



Standby Energy Consumption Study

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(Updated November 6, 2009)

Background

Spa energy efficiency and electricity consumption has long been an important consideration of PDC Spas, our retailers, and our customers. To manage and regulate spa energy efficiency across the entire spa industry, energy standards legislation has been initiated in several states and at the Federal level. As the manufacturer of one of the most energy efficient spas in the industry, PDC Spas has monitored these legislative efforts closely. On December 3, 2008 the California Energy Commission (CEC) finalized the first of these energy standards (Title 20, Cal Code Regs., paragraphs 1601 – 1608), effective for spas sold in California starting January 1, 2009. Connecticut has adopted the CEC standards, and similar standards have been introduced in the Waxman-Markey Energy Bill currently under consideration by the US Congress. Based on the CEC Title 20 standards, PDC Spas has completed a comprehensive energy consumption study of our product line, and the results are presented below.

Energy Consumption Testing Method

The detailed testing method is specified in Title 20, Cal Code Regs., paragraphs 1601 – 1608. In summary, each spa model is to be tested in a sealed, monitored chamber where ambient temperature and air flow can be closely controlled. The specific testing conditions and measurements:

1604(g)

(2) Test Method for Portable Electric Spas

The test method for portable electric spas is as follows:

(A) Minimum continuous testing time shall be 72 hours.

(B) The spa shall be filled with water to the halfway point between the bottom of the skimmer basket opening and the top of the spa. If there is no skimmer basket, the spa shall be filled with water to six inches below the top of the spa.

(C) The water temperature shall be 102°F, ± 2°F for the duration of the test.

(D) The ambient air temperature shall be 60°F, ± 3°F for the duration of the test.

(E) The standard cover that comes with the unit shall be used during the test.

(F) The test shall start when the water temperature has been at 102°F, ± 2°F for at least four hours.

(G) Record the total energy use for the period of test, starting at the end of the first heating cycle after the stabilization period specified in Section 1604(g)(2)(F), and finishing at the end of the first heating cycle after 72 hours has elapsed.

(H) The unit shall remain covered and in the default operation mode during the test.

Energy-conserving circulation functions, if present, must not be enabled if not appropriate for continuous, long-term use. Ancillary equipment including, but not limited to lights, audio systems, and water treatment devices, shall remain connected to the mains but may be turned off during the test if their controls are user accessible.

(I) The measured standby power shall be normalized to a temperature difference of 37°F using the equation, $P_{norm} = P_{meas} * \Delta T_{ideal} / \Delta T_{meas}$.

Where:

P_{meas} = measured standby power during test (E/t)

ΔT_{ideal} = 37°F

ΔT_{meas} = $T_{water\ avg} - T_{air\ avg}$

T_{water avg} = Average water temperature during test

T_{air avg} = Average air temperature during test

(J) Data reported shall include: spa identification (make, model, S/N, specifications); volume of the unit in gallons; supply voltage; minimum, maximum, and average water temperatures during test; minimum, maximum, and average ambient air temperatures during test; date of test; length of test (t, in hours); total energy use during the test (E, in Wh); and normalized standby power (P_{norm}, in watts).

1605.3(g)

(6) Portable Electric Spas. The normalized standby power, as defined in Section 1604(g)(2)(I), of portable electric spas manufactured on or after January 1, 2006, shall be not greater than $5(V^2/3)$ watts where V = the fill volume, in gallons.

- Note that while the regulations specify “spas manufactured on or after January 1, 2006”, the actual testing criteria were finalized December 3, 2008 effective January 1, 2009 in both California and Connecticut.

PDC Spas Testing Results

PDC Spas completed energy testing per the CEC Title 20 requirements and is very pleased with the results. In general, our spa models tested used anywhere from 5% to 35% *less* power than allowed as standby energy consumption by CEC Title 20. With the exclusion of the Sunrise LX, a unique sun lounge design, the remainder of the PDC product line used 17% to 35% less power than allowed:

<u>Model</u>	<u>P (norm, W)</u>	<u>P (allow, W)</u>	<u>% of allowed</u>
Denali SE / Mirage AT / AT750	198	291	68%
Aruba LX	222	291	76%
Bali LX / BL870	236	348	68%
Everest SE	245	346	71%
Fiji LX / FJ840	251	348	72%
Biscayne LX	215	298	72%
Cabo LX	155	204	76%
Antero SE / CY310	149	204	73%
Columbia SE / Isle AT	171	229	75%
Boulder SE / Mystic AT / TH710	200	241	83%
Antigua LX	208	291	71%
Sunrise LX	290	304	95%
Dynasty LX	167	206	81%
Reno LX	215	307	70%
Vancouver SE	182	236	77%
CT410	245	346	71%
RN700	198	307	65%
AR720	198	291	68%
Orbit (220V)	176	244	72%

Quadra (220V)	225	248	91%
Orbit Flex	180	244	74%
Quadra Flex	231	248	93%

Each model was tested with standard equipment and PDC's latest TemperLok™ insulation system introduced in January 2008. Note that models included in the results above may not be available in all areas worldwide.

Important Considerations

Many factors influence spa energy efficiency. The CEC Title 20 energy standards mandate very specific testing criteria that do not include the effects of weather, actual spa use, or optional spa accessories. Each of these factors can and will change the amount of energy consumed by a spa. The amount of standby energy consumption "allowed" is based on a fairly simplistic formula that tends to disproportionately favor larger spas, which again may not reflect actual conditions. Also, the testing criteria allows significant additional insulation on the bottom of the spa far beyond what most manufacturers include as their standard insulation, ostensibly to permit closer ambient temperature control during the test. PDC Spas TemperBase™ system already includes bottom insulation as a standard feature on all spas, and PDC feels other manufacturer's results may be artificially enhanced in comparison. PDC encourages all consumers to consider the results presented above as idealized energy consumption figures, and to compare with other manufacturers accordingly. Consumers should also understand that their individual spa installation location, environment, optional features, and actual usage will significantly affect the amount of energy their spa consumes.