The tax treatment of expenditure on geothermal wells

An officials' issues paper

December 2005

Prepared by the Policy Advice Division of the Inland Revenue Department and by the New Zealand Treasury

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Chapter 1

INTRODUCTION

1.1 Ensuring security of electricity supply is a critical issue for all New Zealanders. The relatively high global oil prices and the run down of the Maui gas field make alternative energy sources for power generation attractive. It is against this background that officials have been looking at a number of tax issues relating to exploration and development of geothermal energy.

1.2 Geothermal energy has been used for power generation in New Zealand since the 1950s. While the government undertook early geothermal exploration and development, it is now being done by commercial businesses, for whom tax is obviously an important matter.

1.3 Taxpayers involved in the power generation industry have identified two tax-related problems:

- the non-deductibility of expenditure incurred in exploration drilling when the geothermal well is not subsequently used for production purposes; and

- the non-deductibility of expenditure on drilling a geothermal well, in a productive field, when the resulting well is unusable.

1.4 This paper, which has been prepared by officials from the Policy Advice Division of Inland Revenue and from the Treasury, outlines the two problems and suggests a range of possible solutions. It seeks views on the suggested changes before we make recommendations to the government on the matter. The government has indicated that it would like to see legislative changes included in a taxation bill to be introduced in early 2006.

Summary of suggested legislative changes

1.5 An "exploration well" would be a well drilled before a company applies for resource consents to develop a geothermal field. Furthermore:

- The cost of exploration wells would be amortised and the value of the annual deduction would be a straight line rate of 11 per cent of the costs of drilling.

- Tax deductions for exploration wells would be allowed from the date that well completion testing begins. Failed exploration drilling would be amortised at the same rates as successful wells. The possibility of failed wells is taken into account in the amortisation rate.

- Expenditure on drilling geothermal wells incurred after the date that the first application is made to develop a geothermal field would have to be capitalised and treated under normal depreciation rules.

1.6 It is also suggested that a write-off for the value of a geothermal well be allowed in limited circumstances. For wells drilled in the production phase, a tax deduction would be allowed if the well could not be used and the expenditure was written off for accounting purposes. For expenditure incurred on wells when the field is subsequently abandoned, a deduction for losses would be allowed if a geothermal well were sold or the rights to develop a geothermal field were abandoned.

1.7 The suggested changes would apply from the 2003-04 income tax year.

How the changes would work – example

Hotwater Co is looking for a geothermal field that is suitable for its business of power generation. It has a resource consent to explore the Waiariki field and after initial survey work, it drills ten exploration wells. On the basis of the information provided by these wells, Hotwater Co decides to build a power station on the field. It lodges resource consent applications to develop the field, including water use, water discharge and building consents.

Under the suggested approach, the cost of the first ten exploration wells would be capitalised and amortised. The annual deduction is 11 percent of cost, from the date that the well's completion testing starts. If the resource management applications are unsuccessful or the project is subsequently abandoned any resulting losses can be written off.

In this case, Hotwater Co is committed to use the field for production purposes. It decides to drill two more wells after lodging applications for the necessary resource consent. The tax implications of this decision, under the suggested changes, are that this expenditure would be capitalised as field development and would be subject to the normal depreciation rules. In other words, the expenditure would be deemed to be incurred for production wells, since it was incurred after the exploration drilling phase. It would be depreciable over 20 years, the current estimate of estimated useful life, from the date that the wells are in use or available for use.

How to make a submission on the suggested changes

1.8 We would appreciate receiving any comments on the suggested changes by 31 January 2006.

1.9 Submissions should be sent to:

Geothermal expenditure project
C/- Deputy Commissioner, Policy
Policy Advice Division
Inland Revenue Department
P O Box 2198
Wellington
New Zealand

1.10 Alternatively, submissions can be made in electronic form, in which case 'Geothermal expenditure project' should appear in the subject line. The electronic address is:

policy.webmaster@ird.govt.nz

1.11 Please note that submissions may be the subject of a request under New Zealand's Official Information Act 1982. The withholding of particular submissions on the grounds of privacy, or for any other reason, will be determined in accordance with that Act. If there is any part of your submission that you consider could be properly withheld under that Act (for example, for reasons of privacy), please indicate this clearly in your submission.

Chapter 2

THE CURRENT TAX TREATMENT OF EXPENDITURE ON GEOTHERMAL WELLS

2.1 For geothermal generation, the "fuel" largely remains a capital item, and it is important to get the tax treatment of capital costs as correct as possible.

2.2 The term "blackhole expenditure" is often used to describe expenditure such as that incurred on geothermal wells. The issue of blackhole expenditure on geothermal drilling has been raised in the context of:

- expenditure incurred in exploration drilling of wells that are not subsequently used for production purposes; and
- expenditure on production drilling that result in wells that cannot be used in the production process.

2.3 Analysis of these tax issues is made more problematic because it is difficult to define a successful exploration well or the contribution that a well makes toward any future income-earning asset.

2.4 When businesses spend money on exploration drilling, they do not know whether a well will be used for producing income. Not only are there the physical aspects of the field and each well to consider. There are also broader economic considerations, such as whether the business can make enough money from building a new power station. Thus a well could be successful in one sense, in that it produces enough steam to be used to generate power, but it may not be sensible to build a power station for the foreseeable future.

2.5 It is also difficult to know to what extent an exploration well, successful or otherwise, contributes towards a better understanding of the field and the location of any eventual production wells.

Geothermal energy and power generation

2.6 Geothermal power generation involves finding and harnessing a geothermal resource. The stages of developing a geothermal field for power generation include:

- *discovery phase*: determining that a geothermal resource exists and warrants further examination;

- *an exploration phase*: determining the size, quality and viability of using the geothermal field to generate electricity; and

- *production phase*: developing the power station/steam field concept, getting the necessary resource and building consents, drilling production wells and building the power station.

2.7 Geothermal exploration and production are managed under the Resource Management Act 1991. Local regional councils are the organisations responsible for the resource consenting processes. In practice, there are separate resource consents for the exploration phase and the production phase.

2.8 Under the current resource consent process there is no certainty that the company that does the initial exploration will be the company that develops the geothermal field. Thus it is possible that the first exploration company could be left with exploration wells on a field that another company takes into the production phase. In practice, the initial explorer will have the advantage of additional information from its exploration drilling programme. It should also have developed a workable relationship with local landowners and other interest groups.

2.9 The major risks with trying to harness geothermal energy are associated with the fluid conditions (and the risks of well scaling or corrosion) and permeability of the reservoir. Geothermal exploration typically costs between $25 and $60 million per field. These costs typically include:

- pre-drilling cost – land access, analysis of any existing field data and surface surveying and analysis (mapping, geological, geochemical and geophysical work), with ecology studies carried out in preparation for consent applications;

- the exploration drilling consent process;

- drilling exploration wells (the bulk of the costs) – typically involves drilling a number of wells at between $3-5 million per well;

- subsurface data analysis – which tends to occur as the drilling is being done, including analysis of cores and cuttings, sampling and analysis of deeper fluids, testing of specific well characteristics and general assessment of reservoir conditions and response; and

- development of a computer simulated reservoir model.

2.10 When a field is found to be a good prospect, the explorer proceeds to develop a station/steam field concept, possibly in partnership with local interests. The firm then applies for the necessary resource consents only if the field is sufficiently attractive. When development resource consents have been obtained, the developer may hold them for years before it commits to the production phase.[1]

2.11 The decision whether to build a power station hinges on the attractiveness of a steam field and on many other variables – notably expectations about the future wholesale price of electricity.

2.12 If a geothermal field is developed, the power station and steam field concept is drawn up and implemented. A proportion of the earlier exploration wells may be used. Some may be suitable to use to produce the steam required to generate electricity. Others may be suitable to re-inject the spent water back into the ground or may be suitable for monitoring the condition of the geothermal field. Additional production, monitoring and re-injection wells may also be drilled at this time. The power station and steam field infrastructure are also built.

2.13 Once up and running, a geothermal power station requires new wells from time to time. Existing wells may run out of pressure or be damaged by corrosion, scaling within the well (or surrounding formation), earth movement (subsidence or earthquake), or during well workovers. Other wells may be required to develop new sectors of the wider resource. Replacement rates tend to be field-specific depending on the nature of the fluid being produced or re-injected. Some of this production drilling may not be suitable for use.

Current tax law

2.14 The current tax rules work to create non-depreciable and non-deductible capital expenditure.

2.15 Section DA 2(1) of the Income Tax Act 2004 limits deductions for capital expenditure. It says that a person is denied a deduction for an amount of expenditure or loss to the extent that the expenditure is of a capital nature.

[1] Resource consents may have a "use it or lose it" condition that indicates that consent rights are forfeited if no work is done within a specified period. However, the Resource Management Act 1991 allows local councils to extend this period.

2.16 Section DA 4 says that the capital limitation (section DA 2(1)) does not apply to an amount of depreciation loss merely because the item is itself of a capital nature.

2.17 Section EE 1(2) describes when an amount of depreciation loss arises. In broad terms, the asset must be owned by the taxpayer, must be property that in the normal course of events is expected to depreciate, and must be in use or be available for use.

2.18 Section EE 41(2) allows the amount of depreciation loss to include, losses arising from the difference between the tax book value and the amount received when an asset is sold or scrapped.

2.19 The concerns that certain drilling costs are blackhole expenditure seem valid. The cost of unused exploration wells falls within section DA 2(1) unless section EE 1(2) applies. However, such a well is not in use or available for use and it is therefore non-depreciable and non-deductible expenditure. The same analysis holds for the cost of unsuccessful production drilling. That is, the well is never in use or available for use and also appears to be non-depreciable and non-deductible expenditure.

The economic framework

2.20 From an economic perspective, we are concerned about the non-deductibility of capital expenditure only when the expenditure provides an asset that falls in value immediately or over time.

2.21 For taxes not to interfere with investment decisions, it is necessary for the investment decisions of taxpayers and non-taxpayers to be identical. As people will wish to invest if the present value of the benefits from an investment exceeds its cost, asset valuations must be independent of tax rates.

2.22 For asset valuations to be independent of tax rates, economic depreciation (the fall in market value of assets) must be deductible.[2] Conversely, if assets rise in value, the accruing capital gain (the rise in the market value) would need to be taxed, irrespective of whether or not assets were sold. In practice, there are formidable problems in taxing accruing capital gains. Even countries with capital gains taxes generally do not levy taxes on accruing gains.

[2] This proposition is often referred to as the "invariant-valuations proposition". For a formal discussion, see P.A. Samuelson (1964), "The Deductibility of Economic Depreciation to Insure Invariant Valuations", *Journal of Political Economy*, 72(6), 604-606. Samuelson's article ignores uncertainty. For an extension that considers uncertainty see, G. Fane (1987) "Neutral Taxation under Uncertainty", *Journal of Public Economics*, 33, 95-105.

2.23 Most business assets depreciate, however. Allowing deductions for economic depreciation for depreciating assets would, at least in theory, be a way of ensuring that, at least for these assets, investment decisions are independent of tax rates.

2.24 As discussed earlier, it may be difficult at the time of drilling to determine whether a useful asset has been created. It is also difficult to estimate the value the asset might have.

2.25 One approach when faced with such uncertainty is to capitalise the value of all unsuccessful wells into the next successful well. This approach recognises that the amount spent on exploration is related to the expected gains from exploring. However, this approach would be harsh in cases where the field never proves successful. For most depreciating assets, the law allows depreciation deductions as well as a deduction for any loss on scrapping. We therefore suggest treating expenditure on geothermal exploration wells in a way that is reasonable given the tax treatment of depreciable assets.

The suggested tax solution

2.26 The depreciation rules seem to be generally working in relation to the production phase of geothermal drilling. The one exception is when production drilling produces a well that cannot be used. In this instance, we suggest allowing a deduction for expenditure incurred on failed production drilling.

2.27 For exploration drilling, we suggest that expenditure on geothermal exploration wells be guided by rules that allow the expenditure to be amortised. The amortisation rate would be an estimate of the likely success rate multiplied by the estimate of useful life of a successful geothermal well. The amortisation rate applies to all exploration wells, regardless of whether they are or are not successful.

2.28 The suggested approach is set out in more detail in chapters 3 and 4.

Chapter 3

EXPLORATION DRILLING

3.1 As discussed earlier, we suggest that expenditure on exploration drilling be treated separately from production drilling. To do this we need a reasonably robust and workable definition of exploration drilling.

3.2 The date of filing resource consents applications to develop a geothermal field, taking it to the production phase, is a way of differentiating between exploration and production drilling. Under this approach, expenditure on drilling incurred before the date of lodging applications to develop a field (typical resource applications for field development relate to the water extraction and water discharge and the relevant building consents) would be subject to the suggested amortisation rules.

3.3 We invite feedback on the way that we have suggested exploration drilling could be defined.

Amortising exploration drilling

3.4 We suggest that expenditure incurred on exploration drilling be amortised at 11 per cent per annum. The deductions would be calculated from the start of well completion testing.

Using an average success rate for exploration drilling

3.5 As discussed earlier, defining a successful exploration well and its contribution toward an income-earning asset is problematic. There is the question of whether the well will ever be used and the physical aspects of the field and each well to consider. When faced with such uncertainties a pragmatic approach seems best.

3.6 We suggest using an estimate of the average success rate for geothermal exploration drilling to assist in working out an amortisation rate for expenditure on all geothermal exploration wells. The benefit of this approach is that it is not necessary to identify whether a particular exploration well is or is not a failure. This would deal with the practical problem of determining whether an exploration well is successful or unsuccessful.

3.7 Since we are considering exploration drilling, it is appropriate to consider the success rates for the first few wells drilled in a geothermal field. In the past, seven to 15 exploration wells were normally required to answer critical questions about the suitability of a geothermal field for power generation.[3] However, changes to the structure of the industry suggest that exploration programmes of five to ten wells are now likely to be the typical approach.[4]

3.8 Table 1 summarises the success rate for geothermal drilling in New Zealand and is based on research by Barr, Grant and McIachlan.[5] Their definition of success was any well capable of producing 1MW or more of power. These data clearly suggest that treating all exploration wells as successes is too harsh. They also suggest that expensing all exploration drilling is too generous. What we need is an estimate of the likely success rate for exploration drilling.

3.9 Table 1 data suggest a 53 percent success rate for well drilling, meaning a ten-well exploration programme will find, on average, 5.3 productive wells.[6]

Table 1: Success rates for geothermal well drilling

	Success rate (percent) per 5 wells drilled*				
Field	**1st**	**2nd**	**3rd**	**4th**	**5th**
Wairakei	20%	40%	40%	80%	40%
Kawerau	20%	80%	60%	100%	60%
Broadlands	60%	60%	40%	80%	80%
Mokai	60%	n.a	n.a	n.a	n.a
Ngawha	40%	100%	60%	n.a	n.a
Average success rate	***40.0%***	***70.0%***	***50.0%***	***86.7%***	***60.0%***

*A success is denoted as a well that produces 1MW or more

3.10 It is not clear whether the 53 percent average success rate is appropriate. On one hand, the 53 per cent average success rate for geothermal exploration drilling may be too generous because the Table 1 definition of a success excludes wells that produce less than 1MW or more of steam. Some of these unsuccessful wells may still have an economic value. They may have been useful for field monitoring or re-injection purposes or have contributed information about where to drill next, or where best to locate of the final production wells (assuming that the geothermal field is developed).

[3] Proving and development of geothermal fields(1984), Hugh Barr, Malcolm A. Grant, and Robert Mclachlan, Report no. 116, Department of Scientific and Industrial Research, Wellington, pp 2, 18, and 24.
[4] This is based on advice from the Resources and Networks Branch, Ministry of Economic Development.
[5] Proving and development of geothermal fields(1984), Hugh Barr, Malcolm A. Grant, and Robert Mclachlan, Report no. 116, Department of Scientific and Industrial Research, Wellington.
[6] (1+1+3+3+2+2+4+3+5)/(9*5)=0.53

3.11 On the other hand, the average success rate of 53 percent counts wells that produce more then 1MW of steam, even though these wells may be unsuitable for production purposes. Such wells may be either too distant or too difficult to use for production purposes.

3.12 On balance, we suggest that a 53 percent success rate is not an unreasonable estimate to use, although we invite feedback on this estimate. We would also be interested in receiving information about the success rates for exploration drilling in other geothermal fields and any different approaches that could take into account the uncertainty round what is or is not a successful well.

Working out the amortisation rate

3.13 Under the current depreciation rules, a geothermal well would be depreciated over 20 years once it is in use or is available for use. This suggests that a geothermal well can be used, on average, for 20 years – for example, the period for which it is connected to a power plant or can be connected to a power plant or some other income-generating asset.

3.14 A possible way of working out the amortisation period would be to multiply the average success rate for exploration drilling by the estimated useful life of a geothermal well. However, there is a draw back with this approach.

3.15 The current estimate of average useful life of a production well is 20 years.[7] Under the preceding assumptions, the amortisation period equals 10.67 years (0.53 x 20). This equals an annual straight-line deduction of 9.5 percent (1/10.67=.0938 rounded up). However, this approach does not produce the same present value of deductions as would allowing an immediate deduction for failed exploration drilling.

3.16 The amortisation rate of 9.5 per cent seems harsh when the present value of this stream of deductions is compared to the present value of deductions where an immediate deduction is allowed for failed wells and successful wells are depreciated over 20 years.[8] To address this concern we suggest an alternative approach.

3.17 We suggest using an amortisation rate of 11 percent straight line. Applying this rate results in the present value of deductions being approximately equal, between this approach and allowing an immediate deduction for failed wells and depreciating the successful wells over 20 years.

[7] Geothermal wells are treated the same as "borewells". In Determination 1 of the 2004 Income Tax Act, borewells have an estimated useful life of 20 years.

[8] For comparing the present value of these streams of deductions, we use a discount rate of between 7 to 8 percent. For the depreciation stream of deductions we use the same average success rate of 53 per cent and assume a two year lag between the well being drilled and being used or available for use. This lag is based on the estimated time that it takes to build a power station.

3.18 We invite submissions on the suggested modified averaging approach.

When to begin amortising

3.19 We suggest, again for pragmatic reasons, that the calculation of the deductions for each well begin from the date that completion testing starts. Such an approach is likely to be more generous than the treatment under the ordinary depreciation rules as it can take around two years to construct and bring into production a geothermal power plant. However, given the uncertainties that surround the decision to build a power station, it seems a pragmatic starting point.

3.20 This suggestion is an approach to amortising expenditure on exploration drilling to resolve the issue of blackhole expenditure. We invite feedback and are especially interested in new information that may affect the estimate of average success rates for exploration drilling, comments on the proposed definition of exploration drilling and the suggested amortisation rate.

Chapter 4

AN IMMEDIATE WRITE-OFF FOR WELL DRILLING EXPENDITURE IN CERTAIN CIRCUMSTANCES

4.1 We also suggest that taxpayers be allowed to write off expenditure incurred on geothermal wells in certain situations.

Unsuccessful production drilling

4.2 From time to time, new geothermal wells are required in a production field. While this production drilling is not as risky as exploration drilling, it sometimes produces wells that cannot be used for any purpose.

4.3 Because it is necessary to have a definition of "production drilling", we suggest it is drilling done after the date the first resource consent application that relates to the production phase is lodged. Here we assume that an explorer will seek to lock in as quickly as possible the rights to develop a viable geothermal discovery.

4.4 When production drilling turns out to be unusable, we suggest that a deduction be allowed for this expenditure. Examples of problems that make production drilling useless include well casing failures and discovering that the ground around the well has poor permeability.

4.5 To claim a tax deduction for failed production drilling, the accounting treatment must also mirror the tax treatment. This means that the well must also be written off for accounting purposes.

4.6 We invite submissions on this approach and invite ideas on how best to define "production drilling" in legislation.

When the right to develop a field is abandoned

4.7 As discussed in chapter 2, a geothermal field that is suitable for development may remain undeveloped for a number of years. During this time, deductions for the cost of exploration wells are allowed under the suggested amortisation rules. However, we also need rules to account for a total loss of value of the exploration wells. This could occur when:

- the application to develop is not approved; or

- the rights to develop a field lapse (under the provisions of the Resource Management Act 1991); or

- the proposed project is completely abandoned.

4.8 We suggest that a deduction for losses actually incurred on expenditure on the remaining wells in the field when a taxpayer abandons or sells the rights to develop the particular geothermal field. Examples of the type of rights that contribute to the development of a geothermal field are land access rights, water use and discharge rights issued under the Resource Management Act and any relevant building consent.

How the new rules might work – example

Hotwater Co spends $50 million on exploration wells and finds a usable resource. In order to develop the geothermal field, the developer applies for and is granted field development rights.

At this point, Hotwater Co decides not to develop the geothermal field and decides to re-evaluate this decision in five years. Under the suggested amortisation rules, Hotwater Co is able to make a deduction of $5,500,000[9] per year for the cost of the exploration wells.

After five years, it decides to abandon the idea of developing the field.
It lets the development resource rights lapse and exits all the land access arrangements to the geothermal field. It receives no payments for giving up these rights and their financial accounts reflect that the project has been abandoned. It is able to claim a loss on abandonment of the remaining book value of the exploration wells. The total deduction for the loss on abandonment is $22,5000,000 ($50,000,000 – (5 x $5,500,000)).

4.9 We invite submissions on this approach and welcome alternative suggestions on how to approach the issue of deductions for the remaining book value of wells that are abandoned.

Application date

4.10 We suggest that the proposed new rules apply from the 2003-04 income year on the basis that the current rules result in an economically incorrect result and that a significant amount of exploration expenditure has been incurred since this date.

4.11 However, we invite submissions on other possible application dates.

[9] $50,000,000*0.11=$5,500,000.