Seven Wonders

Everyday Things
for a Healthier Planet

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The Clothesline

Susan Warner lives in the middle of a rain forest—in Juneau, Alaska—but she loves hanging clothes up to dry. "I *like* seeing laundry," the working mother of one explains. "Last weekend, our neighbor had pretty colored sheets hanging in the wind, and I really appreciated it. Where my parents live now in California, they're not even *allowed* to use clotheslines." It rains every other day in Juneau, and hypothermia-inducing drizzle seems to threaten year-round, yet Sue and husband Ken have no dryer in the laundry room of their 1913 home in Juneau's downtown historic district. Sue relies mostly on foldable wooden racks in her basement. "Why would I want a dryer?" she asks. "I mean, clothes dry by themselves!"

Clotheslines do require more time and effort than dryers, but I figure if Susan can line-dry her clothes in North America's rainiest city, anyone can. She loves clotheslines and clothes racks because they're simple, silent, and completely nonpolluting. They take few materials to manufacture and require no electricity or fuel to operate. Line-dried clothes smell fresh and have no static, and people who air their drippy laundry outside get to notice the weather, which flowers are in bloom, and who their neighbors are.

Ken Baldwin contributed to this chapter.

By letting the sun and wind do for free what dryers need electricity or gas for, clotheslines also save money. Diehards like Sue avoid the expense of a new dryer, but even dryer owners save money by hanging clothes on the line whenever time and weather permit. In a typical home, the clothes dryer uses much less electricity than central air-conditioning or a refrigerator but more than any other appliance. Feeding the dryer electricity will cost about $85 annually, and $1,100 over its lifetime. Because clothes last longer when they're spared a tumble dryer's heat and wear and tear, clotheslines protect the $1,000 that the average American household invests in new clothing each year. Just look in any dryer's lint trap to see the damage done as clothes shake and bake.

Sadly, clotheslines have fallen out of fashion. The automatic dryer, first manufactured in 1939, started becoming popular in the postwar appliance frenzy of the 1950s. In 1960, less than a fifth of American households, and only an eighth of Canadian households, had automatic dryers. Today three fourths of both nations' households have dryers; only 15 percent of U.S. households even occasionally line-dry their clothing. Many apartment buildings and homeowners' associations have gone so far as to ban clotheslines entirely. They apparently fear that sweet-smelling, freshly washed clothes billowing in the sun will somehow bring down their property values.

Clotheslines—and the energy that makes them work—get no respect. Although solar, wind, geothermal, and biomass power officially contribute less than 2 percent to current global energy supplies, we already use these renewable energy sources—the sun, above all—in unacknowledged ways. Solar designer-philosopher Steve Baer has dubbed this "the clothesline paradox": dry your laundry in an electric dryer, and the electricity you use is counted in

conventional energy statistics, but dry your clothes on a clothesline instead, and the solar and wind energy you harness is never measured. The sun, of course, also heats our entire world from about 400°F (240°C) below zero to livable temperatures, but we only count as "energy use" the energy required to heat or cool the insides of our buildings the last few degrees to room temperature.

The decline and fall of the clothesline have come at an environmental price. A typical North American family of four does about six loads of laundry a week and devotes about 5 percent of its annual electricity use to the dryer. With the mix of fuels burned to generate U.S. electricity, the average household dryer puts almost a ton of climate-damaging carbon dioxide into the atmosphere per year. (The same dryer in Canada would send up less than 500 pounds [about 200 kilograms] of carbon dioxide but create more river damage and nuclear waste.) The heating coils in most dryers (20 percent of American dryers heat with gas) require about three kilowatt-hours of electricity per load, enough to read by the light of a 60-watt bulb for two days or work on a laptop computer for a week.

Like many appliances, new dryers are more efficient than old ones. Moisture sensors in today's dryer drums can save about 15 percent of the energy used when relying on a dryer's timer. On the horizon is the microwave clothes dryer, which offers a potential 28 to 40 percent savings. But none of these technologies can match the 100 percent savings of the simple clothesline.

By drawing on the wind and sun, the clothesline avoids all the environmental impacts of electricity and natural gas. The clothesline is one of an array of technologies—from the ancient to the avant-garde—that fight global warming, acid rain, nuclear waste, and a host of other ills. These pervasive energy-related problems

have twin solutions: using energy more efficiently (see "The Ceiling Fan," page 27) and shifting as quickly as possible to renewable energy sources.

Fortunately, renewable energy is superabundant, and the cost of tapping into it is falling rapidly. In an hour and 15 minutes, the Earth receives as much energy in the form of sunlight as humans officially use in a year. If American rooftops were covered with solar shingles, they could supply half to three quarters of the country's present energy needs; winds in the United States are capable of supplying roughly one and a half times all the electricity used nationwide. Capturing a tiny fraction of these abundant resources would go a long way toward meeting the world's energy demands.

The clothesline is only the most obvious way to tap into the renewable energy all around us. Considering the energy used to heat water, washing a load of clothes in warm water actually uses about twice as much energy as heating the load in a dryer. (Water heating accounts for nearly 20 percent of home energy use in the United States.) Rooftop solar water heaters use the sun to heat and natural convection to pump water into a home water tank. It can take several years to recoup the initial costs of these simple but pricey systems, depending on energy prices and how much sun smiles on your home. Israel has installed nearly a million solar hot water heaters, which now provide hot water for four out of five Israeli homes.

Homes and businesses can be (and are) heated, cooled, lit, and powered by solar energy in its various forms. "Passive solar" design, such as well-placed windows and overhangs that let in warm light from the low-hanging winter sun but not from the high summer sun, can minimize or eliminate the need for heating and air-conditioning. Even in the cloudy Pacific Northwest, passive solar

design can supply 65 percent of a home's space heating. As an ad for Velux windows says of sunlight, "It traveled millions of miles to get here. The least you can do is let it in."

Half a million homes worldwide generate their own solar power with photovoltaic (PV) cells, wafer-thin semiconductors that turn light into electricity. PVs are probably most familiar as the power source for many handheld calculators. Solar cells provide a minuscule share of the world's electricity, but their sales have nearly tripled since 1990. Production costs are dropping rapidly as sales multiply, though PV-generated power still costs too much to compete except in remote locations. Much like related computer chip technology, PV technology is advancing swiftly, and major corporations like British Petroleum and Shell are making multimillion-dollar investments. Still, it's likely that, as clothes dryers and energy-inefficient buildings replace clotheslines and passive solar practices, solar energy's *real* share of world energy use is declining.

The circulation of the atmosphere is driven by differences in the amount of solar energy reaching different parts of the Earth. Humans have harnessed energy in the resulting winds with windmills, sails, and other technologies for millennia. As in passive solar design, buildings can be designed (and operated) to take advantage of the prevailing air movements. Opening the windows on opposite sides of a house harnesses wind energy for good cross-ventilation. A "thermal chimney"—which can be created simply by opening first-floor windows and a window at the top of the stairs to the second floor—draws breezes through the house because warm air rises and is replaced by cooler air below.

A more sophisticated means of capturing wind energy, wind turbines convert wind into electricity. Wind power provides less than 1 percent of world electricity, but capacity is expanding at a

rate of 25 percent per year, making wind the world's fastest-growing energy source. The cost of wind-generated electricity in the United States has dropped from 25 cents per kilowatt-hour in 1984 to less than 5 cents per kilowatt-hour today, making it competitive with coal and cheaper than nuclear power. In some regions of Europe, wind power already supplies 5 to 10 percent of electricity.

The United States was the world leader in installed wind power until recently, but pressures to cut costs in the newly deregulated utility industry have led many electric utilities to slash their spending on renewable energy and conservation. Canada, despite having vast prairies, windswept coasts, and a land area second only to Russia's, has only one major wind farm in operation.

Modern wind turbines are much quieter than their predecessors; most people cannot hear them 300 yards away. Some nature lovers fear that wind farms will endanger bird populations, but recent studies in Europe have concluded that well-designed and well-sited wind farms pose little risk to birds. A study for the Danish Ministry of the Environment found that power lines, including those leading to wind farms, endanger birds much more than do wind turbines themselves.

Realizing the promise of renewables will take more than concerned individuals using clotheslines or rooftop solar panels. Building market volumes enough to bring prices down will require large-scale investments. The U.S. Department of Energy recently launched a "million roofs" initiative aimed at installing solar systems on a million U.S. buildings, but the program has stalled for lack of funding. By contrast, the Japanese government recently launched the largest-ever initiative to jump-start markets in solar PV cells, providing $130 million in 1997 to put solar panels on 9,000 homes.

This initiative alone increased the global market for solar cells by roughly a third. In response, companies such as Sharp, Sanyo, and Canon began major scale-ups in their PV production facilities. The government hopes to have installed solar cells on 70,000 Japanese homes by the year 2000.

Shifting to renewable energy sources and reducing the amount of energy we waste are the keys to reducing the bloated impacts of industrial nations on the atmosphere. To stabilize the world's climate, industrial nations will also need to help provide alternatives to fossil fuels in the developing world. Otherwise, the two billion people in the world without electricity, and the many who have a little but want more, will turn to the world's vast supplies of heavily polluting coal to meet their energy needs. And books like *Our Landscapes Are from Mars, Our Climate Is from Venus* will top the best-seller lists of the twenty-first century.

While European nations have begun taxing fossil fuels to discourage their combustion, U.S. and Canadian government policies make these fuels artificially cheap, discouraging investment in renewable alternatives. The United States provides direct subsidies and tax breaks for fossil fuels to the tune of $18 billion per year; Canada provides Can$8 billion (about US$6 billion) worth of tax incentives (a whopping Can$290 per Canadian) to its oil and gas producers.

In short, if investors and energy users had to pay (through taxes or other mechanisms) for all the pollution, health problems, and climate change caused by fossil fuels, renewables would quickly take over the world energy market. Clotheslines would spring up in North American backyards faster than dandelions, and energy-efficient front-loading washing machines—which use less hot water

than top-loading machines and make drying easier with their faster spin cycles—would quickly turn today's top-loaders into an icon of wasteful decades past.

Individuals have usually lacked the power to choose renewable energy (except with actions like drying clothes in the sun), but that may soon change. Deregulation of the utility industry, if it doesn't extinguish renewable providers first, may soon allow electricity customers in much of North America to choose "green" power, often for a few dollars more per month. Several companies began offering "coal- and nuke-free" electricity at premium prices to test markets in 1998. Yet not everything is as it seems in the world of green marketing. The Bonneville Power Administration is marketing power from salmon-killing dams in the Columbia River basin to California customers under the name Environmental Resource Trust, even as many environmentalists in the Northwest advocate tearing down four of those dams to save endangered salmon runs. Go figure.

Running through this tangle of policy, economics, and technology, the simple clothesline proves that we can meet our needs without overwhelming the Earth. In 1997, when student activists at Vermont's Middlebury College wanted to protest nuclear energy, they organized students across New England to hang their sheets out on clotheslines as a symbolic protest. Their simple message: sustainability can begin in our own backyards.

Pad Thai

I am weak. Almost every time I go to a Thai restaurant, I order the same thing. Though I love peanut sauces and hot-and-sour soups and curries over rice, the siren song of *pad thai* inevitably draws me in. For those who don't live near trendy towns like Seattle where Asian restaurants abound, *pad thai* means simply "Thai noodles." This savory, slightly sweet dish, one of the most commonly eaten foods in Thailand, is a mainstay of Thai restaurants everywhere. Flat rice noodles are sautéed with garlic and a complex balance of sweet, sour, salty, and spicy flavorings. Scattered through the tangle of seasoned noodles are a variety of vegetables and usually one's choice of chicken, shrimp, or tofu. The best *pad thai* includes traditional ingredients such as fish sauce, tamarind, and palm sugar, but it can be made (quite palatably, believe it or not) with ketchup as a key ingredient. I've never met a *pad thai* I didn't like.

I'm not alone in my feelings for Thai noodles. Food industry watchers have dubbed Asian cuisine a major trend of the 1990s, as noodle houses and other Asian restaurants crop up in hip downtown neighborhoods and suburban food courts across North America. Sales at Asian restaurants in the United States nearly doubled from 1984 to 1995, while mainstream supermarkets and decidedly

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