Price of Energy Cost-Comparisons

Potential customers often wonder what the least expensive form of energy is in their area. Should I use electricity or is natural gas cheaper? We have no way of answering this question broadly, although natural gas in most locations is still the cheapest heating fuel. You will have to contact your local electric and gas utilities and ask what they charge. Electricity is charged in $ per kilowatt-hour and natural gas is charged in $ per therm or sometimes in $ per 1000 cubic feet (Mcf) or $ per cubic meter. Once you have this information, then you can make a comparison. Here are the conversion factors:

1 therm =0.097Mcf or 1 Mcf = 10.3 therm
1 therm = 29.3 kilowatt-hrs
1m³ =35.315 ft³
1US gal = 3.785 liters
1 IMP gal = 4.55 liters

Energy content conversion factors for fuel alternatives are as follows:

1 kW-hr = 3413 Btu
1 m³ of natural gas = 35,310 Btu
1 liter of Propane = 24,200 Btu
1 lbs of propane = 21,700 Btu

While electric heating is nearly 100% efficient, gas pool and spa heaters are typically only 80% efficient. Taking this efficiency factor into account, the table on the next page provides the equivalent cost at which natural gas and propane would have to be priced to result in the same costs as the kW – hr costs. If the actual gas price is higher than the numbers in the table, the heating with gas will be more expensive than heating with electricity. If lower, then heating with gas will be cheaper than heating with electricity.

Example
In Manitoba Canada where I live, the residential electric rate is $0.06/kW-hr, natural gas is priced at $0.41/m³ and propane is priced around $0.68/liter. Examining the table shows those electric costs of $0.06/kW-hr equates to $0.78/m³ of natural gas and $0.53/liter of propane. Thus in this region electricity is 90% more (nearly double) than natural gas and propane is a further 28% more expensive than electricity.

When considering gas versus electricity, break-even is not good enough. At least a 25% savings is required, to justify the extra capital cost and extra maintenance costs of a gas heater system. Capital cost for a more elaborate gas heater with the additional digital spa pak can be $1000 more. There may also be a basic monthly charge involved with natural gas or a tank monthly leasing charge associated with propane. These have nothing to do with energy usage. Also be aware that exterior located spa and pool gas heater are not to be used in strong winter climates, and the manufacturer typically has a warning about this. Your options then involve locating the heater indoors, which involves further expenses or heating by electricity during the coldest part of the winter or shutting down the hot tub during the winter.

Cost of Electricity	Equivalent Cost of Natural Gas @80% heater efficiency			Equivalent Cost of Propane @80% heater efficiency			
$/kW-hr	$/Therm	$/m³	$/mcf	$/US gal	$/IMP gal	$/liter	$/lbs
0.05	1.83	0.65	18.31	1.68	2.02	0.44	0.40
0.06	2.20	0.78	21.97	2.01	2.42	0.53	0.48
0.07	2.56	0.91	25.63	2.35	2.82	0.62	0.56
0.08	2.93	1.03	29.30	2.68	3.23	0.71	0.64
0.09	3.30	1.16	32.96	3.02	3.63	0.80	0.72
0.1	3.66	1.29	36.62	3.35	4.03	0.89	0.79
0.11	4.03	1.42	40.28	3.69	4.44	0.97	0.87
0.12	4.40	1.55	43.94	4.03	4.84	1.06	0.95
0.13	4.76	1.68	47.61	4.36	5.24	1.15	1.03
0.14	5.13	1.81	51.27	4.70	5.65	1.24	1.11
0.15	5.49	1.94	54.93	5.03	6.05	1.33	1.19
0.16	5.86	2.07	58.59	5.37	6.45	1.42	1.27
0.17	6.23	2.20	62.25	5.70	6.86	1.51	1.35
0.18	6.59	2.33	65.92	6.04	7.26	1.60	1.43
0.19	6.96	2.46	69.58	6.37	7.66	1.68	1.51
0.2	7.33	2.59	73.24	6.71	8.07	1.77	1.59
0.21	7.69	2.72	76.90	7.04	8.47	1.86	1.67
0.22	8.06	2.85	80.56	7.38	8.87	1.95	1.75
0.23	8.42	2.97	84.22	7.72	9.28	2.04	1.83
0.24	8.79	3.10	87.89	8.05	9.68	2.13	1.91
0.25	9.16	3.23	91.55	8.39	10.08	2.22	1.99
0.3	10.99	3.88	109.86	10.06	12.10	2.66	2.38
0.35	12.82	4.53	128.17	11.74	14.11	3.10	2.78
0.4	14.65	5.17	146.48	13.42	16.13	3.55	3.18
0.45	16.48	5.82	164.79	15.10	18.15	3.99	3.58
0.5	18.31	6.47	183.10	16.77	20.16	4.43	3.97
0.55	20.14	7.11	201.41	18.45	22.18	4.87	4.37

Energy Usage

The amount of energy used by a 5ft 5in OD cedar hot tub, with an insulated floor, is in the order of 30 kW-hrs/day during a moderate winter season (similar to NYC or London). At 10 cents/kW-hr this cost you .10 x24 x30 = $90/month, during this season. During the summer the energy usage is considerably less (~1/3) and during spring and fall it would be about 1/2. If you live in a warmer climate (such as LA) your usage will be much less in the winter and during the summer the pump energy can be enough to keep the tub at temperature. Of course if you live in a more severe winter climate (Montreal) it will be more during winter, fall and spring. During the times you are in the tub, energy usage will be greater since the cover is off. Larger tubs will also require more energy to heat, roughly in proportion to the ratio of the surface area of the staves.

If using LPG (propane) a good question is how many gallons I will use and how big should my tank be. 30 kW-hrs/day equates to 1.07 gal (US)/day of LPG. You should therefore expect to use 30 – 40 Gal (US)/month during in a moderate winter (such as in NYC). We recommend at least a 500 pound size tank (called a “pig” in some areas). LPG has a density of approx 4.2 lbs/ Gal (US). A 500 lbs tank would therefore hold somewhat more 100 Gal (US) or a 3 – 4 winter-month supply.

Dieter Jung
Professional Engineer
Northern Lights Cedar Tubs Inc.