

清洁地热 CLEAN GEOTHERMAL GREEN EARTH 録を必疑 2023年世界地热大会 World Geothermal Congress 2023 (WGC2023)

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Paper 190

Geoheat

Geothermal Heat Energy Powering Industrial and Commercial Processes in Aotearoa New Zealand

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From where on the globe?







Kia ora koutou katoa - Greetings from Katie Mclean



President







And greetings from the authors







Today... Geoheat

- Strategic Initiative
- Benefits of Geoheat
 - Low Carbon
 - Low Cost for industrials
 - And more
- Introduction to some NZ Geoheat Users
- Four Case studies





New Zealand Geothermal Association Strategic Initiative







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Actions to achieve more

- Advocate
- Communicate
- Showcase
- Advance
- Partner
- Represent





Why Geoheat?

- Low carbon
- Cost effective
- Renewable
- Available
- Proven at scale
- Low risk







And Geoheat is MORE

- Attracts investment into the regions
- Contributes to regional economic growth
- Value-adds Builds on natural strengths sitting downstream of primary industries in the region
- Presents opportunities for Māori investment and asset ownership
- Typically involves industries with above average economic productivity
- Creates jobs lifting skills and incomes





Geothermal for Heat is Low Carbon – NZ ETS Data

Туре	tCO ₂ e/t	GJ/t	tCO ₂ e/GJ
Coal (sub-bituminous)			0.09043
Natural Gas (national average)			0.05573
Geothermal steam (default factor)	0.03	2.78	0.01079
Kawerau - Steam	0.0202	2.78	0.00726
Tauhara - two phase	0.0009	1.2	0.00075
Geothermal Water	0	-	0





Cost Effective – carbon at \$50 / tonne

Fuel Type	\$/GJ	Carbon tCO2e/GJ	Carbon costs	Conversion Factor	Total Cost \$ / GJ Deliverer/
Geothermal - Kawerau Steam	8	0.0072	\$0.36	0.83	\$10.07
Biomass	8	0	\$0.00	0.64	\$12.50
Electricity - Heat Pump	45	0.0265	\$1.33	3.5	\$12.86
Coal	6	0.0904	\$4.52	0.81	\$12.99
Gas	9	0.055	\$2.75	0.85	\$13.82
Wood Pellets	14	0	\$0.00	0.81	\$17.28
Electricity - Heat Pump	45	0.0265	\$1.33	2.5	\$18.00
Electricity - Resistance	45	0.0265	\$1.33	1	\$45.00





In NZ Coal for industrial heat (<300C) is out by 2037

- In July 2023 the Ministry for the Environment promulgated under the Resource Management Act
 - A National Policy Statement for GHG Emissions from Industrial Process Heat
 - A National Environmental Standard for GHG Emissions from Industrial Process Heat
- Focus is on reducing greenhouse gas emissions
 - With activity restrictions and prohibitions
- Coal is phased out by 2037 for any heat use at temperatures below 300 C







Geoheat only going to get better with time ...







Heat users come in all shapes and sizes

Incubator	Small	Medium	Large
From bench to pilot scale Gather data Prove concept Make product to show & test market	\$KKK - \$M build Week day operations Intermittent / batch processing Image: state stat	\$M -\$MM build	
confidence	Opportunities to sha	are infrastructur	e

Where Economic Development Agencies can assist





Some NZ Geoheat Users - now







Some NZ Geoheat Users - now

















Kawerau Industrial Complex – Geoheat







Four Examples Geoheat – reducing emissions

- Kawerau
 - Oji Fibre Solutions power boiler project
 - Essity paper drying drum and hood conversion
- Tauhara
 - Natures Flame biofuel
 - He Ahi Eco-Energy Park





Beyond the Boundaries

Oji Fibre Solutions Kawerau

- 2020 mill used 7.77 PJ
- ~20% (1.64 PJ) supplied from geothermal energy
- 2019-20 Power Boiler Project
 - Process steam generated from geothermal replaces the power boiler
 - CO_{2-e} emissions reduced by 10,000 tonnes per annum
 - Operational savings of \$4 Million per annum
 - A further 10,000 tonnes per annum of CO_{2-e} emissions reduced with wood residues no longer required at Kawerau being transported to Tokoroa for use as biofuel in fuel substitution
 Tuwharetoa Geothermal



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Essity – Been using geothermal energy since 2010

- 2010 phased out a natural gas boiler
 - moved to a geothermal supply



- reducing their carbon emissions by 37% (17,000 tonnes per annum).
- Now converting one of two large tissue drum dryers to use geothermal energy instead of natural gas
 - First paper machine in the world to use geothermal to power the hood and drying drum.
 - Investment NZD 15.5 Million
 - Reducing carbon emissions by 6,500 tonnes per annum



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ESSITY Tissue Paper Machine Rebuild - Project Overview

Redesign and replacement of the Headbox, Hoods with Steam Hoods, Yankee and Suction Press Roll





Nature's Flame – Geoheat Lowering Carbon Footprints

- Taupō Biofuel pellet manufacturer
- Embraced geothermal energy in late 2019
 - Installed 20 MWth geothermal process heat supply from Contact Energy
- Pellets supplied to the Te Awamutu Dairy Factory
 - Phased out a 43 MWth coal-fired boiler
 - \$11 Million capital for the boiler conversion to biofuel
 - Reduced carbon emissions by ~90,000 tonnes / annum













Geoheat a Change that Matters







He Ahi, Eco-Energy Park - Taupō

- ~40 sites in preparation
- Geothermal heat energy to be available to ~20 sites
- Gets over the capital hurdle for smaller / medium sized Geoheat users



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There is more in the paper

- Enough for today
- Read the rest in paper 190.

Have a look at the Action Plan





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Kia Ora!







