The End of Silica Scaling and Unlocking the Full Potential of Geothermal Energy

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CaSil

TECHNOLOGIES

In short…

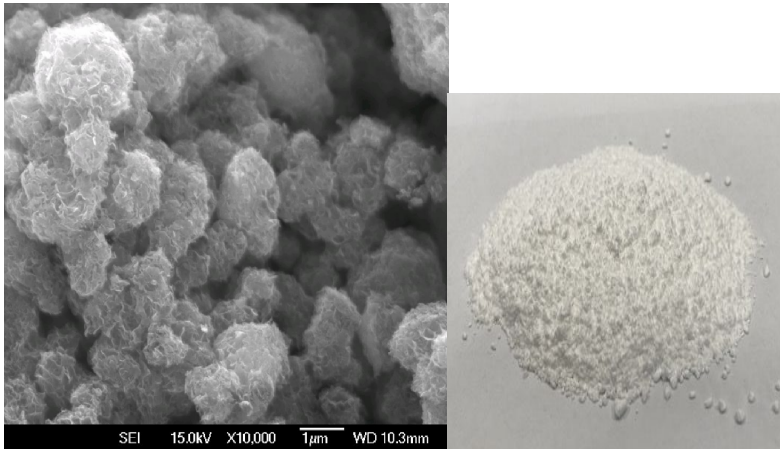
- The CaSil technology **eliminates silica scaling**.
- Geothermal **brine can be cooled significantly further** than possible with any other technology.
- **CaSil reaction** is **completed within seconds** and creates novel CaSil product.

→ More electricity

→ More heat energy

→ The full energy potential of the resource is unlocked.

CaSil Technology



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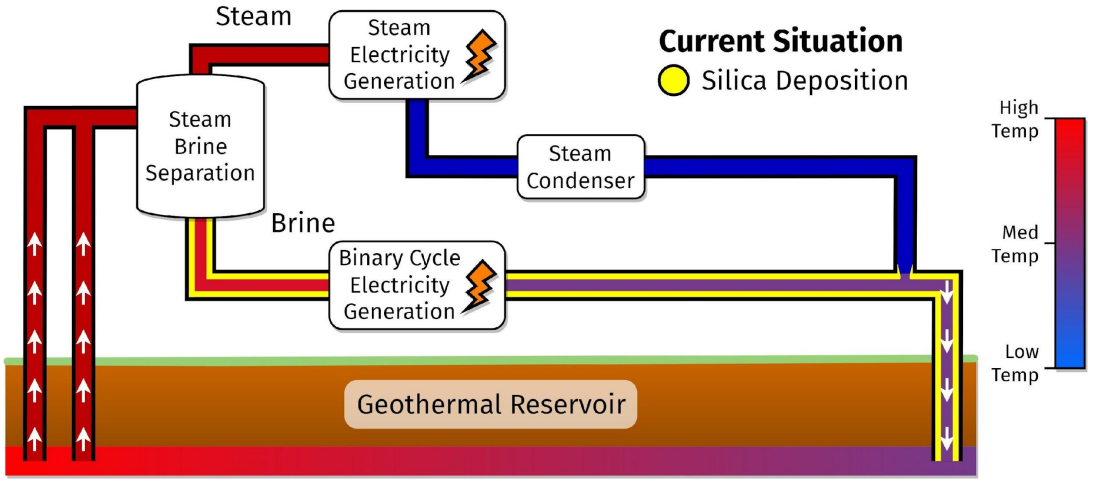
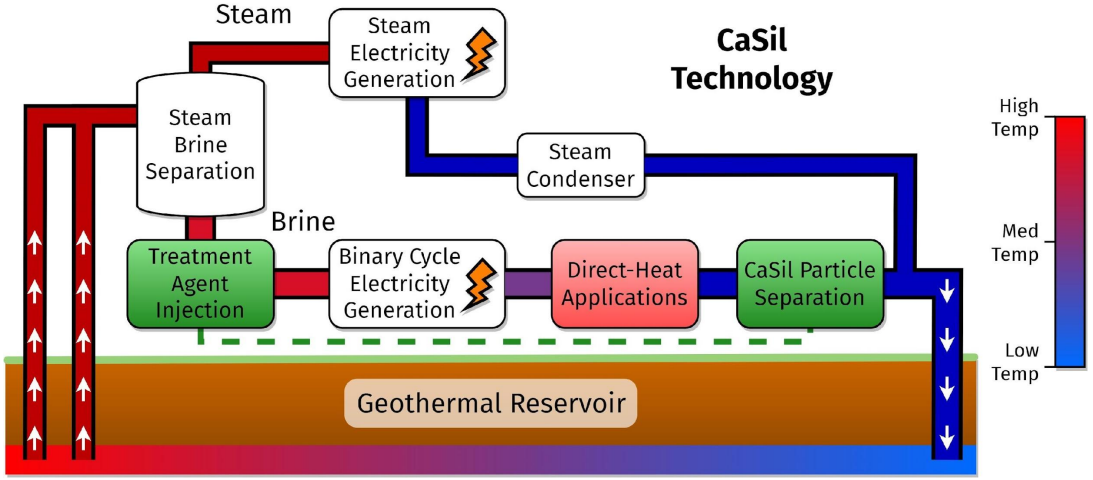
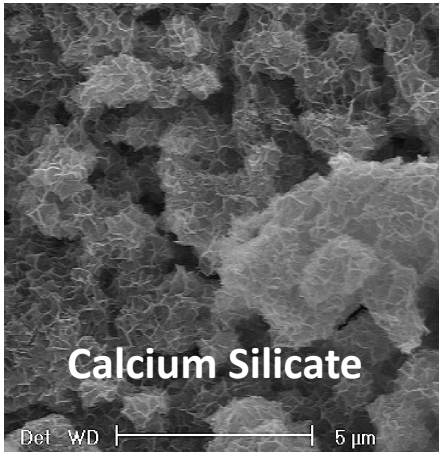
Silica Scaling and CaSil Technology



Silica Scale

- **Silica** becomes **supersaturated** due to flashing and **scales** pipes, heat exchangers, reinjection wells.
- Significant **maintenance** effort required.
- **Limits heat utilisation**.





- **CaSil** forms colloidal suspension which **does not stick to metal**.
- **No saw-tooth profile** in binary plant (**constant production**).
- Useful **CaSil** material is **separated.**

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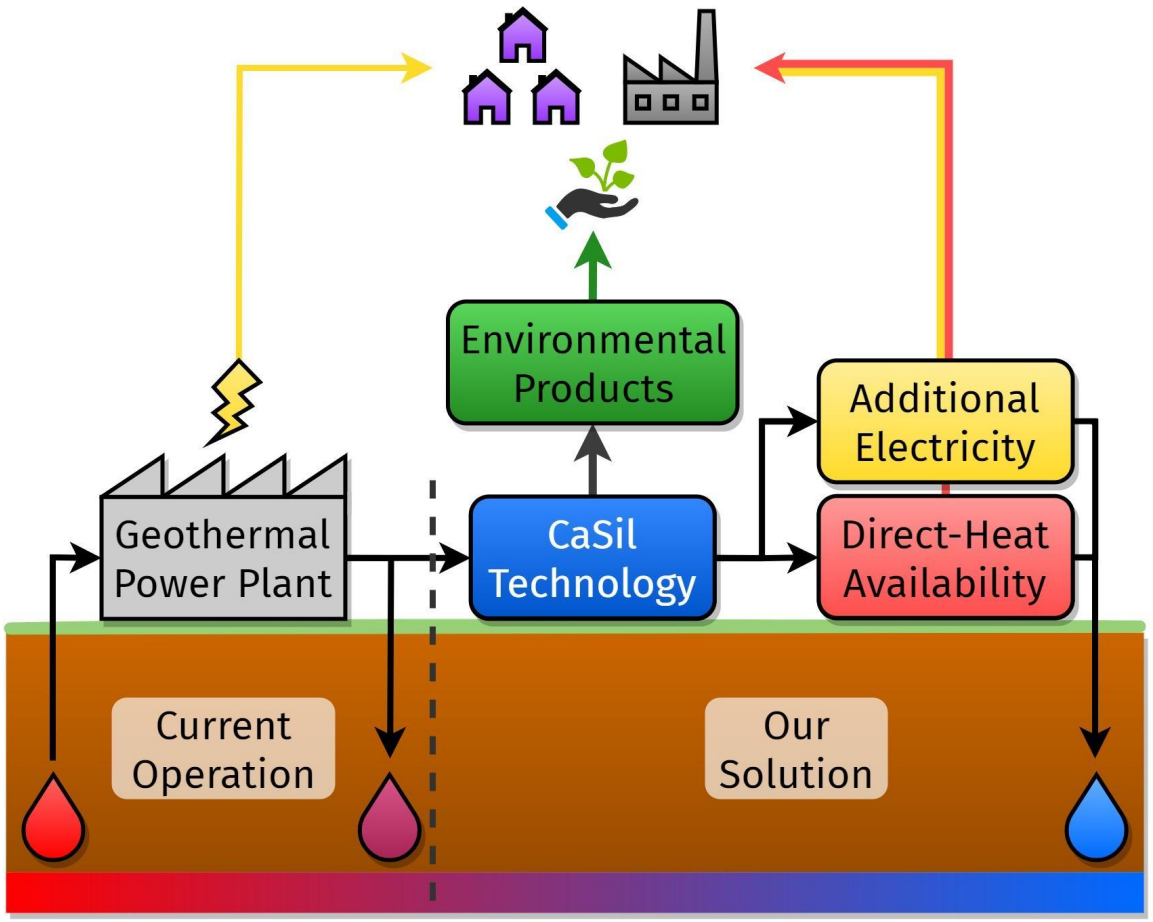
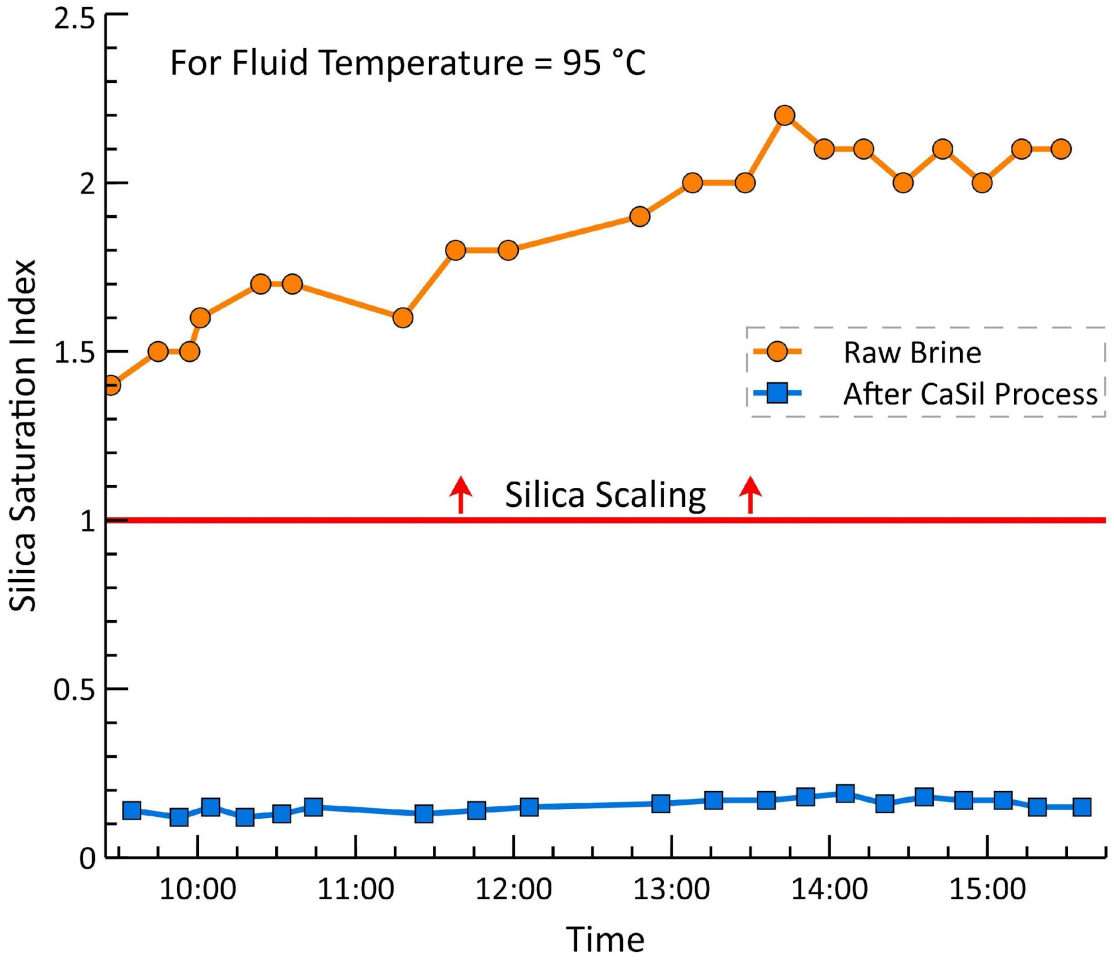
CaSil Technology Features and Benefits

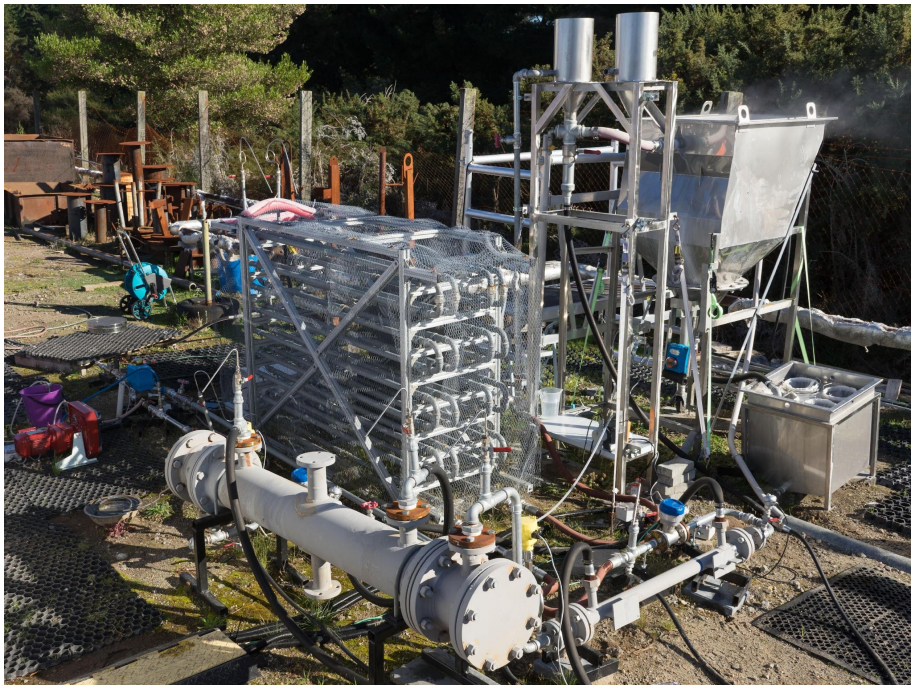


- CaSil Technology chemically **removes silica** from geothermal brine.
- Resulting brine chemistry favourable to **significantly decrease fluid temperature without scaling.**
- **More** heat energy can be safely harnessed by **electricity generation** and/or **direct-heat applications**.
- CaSil Technology **fully unlocks heat potential** of existing or greenfield **geothermal utilisation**.
- **CaSil** material has **environmentally beneficial uses** such as a controlled-release fertiliser.

CaSil Development Plant in Wairakei



- The CaSil Technology **reliably lowers the SSI** independent of initial silica level.
- After approximately **250 operational hours** we **completed** our development plant and process chemistry **research at Wairakei**.



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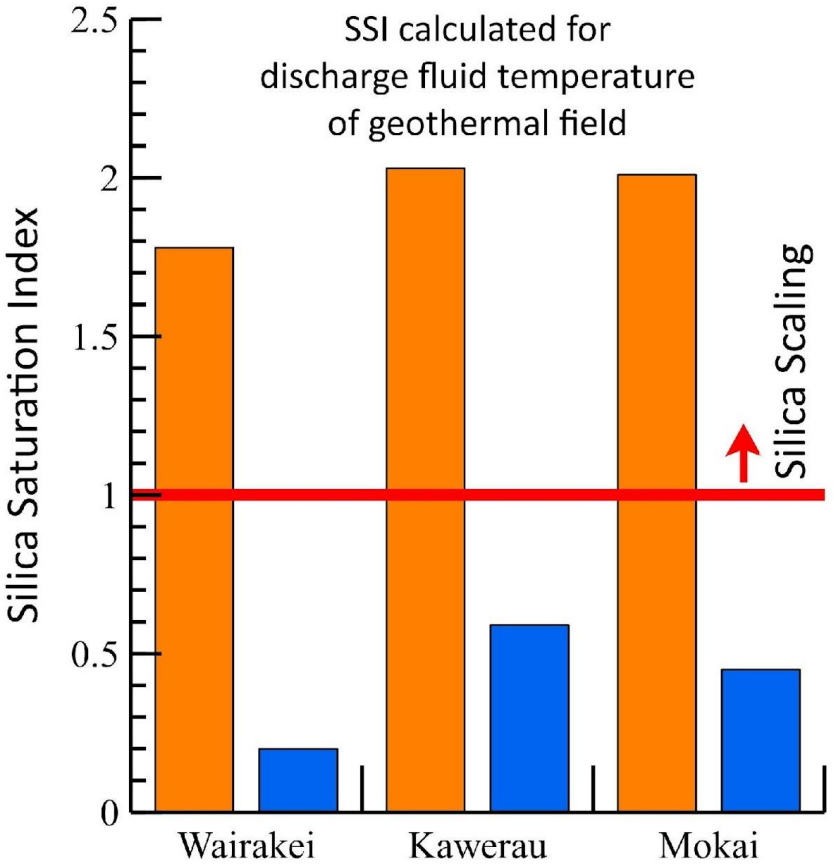
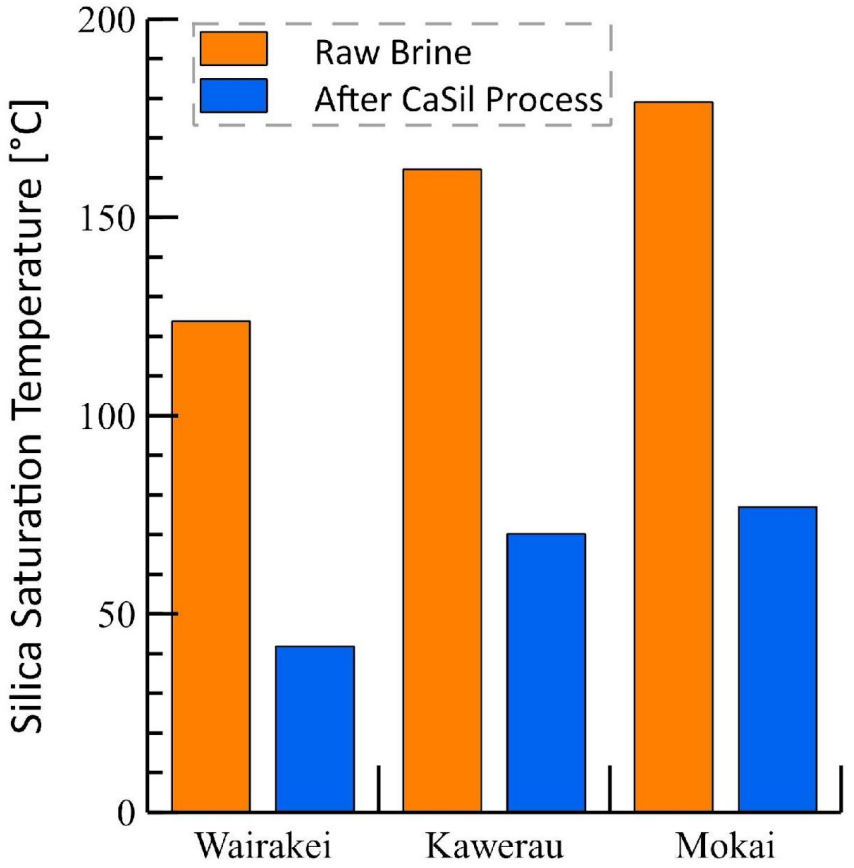
CaSil Development Plant Performance Comparison





- Silica saturation temperatures as low as 42 °C were achieved.
- The robust technology works reliably at different geothermal resources.
- By adjusting the CaSil process chemistry the SST can be lowered even further.

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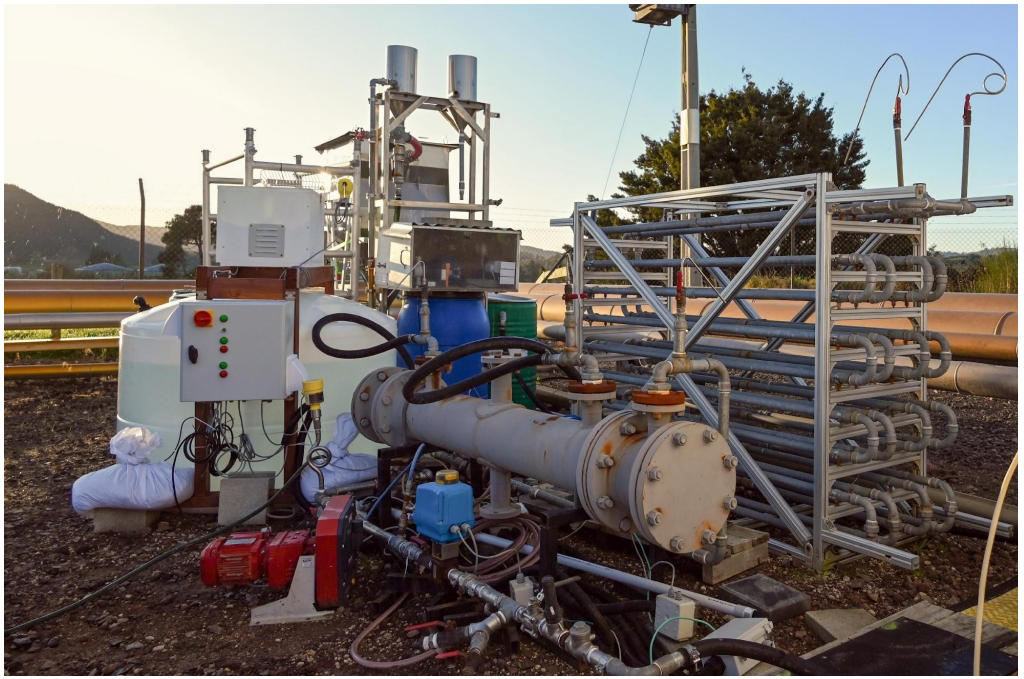
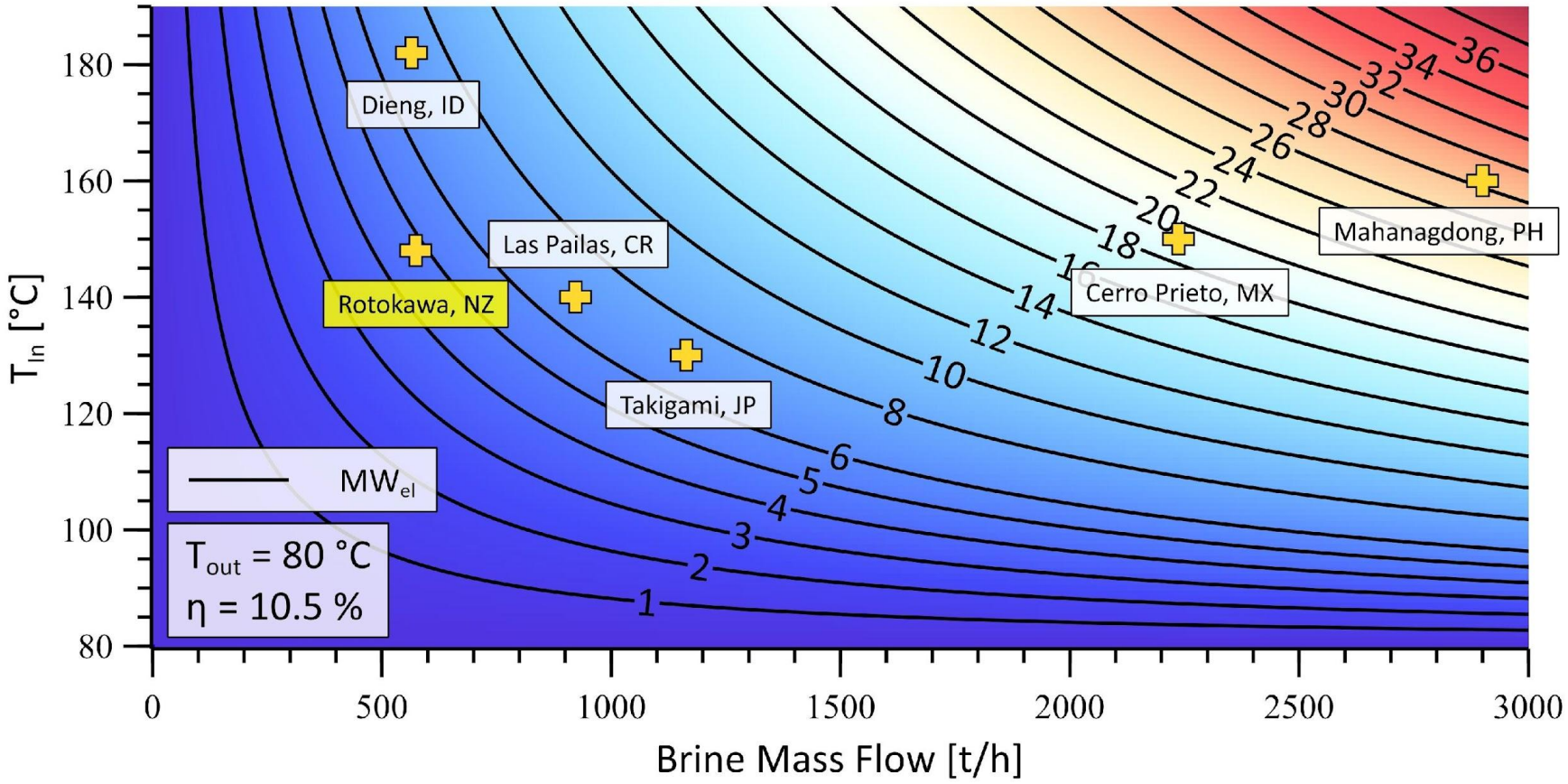
CaSil Development Plant



- The automated **CaSil Development Plant successfully demonstrates** and verifies the **technology**.
- Different **tie-in scenarios** for a **large scale** application can be **tested**.

- **All unit-operations** are **demonstrated** in a continuous process for **up to 3 t/h of geothermal brine.**
- **Complementary batch experiments** can be conducted in our **mobile laboratory**.

Enhanced Electricity Generation



New Opportunities for Electricity:	
Rotokawa: 4.8 MW$_{el}$	Mahanagdong: 28.5 MW$_{el}$

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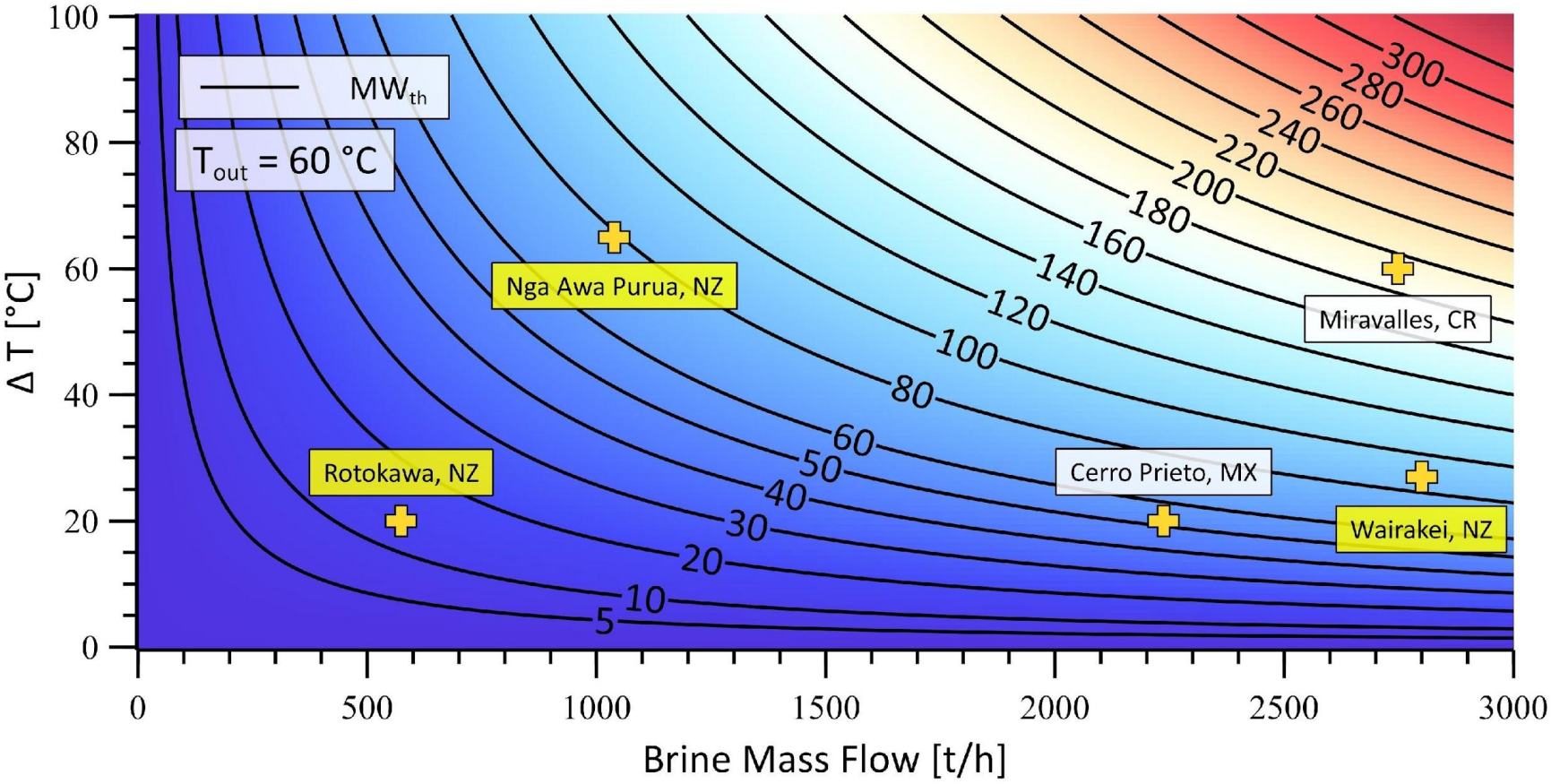
Process Heat Opportunity



New Opportunities for Process Heat:	
Rotokawa: Electricity + 13 MW$_{th}$	Wairakei: 88 MW$_{th}$
Nga Awa Purua: 79 MW$_{th}$	

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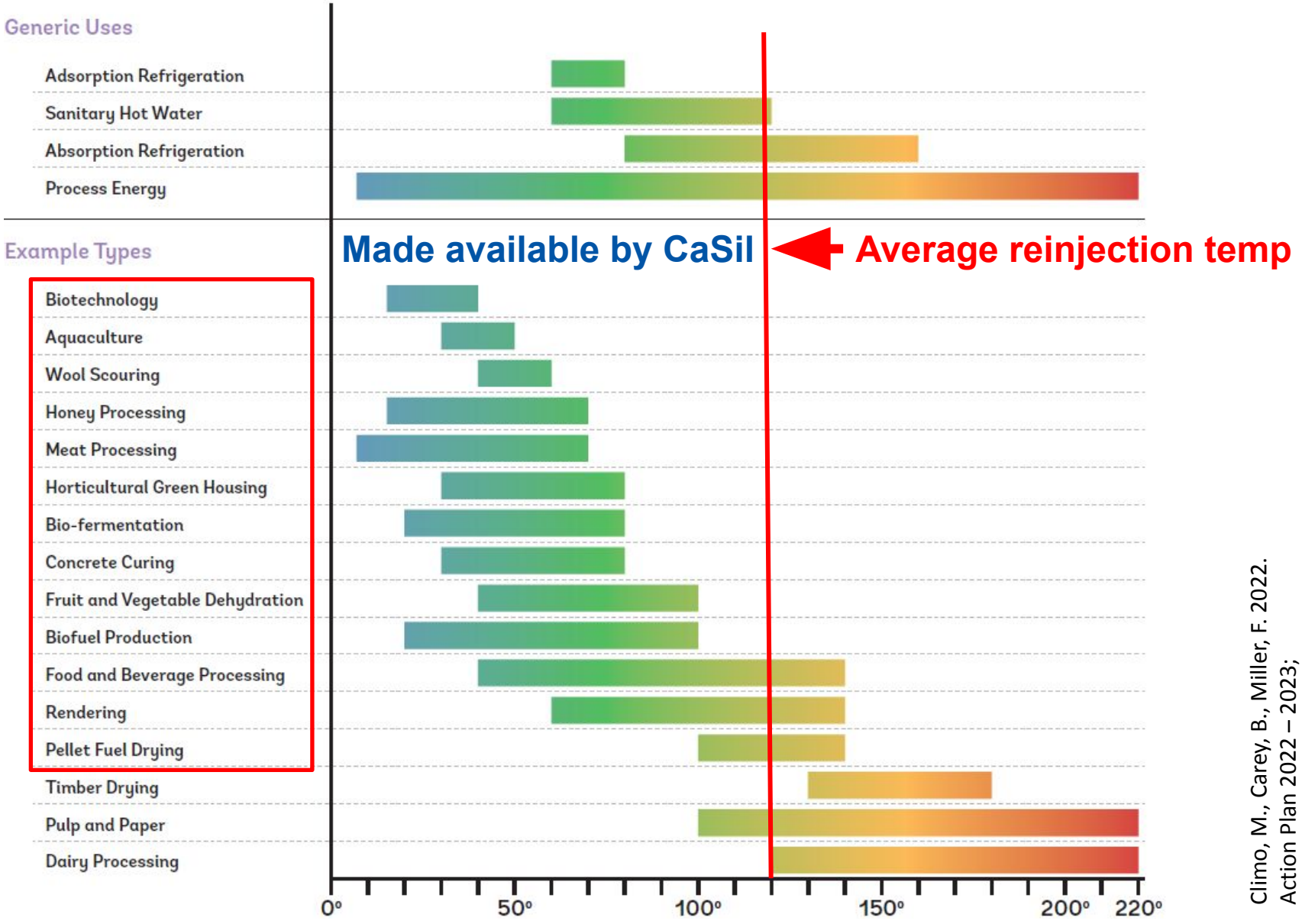
Process Heat Applications



Climo, M., Carey, B., Miller, F. 2022. Action Plan 2022 – 2023; Geoheat Strategy for Aotearoa NZ., New Zealand Geothermal Association.

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Summary

	Current Technologies	CaSil Technology
Silica scaling	Mitigation	Elimination
Maintenance	Periodic cleaning required	No deposits
Existing binary plants	Saw-tooth production profile	Constant production
Additional electricity	Not accessible	Significant performance uplift possible
Heat energy	Not accessible	Significant quantities of process heat available.

Acknowledgements

- Ministry of Business, Innovation and Employment for funding.
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Questions?

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