CALCULATION OF ROYALTIES BASED ON NETBACK METHOD

CALCULATION OF ROYALTY WAIVER BASED ON EXPANDED NETBACK METHOD

APRIL 1991

for

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF WATER RESOURCE MANAGEMENT

by

Steven E. Morris
Financial Consulting Services
Calculation of Royalties Based on Netback Method
Calculation of Royalty Waiver Based on Expanded Netback Method
April 1991

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Introduction

To encourage the development of geothermal energy in Hawaii, the Board of Land and Natural Resources (the "Board") has the authority to waive royalty payments that would otherwise be due to the State of Hawaii (the "State") from the production of geothermal resources from State leases. The Board’s assessment of each application for royalty waiver is required by statute to include the examination of such factors as the need for providing financial incentives in order for the applicant to proceed with development. The Board can waive royalties for a maximum period of eight years.

The decision on whether or not to grant royalty waivers to a project is a difficult process that involves many considerations. I believe it would be useful for the Board to separate its decision on whether or not to grant royalties waivers to a project from its decision as to how much and when the royalties should be waived.

Further, I believe that the timing and amount of royalties to be waived should be determined on the basis of the actual results of operations and not based on projections. Determining the timing and amount of royalties to be waived based on the actual results of operations gives the Board the opportunity to provide support to projects based on actual need, not projected need. If a project operates better than expected, the Board won’t be in the position of being committed to waive a fixed amount or fixed percentage of royalties when financial support to the project is not needed.

Uncertainty as to the specific amount of royalties to be waived should not cause any major concern to the developer or its financial backers in that the amounts to be waived will vary only if the results of operations vary from the projections. If the results are better than projected, the developer should not mind receiving a lower subsidy from the State.

The Puna Geothermal Venture ("PGV") has requested that the Board agree to waive 60% of the royalties that would otherwise be due to the State during the first eight years of operations of its Puna geothermal project (the "PGV Project").

In connection with PGV's request, I have reviewed the projected operating cashflows of the PGV Project submitted in
support of the waiver request. My review was performed in the context of 1) using the assumptions in the projected cashflows to calculate the amount of royalties that would be due the State based on the geothermal netback method of valuing geothermal resources and 2) recommending to the State, a methodology to be used in evaluating requests for royalty waivers.

A copy of my comment letter regarding the projected cashflows of the PGV Project, which was sent under a separate cover, is Exhibit 1 to this report.

Set forth below are the royalty calculations for the first eight years of the PGV Project using the geothermal netback method of valuing the resource produced from State leases. Also below are the details of a methodology for calculating an appropriate amount of royalties to be waived for projects determined by the Board to qualify for royalty waiver consideration. The results of applying this methodology to the projected operating cashflows of the PGV Project are also contained in this report.

Netback Method of Royalty Calculation

In my February 1991 report to the State, "Review of Methods Used in the Geothermal Industry to Value Resource", I recommended that the State adopt the geothermal netback valuation method (the "Netback Method") for valuing resource produced from State leases when such resource is not subsequently sold under the terms of an arms-length steam sales contract. The Netback Method was recommended because I believe it is logical and fair. In addition, it can be consistently applied to multiple projects.

The Netback Method has been developed by the Mineral Management Services ("MMS") of the Department of the Interior to value geothermal production from Federal leases when the resource is not subsequently sold under the terms of an arms-length steam sales contract. The MMS has spent considerable time and effort to develop this method in a manner that protects the interests of the resource owner without being unfair to the developer. The Netback Method is currently under administrative review and changes may be forthcoming. Calculations contained in this report are based on existing regulations.

The Netback Method determines the value of the geothermal resource used in a given project by subtracting the reasonable cost of transmission and the reasonable cost of generating electricity from the proceeds of the sale of the electricity. The remainder in this calculation is considered to be the value of the geothermal resource. Reasonable cost includes a return on invested capital for each cost category.
Table I below shows the amounts of royalties that would be due to the State and the resource value as a percentage of the total project revenues for each of the first eight years of the PGV Project. These amounts have been calculated using the Netback Method and the assumptions provided by PGV. The assumptions used in the calculations are listed in Exhibit 2. Details of the Netback Method royalty calculation for each year are contained in Exhibit 3.

Also shown in Table I are the amounts of royalties that would be due the State based on the assumption used by PGV in its projected cashflows. PGV has valued the resource at an amount equal to 33% of the project revenues.

Table I Royalty Amounts - PGV Project

<table>
<thead>
<tr>
<th>Year</th>
<th>Royalty Amount</th>
<th>Resource Value as a % of Project Revenue</th>
<th>Royalty Amount</th>
<th>Resource Value as a % of Project Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$658,620</td>
<td>39.51 %</td>
<td>$550,000</td>
<td>33 %</td>
</tr>
<tr>
<td>2</td>
<td>666,950</td>
<td>40.01</td>
<td>550,000</td>
<td>33</td>
</tr>
<tr>
<td>3</td>
<td>674,794</td>
<td>40.48</td>
<td>550,000</td>
<td>33</td>
</tr>
<tr>
<td>4</td>
<td>742,226</td>
<td>42.97</td>
<td>570,000</td>
<td>33</td>
</tr>
<tr>
<td>5</td>
<td>815,620</td>
<td>45.47</td>
<td>592,000</td>
<td>33</td>
</tr>
<tr>
<td>6</td>
<td>891,850</td>
<td>47.85</td>
<td>615,000</td>
<td>33</td>
</tr>
<tr>
<td>7</td>
<td>897,488</td>
<td>48.15</td>
<td>639,000</td>
<td>33</td>
</tr>
<tr>
<td>8</td>
<td>1,053,104</td>
<td>52.28</td>
<td>665,000</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>$6,400,652</td>
<td></td>
<td>$4,731,000</td>
<td></td>
</tr>
</tbody>
</table>

Methodology for Calculating Royalty Waivers - The Expanded Netback Method

I believe that the logic and fairness of the Netback Method can be expanded from valuing the resource to valuing the project as a whole. This would then, provide a basis upon which to determine the amount of royalties, if any, to be waived for a project.
The Netback Method values resource by subtracting the reasonable cost of the other aspects of the project from the total project revenues. The Expanded Netback Method values the project as a whole by subtracting the reasonable cost of all aspects of the project, including steam production, from the total project revenues. This calculated project value is considered to be the amount available for royalty payments. If the amount is negative or less than the amount of royalty due, then all or a portion of the royalty is waived. Table II illustrates the concept of the Expanded Netback Method.

### Table II Concept of the Expanded Netback Method

<table>
<thead>
<tr>
<th>Year of Operation</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Project Revenues</td>
<td>$1,000</td>
<td>$1,200</td>
<td>$1,300</td>
</tr>
<tr>
<td>Less:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmissions Costs</td>
<td>60</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Generating Costs</td>
<td>600</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>Steamfield Costs</td>
<td>500</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td><strong>Total Costs</strong></td>
<td>1,160</td>
<td>1,160</td>
<td>1,160</td>
</tr>
<tr>
<td>Project Value (amount available for royalties)</td>
<td>(60)</td>
<td>40</td>
<td>140</td>
</tr>
<tr>
<td>Calculated Royalty</td>
<td>34</td>
<td>54</td>
<td>64</td>
</tr>
<tr>
<td>Royalty to be Paid</td>
<td>0</td>
<td>40</td>
<td>64</td>
</tr>
</tbody>
</table>

The above table illustrates the three situations that can occur when using the Expanded Netback Method. In year 1, insufficient value exists to pay any of the royalties. Accordingly, the royalties are waived. In year 2, the project value is such that a portion of the royalties can be paid. In year 3 the project value is such that all of the royalties can be paid.

Calculations in the Expanded Netback Method are made in the same manner as the calculations in the Netback Method with the following exceptions.

1. The Expanded Netback Method would include a cost category for steamfield development and operations. The cost rate for steam is determined in the same manner as the cost
rate for transmission and electricity generation.

2. The Netback Method contains cost limitations for each category of cost to protect the resource owner from excess costs. Because the purpose of the royalty waiver is to help the project during periods of high cost, limitations are disregarded in the Expanded Netback calculations.

3. The rate of return on invested capital has been increased to 150% of the S & P Industrial Bond Rate. It is not the intent of this proposed methodology to suggest or define a hurdle rate of return below which the Board would grant royalty waivers. However, the rate of return selected does significantly affect the calculation. For example, the rate of return on invested capital used in the calculations below is 15%. When this rate is changed to 14.5%, the result is that sufficient funds are available to pay all royalties. When this rate is changed to 17.5%, the result is that there are no funds available to pay royalties.

Table III below shows the results of applying the Expanded Netback Method to the assumptions contained in the PGV Project projected cashflows. Specific assumptions used are listed in Exhibit 5. Details of the calculations for each year are contained in Exhibit 6. Royalty amounts are from Table I.

Table III Royalties Waived - PGV Project

<table>
<thead>
<tr>
<th>Year</th>
<th>Royalty Amount</th>
<th>Available for Royalties</th>
<th>Royalties to be paid</th>
<th>Royalties Waived</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$658,620</td>
<td>$(12,815)</td>
<td>$0</td>
<td>$658,620</td>
</tr>
<tr>
<td>2</td>
<td>666,950</td>
<td>226,979</td>
<td>226,979</td>
<td>439,971</td>
</tr>
<tr>
<td>3</td>
<td>674,794</td>
<td>461,346</td>
<td>461,346</td>
<td>213,448</td>
</tr>
<tr>
<td>4</td>
<td>742,226</td>
<td>690,016</td>
<td>690,016</td>
<td>52,210</td>
</tr>
<tr>
<td>5</td>
<td>815,620</td>
<td>912,704</td>
<td>815,620</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>891,850</td>
<td>1,129,110</td>
<td>891,850</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>897,488</td>
<td>1,338,920</td>
<td>897,488</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>1,053,104</td>
<td>1,541,805</td>
<td>1,053,104</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>$6,400,652</td>
<td>$5,036,403</td>
<td>$1,364,249</td>
<td></td>
</tr>
</tbody>
</table>

Table III shows the results of applying the Expanded Netback Method to the assumptions contained in the PGV Project projected cashflows. Specific assumptions used are listed in Exhibit 5. Details of the calculations for each year are contained in Exhibit 6. Royalty amounts are from Table I.
March 25, 1991

Mr. Manabu Tagomori
Deputy Director
Division of Water Resource Management
P.O. Box 373
Honolulu, Hawaii 96809

Re: Review of Puna Geothermal Venture's Projected Operating Cashflows as per Item 5 of Our Letter of Agreement - Amendment No. 1.

Dear Mr. Tagomori:

I have reviewed the projected operating cashflows for the Puna Geothermal Project that were submitted to the State of Hawaii ("State") on December 11, 1990. These projected operating cashflows were submitted by the Puna Geothermal Venture ("PGV") in support of its request for a waiver of 60% of the royalties that would otherwise be due the State for geothermal resources produced from State leases.

My review was performed in the context of 1) using the assumptions in the projected cashflows prepared by PGV in calculating the amount of royalties that would be due the State based on the geothermal netback method of valuing geothermal resources and 2) recommending to the State a methodology to be used in evaluating requests for royalty waivers.

PGV has considerable knowledge, expertise and experience in the development and operation of geothermal projects. Accordingly, I have not attempted to second guess PGV’s assumptions on the costs of developing and operating the project. My questions and comments have been formulated to obtain information that is relevant to evaluating PGV’s request for a royalty waiver and/or is necessary for the geothermal netback calculation.
Comments and Questions for PGV

1. PGV has indicated in the information submitted on December 11, 1990, that the ultimate term financial structure for the project has not been finalized and is largely dependent on the outcome of its royalty waiver request. Please explain what structures are being considered and what affect the royalty waiver has on the considerations.

2. In what ways will granting a royalty waiver for this project provide benefits to the State in terms of encouraging the development of geothermal resources?

3. What affect, if any, does the royalty waiver have on the financial viability of their project?

4. PGV has asked the State to waive 60% of its royalty. How was the 60% derived?

5. What is the project's estimated annual amount of gross electricity generation?

6. What is the project's estimated annual amount of tailgate electricity as measured on the high voltage side of the transformer?

7. What is the basis for using 33% of the electricity revenues as the value of the resource for royalty calculations? How does this percentage compare with other geothermal projects?

If you have any questions or comments on the above items or if you would like to discuss any other issues related to the projected cashflows prepared by PGV please give me a call.

Very truly yours,

Steven E. Morris
Puna Geothermal Venture
Calculation of Royalties Based on Geothermal Netback Method

Assumptions

<table>
<thead>
<tr>
<th>Source of Year One of Operation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Assumption</td>
<td></td>
</tr>
<tr>
<td>Electricity delivered (kwh)</td>
<td>PGV 209,330,000</td>
</tr>
<tr>
<td>Electricity generated (kwh)</td>
<td>Estimated 213,516,600</td>
</tr>
<tr>
<td>Electricity tailgate (as measured on the high voltage side of the transformer) (kwh)</td>
<td>Estimated 211,423,300</td>
</tr>
<tr>
<td>Electricity revenues (energy and capacity)</td>
<td>PGV $16,671,000</td>
</tr>
<tr>
<td>Resource delivered (pounds)</td>
<td>Estimated 5184000000</td>
</tr>
<tr>
<td>Lease royalty rate</td>
<td>10.00%</td>
</tr>
<tr>
<td>S &amp; P BBB Industrial Bond Rate</td>
<td>Estimated 10.00%</td>
</tr>
<tr>
<td>Transmission-line costs</td>
<td></td>
</tr>
<tr>
<td>Capital costs</td>
<td>PGV $10,000,000</td>
</tr>
<tr>
<td>Salvage value</td>
<td>Estimated $0</td>
</tr>
<tr>
<td>Length of electric sales contracts (years)</td>
<td>PGV 35</td>
</tr>
<tr>
<td>Operating and maintenance costs</td>
<td>PGV $120,000</td>
</tr>
<tr>
<td>S &amp; P BBB Industrial Bond Rate</td>
<td>Estimated 10.00%</td>
</tr>
<tr>
<td>Cost rate - Depreciation Method (per/kwh)</td>
<td>Exhibit 4 0.006584</td>
</tr>
<tr>
<td>Cost rate - Return on Investment Method (per/kwh)</td>
<td>Exhibit 4 0.005245</td>
</tr>
<tr>
<td>Method used for netback calculation 1-Depreciation 2-Investment</td>
<td></td>
</tr>
</tbody>
</table>

Generating costs

<table>
<thead>
<tr>
<th>Source of Year One of Operation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Assumption</td>
<td></td>
</tr>
<tr>
<td>Capital costs</td>
<td>PGV $60,000,000</td>
</tr>
<tr>
<td>Salvage value</td>
<td>Estimated $6,000,000</td>
</tr>
<tr>
<td>Length of electric sales contracts (years)</td>
<td>PGV 35</td>
</tr>
<tr>
<td>Operating and maintenance costs</td>
<td>PGV $1,850,000</td>
</tr>
<tr>
<td>S &amp; P BBB Industrial Bond Rate</td>
<td>Estimated 10.00%</td>
</tr>
<tr>
<td>Cost rate - Depreciation Method (per/kwh)</td>
<td>Exhibit 4 0.041181</td>
</tr>
<tr>
<td>Cost rate - Return on Investment Method (per/kwh)</td>
<td>Exhibit 4 0.036765</td>
</tr>
<tr>
<td>Method used for netback calculation 1-Depreciation 2-Investment</td>
<td></td>
</tr>
</tbody>
</table>
Puna Geothermal Venture
Calculation of Royalties Based on Geothermal Netback Method

Year 1

Delivered Electricity .................. 209,330,000 kwh
Tailgate Electricity .. .................. 211,423,300 kwh

Value of delivered electricity .................. $16,671,000

Transportation deduction:

Transmission line costs (cost rate \( \times \) delivered electricity):

\[ $0.006584 \ \text{kwh} \times 209,330,000 \ \text{kwh} = $1,378,151 \quad (1,378,229) \]

Transmission as percentage of delivered value: 8.27%

Allowable deduction for royalty calculation

\( \frac{50\%}{6} \) of electricity value) .................. $1,378,151

Tailgate value of electricity .................. $15,292,849

Generating deduction

Generating costs (cost rate \( \times \) tailgate electricity):

\[ $0.041181 \ \text{kwh} \times 211,423,300 \ \text{kwh} = $8,706,653 \]

Generating costs as a percentage of tailgate value: 56.93%

Allowable deduction (2/3 of tailgate value) .................. $8,706,653

Value of geothermal production .................. $6,586,196

\% of total revenue .................. 39.51%

Royalty amount (value of geothermal production \( \times \) royalty rate) .......... $658,620

\% of total revenue .................. 3.95%

Gross Elect. Output (219,000,000 kWh)

\[ (25,000 \text{ kwh} \times 24 \text{ h} \times 365 \text{ days}) \]

or

\[ (232,183,800) \text{ PAV} \]

(28.5 MW \( \times \) 8760 \times 93\% efficiency)
Puna Geothermal Venture

Calculation of Royalties Based on Geothermal Netback Method

Year 2

Delivered Electricity ................... 209,330,000 kwh
Tailgate Electricity ..................... 211,423,300 kwh

Value of delivered electricity................................. $16,671,000

Transportation deduction:

Transmission line costs (cost rate x delivered electricity):

$0.006478 /kwh x 209,330,000 kwh = $1,356,022

Transmission as percentage of delivered value: 8.13%

Allowable deduction for royalty calculation
( 50% of electricity value)................................. $1,356,022

Tailgate value of electricity................................. $15,314,978

Generating deduction

Generating costs ( cost rate x tailgate electricity ):

$0.040892 /kwh x 211,423,300 kwh = $8,645,473

Generating costs as a percentage of tailgate value: 56.45%

Allowable deduction ( 2/3 of tailgate value ).............. $8,645,473

Value of geothermal production.............................. $6,669,505
% of total revenue.............................................. 40.01%
Royalty amount ( value of geothermal production x royalty rate )..... $666,950
% of total revenue.............................................. 4.00%
Puna Geothermal Venture
Calculation of Royalties Based on Geothermal Netback Method

Year 3

Delivered Electricity....................... 209,330,000 kwh
Tailgate Electricity...................... 211,423,300 kwh

Value of delivered electricity................................. $16,671,000

Transportation deduction:

Transmission line costs (cost rate x delivered electricity):

$0.006374 /kwh x 209,330,000 kwh = $1,334,188

Transmission as percentage of delivered value: 8.00%

Allowable deduction for royalty calculation
(50% of electricity value).......................... $1,334,188

Tailgate value of electricity................................. $15,336,812

Generating deduction

Generating costs (cost rate x tailgate electricity):

$0.040624 /kwh x 211,423,300 kwh = $8,588,872

Generating costs as a percentage of tailgate value: 56.00%

Allowable deduction (2/3 of tailgate value).......... $8,588,872

Value of geothermal production............................... $6,747,940

% of total revenue............................................. 40.48%

Royalty amount (value of geothermal production x royalty rate)...... $674,794

% of total revenue............................................. 4.05%
Puna Geothermal Venture
Calculation of Royalties Based on Geothermal Netback Method
Year 4

Delivered Electricity ......................... 209,330,000 kwh
Tailgate Electricity ......................... 211,423,300 kwh

Value of delivered electricity ...................... $17,272,000

Transportation deduction:
Transmission line costs (cost rate x delivered electricity):
$0.006271 /kwh x 209,330,000 kwh = $1,312,662
Transmission as percentage of delivered value: 7.60%
Allowable deduction for royalty calculation
(50% of electricity value) .................. $1,312,662

Tailgate value of electricity ...................... $15,959,338

Generating deduction
Generating costs (cost rate x tailgate electricity):
$0.040379 /kwh x 211,423,300 kwh = $8,537,081
Generating costs as a percentage of tailgate value: 53.49%
Allowable deduction (2/3 of tailgate value) ........ $8,537,081

Value of geothermal production ...................... $7,422,258
% of total revenue ................................ 42.97%
Royalty amount (value of geothermal production x royalty rate) .... $742,226
% of total revenue ................................ 4.30%
Puna Geothermal Venture
Calculation of Royalties Based on Geothermal Netback Method

Year 5

Delivered Electricity.................. 209,330,000 kwh
Tailgate Electricity............. 211,423,300 kwh

Value of delivered electricity.......................... $17,938,000

Transportation deduction:

Transmission line costs (cost rate x delivered electricity):
$0.006169 /kwh x 209,330,000 kwh = $1,291,460

Transmission as percentage of delivered value: 7.20%

Allowable deduction for royalty calculation ( 50% of electricity value)................. $1,291,460

Tailgate value of electricity......................... $16,646,540

Generating deduction

Generating costs (cost rate x tailgate electricity):
$0.040158 /kwh x 211,423,300 kwh = $8,490,338

Generating costs as a percentage of tailgate value: 51.00%

Allowable deduction ( 2/3 of tailgate value )............ $8,490,338

Value of geothermal production.............................. $8,156,202
% of total revenue........................................... 45.47%

Royalty amount (value of geothermal production x royalty rate)........ $815,620
% of total revenue........................................... 4.55%
Delivered Electricity: 209,330,000 kwh
Tailgate Electricity: 211,423,300 kwh

Value of delivered electricity: $18,638,000

Transportation deduction:
Transmission line costs (cost rate x delivered electricity):
$0.006070 /kwh x 209,330,000 kwh = $1,270,599

Transmission as percentage of delivered value: 6.82%
Allowable deduction for royalty calculation (50% of electricity value): $1,270,599

Tailgate value of electricity: $17,367,401

Generating deduction
Generating costs (cost rate x tailgate electricity):
$0.039962 /kwh x 211,423,300 kwh = $8,448,897

Generating costs as a percentage of tailgate value: 48.65%
Allowable deduction (2/3 of tailgate value): $8,448,897

Value of geothermal production: $8,918,504
% of total revenue: 47.85%

Royalty amount (value of geothermal production x royalty rate): $891,850
% of total revenue: 4.79%
Puna Geothermal Venture
Calculation of Royalties Based on Geothermal Netback Method
Year 7

Delivered Electricity.......................... 209,330,000 kwh
Tailgate Electricity......................... 211,423,300 kwh

Value of delivered electricity.......................................................... $18,638,000

Transportation deduction:
Transmission line costs (cost rate x delivered electricity):

$0.005972 /kwh x 209,330,000 kwh = $1,250,095

Transmission as percentage of delivered value: 6.71%

Allowable deduction for royalty calculation
( 50% of electricity value)........................................................... $1,250,095

Tailgate value of electricity.......................................................... $17,387,905

Generating deduction

Generating costs ( cost rate x tailgate electricity ):

$0.039792 /kwh x 211,423,300 kwh = $8,413,023

Generating costs as a percentage of tailgate value: 48.38%

Allowable deduction ( 2/3 of tailgate value ).......................... $8,413,023

Value of geothermal production................................. $8,974,882

% of total revenue................................................................. 48.15%

Royalty amount ( value of geothermal production x royalty rate ) $897,488

% of total revenue................................................................. 4.82%
Puna Geothermal Venture
Calculation of Royalties Based on Geothermal Netback Method
Year 8

Delivered Electricity.......................... 209,330,000 kwh
Tailgate Electricity.......................... 211,423,300 kwh

Value of delivered electricity.......................... $20,144,000

Transportation deduction:

Transmission line costs (cost rate x delivered electricity):

$0.005876 /kwh x 209,330,000 kwh = $1,229,967

Transmission as percentage of delivered value: 6.11%

Allowable deduction for royalty calculation
(50% of electricity value).......................... $1,229,967

Tailgate value of electricity.......................... $18,914,033

Generating deduction

Generating costs (cost rate x tailgate electricity):

$0.039650 /kwh x 211,423,300 kwh = $8,382,993

Generating costs as a percentage of tailgate value: 44.32%

Allowable deduction (2/3 of tailgate value)............. $8,382,993

Value of geothermal production.......................... $10,531,040

% of total revenue........................................ 52.28%

Royalty amount (value of geothermal production x royalty rate)........ $1,053,104

% of total revenue........................................ 5.23%
**Puna Geothermal Venture**

**Calculation of Transmission-line Cost Rate**

**Depreciation Method**

Cost Rate = \( E + D + \frac{I}{F} \)

- **E** = Operating and maintenance expenses
- **D** = Depreciation
- **I** = Return on undepreciated investment (based on 10%)
- **F** = Annual delivered electricity

**Year**

<table>
<thead>
<tr>
<th>Year</th>
<th>((E)) O &amp; M</th>
<th>((D)) Depreciation</th>
<th>((I)) Return on Undepreciated Investment</th>
<th>((F)) Electricity Delivered</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$120,000</td>
<td>$285,714</td>
<td>$1,000,000</td>
<td>213,516,600</td>
</tr>
<tr>
<td>2</td>
<td>$126,000</td>
<td>$285,714</td>
<td>$971,429</td>
<td>213,516,600</td>
</tr>
<tr>
<td>3</td>
<td>$132,300</td>
<td>$285,714</td>
<td>$942,857</td>
<td>213,516,600</td>
</tr>
<tr>
<td>4</td>
<td>$138,915</td>
<td>$285,714</td>
<td>$914,286</td>
<td>213,516,600</td>
</tr>
<tr>
<td>5</td>
<td>$145,861</td>
<td>$285,714</td>
<td>$885,714</td>
<td>213,516,600</td>
</tr>
<tr>
<td>6</td>
<td>$153,154</td>
<td>$285,714</td>
<td>$857,143</td>
<td>213,516,600</td>
</tr>
<tr>
<td>7</td>
<td>$160,811</td>
<td>$285,714</td>
<td>$828,571</td>
<td>213,516,600</td>
</tr>
<tr>
<td>8</td>
<td>$168,852</td>
<td>$285,714</td>
<td>$800,000</td>
<td>213,516,600</td>
</tr>
</tbody>
</table>

**Investment Balance** (begin yr)

<table>
<thead>
<tr>
<th>Year</th>
<th>(\text{Annual Depreciation})</th>
<th>(\text{Depreciated Investment (end of year)})</th>
<th>(\text{Return on Investment})</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$285,714</td>
<td>$9,714,286</td>
<td>$1,000,000</td>
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<tr>
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<td>$285,714</td>
<td>$9,428,571</td>
<td>$971,429</td>
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<tr>
<td>3</td>
<td>$285,714</td>
<td>$9,142,857</td>
<td>$942,857</td>
</tr>
<tr>
<td>4</td>
<td>$285,714</td>
<td>$8,857,143</td>
<td>$914,286</td>
</tr>
<tr>
<td>5</td>
<td>$285,714</td>
<td>$8,571,429</td>
<td>$885,714</td>
</tr>
<tr>
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<td>$8,285,714</td>
<td>$857,143</td>
</tr>
<tr>
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<td>$285,714</td>
<td>$8,000,000</td>
<td>$828,571</td>
</tr>
<tr>
<td>8</td>
<td>$285,714</td>
<td>$7,714,286</td>
<td>$800,000</td>
</tr>
</tbody>
</table>
Puna Geothermal Venture

Calculation of Transmission-line Cost Rate

Return on Investment Method

Cost Rate = E + R / F

E = Operating and maintance expenses

R = Return on investment (based on 10%) (F)

F = Annual delivered electricity

\[ \text{Cost Rate} = 0.005245 / \text{kwh} \]

\[ \begin{array}{cccccc}
\text{Year} & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\
\text{Cost Rate} & 0.005274 & 0.005303 & 0.005334 & 0.005367 & 0.005401 & 0.005437 & 0.005474 & \\
\end{array} \]

\( \text{Electricity Delivered} \) = 213,516,600

\( (F) \)

\( (R) \)

\( (E) \)

\( \text{Rate of} \ 
\text{Return} \)

\( \text{Return on} \ 
\text{Investment} \)

\( \text{O} \ & \ \text{M} \)

\begin{array}{cccccc}
\text{Year} & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\
\text{Investment} & $10,000,000 & $10,000,000 & $10,000,000 & $10,000,000 & $10,000,000 & $10,000,000 & $10,000,000 & $10,000,000 \\
\text{Rate of Return} & 10.00\% & 10.00\% & 10.00\% & 10.00\% & 10.00\% & 10.00\% & 10.00\% & 10.00\% \\
\text{Return on Investment} & $1,000,000 & $1,000,000 & $1,000,000 & $1,000,000 & $1,000,000 & $1,000,000 & $1,000,000 & $1,000,000 \\
\text{O} \ & \ \text{M} & $120,000 & $126,000 & $132,300 & $138,915 & $145,861 & $153,154 & $160,811 & $168,852 \\
\end{array} \)
Puna Geothermal Venture
Calculation of Generating Cost Rate
Depreciation Method

Cost Rate = \( E + D + \frac{I}{F} \)

\( E \) = Operating and maintenance expenses

\( D \) = Depreciation (based on 10%)

\( I \) = Return on undepreciated investment

\( F \) = Annual delivered electricity

Cost Rate = \( 0.041181 \) /kwh

<table>
<thead>
<tr>
<th>Year</th>
<th>(E) O &amp; M</th>
<th>(D) Depreciation</th>
<th>(I) Return on Undepreciated Investment</th>
<th>(F) Electricity Delivered</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$1,850,000</td>
<td>$1,542,857</td>
<td>$5,400,000</td>
<td>213,516,600</td>
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<tr>
<td>2</td>
<td>$1,942,500</td>
<td>$1,542,857</td>
<td>$5,245,714</td>
<td>213,516,600</td>
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<tr>
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<td>$4,937,143</td>
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<tr>
<td>5</td>
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<td>$1,542,857</td>
<td>$4,782,857</td>
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<tr>
<td>6</td>
<td>$2,361,121</td>
<td>$1,542,857</td>
<td>$4,628,571</td>
<td>213,516,600</td>
</tr>
<tr>
<td>7</td>
<td>$2,479,177</td>
<td>$1,542,857</td>
<td>$4,474,286</td>
<td>213,516,600</td>
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<tr>
<td>8</td>
<td>$2,603,136</td>
<td>$1,542,857</td>
<td>$4,320,000</td>
<td>213,516,600</td>
</tr>
</tbody>
</table>

Investment Balance (beginning of year) | Annual Depreciation | Depreciated Investment (end of year) | Return on Investment |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 $54,000,000</td>
<td>$1,542,857</td>
<td>$52,457,143</td>
<td>$5,400,000</td>
</tr>
<tr>
<td>2 $52,457,143</td>
<td>$1,542,857</td>
<td>$50,914,286</td>
<td>$5,245,714</td>
</tr>
<tr>
<td>3 $50,914,286</td>
<td>$1,542,857</td>
<td>$49,371,429</td>
<td>$5,091,429</td>
</tr>
<tr>
<td>4 $49,371,429</td>
<td>$1,542,857</td>
<td>$47,828,571</td>
<td>$4,937,143</td>
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<tr>
<td>5 $47,828,571</td>
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<td>$46,285,714</td>
<td>$4,782,857</td>
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<tr>
<td>6 $46,285,714</td>
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<td>$43,200,000</td>
<td>$4,474,286</td>
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<tr>
<td>8 $43,200,000</td>
<td>$1,542,857</td>
<td>$41,657,143</td>
<td>$4,320,000</td>
</tr>
</tbody>
</table>
Puna Geothermal Venture

Calculation of Generating Cost Rate

Return on Investment Method

Cost Rate = E + R / F

E = Operating and maintenance expenses

R = Return on investment \( \text{based on 10\%} \)

F = Annual delivered electricity \( \text{see page 13} \)

<table>
<thead>
<tr>
<th>Year</th>
<th>Cost Rate (kwh)</th>
<th>Year</th>
<th>Rate of Return</th>
<th>Return on Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.036765</td>
<td>1</td>
<td>10.00%</td>
<td>$6,000,000</td>
</tr>
<tr>
<td>2</td>
<td>0.036765</td>
<td>2</td>
<td>10.00%</td>
<td>$6,000,000</td>
</tr>
<tr>
<td>3</td>
<td>0.036765</td>
<td>3</td>
<td>10.00%</td>
<td>$6,000,000</td>
</tr>
<tr>
<td>4</td>
<td>0.036765</td>
<td>4</td>
<td>10.00%</td>
<td>$6,000,000</td>
</tr>
<tr>
<td>5</td>
<td>0.036765</td>
<td>5</td>
<td>10.00%</td>
<td>$6,000,000</td>
</tr>
<tr>
<td>6</td>
<td>0.036765</td>
<td>6</td>
<td>10.00%</td>
<td>$6,000,000</td>
</tr>
<tr>
<td>7</td>
<td>0.036765</td>
<td>7</td>
<td>10.00%</td>
<td>$6,000,000</td>
</tr>
<tr>
<td>8</td>
<td>0.036765</td>
<td>8</td>
<td>10.00%</td>
<td>$6,000,000</td>
</tr>
</tbody>
</table>

Electricity Delivered: 213,516,600

O & M: $1,850,000

Investment: $60,000,000
### Puna Geothermal Venture
Calculation of Royalty Waiver Based on Expanded Netback Method

**Assumptions**

<table>
<thead>
<tr>
<th>Source of Assumption</th>
<th>Year One of Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electricity delivered (kwh)</strong></td>
<td>PGV 209,330,000</td>
</tr>
<tr>
<td><strong>Electricity generated (kwh)</strong></td>
<td>Estimated 213,516,600</td>
</tr>
<tr>
<td><strong>Electricity tailgate (as measured on the high voltage side of the transformer) (kwh)</strong></td>
<td>Estimated 211,423,300</td>
</tr>
<tr>
<td><strong>Electricity revenues (energy and capacity)</strong></td>
<td>PGV $16,671,000</td>
</tr>
<tr>
<td><strong>Resource delivered (pounds)</strong></td>
<td>Estimated 5184000000</td>
</tr>
<tr>
<td><strong>Lease royalty rate</strong></td>
<td>10.00%</td>
</tr>
<tr>
<td><strong>S &amp; P BBB Industrial Bond Rate (150%)</strong></td>
<td>Estimated 15.00%</td>
</tr>
<tr>
<td><strong>Transmission-line costs</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Capital costs</strong></td>
<td>PGV $10,000,000</td>
</tr>
<tr>
<td><strong>Salvage value</strong></td>
<td>Estimated $0</td>
</tr>
<tr>
<td><strong>Length of electric sales contracts (years)</strong></td>
<td>PGV 35</td>
</tr>
<tr>
<td><strong>Operating and maintenance costs</strong></td>
<td>PGV $120,000</td>
</tr>
<tr>
<td><strong>S &amp; P BBB Industrial Bond Rate</strong></td>
<td>Estimated 15.00%</td>
</tr>
<tr>
<td><strong>Cost rate - Depreciation Method (per/kwh)</strong></td>
<td>Exhibit 7 0.008925</td>
</tr>
<tr>
<td><strong>Cost rate - Return on Investment Method (per/kwh)</strong></td>
<td>Exhibit 7 0.007587</td>
</tr>
<tr>
<td><strong>Method used for netback calculation</strong></td>
<td>1-Depreciation 2-Investment</td>
</tr>
</tbody>
</table>

**Generating costs**

<table>
<thead>
<tr>
<th>Source of Assumption</th>
<th>Year One of Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Capital costs</strong></td>
<td>PGV $60,000,000</td>
</tr>
<tr>
<td><strong>Salvage value</strong></td>
<td>Estimated $6,000,000</td>
</tr>
<tr>
<td><strong>Length of electric sales contracts (years)</strong></td>
<td>PGV 35</td>
</tr>
<tr>
<td><strong>Operating and maintenance costs</strong></td>
<td>PGV $1,850,000</td>
</tr>
<tr>
<td><strong>S &amp; P BBB Industrial Bond Rate</strong></td>
<td>Estimated 15.00%</td>
</tr>
<tr>
<td><strong>Cost rate - Depreciation Method (per/kwh)</strong></td>
<td>Exhibit 7 0.041181</td>
</tr>
<tr>
<td><strong>Cost rate - Return on Investment Method (per/kwh)</strong></td>
<td>Exhibit 7 0.036765</td>
</tr>
<tr>
<td><strong>Method used for netback calculation</strong></td>
<td>1-Depreciation 2-Investment</td>
</tr>
</tbody>
</table>
### Steamfield costs

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital costs</td>
<td>PGV $20,000,000</td>
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<tr>
<td>Salvage value</td>
<td>Estimated $2,000,000</td>
</tr>
<tr>
<td>Length of electric sales contracts (years)</td>
<td>PGV 35</td>
</tr>
<tr>
<td>Operating and maintenance costs</td>
<td>PGV $221,000</td>
</tr>
<tr>
<td>S &amp; P BBB Industrial Bond Rate</td>
<td>Estimated 15.00%</td>
</tr>
<tr>
<td>Cost rate - Depreciation Method (per/pound)</td>
<td>Exhibit 7 0.000663</td>
</tr>
<tr>
<td>Cost rate - Return on Investment Method (per/lbs)</td>
<td>Exhibit 7 0.000621</td>
</tr>
</tbody>
</table>

### Method used for netback calculation

1. Depreciation
2. Investment
Puna Geothermal Venture
Calculation of Royalty Waiver Based on Expanded Netback Method
Year 1

Delivered Electricity.............................................. 209,330,000 kwh
Tailgate Electricity............................................... 211,423,300 kwh

Value of delivered electricity........................................ $16,671,000

Transportation deduction:
Transmission line costs (cost rate x delivered electricity):
$0.008925 /kwh x 209,330,000 kwh = $1,868,347

Transmission as percentage of delivered value: 11.21%
Allowable deduction for waiver calculation...................... $1,868,347

Tailgate value of electricity........................................ $14,802,653

Generating deduction
Generating costs (cost rate x tailgate electricity):
$0.053827 /kwh x 211,423,300 kwh = $11,380,182

Generating costs as a percentage of tailgate value: 76.88%
Allowable deduction for waiver calculation...................... $11,380,182

Value of geothermal production.................................... $3,422,471

Steamfield deduction
Steamfield cost (cost rate x delivered resource):
$0.000663 /lb x 5184000000 lbs = $3,435,286

Steamfield costs as a percentage of geothermal production value: 100.37%
Allowable deduction for waiver calculation...................... $3,435,286

Value available for royalty payments............................. ($12,815)

Royalty amount as calculated by the netback method............. $658,620

Amount due................................................................. $0
Puna Geothermal Venture
Calculation of Royalty Waiver Based on Expanded Netback Method
Year 2

Delivered Electricity............... 209,330,000 kwh
Tailgate Electricity................. 211,423,300 kwh

Value of delivered electricity.......................... $16,671,000

Transportation deduction:
Transmission line costs (cost rate x delivered electricity):
$0.008753 /kwh x 209,330,000 kwh = $1,832,213

Transmission as percentage of delivered value: 10.99%

Allowable deduction for waiver calculation.............. $1,832,213

Tailgate value of electricity........................... $14,838,787

Generating deduction
Generating costs (cost rate x tailgate electricity):
$0.053176 /kwh x 211,423,300 kwh = $11,242,616

Generating costs as a percentage of tailgate value: 75.77%

Allowable deduction for waiver calculation.............. $11,242,616

Value of geothermal production........................... $3,596,172

Steamfield deduction
Steamfield cost (cost rate x delivered resource):
$0.000650 /lb x 518,000,000 lbs = $3,369,193

Steamfield costs as a percentage of geothermal production value: 93.69%

Allowable deduction for waiver calculation.............. $3,369,193

Value available for royalty payments.................. $226,979

Royalty amount as calculated by the netback method...... $666,950

Amount due............................................... $226,979
Puna Geothermal Venture
Calculation of Royalty Waiver Based on Expanded Netback Method
Year 3

Delivered Electricity .................. 209,330,000 kwh
Tailgate Electricity .................. 211,423,300 kwh

Value of delivered electricity ............... $16,671,000

Transportation deduction:
  Transmission line costs (cost rate x delivered electricity):
  $0.008582 /kwh x 209,330,000 kwh = $1,796,373
  Transmission as percentage of delivered value: 10.78%
  Allowable deduction for waiver calculation ........ $1,796,373

Tailgate value of electricity ................ $14,874,627

Generating deduction
  Generating costs (cost rate x tailgate electricity):
  $0.052547 /kwh x 211,423,300 kwh = $11,109,629
  Generating costs as a percentage of tailgate value: 74.69%
  Allowable deduction for waiver calculation ........ $11,109,629

Value of geothermal production .................. $3,764,999

Steamfield deduction
  Steamfield cost (cost rate x delivered resource):
  $0.000637 /lb x 518,400,000 lbs = $3,303,653
  Steamfield costs as a percentage of geothermal production value: 87.75%
  Allowable deduction for waiver calculation ........ $3,303,653

Value available for royalty payments ................ $461,346
Royalty amount as calculated by the netback method ........ $674,794
Amount due ............................................ $461,346
Puna Geothermal Venture

Calculation of Royalty Waiver Based on Expanded Netback Method

Year 4

Delivered Electricity: 209,330,000 kwh
Tailgate Electricity: 211,423,300 kwh

Value of delivered electricity: $16,671,000

Transportation deduction:
Transmitton line costs (cost rate x delivered electricity):

\[
\text{Cost rate} \times \text{Delivered electricity} = \frac{0.008412}{\text{kwh}} \times 209,330,000 \text{ kWh} = 1,760,841
\]

Transmission as percentage of delivered value: 10.56%
Allowable deduction for waiver calculation: $1,760,841

Tailgate value of electricity: $14,910,159

Generating deduction
Generating costs (cost rate x tailgate electricity):

\[
\text{Cost rate} \times \text{Tailgate electricity} = \frac{0.051941}{\text{kwh}} \times 211,423,300 \text{ kWh} = 10,981,450
\]

Generating costs as a percentage of tailgate value: 73.65%
Allowable deduction for waiver calculation: $10,981,450

Value of geothermal production: $3,928,709

Steamfield deduction
Steamfield cost (cost rate x delivered resource):

\[
\text{Cost rate} \times \text{Delivered resource} = \frac{0.000625}{\text{lb}} \times 518,400,000 \text{ lbs} = 3,238,692
\]

Steamfield costs as a percentage of geothermal production value: 82.44%
Allowable deduction for waiver calculation: $3,238,692

Value available for royalty payments: $690,016
Royalty amount as calculated by the netback method: $742,226
Amount due: $690,016
Puna Geothermal Venture
Calculation of Royalty Waiver Based on Expanded Netback Method
Year 5

Delivered Electricity......................... 209,330,000 kwh
Tailgate Electricity......................... 211,423,300 kwh

Value of delivered electricity.................. $16,671,000

Transportation deduction:
Transmission line costs (cost rate x delivered electricity):

$0.008244 /kwh x 209,330,000 kwh = \$1,725,634

Transmission as percentage of delivered value: 10.35%
Allowable deduction for waiver calculation.............. \$1,725,634

Tailgate value of electricity.......................... \$14,945,366

Generating deduction
Generating costs (cost rate x tailgate electricity):

$0.051358 /kwh x 211,423,300 kwh = \$10,858,321

Generating costs as a percentage of tailgate value: 72.65%
Allowable deduction for waiver calculation.............. \$10,858,321

Value of geothermal production........................ \$4,087,045

Steamfield deduction
Steamfield cost (cost rate x delivered resource):

$0.000612 /lb x 518,400,000 lbs = \$3,174,341

Steamfield costs as a percentage of geothermal production value: 77.67%
Allowable deduction for waiver calculation.............. \$3,174,341

Value available for royalty payments........................ \$912,704
Royalty amount as calculated by the netback method................ \$815,620
Amount due............................................... \$815,620
Puna Geothermal Venture

Calculation of Royalty Waiver Based on Expanded Netback Method
Year 6

Delivered Electricity .......................  209,330,000 kwh
Tailgate Electricity .........................  211,423,300 kwh

Value of delivered electricity ................ $16,671,000

Transportation deduction:
  Transmission line costs (cost rate x delivered electricity):
  \[ \$0.008077 \text{ /kwh} \times 209,330,000 \text{ kwh} = \$1,690,767 \]
  Transmission as percentage of delivered value: 10.14%
  Allowable deduction for waiver calculation .......... $1,690,767

Tailgate value of electricity .................. $14,980,233

Generating deduction
  Generating costs (cost rate x tailgate electricity):
  \[ \$0.050801 \text{ /kwh} \times 211,423,300 \text{ kwh} = \$10,740,494 \]
  Generating costs as a percentage of tailgate value: 71.70%
  Allowable deduction for waiver calculation .......... $10,740,494

Value of geothermal production ................ $4,239,739

Steamfield deduction
  Steamfield cost (cost rate x delivered resource):
  \[ \$0.000600 \text{ /lb} \times 5184000000 \text{ lbs} = \$3,110,630 \]
  Steamfield costs as a percentage of geothermal production value: 73.37%
  Allowable deduction for waiver calculation .......... $3,110,630

Value available for royalty payments ............ $1,129,110

Royalty amount as calculated by the netback method ......... $891,850

Amount due .................................. $891,850
Puna Geothermal Venture

Calculation of Royalty Waiver Based on Expanded Netback Method
Year 7

Delivered Electricity......................... 209,330,000 kwh
Tailgate Electricity.......................... 211,423,300 kwh

Value of delivered electricity.......................... $16,671,000

Transportation deduction:
Transmission line costs (cost rate x delivered electricity):
$0.007912 /kwh x 209,330,000 kwh = $1,656,258
Transmission as percentage of delivered value: 9.93%
Allowable deduction for waiver calculation.............. $1,656,258

Tailgate value of electricity.......................... $15,014,742

Generating deduction
Generating costs ( cost rate x tailgate electricity ):
$0.050270 /kwh x 211,423,300 kwh = $10,628,233
Generating costs as a percentage of tailgate value: 70.79%
Allowable deduction for waiver calculation.............. $10,628,233

Value of geothermal production.......................... $4,386,510

Steamfield deduction
Steamfield cost ( cost rate x delivered resource ):
$0.000588 /lb x 518400000 lbs = $3,047,590
Steamfield costs as a percentage of geothermal production value: 69.48%
Allowable deduction for waiver calculation.............. $3,047,590

Value available for royalty payments.......................... $1,338,920

Royalty amount as calculated by the netback method................. $897,488
Amount due............................................ $897,488
Puna Geothermal Venture

Calculation of Royalty Waiver Based on Expanded Netback Method
Year 8

Delivered Electricity ......................... 209,330,000 kwh
Tailgate Electricity ......................... 211,423,300 kwh

Value of delivered electricity .................. $16,671,000

Transportation deduction:
  Transmission line costs (cost rate x delivered electricity):
  
  $0.007749 /kwh  x  209,330,000 kwh = $1,622,124

  Transmission as percentage of delivered value: 9.73%

  Allowable deduction for waiver calculation ........................ $1,622,124

Tailgate value of electricity .................... $15,048,876

Generating deduction
  Generating costs (cost rate x tailgate electricity):

  $0.049767 /kwh  x  211,423,300 kwh = $10,521,817

  Generating costs as a percentage of tailgate value: 69.92%

  Allowable deduction for waiver calculation ........................ $10,521,817

Value of geothermal production .................. $4,527,060

Steamfield deduction
  Steamfield cost (cost rate x delivered resource):

  $0.000576 /lb  x  518,400,000 lbs = $2,985,255

  Steamfield costs as a percentage of geothermal production value: 65.94%

  Allowable deduction for waiver calculation ........................ $2,985,255

Value available for royalty payments .......... $1,541,805

Royalty amount as calculated by the netback method ................... $1,053,104

Amount due ........................................... $1,053,104
Puna Geothermal Venture

Calculation of Transmission-line Cost Rate

Depreciation Method

Cost Rate = \( E + D + I / F \)

\( E \) = Operating and maintenance expenses
\( D \) = Depreciation
\( I \) = Return on undepreciated investment
\( F \) = Annual delivered electricity

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<th>Year</th>
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<th>( D )</th>
<th>( I )</th>
<th>( F )</th>
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### Yearly Investment, Depreciation, and Return

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<th>Investment Balance (begin yr)</th>
<th>Annual Depreciation</th>
<th>Depreciated Investment (end of year)</th>
<th>Return on Investment</th>
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### Operating and Maintenance Expenses

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<td>$160,811</td>
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<tr>
<td>8</td>
<td>$168,852</td>
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</tbody>
</table>
Cost Rate = E + R / F

E = Operating and maintenance expenses
R = Return on investment
F = Annual delivered electricity

Cost Rate = 0.007587 /kwh
0.007615
0.007645
0.007676
0.007708
0.007743
0.007778
0.007816

Year | Electricity Delivered
---|---
1 | 213,516,600

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Puna Geothermal Venture

Calculation of Generating Cost Rate

Depreciation Method

Cost Rate = \( E + D + I / F \)

- \( E \) = Operating and maintenance expenses
- \( D \) = Depreciation
- \( I \) = Return on undepreciated investment
- \( F \) = Annual delivered electricity

<table>
<thead>
<tr>
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<th>( I )</th>
<th>( F )</th>
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<table>
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<th>(I)</th>
<th>(F)</th>
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Puna Geothermal Venture
Calculation of Generating Cost Rate

Return on Investment Method

Cost Rate = E + R / F

E = Operating and maintenance expenses
R = Return on investment
F = Annual delivered electricity

Cost Rate = 0.050816 /kwh

<table>
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<th>Year</th>
<th>Electricity Delivered (F)</th>
<th>Rate of Return (R)</th>
<th>Return on Investment (E)</th>
<th>O &amp; M</th>
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Puna Geothermal Venture
Calculation of Steamfield Cost Rate
Depreciation Method

Cost Rate = E + D + I / F
E = Operating and maintenance expenses
D = Depreciation
I = Return on undepreciated investment
F = Annual delivered resource (pounds of steam)

Cost Rate = 0.000663 /pound of steam
0.000650
0.000653
0.000625
0.000612
0.000600
0.000588
0.000576

<table>
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<tr>
<th>Year</th>
<th>(E) O &amp; M</th>
<th>(D) Depreciation</th>
<th>(I) Return on Undepreciated Investment</th>
<th>(F) Resource Delivered</th>
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Per Morris -
5,184,000,000 lbs / 24 hrs / 365 days = 591,781 lbs/hr for 25 MW
591,781 / 25 = 23,671 lbs/MW

Per PGE -
480,000 lbs/hr for 25 MW plant
480,000 / 25 = 19,200 lbs/MW

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<th>Year</th>
<th>Investment Balance (beginning of year)</th>
<th>Annual Depreciation</th>
<th>Depreciated Investment (end of year)</th>
<th>Return on Investment</th>
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Puna Geothermal Venture
Calculation of Steamfield Cost Rate
Return on Investment Method

Cost Rate = \( E + \frac{R}{F} \)

\( E \) = Operating and maintenance expenses
\( R \) = Return on investment
\( F \) = Annual delivered resource (pounds of steam)

<table>
<thead>
<tr>
<th>Year</th>
<th>Investment</th>
<th>Rate of Return</th>
<th>(R) Return on Investment</th>
<th>(E) Investment</th>
<th>(F) Resource Delivered</th>
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<td>4</td>
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<td>$310,969</td>
<td>5184000000</td>
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</table>

Cost Rate = 0.000621 /pound of steam

0.000623
0.000626
0.000628
0.000631
0.000633
0.000636
0.000639