THINKING AHEAD SINCE 1932

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Transitioning to Renewable Energy - A Working Model from Secondary Education
By Lise Goddard

Though 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 governments who haven't *really* gotten behind renewable energy as a bridge to a brighter future, the easiest path is to procrastinate. To hope that one fine morning there will be an elixir - a technological or cost breakthrough that will take some of the sting out of the upfront price tag associated with long-term thinking. Or to fall into despair by thinking that since small steps aren't enough, then why bother taking any steps at all, if we'll meet with the same outcome of global weirding, regardless.

Even among folks outraged by the problem, the path to a brighter future is littered with traps that can ensnare or depress even well-meaning minds. The problem is compounded when the inaction of adults is absorbed by our kids, or the related problem, when our actions and our stories scare our kids, on whose shoulders we have placed a burden we are too weary to lift.

But procrastinating and fatal 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 out of the spiral of procrastination, by committing to move in the direction of sustainability *always*, in increments. We need to show kids that the technology to meet our electricity needs with renewable energy exists today, and help them build the infrastructure, 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 kids who possess skill sets to continue building, scaling up, and evolving the infrastructure for a sun-, wind-, and water- powered future. We will produce kids who can't imagine procrastinating the way so many adults do. We will produce kids who "get" it.

Midland School in Los Olivos, California is living proof that this vision is possible. Midland is a 9th-12th grade college preparatory boarding school - rigorous, rustic, and full of heart. Founded at the height of the Depression by Paul and Louise Squibb, Midland has, for eight decades, stayed true to its core values of personal accountability, authentic student leadership, building character through honest work, working to meet basic needs, and distinguishing between needs and wants. Since 1932, Midland students have *lived* as though we live in a world of limited resources. The genius of the Squibbs was in making our relationships with our resources transparent. Students chop wood to heat their cabins and shower water, help tend Midland's large organic garden, are relatively unplugged, and for almost a decade, have helped build the school's renewable energy infrastructure in annual increments. In 2009, Midland was awarded a Governor's Award for Environmental and Economic Leadership, California's highest environmental honor.

Transparent relationships with our resources are central to Midland's academically rigorous curriculum, and have proven to be a great backdrop for learning real science – the geology and ecology of our native landscapes, the water quality of our local creek, the tight nutrient cycling between food scraps, the compost pile, and the organic garden, and how electrons move through photovoltaic cells.

The great educator David Orr reminds us that *all* education is environmental education. For better or for worse, kids learn more than academic content in their classes; they learn the values lived by the adults around them. They learn something about their role in the natural world. The question is, whether these lessons are taught intentionally or unintentionally.

Midland has always subscribed to Paul Squibb's belief that, "money, light, heat, and water are not things that flow naturally out of pipes, but are things for which somebody has to spend time and thought and energy… I believe the [student] who has learned not to take the material blessings of life for granted will live a more vivid and interesting life and will be the better citizen." Consuming items of convenience, such as electricity or warm water, by simply flipping a switch makes the true cost of these resources invisible. At Midland, making the invisible visible is a tangible way of teaching personal accountability. Midland has been fortunate with eight decades of intentional leadership focused on our community meeting our basic needs, avoiding the trend of increasingly isolating our youth from the daily concerns of where our water, food, warmth, and electricity come from. For Squibb, this work was a way of building character. Over the years, it has evolved into a deep environmental ethic, which has set up Midland as an ideal proving ground for kids building a solar-powered future.

Every year beginning with a pilot project in 2003-04, our 10th grade Chemistry students work alongside a professional solar electrician to install a 3-kW PV system on campus, after writing technical reports on how electrons move through PV cells and how to scale up from single cells to arrays that can power households. We have found a model that works for Midland – annual, incremental action which engages *all* our students while moving steadily in the direction of grid neutrality. A 3-kW array meets about 3% of our campus's communal electricity needs. As of 2011, 20% of our needs are met with solar arrays installed by our 10th graders, and we plan to keep going until all our needs are met by the sun.

Students learn this is something *they* can do, rather than simply watching the professionals do it. We take cumulatively consequential steps EVERY year, never procrastinating or being paralyzed by the scale of global climate change, while allowing our students to feel ownership of the process. According to the Midland Model - 3% a year - it will take a generation to meet all our communal electricity needs with solar. But we will have far more than clean energy; we will have a generation of students who "get" it.

This multi-year project meets the expectation of college preparatory rigor for our students, and we look ahead to a future of iterative projects, in which we build on successes, learn from mistakes, and re-calibrate the message each year to best serve our students, whose secure futures will depend upon solar energy. With Midland monthly solar production recorded back to the spring of 2005, we have the data sets to provide continued opportunities for data analysis.

Looking back over eight years, one outcome of this endeavor becomes clear - we have achieved institutional momentum. Everyone, from our 10th grade students, to faculty, to administration, to the trustees are on board. The data sets show that 30% of our dining hall, kitchen, library, and administrative building, plus 50% of our water pumping needs are met by student-installed solar arrays. But more than that, the campus mindset is that we will install an array next year, and another the year after that, and wouldn't it be cool to pair the next several arrays with a shade structure for our horses or our vehicles? We will keep doing it because… this is what we do. Just like brushing our teeth or doing our laundry or taking final exams. This is what we do. The community benefits are clear – the next cohort of 10th graders will help build their energy infrastructure while learning the science.

Admittedly, the hardest part was getting the first few years of the PV installations under our belts. We had to figure out which electricity meter to target, where to put the arrays, who to hire to do the work (and how do you find someone who is both good with electricity and good with teenagers?), and most importantly, how to pay for it. In

the early years, we were awarded two $10,000 "A+ for Energy" grants from BP, and we purchased four-arrays-worth of used modules to help our funds stretch further. Though the installations with used modules required out-of-the-box thinking and engineering, they were well worth it, since these arrays are performing beautifully, and modules last for decades. We will continue to seek grant and donor support.

It took a bit of tenacity to get started, but as with all worthy movements, this one found allies. A generous alumnus of the school funded a couple installations. Our local solar contractor from Santa Ynez Valley Solar donated his time to help out the school and its students. In 2011, Midland alumnus Mathias Craig '96, founder of blueEnergy, installer of community-supported wind turbines and water filtration systems in Nicaragua, led a two-day wind workshop with our 10th graders. Midland students carved turbine blades from four-foot-long boards and learned how to assemble a small wind generator from powerful magnets and copper coils. This Midland student who "got it" returned to his alma mater to help us add wind to our renewable energy knowledge base and our annual plan for community-installed renewable energy systems.

Midland is a model that can be replicated elsewhere. 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 to just bring in the team of professionals to do the installation, but that is precisely the point. It *does* take work to train people, but the outcome is a group of students who feel stoked by doing meaningful work. The value of a $12-$20K 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.

Annual incremental action towards a clear goal of carbon neutrality starts to make sense when one realizes it will reach students across many years. Moreover, it is more affordable to do a large-scale renewable energy project in incremental installments than all at once, up-front. It provides a medium for schools to simultaneously teach intentional values and real-world science. It is an antidote to procrastination. And it can gather momentum over the years.

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 it makes renewable energy technologies accessible to the people who need it most.