



POLICIES AND PROGRAMS

The most important recent developments on the policy landscape have been two mandatory standards by the California Energy Commission.

Title 20 regulates pool pump motors and controls, while Title 24 (in process) addresses pool heating, pumping, system piping, filtration equipment, pool equipment controls, and covers.

These standards are a suitable foundation for a national effort to go beyond just compliance, and to incorporate additional voluntary savings measures to capture even more savings. We recommend that the following programs be developed to build on California's efforts:

- Create a standardized software package that allows pool builders to model the energy use of various sizes and types of pools, and to understand the energy impacts of particular component choices. This software could also be used to educate consumers about how to operate their pools efficiently.
- Once such software is available, it would be possible to assign numeric scores to various efficiency features. This could facilitate a system similar to the Home Energy Rating System (HERS) or various green-built homes programs, whereby builders need to accumulate a certain number of points to achieve particular rating levels.

- ENERGY STAR®, LEED, or other voluntary labeling programs should consider adopting specifications for new pools that at least meet the "Shallow End" new construction criteria.
- Utilities should consider deploying energy efficiency incentives and marketing programs keyed to those voluntary ratings, to encourage installation of efficient equipment.
- Utility-funded efforts to document user behavior and verify energy savings in the field are also needed.

As utilities seek more and more ways to meet rising energy savings targets, pools are a very promising place to look. Once in-ground pools have been addressed, significant savings await in above-ground pools and spas as well.



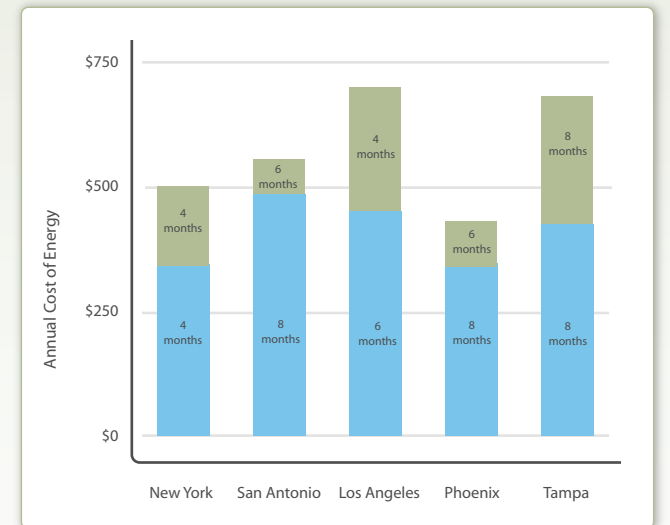
ENERGY EFFICIENCY: PROSPECTS FOR ENERGY SAVINGS IN POOLS

As more of the U.S. population migrates to sun-drenched portions of the country, residential swimming pools are becoming increasingly common. There are now more than 4.5 million in-ground residential pools in the United States consuming between \$1.1 and \$1.6 billion in energy costs per year. The number of new pools is growing by about six percent per year. Energy use varies widely by region due to differences in the length of the swimming season, energy rates, prevalence of heaters, and the way owners operate their pools.

We estimate that our nation's residential in-ground swimming pools consume nine to 14 billion kWh and 36 to 63 million therms of natural gas each year. This results in national CO₂ emissions of approximately 10 million tons per year – the equivalent of 1.3 million cars and light trucks on the road. Pools are also responsible for a range of other environmental impacts, including the use of water to replace evaporative losses and the production and discharge of various chemicals to treat the water. Fortunately much of the energy-associated impacts of pools can be offset cost-effectively with energy efficient components and better system design.

*Project managed by Noah Horowitz, Senior Scientist, NRDC.
Research and analysis conducted by Ecos.*

EXAMPLE HEATING AND PUMPING COSTS



■ Example Cost of Heating ■ Example Cost of Pumping

We have estimated the annual operational costs for an uncovered, occasionally heated pool in five different climates. Seasons of use and energy prices vary for each city analyzed. Since most pools are not heated, the pumping portion of costs are more typical for most pools. Assumptions: 20,000 gallon pool, 1.5" diameter piping, 1 HP pump, one water turnover/day, no cover, and 78% efficient natural gas heater enabled for 10% of the time that heat is needed to bring the pool to swimming temperature during the heating season specified. Note that more heat is needed to bring pools to swimming temperature in cool climates with shorter swimming seasons than in warm climates with longer swimming seasons.

HOW MUCH CAN BE SAVED?

This report focuses on the energy savings opportunities in new and existing residential in-ground swimming pools. Our research has found that annual utility bill savings of up to \$400 or more are possible by addressing inefficiencies in pool pumping; more savings are possible by addressing losses in pool heating. In fact, the savings for some heated pools approach the typical savings from upgrading average-sized new homes to meet ENERGY STAR®'s new home requirements.

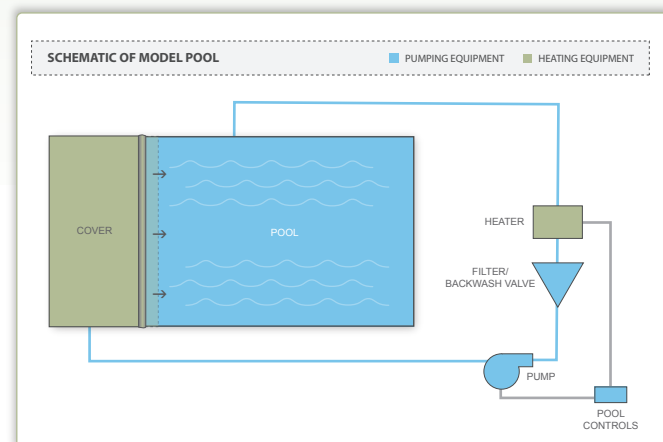


The research performed to prepare this report was funded by a grant from the U.S. EPA to the NRDC. The views and findings expressed herein are solely those of the authors and do not necessarily state or reflect those of the EPA. For more information, contact the Project Manager, Noah Horowitz, at nhorowitz@nrdc.org or (415) 875-6100.

As with homes, the total savings opportunity is much greater with retrofits than in new construction due to the sheer numbers of pools already in existence. However, the achievable savings per pool are somewhat lower in retrofits since much of the system is already installed below-ground and cannot be easily modified. Tremendous savings in heating and pumping energy use are possible in all pools through comprehensive design changes and/or component upgrades.

Overall, our energy modeling indicates the potential to save more than two-thirds of total swimming pool energy use. Comprehensive data on national pool energy use is limited. However, assuming that many pools already employ some efficiency measures, we estimate that if all residential pools were upgraded to reduce pumping energy by only one-third, and all heated pools were also upgraded to reduce heating energy by one-third, total annual savings would be worth more than \$360 million. Carbon dioxide emissions would be reduced by at least three million tons — the equivalent of removing all of San Antonio’s cars from the road for one year.

With both retrofit and new construction, we examined three scenarios for energy savings: “Toe in the Water,” “Shallow End,” and “Deep Dive.” Our recommendations build on the California Energy Commission’s appliance (Title 20) and building code (Title 24) efficiency standards. (The Title 24 Residential Swimming Pools standard is in process and not yet finalized.) With each savings scenario, the cost and the scope of measures addressed goes up along with the resulting energy savings.



This pool schematic illustrates the heating and pumping components whose energy use we modeled in our analysis. Note that the piping system is grouped with pumping equipment because hydraulic head of pipes and fittings affects the workload of the pump. Covers are considered part of the heating system because they prevent heat loss.

To date, most swimming pool efficiency efforts by utilities have focused almost entirely on pumps: down-sizing, upgrading, or switching to two-speed models. Other utilities have focused on time-of-use and encouraged pool owners to shift pump operation away from peak periods.



Variable speed pumps can be used with both new and retrofit pools. When properly programmed, they can reduce pumping energy by up to 90 percent. Photo courtesy of Pentair Water Pool and Spa.

We found that addressing pool pumps in only these ways leaves a great deal of energy savings on the table. Highly efficient variable speed pumps offer tremendous promise in new and retrofit applications. They deliver a minimum flow rate automatically, regardless of variations in the hydraulic head of piping, valves and filters. Many also provide sophisticated control options, making it possible to align operation with off-peak reduced utility rates. Energy reductions from efficient variable speed pumps are so great that it is often cost-effective to retire single-speed pumps early.

Similarly, it is possible to reduce the workload on the pump significantly in a new pool through the use of larger and straighter pipes, sweep elbows, lower pressure backwash valves, and oversized filters.

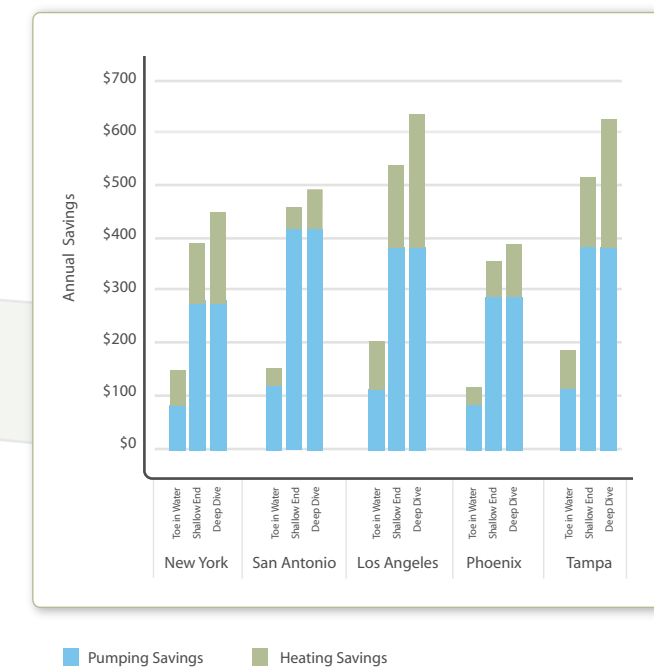
On the heating side, covers are highly desirable, since the vast majority of heating losses occur through evaporation. Automatic covers, while more expensive than bubble covers, are more likely to be used and provide safety and aesthetic benefits.

We also noted that solar heaters and heat pumps are still less widely used for pool heating than is economically justified given significant recent increases in residential natural gas, propane, and electric rates.



Automatic pool covers conserve heat and water by preventing evaporation. In addition, they are unobtrusive, offer safety benefits, and help keep the pool free of yard debris. Photo © Cover-Pools Inc.

SAMPLE SAVINGS FROM ENERGY EFFICIENCY MEASURES FOR NEW POOLS



Annual savings of \$100 to over \$400 are possible with pumping-related efficiency measures. Even more savings are possible with heated pools through the use of covers and efficient heaters.

ENERGY EFFICIENCY MEASURES	RETROFIT POOLS	NEW POOL
BASIC REGULATORY OPTION “Toe in the Water”	Meet existing CA Title 20 requirements Cover for all pools	Meet existing CA Title 20 requirements Meet proposed CA Title 24 requirements Cover for all pools
VOLUNTARY OPTION “Shallow End”	Above plus: Variable speed pump with programmable controls Efficient filter	Above plus: Variable speed pump with programmable controls Efficient piping and filter Efficient gas or heat pump heating
MAXIMUM SAVINGS OPTION “Deep Dive”	Above plus: Efficient gas, heat pump, or solar heater Robotic cleaner	Above plus: Automatic cover PV-powered pump Solar heating Proper solar orientation Appropriate wind block Robotic cleaner