

Intentions Paper Geothermal Royalty Policy Proposal

British Columbia Ministry of Energy Mines and Petroleum Resources

Table of Contents

Introduction	1
BC Resource Royalties.....	2
Cross Jurisdictional Review	3
Past Consultation	4
Proposed Geothermal Royalty Model for BC.....	4
Summary	6
Anticipated Timelines	7
Appendix 1.	8

Introduction

This document is intended for information purposes only. The power to enact regulations under the *Geothermal Resources Act* (GRA) resides with Lieutenant Governor in Council. This document makes no assurances with respect to whether a regulation will be made, or as to its content.

British Columbia has significant geothermal energy resources which are expected to provide a source of renewable electricity in the future. The rights to geothermal energy resources, which include water and steam that are greater than 80°C when produced at surface, are vested with the Crown and regulated under the *Geothermal Resources Act* (1996) (GRA). Geothermal resources are disposed through a framework of permits and leases.

Geothermal exploration permits allow the holder the exclusive right to explore for geothermal resources and to convert the permit, after successful exploration, to a lease. The GRA requires that royalties, or a payment in lieu of royalties, must be provided to the government for the use of the Crown’s geothermal resources. The GRA contemplates an agreement between the government and individual proponents; or that a royalty policy is set out in a regulation. To date, no geothermal project has proceeded to the point of commercial development and a royalty rate has not been set. A royalty rate policy will provide geothermal developers and their investors’ confidence that geothermal projects can move forward in a timely manner and be able to accurately predict royalty payments.

The purpose of this paper is to outline a proposed royalty policy being considered by the Ministry of Energy, Mines and Petroleum Resources (EMPR) for geothermal energy, and solicit comment from the geothermal industry, prior to review of the policy with the Lieutenant Governor in Council.

BC Resource Royalties

British Columbia charges royalties for the production or use of its mineral, petroleum, and clean energy resources. Existing royalties for clean energy can be classified into two types: ad valorem and specific. Ad valorem rates are determined as a percentage of the market value based on the sale price; specific rates are calculated on a quantity, rather than revenue, basis.

British Columbia's wind participation rent is an ad valorem royalty applied as a rent for the Crown Land licenced for use as a wind farm. The royalty charged is a percentage factor between 1% and 3 % of annual gross revenues. The rate is based on a facility's annual capacity factor, starting at 1% with an annual production factor less than 25%, increasing linearly from 1% to 3% at 40% annual production factor and remaining at 3% a higher annual production factors (Figure 1). Royalty holidays are a time-limited suspension of royalty payments usually employed to increase investment in a new or marginally economic resource. In 2005, a ten-year royalty holiday was provided to wind energy projects to encourage investment to grow and mature the industry.

Small run-of-river hydro energy projects are charged a specific royalty. The Province collects annual water rental fees on waterpower projects based on both capacity and production. Capacity fees are \$0.429 per kilowatt (kW) under construction, and \$4.295 for each kW of authorized capacity greater than construction capacity. Once in service, the production fees range from \$1.288 - \$7.226/MWh. Water rental charges are indexed to annual changes in the British Columbia consumer price index.

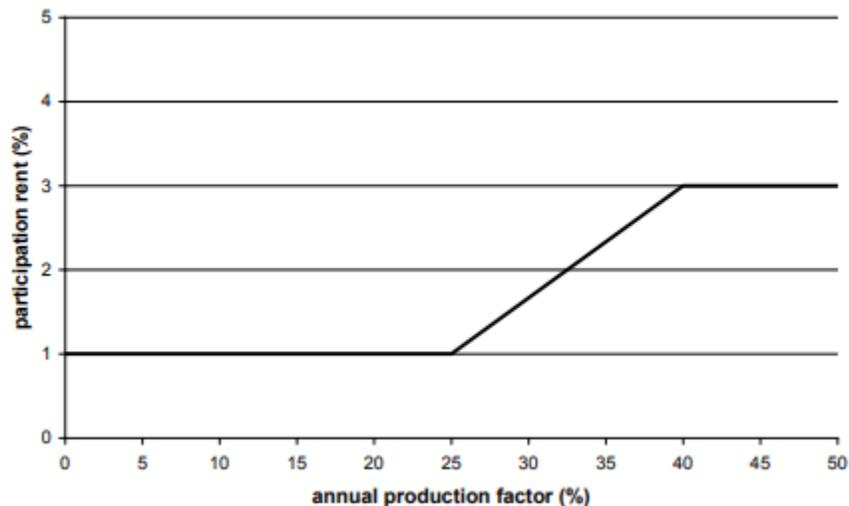


Figure 1 -Wind Participation Rent in BC

Cross Jurisdictional Review

There are several jurisdictions with geothermal resources similar to those found British Columbia with royalty frameworks in place (Table 1). All of these jurisdictions apply an ad valorem royalty rate; either as a flat rate charged based on gross revenue, with or without a royalty holiday; or as an inclining royalty rate that provides a lower rate during the initial years of production. Ad valorem royalties are popular for geothermal energy because they provide a level playing field between different geothermal projects, and are straightforward to calculate.

The United States is the largest producer of geothermal energy in the world with over 3.7 GW of installed capacity at the end of 2015. Most geothermal developments in the United States are on federal land regulated by the Bureau of Land Management. These plants are subject to an ad valorem royalty calculated on the gross proceeds of electricity sales. The rate is 1.75% for the first 10 years of production rising to 3.75% thereafter. For developments on state land in California and Washington, geothermal plants are subject to a 10% royalty rate charged on gross revenue.

Australia has several geothermal projects in the development and exploration stage. Ad valorem royalty rates in Tasmania and Western Australia are 2.5%. In New South Wales, the royalty rate is 4%. South Australia has a royalty holiday until payout of the project, and then a royalty rate of 2.5%.

Kenya presented a draft bill outlining proposed royalties for geothermal energy in early 2018. The proposed royalty rates are 1 to 2.5% in the first ten years, increasing to between 2 and 5% thereafter. The royalty is an ad-valorem rate of plant revenue.

Jurisdiction	United States		Australia			Kenya
	Federal Lands	California, Washington State lands	Tasmania, Western Australia	New South Wales	South Australia	
Royalty Rate	1.75% year 1-10 3.75% year 11+	10%	2.5%	4%	2.5% Royalty holiday till project payout	1-2.5% for first 10 year; 2-5% thereafter. (proposed)

Table 1 – Jurisdictional comparison of geothermal production royalties.

Past Consultation

Although royalties were not a focus of the consultation when amendments to the GRA were considered in 2015, industry participants were invited to comment on royalties. At that time, comments were received in support of a fixed-time royalty holiday, with subsequent royalties calculated based on transported energy, an ad valorem rent independent from the plant's capacity factor and efficiency.

Proposed Geothermal Royalty Model for BC

Three primary objectives guide the proposed geothermal royalty policy for British Columbia:

1. Provide certainty to project developers by setting the rate in a regulation under the *Geothermal Resources Act*;
2. Ensure that the royalty rate is competitive with other clean energy resources in BC and with geothermal royalties in other jurisdictions; and,
3. Provide an incentive to geothermal developers similar to what has been provided for other clean energy developers in British Columbia.

EMPR proposes to apply an ad valorem royalty of 3% following an initial 10 year royalty holiday (Figure 2), similar to the wind participation rent, for any electricity or energy that is sold. This rate is aligned with the wind participation rent, which is 1%-3% of gross revenue with the highest 3% rate applied for developments with greater than a 40% annual capacity factor. Geothermal energy plants typically have capacity factors around 90%, so the 3% royalty rate would apply. In 2005, at the time the land use policy governing wind energy plants was developed, a 10 year royalty holiday was given as an incentive for the then nascent wind industry. EMPR proposes a similar royalty holiday for the initial ten years of production for a geothermal development. The royalty holiday may be re-evaluated in future as the industry develops and matures.

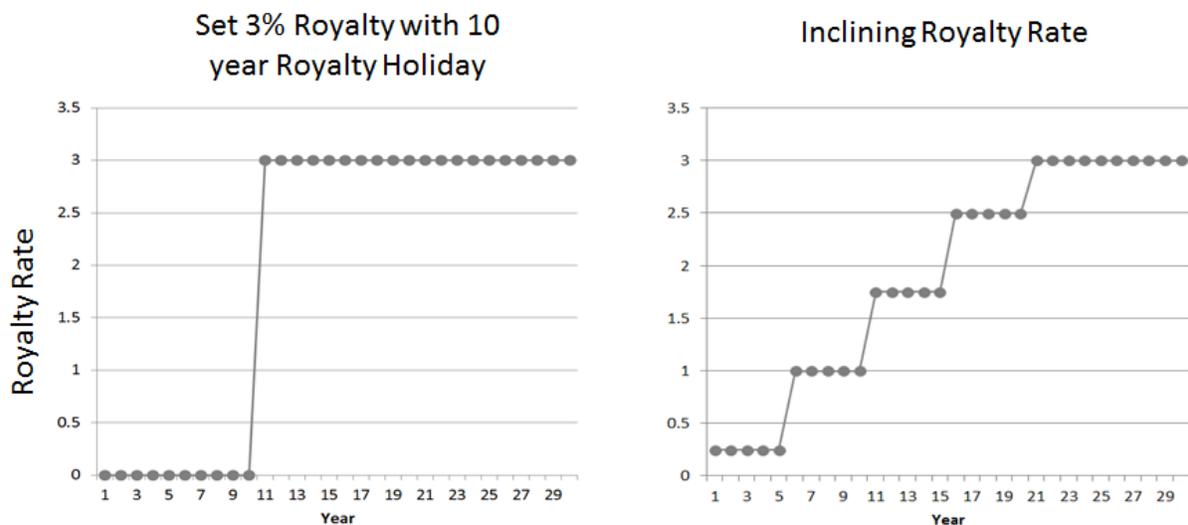


Figure 2 – Proposed and alternative geothermal royalty rate.

An alternative royalty model, an inclining ad valorem royalty rate which starts low with scheduled increases, was also considered. In this proposed option, geothermal projects would be subject to an

initial rate of 0.25% and increases every 5 years by 0.75% to a maximum of 3% (Figure 2). Royalty payments would commence in the first year of production (i.e., no royalty holiday). When compared to royalty schemes that do not have a royalty holiday this royalty type would provide a front-end incentive with low royalty rates at the start of the project to improve project economics.

For both royalty schemes an economic model (see Appendix 1 for economic model inputs) was analysed to compare the estimated royalty payment and the net present value (NPV) of the revenue streams to the developer and government. Provincial taxes were estimated at a corporate tax rate of 12%, with a small business rate of 2.5% for the first \$500,000 applied to the 15MW geothermal plant model when the total revenue was less than \$10,000,000. Federal taxes were estimated as 15%, the full rate is 38% before deductions; including a 10% deduction that is applied on if a business has to pay provincial or territorial tax. The estimated federal and provincial taxes and annual royalty payments for both royalty schemes evaluated are presented in Figure 3.

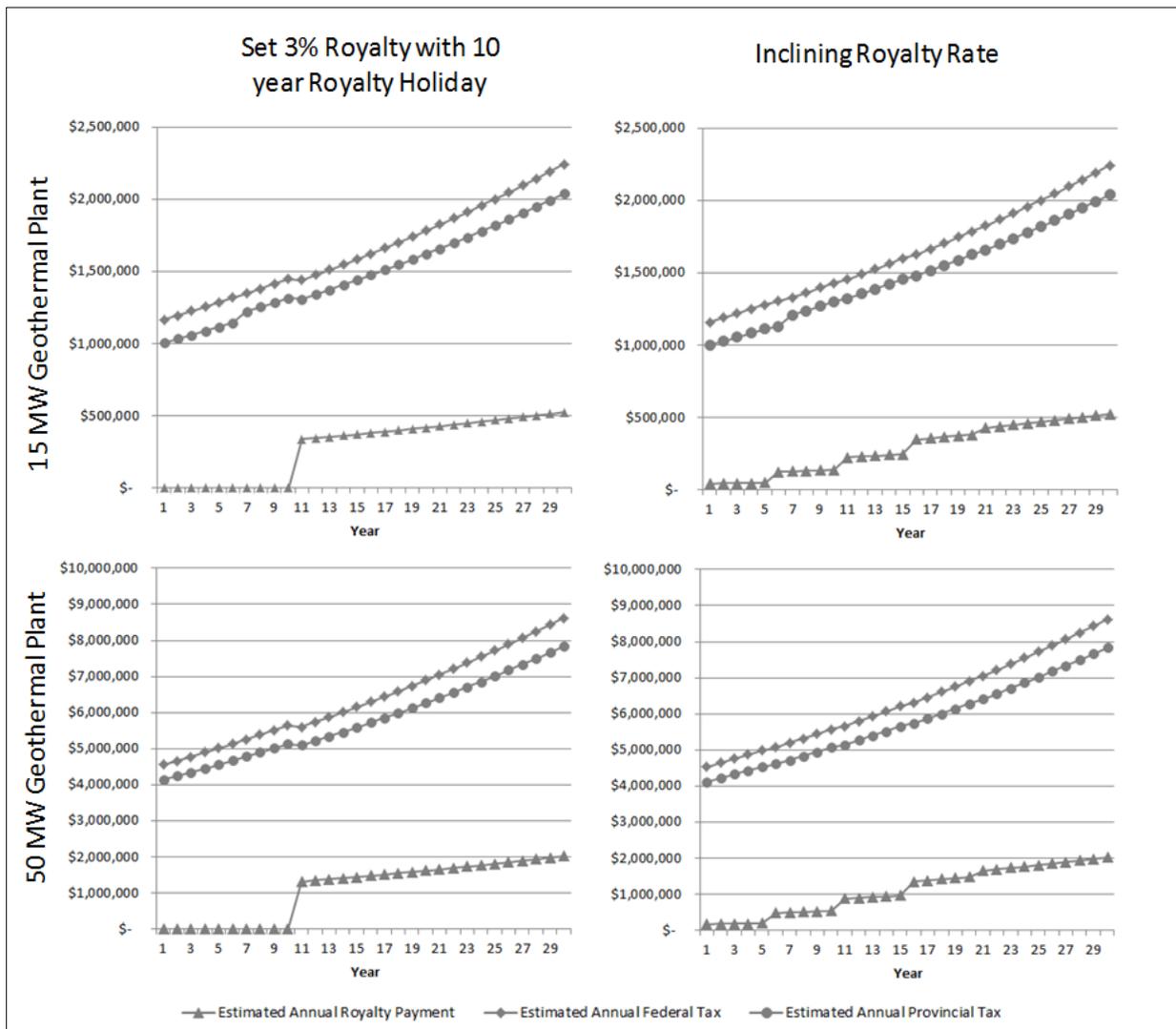


Figure 3- Estimated royalty and tax payments for representative geothermal plants.

The net present value (NPV) to the province from royalties and taxes collected, and the NPV of the project and internal rate of return for the developer are summarized in Table 2. The difference in all NPV between the two royalty schemes is minor to both the Province and developers. For the province the value of the provincial tax is greater than the royalties collected by approximately an order of magnitude. For the developer alignment with the wind participation has a slight positive effect primarily due to the royalty holiday.

		3% Royalty Rate with 10 Year Royalty Holiday	Inclined Rate
NPV Provincial Royalty	15MW	\$3,136,615	\$3,396,148
	50MW	\$12,141,521	\$13,166,128
NPV Provincial Corp. Tax	15MW	\$20,956,636	\$20,925,492
	50MW	\$82,454,665	\$82,331,712
NPV of Project to Proponent	15MW	\$10,709,791	\$10,530,196
	50MW	\$210,297,637	\$205,380,591
Internal Rate of Return	15MW	8.1%	8.1%
	50MW	17.5%	17.1%

Table 2 – Summary of NPV for different royalty scenarios.

Summary

The GRA requires that royalties, or a payment in lieu of royalties, must be provided to the government for the use of the Crown’s geothermal resources. The Government intends to develop a royalty regulation to provide certainty for future geothermal developments.

A geothermal royalty rate based on an ad valorem calculation of a percentage of net sales will be familiar to the geothermal industry as it aligns with other jurisdictions. Alignment of a geothermal royalty with the wind participation rent would be an incentive for geothermal projects similar to what was provided to the nascent wind industry. In addition, a royalty of 3% would be competitive with the United States, the largest producer of geothermal energy. Therefore it is the intention of the Government to proceed with a royalty rate of 3% following a ten-year royalty holiday aligning geothermal royalties with the wind participation rent.

The proposed royalty scheme was developed with feedback received during past consultation with the geothermal industry. At this time, further comments are requested regarding this proposal. Interested parties are invited to submit comments in writing to the address at the end of this paper. Feedback is request on the issues raised by this paper, specifically regarding:

1. The proposed royalty rate and impact of the royalty holiday;
2. If the inclined royalty rate is preferable, please indicate why this would be a better option to meet the objectives outlined; and,
3. Are there any additional considerations the Province should consider?

Responses to this Consultation Paper are being solicited until July 15, 2018.

Anticipated Timelines

The period for public input on this intention paper will be open until July 15, 2018. Following the close of consultation, the Ministry will consider the input received, which will inform the complete regulatory drafting for presentation to the Lieutenant Governor-in-Council.

Implementation of a royalty regulation is targeted for early 2019.

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Appendix 1.

Economic Modeling Assumptions

To evaluate different royalty options, a simple economic model was constructed. Two key assumptions are required for modeling geothermal plant economic characteristics; the size of the plant and the purchase price of the produced electricity. The variability of geothermal resources and the lack of Canadian geothermal developments pose challenges to the economic modeling of geothermal developments. To simplify the analysis and provide representative models of potential geothermal developments, two different plant sizes were considered: a 15 MW geothermal project, representing lower temperature geothermal prospects similar to those located throughout much of BC; and, a geothermal project 50 MW to represent high-temperature geothermal prospects located at high potential geothermal prospects such as Mount Meager.

Contract prices for the model are based on historical prices and are used for comparison only. A 15 MW project would be consistent with BC Hydro's Standing Offer Program (SOP). The revenue model was developed based on the historical SOP price. The SOP is currently under review and procurement opportunities and prices for clean energy are not known at this time. For the 50 MW project the electricity sale price was estimated from the lowest cost estimates for geothermal energy in the 2013 Integrated Resource Plan.

The technical assumptions for the cash-flow model are summarized in Table 2. With no geothermal plants in Canada, it is very difficult to estimate costs, therefore for the purposes of this model the total price was estimated as \$6,000/kW for 15 MW, and \$3,200/MW for 50MW based on evaluation from US Department of Energy's Office of Energy Efficiency and Renewable Energy (https://energy.gov/eere/geothermal/geothermal-faqs#cost_to_develop_geothermal_power_plant). The costs have been adjusted to account for exchange rates.

Plant Capacity	15 MW Geothermal Plant	50 MW Geothermal Plant
Nameplate Capacity	15 MW	50 MW
Capacity Factor	95%	90%
Parasitic Load (run production/disposal pumps and meet ancillary loads)	25%	5%
Plant Life	30 years	30 years
Development Cost	\$6,000/kW nameplate capacity	\$3,200/kW nameplate capacity
Exploration Costs	25% of Development Costs	25% of Development Costs
Operating Costs	\$0.02/kWh	\$0.02/kWh
First Year Operating	2020	2024
Inflation	2%/annum	2%/annum
Corporate Discount Rate	7%	7%

Table 3 – Economic model inputs.

For the purposes of modeling this cost is estimated to be spent over two years, the first year is exploration accounting for 25% of the total development cost. The actual exploration program time for geothermal projects is likely several years. The *Geothermal Resources Act* allows for up to eight years of exploration with a permit; however, the majority of the exploration expenses (drilling) will occur in the later years of exploration and this model is designed to represent these last years of exploration where the geothermal resource is confirmed through drilling and testing.