# Spas and hot tubs

Guides to Energy Management


## OVERVIEW

Spas and hot tubs use large amounts of energy, but by choosing an energy-efficient model and operating it wisely, you can keep your energy costs down. This BC Hydro *Guide to Energy Management* helps you select a spa or hot tub, and operate it efficiently and effectively.


## Background

The term "hot tub" refers to a freestanding wooden tub, whereas a "spa" is an acrylic or fibreglass mould that can be installed above ground or directly into the ground. Today, the two terms are used interchangeably, except when discussing energy consumption and heating costs.

A spa or hot tub system includes the tub itself, insulating cover, heater, pump, filter, hydro jets and disinfecting chemicals that clean the water. In addition to the initial cost, there are operating costs for chemicals and for energy to warm the water and keep it circulating. Energy costs are typically $15 to $75 a month, depending on the type of fuel used, tub size, pump horsepower and speeds, pump and motor efficiency, and how the tub is used.

## Selecting a water heater

Electricity and natural gas are the primary fuel choices for spa and hot tub heating. Propane can also be used in situations where quick heating is required and natural gas is not available.

Because gas heaters cost more to purchase and install, most heaters sold are electric. On the other hand, electric heaters take longer to heat the water. Annual operating costs for electric spa heating are 60 to 70 per cent higher on average than those for gas heating (except on Vancouver Island and the Sunshine Coast, where natural gas is more expensive and electric heating is only 9 to 12 per cent higher than gas).

### Heater capacity and heat-up time

Heaters are sized according to the rate of heat loss from the spa when it is being used, and the amount of time required for heating before use. If you use your spa daily and keep the temperature at an almost constant level, you can install a smaller heater. However, if you use the spa only on weekends and turn off the heater during the week, the water will be cold and will take a long time to heat. In this case, a larger heater will reduce the heat-up time (see the table on page 2).

When the heater is turned off, a well-insulated spa with a tight-fitting, rigid insulating cover will lose only 2°C to 3°C (3°F to 5°F) a day. If

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your spa is well insulated and you use a good quality insulating cover, the added cost of keeping the heater on when the spa is not in use is small. You also have the advantage of starting the water heat-up from a higher temperature if you turn the heater off.

The following table shows the time required to heat a 2.1-metre (7-foot), 1430-litre (315-imperial gallon or IG), square spa to 40°C (104°F) using heaters of varying sizes and starting at different water temperatures.

| Time needed to heat to 40°C | | | |
|---|---|---|---|
| Heater | | Time needed | |
| | | Initial temperature | |
| Fuel | Input | 29°C (84°F) | 37°C (99°F) |
| Electric | 4 kW | 5.8 hrs. | 1.5 hrs. |
| | 6 kW | 3.9 hrs. | 1.0 hrs. |
| | 9 kW | 2.6 hrs. | 0.7 hrs. |
| Natural gas or propane | 50,000 Btu/hr. | 2.0 hrs. | 0.5 hrs. |
| | 75,000 Btu/hr. | 1.3 hrs. | 0.4 hrs. |
| | 100,000 Btu/hr. | 1.0 hrs. | 0.3 hrs. |
| | 125,000 Btu/hr. | 0.8 hrs. | 0.2 hrs. |

### Heater sizing recommendations

The following heater sizing recommendations are adequate for most spas and hot tubs. For situations with special heat-up requirements or where high operating heat loss is anticipated (because of numerous hydro jets, for example), ask your spa or hot tub dealer to advise you.

| Recommended heater size | | |
|---|---|---|
| | Spa size | Recommended heater size (input) |
| Electric | less than 1350 litres (300 IG) | 4 kW |
| | more than 1350 litres (300 IG) | 9 kW* |
| Natural gas or propane heater | all sizes | 50,000–125,000 Btu/hr. |

*9 kW electric heaters require up to a 70-amp breaker. The electric capacity in your home may make this heater size impractical.

## Annual energy costs

Total annual energy costs include two major components: the cost of operating the pump and the cost of heating the water.

### Pumping costs

Spas and hot tubs typically have one of three pumping systems:

- a **single-speed pump** that runs continuously
- a **two-speed pump** that circulates water through the filter and heater at low speed and operates the hydro jets at high speed
- a **two-pump combination**, consisting of a small recirculating pump and a more powerful jet pump that is turned on separately when the tub is in use (not recommended - see the explanation under Health Considerations).

Some spas contain a hydrotherapy "jet" action, operated only while the tub is in use. Without jets (also known as blowers), costs are 50 per cent less for spas, 25 per cent less for hot tubs.

Pumping costs are based on the motor size. Motors are rated in horsepower. One horsepower (hp) is equal to 0.746 kilowatt (kW). You can calculate the cost of the energy with this formula:

**kW x hours of use x $0.06 (the cost of electricity in B.C.)**

### Water heating costs

The table on page 3 shows the estimated heating costs for outdoor spas and hot tubs in different areas of the province. These figures do not include pumping energy costs, and are based on the following assumptions:

- water temperature is 40°C (104°F) during use;
- heater is turned off when not in use;
- spa or hot tub is used for half an hour a day with the jets on; and
- energy rates are based on electricity at 6¢/kWh, natural gas at $6.44/GJ ($9.94/GJ on Vancouver Island), and propane at 40¢/litre (current as of June 2000).

| Typical annual water heating costs | | | | | | |
|---|---|---|---|---|---|---|
| **Hot Tubs** - top quality insulated cover with RSI 2.1 (R12) insulation. | | Vancouver | Vernon | Terrace | Pr. George | Victoria |
| 5′ x 4′ x 2′6″ | gas | $208 | $222 | $229 | $243 | $313 |
| | electric | $340 | $365 | $385 | $410 | $340 |
| | propane | $495 | $530 | $560 | $590 | $495 |
| 6′ x 4′ x 2′6″ | gas | $236 | $250 | $258 | $279 | $349 |
| | electric | $390 | $415 | $430 | $470 | $390 |
| | propane | $565 | $600 | $625 | $680 | $565 |
| **Octagonal spas** - top quality insulated cover with RSI 2.1 (R12) insulation, and set in-ground with sand fill. | | Vancouver | Vernon | Terrace | Pr. George | Victoria |
| 7′ x 2.75′ | gas | $ 86 | $ 86 | $ 93 | $100 | $126 |
| | electric | $140 | $145 | $150 | $160 | $140 |
| | propane | $200 | $210 | $220 | $235 | $200 |
| 8′ x 2.75′ | gas | $ 86 | $ 93 | $ 93 | $100 | $132 |
| | electric | $145 | $150 | $155 | $170 | $145 |
| | propane | $210 | $220 | $225 | $245 | $210 |

## Energy-efficient operation

Although spas and hot tubs use significant amounts of energy, there are ways to increase their energy efficiency.

### Tub insulation

Insulation is generally one of two types: solid foam or an air space sandwiched between two layers of foam. Both are equally effective. Ensure that the tub insulation is continuous, without gaps, and that it covers all hot water piping. Spray-on full foam insulation can be added to a spa that has already been installed.

### Insulating cover

An insulating cover on a spa or hot tub should be considered an essential component of a complete and well-designed system. Although floating foam covers are extremely effective on swimming pools, rigid foam insulating covers are better for spas because of the higher water temperature.

Insulation of at least RSI 2.1 (R12) is recommended. A high-quality insulating cover will cost about $400 to $500. Energy savings will provide a payback of about 1.5 years with natural gas heaters, 1 year with electric heaters, and six months with propane heaters.

The table below illustrates the significant difference a rigid foam insulating cover can make in annual energy costs.

| Effect of cover on annual heating costs | | |
|---|---|---|
| May 2000 | with R12 cover | without cover |
| gas | $ 86 | $ 415.00 |
| electric | $140 | $ 685.00 |
| propane | $200 | $1,000.00 |

### Energy-efficient pump

Whether you have a single-speed, double-speed or two-pump system, make sure it is energy-efficient. An efficiency level of at least 82 per cent is recommended.

## Installation and electrical safety

To ensure safe installation and operation of your spa or hot tub, follow these guidelines:

- Make sure the whole unit, not just individual components, is CSA-certified.
- Spas must be permanently connected to supply circuits, except for portable hydromassage units.
- Your hot tub should be installed by a qualified electrician, in accordance with the Canadian Electrical Code, and inspected by the proper electrical inspection authority in your area.
- Ensure the system contains a ground fault circuit interrupter (GFCI), which shuts off power if there is a problem in the electricity supply to the unit. Regularly test the GFCI to make sure it is working properly.
- A good safety feature to consider is a flow meter. It automatically shuts off the pump in the case of falling water pressure, which would occur if someone's hair or body was being sucked into the pump.
- Another optional feature is an automatic shutoff, which automatically turns off the heater if the thermostat malfunctions and the water temperature gets too high.

This is a general guide only. Please ensure that installations meet your requirements, manufacturers' instructions and all applicable codes, standards and regulations. BC Hydro is not responsible for installations.

## Health considerations

Hot tubs and spas—because they are warm and moist—can provide a fertile breeding ground for a number of disease-causing organisms. The following tips can help you improve the health and safety of your spa or hot tub.

### Pump use

Although some spa dealers suggest installing a timer on the pump to reduce energy costs, this is not advisable because harmful bacteria can grow in stagnant water, especially where it collects in water pipes. Keep the pump running 24 hours a day in order to prevent bacterial growth. A two-pump combination system is not recommended either. Small recirculating pumps which run continuously, but which by-pass some water lines, won't prevent problems with stagnant water in those lines. Health considerations should outweigh any possible energy cost savings.

### Disinfectant levels

Maintain proper disinfectant levels at all times. Test the water daily (kits are available from hot tub and swimming pool dealers) and adjust chemical levels, as needed, half an hour before using the tub. A knowledgeable dealer can advise you on the right program of water balance and safety.

### Heater use

It's safe to turn the heater off between uses, since cooler water is not a major factor in bacterial growth. If the tub is not going to be used for a long time, shut it down completely, but add high doses of disinfectant before using it again.

### Filter cleaning

Clean the filter once a month or according to the manufacturer's instructions.

### General health

Spas and hot tubs should not be over-used by children, pregnant women and people with health problems. Consult your doctor for advice.

For more information on safe hot tub use, contact the Provincial Ministry of Health.

## Summary

Although electricity and natural gas are both used for spa heating, annual operating costs for electric heating average 60 to 70 per cent higher than those for gas heating.

Energy-efficient features to look for include continuous insulation, a rigid insulating cover and an energy-efficient pump. It's important to keep the water circulating and to maintain proper disinfectant levels at all times, in order to prevent the growth of harmful bacteria.

## ASK US FOR MORE INFORMATION

The *Guides to Energy Management* series provides advice for BC Hydro customers.

Contact us for more information:

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