

# Finding a Home for the Orphans and Inactives: repurposing oil and gas wells for geothermal?

## The Problem?

### Abandoned and inactive wells in Alberta

The Province of Alberta has a multi-billion-dollar cleanup on its hands. Scattered throughout the province are thousands of orphaned or inactive oil and gas wells that need to be properly decommissioned and remediated. Once a symbol of the province's economic achievements, the wells are now an environmental, public health, and economic liability. Unfortunately, many well owners are currently unwilling or financially unable to pay for the costs of the required cleanup.

**\$** 1989 = 25,000 inactive wells  
 2019 = 90,000 inactive wells & 4680 orphan wells  
**\$58.7 billion estimated cleanup**

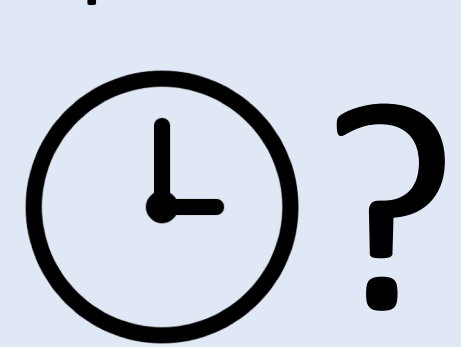
## Why Decommission?

Environment	Public Health	Economic
<ul style="list-style-type: none"> <li>Contamination of surrounding land</li> <li>Negative impact to flora and fauna (domestic and wild animals)</li> </ul>	<ul style="list-style-type: none"> <li>Potential direct exposure to contaminated soil, water, or air</li> <li>Indirect exposure through consumption of agricultural byproducts sourced from land near wells</li> </ul>	<ul style="list-style-type: none"> <li>Continuous liability until properly decommissioned</li> <li>Inability to use the land for other purposes</li> </ul>

## The Failure of Alberta's Decommissioning Laws

**1** Wells are permitted to be held in suspension status indefinitely

Suspension



Abandonment  
Reclamation  
Remediation

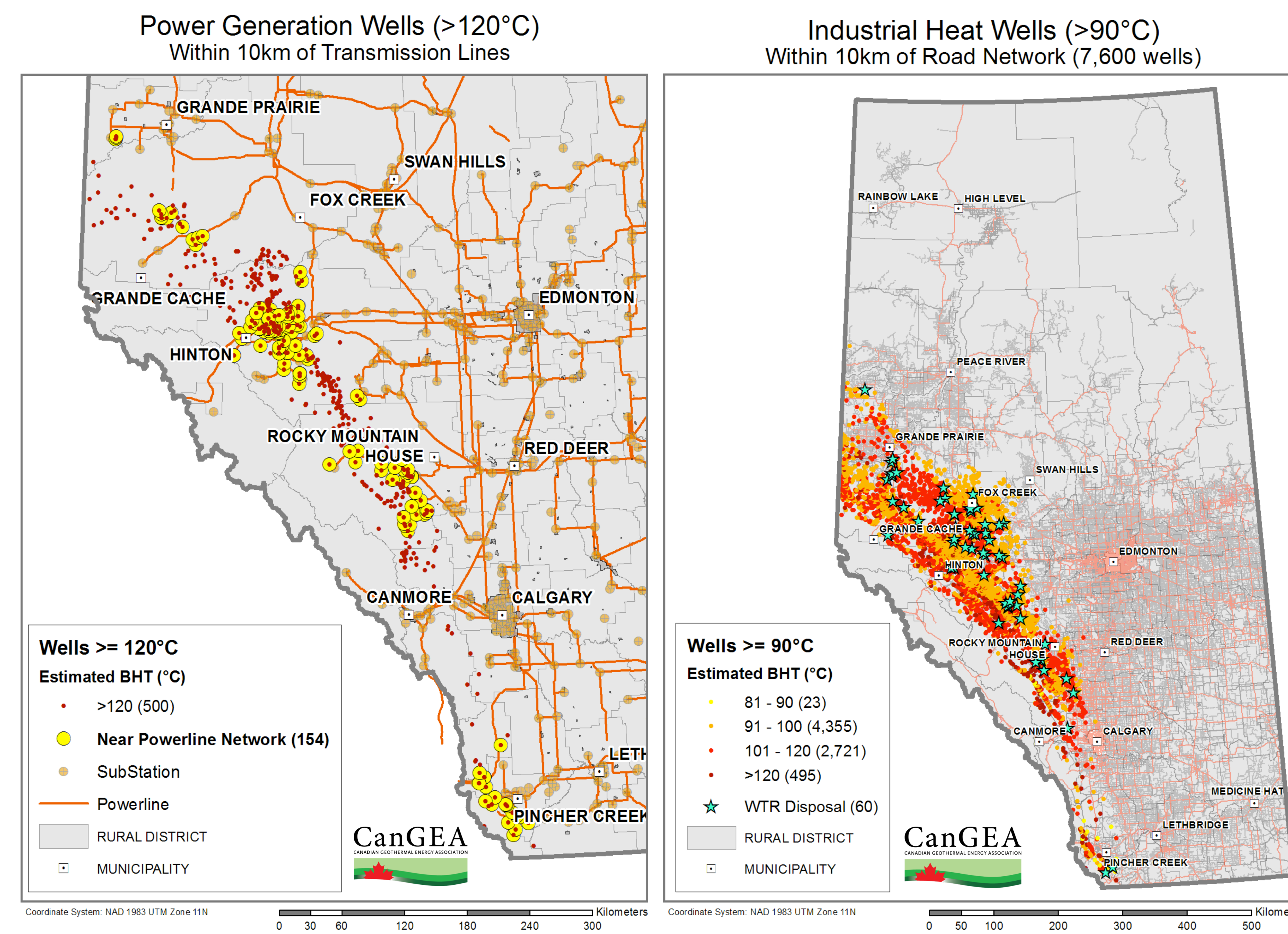
There is no strict timeline for when suspended wells must be fully abandoned, reclaimed, and remediated. Companies are likely holding wells in suspended status to avoid cleanup costs. It is unlikely that the market will improve enough for many wells to become economically viable again.

**2** Insufficient funds within the Orphan Well Fund to pay for the cleanup

- Only a **\$60M** levy on industry in 2019 and 2020

## A Partial Solution?

### Repurposing wells for geothermal could transform wells from liabilities into assets



## Geothermal Potential of Oil and Gas Wells in Alberta

Electrical Generation Potential (> 120°C)	Industrial Heat (> 90°C) or Direct Heat Potential (> 60°C)
<ul style="list-style-type: none"> <li>500 wells &gt; 120°C</li> <li>495 within 10 km of a road</li> <li>154 near provincial transmission lines</li> <li>308 are abandoned and cemented shut</li> <li>192 yet to be cut, capped, and cemented</li> </ul>	<ul style="list-style-type: none"> <li>7,600 wells &gt; 90°C</li> <li>located within 10 km from a road</li> <li>11,682 wells &gt; 60°C</li> <li>located within 10 km of municipal infrastructure</li> </ul>



Developing **10%** of the geothermal potential wells = **6093** geothermal systems in Alberta

## The Town of Hinton, Alberta Pilot Project

- The town conducted a Front End Engineering Design ("FEED") study to determine the viability of repurposing nearby wells for geothermal
- The repurposing approach was determined to be 10 to 20 times more cost effective than drilling new holes for a geothermal operation
- The FEED study concluded the project was not feasible; however, the results were considered a "hyper-local phenomenon" that did not imply anything about the quality of geothermal resources elsewhere in Alberta
- The FEED study emphasized that a major setback was that the most promising wells, based on their location to the town, were owned by parties unwilling to offer the wells for geothermal

## Fostering the Potential: Law and Policy Approaches and Recommendations

**1** Development of a provincial geothermal statute and/or regulations

- Alberta has the constitutional jurisdiction to develop geothermal laws
- Alberta should refer to British Columbia's *Geothermal Resources Act*, but also draft a unique statute that specifically addresses repurposing wells for geothermal
- New legislation should consider the transfer of liability when repurposing wells, regulating low-heat geothermal applications, and reporting requirements for current well owners

**2** Modification of current oil and gas laws

- Companies should be required to offer inactive wells for geothermal before long-term suspension or abandonment
- A time limit should be implemented for how long a well can remain in suspended status before being offered for geothermal
- Alberta should better recognize low-heat geothermal applications within its current laws

**3** Development of a more favourable tax regime

- Additional capital cost allowances should be established for companies involved in repurposing wells for geothermal
- A unique fee and royalty framework should be established for Alberta's geothermal industry, including a royalty holiday program that is only lifted once a geothermal operation becomes profitable
- Geothermal companies should be exempt from any carbon-related levies

**4** Creation of a provincial crown corporation?

- Alberta could explore developing a crown corporation that repurposes wells into geothermal operations
- Alberta is already tasked with the cost of cleaning up the wells and may be better positioned than industry to take on the liability risks associated with inactive wells
- A profitable crown corporation could help to support the Orphan Well Fund

## References

Alberta Energy Regulator. "Orphan Well Association", online: *Alberta Energy Regulator* <https://www.aer.ca/regulating-development/project-closure/liability-management-programs-and-processes/orphan-well-association>

Canadian Geothermal Energy Association. "Potential for Geothermal Energy Development from Co-Production in Alberta Using Existing Oil and Gas Wells: Alberta Geothermal Opportunity Overview" (CanGEA, Calgary: 2017).

Canadian Geothermal Energy Association. "The Potential for Geothermal Energy from Co-Production in Alberta Using Existing Oil and Gas Wells: Background" (CanGEA, Calgary: 2017).

Cheng, Wen-Long et al. "Studies on Geothermal Power Generation Using Abandoned Oil Wells" (2013) 59 Energy 248.

Epoch Energy Development. "FEED Study: Hinton Geothermal District Energy System" (16 October 2018), online: *Town of Hinton* <https://www.hinton.ca/DocumentCenter/View/7203/2018-11-20-Hinton-DES-FEED-Report-final>

Grasby, Steve E et al. "Geothermal Energy Resource Potential of Canada" (2012) Geological Survey of Canada, Open File 6914 (revised).

Hettiarachchi, Madhawa et al. "Optimum Design Criteria for an Organic Rankine Cycle Using Low-Temperature Geothermal Heat Sources" (2007) 32:9 Energy 1698.

Leitch, Aletta et al. "Heat Seeking - Alberta's Geothermal Industry Potential and Barriers" (Calgary: The Pembina Institute, 2017), online: <https://www.pembina.org/reports/heat-seeking.pdf>

Muehlenbachs, Lucija. "A Dynamic Model of Cleanup: Estimating Sunk Costs in Oil and Gas Production" (2015) 56:1 International Economic Review 155.

Muehlenbachs, Lucija. "80,000 Inactive Oil Wells: a Blessing or a Curse?" (2017) 10:3 The School of Public Policy Publications 1, online: *University of Calgary* <https://www.policyschool.ca/wp-content/uploads/2017/03/inactive-oil-wells-muehlenbachs-1.pdf>

Nian, Yong-Le & Wen-Long Cheng. "Evaluation of Geothermal Heating from Abandoned Oil Wells" (2018) 142 Energy 592.

Thompson, Alison, Faisal Bakhteyar & Grant Van Hal. "Geothermal Industry Development in Canada - Country Update" (Paper delivered at the World Geothermal Congress 2015, Melbourne, Australia, 19-25 April 2015) [unpublished], online (pdf): <https://pangea.stanford.edu/ERE/db/WGC/papers/WGC/2015/01037.pdf>

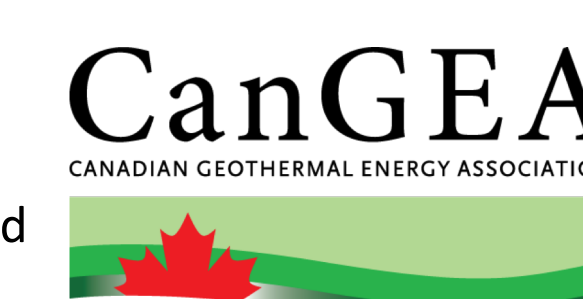
Tomac, Ingrid & Robert A. Caulk. "Reuse of Abandoned Oil and Gas Wells for Geothermal Energy Production" (2017) 112 Renewable Energy 388.

Van Hal, Grant. "Legal Obstacles to the Development of Geothermal Energy in Alberta" (2013) Canadian Institute of Resources Law, CIRL Occasional Paper #42, online (pdf): <https://dspace.ucalgary.ca/bitstream/id/39528/GeothermalOP42w.pdf?jsessionid=D9D7C7B40C8CECC7513DD374E89372>

## Acknowledgments

Professor Rudiger Tscherning  
 Faculty of Law, University of Calgary

Thank you to the Canadian Geothermal Energy Association for its permission to use the enclosed images.



## Contact

Brady Chapman  
 Juris Doctor Candidate, 2020  
 Faculty of Law  
 E: brady.chapman1@ucalgary.ca  
 P: 403-714-7575