

Geothermal Energy in New Zealand Process Industries



Brian Carey

Paper 259 - Chemeca 2018

Presentation - 2 October 2018

Energy Session - Millennium - Galaxy 2 16:00-16:15



Tea ! - The original geothermal powered process



Courtesy Alexander Turnbull Library – TAPUHI collection

Who am I ...

- **Brian Carey**
- **GNS Science**
 - Geothermal Resource Management Specialist
- **IEA Geothermal**
 - Executive Secretary



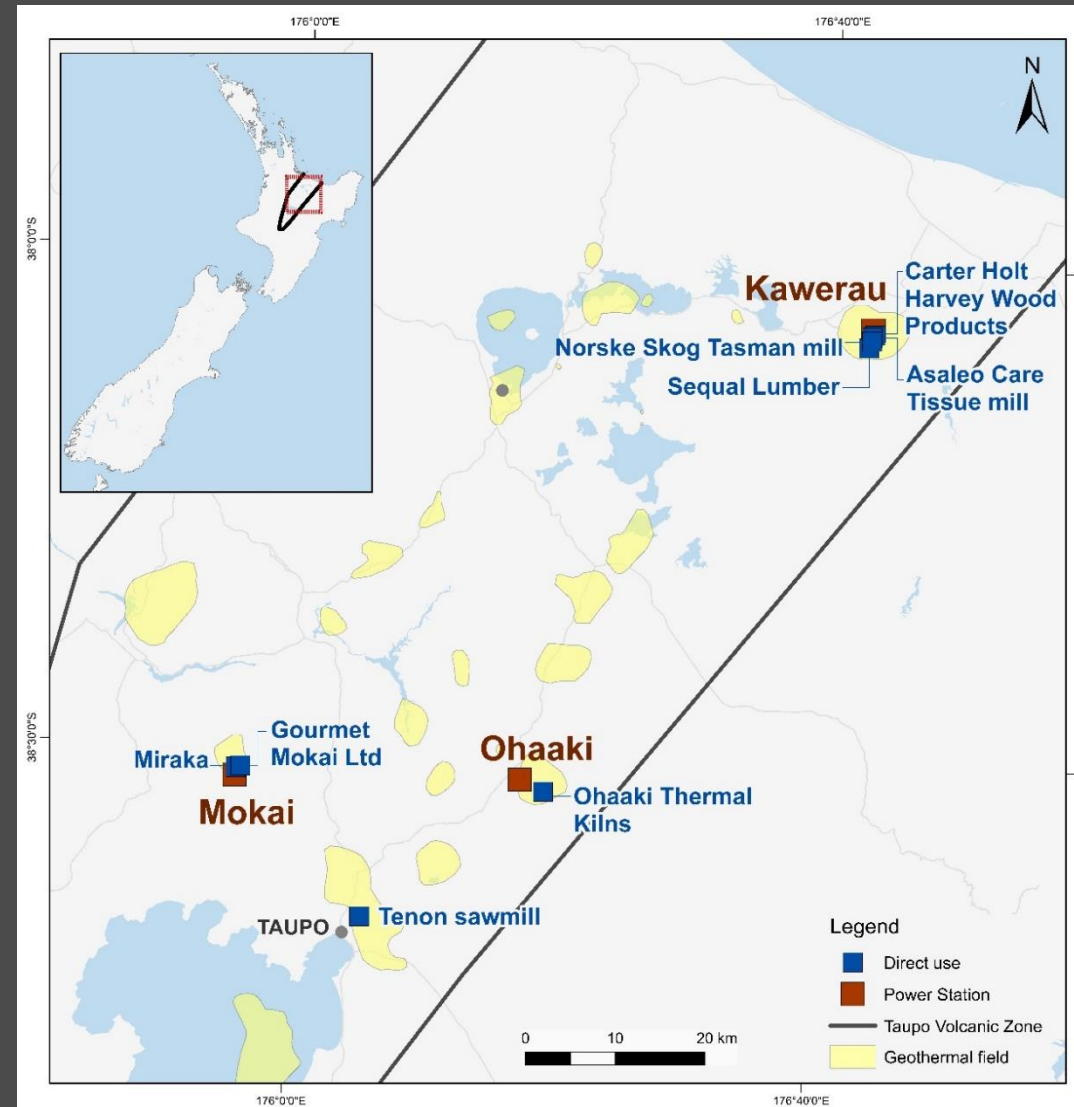
IEA Geothermal



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Paper 259 - Geothermal energy use at a number of locations in the Taupo Volcanic Zone



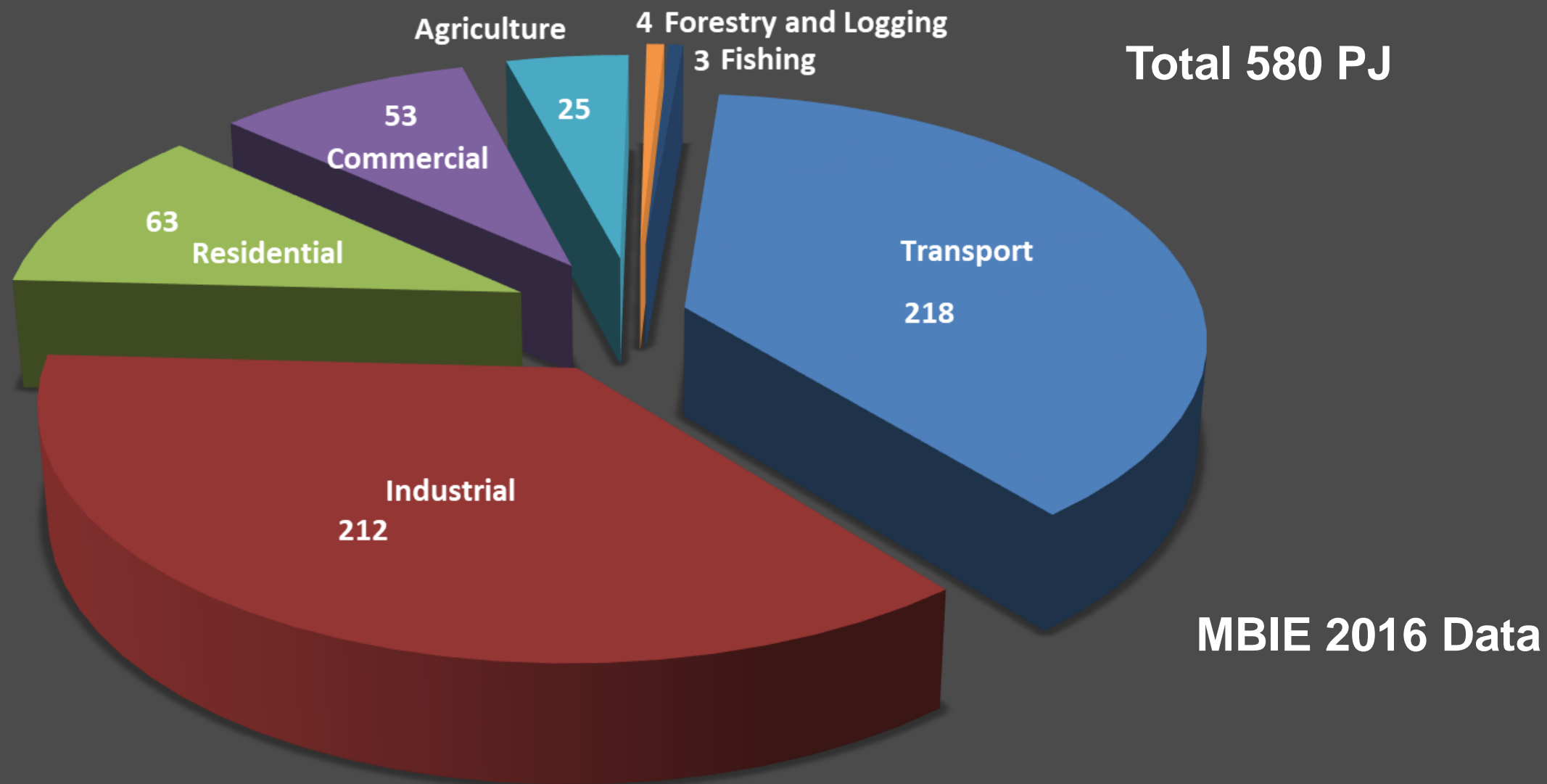


Read paper 259 at your leisure

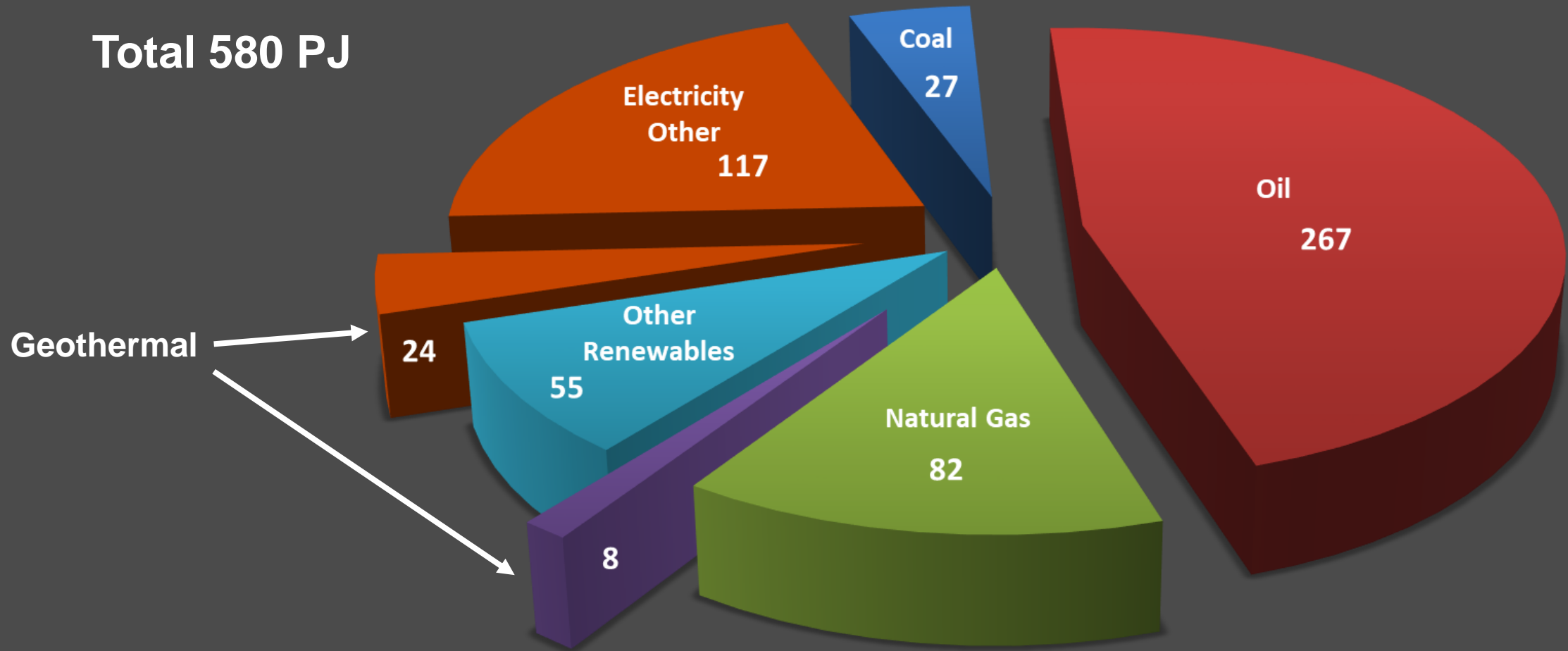
Energy Transformation

Transformational Technology

NZ Consumed Energy by Sector



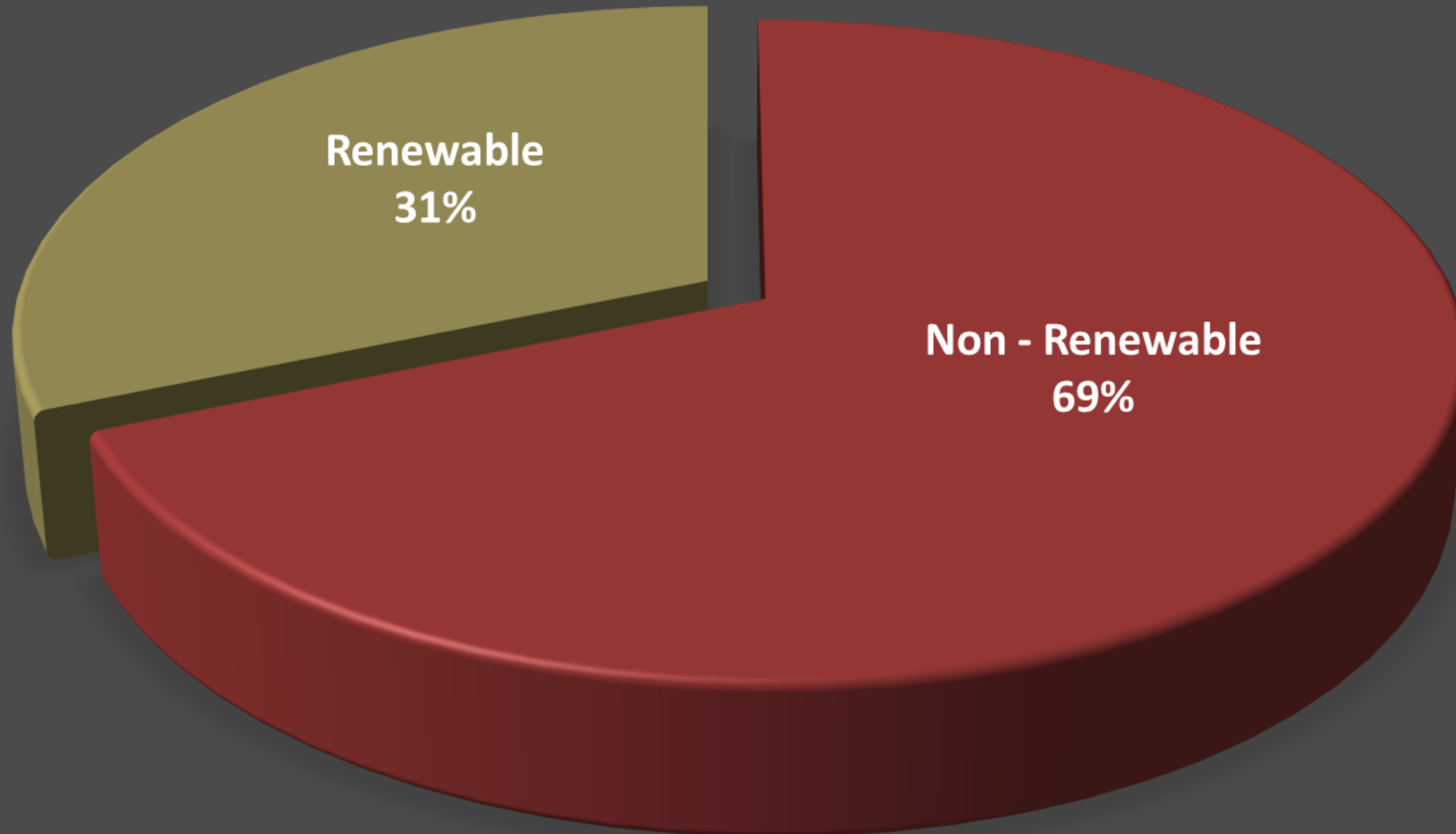
Consumed Energy by Type



less renewable than you might think



< 40% Renewable



What of Energy Transformation

- **And Our part**

- Client discussions
- Advice as an engineer in your business
- Training your students
- Our energy use



Asaleo Care

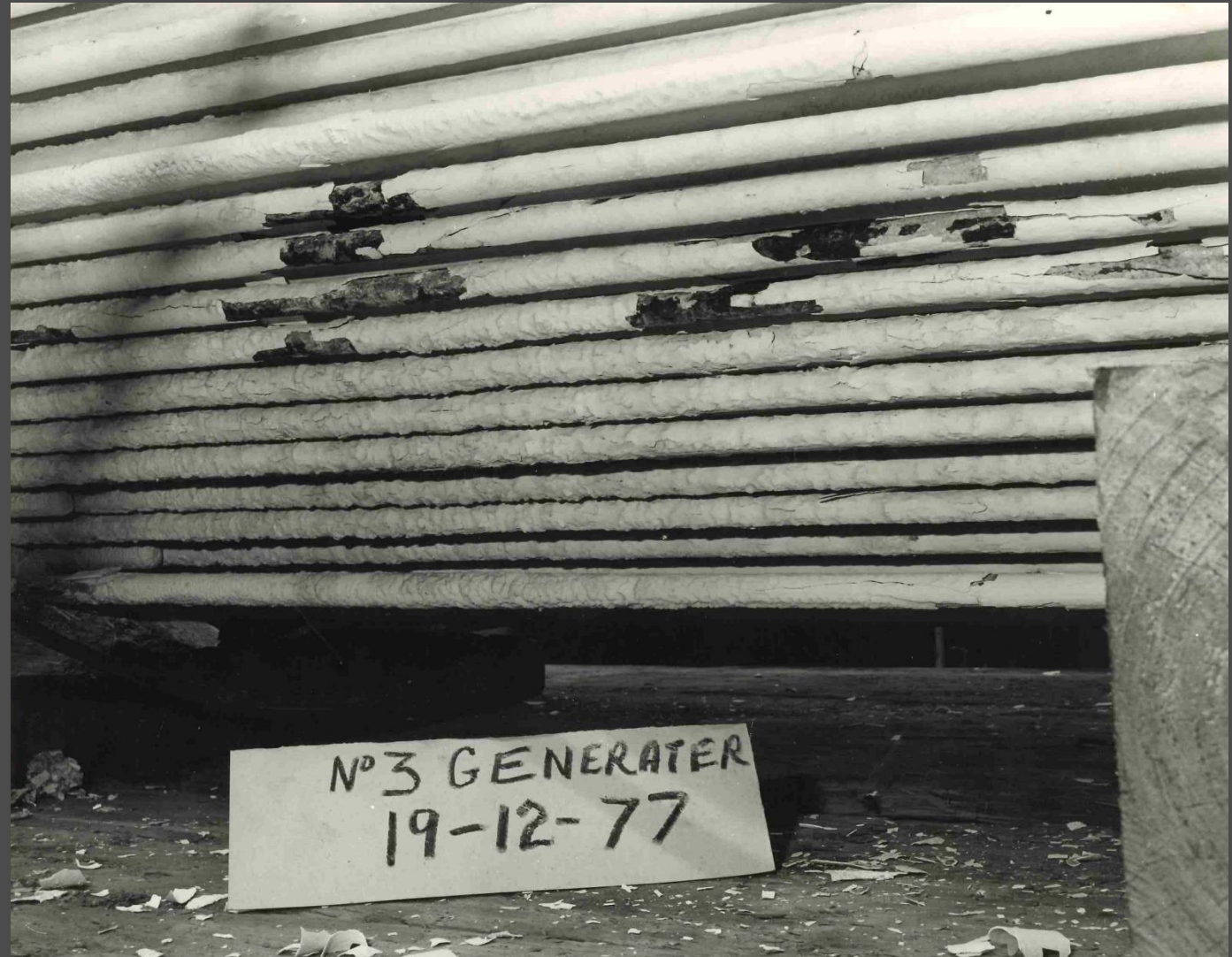


<https://www.youtube.com/watch?v=oupL6mO0Usl&t=2s>

Transformational Technology

Started Here

- Fouled heat exchangers
- 6 monthly chemical cleaning



Solve this

- **Photo is one of the process steam raising vapouriser bundles**
 - Feed water / steam raising on the shell side
- **Poor feed water quality was an ongoing issue**
- **A good percentage of the process steam was raised using geothermal steam**
- **Condensed geothermal steam was discharged to waste**
- **No time to solve it**

Until industrial action in mid 1980's

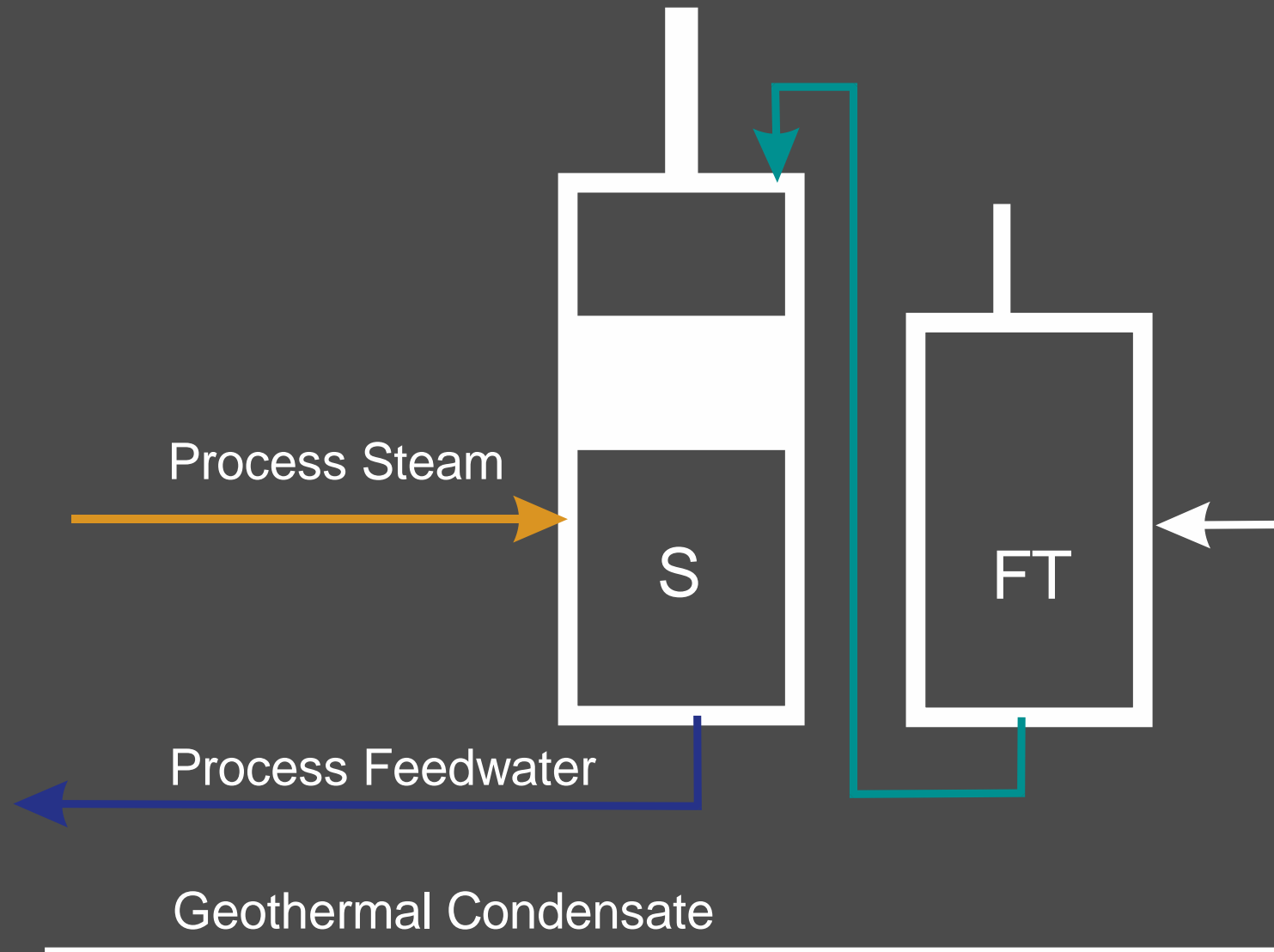
Gave time for the staff to focus on a solution

Joe Hotson + team



Some background in sour gas treatment from the oil and gas sector

Geothermal Condensate Recovery Process

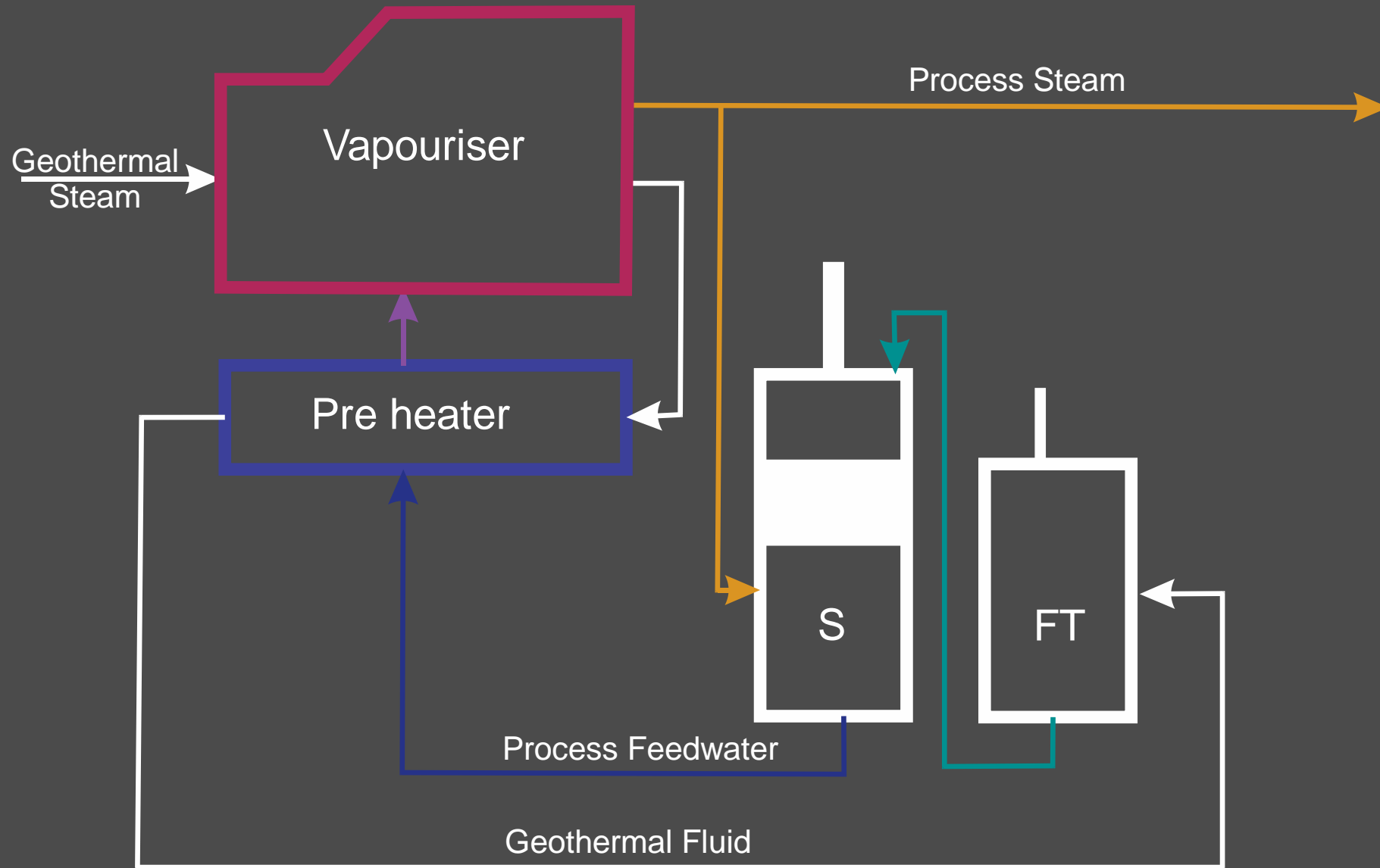


Convinced Management

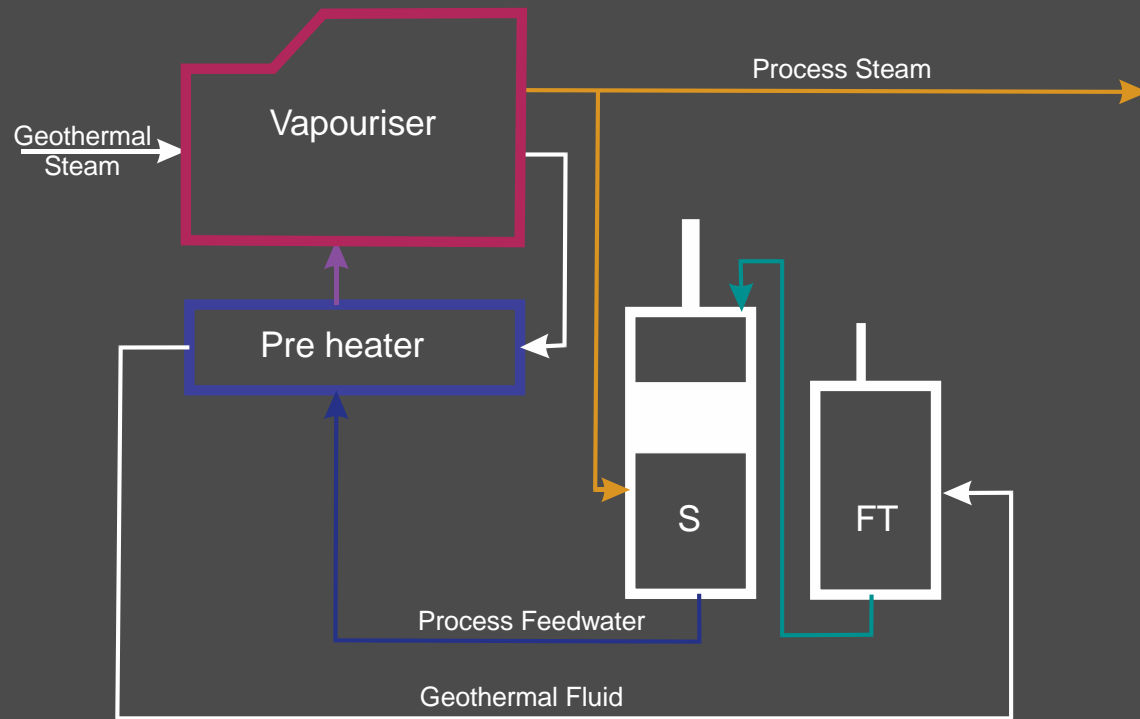
- No pilot plant here
- From lab to full scale in one step
- 1988 geothermal condensate / reboiler plant operational



1988 – Reboiler



Stripper and Flash Tanks (x2)



2018 – 30 Years on - Tube bundle after 4 years in service



Outcome

Magic

Others pick up the magic (2010)

Asaleo Care – Tissue Making



Photo courtesy Dobbie Engineers

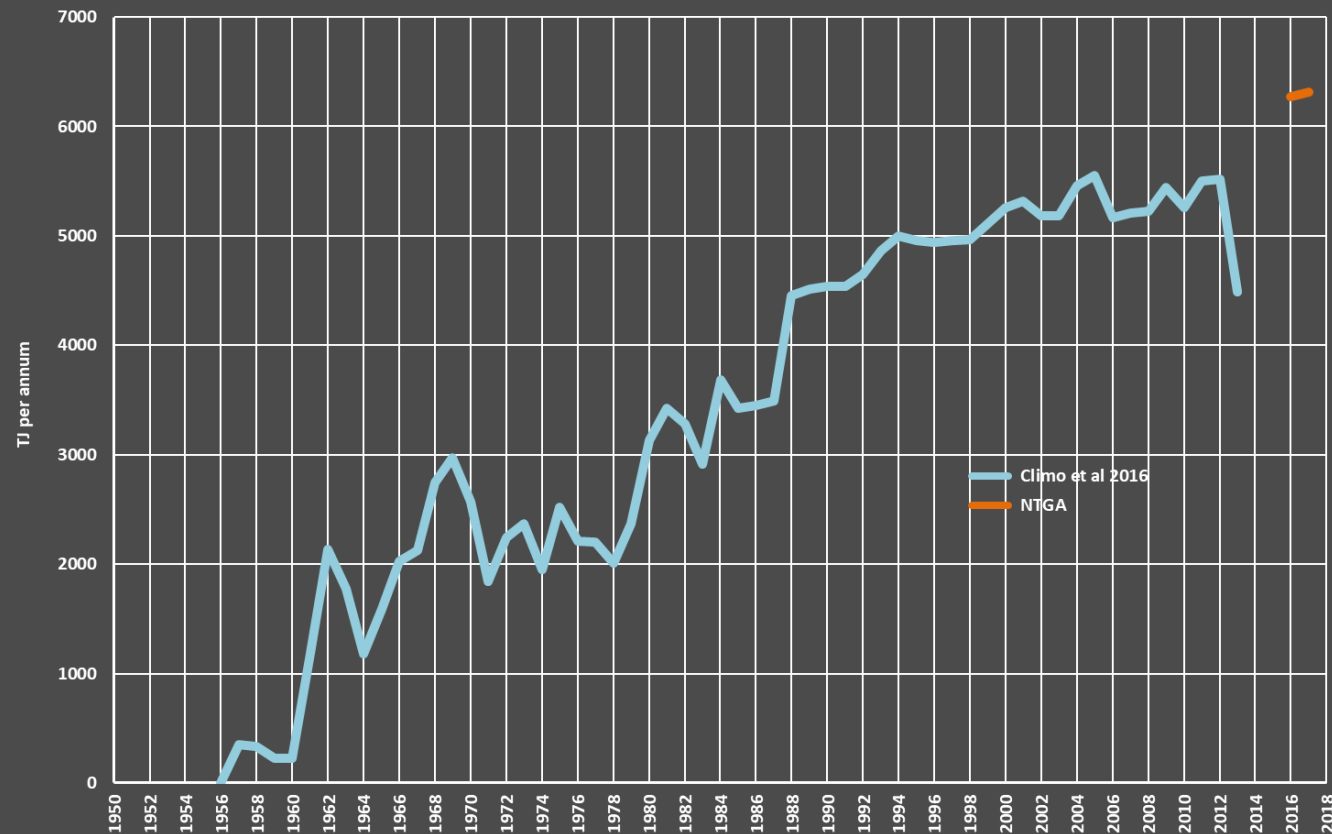
Others pick up the magic (2011)

Miraka – Dairy Processing

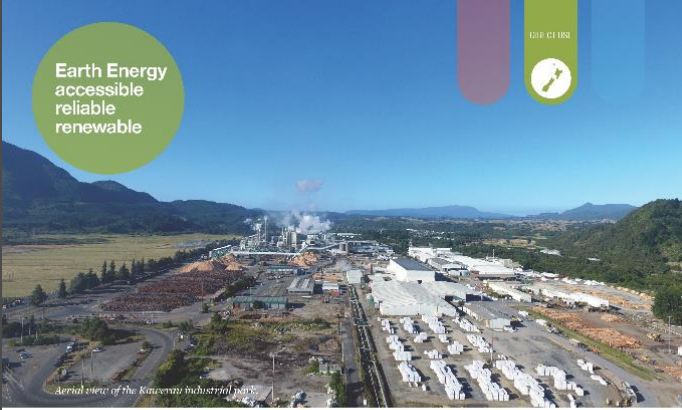


Kawerau – just so you know

- Largest geothermal direct use site in NZ (actually in the world)
- ~6.5 Pj per year



Kawerau – 2 page case study



Earth Energy
accessible
reliable
renewable

Aerial view of the Kawerau industrial park

Kawerau's industrial geothermal heat park

Since 2005, Kawerau's geothermal field and infrastructure have been owned by Ngāti Tuwharetoa Geothermal Assets (NTGA), a wholly owned subsidiary of Ngāti Tuwharetoa (BOP) Settlement Trust, established on behalf of the Ngāti Tuwharetoa ki Kawerau Iwi.

Geothermal exploration in Kawerau began in the 1950s, prompted by New Zealand Government incentives to develop a newsprint industry. Kawerau was chosen for its forestry, geothermal, and water resources, and the planned rail link to the port in Tauranga. The first steam flowed in 1967, and geothermal steam has since supplied timber drying kilns, wood preparation and chemical plants, greenhouses, and a local swimming pool complex.

Today, the supply of geothermal energy to Kawerau's industries is the world's largest geothermal direct heat supply. A 2012 resource consent saw NTGA expanding their operational capacity to over 89,000 tonnes of geothermal fluid per day, ready to meet future customer demands for clean, renewable energy.

Spence McClinton, CEO of NTGA, says, "NTGA's role is to facilitate access and provide for the sustainable development of the geothermal resource and its use in Kawerau."

KEY BENEFITS:

- Industrial geothermal heat and steam supply
- Integrated field management for sustainability

KEY FEATURES:

- Geothermal business 100% owned by Iwi
- Over 50 years of geothermal heat supply
- Consented for 89,000 tonnes of geothermal fluid per day



The TOPP1 geothermal power plant was purchased in 2016.



NTGA supplies clean steam for the Asaleo Care tissue plant.

The 2005 purchase of the geothermal steam supply business off the New Zealand Government included steam supply contracts to the industrial mills. NTGA has been expanding ever since.

By working with NTGA, the Asaleo Care Kawerau tissue manufacturing plant replaced natural gas boilers with sustainable, naturally-produced geothermal steam. In 2010 NTGA developed a purpose built geothermal clean steam plant, supplying Asaleo. This has reduced their carbon emissions by 99 percent.

In 2015, NTGA began supplying geothermal heat to Sequel Lumber for their new timber drying operation which is expected to expand in future.

In 2016, the Iwi purchased the 23 MW TOPP1 geothermal power plant from Norske Skog. Now NTGA both supply the geothermal steam and operate this electricity generation plant.

And they are only just getting started. The local forestry resource and rail link to Tauranga are strong advantages in combination with geothermal energy. The wood processing industry offers an exciting opportunity for NTGA to supply geothermal energy.

Spence says, "NTGA is ready to supply the energy needs of the wood processing sector as it moves away from exporting logs to focusing on high-value wood based processing streams."

Kawerau's success as an industrial heat and wood processing park is due to a focus on synergies and

partnerships. The Kawerau geothermal resource operates under a Steamfield Management Agreement, actively involving the resource contest holders: NTGA, Mercury and Norske Skog. This agreement ensures sustainable use and management of the Kawerau geothermal field.

Spence says, "NTGA seeks to not only ensure this resource is still going strong in another 100 years, but we also manage the geothermal infrastructure to provide high efficiency of resource use."

"We are here to provide opportunities for all levels of geothermal development. In doing so, we are assisting in sustainable economic growth, employment and cultural wellbeing for Kawerau, and the wider region."

The geothermal resource is considered a strategic advantage for Kawerau. Direct local benefits are expected to come from the economic developments facilitated from having access to a local, low-carbon, renewable energy source. These have included new industries, employment opportunities and provision of local services.

Kawerau's geothermal is a partnership between Iwi, industry, local government and the community. These synergies are a strong part of how and why the Kawerau industrial sites continue to operate producing world class products. Efficiency, technology and use of renewable natural resources are providing environmental, economic, social and cultural benefits to the region and New Zealand.

"NTGA'S ROLE IS TO FACILITATE ACCESS AND PROVIDE FOR THE SUSTAINABLE DEVELOPMENT OF THE GEOTHERMAL RESOURCE AND ITS USE IN KAWERAU."



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New Zealand requires reliable, renewable energy sources into the future. The Government is supporting GNS Science in fostering increased use of renewable resources. The Government's Energy Strategy aims for greater direct use of geothermal energy. For more information visit our website: www.gns.cri.nz/earthenergy or contact us:

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<https://www.gns.cri.nz/Home/Learning/Science-Topics/Earth-Energy/Case-Studies>

Interested in Geothermal - Find out more

- **Kawerau - Contact Jaime or Spence**

- Ngati Tuwharetoa Geothermal Assets Ltd

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- **Around Taupo – Tauhara - Wairakei Contact Craig**

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- **Contact Andrea**

- Bay of Connections

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- **Go to www.nzgeoheat.nz**

- **Geothermal Case studies**

- Enter GNS Science Earth Energy in your browser



That's me done for today !!!



Kia Ora