Marketing the Klamath Falls Geothermal District Heating System

Kevin Rafferty

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Disclaimer Statement

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Marketing the Klamath Falls Geothermal District Heating System

The Klamath Falls Geothermal District Heating system was completed in 1981. Due to the concerns of existing local well owners, a city ordinance was passed in June 1981 which effectively prevented the system from operating. A great deal of aquifer research was conducted and the system finally entered into "test" operation in 1984. After approximately 1-1/2 years of operation, leaks began to appear in the closed loop portion of the distribution piping and by February 1986, the system had to be shut down. Litigation dragged on until 1990 when a settlement was made which provided partial funding for replacement of the failed piping. These funds together with a loan from the Oregon Department of Energy provided for system repairs and by early 1991 the system was again online.

As of 1992, there was no formal marketing plan for the system. This lack of marketing and the system history of poor availability combined to reduce or eliminate interest in connecting on the part of local building owners. At the time, the system served only the original 14 government (state, federal and local) buildings connected at start up (1981). The revenue from these buildings, however, did not cover the entire cost of operating the system. As a result, the city was faced with a difficult decision--develop the revenue required to make the system self-supporting or shut it down.

As a result of this situation, a marketing strategy for the system was developed. The strategy was designed to address the following major issues:

- Rates
- Customer Retrofit Cost
- Financing
- System Reliability
- City Credibility
- Manpower Requirements

RATES

One of the issues which the strategy had to deal with was competition with low natural gas rates. These rates, as low as $0.34 per therm, provided a formidable barrier to geothermal market penetration. When the geothermal system was first installed, the plan was to equip each customer with an energy (Btu) meter with billing based upon geothermal at a percentage of natural gas. The savings for the customer resulted from two considerations: 1) the cost difference between gas and geothermal, and 2) the efficiency losses in the gas-fired system. Of the two, the savings due to efficiency losses in the gas system provides the largest benefit. For example, consider gas priced at $0.40 per therm and geothermal at $0.32 per therm (80% of natural gas). Assuming the owner's present gas system operates at 60% efficiency, his actual cost of gas heat is $0.67 per therm. In other words, geothermal could provide him with a 52% reduction in heating costs ($0.32 vs $0.67).

Unfortunately, the average building owner is under the impression that his gas system operates at efficiencies of 75 - 85%. As a result, convincing the owner of his potential savings boils down to haggling over the existing system efficiency. This is a difficult task.

In order to avoid this, the new strategy eliminates the use of energy meters in favor of a flat rate billing approach. The flat rate approach has several benefits. Most importantly, it is simple. The rate is negotiable

but for most customers approximates 50% of the gas bill. Building owners understand this. In addition, use of the flat rate reduces the customer retrofit cost since it is no longer necessary to buy a meter. Finally, the flat rate is a guaranteed value for the first 10 years of the contract. There is no inflation in the cost for the customer.

The flat rate is based upon historic fuel bills for the building. This data, for the previous 2 - 3 years, is weather normalized using a computer spreadsheet developed especially for this purpose (Appendix A). The average annual value is then used for calculating the annual geothermal cost. The city is flexible in terms of its payment schedule with the customer (12 months, 6 months, lump sum, etc.).

CUSTOMER RETROFIT COSTS

Retrofit costs for the size buildings in the downtown area can be a problem. Many buildings do not have hot water heating systems. As a result, connection to the district requires the installation of new terminal equipment.

The original requirements (1981) called for the installation of customer heat exchangers at each building. For buildings without existing hot water systems, this approach also requires a circulating pump, expansion tank, cross connection to city water, pressure reducing valve and all the components necessary to accommodate a closed loop in the building. In larger buildings, the cost of these components is not a significant part of the project cost. For small buildings, however, the costs are a much greater percentage of the total costs due to the smaller number of terminal units.

To reduce retrofit costs, the new marketing plan eliminates the requirement for a customer heat exchanger. New customers are now connected directly into the distribution system with district loop water used as the building heating medium. This eliminates all of the above mentioned components with the exception of the circulation pump. In some of the smallest buildings, even the pump can be eliminated. Coupled with the elimination of the Btu meters, this approach greatly reduces the retrofit costs for customers. For a customer with an 800,000 Btu/hr load served by eight unit heaters, the elimination of these components would reduce retrofit cost by 25% (Appendix B).

FINANCING

Lack of sufficient revenue for the district heating system coupled with the city's tight budget situation precluded any financing program at the local level.

Fortunately, the state operates two programs which have been used in the marketing plan. The first of these is available only to taxable entities and is referred to as the Business Energy Tax Credit (BETC). This program offers business a 35% tax credit on the cost associated with connection to the geothermal district heating system (retrofit, design, permits, etc.). The tax credit must be taken over five years (10%, 10%, 5%, 5%, 5%), but substantially improves the outlook for those able to take advantage of it. It is a very popular program and the funds set aside by the legislature for it are committed very quickly each year. As a result, it has been necessary to concentrate marketing efforts on tax credit eligible customers during December, January and February so that applications can be forwarded to the state early enough in the year to take advantage of the BETC. State approval of the applications must be secured prior to construction.

The second state program is the Small Energy Loan Program (SELP). This program will loan the entire cost of the energy project to the customer. The program is financed by the sale of bonds with the loan terms and rate tied to the bond sale. Current terms are approximately 7 to 8%, and 10 years.

Few, if any potential customers, were aware of the existence of these programs. In addition to introducing the customer to the program, assistance in filling out the applications has been provided.

SYSTEM RELIABILITY

The Klamath Falls system has not had (prior to the past few years) a particularly reliable history. Due to the political and piping issues discussed earlier, a greeat deal of downtime occured. Although these problems have been solved and the system now provides a reliable energy source to the customer, advising potential customers of this is sometimes a difficult task.

These issues were discussed in several public meetings when the county threatened to remove their buildings from the system in early 1992. After much discussion, the county decided to remain with the system for the long term. This was very reassuring to many of the prospective local customers.

For others who remain skeptical, individual discussions in which the details of the past piping problems are clearly explained, generally has proven to be an effective strategy.

CITY CREDIBILITY

The credibility of the seller is always subject to question from the customer perspective. In the case of the city of Klamath Falls, This ha been a particular problem. In 1991, it was necessary to implement a substantial rate increase for the city's municipal water system customers. The rate increase was the subject of considerable controversy and media attention. This episode was fresh in the minds of many of the local building owners who were contacted about the geothermal system. Fortunately, time has eroded much of the bad feeling regarding the water rate increase.

More effective, however, has been the fact that once agreed upon between the city and the customer, the geothermal rate is included in the contract and guaranteed for 10 years. This precludes any possibility of the city implementing unexpected rate increases. In addition, the guaranteed flat rate is very useful for budgeting purposes. Non-profit agencies such as churches and social clubs find this especially attractive.

MANPOWER REQUIREMENTS

One of the issues which most thwarted previous marketing of the system was a lack of manpower to do the job. The geothermal system has no staff of its own. The geothermal system has no staff of its own. It is supervised by an individual who also has responsibility for the waste water system as well. For the past several years, waste water regulatory issues have absorbed all of the time available leaving nothing for the geothermal system. As a result, it was necessary to identify another source of manpower for the effort.

The Geo-Heat Center provides initial retrofit estimates and developed a life-cycle cost analysis for the customer evaluation (Appendix C) along with the fuel use weather normalization spreadsheet described earlier.

A local mechanical engineer was also instrumental in the evaluation of retrofits for several buildings. His volunteer efforts at the outset have been rewarded with design work as some of the larger buildings have prepared for connection to the system.

Finally, a local wood products firm provided an individual from its public relations staff to coordinate the fund drive for a line extension to the local performing arts center. The line to the theater will permit several other buildings along its route to connect to the system. A formula was developed to calculate the fee these buildings will pay to the theater for the privilege of connecting to the new extension (Appendix D). The publicity arising from the connection of the theater (a high-profile building in the downtown area) has been very beneficial to the marketing effort.

CONCLUSION

The new marketing strategy for the Klamath Falls system has concentrated on offering the customer an attractive and easy-to-understand rate structure, reduced retrofit cost and complexity for his building along with an attractive package of financing and tax credits.

A technical evaluation of the customer's retrofit costs and savings is provided by a third-party individual (either a local engineer or Geo-Heat Center staff) free to render an impartial opinion of the advantages and disadvantages. This personalized individual approach, although labor intensive, has proven to be an effective strategy.

A copy of a typical report to the customer is included as Appendix E.

RESULTS TO DATE

Initial retrofit costs and life-cycle cost analysis have been conducted on 22 buildings to date. For some, the retrofit costs are simply too high for the conversion to make sense at current geothermal rates. For many, however, the prospects are good. At this writing, two new customers are now connected and operating with 5 to 8 more buildings committed to connect this construction season after line extensions are completed.

This represents nearly a 60% increase in the number of buildings connected to the system and a 40% increase in system revenue.

Appendix A

Fuel Use Weather Normalization Spreadsheet

Fuel Use Weather Nomalization

month	89			90			91			92			93			AVERAGE
	DD	actual	corrected	DD	actual	corrected	DD	actual	corrected	DD	actual	corrected	DD	actual	corrected	DD
J	1339	0.00	0.00	1028	0.00	0.00	1057	341	352	974	328	367	1380	570	451	1091
F	1134	0.00	0.00	1002	0.00	0.00	688	263	320	708	247	292	1083	397	307	837
M	790	0.00	0.00	739	0.00	0.00	885	240	223	670	153	188	1	0	0	822
A	497	0.00	0.00	433	0.00	0.00	702	185	163	495	118	147	1	0	0	618
M	462	0.00	0.00	495	0.00	0.00	554	130	91	182	27	58	1	0	0	389
J	128	0.00	0.00	218	0.00	0.00	295	25	15	146	28	35	1	0	0	181
J	67	0.00	0.00	48	0.00	0.00	12	19	54	50	22	15	1	0	0	34
A	112	0.00	0.00	97	0.00	0.00	33	20	45	39	21	40	1	0	0	74
S	213	0.00	0.00	118	0.00	0.00	89	20	44	213	34	31	1	0	0	194
O	555	0.00	0.00	558	0.00	0.00	411	118	139	465	69	72	1	0	0	484
N	841	0.00	0.00	877	0.00	0.00	762	306	324	853	195	184	1	0	0	807
D	1011	0.00	0.00	1318	0.00	0.00	1027	400	409	1261	318	265	1	0	0	1051
	7149			6931			6515	2067	2179	6056	1560	1694		967	758	6582

Appendix B

Example Customer Cost Comparison Heat Exchanger
vs.
Direct Connection

Example customer - 800,000 Btu/hr load, 8 unit heaters, 40ºF ? T

			Without Heat Exchanger
Heat exchanger	-	$ 3,000	$ 0
Meter	-	750	0
Temp. & press. instrumentation	-	180	180
4 ball valves	-	236	236
Expansion tank	-	160	0
Cross connect	-	150	0
Pump 40 gpm @ 40 ft of head, 1 hp	-	885	785
Pump electrical	-	100	100
150 ft 1-1/2 pipe	-	2,083	2,083
8 unit heaters (with 2 ball valves, 1 zone valve, 30 ft 1-in. pipe ea.)	-	8,700	8,700
Subtotal	-	16,244	12,084
25% contingency	-	4,061	3,021
Total	-	$20,305	$15,105

% reduction in cost

$$= \left(\frac{20,305 - 15,105}{20,305} \right) x\ 100$$

= 25.6%

Appendix C

Life Cycle Cost Analysis Spreadsheet

Existing Heating Cost	6000	Retrofit Cost	17,000.00
Gas Inflation Rate	0.010	Credit Eligible	0.00
Geothermal Cost	3000	Discount Rate	0.070
Interest Rate	0.070		
Term	10		

Year	Nat Gas	Geot	Tax Credit	Debt Service	Cash Flow	Cumulative Cash Flow	Discntd. Cash Flow	Cumlative Dscntd CF
1	6000	3000	0	2420	580	580	542	542
2	6060	3000	0	2420	640	1219	559	1100
3	6121	3000	0	2420	700	1919	572	1672
4	6182	3000	0	2420	761	2681	581	2253
5	6244	3000	0	2420	823	3504	587	2840
6	6306	3000	0	2420	886	4390	590	3430
7	6369	3000	0	2420	949	5338	591	4021
8	6433	3000	0	2420	1012	6351	589	4610
9	6497	3000	0	2420	1077	7427	586	5195
10	6562	3000	0	2420	1142	8569	580	5776
11	6628	3314	0	0	3314	11883	1574	7350
12	6694	3347	0	0	3347	15230	1486	8836
13	6761	3380	0	0	3380	18610	1403	10239
14	6829	3414	0	0	3414	22025	1324	11563
15	6897	3448	0	0	3448	25473	1250	12813
16	6966	3483	0	0	3483	28956	1180	13993
17	7035	3518	0	0	3518	32474	1114	15107
18	7106	3553	0	0	3553	36027	1051	16158
19	7177	3588	0	0	3588	39615	992	17150
20	7249	3624	0	0	3624	43239	937	18087

Appendix D

Pipeline Extension Cost Contribution Formula

RESOLUTION NO. 3388

A RESOLUTION ESTABLISHING A REIMBURSEMENT POLICY FOR CONNECTIONS TO GEOTHERMAL BRANCH LINES FINANCED PRIVATELY

WHEREAS, the City desires to encourage expansion of the downtown heating system; and

WHEREAS, expansion may require extension of the main line at private expense; and

WHEREAS, to encourage such expenditure the City is willing to provide for reimbursements against such costs from connection charges from others who may wish to connect to that privately funded extension; **NOW THEREFORE**

THE CITY OF KLAMATH FALLS RESOLVES AS FOLLOWS:

In the event an owner of property desires to connect to a privately financed geothermal main line, the City shall charge and collect a connection fee sufficient to reimburse the party who financed the extension a fair portion of the original cost. Said proportional share shall be calculated as follows:

$$BC = MC \times \frac{BF}{F} \times \frac{BD}{L}$$

where:

F - branch line peak flow capacity (gpm)
BF - new building peak flow requirement (gpm)
L - total length of branch line (ft)
BD - distance of new building from the supply end of the branch line (ft)
MC - cost of main line
BC - proportional share of branch line cost for new building

Reimbursements shall be collected and paid only during the first ten (10) years following completion of the extension. Further, payments shall be made to the then current owner of the structure initially served with the extension.

Passed by the Council of the City of Klamath Falls, Oregon, this 15th day of June, 1992.

Presented to the Mayor (~~Mayor Pro-tem~~), approved and signed this 15th day of June, 1992.

George C. Flitcraft
Mayor (~~Mayor Pro-tem~~)

ATTEST:

Lisa D. Fritz
City Recorder (~~Deputy Recorder~~)

STATE OF OREGON)
COUNTY OF KLAMATH)ss.
CITY OF KLAMATH FALLS)

I, _____, Recorder (Deputy Recorder) for the City of Klamath Falls, Oregon, do hereby certify that the foregoing is a true and correct copy of an Resolution duly adopted by the Council of the City of Klamath Falls, Oregon, at the regular meeting held on the 15th day of June, 1992, and thereafter approved and signed by the Mayor (~~Mayor Pro-tem~~) and attested by the City Recorder (~~Deputy Recorder~~).

_____
City Recorder (Deputy Recorder)

Appendix E

Typical Customer Evaluation Report

GEO-HEAT CENTER
Oregon Institute of Technology • Klamath Falls, Oregon 97601 • 503/885-1750 • FAX 503/885-1754

Paul J. Lienau, Director

April 21, 1993

Mr. Norman Jones
First Baptist Church
707 High Street
Klamath Falls, OR 97601

Dear Mr. Jones:

We have completed a preliminary review of the connection of your building to the city's geothermal system. Based on data from the gas company (1/91 to 2/93), your weather normalized annual gas cost is approximately $6000. Retrofit of the existing heating system for connection to the district heating system is estimated to cost $10,000 including a 20% contingency factor. This factor considers only the costs associated with conversion of the building itself and for extending service lines from the city's lines in the street. The city's rate for geothermal heat is a negotiable figure; but, for many customers approximately 50% of the current natural gas bill.

Retrofit of the existing heating system consists of connecting supply and return lines, from the city system to the existing supply and return lines at the boiler. The boiler would remain in place and available as emergency backup to the geothermal system. It would be valved off during normal operation. A new control valve would be added to modulate the flow of hot water into the building and assure the system achieves a 40° temperature drop. In addition to the modifications in the boiler room, supply and return lines (3") would be installed across the parking lot on the north side of the building to connect your heating system with the main lines in the street.

As I mentioned earlier, the $10,000 figure does not consider the costs associated with extending service lines up 8th Street from their present location. These costs can be broken down into two parts: 1) the contribution to the Ross Ragland Theatre for connection to their line (at 8th and Pine), and 2) the cost for installing lines up 8th Street to the church.

The cost of the Ragland contribution is determined using a formula approved by the City Council. For the church, this formula yields a value of $7,200. The value is arrived at by ratioing the water flow required by the church to the total water flow the line can

carry. A similar procedure for length of the line used compared to total length of the line is made. Questions regarding this cost can be addressed to Bob Kingzett at Jeld-Wen (882-3451).

The cost of lines extended up 8th Street to the building location would be best discussed with Kent Colahan at the city (883-5366). Your cost for these lines is dependent upon participation by neighboring buildings (Sacred Heart School, Sacred Heart Church, American legion, St. Paul's Church).

To evaluate the costs and benefits of connecting to the system (exclusive of the as yet undefined costs described above), we have prepared two tables. Table 1 considers the case in which the entire capital cost is financed for 10 years at 7% which is similar to the terms offered through the states Small Energy Loan Program (SELP). Based on a natural gas inflation rate of 1% per year and a total heating cost of $6000 per year, the total savings over the 20-year period amounts to just over $43,000.

The second case assumes the project is 100% equity financed. In this arrangement, the 20-year savings amounts to $67,000 and yields a simply payback of approximately 6 years. Looking at it another way, the project rate of return is approximately 18%.

At this point, it might be useful to contact the city and discuss geothermal rates and the costs associated with installation of service lines. If you have any questions, please don't hesitate to contact us.

Sincerely,

Kevin Rafferty, P.E.
Research Associate

KR/dg

CPBHISTR CIS BILLING HISTORY 4/15/93
OFFICE: 24 DIST: 27 10:48:07
SERVICE/USER NO: 182480 0 FIRST BAPTIST CHURCH
SERVICE DATE:... 9/22/72 707 HIGH ST KLF 97601
TEL: BUS:..... 503 8846272 RES:..... 503 8846272
CURR AMT DUE:... 1753.24 LAST PAYMT: 475.00 PAYMT DATE: 4/12/93
12 MO.TOTALS: MChrg: 6511.10 Cons: 16714.00 Avg.Mtr.Chrg: 542.59

BILL DATE	STS*	AMT BILLED	MTR CHRG	ECF	CONS	DYS	DLY AVE
3/22/93		2228.24	1071.69		2720.00	29	93.79
2/19/93		1661.64	1156.55		2936.00	30	97.86
1/20/93		505.09	1324.32		3363.00	33	101.90
12/18/92		478.00	1057.65		2736.00	33	82.90
11/17/92		478.00	543.47		1428.00	30	47.60
10/16/92		478.00	284.97		745.00	29	25.68
9/18/92		3.00	133.20		344.00	32	10.75
8/18/92		3.00	17.76		39.00	29	1.34
7/20/92		478.00	21.92		50.00	30	1.66
6/18/92		953.00	232.74		607.00	32	18.96
5/19/92		478.00	177.86		462.00	29	15.93
4/20/92		478.00	488.97		1284.00	29	44.27
3/20/92		3.00	583.59		1534.00	29	52.89 +

*C - Cancl Bill
A - Adj Bill

CMD1-END CMD24-RETURN TO DIRECT INQUIRY ROLLUP/ROLLDOWN

4/6/93 Hope this helps. If we can be of further assistance, please let us know.

Donna

CPBHISTR CIS BILLING HISTORY 4/15/93
OFFICE: 24 DIST: 27 10:48:07
SERVICE/USER NO: 182480 0 FIRST BAPTIST CHURCH
SERVICE DATE:... 9/22/72 707 HIGH ST KLF 97601
TEL: BUS:..... 503 8846272 RES:..... 503 8846272
CURR AMT DUE:... 1753.24 LAST PAYMT: 475.00 PAYMT DATE: 4/12/93
12 MO.TOTALS: MChrg: 6511.10 Cons: 16714.00 Avg.Mtr.Chrg: 542.59

BILL DATE	STS*	AMT BILLED	MTR CHRG	ECF	CONS	DYS	DLY AVE
2/20/92		3.00	860.64		2266.00	32	70.81
1/21/92		3036.18-	964.34		2540.00	31	81.93
12/19/91		4100.00-	1008.94		2638.00	33	79.93
11/18/91		4100.00-	558.00		1444.00	30	48.13
10/17/91		4100.00-	141.33		359.00	29	12.37
9/18/91		4100.00-	16.92		36.00	32	1.12
8/19/91		4100.00-	16.53		35.00	29	1.20
7/19/91		4100.00-	29.28		68.00	30	2.26

*C - Cancl Bill
CMD1-END CMD24-RETURN TO DIRECT INQUIRY ROLLUP/ROLLDOWN A - Adj Bill

First Baptist

91			92			93		1097 893
DD	actual	corrected	DD	actual	corrected		actual	
1057	0	0	974	964	1080	1380	1324	
688	0	0	708	861	1018	1083	1156	
885	0	0	670	584	716	1	0	
702	0	0	495	489	611	1	0	
554	0	0	182	178	380	1	0	
295	0	0	146	234	290	1	0	
12	29	82	50	22	15	1	0	
33	17	38	39	18	34	1	0	
89	17	37	213	133	121	1	0	
411	141	166	465	285	297	1	0	
762	558	591	853	543	514	1	0	
1027	1008	1032	1261	1058	882	1	0	
6515	1770	1946	6056	5369	5958	0	2480	

3" DI 12" Pen ins
195

First Baptist Church -

In building costs:

wall cut	100
2- 2½" gates	230
therm	110
press	40
40' 2½" BI · 1.3 17.5 5.70	1198
TCV 2½"	705
cut in existing	200
	2573

Lines to value box 19'+32"

trench & bk fl 150' @ 5	750
150' S&R 3" DI insul 24'+7.20	4722
remove paving @ 4"/yd	100
	5572
sub	8145
20%	1629
total (bldg)	9744
Ragland	7200
	16974

$17,000

Ragland fee @ 1200000 btu/hr
6000 · (1,200,000/1000000)
= $7200

Existing Heating Cost	6000	Retrofit Cost	17,000.00
Gas Inflation Rate	0.010	Credit Eligible	0.00
Geothermal Cost	3000	Discount Rate	0.180
Interest Rate	0.070		
Term	10		

Year	Nat Gas	Geot	Tax Credit	Debt Service	Cash Flow	Cumulative Cash Flow	Discntd. Cash Flow	Cumlative Dscntd CF
1	6000	3000	0	2420	580	580	491	491
2	6060	3000	0	2420	640	1219	459	951
3	6121	3000	0	2420	700	1919	426	1377
4	6182	3000	0	2420	761	2681	393	1769
5	6244	3000	0	2420	823	3504	360	2129
6	6306	3000	0	2420	886	4390	328	2457
7	6369	3000	0	2420	949	5338	298	2755
8	6433	3000	0	2420	1012	6351	269	3024
9	6497	3000	0	2420	1077	7427	243	3267
10	6562	3000	0	2420	1142	8569	218	3485
11	6628	3314	0	0	3314	11883	537	4022
12	6694	3347	0	0	3347	15230	459	4481
13	6761	3380	0	0	3380	18610	393	4874
14	6829	3414	0	0	3414	22025	336	5211
15	6897	3448	0	0	3448	25473	288	5499
16	6966	3483	0	0	3483	28956	247	5745
17	7035	3518	0	0	3518	32474	211	5956
18	7106	3553	0	0	3553	36027	181	6137
19	7177	3588	0	0	3588	39615	155	6291
20	7249	3624	0	0	3624	43239	132	6424

Existing Heating Cost	6000	Retrofit Cost	0.00
Gas Inflation Rate	0.010	Credit Eligible	0.00
Geothermal Cost	3000	Discount Rate	0.180
Interest Rate	0.070		
Term	10		

Year	Nat Gas	Geot	Tax Credit	Debt Service	Cash Flow	Cumulative Cash Flow	Discntd. Cash Flow	Cumlative Dscntd CF
1	6000	3000	0	0	3000	3000	2542	2542
2	6060	3000	0	0	3060	6060	2198	4740
3	6121	3000	0	0	3121	9181	1899	6639
4	6182	3000	0	0	3182	12362	1641	8280
5	6244	3000	0	0	3244	15606	1418	9698
6	6306	3000	0	0	3306	18912	1225	10923
7	6369	3000	0	0	3369	22281	1058	11981
8	6433	3000	0	0	3433	25714	913	12894
9	6497	3000	0	0	3497	29211	788	13682
10	6562	3000	0	0	3562	32773	681	14363
11	6628	3314	0	0	3314	36087	537	14899
12	6694	3347	0	0	3347	39434	459	15359
13	6761	3380	0	0	3380	42815	393	15752
14	6829	3414	0	0	3414	46229	336	16088
15	6897	3448	0	0	3448	49677	288	16376
16	6966	3483	0	0	3483	53160	247	16623
17	7035	3518	0	0	3518	56678	211	16834
18	7106	3553	0	0	3553	60231	181	17014
19	7177	3588	0	0	3588	63819	155	17169
20	7249	3624	0	0	3624	67444	132	17301

Appendix F

Customer Contract

EXHIBIT "A"

RULES AND REGULATIONS FOR GEOTHERMAL SERVICE

1. These rules and regulations become a part of each and every GEOTHERMAL ENERGY CONNECTION AND SERVICE AGREEMENT (AGREEMENT) between the City of Klamath Falls, an Oregon municipal corporation (CITY) and users of geothermal water (USER) and may be changed at any time by the CITY upon due notice.

2. The privilege of the use of geothermal heat shall be conditioned upon a written and signed AGREEMENT.

3. No relocation of geothermal mains or taps will be made for any USER except upon agreement satisfactory to the CITY.

4. Changes or alterations in the USER's piping or fixtures are not permitted during the period of any AGREEMENT, except upon written approval of the CITY. The USER's system must conform to the requirements of the CITY at all times. Diagrams illustrating acceptable types of connection systems are attached for reference purposes.

5. Upon request of CITY, CITY provided flow meters must be installed on USER's inlet piping, and meters shall be located as to provide access for convenient inspection by representatives of CITY at reasonable hours.

6. No more than one building may be connected to any one service connection without written consent of the CITY.

7. Use of the geothermal heat is not permitted for any purpose other than that specified in Exhibit "B" to the AGREEMENT.

8. The CITY is not responsible for the efficiency of any system supplied with heat from its mains, even though the CITY grants the approval of its installation.

9. The CITY is not responsible for damage of any kind caused by the geothermal heated water or resulting from shut-off of water without notice. The CITY shall not be liable for its inability to deliver water for any reason whatsoever.

10. The USER shall design and install its system so as to achieve a 40°F temperature drop throughout the load range between the supply water and return water temperatures.

11. Seals installed on geothermal supply or return valves by the CITY must not be broken, tampered with or interfered with by anyone other than the CITY's employees or agents.

12. The USER must permit access of CITY's employees or agents to its premises at all reasonable hours for purposes of inspection.

13. No person other than an employee of the CITY shall be permitted to turn on or off the water at CITY's valve installed on USER's service line.

14. The CITY reserves the right to install any type of equipment or devices that it determines are necessary in the future including metering and measuring equipment within the USER's premises.

15. The use of a booster pump or any device which will affect the pressure in the main supply lines of the CITY shall be approved by CITY prior to installation.

16. The CITY reserves the right to discontinue service without notice for violation of any of its rules and regulations.

GEOTHERMAL ENERGY CONNECTION
AND
SERVICE AGREEMENT

THIS AGREEMENT is made this _____ day of _____, 19____, by and between the City of Klamath Falls, an Oregon municipal corporation, hereinafter referred to as "CITY", and _____ hereinafter referred to as "USER".

W I T N E S S E T H

WHEREAS, CITY has rights in a geothermal well and distribution system, hereinafter called "SYSTEM", to supply geothermal heat to its customers; and

WHEREAS, USER is the owner of a building or structure located within the City of Klamath Falls and desires to connect to CITY's SYSTEM and receive space heating service therefrom; and

WHEREAS, by this GEOTHERMAL ENERGY CONNECTION AND SERVICE AGREEMENT, the parties intend to evidence USER's commitment to connect to the SYSTEM and to purchase geothermal heat from CITY;

NOW THEREFORE, in consideration of the promises, the mutual covenants and obligations set forth below, and other good and valuable consideration, CITY and USER hereby agree as follows:

1. Service. USER commits to connect to the SYSTEM, and to purchase geothermal heat from CITY and CITY agrees to sell geothermal heat to USER when said geothermal heat is available.

USER agrees to abide by all rules and regulations of CITY as set forth in the attached Exhibit "A" RULES & REGULATIONS FOR GEOTHERMAL SERVICE, as the same may be amended from time to time. Said heat shall be limited to use for the purposes described in Attached Exhibit "B".

2. Place of Delivery. The geothermal heat shall be delivered to USER at a point terminating at the valve box at USER's structure located at _____ in the City of Klamath Falls, Oregon.

3. Use of Service. CITY and USER specifically agree that geothermal service as set forth in this Agreement is available at the time of execution of this Agreement.

4. Term. This Agreement shall commence on the 1st day of _____, 19____, or as soon thereafter as the USER's building is connected to the SYSTEM and shall continue for a term of _____ years. This Agreement may be extended thereafter by mutual consent of the parties.

5. Installation and Maintenance of Receiving Facility. Subject to CITY's prior plan approval, USER shall provide, furnish and maintain at its expense, all necessary facilities, including but not limited to, pipelines, appliances and fittings within USER's building or structure to connect the CITY's SYSTEM at the point set forth in Paragraph 2 above.

6. Backup System. USER shall provide a backup heating system capable of providing service to its building in the event of an interruption in geothermal energy service. The USER's backup system shall be capable of providing service on a temporary basis in order to minimize potential damages in the event of a prolonged interruption in the supply of geothermal energy.

7. Meters and Monitoring Equipment. CITY may, in its discretion, install CITY furnished metering equipment to provide for the accurate recording of all geothermal heat consumed by USER. Meters shall be installed by CITY in the event CITY suspects heat

is being utilized in excess of the purposes approved of under this Agreement.

8. Connection Charge. USER shall be required to pay the cost of extending the geothermal supply and return lines to the valve box at USER's building or structure.

9. Billing and Payment. Bills will be rendered each month by CITY to USER for geothermal heat delivered during the preceding month, and each such bill shall be payable to the CITY on or before the 15th day after the date of such bill.

10. Rates. USER shall pay the flat rate of _____ ($_____) monthly during the heating season, _____ to _____, for the term of this Agreement.

11. Interruption of Service. CITY will endeavor to provide an uninterrupted supply of geothermal heat, but in case it shall be wholly or partially prevented from delivering geothermal heat to USER, due to any force majeure or in the event CITY deems it necessary to suspend delivery of geothermal heat for the purpose of inspecting or repairing its transmission and distribution system, its source of geothermal heat supply or other apparatus or to make repairs or alternations thereon or connections therewith, then CITY shall not be obligated to deliver geothermal heat to USER during such period and shall not be liable for any damage or loss resulting from such interruption, prevention, suspension or failure. In the event the temperature of the geothermal heat delivered to USER is less than ____ F., and/or sufficient quantity of heat is not available to meet peak demands, at USER's option, USER may terminate this Agreement, but shall not claim any loss or damage resulting from the termination of service.

In the event service is interrupted for a period of twenty-four (24) hours or more, the monthly bill shall be reduced proportionately to reflect such interruption.

The extent of any liability on the part of CITY shall be as provided for in this Agreement and as set forth in Oregon Revised Statutes, 30.270.

12. Injury to Persons or Property. CITY shall not be responsible for the distribution, transmission, control, use or application of geothermal heat beyond the point of its delivery to USER, and shall not, in any event, be liable for damages or injury to persons or property arising, occurring or resulting in any manner from the receiving, use, application or distribution by USER of geothermal heat except for such damage or injury which shall be shown to have been occasioned by negligence of CITY, its agents or employees.

13. Ingress and Egress. CITY shall, at all times during the continuance of this Agreement, have the right of ingress and egress at reasonable times and places to the premises of USER, for any purposes connected with the delivery, monitoring of, metering of, and/or distribution of geothermal heat hereunder, or the exercise of any rights secured to or the performance of any obligation imposed upon it by this Agreement.

14. Default. If default shall be made at any time by USER in the payment of any sum of money due hereunder, or in the performance of any other term or condition of this Agreement, and if such default shall continue for a period of twenty (20) days, CITY shall have the right at its option, on fifteen (15) days written notice to USER, to terminate this Agreement, or at its option, without terminating or in any way voiding this Agreement, to discontinue, suspend or withdraw the delivery, furnishing or supply of geothermal heat until such default has been completely remedied.

15. Modification of Agreement. No amendment, modification, alternation or enlargement of this Agreement shall be valid or binding unless reduced to writing and signed by both CITY and USER.

16. General Provisions. Except to the extent specifically set forth in this Agreement, CITY does not warrant or guarantee pressure, temperature or the chemical quality of the geothermal heat delivered to USER, nor assume any lability, direct or implied, for corrosion, scaling or similar physical degradation of USER's service lines, monitoring equipment, metering equipment or other facilities or equipment utilized beyond place of delivery as set forth in Paragraph 2 hereof, by USER.

17. Force Majeure. In the event either party is prevented from performing this Agreement by labor strikes, fires, floods, explosions, riots, severe weather conditions, acts of God, or other force majeure or extraordinary events beyond their control, the performance under this Agreement shall be suspended during the continuance of such acts which prevent performance.

18. Arbitration. In the event of a dispute between parties relative to damages suffered by USER as a result of disruption of service, the matter will be submitted to binding arbitration pursuant to Oregon Revised Statutes 36.300 et.seq.

IN WITNESS WHEREOF, the parties have caused this instrument to be executed by its duly authorized officers on the day and year first above written.

CITY
City of Klamath Falls, Oregon

By: _____
City Manager

ATTEST:

_____
City Recorder

USER

_____

By: _____
Title: _____

ATTEST:

_____
Title: _____