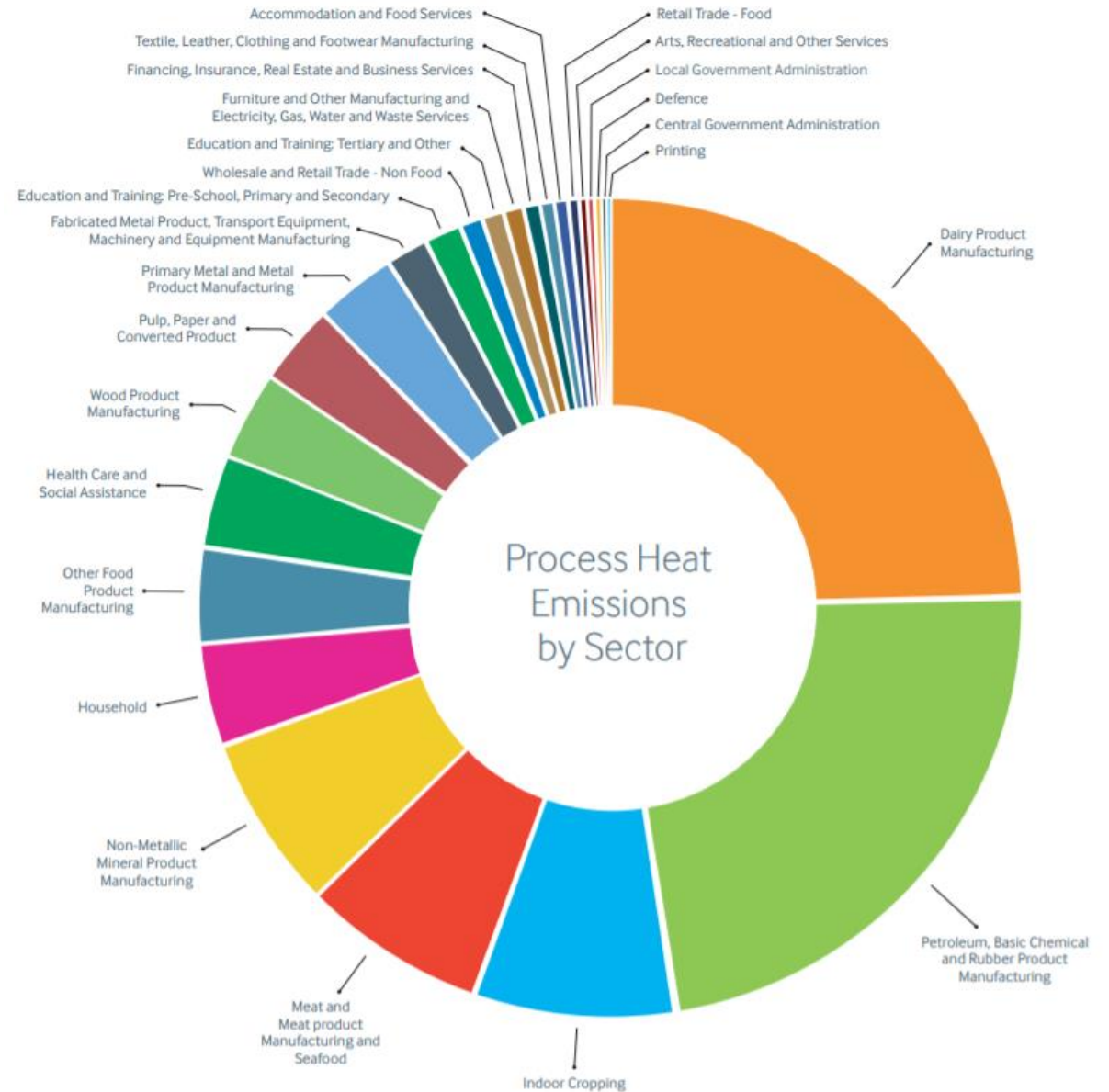
- Bio-solids (DAF& WAS) co-digestion in a municipal digester
- More biogas for electricity generation or direct use (esp. FOG)
- Improved biosolids as fertiliser products
- Improved energy availability and carbon reduction- offsets transport CO<sub>2</sub>.



# Energy Streams: Process Heat

- Process heat/ steam required for dairy processing
- Offers a significant opportunity to lower carbon footprint

Figure 1: Process heat emissions by sector<sup>5</sup>



# Process Heat - Electrification



Figure 6: Seasonality of current dairy factory electricity consumption is complementary to New Zealand's existing winter electricity peak

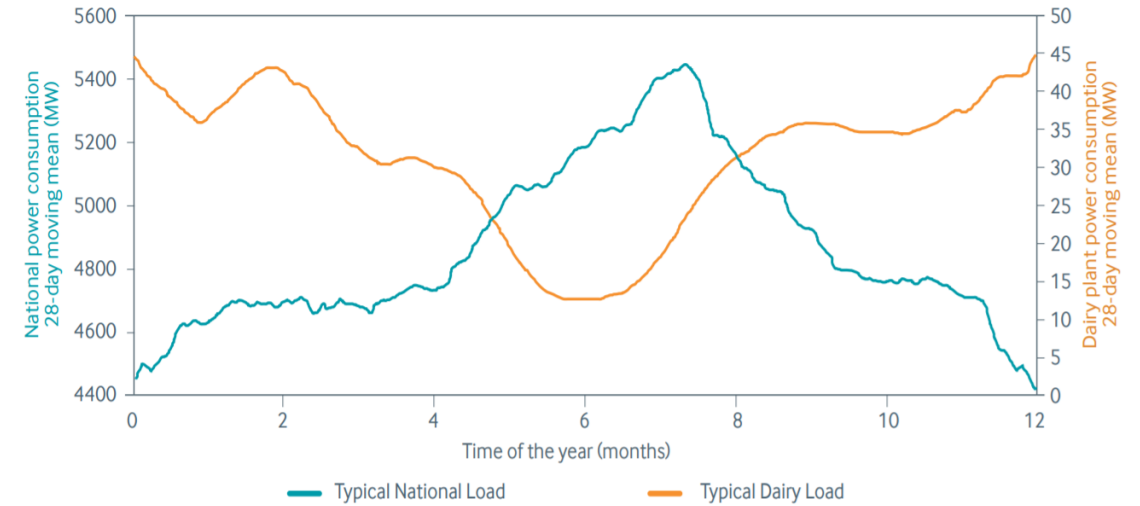
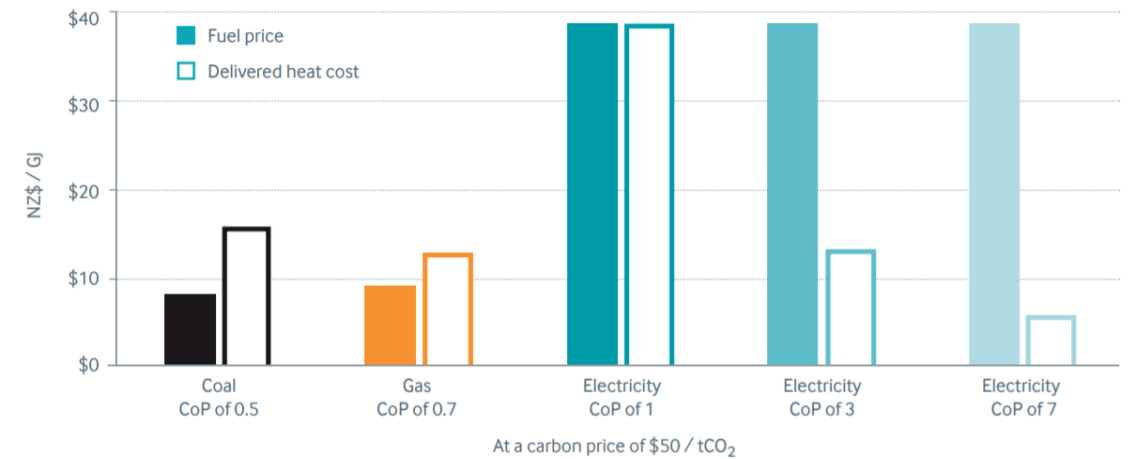


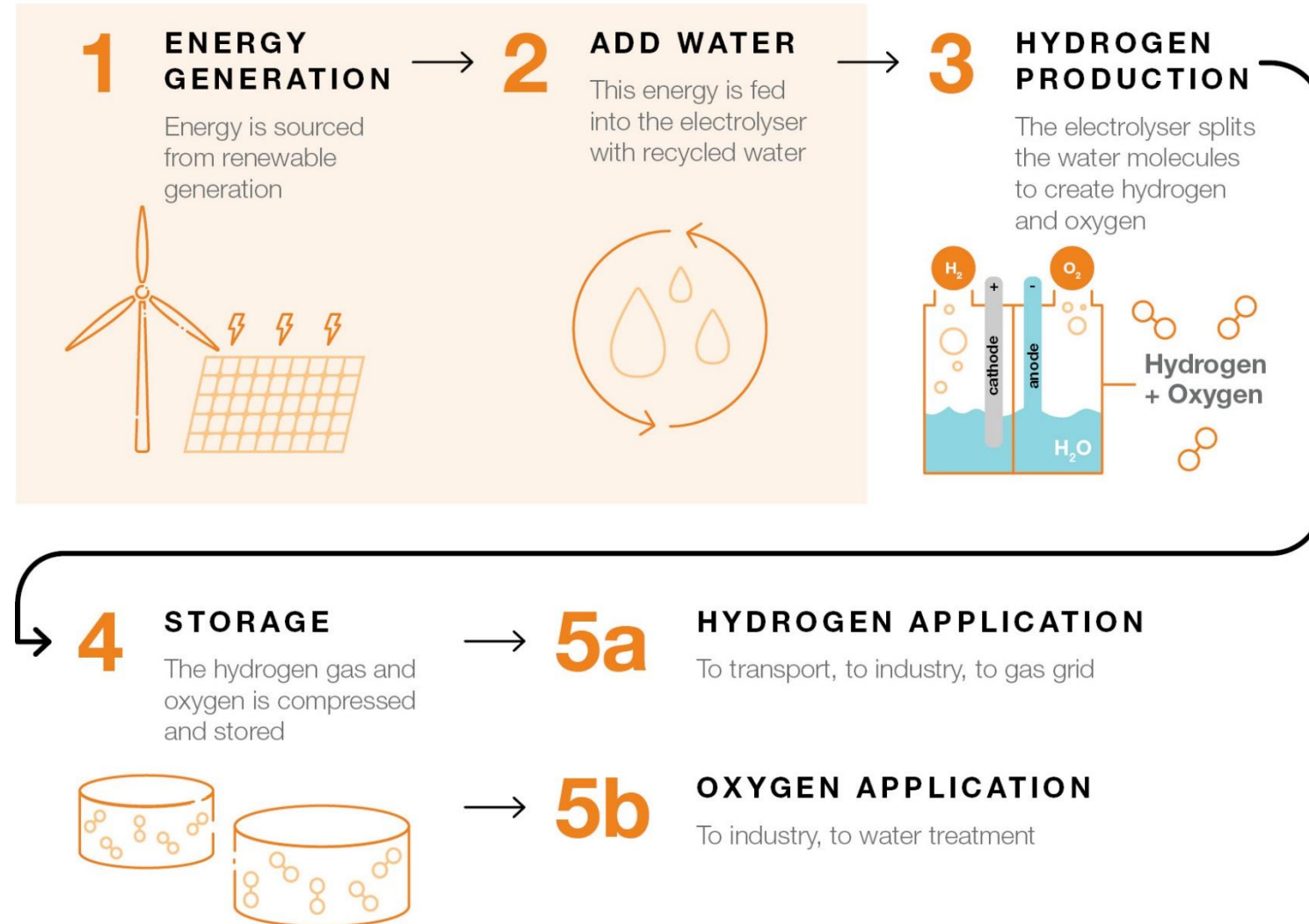
Figure 3: Comparison of fuel prices and delivered heat costs<sup>9</sup>



Source: Transpower Process Heat Report, 2019

# Sustainable Hydrogen

Proposed sustainable hydrogen supply chain model which uses renewable energy and recycled water



# Benefits of ZEFP

- Approach carbon neutral
- Reduction in water extraction
- Cost savings in energy use and waste disposal
- Recovery of nutrients, carbon and water (potential revenue)
- Improved customer perceptions/ compliance



Synlait has switched on New Zealand's First Large Scale Electrode Boiler  
Photo Source: Synlait 2019

At Synlait's Dunsandel site, recently installed 6MW electrode boiler, at 99% efficiency compared to 30% efficiency for coal burners. Estimated to save 14,000 t/CO<sub>2</sub>/year with pay back period of 10 years.

Source: Transpower, 2019

# Conclusion

- Zero Environmental Footprint Plant is a paradigm shift
- Challenge the view from waste to resource recovery and reuse.
- Applies available, proven and emerging technologies
- Eliminates or significantly minimises discharges and emissions to the environment and reduces the importation of energy and water.
- Applies a circular economy approach
- Demonstrates socially and commercially responsible practices for community, employees and shareholders
- Carbon neutrality achieved

# Contacts

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