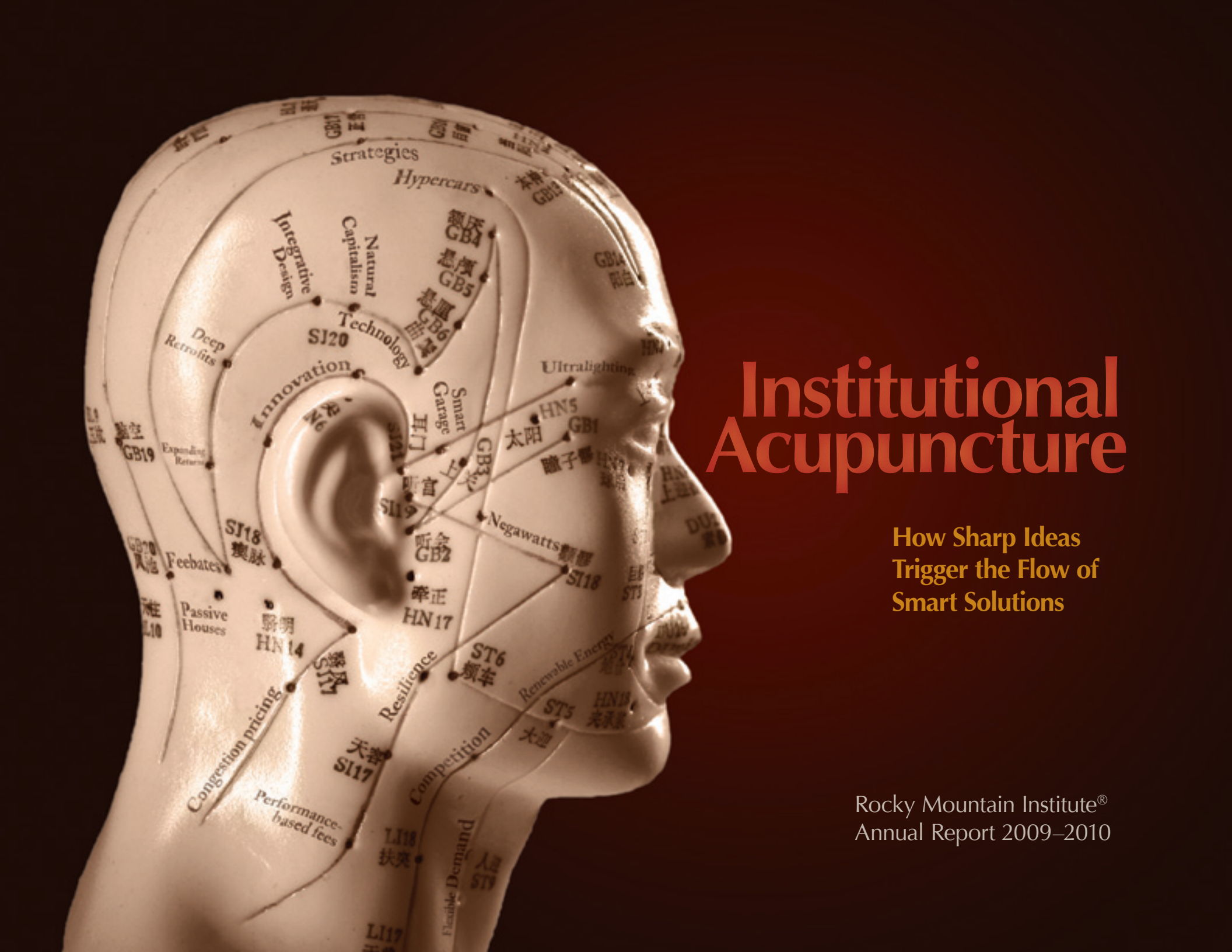

Institutional Acupuncture

How Sharp Ideas Trigger the Flow of Smart Solutions

Rocky Mountain Institute®
Annual Report 2009–2010

Act without doing;
work without effort.
Think of the small as large
and the few as many.
Confront the difficult
while it is still easy;
accomplish the great task
by a series of small acts.

The soft overcomes the hard.
The slow overcomes the fast.
Let your workings remain a mystery.
Just show people the results.

Laozi (Lao Tzu) (6th Century BCE),
Daodejing (Tao Te Ching) *36*

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"The Tao of Leadership" 47

RMI thanks Stephen Mitchell for kind permission to quote from his translation:
Stephen Mitchell, *Tao Te Ching: A New English Version*, Harper Perennial Modern Classics, NY, 1988/2006
Stephen Mitchell, *The Second Book of the Tao*, Penguin, NY, 2009

The "Tao of Leadership" poster on p. 47, calligraphed by Master Chungliang Al Huang, was originally copublished in the 1980s by his Living Tao Foundation and RMI.

Thanks also to Judy Hill Lovins for her expert technical and artistic assistance with several graphics.

Institutional Acupuncture

Rocky Mountain Institute seeks to turn scarcity by inattention into abundance by design. To drive big changes despite political gridlock, RMI works mainly with society's most dynamic force—private enterprise—to transform design, bust barriers, and spread innovation.

Engaging with commerce skirts the policy swamp but often reveals stagnant business logic instead. As practitioners of transformational solutions, we therefore apply "institutional acupuncture"—sticking metaphorical needles into carefully chosen points in complex organizations and relationships to get the business logic flowing properly in the channels and directions it already naturally follows.

Institutional acupuncture requires identifying overlooked opportunities and the often delicate or obscure points whose precise stimulus can unblock congestion. Sometimes our efforts directly change an industry, but more often, behind-the-scenes actions trigger indirect change. Our work with automakers, for example, started in 1990–91, when we realized that vehicles needed fundamental redesign. Thus began a two-decade-long exploration, with and within the global industry, of how to design, build, operate, and think about cars. That reconnaissance led in 2000 to the Hypercar® *Revolution*, an SUV design (with two European industry partners) that remains surprisingly advanced even a decade later. Further refinement morphed that effort into our spin-off Fiberforge Corporation, a for-profit innovator in technology for making cost-competitive ultralight structures at automotive speed and, ultimately, scale. RMI's early and broad reframing of auto design has given us an influential role in a critical solution space, ultralightweighting, where judicious but insistent pressure is starting to thaw cultural rigidities.

Encouraging recent signs include Toyota's 2007 *1/X* carbon-fiber concept car (with a *Prius's* interior volume, half the fuel use, and one-third the weight) and BMW's *MegaCity* carbon-fiber car announced in 2010 for 2013 mass-production. In 2004, when Boeing revealed a half-carbon-fiber airplane (now the *787 Dreamliner*) that annually saves eight times its weight in fuel at no extra cost, we drew the strategic analogy to cars. In 2006, Ford Motor Company recruited Boeing Commercial Airplanes' CEO as its own. In 2010, Ford is leading innovation in lightweighting and advanced propulsion. As a strategic advisor to its Chairman (2007–09), I'm impressed with Ford's technical progress and market success.

RMI injects some innovations directly into the marketplace: at the end of the 2009–10 fiscal year reported here, our third formal for-profit spinoff entered a unique strategic partnership with General Motors (p. 23). Quiet collaboration with powerful partners is another route. In early 2005 we helped support and accelerate Walmart's and its suppliers' efficiency gains in trucks and stores. That October, Walmart's CEO set a goal of raising the 2005 efficiency of its trucks—the world's biggest civilian fleet—25 percent by 2008 and doubling it by 2015. By 2008, the actual gain in cases moved per gallon was 38 percent. The onboard generators Walmart had introduced to displace parked trucks' idling soon began spreading industrywide. These successes spurred RMI to publish in 2008 a path to

roughly tripled efficiency. To help vault barriers, like sparse objective assessments of a myriad new fuel-saving techniques, RMI drew corporate partners into a nonprofit spinoff—the North American Council on Freight Efficiency (p. 22)—seeking strong efficiency for competitive advantage. This helped build industry receptiveness to the first U.S. efficiency standards for heavy trucks, which EPA published in October 2010.

Our collaborations with key industrial partners are frequent, diverse, and effective. Previous Annual Reports have described joint efforts ranging from iconic, like the Empire State Building retrofit (p. 14), to little-known or proprietary, like many mining, chemical, real-estate, and automotive projects. RMI has for decades helped leading hydrocarbon and electric-utility firms face strategic challenges, because as Bill Tolbert said, "If you're not part of the problem, you can't be part of the solution." Hence our collaboration with the nation's number three producer of coal-fired electricity, Duke Energy (p. 20), and soon with others.

Some technical projects demonstrate big savings but reveal even bigger icebergs of hidden opportunity. For example, a U.K. data center we codesigned, which EDS (now HP) built in 2009 at normal cost, saved 73 percent of non-IT energy and 98 percent of cooling and pumping energy, tripled computing per watt, and quadrupled potential capacity. Yet EDS reckoned adopting all our recommendations could have saved about 95 percent of energy and 50 percent of capital cost—tempting us to test that hypothesis next.

Such breakthroughs have a way of pushing industry to a new level. Often the highest hurdle is the first—finding the right receptive partner at a ripe instant. Our chance to shift chip fabs' efficiency followed more than a decade of failures to slip through the invisible crack between industry upturns (when everyone is too busy to think about novel design) and downturns (when such rethinking is deferred until it'll be needed). Texas Instruments' Paul Westbrook finally achieved that feat. Our 2003 collaboration saved $230 million of capital cost as well as much energy, water, and up to a thousand high-tech American jobs. TI's farsighted choice to share its learnings with competitors—it blessed Applied Materials' sending me to describe them at China's big chipmaking conference—has raised that sector's global efficiency bar.

Even in that excellent project, some big efficiency opportunities couldn't be tested in time for the design deadline, but intrigued another firm galvanized by TI's breakthrough. That company's next fab should save about two-thirds of the energy and half the capital cost. Now we're starting to envisage 8–10-fold energy savings at even lower cost. The master key is rapid mutual learning with highly motivated expert partners. This creates hands-on implementation experience, teachable cases, competitive pressure for emulation, and revenue to leverage the philanthropy that funds our innovation. Adam Kahane quotes an African proverb: "If you want to walk fast, walk alone. If you want to walk far, walk together." Through business collaborations, RMI does both.

Some interventions tightly focus our convening power on assembling technical "innovation workshops," like RMI's recent solar-cost charrette (p. 17). Such carefully researched and targeted events redefine what's possible and profitable, then mobilize and motivate industry leaders to create radical change.

In contrast, it can take decades to map and pierce the acupuncture points of extremely complex organizations like the U.S. Department of Defense, which RMI is helping become a leader in energy efficiency and resilient electricity (p. 27). Similarly, our micropower analysis (p. 21) supports a long-term effort to inform key financial institutions about nuclear power's competitive landscape, making them more prudent in rating securities, assessing risks, and allocating capital.

RMI's acupuncture needles sometimes unblock policymakers' meridians, too. A 2004 meeting with Dr. Jeffrey Runge—an emergency-room physician who'd treated many car-crash victims before he led the National Highway Transportation Safety Administration—helped shift NHTSA to regulate light trucks' efficiency by size, not weight. This innovation, later extended to cars, helped decouple size from mass, so automakers can make vehicles big, comfortable, and protective but not heavy, hostile, and inefficient—thus saving lives, oil, and money.

Buckminster Fuller said, "You never change things by fighting reality. To change something, build a new model that makes the existing model obsolete." In 2009–10, our disruption hatchery launched intensive Institute-wide research on a new strategic focus, Reinventing Fire. This "grand synthesis" will map and drive the U.S. transition from oil and coal (and ultimately natural gas) to efficiency and renewables, led by business for profit. In autumn 2011, when it rolls out a book, technical website, and other publications, our engagement with industry will jump to a new level—doubtless disclosing still more enticing meridians, points, and needles.

Photo courtesy of Judy Hill Lovins

Institutional acupuncture is one of many sharp tools in RMI's Reinventing Fire kit, but it's no panacea. To suggest we're unique because we operate both within and on the periphery of the private sector would be a stretch. To suggest we've singlehandedly transformed major industries would be fanciful. But with your help, which we value as much as our independence, we strive at every opportunity to get business leaders' *qì* ("chi" or "vital energy")—their entrepreneurial juices—flowing, nay blasting, through blockages. The best way we know to dissolve that congestion is to inject new ideas with seemingly magical effect, one sharp little needle at a time—expertly, gently, mindfully, and decisively inserted into the right spot at the right moment.

Amory B. Lovins, *Cofounder, Chairman, and Chief Scientist*

Insight + Engagement = Impact

RMI is built on innovative insights. For nearly 30 years, your support has helped us conceive and realize many of the hallmarks of the next industrial revolution: innovations such as ultralightweight cars, superefficient trucks, deep building retrofits, and breakthrough data centers; concepts such as radical efficiency, end-use/least-cost thinking, integrative design, and whole-system thinking. Yet it has become clear that insights alone are not sufficient. There are encouraging signs, but the pace of change is far too slow. So we are both building on RMI's trademark insights and dramatically increasing our engagement with key decision-makers and practitioners.

Today's RMI is organized to drive change. In the past year, we have reorganized our traditional teams based on subject-matter expertise into a unified practice around strategic initiatives. These initiatives, like the thorny challenges they tackle, span and surmount boundaries of sector and expertise. We strive not only to discover and foster innovations but also to get them adopted at scale and speed. This higher bar challenges us to overcome a myriad technical, economic, and cultural barriers.

For example, RMI's RetroFit initiative aims to accelerate the depth, scale, and speed of energy-efficiency retrofits in commercial buildings. Our research and experience have been honed in projects like leading the conceptual design of the retrofit for the Empire State Building (p. 14). Such projects in turn test and validate integrative design strategies and best practices that can often at least halve a commercial building's energy use with an attractive payback.

To achieve these results in individual buildings, we not only apply efficiency techniques such as daylighting and superwindows but also use and teach more innovative practices such as "right-sizing" mechanical systems to match reduced loads and save capital, and "right-timing" retrofit schedules so that efficiency improvements can reduce or even eliminate already-planned capital improvements.

Further, we are refining and teaching energy modeling that aims efforts toward the highest-performing buildings possible, rather than focusing on incremental gains, as is traditionally done.

These design strategies and best practices flow from RMI's traditional strengths in problem-solving and innovation. But today's RMI is "turbocharging" these insights with much deeper engagement. Accordingly, the RetroFit team (p. 13) is now partnering with large property owners and energy service companies (ESCOs) to spread these practices across regions and building types—from the Empire State Building to a Denver federal office tower, from grocery chains (p. 15) to museums and auto dealerships. Each collaboration is selected for greatest industry leverage and impact. And the findings will be distilled into a technical tool-set available at no charge to industry practitioners via

our upcoming "RetroFit Depot," a comprehensive online resource about why, when, and how to do deep energy-efficiency retrofits.

Further, RMI's RetroFit effort aims to understand and tackle other barriers throughout the deep-retrofit "ecosystem" that includes building owners, energy service companies (ESCOs), utilities, financiers, appraisers, code officials, and more, plus the architects, engineers, and contractors implementing retrofits. We engaged an external research organization to interview a sample of stakeholders so we could better understand their needs. This process confirmed, for example, that building owners need tools to analyze and verify paybacks—so early in 2011, such tools will be available for download.

On another front, our Next Generation Utility team (p. 19) is accelerating two necessary but difficult and complex shifts of the electricity system: from fossil fuels to efficiency and renewables, and from centralized to distributed architectures. To mobilize many diverse players and help them overcome barriers, our NGU team is driving deeper engagement along many dimensions. While continuing our strategic collaborations with leading electric utilities, we also work with regulators, investors, analysts, research laboratories, and entrepreneurs. Noted thought leaders in these sectors advise our research work, and we are collaborating with key organizations to increase the relevance, focus, and effectiveness of our work.

This focus on wide-scale engagement and transformation has also shifted our business model. In past years, consulting fees typically provided more than half our revenue. But a dramatic increase in your philanthropic support has enabled us to intensify our focus on writing, thought leadership, convening, teaching, and online tool development—thereby making our collaborative partnerships more discriminating, valuable, and effective.

As we increase our level of engagement with target sectors and deepen our practice as "institutional acupuncturists," the world is becoming more and more receptive to our collaboration. Industry leaders want to understand how to create a cleaner, safer, smarter world. The massive outward changes we intend to drive are requiring inward change at RMI. Your support makes both kinds of change possible, and we are grateful to be on this exciting path with you.

Michael Potts, *President and CEO*

Letter from the Lead Independent Trustee

Many events in the past year have caused me to reflect on RMI's key role in the harder-than-ever-expected transition the U.S. is making to a more vibrant, efficient, and benign energy future. Several years ago, RMI leadership and Trustees agreed to strengthen the Institute's organizational and financial foundations and focus on a limited set of crucially important topic areas. The letters from Amory Lovins and Michael Potts reflect our thoughts on implementation of these directions. Amory has long talked of the necessity for "institutional acupuncture" with systems both human and physical. In this case we are applying acupuncture techniques to improve the flow of *qì* ("chi") energy among ourselves and our many partners.

We are very excited about Reinventing Fire, which follows the lead of our path-breaking *Winning the Oil Endgame* of 2004 and broadens the focus to showing how we can free ourselves from the need for other fossil fuels as well. Once again, we are focusing on applying the RMI trademark whole-system thinking to help the nation move more efficiently to a better future. Oil spills and mine disasters punctuate the human and ecological urgency of this effort. But the inconstancy of media attention to such disasters stands in stark contrast to RMI's consistent and persistent focus on these issues. Amory Lovins and our other leaders have been analyzing, writing, and speaking out on energy efficiency, the role of renewables, and the imperative of thoughtful and expeditious change for decades—regardless of fluctuations in energy prices, public policy positions of the parties in power, or vagaries of public opinion. This constancy is supported by the generosity of our much-appreciated donors, who have raised the level of gift support to RMI to a new record in FY2010. We thank you!

One of the unique features of RMI over the years has been our determination to test our ideas in the marketplace, making sure that our thinking maintains close contact with the realities experienced by those who are confronted with the doing of energy efficiency. Thus, as a "think-and-do tank" we have long lived with the tension of contracting with corporations for real conceptual and design work, on the one hand, and a being more publication-oriented research shop on the other. In this past year we have been experimenting with a new model of greater partnership and collaboration in our initiatives, working with corporate, government, and other nonprofit entities, emphasizing the quality and impact of our joint efforts. These initiatives are carefully devised, planned, scheduled, and undertaken to match both the sectoral impact we can have (e.g., solar PV) and to pair our in-house resources with those we must draw on. We have established a "Programmatic Review and Evaluation Panel" (PREP) to vet every RMI initiative and ensure the effort is both game-changing and practicable. Only after this diverse team of in-house experts has scrutinized every aspect does an initiative progress to implementation. The rigor required by this process can be seen in the enhanced focus of the projects described in this annual report. The Trustees of RMI are proud and grateful to be a part—along with our National Solutions Council members, the Legacy Society, generous philanthropists, and our collaborators and partner organizations—in this crucial and exciting work.

Suzanne H. Woolsey, *Lead Trustee*

Human beings are born [because of] the accumulation of qì ["chi" or "vital force"]. When it accumulates there is life. When it dissipates there is death...
There is one qì that connects and pervades everything in the world.

Zhuangzi (Chuang Tzu) (ca. 4th Century BCE)

True mastery can be gained by letting things go their own way.
It can't be gained by interfering.

Laozi (Lao Tzu) (6th Century BCE),
Daodejing (Tao Te Ching) *48*

RMI's Reinventing Fire Initiatives: What and Why

In July 2010 RMI celebrated the results of its year-long strategy development by choosing its first five initiatives. Two initiatives have a multi-sector focus. One is, of course, the capstone Reinventing Fire effort to develop, roll out, and aggressively market a 40-year plan to migrate the United States off fossil fuels smoothly, securely, and profitably—so business is motivated to do the heavy lifting. Another is our old friend 10xE (Factor Ten Engineering, p. 26), reborn with a twin focus on both academic and practitioner environments to provide methodologies and processes for our major industrial projects and work in all other sectors.

Two additional initiatives center on building owners and service industries. RetroFit (p. 13) focuses on how and when to deeply retrofit existing commercial buildings, while our Superefficient Housing Initiative (p. 16) will accelerate superefficiency (more than 60 percent better than today's average new build) into housing built at scale, including affordable housing and modular housing. The final initiative, Next Generation Utility (NGU, p. 19), will speed change in the electricity sector by working with industry leaders seeking low- or no-carbon operation and increased security, reliability, and resilience.

Each initiative will run for three years or more and is approved, guided, and monitored by RMI's new senior leadership steering group, the PREP (p. 9). Each is designed around a detailed theory of change—what needs to happen, who needs to take action, how, and in what order—with checkpoints, feedback, and continuous learning. Each initiative also requires extensive resources, typically costing from one to several million dollars per year. Most initiatives will involve all RMI's capabilities—research, collaborative work, design, convening, writing and speaking, communications and outreach, fundraising, leadership, and management. We expect each initiative to have a significant impact, but there are no easy wins here; each initiative is a considerable challenge. But at RMI we don't run away from big problems—we run toward them.

Besides these five initiatives, we continue to work on three more modest but still important and familiar projects. Project Get Ready (PGR, p. 25), an RMI-funded effort to improve and accelerate the adoption of electric cars and their supporting infrastructure, will continue, and we are exploring partnerships with organizations that can contribute insights and expand PGR's impact. The North American Council for Freight Efficiency (NACFE, p. 22), which we helped incubate, already has nearly 300 members. And RMI recently executed our solar "Balance of System" project (p. 17), which included a successful industry charrette on redesigning everything except the module in order to reduce cost in large-scale photovoltaic (PV) plants—the processes, system-level concepts, and in some cases even the physical design and materials. In addition, RMI continues several long-term efforts important to our mission, such as military energy efficiency (p. 27) and micropower analysis (p. 21).

RMI Initiatives:

- Reinventing Fire™
- RetroFit
- Next Generation Utility
- Superefficient Housing
- Factor Ten Engineering

To wrap up, I'd like to answer the most basic question about this new RMI approach, the initiative. That question: Why structure RMI's work around initiatives?

1. **Initiatives provide continuity of effort and skill accumulation**—they focus us on digging into tough topics on a repeated basis, which is key for learning and innovation about problems that are truly hard. Positioning our work for success means structuring large, sustained efforts to ensure we get to the heart of the matter and follow through to take initial successes to scale.

2. **Initiatives enable proactivity**—we have a focused story to tell the world about where we'd like to go, and can proactively ask for not only support, but also for leading companies and thinkers to get involved. The best players and funders need time to work RMI into their plans.

3. **Initiative-centered organization**—initiatives can anchor much of RMI, and they've let us break down some internal barriers to enable the cross-disciplinary work that is RMI's hallmark and a key to its achievements.

Robert "Hutch" Hutchinson, *Managing Director*

When it is obvious that the goals cannot be reached, don't adjust the goals, adjust the action steps.

Kong Fuzi (Confucius) (ca. 551–479 BCE)

RetroFit on a Roll: Restructuring the Commercial Building Sector

RetroFit is Rocky Mountain Institute's most developed initiative. Its ambitious goal is to implement "deep retrofits" to save at least half the energy the entire U.S. commercial building stock uses and to do so by 2050. About 80 percent of the U.S. commercial buildings that will exist in 2050 exist today. "Deep" retrofits use design methods, long pioneered at RMI, that optimize the whole building as a system rather than its parts in isolation, thus making the savings bigger and cheaper. Typical "shallow" retrofits cut operating cost by 15 to 25 percent and pay back in a few years; "deep" retrofits save upwards of 50 percent with comparable or better economics.

To retrofit more than 80 billion square feet, we're leveraging education, partnerships, outreach, and the power of example and competitive pressure. To start, we assessed the needs of building-industry players who could perform and benefit from deep retrofits, such as large commercial property owners, financiers, and energy service companies (ESCOs). For decades, RMI and ENSAR Group, which merged into RMI's buildings practice in 2005, have collectively helped design over a thousand energy-efficient buildings worldwide.

Last year, RMI engaged Pike Research, a clean-tech market firm, to help us understand what stakeholders need to turn deep retrofits into standard practice. This survey of industry leaders, such as members of the corporate real-estate trade association CoreNet Global and the Building Owners and Managers Association (BOMA), confirmed that case-studies on typical retrofit characteristics, an inventory of common deep retrofit measures and practices, and improved energy-modeling tools could be particularly useful. The resources industry seeks most include online media, conferences, seminars, and training.

RMI-IBPSA workshop

To meet those needs, RMI will be unveiling new support tools, including workshops, training materials, reference manuals, education modules, and industry partnerships. For example, RMI has teamed with the International Building Performance Simulation Association (IBPSA) to develop an energy-modeling database and conduct training workshops covering energy-modeling best practices and engineering fundamentals. Energy modeling is a vital but young discipline with limited standardization. Though it has grown from a handful of practitioners in the 1970s, most practitioners are still self-taught. We aim to add a new focus on integrative design, especially deep retrofit expertise, helping ensure modelers use best practices to maximize energy and capital efficiency.

"The idea of designing a building from a place of looking at the best design instead of the worst [baseline case] is something I would love to start doing," said Neil Bulger, a project engineer who recently completed an RMI-IBPSA workshop. Bulger said he plans to share his new knowledge with his colleagues at Integral Group, a top engineering firm specializing in high-performance buildings.

Kendra Tupper, PE, RMI senior consultant

RMI also plans to convene in 2011 a group of expert building modelers and major energy-simulation software developers to brainstorm features that would help the industry better represent energy-saving features and promote the technical and financial benefits to their clients.

"To achieve widespread adoption of whole-system retrofits, the industry needs competent energy and financial analysis," said Kendra Tupper, an RMI senior consultant. "In the short term, RMI is addressing the barriers to this by developing and disseminating training and educational materials and creating tools and templates that will save time and increase the quality of energy modeling. RMI will also convene currently fragmented industry stakeholders and practitioners to develop a coordinated long-term vision and workplan for the industry."

The energy-modeling tools and training materials will be available on RetroFit Depot, RMI's online resource for deep retrofits. RetroFit Depot will offer case-studies, financial and energy tools, and data. There, a property owner will find the business case for doing deep retrofits while a service provider will find supporting technical data, such as energy survey checklists and lifecycle-cost analyses. Look for RetroFit Depot in early 2011 at www.retrofitdepot.org.

Empire State Building Project Update

The flagship Empire State Building project is well along in implementation, with the most important step—remanufacturing its 6,514 windows onsite into superwindows—completed in September 2010. Cutting winter heat loss by at least two-thirds and summer heat gain by half, the advanced glazings, along with improved lights and office equipment, will cut the building's peak cooling load by one-third. The old chillers can then be renovated and reduced rather than replaced and expanded—saving more than $17 million of capital cost that helps pay for the other savings and thus cuts the payback time to three years. The expected 38 percent energy saving is several times the norm for a building of this kind.

The Empire State Building project nicely illustrates the power of the deep retrofits that RMI's RetroFit initiative aims to make standard. It also illustrates how we choose partners: an owner, Tony Malkin, who is eager to share his experience; an energy service company, Johnson Controls, seeking momentum in deep retrofits and able to put competitive pressure on other ESCOs; and a property manager, Jones Lang Lasalle, that could similarly shift its business model, influencing not only the billions of square feet it manages but also the space its rivals manage.

Making Markets Super: Shopping for Energy Bargains

The United States has more than 85,000 grocery stores, each with the floorspace of a large office building but using twice the energy. In the past year, RMI worked with several supermarket chains to develop innovative ways to save energy, reduce waste, and increase revenues. Supermarkets have such razor-thin profit margins that energy efficiency is vital to their survival. For some supermarket chains, store energy, water and waste costs amount to less than one percent of gross sales but can equate to nearly one-third of profits.

In a typical supermarket, refrigeration uses about 36 percent and space conditioning about 28 percent of electrical use. RMI's experts recently showed one chain how to save nearly 50 percent of its energy consumption, in large part by upgrading space-conditioning and refrigeration equipment, reducing air infiltration, and adding desiccant dehumidification.

Lighting is another big energy user, but simple and often low-cost measures such as skylights, LED case lighting, dimming controls, and light-colored surfaces can save almost half of a store's lighting energy while improving merchandising.

Stores also use a lot of water. To save over half, the RMI and client team proposed water-frugal restroom fixtures and kitchen equipment, removing ice from seafood cases, xeriscaping with native landscaping (which can often eliminate the need for irrigation), capturing rainwater and condensate, and reclaiming carwash water for reuse.

"Turning 'waste' at a grocery store into valuable recyclables and compost can be a profit center for stores by avoiding tipping fees while reaping recycling revenues," said RMI Principal Alexis Karolides, AIA. "The gold standard is 'zero' waste, defined as at least 90 percent reduction in landfill waste."

This work, like most efficiency efforts, goes on behind the scenes, away from customers. But a conventional store's extensive signage and advertising give grocery chains an opportunity to craft a message that's attractive to customers while influencing the entire industry.

"Chains have a golden opportunity to highlight the efficiency measures they are undertaking, which helps them keep costs and prices low," Karolides said. "Some green building measures, such as daylighting, have been linked to improved shopping experience and sales. And customers may take away more than groceries from their shopping experience. They may gain energy- and water-efficiency ideas they can apply at home—so they'll have more money to spend on, say, groceries."

A charrette led by RMI produced a 38% more energy-efficient new prototype store for Stop & Shop in Foxboro, Mass. Shown here is the daylighting/electric lighting design by the late leader of RMI's building practice, Greg Franta, FAIA, and RMI Senior Fellow Nancy Clanton, PE.

RMI's Superefficient Housing Initiative: Getting New Homes on the Right Track

What if our homes could be 60 to 80 percent more efficient, healthier, and more comfortable than contemporary homes, yet equally or more affordable? Today, that's feasible, but energy- and dollar-efficient homes remain uncommon. Why?

This question is central to RMI's soon-to-launch Superefficient Housing Initiative. Over the past year, an RMI team dug into the production-home industry to explore how affordable residences can be built to use 60 to 80 percent less energy than current building codes require, even *without* renewable energy sources.

"Most people aren't aware that in new and existing homes, integrated, efficient design and retrofit strategies can dramatically reduce fossil fuel use, can improve comfort and health, and need not break the bank."

"Most people aren't aware that in new and existing homes, integrated, efficient design and retrofit strategies can dramatically reduce fossil fuel use, can improve comfort and health, and need not break the bank," said RMI Principal Alexis Karolides, AIA. "People may associate 'green' with expensive PV panels, but it is much more cost-effective to optimize your home's efficiency first, before considering renewables. Though there are good examples of superefficient homes, there are many impediments in the marketplace that have kept such homes from going mainstream. This is what we will address."

RMI plans to achieve scale by seeding superefficiency into the business strategies of key builders' nationwide portfolios, and by spreading best practices through regional and city-to-city peer networking structures.

"If we know that the country's top 20 builders build one-third of America's homes, we have a good idea of where to start," said RMI Principal James Brew, AIA, an expert on Japanese precision-built-home techniques and a certified Passivhaus Design Consultant. "If we can change one or two of the large production builders, it will have a profound effect on the others as they see themselves fall behind in the increasingly competitive housing market. It is a great opportunity to achieve significant impact broadly and quickly."

RMI's Superefficient Housing Initiative evolved differently than the rest and represents a new arena for RMI, which until now focused on commercial buildings. The idea emerged from hundreds of meetings and interviews with professionals from every corner of the industry. Institute researchers identified a need, a new hypothesis, and a distinctive set of barriers that the industry needs to overcome.

"If builders are going to increase the efficiency of the homes they build, they need creative financing." Brew said. "The large builders have ironed out all the costs of building homes at scale down to pennies, so they think of high energy efficiency as an added cost—meaning a bigger mortgage."

RMI's initiative will explore creative financing that encourages efficiency instead of ignoring it. Our Superefficient Housing Initiative starts with large homebuilders, but it will also explore how homes are designed, built, financed, appraised, sold, and operated.

"For design and construction, we will focus on everyone from manufacturers to modular factories to component manufacturers to subcontractors—to educate them on the efficient design approaches and products that we can leverage and bring to the builder's attention," Brew said. "That's only half the battle. For these homes to sell, appraisers need to understand the value of the home, realtors need education on how to market these homes competitively, and consumers need to understand the benefits of living in an efficient, comfortable, healthy, and cost-effective residence."

This initiative's partners include Davis Energy Group, U.C. Davis, Heschong Mahone Group, Green Home Solutions, and Bevilacqua-Knight, who are working with RMI on the U.S. Department of Energy's Alliance for Residential Building Innovation (ARBI)—a team assembled as part of the U.S. Energy-Efficient Housing Partnerships. By optimizing regional strategies with production builders and collaborating with industry groups and local entities to seed change, RMI will drive early examples, create an environment that encourages continued progress, and thus help to transform the industry.

Up with the Sun: Making Solar Power Broadly Cost-Competitive

Despite great advances over the past half-century, photovoltaic (PV) systems must become even cheaper to help shift electricity generation from fossil-fueled to renewable (PV systems convert sunlight directly to electricity with no moving parts). In 2009, PVs provided only 0.02 percent of U.S. electricity.

Yet, with global solar energy production for the grid growing at an average rate of about 60 percent for the past decade, PVs have the potential to become one of the world's largest industries. PV module prices continue to fall dramatically, but the other half of PV systems' total upfront cost, collectively called "Balance of System" or "BoS," is still high, diluting the drop in module prices and limiting adoption.

Doug Payne, SolarTech cofounder and executive director

In June 2010, Rocky Mountain Institute convened more than 50 industry stakeholders and experts for a design charrette. The charrette offered this fragmented, fast-moving, and multifaceted industry a forum for collaborative innovation on cutting installed BoS costs for commercial and utility-scale roof- and ground-mounted PV systems. The charrette's findings, at rmi.org/BOSreport, underscore how a systemic approach, leveraging synergies across boundaries, can yield major savings.

Charrette participants found ways to reduce BoS costs to $0.60–0.90 per peak watt—45 to 65 percent below current best practice—via highly efficient structural designs, new electrical system architectures, better site information, and increased standardization of physical designs and processes to enable high-volume manufacturing and speed project development. Coupled with cheaper modules, these recommendations could make solar energy match or beat retail electricity in most U.S. markets. Industry "coopetition"—cooperation for mutual benefit in a competitive environment—is essential for identifying and removing barriers.

A key workshop finding is that major BoS cost reductions are not contingent on a single breakthrough technology: existing approaches offer high potential for cost reduction but significant challenges remain. Each PV system is unique, must be individually designed, and is regulated by one of nearly 30,000 local jurisdictions.

Business process costs, from proposal to interconnection, are a particularly thorny issue. Since the charrette, RMI has worked with California-based SolarTech, a national consortium dedicated to eliminating barriers to PV market growth, to streamline BoS processes and reduce associated cost and risk. Cofounder and Executive Director Doug Payne, who attended the charrette, said it helped SolarTech reframe the issue strategically. The bottom line, he said, is figuring out how to drive down the costs incurred from process delays and eliminate inefficiencies. "We need to attack this on multiple fronts, in many new ways, with as much innovative thinking as possible," he said.

The charrette also helped SolarTech wrap a long-planned set of best practices into the broader framework of a "National Solar Exchange." These practices provide developer expertise and critical information about viable sites that make markets more efficient.

RMI's BoS charrette report suggests a number of industry activities across physical design, business processes, and industry scale to help support BoS cost-reduction goals. RMI is collaborating with SolarTech, the U.S. Department of Energy, and other stakeholders, including PV developers and manufacturers, to increase understanding and awareness of cost-reduction opportunities. Among other tasks, RMI is undertaking deeper analysis of business process costs—which vary substantially by project size, location, ownership, and project phase—to help align industry-wide incentives for cost reduction.

Several weeks after the San Jose charrette, Energy Secretary Dr. Steven Chu kicked off the DOE's "$1/W Workshop" (attended by RMI's Dr. Stephen Doig). The assembled experts lauded the charrette's findings, which reach encouraging conclusions about the feasibility of a game-changing goal—an installed PV system cost low enough to beat the cost of all new central power stations. RMI is confident that this work will contribute to significant near-term BoS cost reductions.

RMI's Next Generation Utility (NGU) Initiative: Rethinking Electricity Demand, Supply Architecture, and Industry Strategy

In the past few years, the utility sector has evolved tremendously. As climate, economic, and security challenges have grown, and as the regulatory world has shifted, utilities have reexamined their roles. Today, simply serving the customer isn't enough—*how* is just as important. Efficiency and renewables are now commonplace in utility parlance, and some firms are delving deeply into unfamiliar areas ranging from biomass to combined-heat-and-power.

Throughout its history, RMI has been active in the electricity sector—the most complex, vital, and capital-intensive sector of the economy. In 2009, this effort entered its next phase, the Next Generation Utility (NGU) initiative, to pursue and apply advanced concepts in collaboration with forward-thinking utilities.

NGU has four threads: creating a techno-economic vision of a fossil-fuel-free electric system; identifying key enablers to make that vision a reality; designing tools to support insightful decision-making; and collaborating with electric utilities to overcome barriers. In the process, NGU is rolling out some fascinating ideas.

Perhaps NGU's most thought-provoking notion of late, according to RMI principal and utility expert Lena Hansen, turns the notion of electric demand and supply on its head (see www.rmi.org/rmi/Transforming+Electric+Utilities).

"The traditional attitude has been that we have this inflexible demand, so to meet it we need supply-side resources—power plants—that are flexible and that can be turned on and off whenever we like," Hansen explained. "Now we have to flip that equation and consider the supply—wind and solar—inflexible while considering demand flexible. That means smart grids, electric vehicles, efficiency, demand response, load-shifting, and other options that can together choreograph all resources to

Lena Hansen, RMI principal and utility expert

meet customers' service needs reliably and at least cost."
In other words, the power sources previously thought negligible because "the sun doesn't always shine and the wind doesn't always blow" are now relevant because modern digital technologies can act as a time and demand broker, matching whatever supply is available (and cheap, clean, and reliable) with whatever needs society has. "It's a very different way of thinking," Hansen said. "It's a very different way of operating the system."

Energy modeling and analysis are essential to identifying and addressing barriers and solutions, but effectiveness requires adoption by industry. Fortunately, RMI is partnering with the respected and engineering-savvy firm Duke Energy to explore the next generation utility model. A few years back, Duke Energy created Vision 2030—an aspirational look at how the company could cut its carbon emissions 50 percent by 2030.

Based on the results of that work, Duke Energy engaged RMI to "help our thinking about what the future might hold so we could look more broadly at the actions we could take to prepare for a carbon-constrained future," according to Janice Hager, Duke Energy's vice president of Integrated Resource Planning and Regulated Analytics. "I felt like RMI really brought to the table reasonable alternative views of how the future could play out. We looked at a lot of things that RMI did—we really dug into it. I walked away with the perspective that while I might not draw the same conclusion, they had drawn reasonable conclusions. A key example was how much wind you can integrate into a system. As a system operator, that's something we as a utility think hard about, and we tend to believe there is a pretty low limit on how much wind we can have on the system and still feel comfortable that we can operate it. I walked away believing it may be possible to accommodate more wind on our system than I thought going into our discussions. They helped me broaden my thinking on a lot of factors that impact resource plans."

From the partnership with Duke, RMI's team also gained a deeper understanding of the real barriers utilities face in moving towards a fossil-fuel-free electric system. "Partnering with utilities is a critically important part of our work," Hansen said. "We believe that the most effective way to maximize our mission impact is to constantly balance our cutting-edge research with the reality of running a business so that we can create practical solutions."

In the next year, the extensive new findings emerging from the NGU team's Reinventing Fire research will inform new collaborations with leading utilities and policymakers.

RMI's Micropower Database

World electricity production is at last shifting dramatically toward a goal RMI has advanced for decades: diverse, dispersed, renewable sources that make money, cut risk, and boost resilience.

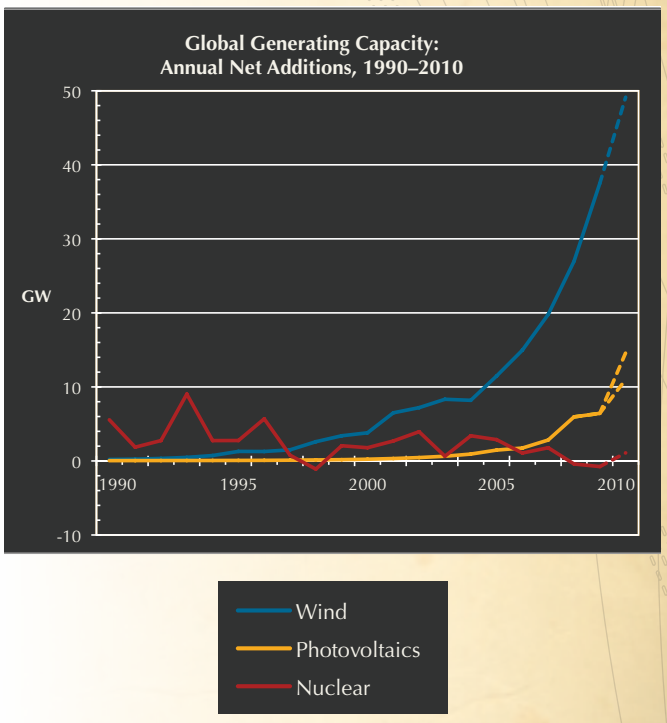
RMI is the independent clearinghouse for data on the global growth of what *The Economist* calls "micropower": cogeneration (a.k.a. combined-heat-and-power) plus all renewable electricity generators except big hydroelectric dams. Our detailed, transparent, documented database's May 2010 update (www.rmi.org/rmi/RenewablesMicropowerTransformingElectricityLandscape) revealed that in 2008, micropower provided *~91 percent* of the world's new electricity. Thanks to lower costs and financial risks, and despite generally lower subsidies, it's walloping new coal, nuclear, and gas-fired power plants.

Micropower remains little-noticed because its economies come from mass production, not giant units; many official databases still omit its small and often privately owned units of capacity. Yet during 2000–09, its share of global electricity production rose from 13 to 18 percent while nuclear power's fell from 17 to 13 percent. The U.S. added more windpower capacity in 2007 than it added coal-fired capacity in 2003–07. Europe in 2009 closed more coal and nuclear capacity than it added; 71 percent of its capacity additions were renewable.

Globally, windpower and solar photovoltaics (PVs) are growing so explosively (see graph) that nuclear generation's output growth fell behind PVs' in 2007 and will probably never catch up. After a decade averaging 60 percent annual growth, grid-connected solar power is entering takeoff into low price and high volume (see p. 17). The end of 2011 will probably see global PV-making capacity around 35 billion watts (GW) per year. The PVs made by those factories every seven years (a typical reactor's construction time) could produce more annual electricity than the 59 billion watts of reactors being built worldwide.

China, now number one in five renewable technologies, just blew past its 2020 windpower target. In 2006, China's distributed renewables had nearly seven times its nuclear capacity and were growing seven times faster; by 2009, this gap had widened, and China had halved its net rate of coal-power additions in just three years. Nearly three-eighths of its net capacity additions planned for 2010 are renewable—encouraging news, since China and India burn nearly half the world's coal and plan three-fourths of the world's new coal-fired power plants.

In 2009, renewables were one-fourth of global power capacity, half of new capacity, and over half of new power-plant investment. Renewables except big hydro will surpass nuclear power in global capacity in 2010 and in output around 2014–15 (micropower did so in 2001 and 2005). In



2009, renewables except big hydro got $131 billion of private investment and added 52 billion watts. Nuclear plants got no private investment, losing capacity for the second and output for the third year running.

In the U.S., new reactors are over 100 percent subsidized, but still can't raise private capital, because they have no business case. Of the 60 reactors under construction worldwide as of 10 September 2010, 12 have been so listed for over 20 years, 42 have no official startup date, half are late, 44 are in four untransparent and centrally-planned power systems (China, India, Russia, South Korea), and all 60 were bought by central planners.

Reinventing Fire (p. 11) will reinforce RMI's decades of integrative thinking (including a 21 January 2010 *Foreign Policy* article, www.rmi.org/rmi/Library/2010-02_ProliferationOilClimatePattern) showing how the market-driven shift to micropower can stem the spread of nuclear weapons, protect the climate (micropower saves far more carbon, far faster, than nuclear could), make electricity supplies more reliable and resilient, and boost global development. Not bad for investments that get little respect and much derision but are already quietly winning in the marketplace.

"Innovative fleets and suppliers see the opportunity and urgency that exists for us to improve freight efficiency not only to help our industry be more successful, but to get ahead of future regulations around fuel consumption."

NACFE: A Comprehensive Search For Improvements

For years, heavy trucks have been synonymous with inefficiency. Class-8 trucks use about 2.4 million barrels of oil a day, or one-eighth of all the oil used in the U.S. Trucks' greenhouse-gas emissions have risen more than 50 percent since 1990. And while other modes of ground transportation have made strides, the trucking industry is slower to adapt. Despite potential for dramatic gains in trucks' fuel economy, recent innovation has been incremental, especially as the recession shriveled truckers' budgets and many struggled for mere survival.

The North American Council for Freight Efficiency (NACFE), formed by RMI in 2009, is focused on improving heavy trucks' fuel efficiency and putting a big dent in the transportation sector's carbon emissions.

A lack of trusted and credible sources of efficiency technology performance, and a shortage of business-case data, make investment in fuel efficiency seem risky. NACFE was established to address that problem by assessing and distributing performance information from testing agencies and laboratories, collecting marketing and user data, and providing accessible, up-to-date efficiency information.

"The independent and credible aspect of the Council gives it a huge opportunity for success," said Michael Roeth, NACFE executive director, a 25-year industry veteran from Navistar. "Most decisions to procure products are based only on information from the suppliers who have a commercial and financial stake in the process. The third-party character of the NACFE is a crucial need of the industry and a direct success factor for the Council."


Michael Roeth, NACFE executive director

Since forming, NACFE has named a Board of Directors and a Technical Advisory Committee, and elected Roeth as executive director. NACFE's initial projects will be announced in fall 2010 at NACFE's second "Driving Innovation" meeting in Dearborn, Michigan. "This meeting will provide the entire trucking marketplace a chance to become personally involved in the development and adoption of cost-cutting, environmentally beneficial technologies and services," Roeth said. "Anyone from fleet owners who are frustrated with fluctuating fuel prices to technology providers and industry suppliers looking to bring efficiency solutions to market will have the opportunity to join a membership organization dedicated to addressing these challenges."

So far, almost 300 industry leaders have joined NACFE, and their numbers continue to grow. According to Roeth, engagement is key. "Innovative fleets and suppliers see the opportunity and urgency that exists for us to improve freight efficiency not only to help our industry be more successful but to get ahead of future regulations around fuel consumption." he said. "Now they have an engaged community to help them do so."

Bright Automotive: Driving for a Brilliant Future

For an example of where RMI's "rubber meets the road," look no further than Bright Automotive—RMI's third formal for-profit spinoff and second automotive spinoff.

Each year, government and business buy or lease hundreds of thousands of fleet vehicles. These fleet vehicles are only 7 percent of all light-duty vehicles sold, but they use 20 percent of their fuel because fleet vehicles are driven hard and fleet vans average less than 15 mpg.

Bright started with the *IDEA*—a lightweight, aerodynamic, electrified fleet van that gets about 100 mpg. It cuts fuel use by about three- to twelve-fold, depending on the driving cycle. Yet unlike other plug-in hybrids, the *IDEA* requires no subsidy to make a strong business case to the fleet buyer. That's because it eliminated most of the costly batteries through "platform fitness"—designing out unnecessary weight, drag, and rolling resistance, so far less energy is needed to move the vehicle.

In April 2009, Bright developed a driving prototype, whose design roots run deep at RMI. Several members of Bright's leadership—including current Vice President of corporate strategy Michael Brylawski, Chairman and CEO Reuben Munger, Vice Chairman John Waters, and VP of Hybrid Technology Jeff Ronning, PE—have served the Institute in some capacity. "One of Bright's unique attributes compared to other startups is John Waters's vision of how to execute RMI's ideas in mature industrial sectors," Brylawski said. "Our execution-focused leadership brings significant automotive experience to the table."

How significant? Bright's team has shepherded dozens of advanced-technology vehicles to market—probably more than all other automotive startups combined. Waters, for example, led the design of the battery pack for GM's *EV1* battery-electric car.

Bright's Vice President of Corporate Strategy, Michael Brylawski

Brylawski was a member of the RMI team that launched the exploration of the Hypercar®: ultralight, ultra-low-drag, hybrid-electric vehicles with software-rich, radically simplified, highly integrative design. To make Hypercar-style technologies and solutions widely available, RMI spun off Hypercar, Inc. in 1999; Brylawski became its chief strategist. In 2004, Hypercar changed its name to Fiberforge (www.fiberforge.com) and became a leading provider of new technologies for making extremely light and strong advanced-composite structures at competitive cost—a key enabler because ultralighting is the most important way to make uncompromised cars both superefficient and affordable.

Bright applied many Hypercar concepts in the *IDEA*. But the differences made for a market-ready prototype. "At Bright, we are staying true to RMI's principles of lightweighting, advanced aerodynamics, and affordable electric drive," Brylawski said. "We think if we can execute with proven technologies, we're going to offer our customers a breakthrough product that will save them money while saving a lot of carbon and oil. It's the ultimate RMI strategy."

Recent news, including a $5 million initial investment in Bright from GM Ventures (the new venture-capital arm of the U.S. auto giant), shows that the market is starting to listen. The next steps for Bright are to hire key personnel (in September 2010, Bright announced Chrysler, Tesla, and Mercedes-Benz veteran Mike Donoughe as its chief operating officer), to continue to raise capital and to gear up for full development and production of the *IDEA*.

"Almost every global car company is getting serious about efficiency and electrification," Brylawski said. "Bright shows how RMI can achieve real impact through its thought leadership."

Project Get Ready: Helping Communities Plug in, Switch on, and Stand out

"I think EV [electric vehicle] readiness is contagious," said Albert Dahlberg, Project Get Ready's Rhode Island (PGR RI) coordinator. "Where there is a healthy bit of competition between neighboring communities, we can make the connections to build a regional planning framework."

That balance of competition and collaboration is key to RMI's Project Get Ready (PGR), an initiative aimed at preparing North American cities for plug-in vehicles. By forming a coalition, creating a near-term strategy for EVs, and committing resources, PGR has helped nearly a dozen cities become plug-in pioneers.

According to Matt Mattila, RMI transportation consultant and PGR manager, Rhode Island is a great example of a plug-in pioneer. Rhode Island joined PGR in January 2010 as the first northeast state to lead the adoption of efficient, low-carbon vehicles. With the guidance of PGR, Rhode Island policymakers, environmental advocates, transportation experts, business leaders and the state's main electric utility are using practical strategies that promote EV adoption. They have made such progress toward Rhode Island's ambitious goal—10,000 plug-in electric vehicles by 2015—that the state hopes to become New England's proving-ground for EVs.

Albert Dahlberg, Project Get Ready's Rhode Island (PGR RI) coordinator.

PGR provides the framework to share best practices and expedites the planning process with shared lessons and resources. The PGR "menu" outlines and prioritizes the most important things cities must do to adopt electric vehicles. This includes "must-have" actions—core criteria to gauge readiness (such as bringing down upfront costs for consumers)—and "nice-to-have" actions that may not be necessary but could speed EV adoption.

Rhode Island relies on the PGR menu and the knowledge their partners bring. For example, PGR RI is coordinating with the regional utility, National Grid, to develop a plan for electrifying two percent of Rhode Island's cars without significantly increasing peak grid load, while simultaneously decreasing transportation costs and carbon emissions.

Rhode Island has also enlisted Environment Northeast (ENE)—which provided vital research and guidance for development of Rhode Island's Low-Carbon Fuel Standard—as a partner. ENE will continue to inform PGR RI's efforts to integrate electric vehicles.

"I think it would be virtually impossible to start a successful EV readiness initiative without the partnerships we have and the comprehensive planning template that RMI developed," Dahlberg said. "This is uncharted territory for many communities, and being able to rely upon a tested, well-thought-out plan was critical. Without it, Rhode Island would not be doing anything in the EV readiness area."

Autodesk's design software helps in the design of buildings and products that touch roughly two billion people.

Autodesk & RMI: Factor Ten Educational Collaboration

Building, infrastructure, and industrial design can be a tricky business. Project teams often include parties as diverse as owners, financiers, architects, designers, engineers, contractors, occupants, product suppliers, manufacturers, and maintenance staff. Such conglomerations often lack aligned interests and cohesive processes. Buildings use roughly 40 percent of global energy, so improving building design and performance is a priority for the architecture, engineering, and construction (AEC) industry to improve competitiveness, gain market share, and protect the climate.

Debra Pothier is a senior AEC education marketing manager at Autodesk, Inc., whose design software runs on nearly two million screens and helps in the design of buildings and products that touch roughly two billion people. She sees groundbreaking technologies that are transforming the industry. "Building information modeling" (BIM) is one of them.

BIM is an integrated process that lets architects, engineers, and construction managers break down barriers and communicate effectively to improve coordination and accuracy. BIM technology provides an integrated digital prototype of a building that gives all parties the same up-to-date information, so collaboration and design analysis can inform decisions earlier in the process, helping ensure a project's success. It's Pothier's job to provide academia with learning tools that help integrate BIM technology into curricula and pedagogy in which design and engineering students can quickly master design, better communicate design intent, and explore sustainable design alternatives.

For RMI, the past year has meant supplying this leading software-maker with material from the Institute's Factor Ten Engineering initiative (www.10xE.org). Factor Ten's new approach to integrative design shows how to make very large energy and resource savings highly profitable in buildings, vehicles, and industrial processes.

Autodesk asked RMI to produce a set of design principles for Factor Ten Engineering, plus several case-studies of projects that use Factor Ten principles. One of these was Autodesk's own Waltham, Massachusetts, AEC headquarters' tenant fit-out, which combined BIM with Integrated Product Delivery—a novel incentive structure and workflow design that aims to eliminate conflicts between designers, builders, and owners, and rewards all for shared success. Autodesk is now deploying these 10xE materials globally via its website, www.autodesk.com.

"Factor Ten principles and looking at design and engineering holistically has aligned well with our sustainable design initiatives," Pothier said. "The way RMI thinks, and leveraging the Institute's knowledge base and perspective combined with technology, will help transform the building industry overall."

"The way RMI thinks, and leveraging the Institute's knowledge base and perspective combined with technology, will help transform the building industry overall."

RMI buildings analyst Michael Bendewald believes the collaboration could have an immense effect. "Autodesk is an extremely influential software company," he noted. "Designers have always been influenced by the technologies they use, and they walk a fine line between their own idiomatic designs and the influence their tools exert. What we're trying to do is create tools that can support the design that we want to see happen in the world."

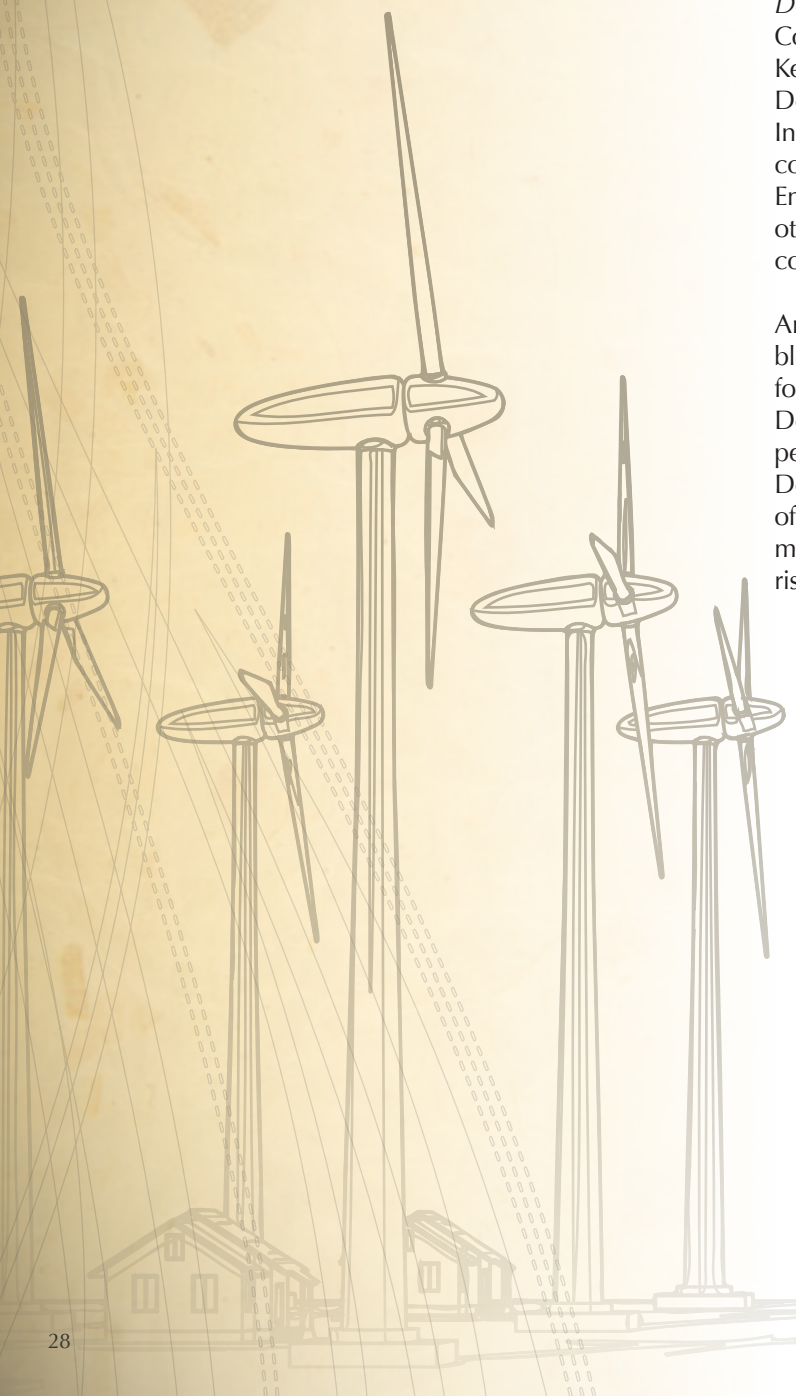
Meanwhile, 10xE staff and their partners in academia and industry have been preparing and field-testing a growing body of case-studies contrasting normal dis-integrated design with integrative design, illustrating how to turn diminishing returns into expanding returns to investments in energy efficiency. In 2011, as we complete the research and rollout of Reinventing Fire, we'll be cranking up the production of our next big thing—a game-changing casebook and other tools for transforming how design is taught and done.

RMI's Work with the Military

The U.S. Department of Defense is arguably the world's largest, most complex, and hardest-to-shift organization—yet it's effective, largely meritocratic, sometimes visionary, capable of rapid learning and fundamental change when needed, and open to engagement. For decades, therefore, RMI has helped make DoD a leader in superefficient energy use and resilient supply, in order to leverage civilian oil savings 50-odd times larger and speed resilient civilian electricity supplies—much as military R&D created the Internet, GPS, and the jet-engine and microchip industries. Military technology, influence, and permeation of training and values into civilian life can give warfighters negamissions in the Persian Gulf—Mission Unnecessary—and help create real energy security for all.

The late Donella Meadows taught that a complex system can be most effectively redirected by changing the mindset of the people who make its rules, so at DoD we use at seven main tools: discussions with 2- to 4-star uniformed and civilian leaders; lectures at conferences and staff colleges (e.g., http://tinyurl.com/2dzcs5w); building strong networks; service on two Defense Science Board task forces (www.acq.osd.mil/dsb/reports/ADA392666.pdf and www.acq.osd.mil/ddb/reports/ADA477619.pdf); key publications, e.g., the February 2010 lead feature article in *Joint Force Quarterly*, the magazine of the Chairman of the Joint Chiefs of Staff (www.ndu.edu/press/jfq-57.html); supporting reform efforts within the Office of the Secretary of Defense (OSD) and the Services; and special projects, such as a few hours' 2006 Air Force observations and briefings, triggering an immediate "treasure hunt" that will save billions of dollars' worth of fuel by eliminating superfluous onboard weight (www.rmi.org/rmi/Library/2010-05_DODsEnergyChallenge, p. 3).

Photo courtesy of the U.S. Army

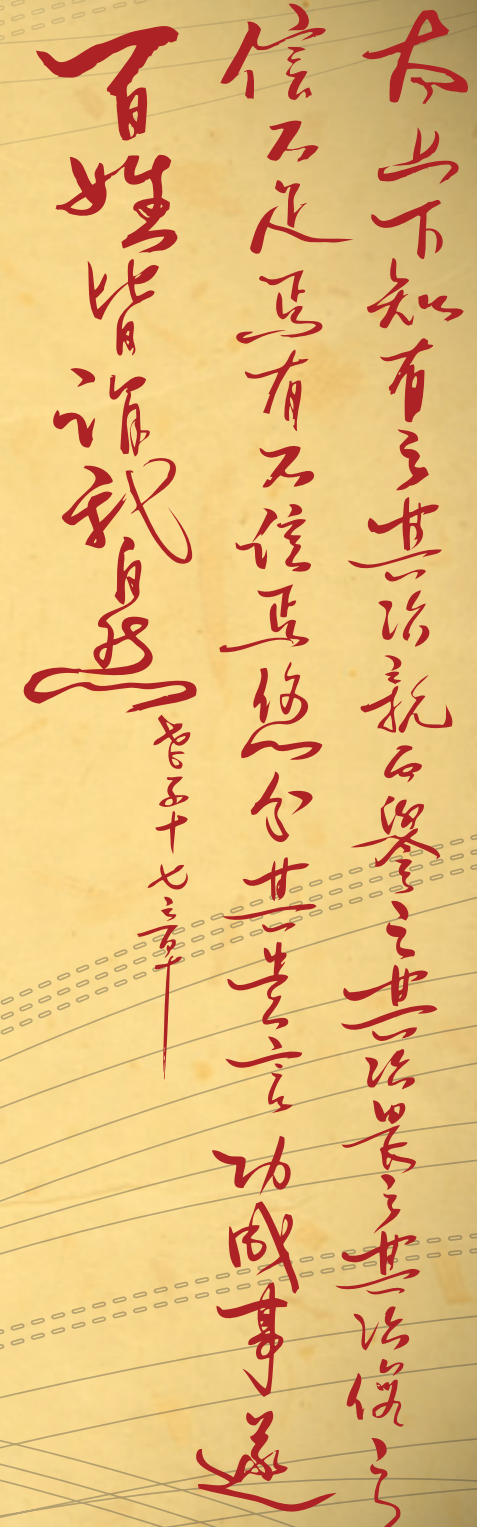


Signs of success appeared during 2009–10. Major RMI goals were written into the 2010 *Quadrennial Defense Review* that sets DoD-wide doctrine. Two crucial implementing mechanisms (Fully Burdened Cost of Fuel—which values saved fuel typically ~5–100 times higher than previously—and energy Key Performance Parameters for new military platforms) were mandated by the 2009 National Defense Authorization Act and confirmed by the QDR. CNA, Deloitte, Brookings, Progressive Policy Institute, and the Government Accountability Office published supportive papers. The Services began competing over leadership on energy. Sharon Burke became DoD's first Director of Operational Energy Planning and Programs. DoD launched real collaboration with the Department of Energy and other agencies. And Red Teams won wargames by "playing fuel," overturning some commanders' complacency by exploiting the fatal vulnerability of their fuel logistics.

Andy Bochman's authoritative DoD Energy Blog kindly commented in March 2010 (http://dodenergy.blogspot.com/2010/03/lovins-on-dod-energy-opportunities-in.html): "Rocky Mountain Institute founder Amory Lovins has been in this long game longer than anyone, and much of the credit for DoD's current momentum on energy can be traced directly to his decades-long leadership and perseverance." Bochman added in May: "He's a thought-leading outsider who knows more about DoD and energy—where it's been and where it needs to go—than maybe all the readers and writers of this blog put together." RMI's reputation within DoD is our greatest asset. We strive to continue to merit it by listening and learning, independence, rigor, and respectful engagement with the dedicated risk-management professionals who share our commitment to a richer, fairer, cooler, safer world.

RMI's mission is to drive the efficient and restorative use of resources.

Our vision is a world thriving, verdant, and secure, for all, for ever.



Communications: Amplifying Our Work

RMI has always harnessed interconnections to make a greater impact. Now that our world is more linked than ever, the need to build a solid community to amplify our message in the marketplace is an increasingly important focus.

And we certainly have a great deal to share, as you will see in the wide range of transformational projects we describe in these pages. However, without reaching the right people at the right time, even the most revolutionary idea can go unnoticed. Luckily, today we have more tools than ever to share our game-changing work.

RMI.org: A New User Experience

This year saw the launch of a completely redesigned rmi.org, offering online visitors a way to engage intuitively with our work. Through compelling content, rich graphics, and multimedia features, the new site is designed to inform our online community and engage visitors each time they visit. Features include:

- A new online library, organized by topic, offers easy access to our rich work in energy and resource efficiency during the past 30 years.
- *RMI TV,* a comprehensive video library, allows viewers to listen to RMI practitioners and outside experts talk about our work.
- RSS feeds deliver project updates, news coverage, and blogs directly to subscribers.
- The new *Solutions Journal* section showcases both the latest articles and 15 years of the Institute's newsletter and *Journal* archives.
- A streamlined online donation process makes it easy for those who want to support our efforts.
- New commenting functionality allows visitors to the site to join the conversation by posting their thoughts about RMI blogs or *Solutions Journal* articles.

RMI in the Media: Sharing our Work with the World

By leveraging our media presence, RMI can position our efforts in the context of larger global issues and inform widely scattered audiences about our activities. During the past year, we have brought attention to key projects in our core practice areas and the media has widely sought RMI experts to provide credible voices for smart resource use in print, online, television, and radio media. Prominent media hits include:

"The California Electric Car Push"
NPR's *On Point*, June 2010
www.onpointradio.org/2010/06/the-california-electric-car-push

"Energy Guru Says Green Needn't Be Grim"
MSNBC, September 2009
http://rss.msnbc.msn.com/id/33074128/ns/technology_and_science-future_of_energy/

"Rising Temps Melt Electric Utilities' Business Models"
New York Times, September 2009
www.nytimes.com/gwire/2009/09/10/10greenwire-rising-temps-melt-electric-utilities-business-72148.html

"Old Wine, New Bottles"
Wall Street Journal, September 2009
http://online.wsj.com/article/SB10001424052970203987204574338684174566044.html?mod=wsjcrmain

"Releasing the Energy Efficiency Floodgates"
Fast Company, July 2009
http://www.fastcompany.com/blog/glenn-croston/starting-and-growing-green-businesses/releasing-energy-efficiency-floodgates

Spark: Connecting Our Online Community

Our new e-newsletter, *Spark*, has made it easier to track RMI's progress in profitably moving the world off fossil fuels. A bi-weekly, *Spark* offers up-to-date information on RMI projects, RMI-authored blogs, news coverage, videos, and upcoming RMI-related events.

Our 50,000 subscribers include RMI colleagues, donors, National Solutions Council members, experts across our core sectors, journalists, and RMI friends around the globe. As this community continues to grow, RMI will continue to offer new ways for supporters and collaborators to connect and learn how they can help drive the transition from fossil fuels to efficiency and renewables. To subscribe, visit www.rmi.org/rmi/Subscribe.

An Unprecedented Year in RMI's Development

Since its inception 28 years ago, RMI has been unconventional in its thinking, innovative in its approach, and game-changing in its work. One would anticipate donors of a similar caliber, and our philanthropic revenues in fiscal year 2010 proved that expectation true.

Despite the effects of the recession, we met our fundraising goals. We strive to "do more with less," and in fact, RMI did much more with more.

In FY2010, RMI's philanthropic revenues totaled $9,870,205—26 percent higher than any other year in RMI's history. This increased philanthropy complemented our strategy focus, demanding greater capacity for and a larger percentage of our time in research and thought leadership so that RMI and our industry collaborators can build the cases and roadmap necessary for a fossil-fuel-free economy.

RMI's focus on speeding the shift from fossil fuels to efficiency and renewables resonates with our supporters. The combination of their loyalty and generosity and our commitment to our mission brought about results of which we can all be proud.

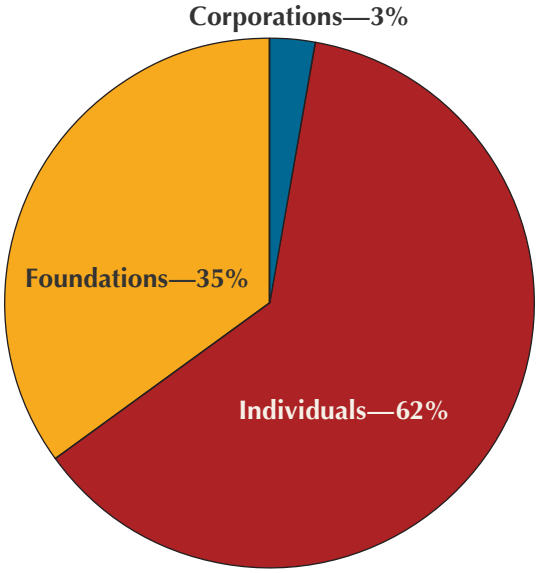
We had more total donors last year than the year before. And, though the greatest number of donors were, by far, those whose gifts ranged from $10 to $1,500, the power of their collective action was critical to our success.

But we simply could not have delivered the outcomes we produced had our biggest individual donors, Fred and Alice Stanback, not doubled their giving last year.

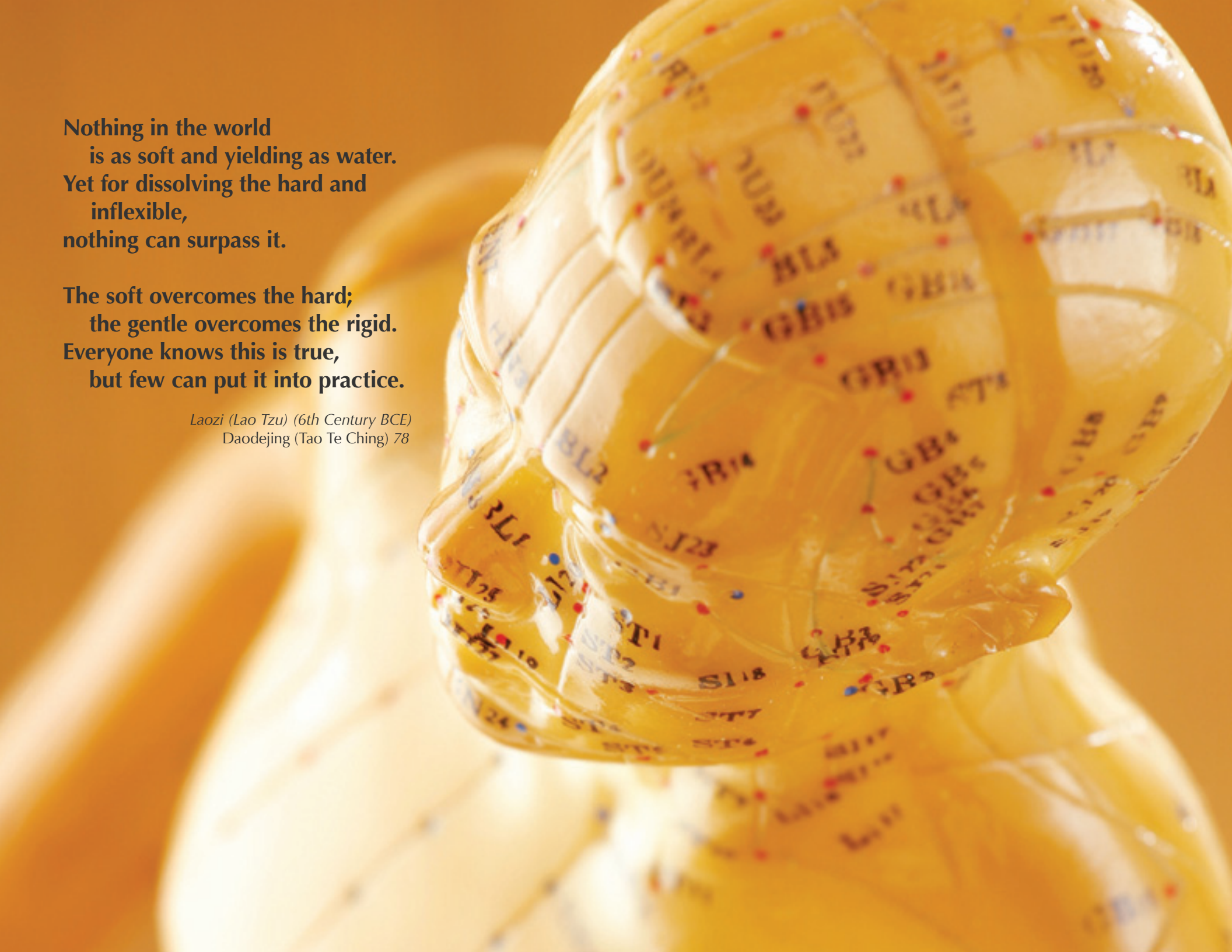
As a result, RMI began its most ambitious effort to date, the synthesis of years of data and research to develop an integrative and feasible roadmap for the U.S. to get off fossil fuels. Funding strengthened RMI's innovation capabilities—from developing energy-modeling tools that help utilities simulate a resource mix to determine build-out schedules and financial impacts, to convening experts to tackle the high price of solar PVs' "balance of system" costs to founding the North American Council on Freight Efficiency.

In our opinion, it was indeed money well spent. We are grateful for our donors' partnership and trust.

Marty Pickett, *Executive Director and General Counsel; Interim Development Leader*



Breakdown of Philanthropic Contributions to RMI in FY2010



Nothing in the world
is as soft and yielding as water.
Yet for dissolving the hard and
inflexible,
nothing can surpass it.

The soft overcomes the hard;
the gentle overcomes the rigid.
Everyone knows this is true,
but few can put it into practice.

Laozi (Lao Tzu) (6th Century BCE)
Daodejing (Tao Te Ching) *78*

RMI Awarded €1,000,000 by Dutch Postcode Lottery for Second Year

In fiscal year 2009–2010, RMI received a second gift of €1,000,000 (U.S.$1,325,874) from the Dutch Postcode Lottery (*Nationale Postcode Loterij*). In addition to this year's gift, RMI has been given the Lottery's long-term beneficiary status for the next five years. The award was granted February 4 at the Goed Geld ("Good Money") Gala at the National Museum 'Van Speelklok tot Pierement' in Utrecht, Netherlands. The check was presented by Lottery Cofounder Boudewijn Poelmann to RMI's Cofounder and Chief Scientist Amory Lovins, who gave the keynote address. The gala, where a total of €256,000,000 was awarded to 75 national and international charitable organizations, was also attended by RMI CEO Michael Potts and Executive Director Marty Pickett.

"The Postcode Lottery has made a huge commitment to advancing worldwide charitable causes and is very much aware of climate change issues," Pickett said. "RMI is honored and grateful to be one of the recipients of this award, and we are especially excited to be named a five-year beneficiary this year."

The Dutch Postcode Lottery has a twenty-year history of philanthropy, and 50 percent of the Lottery's gross revenues are used to support initiatives that improve society all over the world. Thanks to their 2.5 million participants, since its founding the lottery has distributed more than €2.95 billion to its beneficiaries.

RMI2009 & Reinventing Fire

Last October at RMI2009: Reinventing Fire, RMI leaders, collaborators, supporters, and staff shared a wildly hopeful vision of how our resource- and energy-hungry society could run on clean energy and clever technologies.

In his keynote address, Chairman and Chief Scientist Amory Lovins advanced this vision by describing RMI's new strategy as one with the ultimate goal of "driving the profitable transition from oil, coal, and ultimately gas to efficiency and renewables."

Over the course of two days in San Francisco, RMI experts presented evidence that the Institute is making real-world progress in the fields of energy and resources, the built environment, and the transportation sector. The RMI team described ongoing projects that are displacing conventional thinking about solar and wind energy, building and community design, nuclear power and distributed renewables, and energy efficiency and load management. The event drew more than 300 people; the Saturday night RMIQ keynote presentation drew more than 500. Clearly, the Institute's staff and supporters are not the only ones who believe it's time to reinvent fire.

Financial Commentary

Fiscal year 2010 proved to be one of RMI's most successful years on record; the organization enjoyed sustained revenue growth while reducing its operating expenses as compared with FY2009. RMI significantly strengthened its balance sheet, reducing liabilities and ending the year with net assets of $7.69 million, $1.04 million over the previous fiscal year's end.

Considering the unpredictable global economic environment and struggling U.S. economy, we anticipated that FY2010 would provide a new set of challenges for Rocky Mountain Institute. We anticipated that as the economy attempted to gain steam, philanthropy would probably remain slow and consulting clients might be limited in their ability to engage. In response, we emphasized practical and effective management to steward our resources, and we worked closely with our long-standing supporters to ensure that RMI remained a strong and resilient organization.

Fiscal year 2010 GAAP revenues of $13.5 million showed modest gains compared to our FY2009 revenues of $13.1 million. Foundation grants showed a moderate year-over-year decline (a decline of $0.6 million); however, individual and corporate contributions outpaced the previous year's giving by 87.5 percent or $2.7 million. Revenue from consulting was down as well by $1.5 million, due in large part to a heightened selectivity in the work we pursued and an intentional focus on larger projects that better fit RMI's strategic model while creating greater potential impact. Operationally, the previous year's early and significant action to reduce operating costs and continued discipline around general spending allowed RMI to reduce total operating expenses for FY2010 by 8 percent or $1.1 million.

This fiscal year, RMI introduced the model of "stewardship" to its staff. The concept embraces the cooperative planning and management of resources—human, capital, and financial—in the interest of long-term stability. These efforts, together with our ongoing strategic focus and strong financial position, will enable us to move into the next fiscal year with clarity and a renewed sense of optimism.

Ned Harvey, *Chief Operating Officer*
Ed McCullough, *Director of Finance*

★★★★
CHARITY NAVIGATOR
Four Star Charity

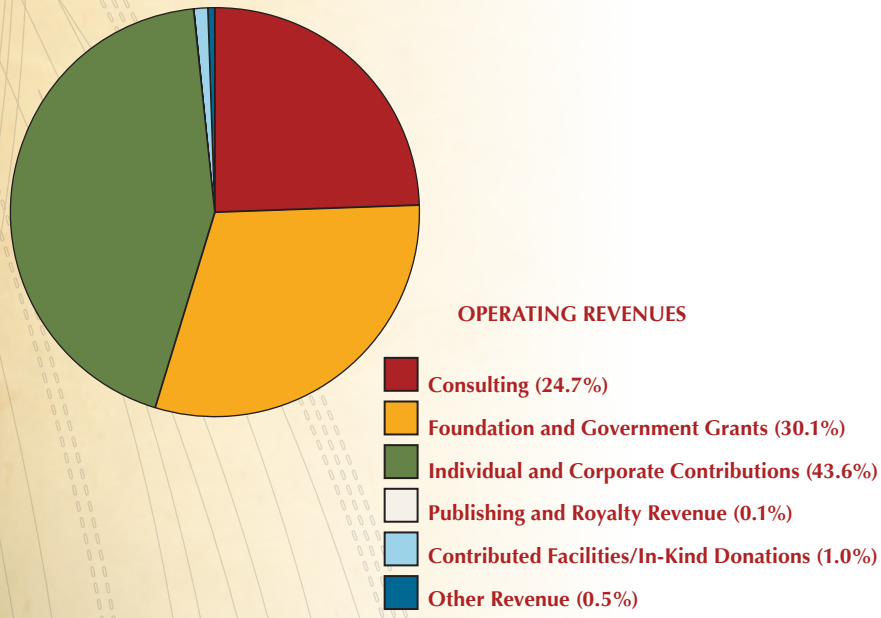
Charity Navigator: Third Consecutive 4-Star Rating

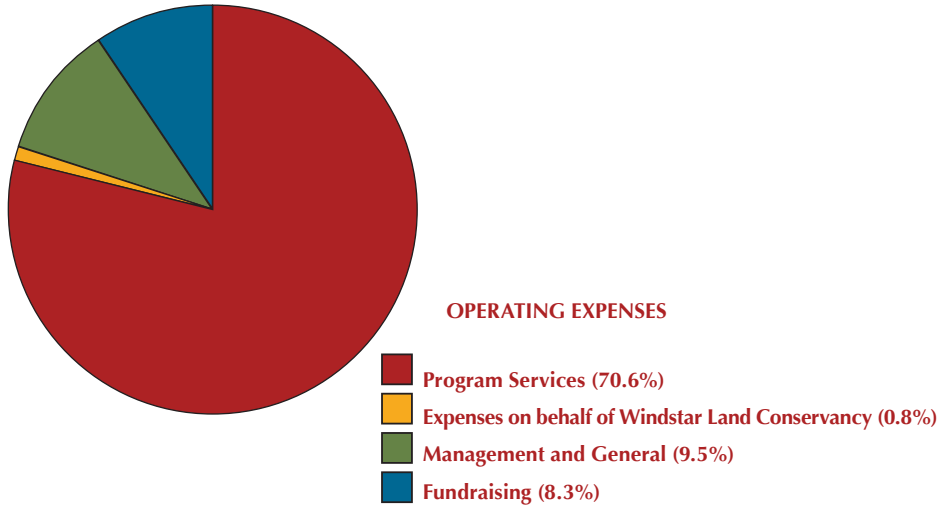
We are proud to announce that RMI has earned its third consecutive 4-star rating from Charity Navigator for its effective and efficient stewardship of of its financial resources. With this exceptional designation, RMI now joins the top 14 percent of all nonprofits in the U.S. for consistently executing its mission in a fiscally responsible manner.

Balance Sheet—Audited (thousands of current dollars, GAAP basis; RMI's Fiscal Year is 1 July–30 June)

ASSETS	*6/30/10*	*6/30/09*	*6/30/08*
Cash and Marketable Securities	$1,133	$412	$149
Capital Reserve Fund	4,318	4,508	4,800
Grants Escrow Fund	1,569	1,258	1,051
Accounts Receivable	665	1,120	2,037
Grants and Pledges Receivable	242	269	464
Notes Receivable	—	—	—
Inventory	16	48	49
Property and Equipment (Net)	1,555	1,726	1,679
Assets Restricted for Endowment	704	673	722
Other Assets	360	435	280
TOTAL ASSETS	**$10,562**	**$10,449**	**$11,231**

LIABILITIES AND NET ASSETS	*6/30/10*	*6/30/09*	*6/30/08*
CURRENT LIABILITIES			
Accounts Payable	$374	$542	$746
Compensated Absences	305	340	279
Other Accrued Expenses	1,835	1,445	1,231
Deferred Revenue	—	2	119
Line of Credit	—	950	921
Total Current Liabilities	**2,514**	**3,279**	**3,296**
Long-Term Liabilities	**363**	**520**	**624**
TOTAL LIABILITIES	**2,877**	**3,799**	**3,920**
NET ASSETS	**7,685**	**6,650**	**7,311**
TOTAL LIABILITIES AND NET ASSETS	**$10,562**	**$10,449**	**$11,231**





Statement of Activities—Audited (thousands of current dollars, GAAP basis)

	12 months ending 6/30/10	*% Operating Revenue*	*12 months ending 6/30/09*	*% Operating Revenue*	*12 months ending 6/30/08*	*% Operating Revenue*
OPERATING REVENUES AND SUPPORT						
Consulting	$3,303	24.7%	$4,843	37.3%	$5,227	41.0%
Foundation and Government Grants	4,031	30.1%	4,690	36.1%	2,570	20.2%
Individual and Corporate Contributions	5,838	43.6%	3,113	24.0%	4,573	35.9%
Publishing and Royalty Revenue	13	0.1%	41	0.3%	41	0.3%
Contributed Facilities/In-Kind Donations	135	1.0%	135	1.1%	139	1.1%
Other Revenue	72	0.5%	162	1.2%	186	1.5%
TOTAL OPERATING REVENUES AND SUPPORT	**13,392**	**100.0%**	**12,984**	**100.0%**	**12,736**	**100.0%**
OPERATING EXPENSES						
Program Services	9,459	70.6%	10,062	77.5%	9,265	72.7%
Expenses on behalf of Windstar Land Conservancy	102	0.8%	86	0.7%	71	0.6%
Management and General	1,274	9.5%	1,610	12.4%	1,798	14.1%
Fundraising	1,116	8.3%	1,258	9.7%	1,096	8.6%
Total Operating Expenses	**11,951**	**89.2%**	**13,016**	**100.2%**	**12,230**	**96.0%**
OPERATING MARGIN	**1,441**	**10.8%**	**(32)**	**(0.2%)**	**506**	**4.0%**
NON-OPERATING REVENUES						
Gain/(Loss) on Sale of Assets	(3)	0.0%	—	0.0%	75	0.6%
Gain/(Loss) on Sale of Investments	(39)	(0.3%)	(262)	(2.0%)	(218)	(1.7%)
Investment Income	142	1.1%	185	1.4%	224	1.8%
Total Non-Operating Income	**100**	**0.7%**	**(77)**	**(0.6%)**	**81**	**0.6%**
NON-OPERATING EXPENSES						
Depreciation	286	2.1%	277	2.1%	161	1.3%
Prior Period Adjustment	—	0.0%	—	0.0%	700	5.5%
Facilities Contributed Expense	135	1.0%	197	1.5%	135	1.1%
Interest Expense	85	0.6%	78	0.6%	87	0.7%
Total Non-Operating Expenses	**506**	**3.8%**	**552**	**4.3%**	**1,083**	**8.5%**
CHANGE IN NET ASSETS	**1,035**	**7.7%**	**(661)**	**(5.1%)**	**(496)**	**(3.9%)**

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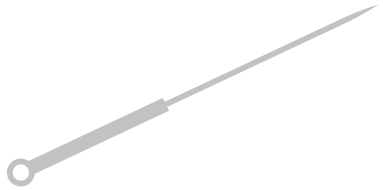

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Ethel Louise Lossing, 1950–2010

One of Rocky Mountain Institute's longest-serving staff members, Ethel Louise Lossing, died on 2 July after a hard-fought battle with cancer in which she was long and devotedly nursed by her friend Jill Lutzeier. Ethel joined RMI in 1994 as the mail clerk and eventually became our Facilities Director, capably overseeing the Institute's Snowmass buildings and grounds.

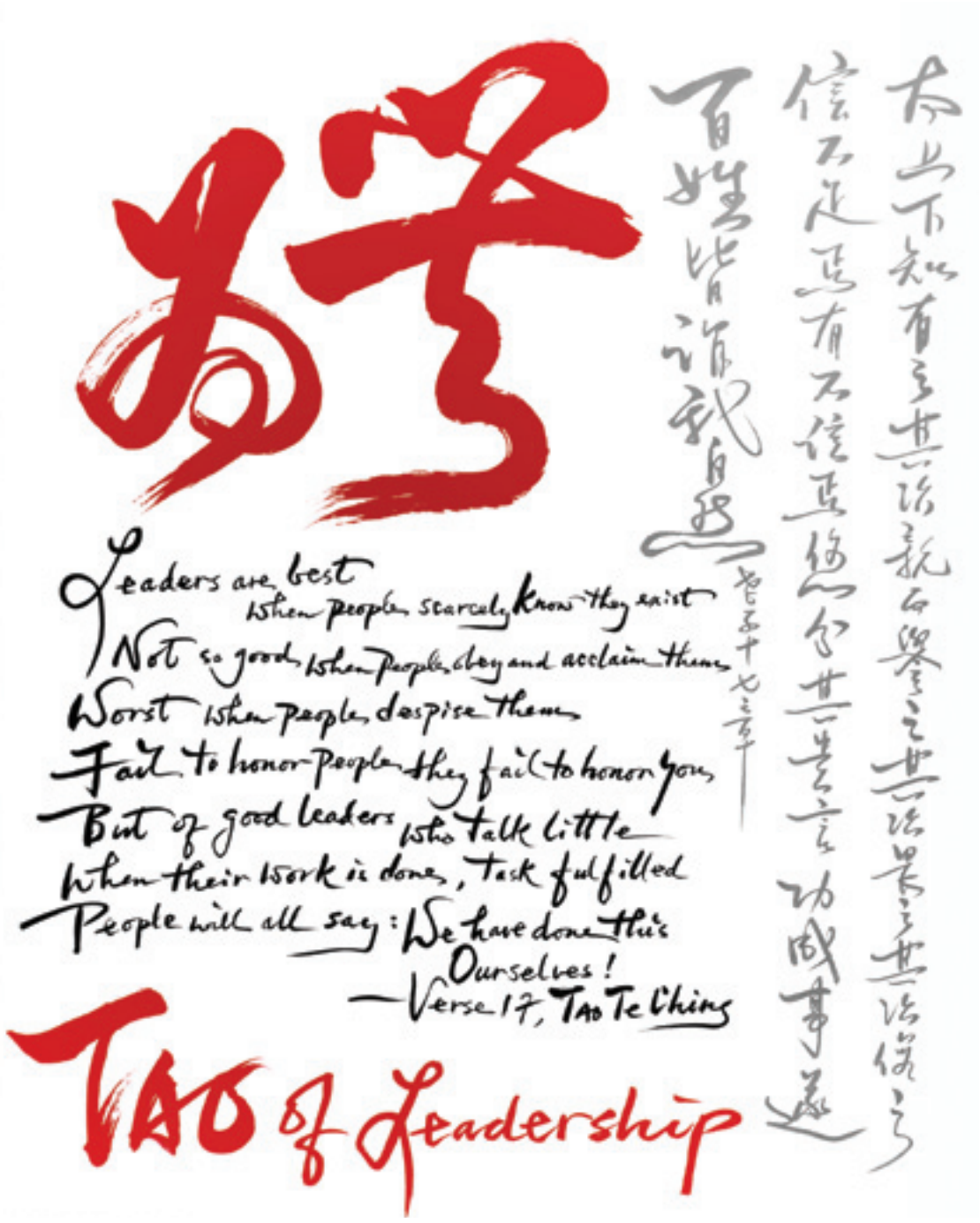
Ethel grew up in Chappaqua, New York. The daughter of an opera singer and a management consultant, she centered her entire life around music. She studied piano, violin, the viola, the guitar, and folk singing, and she had an ongoing interest in performance. Ethel moved to Colorado in 1984 where she discovered the "cowboy" lifestyle and beauty of the Rocky Mountain West. She held various jobs in the Aspen area, managing eateries and running a gardening business for several years, and after a hard day's work would often spend the evening singing at a local venue. She eventually formed her own country/rock band, Rodeo Cool, which gained considerable popularity in Colorado's Roaring Fork Valley.


Photo © Kim Foss

"Performing is about being totally in the present," Ethel said in 2001. "Everything else goes away. It's a great release."

She is survived by her sister Karen (Whitey) Kaufmann; nieces Kim and Chrissy; nephews Mark and Terry; and her canine companion, Schnitzel.

Ethel's passing is felt by the many whose lives she touched—dozens at RMI alone. Her strength, friendship, and love of music and laughter will be greatly missed.


Leaders are best
When people scarcely know they exist
Not so good When People obey and acclaim them
Worst When people despise them
Fail to honor People they fail to honor you
But of good leaders Who talk little
When their work is done, Task fulfilled
People will all say: We have done this
Ourselves!
—Verse 17, Tao Te Ching
TAO of Leadership

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