



# RMI Solutions

## NEWSLETTER

## Small is Profitable

TODAY'S ELECTRICITY PROBLEMS—AND COSTS—  
ARE IN THE GRID

By Amory B. Lovins  
and Jeremy Heiman

Electricity has been so successful providing the energy needs of citizens and industry that many of us can't imagine life without it. Flip a switch, a light comes on. Spin a dial, a fan begins whirling. Crank a knob and a pump starts pushing. Electricity has become a pervasive and essential force in modern life because it is a versatile, convenient, controllable, clean-to-use, and generally reliable form of energy. Although only about one-sixth of the total energy delivered in the United States is electrical, electric power provides our highest-quality energy services.

But once in a while, the lights won't go on. It could be due to a thunderstorm, a traffic accident, or anything else that can compromise reliability in an instant. Simple power failures such as these—as well as more complex ones—almost always originate in the grid, the complex transmission and distribution network that gets electricity from today's giant power plants to the consumer.

For the first century of electrical power, as generating plants became larger and more centralized, delivery of power became more and more dependent on the grid.

Driven by demand that escalated as costs declined, the size of power plants grew during the first years of the 20<sup>th</sup> century.

The complexity and size of the grid increased at the same time. But by the early 1990s, it was clear that utilities

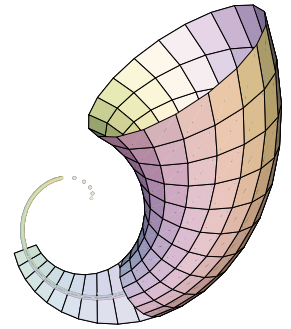
were no longer putting many large power plants in their shopping carts. By 2000, decentralized electricity production was the subject of stories in such mainstream publications as *The Wall Street Journal*, *The Economist*, and *The New York Times*. Power users and utilities alike are recognizing that smaller power sources that can reduce dependence on the grid also have substantial economic benefits.

The economic advantages of these smaller power generating units is the subject of an important new book from RMI, *Small Is*

*Profitable: The Hidden Economic Benefits of*

*Making Electrical Resources the Right Size*, written by RMI cofounder and CEO Amory Lovins and six coauthors. *Small Is Profitable* builds on the assertion central to Lovins's groundbreaking 1977 work, *Soft Energy Paths*, arguing that energy efficiency and cheaper electricity from small, renewable sources of energy will gradually replace the output of large, centralized fossil fuel-powered generating stations and nuclear plants.

Through the 20<sup>th</sup> century, coal- or oil-fired steam turbine power stations evolved from local, neighborhood-scale generators into huge, remote, regional power plants that often served customers hundreds of miles away. Power distribution infrastructure evolved as a network rather than a direct line from producer to user, because interlacing the unreliable power stations of the early days with complex transmission systems made consumer power more reliable—if one plant went on the fritz, the consumer was still hooked up to the rest. As economies of scale drove utilities to build ever-larger power plants, the grid became more complex. Distance, complexity, and age made the grid steadily less reliable at the same time power plants were becoming more dependable.



Amory Lovins

### Why Color?

"Advances in printing technology, such as computer-to-plate press (CTP) imaging, has enabled four-color printing to become more energy- and resource-efficient and more cost-effective than two-color printing. It also allows us to keep the presses in four-color process, eliminating ink waste and special cleanups."

Rich Garigen  
Area Account Manager, Colorado Printing Company

CONTINUED ON NEXT PAGE

“Central thermal power plants stopped getting more efficient in the 1960s, bigger in the '70s, cheaper in the '80s, and bought in the '90s.”

*Small Is Profitable*  
Executive Summary

In today's electricity market, however, the economies of scale that justified building big coal-fired and nuclear power plants have been outrun by diseconomies of scale, both in the grid and in generating plants. Mass production of smaller generating units offers greater economies than big plants can gain through unit size. Centralized power generation is no longer cheaper even on its own—and when supply is expanded, new power plants now cost *less* than the grid linking them to customers.

Smaller power sources located at or near the customer, collectively called “distributed generation,” today offer many other benefits not provided by big, centralized plants. The power quality and reliability essential to high-tech businesses such as semiconductor manufacturers and Internet service providers is not available through the grid, so large, centralized power plants can't compete in power quality with onsite or neighborhood-scale generation.

Although the gradual shift from the old central-plant-based pattern is now more

than a decade old, no systematic economic rationale for a new pattern has been available up to now. The advantages, economic and otherwise, presented by distributed generation have yet to be widely understood across the industry. The shift in the scale of power generation facilities has increasingly been driven by the financial risks of big, lumpy, slow-to-build power plants that have weakened many utilities (and bankrupted a few) that forgot Miss Piggy's Fourth Law—“Never try to eat more than you can lift.” But invisible to most practitioners, partly because of disciplinary boundaries between electrical engineering and financial economics, are scores of positive economic advantages of distributed generation. *Small Is Profitable* for the first time assembles these “distributed benefits” and makes them widely accessible.

“E. F. Schumacher would be proud of this rigorous extension of his thesis in *Small Is Beautiful*. It shows how making systems the right size can make them work better and cost less.”

Dr. Daniel Kammen  
Professor of Energy and Society and of Public Policy, University of California, Berkeley

*Small Is Profitable* is the first comprehensive analysis of how making electrical resources the right size can minimize their costs and risks and capture unexpected sources of profit and advantage. It enumerates 207 ways in which making “electrical

resources” the right size for their task can boost their economic value, typically by about tenfold, though the exact value is site- and technology-sensitive. Electrical resources are not only generating systems, but also devices that save or store electricity. Some of the broader and more important findings of the study include:

- Financial economics: modern tools for portfolio management reveal a nearly tenfold gain in value for renewable sources, about 3–5-fold for nonrenewables, from properly counting the reduced financial risks of small, fast, portable, and (for renewables) constant-price resources.
- Electrical engineering: lower grid costs, fewer losses, and longer equipment life, and more graceful handling of failures can increase the value of a distributed resource by 2–3-fold, or even more if the decentralized generating project is located in an area with a congested grid or if the customer requires high power quality or reliability.
- Miscellaneous benefits: dozens of other benefits may combine to increase the value of distributed generation resources, typically by about 2-fold—more if heat produced as a byproduct of electricity generation is recaptured for industrial processes or space heating.
- Management of external costs: costs not directly charged to the power producer, such as the environmental or public-health costs of combustion emissions, can be important, though they're not included in the roughly tenfold overall gain in value.

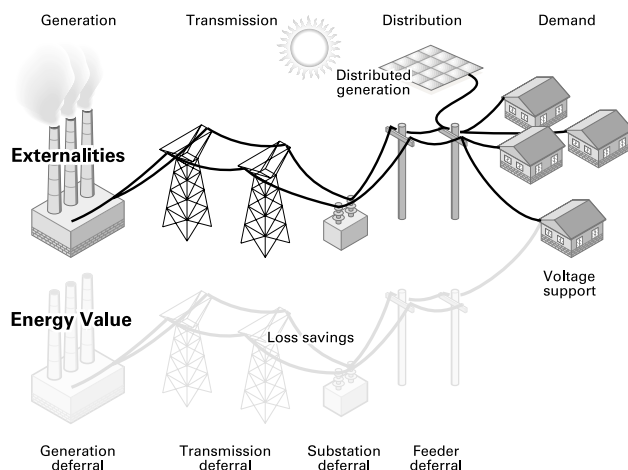
## RMI *news*

### NEP Initiative Draws Crowd

On 26 June, RMI CEO Amory Lovins participated in a Congressional briefing on the National Energy Policy Initiative in Washington DC. The event, sponsored by the Environmental and Energy Study Institute and Rocky Mountain Institute, drew a crowd of over 170 people. The panel was designed to give insight and direction to the current Congressional energy debate. Congressmen Zach Wamp (R-Tenn.) and Mark Udall (D-Colo.), co-chairs of the House Energy Efficiency and Renewable Energy Caucus, provided opening remarks. Amory Lovins of RMI introduced the audience to the consensus-based process behind the NEP Initiative, while Jack Riggs of the Aspen Institute (former Staff Director of the main House energy committee) and Bruce Smart, retired Chairman and CEO of Continental Group and former Under-Secretary of Commerce, described the Initiative's implications for reconciling the House and Senate energy bills currently in conference. For more information on the NEP Initiative, please visit [www.nepinitiative.org](http://www.nepinitiative.org).



Source: Hoff, T. E., "Distributed Generation: An Alternative to Electric Utility Investments in System Capacity" (*Energy Policy* 24, no. 2, 1996), p. 3, fig. 2



*Small Is Profitable* observes, though, that fully capturing the benefits of distributed electricity generation will require astute business strategy from those who develop new smaller resources, and reforms of public policy that currently makes some distributed benefits invisible or uncapturable.

## TODAY'S INFLECTION POINT

The release of *Small Is Profitable* at this time may position the book to provide exactly the clear vision of the future that has been lacking in the electric utility industry. It's evident that a transition—from large to small, from centralized generating plants to distributed generation—is well under way. But it's not clear to many in the industry how to use this transition to their advantage. Andrew Grove of Intel, in his 1996 book *Only the Paranoid Survive: How to Exploit the Crisis Points That Challenge Every Company and Career*, describes such a time of wrenching transition as an "inflection point," a make-or-break point that quickly sorts businesses into two categories: the quick and the dead. Properly understanding an inflection point can be the key that allows a business to survive and prosper in the new environment that results.

*Small Is Profitable* thoroughly and readably explores the issues that will define the new power generating environment

emerging from new technologies, institutions, and attitudes. A clearer understanding of why smaller power sources are superior could greatly accelerate their transition by revealing many unexpected sources of value waiting to be captured

by alert market actors and policymakers. This extra value can swamp the small cost differences that normally drive investment decisions, and can even make solar cells competitive today in most applications.

If the electricity industry, related industries such as real estate, and public officials respond attentively to the current inflection point, they can create greater profits for generators and service providers, cheaper electricity for customers, and a cleaner environment and a safer world for everyone. And when we flip the switch, the lights will go on. And stay on.

Please Visit:  
[www.smallisprofitable.org](http://www.smallisprofitable.org)

## Wind is Profitable

The Rosebud Sioux Tribe recognized some time ago that their reservation in South-central South Dakota has great potential for generating electricity from wind. Tribal lands in the Dakotas have a commercially attractive wind power potential of about 400 gigawatts (400 billion watts), compared with the less-than-800-gigawatt currently-installed electric generating capacity of the entire United States.

During the writing of *SIP*, Amory Lovins observed that Native American tribes appear to be sufficiently sovereign to receive credit on international carbon trading markets for wind power development on their lands, yielding cash to help finance transmission lines to industrial cities of the Midwest. Another option that appears economically viable is production of hydrogen, an energy carrier more valuable than electricity. Existing electric transmission infrastructure could carry only a small fraction of the potential energy from wind in the Great Plains.

The Rosebud Sioux have taken the first step in realizing their wind potential by installing one 750-kilowatt NEG Micon wind turbine on the reservation—a half-millionth of the Dakotas' Tribal lands' potential. Starting in November, it is expected to generate about 2,400,000 kilowatt-hours of electricity annually, enough to serve about 240 households. About 14.2 percent of households on reservations have no grid electricity, as compared to only 1.4 percent of all U.S. households.

Tribal officials see this first turbine as a start of an economic development initiative that will bring a vital industry to the reservation, envisioning future value-added uses of wind energy such as greenhouses or fish farming. In many ways, the Rosebud Sioux's example confirms that small, decentralized, and independent power production, *à la SIP*, works.

—Jeremy Heiman

# Manufacturers Explore Avenues to Efficiency

By Jeremy Heiman

**T**oday's manufacturing plants leave a lot of room for improvement. Products are still rolling off assembly lines designed in the 1950s and '60s, a time when energy and raw materials were cheap and environment was free. While some industrial managers have become aware of the inefficiencies that are perpetuated in factories, and are aware that manufacturing isn't as profitable as it could be, resistance to change is strong.

What to do about it? A few of the more progressive manufacturing managers, along with a handful of industrial consultants, assembled a discussion group last year to haul the twin ideas of efficiency and profit into the open and allow them to mature.

That group, known as the Evolutionary Manufacturing Discussion Group (EMD), convened at Rocky Mountain Institute in mid-August.

The gatherings began in May 2001, when Robert "Doc" Hall, professor emeritus of business at Indiana University, and Charlie Colosky, a consultant and President of Operations Development Associates, Inc., of Mooresville, Ind., convened a discussion group "to look into the future of manufacturing and management in general," as Colosky put it. Members of the group deemed the initial meeting productive and decided to continue. The August meeting at RMI was the group's fourth.

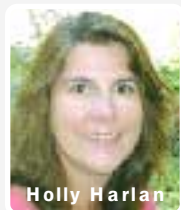
Many *RMI Solutions* readers have heard the term "lean manufacturing"—the systematic identification and elimination of waste from industrial processes.

The challenge for Hall, Colosky, and their colleagues in industry is to see what the future possibilities might be for slashing waste in manufacturing systems.

Evolutionary Manufacturing Discussion Group events begin with a guest speaker in the morning, followed by an afternoon of discussion of the ideas inspired by the speaker. RMI CEO and cofounder Amory Lovins kicked off the meeting with a presentation of his popular parable about parachuting cats into Borneo, a classic example of how a lack of whole-systems thinking can lead to unintended consequences. In the early 1950s, the Dayak people of Borneo suffered from malaria. The World Health Organization had a solution: the WHO sprayed large amounts of DDT to kill the mosquitoes that carried the malaria. The mosquitoes died; the malaria declined—so far, so good. But there were side effects. First, the roofs of people's houses began to fall down on their heads. It seemed that the DDT was also killing a parasitic wasp that had previously controlled

## RMI news

### Former RMite Grows Ohio Entrepreneurs' Group



Holly Harlan

Last year we reported on the formation of a non-profit organization, the Entrepreneurs for Sustainability, that was doing good work in Cleveland, Ohio. Headed by former RMI intern and longtime associate Holly Harlan, the organization supports entrepreneurs who implement sustainability principles in new or existing businesses—in short, it's where the ideas and principles of natural capitalism are brought to life.

In 2001, the group saw some impressive growth—holding eight awareness and community building meetings averaging 25 attendees per meeting. As of early August, in 2002 the organization had hosted five events averaging 70 attendees per meeting. In January, 80 entrepreneurs explored opportunities in the local and organic food industries. In March, 120 participants showed their support for emerging energy technologies and systems (energy efficiency, fuel cells, biodiesel, solar, wind, microhydro, etc.) in northeastern Ohio.

This unique group includes entrepreneurs, inventors, business leaders, bankers, architects, developers, restaurant owners, manufacturers, educators, high school and college students, designers, engineers, researchers, writers, farmers, government planners, environmentalists, and capitalists. According to Harlan, each meeting produces contacts and ideas for participants, and many leave with renewed vigor for possible business opportunities. In only six months, one of the group's members went from an idea to a partnership that is now delivering products.

"My business owes its existence to the Entrepreneurs for Sustainability," noted Ray Holan, of Biodiesel Cleveland. "I am now well into the start-up phase of a business that refines and sells biodegradable diesel fuel made from recycled cooking oil from local restaurants. I had been dreaming of developing a business that could 'make a difference' for some time, but had no organized way of making it a reality. That was before I heard about the Entrepreneurs for Sustainability."

For more information, contact Holly Harlan at [ecoinnovations@aol.com](mailto:ecoinnovations@aol.com).

### “Antibodies.”

John Wallner  
Director of Manufacturing Engineering at  
Tektronix, describing entrenched resistance to  
change often found in large corporations.

thatch-eating caterpillars. Worse, DDT-poisoned insects were eaten by geckoes, which were in turn eaten by housecats. The cats started to die, rats flourished, and the people were threatened by potential outbreaks of typhus and plague. To cope with these problems, which it had itself created, the WHO was obliged to enlist the help of the British Royal Air Force to air-drop 14,000 live cats into Borneo.

This tale about a *lack* of whole-systems thinking underscores that if we don't understand how things are connected then often the cause of problems is solutions. But if we harness hidden connections, we can often solve or avoid a problem in a way that also solves or avoids many others without making new ones—before someone needs to parachute more cats. Getting multiple benefits from single expenditures is the core of integrative design. Because current manufacturing systems are *not* based on whole-systems thinking, humans generate a lot of waste. In the United States, we each daily generate about 20 times our body weight in waste. And that massive flow of materials to no purpose, Lovins pointed out, is a vast business opportunity.

Lovins explained the four principles of natural capitalism (1. radically increase the productivity of resources; 2. shift to biologically inspired production models; 3. move to a solutions-based business model; and 4. reinvest in natural capital), and used real-world examples to show how nature uses raw materials in ever-evolving but virtually perfect processes.

### The Challenge of 'Lean'

Inspired by Lovins's talk, the EMD Group started applying its challenging message to

business. The root of the task with lean manufacturing is implementation—etching nature's impeccable, life-nurturing processes into the hearts and minds of corporate leaders, shop floor supervisors, and employees at every level. There are multiple reasons why resource efficiency isn't standard operating procedure for most firms.

One of the facts of corporate sustainability is that the companies that achieve it generally have an enlightened CEO or leadership team. While solutions might sometimes come from the bottom or the side, top-down conversions are most likely to survive. Worker-initiated advances in waste-stream utilization are often swept out of existence during periodic corporate restructuring.

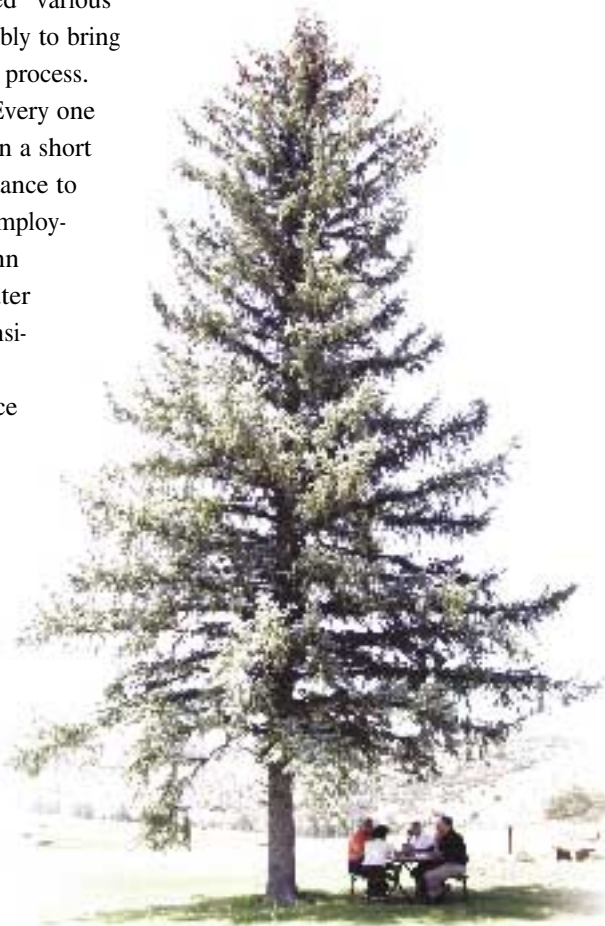
RMI's Catherine Greener, who organized the August meeting, noted that General Motors at one time hired a bunch of “out-of-the-box” engineers and “salted” various departments with them, ostensibly to bring more new ideas into the design process. The plan was foiled, however. Every one of the new engineers quit within a short period of time, because of resistance to their ideas exerted by the old employees. “Antibodies,” remarked John Wallner, a former Apple Computer manager who's currently responsible for instrument assembly at Tektronix. Institutional resistance to change is sometimes known by that term.

Trent Spear, a manager with ABB, a multinational manufacturer of electrical systems and components, observed that a kind of corporate inertia stands in the way of the implementation of efficiency measures. Executives often feel that an engineer who is experienced in the particular field where he will be working is the only sound hire to make. But the experienced

engineer, more often than not, has a preconceived idea of how things should be done, making efficiency innovations harder to achieve. A bright engineer hired from another field might see more readily the inefficiencies in a process because she's inexperienced in that industry, and hasn't become blind to the waste.

Colosky observed that trying to find a way for people to embrace change, a way that interests them and doesn't overwhelm them, isn't easy. Management exhibits a lot of resistance, for example, to leasing or other conversions from product-oriented business to a service-oriented mode. Many are not even comfortable with leasing a car, he said, noting, “We feel ownership is more secure.”

Other ways of bringing about corporate change may work better. With the modi-



Manufacturing group members meet near RMI's southeast annex. Photo: Cameron M. Burns

The companies that achieve sustainability generally have an enlightened CEO or leadership team.

fied architectural design *charrette* process that RMI uses, Lovins said, innovations can be established more firmly by involving more personnel at more levels of the corporate structure. “Once they approach the design fearlessly, with a clean sheet, it’s pretty amazing what happens,” he said.

After lunch, the group broke into three smaller discussion panels for the afternoon, and took up the challenges of education, employee retention, and management changes. Education might be one of the root causes of *unlean* manufacturing. Peter Senge, founder of the Society for Organizational Learning and a friend of RMI, noted that a major flaw in the education system in general is that adults train young people for the current world, not the very different world that will exist when they become adults. The factors that will shape the future must be considered along with the basics of business. Tom Johnson, a professor in the MBA program at Portland State University, observed that business schools in the United States are too often used primarily as a device for screening and recruiting executives.

Hiring and retaining talented young employees, whose energy and new ideas are infectious, is also problematic. Harry Ott, currently with The Coca-Cola Company, recalled that when previously working for another Fortune 500 company one energetic young engineer came from MIT with enthusiasm that infected the whole office. Unfortunately, he didn’t stay long because certain people who were part of the management team felt threatened by his talent and zeal. Transient executives are another major impediment to achieving lean manufacturing and natural capitalism. Spear said he worries that, if natural capitalism is adopted by corporations, the concept won’t be sustained because of the frequent changes in management that plague many companies. “My fear,” he said, “is that leaders will bring in natcap and then leave, and someone else will take over with some other idea.”

### Small Steps First

Although no corporate revolutions were fomented during the day-and-a-half meeting, Colosky said some small-but-important steps towards getting sustainability into industry were accomplished. First, the members of

this young group satisfied themselves that they’re all seeking the same goal. Second, the members had the opportunity to talk about and compare their individual experiences in bringing a fundamentally different idea like natural capitalism into the marketplace. All could compare experiences and begin looking for shareable, cross-sector solutions. New connections were made, too, and existing relationships were cemented as a result of the meeting, bringing new confidence and camaraderie to the members. The fourth accomplishment of the meeting was developing new ways to move forward in the field of industrial efficiency and environmental consciousness.

In a Saturday morning session, group members agreed there is a future for the organization, bringing the message of efficiency and environmental consciousness into industry. Doc Hall might have summed up the discussions best when he said, “David is still looking at Goliath. These people have been beaten up enough times that they know that change doesn’t come easily.” Who can say what the future might hold for the small EMD Group? David was a small guy, but he certainly put Goliath in his place.

## RMInews

### Amory Briefs the Hill on Military Fuel Waste



On Thursday 11 July 2002, RMI CEO Amory Lovins briefed a bipartisan Congressional group about the potential for energy efficiency in military applications. Energy efficiency improvements have enormous potential for enhancing military preparedness and national security and for reducing costs. Lovins led an expert panel that also included Vice Admiral Dennis V. McGinn, Deputy Chief of Naval Operations, Warfare Requirements and Programs, U.S. Navy, and retired Vice Admiral Richard Truly, who directs the National Renewable Energy Laboratory and chaired the Defense Science Board Task Force on which Lovins served. Its report *Enhanced Warfighting Capability Through Reduced Fuel Burden* was published in 2001.

The Environmental and Energy Study Institute (EESI) and the House Energy Efficiency and Renewable Energy Caucus hosted the briefing, and Congressmen Zach Wamp (R-Tenn.) and Mark Udall (D-Colo.), co-chairs of the House Energy Efficiency and Renewable Energy Caucus, provided opening remarks. The public briefing, entitled “Battling Fuel Waste in the Military: How Energy Efficiency and Resilient Energy Supplies Can Enhance National Security and Military Preparedness,” is partly posted at [www.rmi.org/sitepages/art7013.php](http://www.rmi.org/sitepages/art7013.php). Amory Lovins will again brief this subject 8 October at the Center for Naval Analyses and the Naval Sealift Command.

# An Introduction to Green Building

By Alexis Karolides

## Part 1: Resource Efficiency

**T**oday it is commonly assumed that the built environment will degrade the natural one, but this belief is not based on historical evidence. For most of earth's history, structures built for shelter have typically enhanced biodiversity and benefited the surrounding community. Beaver dams, for instance, create eddies where wetlands form, supporting a vast array of diverse life. Why should an office building be any different?

“Green building” is a way of enhancing the environment. It benefits humans, the community, the environment, and a builder's bottom line. It is about tailoring a building and its site to the local climate, site conditions, culture and community, in order to reduce resource consumption while enhancing quality of life.

There is no singular “look” for a green building. While natural and resource efficient features can be highlighted in a building, they can also be invisible within any architectural design.

Likewise, a green building is not an assemblage of “environmental” components or a piecemeal modification of an already-designed, standard building. These approaches not only add to the building's cost, but also produce marginal resource savings at best. True green building takes a holistic approach to programming, planning, designing, and constructing (or renovating) buildings and sites. It involves connecting often-interlinked issues such as site and climate, building orientation and form, lighting and thermal comfort, materials, etc., and optimizing all these aspects in concert. In order

to capture the multiple benefits of synergistic design, the “whole system” design process must occur early in the building's conception and involve interdisciplinary teamwork. In the conventional, linear development process, key people are often left out of decision-making or brought in too late to make a worthwhile contribution. Early and complete collaboration, however, can reduce or eliminate both capital and operating costs, while at the same time meeting environmental and social goals.

It is precisely the integrated approach described above and the multiple benefits thereby achieved that allow many green buildings to cost no more than standard buildings, even though some of their components may cost more. Green design elements may each serve several func-

tions and might allow other building components to be downsized. For example, better windows and insulation can result in smaller heating systems; photovoltaic panels can double as shade for parking or can replace a building's spandrel glazing.

Buildings use 40 percent of total U.S. energy (including 60 percent of electricity) and 16 percent of total U.S. water; they produce 40 percent of the waste in landfills. *Natural Capitalism* documents how radical improvements in resource efficiency are readily possible—today's off-the-shelf technologies can make existing buildings three to four times more resource-efficient and new buildings ten times more resource-efficient.

Reducing energy use in buildings saves resources and money while reducing pollution and CO<sub>2</sub> in the atmosphere. It also leverages even greater savings at power plants. For the average 33-percent-efficient coal-fired power plant, saving a unit of electricity in a building saves three units of fuel at the power plant.

As RMI's Amory Lovins has often said, “It's cheaper to save fuel than to burn it.” But full financial benefits will only be realized by using the integrated approach described above (high performance windows will increase initial costs unless the designer takes proper credit for smaller heating and/or cooling loads and equipment). Just as important as what goes into a green building is what can be left out. Green building design eliminates waste and redundancy wherever possible.

One of the key ways of reducing resource consumption and cost is to evaluate first whether a new building needs to be built. Renovating an existing building can save money, time, and resources, while often enabling a company (or a family, if it is a residential building) to be located in a

### About the Author



*RMI's Alexis Karolides, a former Richter Fellow, holds a Masters of Architecture degree from Rice University. A registered architect with six years'*

*commercial experience, she was previously the sustainability manager for the architectural firm Sussman Tisdale Gayle. This three-part series on the basics of green building is adapted from the forthcoming book Green Building: Project Planning & Cost Estimating, coauthored by Karolides. It is scheduled for publication in late October by R.S. Means Co., Inc., and is available from the publisher at 1-800-448-8182 or at [www.rsmeans.com](http://www.rsmeans.com), in the website bookstore under “New Releases.”*



## Green Building

part of town with existing infrastructure and public transportation, enhancing convenience and reducing sprawl. If a new building is required, it should be sized only as large as it really needs to be. Smaller buildings require fewer materials, less land, and less operational energy. Our cultural assumption is that we should buy (or lease) as much square footage as we can afford. Yet the average new house size has steadily increased over the past few decades while families have gotten smaller. Smaller houses and commercial buildings allow the budget to be spent on quality, not “empty” quantity.

**Energy.** The easiest and least expensive way of reducing operational costs in a building is to lower its energy consumption—best done by increasing energy efficiency. There are great energy-cutting opportunities in simple designs that respond to location and climate. Most North American buildings should face their long side to within 15 degrees of true south (and use proper shading to block summer sun but not winter sun). This can save up to 30 or 40 percent of the energy consumption of the same building turned 90 degrees.

Heat travels in and out of buildings in three ways: radiation, convection, and conduction, all three of which must be addressed. Radiation is the transfer of heat from a warmer body to a cooler one via infrared rays. They can be blocked by using reflective surfaces. Convection is the transfer of heat by heat-driven circulation of a fluid or gas, such as air. Convective heat transfer can be controlled by sealing gaps around windows, doors, electrical outlets, and other openings in the building. Conduction is the transfer of heat across an immobile substance. Every material has a specific conductivity (U-value) and resistance (the inverse of the U-value, called the R-value). Metal is a great conductor, so if high-performance windows have metal frames, there will be

a “thermal break” in the frame (an insulating material inserted to block the heat transfer across the metal).

As the above descriptions suggest, one of the best ways to reduce heat loss or gain is by installing the appropriate high-performance window for the given climate. The right window can save energy, enhance comfort, allow space-conditioning systems to be downsized, reduce fading from ultraviolet light, reduce noise from outside, reduce condensation, and improve daylighting.

Once the building envelope is designed to reduce heat flow, we can use a number of natural heating and cooling methods to downsize or even eliminate fossil-fuel-based heating and cooling systems. Techniques include daylighting, passive solar heating, natural ventilation, passive cooling, efficient and right-sized HVAC systems, and utilization of waste heat.

Daylighting enhances visual acuity for occupants, creates a connection to nature, and increases productivity and well-being. It also reduces operational energy costs as electric lights are turned off or dimmed when daylight is sufficient. This points out the importance of integrating all the technical systems—daylighting, lighting, and space-conditioning. It is also important to design systems for varying loads.

When energy loads are as small as practical, appropriate renewable energy sources should be evaluated. These include wind, biomass from waste materials, ethanol from crop residues, passive heating and cooling, and photovoltaics. An electrically efficient building might be less expensive to build with “off-grid” power than to connect to the grid.

**Demolition/Construction Practices.** With any site development it is important to protect adjoining agricultural areas, rivers, and trees, and to be especially vigilant about erosion control.

Rather than degrading the surrounding environment, development can enhance it.

Next, demolition and construction should be carefully planned to reduce or eliminate waste. Typically, demolition and construction debris account for 15–20 percent of municipal solid waste (and sometimes as much as 40 percent), while estimates are that 90 percent of this “waste” could be reused or recycled. Reusing and recycling waste is not only the environmentally friendly thing to do, but could save money and promote local entrepreneurial activities.

It is critical to note that reusing, salvaging and/or recycling materials requires additional up-front planning. The contractor must have staging/storage locations and must allot additional time for sorting materials, finding buyers or recycling centers, and delivering materials to various locations if buyers don’t collect them.

**Third party commissioning.** When the building is completed, third party building commissioning—making sure systems are installed and running as designed and as efficiently as possible—can save as much as 40 percent of a building’s operating costs for heating, cooling, and ventilation, according to Lawrence Berkeley National Laboratory. Ongoing regularly scheduled maintenance and inspection are also critical to maintain the performance and efficiency of the building and its mechanical systems.

**Recycling.** Americans produce an estimated 154 million tons of garbage—roughly 1,200 pounds per person—every year. At least 50 percent of this trash could be, but currently isn’t, recycled. Recycling doesn’t stop at the jobsite. The building should be designed to foster convenient recycling of consumer goods throughout the life of the building. This usually entails easily accessible recycling bins or chutes, space for extra dumpsters or trash barrels at the loading dock, and a recycling-oriented maintenance plan.

*Next issue: Environmental Sensitivity.*



# Building the Future of Buildings

By Onno Koelman

**W**e now stand at the advent of a revolution that will change the way we conceive, design, and construct buildings. No longer shall buildings be devices to conquer nature; rather, they shall complement and restore her. The instigator of this revolution is an unlikely heroine: a soft-spoken, careful, articulate observer, teacher, and author named Janine M. Benyus (who also happens to be a member of RMI's Board of Directors). Benyus started out as an eager wildlife biologist, but now works as a "biological consultant" to several major corporations, teaching them how to learn better, smarter design from nature. She posits that there exists a tremendous database of tried and tested natural solutions all around us. Indeed, during 3.8 billion years of evolution, those natural solutions that didn't work were recalled by their "manufacturer," Mother Nature. Benyus's message is that if we just open our eyes and look in the right places, there are elegant, efficient, and eminently practical solutions all around us.

Benyus's exposition of these ideas is in her landmark 1997 book, *Biomimicry*. According to Benyus, biomimicry "refers to the new science that studies nature's best ideas and then imitates these designs and processes to solve human problems." The concepts of biomimicry are deceptively simple but profound in their implications. Simple, because the answers are often already present in nature—we merely need to rediscover and apply rather than invent. Profound, because if we can rethink the way that we build and the way we manufacture it will allow us to improve our quality of life and not only do "less bad" to the environment, but actually restore it along the way.

Benyus has distilled her thoughts into nine laws of the circle of life and basic sustainability. Nature (1) rewards cooperation and makes symbiotic relationships work; (2) fits form to function efficiently; (3) develops diversity of possibilities to find the best solution and survival; (4) recycles and finds uses for everything; (5) requires local expertise; (6) avoids excesses and "overbuilding"; (7) taps the power of limits; (8) runs on the sun and other natural sources of energy; (9) uses only the energy and resources that it needs.

Visionary companies are beginning to realize that not only will biomimicry be good for the environment; it will lead to more durable, comfortable, desirable, and effective products. For example, Nike is studying animal foot padding for the design of its shoes. If a mountain goat can run over slippery ice and rough rock due the handy mix of hardness and softness in its hooves, perhaps shoe soles could be made with similar properties.

By understanding how nature does things, the Atlanta-based carpet manufacturer Interface designed carpet tiles that copy the ever-changing pattern of the forest floor and thereby fit together without a noticeable pattern—put the tiles down in random order and they still fit perfectly. This modularity obviates excessive cost in repair and installation; when one high-traffic area tile wears out, just slip in a new one.

Biomimicry holds future possibilities in many other areas as well. Mechanical engineers might learn from sequoias, which lift tons of water hundreds of feet into the air without pulleys, levers, or machinery—using only the power of the sun. Spiders spin material much stronger than man-made Kevlar® out of digested



insects, with no complicated, dangerous, or toxic manufacturing processes. But biomimicry's promise is not limited to materials science alone. It has implications for construction processes as well, especially since the building industry is a major contributor to environmental degradation in its current state. A revolution might be just what the doctor ordered.

Buildings use approximately two-thirds of all U.S. energy when you include all the embodied energy costs of initially extracting those materials, transporting them to, and later hauling truckloads of trash away from, a site. The construction industry produces up to 40 percent of the material that goes into our landfills. Given that humans are now prevalent over the entire globe, we no longer have the option of carrying our waste out of sight to get it out of mind. Does a forest carry away its waste? *Is there any waste in a forest?* The answer to both of these questions is no. How might we emulate forests in this crucial issue by making use of all materials and developing recycling processes that occur spontaneously, without constant human intervention? Answering this question of eliminating waste is vitally important—yet it encompasses but one facet of the biomimicry revolution.

So what might lie in store for us if the potential for biomimicry is fully explored? Imagine a building that, like a chameleon, changes colors to take advantage of weather conditions. Buildings that become dark-

**RMI is now preparing to lead this next revolution, facilitating the integration of biology, engineering, and architecture into a whole-systems program for making fundamentally better buildings.**

er during cold weather and lighter during warm weather would substantially increase their efficiency. The insulation in such buildings might, like a pelican's feathers, fluff up during cold weather and compact during hot weather, allowing cooling and heating processes to be maximized without pumping in additional energy. These buildings could have roofs that open like flower buds to allow ventilation during sunny weather but close to keep out the rain. If a rose bud can open and close without machinery, our buildings could too.

While these solutions might seem a bit far-fetched there are already many ways in which our buildings can, with present technology, mimic natural systems. Take principle one above: "nature rewards cooperation and makes symbiotic relationships work." A building can and should be a net contributor to its surroundings. Like a tree, it could provide and store energy using the technology of solar panels and fuel cells. It could collect and store

water, and with the addition of two- or three-story edible landscaping (like Village Homes in Davis, California), it could be shaded for temperature control while providing delicious organic food for its inhabitants. Additionally, the typical waste streams and garbage that come from buildings (including wastewater and food scraps) could be fed into Living Machines™ and recycled, feeding the fish that swim in the pond under the waterfall in the naturally-illuminated and ventilated lobby atrium. These are just a few of biomimicry's building design possibilities.

RMI is well equipped to make an important contribution to the biomimicry revolution, especially in building construction. For over a decade, RMI has been a leader in the green development movement, fostering the design of buildings that are more energy- and resource-efficient. We are now preparing to lead this next revolution, facilitating the integration of biology, engineering, and architecture into a whole-systems program for making fundamentally better buildings. The staff of

RMI's Green Development Services aims to bring biologists to the design table to help show engineers and architects where to look for inspiration, awe, and practical models for solving some of the building industry's most pressing problems. Biology is nature's treasure trove of outstanding models of sustainability—our job does not stop at preserving Nature; we need to look to her as teacher and role model.

Our goal is to foster buildings that are harmonious with their environments, efficient in their use of energy, and innovative in their use of building materials, but also better suited for human occupation and use. Some of the possibilities are surprising and include buildings that might one day be self-building, self-cleaning, and self-repairing.

The bio-logical revolution is coming.

*Onno Koelman is RMI's inaugural Mineral Acquisition Partners (MAP) summer energy fellow researching biomimicry. He holds a BS in Mechanical Engineering from Stanford University. In the next article in this series, we'll explore how RMI is focusing its research to facilitate the application of biomimicry toward better and more efficient buildings.*

## RMI news

### U.S. Green Building Council Meets at RMI



The United States Green Building Council (USGBC) held a Board of Directors meeting at RMI 1–2 August. RMI is a founding member of the USGBC and several board members wanted to tour RMI's Headquarters, one of the first green buildings in the country. The Council has 1,600 member organizations, including architectural and engineering firms, real estate developers, major corporations, federal agencies, city and state governments, manufacturers, and environmental organizations. Collectively they work to promote buildings that are environmentally responsible, profitable, and healthy places to live and work. The USGBC created the LEED rating system, which is now being used

to gauge the environmental performance of six percent of all commercial and institutional space under design in the United States. For more information on USGBC and the LEED rating system, please visit [www.usgbc.org](http://www.usgbc.org). For more on RMI's headquarters building, please see [www.rmi.org/sitepages/pid379.php](http://www.rmi.org/sitepages/pid379.php).

## Guess Who's Coming for Meetings?



**Marty Pickett,  
Executive  
Director**

In a recent staff meeting, RMI's prominence became a source of discussion—and subsequently, a source of pride. Several staff members reported how well known RMI is across the nation and around the globe. Often, audience members, university students, colleagues, or clients “rush” RMI staff to tell them how impressed they are with RMI's work. Clearly, we have a growing reputation. But the fact that the Board of Directors of the U.S. Green Building Council—the foremost organization concerned with green building—chose to hold its annual meeting at RMI is telling of the Institute's role in sustainability in many sectors (see p. 10). The USGBC is a well-established and impressive

organization (RMI's Bill Browning is on its board), but it wasn't the only group convening at RMI this summer.

RMI also hosted a gathering of the Evolutionary Manufacturing Discussion Group (see p. 4). This body might not be well established or even very prominent, but we think it will be. It certainly comprises prominent participants, including Tom Johnson (coauthor of *Profit Beyond Measure*), Peter Senge (author of *The Fifth Discipline*), and representatives of the automotive, beverage, and appliance industries, and several entrepreneurial manufacturing groups.

Meetings of this sort bring RMI and industry champions together to brainstorm ideas and problems, allowing an opportunity for innovative approaches for solutions. Collaborations with other groups cause RMI to keep a fresh perspective on its

mission while enhancing RMI's ability to be effective. We're having conversations with other organizations as well, including The Natural Step and Redefining Progress, as to whether and how our groups might have more collective impact.

We at RMI know there's much to accomplish in our pursuit to “foster the efficient and restorative use of resources.” We'll take (and seek) all the help we can get!

On behalf of RMI staff, I'd like to thank former Communications Director, Norm Clasen, who recently left RMI for other ventures. During the five years that Norm led our Communications Department, he was instrumental in taking our publications and outreach services to a higher standard. We'll all miss his terrific energy, good humor, and fabulous photos—images that caught the spirit and flavor of RMI as few words ever will. Good luck, Norm!



## Editor's Notes

### Reader Survey Offers Insight

**Cam Burns, Editor**

Recently, *RMI Solutions* went through a bit of a metamorphosis, and you hold the product of that change. In the summer issue, we polled readers and learned a few things. First, readers were very supportive of RMI. The comments scribbled into every returned survey included statements like, “critical contemporary relevance,” “articles demonstrating hope,” and “fresh concepts, clearly presented.” But positive feedback should not encourage resting on one's laurels. So, we took to heart the many comments about our articles being

too long, and the newsletter being so thick. Our new staff art director Ben Emerson—who has the strongest graphics background ever seen at RMI—cleaned up and has now taken over layout (something I did at the last minute with each issue). Now the various elements of *Solutions* connect in space and topic in a sensible, readable way. Also, you'll note this issue is four-color (see p. 1 for the reasons), and looks great.

There were a few other results we took to heart: 82 percent of respondents preferred the printed version, while 12 percent liked the online version—we'll keep printing it, but offer it online as well. Fifty-one per-

cent of donors opposed advertising in the newsletter, 40 percent didn't mind, and 9 percent said “good idea.” We probably won't hire any ad sales folks just yet. And most who read the newsletter read every story in it, the most popular topics being the articles about energy (energy security and policy, technology, etc.) and green buildings (85 percent read the energy pieces and 70 percent read green buildings articles). While this survey lacked controls (we can't force respondents to answer every question if they so choose), it did offer valuable information. As we continue to refine the newsletter, we hope you'll continue your support and offer valuable feedback on all our publishing activities.



by  
**Thammy  
Evans and  
Peter Light**  
(not pictured)

Dear Rocky Mountain Institute,

*I am so happy to read about the hydrogen car in Discover magazine. I had no idea that hydrogen cars were on the market. I have been emailing the wrong people. I have been emailing General Motors et al. for a solar powered car. Please tell me when is this car going to be marketable? Soon, I hope. I want something other than this gas-eating, oil-consuming heap I drive now. I understand that a fuel cell has to be in place somewhere. Well, bring it on. We have a dumpster in the condo that we would love to see used as a fuel supply, and to provide pure water for the pool next door. That's how I see it from what I read. I'm past ready. Ten years ago I decided that I would never buy another American made car much less a foreign car because I am so very tired and exhausted having to watch our military men go over there and fight for oil. How long until this car comes to market?*

*I know it sounds simple, but I am serious about the dumpster/fuel cell idea since the article says the fuel cell can be powered by garbage—nothing like American innovation! Please let me know when this car will be on the market.*

*I want to be one of the first purchasers. Thank you so much.*

Joanne Stewart, Via email

*P.S. Can a nefarious person blow this car up more easily than the oil/gas type car?*

Dear Joanne,

Development of technologies related to the Hypercar® concept is currently taking place worldwide. Anuvu ([www.anuvu.com](http://www.anuvu.com)) is working to incorporate its fuel cell technology into automobiles, and X-Corp develops composite-body vehicles. Both Honda and Toyota have announced plans to market a hydrogen fuel-cell car in late 2002, and six more major automakers by 2005, but those will first appear in limited quantities. For more information about these developments, visit RMI's Recent Hypercar News at [www.rmi.org/sitepages/pid388.php](http://www.rmi.org/sitepages/pid388.php).

As you know, fuel cells run on hydrogen. Hydrogen is a component of much carbon-based material (including dumpster waste). Before it can be used in a fuel cell, hydrogen needs to be extracted or "reformed" into a usable gas or liquid. It will be quite some time before you can throw your trash into a machine and get useable hydrogen out. However, hydrogen vehicle refueling is being intensely researched now. To learn more about these issues, check back at RMI's website for revised hydrogen and fuel cells pages in a few weeks. We'll have them posted soon. In the meantime, you might find the National Hydrogen Association website informative ([www.Hydrogen-US.com/](http://www.Hydrogen-US.com/)).

If you cannot wait to get into a greener car, you may learn about the best of what's available today at [www.fueleconomy.gov/](http://www.fueleconomy.gov/), or [www.greencars.com/indexplus.html](http://www.greencars.com/indexplus.html), from which you can order a copy of their *Green Book*.

I hope that these are good starting points for you. If you have any other questions after visiting our website, please do not hesitate to get in touch.

—Peter Light

Dear Joanne,

Your neighbor would not be able to blow up this car more easily than a conventional vehicle. This has more to do with design than type of fuel. We recommend that the Hypercar® design be made stronger and more secure than the conventional vehicle because this would help with durability of the vehicle and therefore lower expense for the owner. Extra security from outside tampering could be made available in this type of vehicle because of the increased electronic capability of the Hypercar® concept.

A hydrogen leak is less likely than a gasoline leak, due to the higher standards on compressed gas tanks than on the conventional gasoline tank. (In Hypercar, Inc.'s *Revolution* concept car, the hydrogen tanks are three times stronger than the car, which would be one of the strongest cars on the road.) Furthermore, even if hydrogen were to leak out, it quickly dissipates up and away rather than pooling around the car as a gasoline leak would. The compressed hydrogen gas tanks are designed to withstand gunfire and are placed centrally in the car so they are better protected even in a side crash.

Of course, any car can still be blown up with enough explosive, although a bomb would be harder to hide under the vehicle as it would have a flat underbelly.

I hope this allays your concerns—you can find out much more about the properties of hydrogen and its safety from the following websites:

[www.eren.doe.gov/hydrogen/](http://www.eren.doe.gov/hydrogen/)  
[www.hydrogennow.org](http://www.hydrogennow.org)  
[www.ttcorp.com/nha/](http://www.ttcorp.com/nha/)  
[www.hydrogen.org/Introduction/main.html](http://www.hydrogen.org/Introduction/main.html)

Thank you for your continued support of RMI.

—Thammy Evans

**Clarification** In a story on performance-based fees, *RMI Solutions*, Summer 2002, the authors failed to mention contributions from the Northwest Energy Efficiency Alliance, which funded the North Clackamas High School design work at the Lighting Design Lab (no longer called Seattle City Light's Lighting Design Lab). The Alliance also funded the commissioning at North Clackamas, a critical component in making sure all of the aspects from lighting to mechanical systems are working and integrated. Its website ([www.betterbricks.com](http://www.betterbricks.com)), run by Managing Editor John Jennings, is an interesting source of information on commercial energy efficiency design. Also, a special thank-you to Gunnar Hubbard, RMI's project manager for the PBF project.

## Enjoy Sun-Powered Surfing at RMI Websites



In 1977 RMI CEO Amory Lovins wrote, "Recent research suggests that a largely solar or wholly solar economy can be constructed in the United States with straightforward soft technologies that are now demonstrated and now economic or nearly economic." That was 25 years ago. Today's solar technologies (and tomorrow's) hold a lot more promise, and we can't wait to see what they bring.

At Rocky Mountain Institute, staff members try to live what they preach. In recent months we've been noting the latest steps in our shift to environmentally sensitive papers, but we are working to "green up" operations elsewhere too—notably our websites.

Several of RMI's websites are now hosted on solar-powered servers owned by SolarHost, the world's first (and so far probably only) web-hosting service provider that is powered by 100

percent renewable energy. RMI chose SolarHost for web-hosting services in early 2002.

"After speaking with SolarHost's Steve May and Randy Mayes about the company's background in web-hosting plus their interest in the environment and renewable energy, we decided to give them our business," said Bill Simon, RMI Webmaster. "Their goals were in line with RMI's mission statement. It was the perfect match. SolarHost is providing the same web-hosting services found at other companies, but they do it without polluting the environment. All of their web servers, routers, and Internet equipment are 100 percent powered by the sun."

SolarHost is currently hosting three of RMI's websites, including: the *Small Is Profitable* ([www.smallisprofitable.org](http://www.smallisprofitable.org)) website, the NEP Initiative ([www.nepinitiative.org](http://www.nepinitiative.org)) website, and the Natural Capitalism Academy ([www.natcapacademy.org](http://www.natcapacademy.org)) website. SolarHost started hosting RMI websites in January 2002, when [www.nepinitiative.org](http://www.nepinitiative.org) was launched.

"SolarHost's staff has been first class—professional and responsive," said Simon. "And the hosting service has been flawless. The RMI websites hosted by SolarHost have not been down once."

SolarHost uses Siemens solar panels and batteries to collect and store the energy,

"The RMI websites hosted by SolarHost have not been down once."

Bill Simon, RMI Webmaster

then converts it to alternating current as it is transmitted to the load. If charged for about five hours, the batteries can supply 140 percent of the energy needed for the company's servers and energy needs in SolarHost's Warrenton, Va. offices (night and day). The leftover energy is sold back to the regional grid.

SolarHost went "live" in March 2000, and since then has been down for only 11 minutes, mostly for service upgrades. Within a year of starting, SolarHost had attracted over 75 environmental groups and many private-sector firms motivated by the reliability of SolarHost's service.

Besides RMI, SolarHost works with The Center for Renewable Energy and Sustainable Technology or CREST ([www.crest.org](http://www.crest.org)); the Interstate Renewable Energy Council or IREC ([www.irecusa.org](http://www.irecusa.org)); the Maryland, Va., and Washington, DC Chapters of the Solar Energy Industries Association or MDV-SEIA ([www.mdv-seia.org](http://www.mdv-seia.org)); the Solar Energy Industries Association (SEIA) national website ([www.seia.org](http://www.seia.org)); the Renewable Energy Policy Project (REPP) ([www.repp.org](http://www.repp.org)); and *Home Power Magazine* ([www.homepower.com](http://www.homepower.com)).

For more information, visit [www.solarhost.com](http://www.solarhost.com).

# What Are You Doing?

## KATHERINE GRIMBERG



(PHILLIP SEMMER  
INTERNSHIP)

Just how sustainable are you? That is the question companies are beginning to ask themselves. However, companies

are using different devices for measuring success. My internship involves the development of a tool that will facilitate comparisons amongst companies of different sizes, and serve as a continuous improvement tool for companies to assess their progress. While the general nature of this tool currently does not address the intricacies of various organizations, it covers enough information to help identify trouble spots in the system and to discover leverage points for future improvements.

## BETSY HANDS



This summer I have been working with the economic renewal team on an exciting project that looks at the intrinsic links between businesses and commu-

nities. More and more companies are recognizing that they play a valuable role in a community's quality of life and economic revitalization. Interestingly, they are partnering with a variety of stakeholders to enhance the assets of the community while maintaining their bottom line. I am researching how the concept of sustainable development can be applied so that it captures the principles of natural capitalism and strengthens the relationship between communities and businesses.

## ONNO KOELMAN



Having just graduated from Stanford University with a degree in Mechanical Engineering and a passion to save the environment, I find myself fortunate

enough to be at RMI. I am working for GDS as this year's Summer Energy Fellow (sponsored by Mineral Acquisitions Partners) exploring how we can apply the revolutionary and evolutionary concepts of *biomimicry* and *biophilia* to buildings, making them happier, healthier, and more productive places to live and work.

## JEREMY MAGLIARO



The U.S. EPA is re-evaluating the efficiency of centralized wastewater treatment plants. I'm working with RMI Adjunct Scholar Richard

Pinkham preparing "Case Studies of Economic Analysis and Community Decision Making for Decentralized Wastewater Systems." This report aims to illustrate the full spectrum of economic, social, political, and environmental issues associated with decentralized wastewater treatment systems and their implementation in communities.

## MEREDITH SHEMP



(DAVID TICE  
INTERNSHIP)

In order to stay competitive, livestock producers must understand ecological processes as they pertain to land use.

Increased knowledge can be applied to goal-setting and decision-making in order to sustain agriculture, fish and wildlife populations, and the functions of water catchment basins. This summer I have been managing cattle in a high-intensity/short-duration rotation grazing cycle. The benefits of high-intensity/short-duration rotation grazing cycles include increased soil productivity and vegetative biodiversity. I have also been monitoring wetlands hydrology, assisting with irrigation, improving and maintaining the Nature Trail, and aiding with invasive species abatement.

## JOSH TERRY



(JOHN &  
MARY FRANTZ  
INTERNSHIP)

As a designer, my work involves encoding complex information within a specific design application for broadcast

in an easily understandable format. I hope to accomplish this with RMI's Virtual Reality Tour of the superefficient headquarters building. The goal is to show virtual visitors the building's unique design with the click of a mouse.

"Have you ever seen a parachuting cat?"



The future generation of interns practice their writing skills at RMI's 20<sup>th</sup> Anniversary Picnic celebration.



## Staff Spotlight: Christina Page

It's fortunate for Chris Page that RMI is located in the Rocky Mountains. It makes her feel right at home.

Chris, now a researcher and consultant in RMI's Commercial and Industrial Services Team, was an instructor for the National Outdoor Leadership School (NOLS) before coming to RMI. She spent five years teaching NOLS wilderness skills in the mountains of Alaska, Utah, Washington, Wyoming, and East Africa. She taught her students natural history, leadership, map and compass navigation, backcountry medical care, and how to stay warm, dry, and well fed in the woods. She also taught them hazard evaluation and avoidance, which varied from location to location. In East Africa it was hyenas, elephants, and malaria; in Alaska, grizzly bears, mosquitoes, and food re-rations being dropped from airplanes. Some courses were as short as two weeks, some as long as two and a half months.

Now RMI's point person on educational initiatives, Chris credits her successes there to her NOLS teaching experience. "The ability to work as a team is important," she said, "and so is self-reliance." She found it challenging and exciting to work with staff from around the world: "there are so many people who are talented and inspirational who worked for NOLS, just like at RMI."

Resource efficiency was an important idea at NOLS, as it is at RMI, but with a different twist. "You learn how little you really need in order to get by and be happy," Chris said.

Chris's teaching experience helped her recognize that people learn and absorb information in different ways, and that a teacher needs to use creativity to get the message across.

"For different people, different things cause that light bulb to come on," she said, referring to the universal cartoon symbol for realization. Presumably, that's a compact fluorescent light bulb.

Chris is now a member of Mountain Rescue Aspen, the local volunteer search and rescue team that rescues fallen climbers, injured hikers, and lost skiers, and also is occasionally called upon to recover a body in the backcountry.

"It's been a really slow summer," Chris observed. But search and rescue teams must keep their skills sharp with ongoing training. This year, members spent the spring practicing search techniques, high-angle rescues, snow and screefield evacuations, and avalanche safety. Early this summer, a re-certification committee made up of members of other Colorado search and rescue teams unanimously passed Mountain Rescue Aspen with flying colors.

So Chris still works in the mountains. And Colorado's mountains provide a playground where Chris can practice her recreational skills too. She's a devout telemark skier, rock climber, and a beginning whitewater kayaker. She does a bit of ice climbing, too. But this fall will bring a radically different activity, far from the Rocky Mountains.

This fall, Chris will be kicking off a semester's worth of RMI lectures at Beijing's Peking University School for the Environment. A rotating team of RMI staff members will be instructing environmental engineering graduate students in the four principals of natural capitalism, tools for designing sustainable projects, and how to implement sustainability. The participants, from the top one percent of China's students, will be key decision-makers in government and industry after they graduate.

Anticipating many cultural differences, Chris expects to take along some of the lessons she learned as a NOLS instructor in Africa. "Teaching wilderness medicine to Ugandan and Tanzanian park rangers on Mt. Kenya in Swahili was quite an experience. Sometimes they just didn't get it," she said. At that point, it would be time to use some of that NOLS creativity to get the message across.

—Jeremy Heiman

RMI **news**

### Greening China from the Roots Up

In early 2002, Professor Jinren Ni of the School of the Environment at Peking University, in Beijing, China, requested that RMI lead a semester-long course on natural capitalism in autumn 2002. The Institute accepted the invitation and organized a team of top RMI researchers to lecture on a rotating basis. Class participants will consist of postgraduate students and faculty members from Peking University, as well as visitors from other institutions. The course will focus on natural capitalism examples relevant to China. While it is a modest start, Professor Ni, the University, and many others have indicated their interest in offering this course on an ongoing basis at the University. RMI is, of course, excited to spread "natcap" to the future leaders of 1.3 billion people.

# Can Sustainability Sell?

**Chris Pomfret**

**W**hen I was asked to speak at the 20 March 2002 meeting of the IPA (Institute of Practitioners in Advertising), my first response was to question the title of the conference—"Can Sustainability Sell?"

I thought it was the wrong question. Why would I suggest that? You may find this hard to believe from a company as focused on marketing as mine, but while Unilever as a whole—and Birds Eye Walls in particular—regards sustainability as absolutely critical to the future of our business, the fact is that our commitment to finding sustainable sources currently has little to do with today's brand values, or with trying to increase our sales.

You might think this statement is disingenuous, or that I need a dose of the real world. But Unilever's view of sustainability is grounded very much in the real world.

## **UNILEVER'S VIEW OF SUSTAINABILITY**

The reason lies in the fundamental mechanics of our business. We rely on our ability to take high-quality raw materials—be they fish, peas or palm oil—and turn them into high-quality, added-value products that we can market and sell, with the help of the brand values and consumer trust we have worked to create around them. If our supply of raw materials runs out, we cannot produce any more, and we cannot sell anything to anyone—no matter how good our branding.

So sustainability is all about the long-term security of our supply chain. Which is why, in all our sustainability initiatives at Birds Eye, selling the concept has been the

## **About the Author**



*Editor's note: Chris Pomfret is the Brands Director of Birds Eye Walls, Unilever's Frozen Food products company in the UK. This article is*

*based on a speech delivered at a public meeting on 20 March 2002 of the IPA (Institute of Practitioners in Advertising) in the United Kingdom.*

last thing on our minds. Instead, the driver is our awareness that if our business is to continue, then we need to sustain our sources of supply—and the only way to do that is to make them sustainable.

This realization leads us to two conclusions. First, sustainability is the only way for a business like ours to thrive in the long-term, so ultimately we will have to sell it to consumers. Second, in the short term they are unlikely to buy into it because of the dislocation between consumers' day-to-day buying behavior and their wider concerns. While many people have genuine concerns about global warming, over-fishing, and other issues, they don't relate these issues to driving their car to the supermarket or buying Birds Eye Fish Fingers. Sure, they'll accept a theoretical link between the two if it is pointed out to them. But a significant emotional bridge between people's concerns over sustainability and their buying habits is yet to be built. Until that time, sustainability as a branding concept will not sell more peas, fish fingers or anything else.

## **ITS PLACE IN OUR BUSINESS**

You may wonder why Unilever became involved in sustainability in the first

place. Simple: Unilever plc. is one of the world's leading foods and consumer goods companies, with annual sales of around £30 billion in 150 countries. Every day 150 million people choose our brands for feeding their families and cleaning their homes. Within Unilever, Birds Eye Walls is the UK market leader in both frozen food and ice cream. Running a multi-local, multinational FMCG (fast moving consumer goods) business on this scale requires a tremendous amount of raw material, about two-thirds of which comes from agriculture—and therefore has the potential to be sourced through sustainable farming, on land or in the ocean.

Our mission is to meet the everyday needs of people everywhere, and to do that consistently we need to know where all our raw materials are coming from—not just next year, but in a decade's time. That is why our drive for sustainability covers three key areas: water management, fisheries, and agriculture.

## **THE SUSTAINABLE PEA PROJECT**

So what does this mean for Birds Eye Walls? The initial impact of our drive for sustainable sourcing is on peas and fish—but ultimately its effects will be felt across Birds Eye Walls and across Unilever as a whole. Birds Eye is the UK's largest food brand and peas are our biggest product and the foundation of our reputation for great food, simply frozen.

Ninety-six percent of consumers in the UK eat Birds Eye peas, and we grow them all ourselves, on 520 independent commercial farms across East Anglia and Humberside, all picked and frozen in two



and a half hours and each one individually inspected! So it's logical that we've focused on peas in our main sustainable agriculture initiative in the UK.

Birds Eye has been working with pea growers since 1998 to develop a model of sustainability that can be applied to our entire frozen pea business. About 20 of our pea farmers are currently taking part in an initiative called the "partnership for sustainability." It's based on an unprecedented collaborative effort between ourselves, our farmers, academics, and non-governmental organizations—including ornithologists, environmentalists, wildlife trusts, and Forum for the Future, the UK's leading sustainable development organization.

Under their supplier contracts with Birds Eye Walls, our farmers have always been required to meet quality thresholds, cooperate with local pea-growing groups, and be close enough to our freezing plants to get their freshly-picked produce there within the requisite two and a half hours.

Under the partnership for sustainability, the commitment on both sides goes much further. It calls for Birds Eye and the farmers to work together to promote a definition of sustainable agriculture drawn up in co-operation with environmental groups.

We have refined ten key indicators—from soil fertility and health to pest management, from water and energy efficiency to social and human capital—in order to define sustainable agriculture. They include:

- keeping yields and nutritional quality high, while keeping resource inputs as low as possible;
- minimizing adverse effects on soil, water, air quality and biodiversity while making a positive contribution to these where possible;
- optimizing the use of renewable resources, and minimizing non-renewable ones; and

- supporting the principle that sustainable agriculture should enable local communities to protect and improve their well-being and environments.

The first pea crop under the sustainability project was planted in the spring of 1999. The results, so far, appear promising. Primarily, it seems possible that one can maintain quality and productivity, and encourage biodiversity, while reducing the use of pesticides and chemical fertilizers. Similar results are being achieved by Unilever companies elsewhere in the world with tea, tomatoes, and spinach.

### **PARTNERSHIP FOR SUSTAINABILITY**

There are three aspects of the Sustainable Pea Initiative that might make it hugely significant. First, the pilot scheme is now being implemented by all our pea farmers in Eastern England. Second, the knowledge and experience we are gaining will help us in our drive to increase the security of our future supply chains. And finally, the valuable body of research being built up in a commercial setting—with proven, saleable, mass-market products—will help develop procedures and findings to be shared across the food production industries, and across society as a whole.

Given our level of excitement over the Sustainable Pea Initiative, you might think Unilever has missed an opportunity to "sell" sustainability to consumers—and thereby sell more peas. Again, that's the wrong perspective.

I have already noted that one day sustainability will have to sell because we have no alternative. But selling sustainability proactively as an overt brand value will have to wait. We do include the Sustainable Pea Initiative on our packaging now, but in a low-key manner: on the back of a package of Birds Eye peas, we print a small text box mentioning our part-



nership with farmers to protect the long-term health of the land.

Why so little advertising? Because blowing our own trumpet now to an already-skeptical public would risk undermining the credibility of the whole project.

Although Unilever understands the creation and marketing of brands as well as anyone else in the world, what we have seen in recent years is a major change in the nature of brands themselves.

When I started in this business 30 years ago, the relationship between the consumer and the brand was simple. People like the product, so they took them home and used them. Today, the issue is what's behind the brand and how does that express a consumer's values? A BMW says more about the driver than the quality of German engineering. Nike athletic shoes say more about someone being up-to-the-mark than fast off it.

Besides increasing the value and utility of brands, this shift also exposes them to closer scrutiny and higher risks.

Nowadays people want to know what lies behind a brand. Is the company committed to high ethical standards of behavior? Is it a good corporate citizen?

And does it apply the same values in all parts of the world?

### **SUSTAINABLE FISHERIES**

Now for a "sustainable fish story." Unilever is a major global processor of fish and producer of branded frozen fish

CONTINUED ON NEXT PAGE

## Other Voices

products—and to stay that way, we need to secure our supply chains amid growing global concern over the depletion of fish stocks. Our strategy is to reach a position by 2005 in which all our fish supplies come from sustainable sources.

To achieve sustainability our approach has been to center our decisions around the Marine Stewardship Council (MSC), a non-profit body that was founded in 1996 as a joint venture between Unilever and the World Wildlife Fund (WWF); it became an autonomous organization in 1999. The MSC helps create and certify sustainable fishing grounds and fisheries around the world. It does the former by engaging with a wide range of stakeholders and local communities to balance the long-term viability of global fish supply with the health of marine ecosystems. And it achieves the latter by benchmarking fisheries against a number of criteria—principally that the fishing methods used make a fishing ground sustainable.

The MSC has recently certified its first major species, New Zealand Hoki, which we are now launching as a product. However, when it comes to marketing this fish and its sustainable sourcing, we face two issues: one is that nobody has heard of New Zealand Hoki—so our new packaging proclaims it as a “new excellent alternative to cod.” The other is that nobody has heard of the MSC or what it does. The logo is non-motivating and obscure for

most people. Even if they recognize it, consumer research shows that protection of fish stocks is not linked to purchasing habits. To start building that link, we have turned to the appeal of the ocean—and have included a statement saying “Ocean Friendly” on the packaging.

The small mention of our Sustainable Pea Initiative and ocean-friendly sourcing on our packaging is a modest first step towards linking people’s concerns to sustainability as a brand value.

### LESSONS FROM THE ORGANICS INDUSTRY

There are important lessons to be learned from the organic food industry. The rise in demand for foodstuffs produced through organic farming has been a prominent feature of UK retailing in recent years, and the demand for organic produce, at what are still premium prices, is unquestionably impressive. The growth of organic farming here was very much led by the Soil Association, in a role that foreshadowed that of the MSC in fisheries.

The UK government now plans to triple the land under organic cultivation by the end of 2006—and this continuing momentum was one of the reasons why Unilever acquired a small organics business in Scotland last year.

Certainly, as an alternative to environmentally-damaging agricultural practices, organic food has many attractions. Its pro-

motors have linked organic produce with concerns over an array of issues, from the use of chemical pesticides, fertilizers and GMOs, to children’s health and food crises such as BSE (mad cow disease).

### THE ORGANIC DOWNSIDE

Regardless, we don’t think organic products are the overall solution as there are some obvious structural problems in the organic marketplace. More than 70 percent of organic food eaten in the UK is imported. Also, proponents of organic food seem divided as to whether their goal is the organic food itself or the method and values of organic food production (*i.e.*, by independent farmers and small landowners).

There are also doubts about consumer attitudes. The British retailer Iceland’s decision to commit itself to organic food was not very successful, although it must be said the demographics of Iceland’s customer base were less than ideal. Greater doubts have been raised by recent research suggesting that today’s consumers have less faith in the health advantages of organic food over conventional produce.

What organics cannot guarantee is security of the supply chain or the social conditions of the people employed to produce it. I recently read an editorial which asked, “How can something be good for the environment if it is picked by laborers on slave wages and air-freighted half way round the world?” Unlike organics, any definition of sustainability must deal with

RMI **news**

## RMI Dishes Up Ideas for Sustainability Authors

RMI recently contributed to a book (to be released in March) by one of the leaders in sustainable, organic food industry, Newman’s Own Organics. The book is *The Newman’s Own Organics Guide to a Good Life: Simple Measures That Benefit You and the Place You Live*, by biologist Nell Newman (co-founder of Newman’s Own Organics) with Joseph D’Agnese.

According to D’Agnese, the book is “Nell’s take on what ordinary citizens can do to help the environment. It’s intended as a primer for people who are interested but don’t know where to start.”

RMI’s CEO Amory Lovins is mentioned extensively in the book for his work in transportation; Dr. Jon Fox-Rubin, CEO of Hypercar, Inc., the Basalt-based RMI spin-off, was also interviewed.

the human inputs to the chain—and the human aspect is crucial to ensuring the supply chain really is sustainable.

## FINDING THE RIGHT VOCABULARY

What we can learn from the organics industry is that vocabulary counts. You would not sell organic food by slapping “Approved by the Soil Association” all over it. Similarly, sustainability needs a language that encapsulates what it means without turning people off.

“Ocean-friendly” is a start, giving us an accessible way of communicating what the Marine Stewardship Council is about. We haven’t yet cracked the right form of words for land-based sustainability, but we will. When we do it will enable us to draw a road map for sustainability’s role in the consumer marketplace. Having the right vocabulary will let us move from a defensive to a proactive approach, enabling us to build—and then steadily reinforce—the emotional link needed to make consumers more willing to buy products and brands from sustainable sources.

## THE CONSUMER VIEW

But does the necessary level of concern over depletion of the world’s resources already exist? To an extent, yes. But its fragility and embryonic state means it needs to be nurtured carefully by marketers.

If asked directly, consumers are, of course, worried about sustainability. But will they pay more for it? Probably not. Iceland’s experience is a warning to anyone putting too much commercial faith in the consumer’s level of environmental commitment.

If we manage to build the emotional link I keep mentioning between sustainable products and consumers’ nagging concerns over the future of the planet, then maybe one day they will pay a premium

for it. Yet interestingly, the best way to build this link may not be through the selling process, but through education.

Consumers nowadays are intelligent and sophisticated enough to see marketing for what it is. Thus, if we present sustainability through a traditional marketing pitch and call to action, they will reject it. Instead, we need to develop a debate in straightforward language about the long-term survival of the land and sea as sources of food.

Good old Marketing Language, that which we traditionally use in mass communication, will not work here. This is my challenge to the experts in communication. We have to re-think how we relate to the consumer.

## COMPETITIVE ADVANTAGE

Unless sustainable produce has a competitive advantage over whatever else is available, consumers will not buy it anyway. The conundrum here is that neither Unilever nor any other supplier can fence itself off from the rest of the world. If our fish stocks are sustainable but nobody else’s are, then the world will gradually run out of fish and we will have a cost disadvantage.

This means two things. First, we have to share what we learn—making it the reverse of the traditional approach to research and development, which is targeted at building up competitive advantage. We are not creating proprietary intellectual property to be guarded and exploited, but instead we are identifying broad approaches which we need to communicate to, and allow to be used by, other companies facing similar issues.

Second, it means we have to be in it for the long term. Peas are grown under a seven-year rotation and there is no point being sustainable for one year and then spending the next six flagrantly using up

resources. Similarly, the sustainable farm is not just a place that can continue to produce high quality food on a reliable basis. They must consider the needs of their workforces and local communities as well.

As a result, we feel sustainability is closer to the concept of “quality” than any form of “competitive advantage.” It is not a one-time opportunity to steal a march on the competition, but a long-term learning process to be shared.

## THE CONSUMER DILEMMA

In the beginning of this piece I claimed that by asking whether sustainability sells, we were posing the wrong question. To illustrate why, I would like to highlight the dilemma that surrounds sustainability for a company like ours. In simple terms, the dilemma is that sustainability currently does not sell. Yet, it is essential to our future, for three key reasons:

1. The survival and security of our supply chains
2. As a defensive stance to ensure the continued quality and relevance of our brands in the future, and
3. To ensure that we continue to be able to attract and recruit the best young people—many of whom, as you know, place huge importance on the social awareness and responsibility of prospective employers.

Thus, the question “can sustainability sell?” is the wrong question. Instead, from the perspective of Unilever and Birds Eye Walls, the real question is, “Can a business like ours survive in the long term without sustainability?”

One day, sustainability has to sell. Not just because it is the only way for us at Unilever to secure our future supply chains, but also for the future of the resources on this planet. Like you, we don’t yet know when that day will come, but we hope it will not be too far away.

## Adam Albright

**A**dam Albright believes the world needs to change its thinking about energy use.

But he's optimistic that change will come, and can be relatively painless. Albright has been on Rocky Mountain Institute's Board of Directors for just over three years, because he sees RMI as an important agent of that change. He is currently chairman of the board's Nominating Committee and a member of the Development Committee.

Albright is notable for the number and quality of the organizations he advises. He's a member of the board of directors of the Natural Resources Defense Council, a high-profile environmental advocacy and legal group, and the Worldwatch Institute, well known for published research on sustainability issues. He serves on the board of Redefining Progress, an Oakland-based group that studies the economic drivers of environmental degradation, and Population Communications International, a unique organization that promotes the causes of women's empowerment and population control through the use of soap operas, both in the third world and in developed countries. He's also on the board of Futures for Children, a group that promotes the advancement of Native American children, focusing on education.

An economics graduate of Brown University, Albright has, in his own words, "done everything from art to farming to venture capital." Now 55, he lives with his wife on a ridge in the Berkshires. They do yoga together and make frequent use of hiking trails right outside their door, and they ski and snowshoe with other members of their family. Adam spent his most recent birthday hiking in the Alps with his wife and daughter.

"You get one life.  
It's about being  
optimistic and enjoying it.  
It's not about  
wearing a hair shirt."

Albright makes his living as a private investor, both in traditional companies and non-traditional ones. He was formerly a venture capitalist, investing money in start-up companies. But he now uses the know-how he gained in the venture world to guide investments in the non-profit world. In 1991, he started a private foundation that provides start-up money to selected non-profit organizations.

"I just had an inspiration to do it, when some of the other things I was doing weren't very satisfying any more," he says. It's not easy, because non-profit startups have a spotty record, and it's hard to know whether they deserve support. "Sometimes they have great ideas but fall short on execution."

Albright came to RMI's board at the invitation of CEO Amory Lovins. Amory knew of Albright through his friend Ted Halstead, the president of Redefining Progress. At the time Albright came on, RMI's board was trying to implement a new strategic plan, but was meeting with some resistance, both from the staff and on the board. He was brought in on the strength of his reputation for assisting with organizational restructuring. Though the new approach meant some changes in personnel, he's now satisfied that the changes put in place will be successful.

Though he says the work he's most interested in is RMI's energy work, his focus as a board member is on the whole organization.

**Adam Albright with Garrett Albright, in the Arctic National Wildlife Refuge.**



"My long-term vision for RMI is for it to be as good at functioning as an organization as it is at thinking up ideas," he says. He's happy to be with RMI, partly because he's impressed with Amory's ability to get decision-makers to think creatively.

Albright's view is that there's a strong need for a change of thinking in the world, with 40 percent of our planet's productivity now expropriated for the use of the human species alone. People like Amory Lovins are telling us not only that we need to change, but also that the change need not be painful.

"My own view is that there's all kinds of opportunities," he says, especially those presented by new technologies. Despite his view that the tipping point may be near, after which Earth can no longer replenish its resources, he's not gloomy.

"You get one life," he says. "It's about being optimistic and enjoying it. It's not about wearing a hair shirt."

"It feels so much better to work on things that are positive," he continues. "That's what I think is so strong about RMI. We can look forward to a future that's not quite so bleak."

—Jeremy Heiman

## Craig Melby: And Real Estate's Hard Sell

If you've ever been to South Florida, you know it's an area where RMI's green building work needs to be shared with developers and architects. According to the U.S. Census Bureau, Florida's population jumped from seven million to 16 million between 1970 and 2000 (South Florida went from two to four million), and today the Sunshine State shows no sign of slowing down. Growth is an often-discussed subject.

Fortunately, some of RMI's philosophy is being spread around in South Florida, thanks to longtime Institute supporter Craig Melby. Melby is unusual—he's heavily involved in many aspects of the commercial real estate sector, yet he's also adamant about changing the industry. He's a green building and development salesman in a land where such fellows seem few and far between.

"I don't remember how I first found out about RMI, but the more I read the more impressed I am that your group can help solve the world's problems," he said. "So I keep contributing."

"Most of my contemporaries still don't seem to be aware of the world's environmental problems, or that they can do a lot to solve them while at the same time making money. But it is getting a lot better than it used to be. Recently SIOR (The Society of Industrial and Office Realtors) decided to support the LEED (Leadership in Energy & Environmental Design) program, and some of the nation's biggest developers are discovering green design, materials, and technologies."

Melby grew up in St. Petersburg, Fla., but has spent the last ten years in the Stuart, Fla. area—"much less developed than most of Florida—so far—which I like."

During his 20-year commercial real estate career Melby has owned, managed, leased and/or brokered millions of square feet of office buildings, shopping centers, industrial properties and land. Currently, he runs The Melby Group, Inc., which provides tenant representation services to expanding companies throughout Florida. "When my clients are in the site selection and design stage, I never hesitate to bring up things like proper solar orientation, the advantages of daylighting, indoor air quality and energy-efficient technologies. Most look at me like I'm a nut—but I can't help it. It's something I gotta do."



Melby sits on the on the board of the Florida Green Building Coalition (a non-profit dedicated to improving the built environment) and is a charter member of the South Florida Green Design Council. He also writes a column quarterly for the *Real Estate Strategies* newsletter, in which he espouses the virtues of energy and resource efficiency in buildings whenever he can.

What frustrates him most about green building and development is that "our government leaders do so little 'leading.' Also, that zoning and building regulations so often get in the way and prevent you from doing something better than a code which is many times far behind the curve."

Putting his money where his mouth is, Melby is completing his own passive-solar six-bedroom mountain lodge, which he designed and contracted himself. The house features a heat-reflecting light colored metal roof; high performance windows; ICF (insulating concrete forms) construction; earth-berming; natural ventilation; concrete and wood floors; and uses no pressure-treated wood and a bare mini-

num of materials that emit volatile organic compounds (VOCs). He's planning a future conversion of the house's energy systems to active solar, wind, and hydrogen.

Craig has three daughters, aged three, 13, and 16 years, respectively, and, his ideas about raising them are provocative compared to some.

"Isn't it ironic that parents will 'work hard to provide a better life for their kids,' taking them to soccer, swimming, trips, etc., all the while driving an SUV that is ruining the planet they are going to have to live on?" he asked, in a reference to global warming. "I assume that if they knew better, they would make better choices—and it is still too easy to turn a blind eye and pretend there is no problem when the skies are still blue and the air still clean. I really hope they're right and there is no problem!"

But just in case, Craig Melby will continue selling his green ideals—for his business, and for his girls.

### Dear RMI Readers and Supporters,

One of the benefits of being an RMI supporter of \$20 or more is receiving three issues of our newsletter, *RMI Solutions*, annually. Of course, you can read the newsletter online anytime at [www.rmi.org](http://www.rmi.org) without a subscription. However, if you enjoy it, we hope you'll contribute anyway.

Also, we apologize if you received your copy of *RMI Solutions* at the wrong address, or if you requested an email notification and instead received a hard copy in the mail. Please, if you would like changes made in your mailing address or in how you receive RMI information, contact Ruth Klock at 970-927-7203, or email her at [ruth@rmi.org](mailto:ruth@rmi.org).

## A Hearty Thanks to All



**Dale Levy,  
Development  
Director**

Sunday 14 July may go down in history as the day the world changed in the

Roaring Fork Valley—where our headquarters in Snowmass, Colo. is located.

On that day RMI celebrated with 350 Valley guests our 20<sup>th</sup> anniversary at a fun-filled, sun-drenched, information-rich, food-, drink-, and music-enhanced picnic on the Windstar Land Conservancy property.

Some Valley residents have had a vague idea of what RMI does, but most had an incomplete picture. Elaine LeBuhn, a donor who lives in Snowmass Village and who has since become an RMI board member, came up with the idea of having a 20<sup>th</sup> anniversary picnic to build awareness among and relationships with our neighbors. We are grateful for the many hours that Elaine spent making this event the success it was!

This wasn't your ordinary Sunday afternoon affair in the park. It included music by the band Rodeo Cool and Bobby Mason; hot-air balloons courtesy of Unicorn Balloon Co. and Above It All Balloon Co.; a Hypercar, Inc. display; lighting, home, and energy efficiency displays provided by E SOURCE, Alpine Ace Hardware, Plug Power, PowerLight Corp., Rising Sun Enterprises, and Interface, Inc.; emcee Tom

Egan; storyteller Linda Levy; fuel cell demonstrations; photography by Gregg Adams; donated beer from New Belgium Brewery, the only wind-powered U.S. brewery; wine given by Best Connect Imports; and food donated by Clark's Market and Peach Valley CSA.

Absolutely vital to pulling all the picnic elements together—invitation lists, shuttle bus transportation, first aid, and much more—was a staff committee including Ginni Galicinao, Ethel Lossing, Jenny Constable, and Ben Shepherd. Indeed, the entire RMI staff helped out at some point. Thanks to everyone who worked long and hard.

My special thanks go to all our Roaring Fork Valley neighbors who celebrated with us. We look forward to getting better acquainted with you and others in the Valley.

**Magician Doc Eason works his slight of hand on some skeptical picnicians.**

Photo: Gregg Adams



**Our sincere appreciation is offered to these friends who have contributed to RMI between 1 May 2002 and 31 August 2002. Numbers in parentheses indicate multiple donations. Please let us know if your name has been omitted or misspelled so it can be corrected in the next issue.**

**BENEFACTORS  
\$ 10,000+**

- The Virginia and Charles Brewer Family Foundation
- Compton Foundation, Inc.
- The Energy Foundation
- Walter and Elise Haas Fund
- The Estate of Laura Hart
- The Estate of Phoebe Love Holzinger
- The Gordon E. and Betty I. Moore Foundation
- The New-Land Foundation, Inc.
- The San Francisco Foundation
- Sandler Family Supporting Foundation
- Alice & Fred Stanback
- Fred Stanback Fund

**PATRONS  
\$ 1,000 – \$ 9,999**

- Anonymous
- Anonymous Donor through the Charitable Gift Fund
- Peter Barnes & Leyna Bernstein Barnes
- Nancy & Robert H. Campbell (2)
- Mary I. Caulkins & Karl Kister, Caulkins Family Foundation
- Earth Share
- Ettinger Foundation, Inc.
- Kathy Finley
- Stephen P. Hanson, in memory of Eric Konheim
- Kathi M. Kerr, in loving memory of Frances D. Kerr

- Bud Konheim, Nicole Miller, in memory of Eric Konheim
- Carolyn Konheim & Brian Ketcham, in memory of Irene Salminen
- Elaine & Robert Le Buhn
- Laurie & John McBride
- Henry P. McIntosh IV, Constance H Bishop Foundation
- Joyce Mertz-Gilmore Foundation
- Hideo Miki, in memory of Eric Konheim
- Tricia Nichols
- Jane & Kent Slaughter
- Effie E. Westervelt

**SPONSORS \$ 100 – \$ 999**

- John Accardi & Nancy Clarke
- Gregg Adams
- Bruce Adams
- Adobe Matching Gift Program
- John L. Allen
- Daniel Alpert
- Deborah Bezanis
- Stephen W. Biegel, in memory of Eric Konheim
- William & Sandra Bliss (4)
- Jabe Blumenthal & Julie Edsforth
- Margaret B. Bodtke
- Lisa L. Brown, in memory of Jack R. Brown
- Nancy A. Cantor
- Rita & Frank Castagna, in memory of Eric Konheim
- Michael F. & Dulinda Coady, in memory of Eric Konheim
- Bill C. Coleman
- George Allen Cook
- Marion P. Culhane
- Lois-ellin Datta (4)
- Bill & Phyllis Davies, in honor of Dawna Davies-Wong
- Michael Edesess & Dyan Zaslowsky
- Clayton H. & Katharine G. Farnham
- Honey S. Fishman
- Victor Garrett
- Jenifer & P.M. Gibbons, in memory of Eric Konheim
- Chris Goplerud

**Vote for RMI in Working Assets' Poll**

In August, Working Assets, the forward-thinking telecommunications firm that donates a portion of its revenues to non-profit groups, announced that RMI would be one of the 50 nonprofits to which it donates a percentage of its annual income in 2002.

“We are hoping to exceed \$4 million to be divided among the 50 groups,” wrote President Michael Kieschnick in a letter to RMI. “You may recall that the allocation is based solely on a vote of our customers by ballot, so the range of grants can be quite large—from roughly \$150,000 down to \$30,000, reflecting their votes.”

Each year, Working Assets selects 50 non-profits to receive a portion of the company's sales. Since Working Assets was founded in 1985, it has disbursed over \$30 million in donations. The company's many customers decide who gets the money, by voting either online or through special ballots that come with telecom bills distributed in October and November.

Additionally, customers can vote for specific percentages of Working Assets' donation to be dispersed to the groups—say, 30 percent to one, 70 percent to another. Remember, you must be a Working Assets customer to vote. Not surprisingly, we encourage you to vote for Rocky Mountain Institute. You can vote online at [www.workingassets.com/voting/](http://www.workingassets.com/voting/).

- S. William Gouse
- Dale L. Gray
- Joshua Greenberg, in memory of Eric Konheim
- Sadja Greenwood (2)
- Richard & Lois Gunther
- Kathy & Robert H. Gurland, in memory of Eric Konheim
- Eldon Haines & Linda Rose
- Jane Hileman & Gaeton Zorzi
- Peggy Hill
- Kurt Holtz
- Joel B. Ingber, D.D.S.
- Kirkman & Lynn Eaton Jackson, in memory of Eric Konheim
- Marye J. Jackson
- Charles N. Jaffee & Marvina Lepianka (2)
- Anne & Brook Jones
- William Joseph
- William A. Kint, in memory of Philip A. Kint
- Kazuaki Komura
- Ken & Gail Kuhns, Peach Valley CSA Farm

- Brian L. Larsen & Renae Kofford
- Kathleen & Charles Lea, in honor of Elaine Le Buhn
- Timothy Leddy
- Cynthia R. Lewis, in memory of Eric Konheim
- Barbara & Irwin Linden, in honor of Gertrude Naster
- Lisa & Jonathan A. Lucas, in memory of Eric Konheim
- Michael L. MacDonald
- Carola Mack, in memory of Eric Konheim
- Janice & Arthur Martin
- Donald & Geraldine McLauchlan, in honor of Geraldine McLauchlan
- Craig A. Melby (2)
- Audrey & Danny Meyer, The Rotonda Foundation, in memory of Eric Konheim
- Nicole J. Miller, in memory of Eric Konheim
- Mary Sue & William F. Morrill
- Johnny M. Mullen, in memory of Benjamin M. Mullen
- Wendy & Ford Northcut

## Institute Supporters

Avis R. Ogilvy  
Susan D. Osofsky (2)  
Robert Patchen, Pace of Southport  
(2), in honor of Eric Konheim  
Judith Schector  
Susan & Ford Schumann  
Sherman Selden  
Cecil Sheib, Optimum Impact Fund  
Philip Silber,  
in memory of Eric Konheim  
Douglas J. Smith  
James Stevens,  
Nancy & Daniel L. Streiffert  
Richard L. Sweeney  
John Tellefsen  
The Sun Microsystems  
Foundation, Inc.  
Ken Thomas  
United Way of Greater Los Angeles  
United Way of Kitsap County  
David W. Vaughan & Martin Stupich  
Jorgen Vos  
Allene Walter  
Eleanor Wasson (3)  
Susan & Seward Weber  
Billie Ann & Sam K. Williams,  
in memory of Sarah Leigh Rives  
Alex & Jerelyn Wilson  
Windstar Foundation  
Harold M. Wit  
World Reach, Inc.

### ASSOCIATES \$ 1 – \$ 99

Leslie Andersen  
Steve Anderson  
Kate Anderson  
Jennifer Anderson,  
in memory of John Denver  
Harry & Cecille Anisgard  
Anonymous (20)  
Ann Marie Bailey  
Edna C. Bartlett &  
Katherine B. Gordon  
Garry Baverstock & Julia Hayes  
Guy L. Bazzani  
Thomas A. Bell  
Cindy Bethel  
Toby Branch  
Renata & Gary J. Brand  
Lorna Brown  
Robert A. Brown  
Sheilah Bryan  
Elaine & Bruce W. Burley  
Michael F. Caffrey,  
in memory of William P. Caffrey  
Andrea Calbow  
Ruth & Ralph N. Calkins  
Laura Carpenter,  
in honor of Art Carpenter  
J. Patrick Carroll  
Lynn R. Chong,  
in memory of Chet Brickett  
Raymond & Janet R. Chu  
Geoffrey Coats

Keith Cochran  
Clark Cole  
Hilary & John Cole  
Consolidated Manufacturing, Inc.  
Jason Davis  
Marilyn & Robert A. Derrickson, Jr  
Dion Devereaux  
Craig & Joni T. Diserens  
Phyllis & Roger L. Duba  
William W. Durrell  
Donald H. Dyall  
Charles Eady  
John M. Ellwood  
Polly & John M. Ely Jr.  
Kim & Marshall Evans (2)  
Robert Fairchild  
Marvin Feldman  
Nicole Hill Finnie  
Kim & David Floria  
Anna Flynn  
Bertorello Francesco  
Mark Friedman (4)  
Marjorie & Brian Gaffikin  
David Garbacz  
Margaret Geist  
Rick Glassman  
Leslie & Merrill Glustrom  
Marian Goad  
Barbara A. & Howard N. Goldsmith  
James Goldstein  
Bobby Grayson  
Larry Greene

Bernard Greening  
Tamara Greenlaw  
Michael Gurau  
Kelly L. Harris  
Paul Harrison  
Michael & Oliva Hassig  
Heifer Project International  
Wava & Reese H. Henry  
Eric Henry  
Craig Hibberd  
Bonny & Dwight Holmes,  
in honor of Douglas Holmes  
Mary Jo & Dale O. Hornberger  
Carl Hungerford  
Christopher M. Hunt  
Larry R. Hyrup  
J.P. Morgan Chase Foundation  
Jay Jabas  
C.J. & Naomi Jackson  
Donna & Jeffrey A. Jaffee  
Thomas Jensen  
James N. Jolly  
William H. & Kay Jones  
Dana Judy & Susan A. Weisner  
JustGive.org  
Gerald & Jane Katcher  
Peter Kendall,  
The Schad Foundation  
Joseph A. Kestner, Jr.  
Satguru Kaur Khalsa  
Charles F. King

**RMI's 20<sup>th</sup> Anniversary Picnic  
celebration featuring the musical  
talents of our very own Ethel Lossing  
and Rodeo Cool.**

Photo: Gregg Adams





Connie Kobs (2),  
in memory of John Denver  
Ed Kountze  
Mike Kutner  
Christopher Landgraf  
Jacque & Greg Lantz  
Mark Larson  
Dawn Layton & Bill Anderson  
Eva & Richard L. Lehman  
Marjorie & Arthur J. Levenson,  
in memory of William P. Bundy  
Wei-Chong Liao  
Donald R. Limbaugh  
Anders Linse  
Steven Lipman  
Roger Lippman  
Little Elk Creek  
Home Owners' Assoc.  
Gretchen Liuzzi  
Don & Helen Lowe  
Lillie H. Lundahl,  
in honor of Irene Salminen  
Nicholas Mack  
Michael J. Malone  
Carl Manz & Christine Johnson  
Lorraine Marie,  
in honor of Ray Fredrick  
Emily McCormack  
Laurie & Craig McDaniel  
Michael McGavock  
Jennifer Means  
Larry & Jacqui Menkes  
Nation Meyer  
Michael Minaides  
Betty & Kenneth Moore  
Lew Moran  
V. Joe Morice  
David Baxter Moyer  
Shannon & Gary E. Mueller,  
in honor of CJ Mueller  
Philipp Muessig  
National Renewable Energy Lab  
Jonathan K. Niermann  
William E. O'Neill  
Robert Olsson  
J. Oosterlinck  
Theresa M. Osborn

Philip D. Pack,  
in memory of Eric Konheim  
Virginia M. Parker  
Arthur Payne  
Nick Pennell,  
Marty Pickett & Edgell Pyles  
John Platt & Lisa Heilbron (2)  
Rudolph & Florence Popolizio,  
in memory of Irene Salminen  
Ron Porter  
Power Saving Inspection Services  
Lee Purcell  
Christopher R. Purvis  
Nan & Andrew Quiroz  
Wolfe Reitz  
Pat & Ray Rich  
Marion Richards (2)  
Patricia & Ronni R. Ridenour,  
in memory of John Denver  
Robin & David S. Rittenhouse  
Alison & Richard R. Roach,  
in memory of Eleanor Velie  
Thomas Roberts  
Mark & Alexandra Robinson  
Jon & Carole Ryberg, in memory of  
Esther E. Valentine-Ryburg  
Scott A. Schaefer  
David A. Schaller  
Charles I. Schnautz  
Suzanne Jean Shafer  
Jerome L. Shain  
Sherga Family  
Carol & Ted G. Skowronek  
Scott Smith  
Mary Smith Cooper,  
in honor of David Orr  
Gail & Gregory C. Speer  
Renee Justice Standley,  
in memory of John Denver  
Thomas S. Stanton  
Richard E. Strucker  
Robert E. Svoboda  
Matt Syme  
Jaymes Tadlock  
Toki & David C. Thompson  
Charles J. & Rhoda Transue  
David Tupper

## Matchmaker, Matchmaker, Make Me a Match!

For the third consecutive year, the Sandler Family Supporting Foundation is challenging individuals and foundations to make initial gifts to RMI of \$10,000 or more. With the help of the Sandler match, your initial gift of \$10,000 or more, made by 31 December, will be matched 50 percent—a \$10,000 gift becomes a \$15,000 gift; a \$20,000 gift becomes a \$30,000 gift.

What can \$10,000 accomplish? It would pay for a month of intensive education and consulting on natural capitalism in China, a country on the brink of tremendous industrial development. It could help RMI's researchers synthesize the best ways to get off oil dependence, or identify the most promising applications of biomimicry in building and industrial design. It would help complete a web-based tool for community planners to estimate cost savings from local energy efficiency. In these and hundreds of other ways, your investment in RMI's work will be timely, strategic, and results-oriented.

If you or someone you know would like to make an initial gift of \$10,000 or more to RMI before 2002 comes to a close, please call Peggy Hill or Dale Levy at 970-927-3851; or email Peggy at phill@rmi.org. Remember, as soon as new supporters contribute a total of \$200,000, the Sandler Family Supporting Foundation will donate an additional \$100,000!

United Way of California  
United Way of King County  
John Van Strien  
Melissa von Schwanenfluegel  
Robert Wallace  
Russell D. Ward, Jr.  
Brian Webster  
Mike Weislik  
Martin Weiss (2)  
Osgood & Barbara Whittemore  
Thomas G. Wilkinson  
Marianne Williams  
Diane Wittner  
Holly A. Zimmerman &  
Peter DeCrescenzo

## WINDSTAR LAND CONSERVANCY DONORS

Anonymous,  
in memory of John Denver  
Grace & Bryan T. Bailey (5)  
Michael Cummings (3),  
in memory of Marcia Bohnen  
Jane Ellen Hamilton  
Joann M. Hutton,  
in memory of John Denver  
Linda L. Locati,  
in memory of John Denver  
Kerry & Ricki R. Newman,  
in memory of John Denver  
Judy Pollock



Earth Share.

We also want to thank those individuals who have contributed to RMI through Earth Share, the combined federal campaign, and other workplace charitable programs. If you would like to have RMI as a charitable option in your workplace campaign, please contact our Development Department (970/927-3851).

# RMI Publications



## **Small Is Profitable: The Hidden Economic Benefits of Making Electrical Resources the Right Size** (softcover)

by Amory B. Lovins, E. Kyle Datta, Thomas Feiler,  
Karl R. Rábago, Joel N. Swisher PE, André  
Lehmann, and Ken Wicker

RMI's energy team's latest contribution to the Institute's already rich store of intellectual capital, *Small Is Profitable: The Hidden Economic Benefits of Making Electrical Resources the Right Size*, builds on CEO Amory Lovins's 1977 *Soft Energy Paths* argument—that the cheapest electricity is not that produced by centralized coal- and gas-burning facilities. Rather, the costly and vulnerable architecture of the grid, our technical society's need for more reliable power, and the enormous difference of scale between most needs and most supplies have brought us to the point where smaller is, in fact, economically superior—a huge shift in energy thinking. 1st edition (paper, 4-color, 2002). 419 pages, 782 refs. ISBN# 1-881071-07-3, \$60 plus S+H. [www.natcap.org](http://www.natcap.org)

While supplies last, a free copy of *Cleaner Energy, Greener Profits* will be shipped with every *SIP* order.

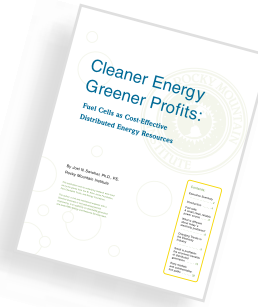
**To Order RMI Pubs Visit:**  
[www.rmi.org/store/pid385.php](http://www.rmi.org/store/pid385.php)  
or call 970-927-3851



## **The New Business Climate: A Guide to Lower Carbon Emissions and Better Business Performance** (PDF-844k)

Joel N. Swisher PE

Global climate change and the potential costs of CO<sub>2</sub> emission limits can impose risks to business performance and asset values, while on the other hand, these concerns also present new business opportunities for pro-active companies and institutions. Profitable “no-regrets” energy-efficiency improvements are widely available today, and longer-term investments in clean energy technology will be increasingly attractive in a carbon-constrained world. Meanwhile, flexible regulation and careful use of the emerging carbon markets can help manage costs. These and other opportunities can be captured by responding to the challenge of climate change in a way that stimulates innovation and improves business practices. This document provides a basic understanding of climate science and policy, and it identifies strategic options for reducing CO<sub>2</sub> emissions and positioning a business to thrive in a carbon-constrained world, including detailed case-studies from well-known companies. (Online only, 2002). Downloadable at: [www.rmi.org/images/other/Bus\\_NewBizClimate.pdf](http://www.rmi.org/images/other/Bus_NewBizClimate.pdf).



## **Cleaner Energy, Greener Profits: Fuel Cells as Cost-Effective Distributed Energy Resources** (softcover)

Joel N. Swisher PE

This research paper explores the cost-effectiveness of fuel cells as an electrical generation source to provide domestic, commercial, and industrial power. *Cleaner Energy, Greener Profits* finds that, over the next decade, the once-centralized electric power industry will evolve toward a more competitive and heterogeneous structure. In this new environment, the use of fuel cells will become economical if their proponents can capture their benefits as small, decentralized power sources. Fuel cells and other distributed generation sources require less power distribution infrastructure (wires and transformers) because they can be sited close to where power is used. They are cleaner and quieter than conventional power generation sources, so they can be located near or inside buildings, facilitating waste-heat recapture. Because fuel cells are modular and flexible in size, they don't result in overbuilding of capacity as do large power plants. (Paper, 2002). 36 pages. Downloadable at: [www.rmi.org/store/p385pid2418.php](http://www.rmi.org/store/p385pid2418.php), or available in print for \$5 plus S+H.



**Natural Capitalism:  
Creating the Next  
Industrial Revolution**  
(softcover)

Paul Hawken, Amory B. Lovins,  
and L. Hunter Lovins

The classic work on reshaping business, *Natural Capitalism: Creating the Next Industrial Revolution*, is now available in a softcover. In *Natural Capitalism*, three leading business visionaries describe a future in which business and environmental interests increasingly overlap, and in which companies can improve their bottom lines, help solve environmental problems—and feel better about what they do—all at the same time. 1st edition (paper, 1999). 416 pages.

ISBN# 0316353000, \$17.95 plus S+H.  
www.natcap.org

**The Economic Renewal  
Guide** (softcover)

Michael Kinsley

This field-tested manual describes how a few energetic people can help steer their community toward development that's sensitive to local values and the environment. Filled with success stories, worksheets, media materials, and resources, it's a do-it-yourself toolkit for anyone who wants to get sustainable economic development moving in the local community.



Hopeful, creative, civil, and fun, the *Economic Renewal* process is designed to defuse factionalism, encourage citizen involvement and collaborative decision-making, and lead to practical projects that benefit everyone. 3rd edition (paper, 1997). 225 pages.

ISBN# 1881071065. \$17.95 plus S+H.



**A Primer on Sustainable  
Building** (softcover)

Dianna Lopez Barnett &  
William D. Browning

Written for architects, developers, general contractors, landscapers, and home owners, this book demonstrates how a holistic approach to design can result in a building even better than the sum of its parts. Topics include site and habitat restoration, transportation integration, edible landscapes, energy-efficient design, materials selection, indoor air quality, and cost implications, plus an extensive bibliography and source lists. 1st edition (paper, 1995). 135 pages.

ISBN# 1881071057. \$16.95 plus S+H.

## RMI Solutions

*RMI Solutions* is published three times a year and distributed to more than 10,000 readers (by mail and online) in the United States and throughout the world. © 2002 Rocky Mountain Institute. All rights reserved.

### LETTERS TO THE EDITOR

We want to hear your comments.  
Please address all correspondence to:

Cameron M. Burns, Editor  
Rocky Mountain Institute  
1739 Snowmass Creek Road  
Snowmass, CO 81654-9199  
tel: (970) 927-3851  
fax: (970) 927-3420  
newsletter@rmi.org  
www.rmi.org

For reprint permission, please contact newsletter@rmi.org. As a leader in promoting resource efficiency, RMI supports leading recycled paper manufacturers. This publication is printed on New Leaf EcoOffset (100% post-consumer waste, processed chlorine-free) using vegetable-based ink. Contact New Leaf Paper for more information, 1-888-989-5323. No new trees were used in the production of this newsletter, and we offer paperless electronic delivery via our website.

### ABOUT THE INSTITUTE

Rocky Mountain Institute is an entrepreneurial nonprofit organization that fosters the efficient and restorative use of resources to create a secure, prosperous, and life-sustaining world.

Our staff shows corporations, communities, individuals, and governments how to create more wealth and employment, protect and enhance natural and human capital, increase profit and competitive advantage, and enjoy many other benefits—largely by doing what they do more efficiently.

Our work is independent, nonadversarial, and transideological, with a strong emphasis on market-based solutions.

Founded in 1982, Rocky Mountain Institute is a §501(c)(3)/509(a)(1) public charity. It has a staff of approximately 50. The Institute focuses its work in several main areas—business practices, climate, community economic development, energy, real-estate development, security, transportation, and water—and carries on international outreach and technical-exchange programs.



Rocky Mountain Institute/VOLUME XVIII #3/FALL 2002

# RMI Solutions

## NEWSLETTER

### CONTENTS

SMALL IS PROFITABLE . . . . .	page 1	STAFF SPOTLIGHT . . . . .	page 15
LEAN MANUFACTURERS' GROUP . . . . .	page 4	OTHER VOICES . . . . .	page 16
GREEN BUILDING INTRO . . . . .	page 7	BOARD SPOTLIGHT . . . . .	page 20
BIOMIMICRY BY DESIGN . . . . .	page 9	DONOR SPOTLIGHT . . . . .	page 21
SUN-POWERED SURFING . . . . .	page 13	INSTITUTE SUPPORTERS . . . . .	page 22
WHAT ARE YOU DOING? . . . . .	page 14	RMI PUBS FOR SALE . . . . .	page 26

Rocky Mountain Institute  
1739 SNOWMASS CREEK ROAD  
SNOWMASS, CO 81654-9199



NON-PROFIT ORG  
U.S. POSTAGE PAID  
PERMIT #143  
GRAND JCT, CO

C H A N G E   S E R V I C E   R E Q U E S T E D