PICKING UP STEAM:
Geothermal and Alberta's Energy Future

November 6, 2020

Alberta's NDP Caucus

Alberta's FUTURE.ca

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Message from NDP Leader Rachel Notley

Dear Albertans,

Alberta has tremendous potential to develop our renewable energy sector, put unemployed oil and gas workers back to work, and export clean technology while ensuring our strengths in oil and gas are used to tap new sources of energy.

Between 2015 and 2019, Alberta made strides in developing renewable energy sources as well as clean technology applications in oil and gas. In a short period of time, Alberta developed a reputation as a leader in industrial efficiency - taking available technology and deploying it. Alberta's energy efficiency agency created 3,000 private sector jobs, putting skilled tradespeople to work. It also reduced operating costs and pollution.

We made great progress but we can - and must - do more.

Geothermal offers a range of clean technology solutions for today's industrial processes. It's also a potential source of electricity. Geothermal energy is a "right-now" jobs prospect for those in the skilled trades, information technology and geospatial mapping.

Geothermal is also an area where Alberta can lead in research and development, manufacturing of technology and exports of services.

Geothermal initiatives could be an important part of Alberta's overall strategy to welcome new investment, new head offices, and new energy for the City of Calgary in particular.

Starting In April 2019, the provincial government took a series of actions that served to discourage investment in renewables and clean technology. Programs were canceled, research and development was cut, industrial efficiency discouraged. New renewables investors were wary of a business climate where regulations could be rapidly changed for political reasons.

Alberta must restore investor confidence in technology and new energy solutions.

A more welcoming investment climate for clean technology and renewable energy can be restored. A robust geothermal strategy is one of several tools that will help achieve that goal.

The Alberta NDP welcomes your feedback on our geothermal proposal. In the weeks ahead, we will build on these ideas with other proposals for broadening our renewable energy economy, our value-add in the non renewable sector and our provincial economy overall. We look forward to proposing more ideas that will create jobs, use our strengths in oil and gas to attract new investment, and ensure Alberta not only recovers from the current economic crisis, but builds toward lasting resilience in a lower-carbon future.

Sincerely,
- Rachel Notley
Alberta NDP Leader

What is Geothermal Energy?

Geothermal energy is thermal energy from the earth's subsurface. It can be used for heating, cooling or to produce electricity. Geothermal energy can also be used as baseload power that produces energy in any season, weather, or time of day.

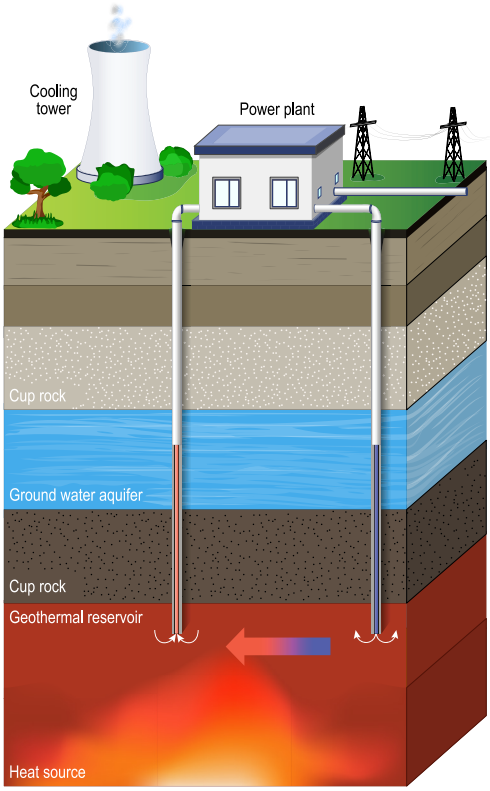
Geothermal energy production and geoexchange are often discussed together. However, it should be noted that industry experts have made it clear that while geoexchange processes can be effective in establishing distributed energy systems, it is not a form of energy production. In this proposal, we focus exclusively on "deep geothermal", which is defined as the process of extracting heat, or energy, in the form of hot water or steam from deep within the earth. Usually, geothermal reservoirs are found along major tectonic plate boundaries, like Alberta's Rocky Mountains and western Sedimentary Basin.

In simple terms, geothermal energy is harnessed by pumping hot water or steam from deep underground where the earth is naturally warm. It is a form of renewable energy, as the heat is constantly produced through radioactive decay within the Earth. Heat "taken out" is usually less than heat lost through natural causes, such as volcanic activity. Thus, it is considered a renewable source of energy.

Geothermal energy has a similar emissions profile to solar PV and can be cost-competitive with other renewable energy sources.

Over its lifetime, the average net cost of geothermal energy, or levelized cost, can be more competitive than conventional generation.

GEOTHERMAL ENERGY



Response to Government Policy

Recently, the UCP Government introduced legislation to establish a legal framework for geothermal development. The framework mirrors the Oil and Gas Conservation Act and, when passed, will place the regulatory responsibility for the geothermal industry with the Alberta Energy Regulator (AER).

While the legislation will enable the creation of a geothermal framework, the details will be determined in regulations, which have not yet been developed. To date, the UCP government has not provided details on their plans for geothermal regulation.

Current gaps in the UCP government's plans for geothermal include:

- *A Crown Royalty system*
- *An appropriate dispute resolution mechanism for landowners*
- *A framework for liability management*

In order to build investor confidence, create jobs, and establish conditions for growth in geothermal, we urge the government to address the previous three items.

The right royalty system will ensure Albertans get good value for our natural resources and that wealth and economic benefits remain in Alberta. Similarly, a well designed dispute resolution mechanism is essential to protect landowner's interests and private property rights. Last, it is essential that liabilities are managed effectively from the outset in order to avoid creating similar challenges faced by Albertans and private property owners as they relate to oil and gas wells.

In addition to establishing an appropriate regulatory regime, the UCP government should be working more closely with industry and communities to build a more robust, concrete plan to attract investment, accelerate growth, and create jobs in geothermal energy.

Setting the Stage for This Report

Alberta has vast geothermal resources that present an opportunity to diversify our economy, create immediate and long-term jobs, provide clean, renewable energy and lower our GHG emissions. However, compared to the rest of the world, Alberta's geothermal energy potential is largely untapped.

Experts are saying that geothermal energy is the "next hot thing in Alberta" because of its potential as a clean, renewable resource that could power a new, sustainable energy industry using the same infrastructure as the oil and gas industry.

Various estimates of Alberta's geothermal capacity have been developed by think tanks, researchers, and investors. The Canadian Geothermal Energy Association and Pembina Institute estimate that Alberta could provide geothermal energy for industry and communities for generations to come.

One of the greatest advantages Alberta has for opportunities in geothermal development is a strong, talented, experienced workforce with skills and technical expertise that relate directly to geothermal development. In addition, Alberta's well developed oil and gas sector lays a foundation for ready-to-go wells and infrastructure that reduce the costs of exploration and land disturbances.

Global markets are looking for expertise and technology to develop geothermal solutions across countless sectors. Growing Alberta's geothermal energy sector now can position Alberta as a leader on the global stage and provide an opportunity for Alberta to meet global market demands for services and technology and capitalize on our existing skills and talents.

There is currently a lot of enthusiasm among companies, researchers, and communities to explore these opportunities. In fact, a number of different companies are already working on different geothermal projects and several others are looking to enter the sector.

There are various applications for geothermal energy including, but not limited to, drying crops, lumber treatment, pulp mills and paper processing, heating for greenhouses and infrastructure. These opportunities, among many others, create the potential to attract new investment and economic growth to Alberta.

Because of our cold climate, most industries in Alberta require heating for buildings and industrial operations. High cost of energy often makes heating costly for industry. Geothermal energy presents an opportunity to reduce the capital intensity of industrial heating systems and offset these costs.

In 2019, geothermal electricity increased by three percent globally. However, the International Energy Agency estimates that, in order to meet its goals under the Sustainable Development Scenario (SDS), this would need to increase by 10 per cent annually until 2030, which is unlikely to happen without substantial investments from local governments.

During our time in Government, we supported a number of projects in geothermal. These included FEED for the Town of Hinton and the Eavor-Loop™ Demonstration Project. Through the Climate Change Innovation and Technology Framework and Alberta Innovates, we supported researchers at the University of Alberta to cooperate with Razor Energy to advance technology to harness geothermal energy in oil and gas production.

Other projects benefitted from the additional investments secured as a result of the Alberta Investor Tax Credit. For example, Terrapin's Alberta No. 1 project is the first in Alberta and among the first of its kind in Canada. This was made possible with Support from the former NDP government's Investor Tax Credit along with funding from the federal government The project is set to generate five megawatts of electricity annually and will provide direct heat to local industries.

Unfortunately, many of the incentives and supports have been cancelled by the UCP government and progress has been slowed as a result.

Restoring those incentives, setting an initial goal of producing the equivalent of 300 MW of geothermal energy in electricity with additional associated heat or stand-alone heat projects, could replace most of the drilling days lost due to COVID-19[1].

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[1] *According to the Petroleum Services Association of Canada, Alberta lost around 795 wells due to COVID-19 slowdowns. This means Alberta's oil and gas sector lost roughly 7,500 drilling days.*

According to the Canadian Association of Oilwell drilling contractors, it takes approximately 9.5 days to complete an oil and gas well. Based on discussions with leading industry experts, drilling a geothermal well takes roughly 38 days, or four times as long.

Our proposal would unlock 300MW of geothermal power annually or the equivalent thereof which, according to industry estimates, would between 185 to 190 new geothermal wells and would take approximately 7,000 drilling days creating a massive opportunity for job creation and economic activity.

Proposals

1. Develop a Geothermal Energy Royalty Regime
2. Build and Promote Local Private Markets for Geothermal in Alberta
3. Support Municipalities and Community Generation
4. Incentivize Geothermal Innovation in Alberta
5. Create Synergies with Oil and Gas
6. Convert Oil and Gas Liabilities into New Assets
7. Work with the Federal Government on Advancing Geothermal Opportunities
8. Promote the Export of Alberta Geothermal Services and Technology

1 DEVELOP A GEOTHERMAL ENERGY ROYALTY REGIME

During the NDP's term in Government, work was started on developing regulations for geothermal projects in the province and steps were taken towards establishing an appropriate royalty rate. A joint effort between the ministries of Energy and Environment and Parks was commenced in 2017 to begin discussions about royalty regime regulations. In the short term, some pilot projects were given preliminary approvals under current regulatory conditions.

Going forward, we propose that the development of a broad-based royalty framework be conducted through a transparent, evidence-based process that includes consideration of the public interest, Indigenous Rights and industry competitiveness.

2 BUILD AND PROMOTE LOCAL PRIVATE MARKETS FOR GEOTHERMAL IN ALBERTA

Success in growing the geothermal energy market means growing and promoting local private markets. Geothermal is still relatively unknown but we are seeing a growing number of applications across multiple sectors including heating water for agricultural operations, and applications to heat large industrial sites. For example, geothermal heating is becoming increasingly important in heating the world-leading Dutch Greenhouses as part of the industry's goal of reducing GHG emissions.

A paper mill in New Zealand, Norske Skog Tasman, recently received a "Large Energy User Initiative of the Year" honour as part of the Deloitte Energy Excellence Awards in New Zealand.

The company has been operating a 20.5 MW geothermal power plant since 2013 and has been able to use the power and heat generated from geothermal to reduce their costs, provide jobs and economic benefits to the community, and showcase the potential of geothermal energy utilisation.

With countless opportunities to use geothermal energy, we expect to see many more innovative geothermal solutions developed in Alberta in the coming years. In order to best support the creation and promotion of local private markets and to help Alberta's businesses leverage geothermal solutions that make sense for them, we suggest two options:

1. ***Establish an online portal that would function as a resource centre and would provide information about opportunities to companies interested in purchasing geothermal solutions. This portal could feature case studies and information about cost and technologies to help customers understand and assess their options.***
2. ***Create a dedicated fund to support early exploration of geothermal opportunities in existing industries. In particular, the fund could be used to underwrite part of the uncertainty of early exploration, thereby making it easier for companies to develop a business case for new projects.***

Helping de-risk geothermal exploration has demonstrated success in countries like Switzerland or Iceland where it led to more exploration projects and more geothermal wells being drilled. This, combined with additional support such as a Green Loan guarantee program or a return to the Alberta Investor Tax Credit could help attract investment and help several projects move forward.

3 SUPPORT MUNICIPALITIES AND COMMUNITY GENERATION

Some Alberta municipalities have expressed interest in geothermal energy and community generation projects. We propose establishing a program similar to the Community Generation Capacity Building Program that was funded through Energy Efficiency Alberta before it was dismantled. The program supported eligible communities in the early development phases of renewable energy community generation, including studies, technical expertise, and stakeholder engagement. This enabled a number of organizations to move forward in exploring solar projects such as the Renfrew Community Association or the RenuWell Solar projects that turned orphan well sites into solar projects.

These kinds of programs can also be used to support the expansion of geothermal energy production. Under the NDP, the Government of Alberta supported the Town of Hinton by funding a feasibility study to assess the benefits of geothermal energy. The project, a research partnership to retrofit wells near Hinton, has the potential to provide several megawatts of power to the community using geothermal energy. This will provide economic benefits to the community, cost savings for residents, and clean renewable energy for the years to come.

It is proposed that this work be expanded substantially to ensure all willing municipalities have the means to explore potential local geothermal applications. This program could also help communities implement lessons from communities in Germany or Netherlands where we have already seen successful examples of geothermal community generation.

Geothermal can potentially also provide further applications that would be worthwhile exploring for Albertan communities. For example, in Iceland geothermal energy has been used to melt snow and remove ice from roads and parking lots.

4 INCENTIVIZE GEOTHERMAL INNOVATION IN ALBERTA

As with other emerging sectors, there is a role for the Government of Alberta in providing targeted incentives in order to drive innovation and grow local expertise. We propose that the Government of Alberta host innovation competitions in order to pilot new ideas, showcase successes, and drive innovative solutions in the private sector.

We propose a model similar to other innovation competitions conducted through Alberta innovates or Emissions Reductions Alberta. For example,the Industrial Efficiency Challenge through Emissions Reduction Alberta was able to leverage almost $4 for every dollar invested and will reduce 5.3 million tonnes of CO_2e by 2030.

Post-secondary institutions also play a role in driving innovation. The University of Alberta already has a working group focused on geothermal energy, though its funding is due to expire. The group is currently working on projects such as extensively mapping data on geothermal potential in the province. If we want to conduct high-level geothermal research, Alberta should be taking strides to keep this group active and consider how to establish similar efforts at other post-secondary institutions in the province.

5 CREATE SYNERGIES WITH OIL AND GAS

There are many oil and gas wells in Alberta that have the potential to be used for geothermal exploration. While the exact number is unclear and will need to be assessed going forward, there is a clear opportunity for partnership and collaboration between the geothermal industry and the oil and gas industry.

Many companies possess data from their oil and gas exploration and production work that could provide valuable insight about local geothermal resources. This data could be used for geothermal exploration and to reduce environmental disruption, avoid unnecessary cost, and limit risk for new projects. We propose working with industry partners to identify new ways to evaluate the data or enable data sharing. This could help companies unlock further value from old projects as well as enable new projects.

In addition, we propose working closely with oil and gas producers to identify opportunities in geothermal within existing operations, such as wells that are close to the end of their life-cycle that might hold new value by being transferred or utilized for geothermal pilots. We also propose exploring whether these types of activities could be further incentivized through offsets or other mechanisms.

6 CONVERT OIL AND GAS LIABILITIES INTO NEW ASSETS

Alberta currently has an estimated 162,500 active wells, 97,000 inactive wells, and 71,000 abandoned wells. Together, liabilities for oil and gas wells have been estimated at $70 billion and upwards of $100 billion for the sector as a whole. While not all oil and gas wells can support new forms of energy production, many have the potential to support developing industries such as geothermal, lithium, hydrogen, and solar. Unlocking this potential has benefits in terms of economic diversification, lower GHG emissions, and creating new value in current liabilities.

While the precise liability of each well varies, we can average the cost to $212,000 in liabilities per well. This means that using $100 million of the federal Site Rehabilitation Program (SRS) funds could cover between 50 and 100 per cent of liabilities for between 450-950 wells depending on the precise formula for the distribution of funds.

Just like other tranches of the SRS we would seek partnership with companies that are able to participate in covering some of the cost of their liabilities.

This proposal offers short term solutions to manage oil and gas well liabilities as well as a proposal to develop an overall liabilities regime in the long term.

In the short term, we propose using funds from the SRS to cover liabilities for companies looking to invest in exploration of potential geothermal sites. The SRS is the province's mechanism for utilizing $1 billion in federal government funding for well-site clean up. To date, $600 million of that remains unallocated by the UCP Government. Industry leaders suggest that liability risks are the main reason for a lack of investment. Thus, our proposal would use funds from the SRS to cover liabilities through bonds, insurances or remediation efforts.

In the longer term, the responsible growth of the geothermal energy sector will also require a robust liability regime that provides confidence to Albertans. It is important that we develop clear rules that avoid some of the challenges that we are observing today in the oil and gas industry when it comes to abandoned and orphaned wells. It is becoming increasingly clear that the existing liability regime has left us with significant environmental and economic challenges that can and must be avoided in future developments. To do this, we would consult extensively with impacted industries, landowners, Indigenous people and Albertans as a whole.

7 WORK WITH THE FEDERAL GOVERNMENT ON ADVANCING GEOTHERMAL OPPORTUNITIES

The Federal Government has identified Geothermal as an emerging industry and indicated an interest in providing further support. We would advocate for federal investment in Alberta's geothermal industry to ensure that any federal legislation or funding would recognize Alberta's unique potential, skills base and resource availability.

We would also ensure that the federal government recognizes geothermal energy as an offset in the federal framework on climate change, which would incentivize investments in geothermal and help grow the sector.

8 PROMOTE THE EXPORT OF ALBERTA GEOTHERMAL SERVICES AND TECHNOLOGY

Alberta has the potential to meet global market demand for expertise in geothermal energy and export services and technology to international markets seeking our unique expertise and skill. The opportunity is great as international markets are set to grow — Indonesia launched a $275-million fund to develop geothermal energy in 2019 and other countries are investing millions to attract geothermal projects as well.

Alberta's trade offices are well positioned to promote our industry across the world and identify opportunities to export leading technologies and services developed in Alberta. Other opportunities include hosting an investor conference, and exploring fiscal tools such as loans, insurance, and guarantees modeled after the green technology export programs through Export Development Canada.

Potential Costs

The costs detailed on this page are neither prescriptive nor exact. They represent a range based on preliminary study and conversation with experts in the field. They're offered solely as means to provide a sense of the scope that would likely be required to achieve these objectives. This is not a budget, this is merely a starting point to facilitate discussion. We welcome feedback on the costing of each proposal put forward as part of Alberta's Future.

POLICY	Estimated Cost (in million CAD)
DEVELOP A GEOTHERMAL ENERGY ROYALTY REGIME	**$0** This work can be done through Alberta Energy and Environment and Parks.
BUILD AND PROMOTE LOCAL PRIVATE MARKETS FOR GEOTHERMAL IN ALBERTA	**$8 - $20** The resource center could be set up through Emissions Reductions Alberta or the Ministry of Environment and Parks. Funding of $8 million would enable businesses to cover some of the cost of evaluating if geothermal applications might make sense for them. A larger investment of $20 million would allow the province to cover up to 25 per cent of costs to drill a first well to understand the opportunities geothermal offers.
SUPPORT MUNICIPALITIES AND COMMUNITY GENERATION	**$6** This is half of the capacity building program of Energy Efficiency Alberta.

Potential Costs *(cont'd)*

POLICY	Estimated Cost (in million CAD)
INCENTIVIZE GEOTHERMAL INNOVATION IN ALBERTA	**$0** Innovation competitions are in the range of $10 to $70 million but could come out of current budgets of Alberta Innovates or Emissions Reductions Alberta. Under the UCP government, this fund is more focused on conventional sectors and we believe there is room to allocate more to emerging industries. This is comparable to other innovation competition through Alberta innovates or Emissions Reductions Alberta. The work of our Universities is currently funded through the budgets of the Universities and support from Alberta Innovates. What is important right now is a commitment to stable predictable continued funding going forward which we would do as we did during our time in Government.
CREATE SYNERGIES WITH OIL AND GAS	**$0** We propose working with industry partners to identify new ways to evaluate the data or enable data sharing. This could help companies unlock further value from old projects as well as enable new projects.
CONVERT OIL AND GAS LIABILITIES INTO NEW ASSETS	**$0 ($100 million in existing funds)** Of the $1 billion that the federal Government has given to the province for well site rehabilitation $600 million remains unspent. We propose using a maximum of $100 million to address liabilities so that geothermal and other companies would be able to utilize existing wells. We estimate this could unlock between 400-850 wells.
WORK WITH THE FEDERAL GOVERNMENT ON ADVANCING GEOTHERMAL OPPORTUNITIES	**$0** The Alberta Government is regularly working with the Federal Government on a wide range of issues. This should therefore be funded out of existing operating funding.
PROMOTE THE EXPORT OF ALBERTA GEOTHERMAL SERVICES AND TECHNOLOGY	**$0** The funding for Alberta's trade offices is already in the budget. Potential export programs would be for the whole green technology sector not specific to geothermal.
TOTAL	**$14-$26 ($100 million in existing funds)**

Conclusion

This paper presented another opportunity to diversify Alberta's economy. Our geothermal proposals are part of the Alberta NDP's Alberta's Future project.

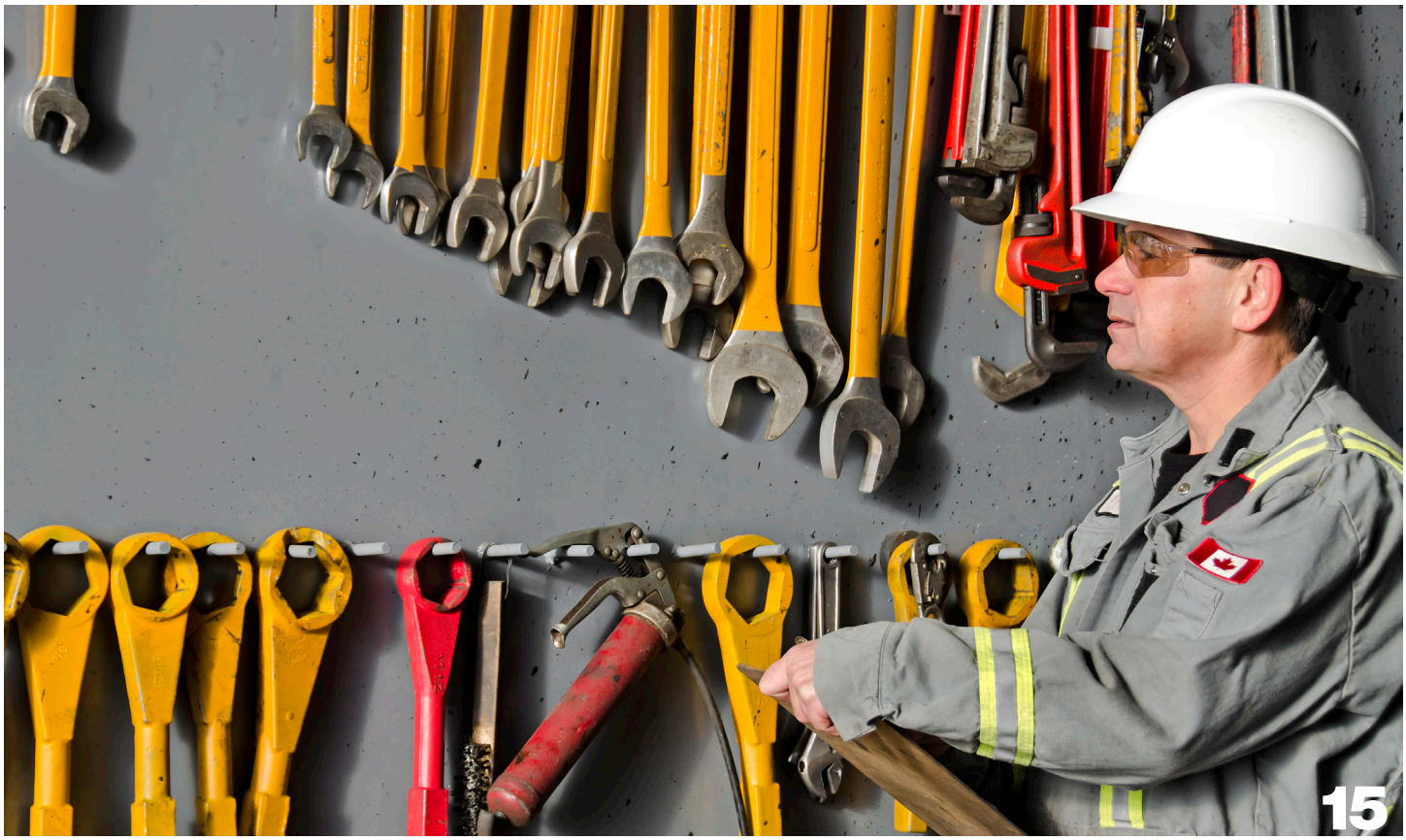
Our ideas are built around five principles:

- *Job security for Albertans;*
- *Equity and inclusion of all Albertans;*
- *Diversification as a priority;*
- *The recognition of the role of the Public Service in growing the economy;*
- *and the rejection of a race to the bottom.*

Our proposals for the Geothermal sector offer ways to leverage the skills and talents of Albertans to create new jobs and to become a global leader in the geothermal industry.

With strategic actions taken by the province we can help create opportunities for Albertans who were hard-hit by the recent economic downturn and create good jobs for decades to come. Geothermal and other green technologies have great potential to reduce our GHG emissions and develop new job and growth opportunities in the province. The proposal you have just read has the potential to create 10,000 jobs and replace most of the drilling days lost due to COVID-19.

We can work together to explore and capitalize on geothermal energy. Just like when Peter Lougheed sparked an economic revolution in his province, we too can make strategic public investments to grow new sectors and create new economic booms. Geothermal energy, we believe, is a key piece of a broader renewable energy strategy that has the potential to secure Alberta's future as an energy leader.



Give Us Feedback

WE WANT YOUR FEEDBACK

Alberta's Future is an initiative to build a new economy that benefits every person in our province. We want you to share your thoughts and ideas on proposals like this one.

We welcome you to submit your own proposals too!

All of our proposals and those contributed by Albertans like you can be found at **AlbertasFuture.ca**. On that website, you can also register for in-person and online conversations happening right across Alberta.

We are also hosting this conversation on social media, using the hashtag **#ABFuture**

Engage directly with NDP Leader Rachel Notley on YouTube, Twitter, Instagram, and Facebook

@RachelNotley

Alberta's FUTURE.ca