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DRILLING CONTRACTS: SOME OPTIONS

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SUMMARY

Geothermal drilling in New Zealand has generally been done on a day rate basis but, since 1996, has been done on a meterage or turnkey basis. This is possible where there is sufficient knowledge about the expected drilling conditions for the contractor and operator to agree to a mutually acceptable contract. If not, then a target contract, based on a day rate contract, can be an appropriate option. Comments on contract options are provided. The ultimate no-risk contract option for an operator is a 'no-steam, no-reward' contract. A case study is provided.

1. INTRODUCTION

Geothermal drilling has historically been undertaken on a day rate basis where the operator (or developer) assumes all the risk on both the time taken to drill the well and the materials consumed in drilling the well. Alternative contract formats can be beneficial to both the contractor(s) and the operator. This paper looks at the alternatives of meterage contracts, of split dayrate/meterage contracts and the option of reimbursing the contractor on the amount of steam produced by the well.

2. "DAYRATE" OR 'METERAGE' CONTRACTS?

The cost of drilling wells is essentially determined by how well the following variables are controlled:

a) Time taken to drill
b) Drillbits
c) Drilling Tools/Consumables
d) Deviation
e) Drilling mud/Chemicals
f) Cement/Additives
g) Casing/Casing Accessories
h) Permanent Wellhead

Items b) to f) are generally provided by external, specialised service companies, Historically, these have been provided by a number of companies but more recently there is a clear trend to incorporate these five components in a single contract, generally known as "Integrated Services".

Items g) and h) are essentially fixed costs so are often supplied by the operator.

The costs of plant and personnel are a direct function of time. Thus, time can be an objective for bo& the drilling contractor and the integrated services contractor.

The drilling contract and integrated services contract can be run separately. However, most geothermal drilling undertaken in New Zealand has been completed under a single contract.

Where the entire scope of drilling work is amalgamated and the contractor agrees to do the defined scope of work for a lump sum price, we have a true "turnkey" contractor. With the ability of the operator to vary cased and drilled depths we have what is commonly known as a "meterage" contract. This type of contract is standard in the mineral and water well drilling industries and is now favoured for geothermal drilling in New Zealand.

Note that in the meterage contract not only is the contractor taking the risk on time and material, but is also taking the risk on equipment lost down hole (including expensive deviation and well testing tools).

It is possible to include all the well planning, access negotiations and arrangements, environmental permitting, civil works and well testing in the scope of work in one contract.

Access arrangements and environmental permitting are, however, best resolved before the drilling contract is agreed.

Meterage contracts should contain a schedule of rates in order that the lump sum payable can be varied in the event that things change (and they do).

Drilling contractors are in a better position to offer meterage contracts when they own the major items not normally included in a drilling day rate package, eg. drilling tools, cementing equipment and mud handling equipment. In any case, the integrated services component will generally be a subcontractor of the drilling contractor. The reason for this is that the daily costs/revenue for the drilling contractor will generally be 20% to 50% higher than the integrated services component.

Day rate contracts will work best in the following circumstances:

- The operator has a substantial risk profile
- The operator has a strong management team
- Little or nothing is known about the prospect to be explored

Meterage contracts will be better when:

- The operator has a low risk profile
- The operator has difficulty in managing the operation
- The prospect is well known
- The operator can confirm the scope of work to be done

When the scope of work changes then variations can be readily agreed upon.

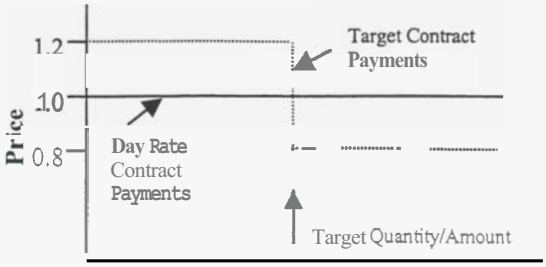
In developing meterage contracts, it is advantageous to have offset data to develop a contract acceptable to both parties. If such data is not available then the day rate concept may be more appropriate. Alternatively, it may be possible to develop a "target" contract based on the day rate contract.

3. TARGET CONTRACT

The target contract endeavours to share the risk on a more equitable basis than either the "dayrate" or the "meterage" contracts.

Time and material consumption targets are agreed by the two parties. The targets are what can be expected in average (normal) circumstances, plus some margin, say 10 – 25%. In the event that the target is bettered then the contractor receives a reward. This might be (say) 0.2P where P is the normal price for personnel, equipment or materials. Conversely, the contractor suffers a penalty if the targets are not of the same amount. A ratio of 0.20 (20%) is in the vicinity of the contractor margin, including depreciation. There is no reason, however, that the ratio could not be higher, eg. 0.5 (50%).

Figure 1 – Contract Payments



The target rate type contract ensures that the operator adequately defines their requirements. It has the effect of focusing all personnel on the objective of drilling an effective well, meeting the requirements of the operator and minimising the risk to the contractor.

Both the target and meterage contracts focus on drilling time and if not managed properly can compromise quality. Thus it may be appropriate for the contractor to provide a warranty on the work, possibly one year. Other controls may be appropriate to avoid the contractor compromising the quality of the work.

4. "NO STEAM, NO REWARD" CONTRACT

4.1. Risk Profile and Margins

Of course the ultimate "no-risk" approach for the operator is a "no steam, no reward" contract.

The probability of the well's output must be determined and agreed by the two parties. For example:

Table 1 – Output Probability

Steam Output t/h @ defined pressure	Probability of Success %
20	90
30	75
40	55
60	40
80	30
100	20

At some level of production it will not be economically attractive to connect to the steam

gathering system. Depending on the location this is likely to be around 10 to 15 t/hr. For this case study, 10 t/hr is assumed.

The expected price for a day rate contract can be agreed by the parties. In this case study it is assumed to be for the given scope of work.

The expected cost to the contractor is (say) 0.85 P, ie. the contractor is expecting an average margin of 15% on revenue.

If the well is to be drilled as a meterage contract then the contractor is entitled to an additional margin assumed to be 12% to cover drilling time, risk, possible material overruns and the risk of losing tools.

Table 2 – Contract Margins

Contract Type	Value of Work	Expected Cost	Expected Contract Margin
Day Rate	P	0.85 P	0.15 P (15%)
Meterage	1.12 P	0.85 P	0.27 P (24%)

4.2. Contract Payments

In developing a contract based on the amount of steam produced, the objective is to arrive at the same expected contract margin as that using the metre rate contract, ie. assuming the probabilities of success as outlined above.

A probability table can be developed as follows:

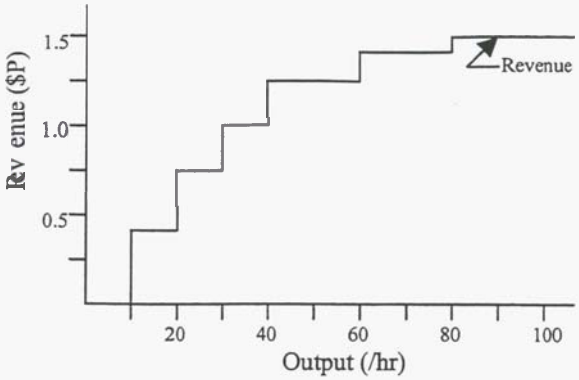
Table 3 – Revenue and Margin

Steam Output (t/hr)	Probability of Success (%)	Revenue ($)	Costs ($)	Margin ($)
0	100	0	0.7P *	-0.7P
10	95	0.4P	0.85P	-0.45P
20	90	0.75P	0.85P	-0.1P
30	75	P	0.85P	0.15P
40	55	1.25P	0.85P	0.4P
60	40	1.4P	0.85P	0.55P
80	30	1.5P	0.85P	0.65P

* *Note that if the well is a failure, savings are made on wellhead equipment, liner and well testing estimated at 0.15P, ie. total costs of 0.70P.*

The contractor and the operator must reach agreement on the revenue and margin table. It is a function of the minimum steamflow which is acceptable to the operator and the threshold at which the maximum payment is made. The lower the minimum steamflow which is acceptable, then the lower the payments. If this minimum is set higher then the operator can expect to make very large payments to the contractor in the event of success.

Figure 2 – Revenue Table



Depending on the probability curve then having a cap (above say 100 t/hr) is unlikely to make a difference to the probable payment.

Graphically, the revenue table is shown in Figure 2.

The probable margin M is calculated as follows:

$$M = (0.3-0.0)0.65P + (0.4-0.3)0.55P + (0.55-0.4)0.4P + (0.75-0.55)0.15P - (0.90-0.75)0.1P - (0.95-0.90)0.45P - (1.00-0.95)0.7P = 0.2675P$$

The probable revenue R is calculated as follows:

$$R = (0.3-0.0)1.5P + (0.4-0.3)1.4P (0.55-0.4)1.25P + (0.75-0.55) + (0.90-0.75)0.75P + (0.95-0.90)0.4P = 1.110P$$

Thus, the contract margin is 0.2675P P/1.110P (24%), ie. the same as undertaking the work on a meterage basis.

The measurement of steam is difficult to assess accurately. Having the threshold points at 20, 30, 40, 60 and 80 tonne/hr means that a small difference in the interpretation of the steam flow could make a very significant difference in the contract payment. This is likely to be contentious.

Thus, a more detailed payment schedule should be calculated which results in a curve (Table 4). This becomes the basis of the no steam, no pay contract.

Table 4 – Payment Schedule

Steam output (t/hr)	Probability of Success (%)	Revenue ($P)	Costs ($P)	Margin Margin ($P)	Incremental Revenue ($P)	Incremental Margin ($P)
0	100	0	0.7	(0.700	0.000	(0.018
5	97.5	0	0.7	(0.700	0.000	(0.018
9.99		0	0.7	(0.700		
10	95	0.4	0.85	(0.450	0.010	(0.011
15	92.5	0.525	0.85		0.013	(0.008
20	90	0.65	0.85	(0.200	0.049	(0.015
25	82.5	0.775	0.85	(0.075	0.058	(0.006
30	75	0.9	0.85	0.050	0.090	0.005
35	65	1	0.85	0.150	0.100	0.015
40	55	1.1	0.85	0.250	0.041	0.009
45	51.25	1.175	0.85	0.325	0.044	0.012
50	47.5	1.25	0.85	0.400	0.047	0.015
55	43.75	1.3	0.85	0.450	0.049	0.017
60	40	1.35	0.85	0.500	0.034	0.013
65	37.5	1.375	0.85	0.525	0.034	0.013
70	35	1.4	0.85	0.550	0.035	0.014
75	32.5	1.425	0.85	0.575	0.036	0.014
80	30	1.45	0.85	0.600	0.036	0.015
85	27.5	1.4625	0.85	0.613	0.037	0.015
90	25	1.475	0.85	0.625	0.037	0.016
95	22.5	1.4875	0.85	0.638	0.037	0.016
100	20	1.5	0.85	0.650	0.300	0.130
		Cumulative Total			1.087	0.262

This shows a margin of 24.1 %. Graphically the revenue is shown in Figure 3.

5. CONCLUSIONS

Drilling contracts in the geothermal industry have traditionally been done on a "day rate" contract basis. This type of contract may be satisfactory when little is known about the reservoir and the likely drilling conditions.

As more is known about the reservoir and the operator's requirements *can* be more clearly specified, then meterage contracts are more appropriate, in that they focus the entire drilling team on the customer's requirements. Essentially, a lump sum price is given for a defied scope of work which may include civil work and the well testing. In the event that the scope of work is amended, eg. the depth of casings, the depth of the well or the extent of well testing, a schedule of prices is available to vary the lump sum payment.

Where the meterage contract is not appropriate then target type contracts can be utilised. Targets can be set for both time and materials and a basis for reward/penalties provided. Controls may be necessary to ensure that the quality of the work is not compromised.

The ultimate no-risk contract for the operator is where the payment to the contractor is based on the steam produced. A case study is provided on how such a contract can be derived so that it is equitable to both the operator and the contractor. The probability of output at different flow rates and the basis of a meterage contract need to be known to arrive at a "no steam no reward" contract. The objective is to ensure that both parties are in no worse a position. The payment schedule will be sensitive to the probability of the Output.

Figure 3 – Revenue Curve