CHANGING THE STORY

MAKING RENEWABLE ENERGY CENTRAL TO LEARNING

Although this generation's greatest challenge is to stabilize our planet's climate system while transitioning from fossil fuels to renewable energy, a working set of blueprints for *how* to do this is hard to come by. When faced with the immensity of the problem, the impenetrable economies and sway of the fossil fuel industries, and federal and state governments that haven't *really* gotten behind renewable energy as a bridge to a brighter future, the easiest path is... to procrastinate.

Some hope that, one fine morning, an elixir will appear: a technological or cost breakthrough that will take some of the sting out of the upfront price tag associated with long-term thinking about energy use. Others fall into despair — thinking, since small steps aren't enough to prevent destabalizing climate change, why bother taking any steps at all. Even among folks outraged and motivated by the problem, the path to a brighter future is littered with traps. The challenge of shifting our culture toward solutions is compounded when kids absorb our inaction, or when our actions and stories scare our kids, on whose shoulders we have placed a burden we are too weary to lift.

BY LISE GODDARD
AND
JOSHUA HAHN

Photos by Midland School

JAMES ROSS/GETTY IMAGES

But procrastinating and fatalistic thinking are not viable options. We need to change the story — its voice, its tone, its tempo, and its plot line. We need to take courageous steps and commit to moving in the direction of sustainability — *always*, in increments. We need to acknowledge to ourselves and show our kids that the technology to meet our electricity needs with renewable energy exists today, and then help build the infrastructure with them, side by side. And we need to realize that, if we do it right, we will produce much more than just clean kilowatt-hours. We will produce young people who possess the skills to continue building, scaling up, and evolving the infrastructure for a sun-, wind-, and water-powered future. We will produce a generation that can't imagine procrastinating the way so many adults do today.

Nearly all independent schools have mission statements that focus on community, responsibility, and service. Independent schools have both the privilege and the imperative to "give back." It's a *privilege*, because living the good life is made fuller by our connection to the world outside. And it's an *imperative*, because we are blessed with both the agility and resources, financial and human, to move toward our vision of the future, to live our values, to think and act outside the bureaucracy, and to leave our mark upon the world.

In *Earth in Mind*, David Orr, professor of environmental studies at Oberlin College, asks, "What is education for?" Lamenting what history has shown — that, "education is no guarantee of decency, prudence, or wisdom" — he makes a plea for us to think beyond ourselves and to do better in the way that we educate in the 21st century. He suggests that, in addition to basic ecological comprehension, we give our students "practical things necessary to the art of living well in a place: growing food; building shelter; using solar energy; and a knowledge of local soils, flora, fauna, and the local watershed. Collectively, these are the foundation for the capacity to distinguish between health and disease, development and growth, sufficient and efficient, optimum and maximum." In other words, provide references for distinguishing between "should do" and "can do."

GREEN POWER

Independent Schools Leading the Movement

By Paul Chapman

IN THE FALL OF 2010, I SET OUT ON A JOURNEY in search of green, environmentally sustainable schools. Having retired that year after more than 25 years as head of Head-Royce School (California), where we worked hard to create a model green school, I wanted to understand the broader school sustainability movement and seek ways to encourage other schools to grow greener. Given the significant environmental challenges we face, there is no more important issue before us and the rising generation of students we are educating today.

The narrative of my inquiry, *Greening America's Schools: The Environmental Sustainability Movement in K–12 Education* (NAIS, 2012), describes a remarkable depth and breadth in the K–12 environmental sustainability movement. Many schools, public and private, are "growing greener"; colleges and universities are demonstrating impressive leadership and engaging in important research on environmental issues and the human response to them; the "informal" education network focused on sustainability is large and innovative; a rapidly growing number of support and advocacy organizations have gotten involved in the movement; and state, regional, and local governments have turned their attention to promoting sustainability in all areas of society — thus underscoring the importance of this work in schools. Further, there is a growing consensus about what constitutes a "green school." My own description of a green school's components, which I call the "Five Foundations," includes:

- efficient use of resources,
- healthy operations,
- ecological curriculum,
- nutritious food, and
- sustainable community practices.

From my vantage point, the best practices to promote sustainability in schools include clear vision and mission, strong leadership and organization, a team approach, and the use of metrics to evaluate and guide progress. Most important, the "triple bottom line" benefits of green schools are increasingly clear: they save money, strengthen achievement, and improve health.

Greening America's Schools: The Environmental Sustainability Movement in K–12 Education contains 50 case studies of private and public schools and their leaders who are infusing environmental practices into their communities and curricula. Two of those exemplary schools, Hotchkiss School (Connecticut) and Midland School (California), are featured in this article. What makes them stand out is their inspired leadership. Since

This article examines two independent schools as case studies for educating for sustainability, and shares what they've learned, what works, and best of all, what can be replicated elsewhere. Midland School — rigorous, rustic, and full of heart — is a small college preparatory boarding school on almost 3,000 acres in the Santa Ynez Valley in Southern California. Sustainability is in Midland's DNA, and has been since the school's founding in 1932. Midland was awarded a Governor's Award for Environmental and Economic Leadership, California's highest environmental honor. The Hotchkiss School — challenging, traditional, and well resourced — is a boarding school on 800 acres, including woods, lakes, and freshwater wetlands in Connecticut. Hotchkiss Josh Hahn became assistant head and director of environmental initiatives at Hotchkiss in 2009, he has led, among many projects, an effort to build a $14 million biomass plant that will save an estimated $700,000 annually. Lise Goddard, director of environmental programs at Midland School, has led the school to pursue an innovative solar power project as part of a larger, ambitious Environmental Action Plan, with a goal of eventual carbon neutrality in which the students themselves are building the renewable energy infrastructure.

Many of the other schools I visited were making notable strides in facilities and operations, demonstrating that greening schools makes good sense (and good "cents"). At Putney School (Vermont), for example, its new LEED Platinum field house is the first zero-net energy secondary school building in the country, meaning it generates sufficient renewable solar power to provide all electricity and offset the fossil fuels used for heating the building. Nearby, the Berkshire School (Massachusetts) installed an eight-acre solar array that will produce an estimated 40 percent of the school's electricity needs and save $1.6 million over the next 10 years. Riverdale Country School (New York) estimates that based on a student-led study, the school cut its carbon footprint 20 percent in a single year through energy efficiency initiatives. The Athenian School (California) has pursued a systematic energy efficiency drive, including a 1,300-panel solar array, solar water heating for the pool, reduced trash off-haul costs through recycling and an extensive composting system, reduced water costs by stopping winter irrigation, and an artificial turf athletic field.

Perhaps most amazing are the California public schools that are striving to become grid neutral; Irvine Unified School District, for example, estimates it will save $8 million a year through its sustainability efforts.

In spite of these success stories, there are many challenges facing schools, including sustainability costs in a recession, limited human resources and time, the relative isolation of people and programs, the plateau effect and fatigue in working on sustainability in schools, the stranglehold of standards-based education, and the pressures of opposing ideology and politics. Looking to the future, we need to:

- Shape an agenda that will allow us to recognize green schools more effectively;
- Coordinate the work of the K–12 schools, college, and universities, and "informal" environmental organizations through "environmental literacy plans";
- Strengthen the system of measuring green school performance to provide feedback for improvement;
- Expand consulting resources to help schools grow greener; and
- Integrate the many local, regional, state, and national groups involved in K–12 environmental education.

Independent schools are prized for their ability to offer a high-quality educational experience while developing innovative educational models. Today we must seize time and embrace the "green power" movement. Not only will our students benefit from their education in green schools, our independent schools collectively will set an example for the rest of the nation to follow.

Paul Chapman, former head of Head-Royce School (California), is the executive director of Inverness Associates. His book, Greening America's Schools: The Environmental Sustainability Movement in K–12 Education, *is available through the NAIS bookstore at* www.nais.org.

We owe it to ourselves and to our kids to think about the cascade of impacts set into place when one flips a switch to turn on the lights, appliances, and electronics. Allowing students to help build their own renewable energy infrastructure as part of their education demystifies that switch and makes renewable energy technologies accessible to the people who need it most.

strengthened its commitment to environmental stewardship in 1996 in its Statement of Goals and Purposes, putting at the forefront of a Hotchkiss education the school's natural resources and student connection to these resources.

An Educational Approach to Carbon Neutrality

Midland School has taken a holistic approach to achieving carbon neutrality: make it educational and spread it out over many years. It's a practical approach, really. A 3-kilowatt (kW) installation for less than $20,000 is easier to manage than trying to solve the problem all at once with an enormous installation costing hundreds of thousands of dollars. But there are other advantages to the process. With the incremental approach, students are at the heart of it all. They can relate to the scale. They can own the process of installing a household-sized array of solar panels, rather than watching the professionals come in and do it, while feeling themselves removed. Understanding how electrons move through photovoltaic (PV) cells is accessible to the adolescent mind, as is scaling up from a single cell to an array that can power a household. There are excellent opportunities to put a PV installation at the core of a 10th grade chemistry unit on energy, as Midland has done, or at the core of a physics, geometry, or economics unit.

Midland School has been an ideal proving ground for developing an educational renewable energy program that works in independent schools. Midland's founders, Paul and Louise Squibb, understood that elemental lives with transparent relationships to our resources — warmth, warm water, clean dishes, food, and energy — build character, bring the community together, and promote accountability and conservation. From this founding principle, Midland has evolved a deep environmental ethic, unique in the way it touches *all* our students in daily habits and hands-on science.

Midland already possessed two key components for growing a renewable energy program — conservation as a habit of mind and community involvement to meet basic needs. Midland entered the competition of recent years to shave excess energy use as a 90-pound lightweight who had been on an energy diet since long before it was labeled as green. In Midland's early years, and still today, students heat their cabins and their shower water with wood fires. Turning off the lights when no one is in the room is a stated expectation. Our use of power is intentional.

But Midland does more than just conserve. Much of our produce is grown in our large organic garden, tended by faculty and students. And much of our grass-fed beef comes from our own pastures. Students participate in a daily Jobs Program, founded upon the model of Kent School (Connecticut) at the turn of the last century. At Midland, students authentically help in the daily running of the school, from washing dishes to fixing plumbing, from building shower fires to installing solar panels, from tending the garden to setting the table.

The genius of the Squibbs was in making our relationships with our resources transparent. As a founding principle for a school, this transparency evolved not only into a way of living relatively unplugged and connected lives, but also into an educational model that moves the building of our energy infrastructure into the science classroom, alongside lessons exploring the geology and ecology of our native landscapes, the water quality of our local creek, and the tight nutrient cycling between food scraps, the compost pile, and the organic garden.

Midland's solar program began with a pilot project in 2003. Every year since, our 10th grade chemistry students have worked alongside a solar electrician to install a 3-kW PV system that meets another 3 percent of our campus electricity use. They write technical reports and become community teachers at Santa Barbara's Earth Day. The Midland Model — 3 percent per year — demonstrates the viability of taking cumulatively consequential steps toward grid neutrality over a

Last fall when our ninth graders arrived on campus, they were asked a simple question, "Have you ever planted a seed and eaten what has grown from it?" Of the 109 incoming ninth graders, nine answered yes.

generation. As of 2011, 20 percent of our campus electricity needs are met with grid-tied, student-installed arrays. After eight years, we've achieved institutional momentum. Everyone — from our 10th grade students to faculty, administrators, and trustees — is on board. We will keep installing solar arrays because this is what we do. Just like brushing our teeth or taking final exams.

In 2011, Midland also incorporated a wind workshop led by Midland alumnus Mathias Craig, founder of blueEnergy, an installer of community-supported wind turbines and water filtration systems in Nicaragua. Students learn how to build a small-scale wind generator from raw materials — hand-carved blades, rotors, powerful magnets, and copper coils. Over the course of five days during "experiential week" in the spring, our 10th graders and faculty build a small demo wind turbine, then break ground and install a grid-tied PV array.

Putting theory to practice shows students that this work is something *they* can do, rather than simply watching the professionals do it. More important, this proactive project offers an antidote to being paralyzed by the scale of global climate destabilization. It is an emblem of hope in a world that needs to envision a way to counterbalance the relentless Keeling Curve, which graphically depicts the inexorable rise of global atmospheric CO_2 since the 1950s, against a background pattern of regular seasonal highs and lows (see sidebar on page 46). Note that, although the scales are different, the shapes are similar. Seeing actual results such as this — what is possible when we set out on a long journey of many steps — can galvanize a movement of bold first steps.

Midland aspires to be a replicable model, a living demonstration that annua l incremental action can accrue to 100 percent. We have touched upon a fundamental truth in our iterative approach to making community-based renewable energy happen. Doing it *every* year spreads its cost and expands its educational impact. With an ultimate goal of grid neutrality, education is at the heart of our project; we repeat the lessons with successive classes, keeping abreast of the technological curve. Midland's vision of showing what is possible in schools by *doing* it helped earn us a $50,000 grant from the E.E. Ford Foundation in 2011. This grant will fund our educational solar and wind program for the next three 10th grade classes — at which point 100 percent of our water pumping needs and 30 percent of our campus electricity needs will be met with solar — and will leverage matching funds to upgrade facilities for long-term water and food security.

Students are an ideal labor force for installing ground-mounted systems. On the one hand, it may seem like more work, and thus harder to involve and train them than it would be to just bring in the team of installation professionals, but that is precisely the point. It *does* take work to train people, and the product is a group of students who feel stoked by doing meaningful work. The value of a less-than-$20,000 investment in a household-sized, grid-tied PV array is amplified by the number of students who get to experience it as part of their education. In fact, given the educational impact, the upfront price tag starts to seem like a bargain when compared to expenses for consumable classroom items or for technology that will become obsolete within years. This is a class project that will actually pay for itself and shrink a school's electricity bills for years and years to come.

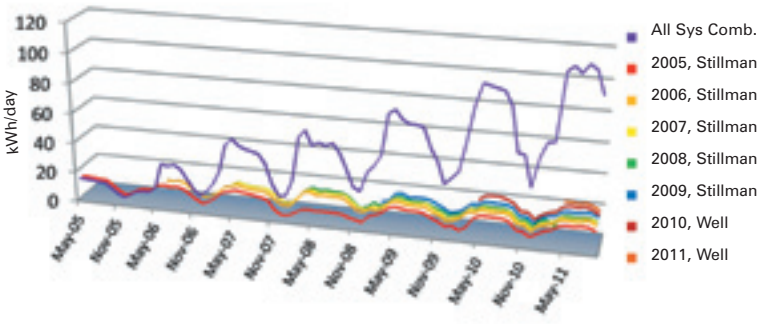
We owe it to ourselves and to our kids to think about the cascade of impacts set into place when one flips a switch to turn on the lights, appliances, and electronics. Allowing students to help build their own renewable energy infrastructure as part of their education demystifies that switch and makes renewable energy technologies accessible to the people who need it most.

Teaching and Living Sustainability

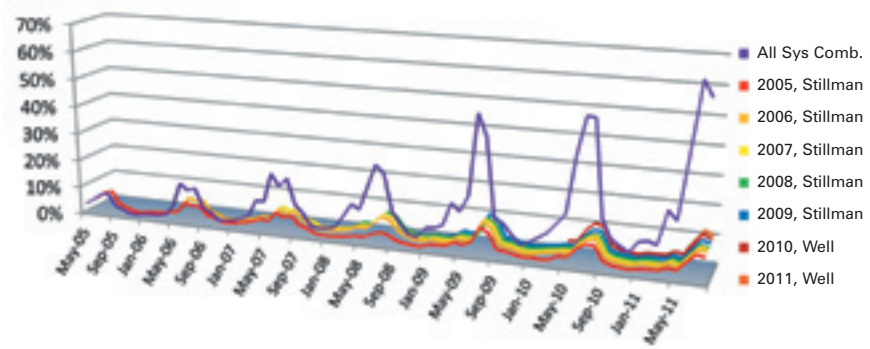
"There are two spiritual dangers in not owning a farm," wrote ecologist Aldo Leopold in 1949 in his seminal work, *A Sand County Almanac*. "One is the danger of supposing that breakfast comes from the grocery, and the other that heat comes from the furnace. To avoid the first, one should plant a garden, preferably where there is no grocer to confuse the issue. To avoid the second, he should lay a split of good oak on the andirons, preferably where there is no furnace, and let it warm his shins while a February blizzard tosses the trees outside."

The Hotchkiss School finds itself at the epicenter of this spiritual crisis. A selective school, we reach out to high-achieving students, yet there is a gap in our process. Last fall when our ninth graders arrived on campus, they were asked a simple question, "Have you ever planted a seed and eaten what has grown from it?" Of the 109 incoming ninth graders, nine answered yes. This exposes a vast gap in true understanding. They

Midland Solar Production, kWh/day, 2005–2011



% Campus Powered by Solar, 2005–2011



may have excelled on a test, but they have not had the experience that takes the concept beyond the academic. Responding to this gap, we have begun an ambitious program to ground the school in the context of sustainability.

Two significant projects frame the Hotchkiss environmental program. First, we have acquired a 280-acre farm less than one mile from the core campus. Second, we have chosen to examine our energy use closely and move our community to be carbon-neutral by 2020, primarily through constructing a state-of-the-art biomass central heating facility. Both the farm and the heating plant make natural resource use on campus transparent for students.

The farm, a subject for another article, has already become a hub for experiential learning on multiple levels. It provides our school with food, including all the potatoes for the first half of the school year, as well as squash, tomatoes, pickles, beets, chard, kale, carrots, chicken, beef, and more.

Around the same time as the farm was acquired, Hotchkiss began to study plans to replace the oldest dormitory on campus, which had met its match with entropy and was coming down whether we liked it or not. The study included a look at the central heating facility, which was attached to the basement of the old dorm. It was determined that those boilers were nearing the end of their useful life. In the past, this study would have resulted in a proposal for a new oil-fired boiler, likely more efficient, but in the same paradigm as the past. However, in the context of a restless school, attentive to the changed energy environment, this question was reframed. How do we want to address energy use on this campus, and how can our answer to this question be consistent with what we teach in the classroom? As a result, we have broken ground on a biomass central heating facility that fits the criteria we set for ourselves in an ambitious energy policy.

The energy policy, worked on extensively by numerous constituents of the school, sets out a three-pronged approach to energy use on the Hotchkiss campus and a road map to carbon neutrality by 2020, a goal set by the board of trustees. The energy policy has three discrete approaches to any energy issue we face as a school:

1. aggressive conservation and efficiency;

2. generation of energy on campus through renewables where possible; and

3. carbon offsets when directly connected to student learning.

Here are some results attributable to the Hotchkiss Energy Policy:

• Despite increasing square footage by one-third, the school has reduced its overall energy use in the past five years by one-third through a combination of behavioral and technological initiatives. Numerous student projects on energy efficiency as well as eager participation in the Green Cup Challenge (a competition among numerous independent schools to see who can reduce energy use the most in a given month) have raised awareness about energy conservation on campus. Technologically, the school has invested in simple projects, like CO_2 sensors in large gathering spaces to assure healthy air quality without overdoing fresh air intake. That most of these projects have had very good economic paybacks is a bonus.

• On the generation side, the construction of the biomass central heating facility (CHF) is the centerpiece of our program. The CHF will burn approximately 5,400 tons of raw "bole" wood chips annually, harvested from sustainably managed forests within 50 miles of the campus. This will offset the 300,000 gallons of #2 fuel oil we have used in the past. The CHF will save the school approximately $700,000 annually. The CHF will keep the $1.2 million we spend on fuel in our immediate region, rather than send it overseas, and it will create several jobs in the immediate region to support its operation. The heating program will allow land to be left as open space, rather than be developed, because landowners will be able to generate income from the sustainable management of their properties. The entire building is being constructed with student access as a fundamental design principle. Students will be able to track the wood chips from the forest to their emissions in both hands-on and virtual ways.

• A significant benefit of the CHF is that it will cut the school's carbon footprint by between one-third and one-half, a major step toward the goal of carbon neutrality in 2020. With additional renewable energy projects focused on electricity and steadily increasing awareness of conservation in the next three to five years, it is plausible for us to be more than 75 percent toward our goal. Currently, Hotchkiss can claim 29 percent of its electricity to be offset through a wind-power purchase. This is an excellent environmental statement by the school, but we have realized that this is not the exclusive way to get to meaningful carbon neutrality and that more meaningful student engagement in offsetting is a program we need to build.

So, why are these projects at Midland and Hotchkiss so important? Beyond their ecological benefits, we have chosen, quite intentionally, to address the gap between the content we deliver and the context in which our students live. Like most schools, we teach environmental issues extremely well in the classroom, even across disciplines. However, in the past there has been a disconnect between the lessons in the classroom and the operational dimension of our institution. The student who learns about energy efficiency or renewable energy in class only to encounter a wasteful, fossil-fuel-driven residential experience will easily categorize that course content as irrelevant and separate from his or her daily life. To reinforce our pedagogical intentions we must model what we teach. As Ted Sizer and Nancy Faust Sizer put it in their book, *The Students Are Watching*, "The kids count on our consistency. Few qualities in adults annoy adolescents more than hypocrisy." Schools need to make major strategic changes to present consistency between environmental theory and daily life.

Past ideas of sustainability center on the negative goal of "*not undermining* future generations" or "*not compromising* the needs of our children." We must ask ourselves if this is how we want to teach adolescents about their future. Shouldn't we focus on the regenerative aspects of environmental issues? We must encourage our institutions to model behavior beyond consumerism and focus on building soil, growing food, producing energy, and sequestering carbon, rather than only studying the sordid past of the environmental movement and succumbing to the pitfalls of what we have been trying for the past 40 years. Instead of asking them to deal with the despair of the past, won't our students respond better to opportunities to create their own future?

Hotchkiss and Midland are two models of how our schools can be regenerative in scope, adaptable to changing times, and resilient in the face of proven scientific limits.

Lise Goddard is the director of environmental programs at Midland School (California). Joshua Hahn is assistant head of school and director of environmental initiatives at The Hotchkiss School (Connecticut).