

RMI Solutions

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Green Design Practice Joins RMI

RMI/ENSAR Built Environment Team Bolsters Implementation

On 1 August, Rocky Mountain Institute and ENSAR Group of Boulder, Colo. joined forces in RMI's newly named RMI/ENSAR Built Environment team.

"The work that RMI does and the work that ENSAR Group does have been complementary for more than twenty years," said RMI Executive Director Marty Pickett. "Indeed, RMI and ENSAR Group have worked on many green building projects together. Hiring ENSAR Group to become part of our green development team was a logical step in the evolution of the Institute."

ENSAR Group, led by Greg E. Franta, FAIA, has for 27 years been a leading consultancy in high-performance buildings, and is one of only five U.S. firms certifying LEED™ buildings (Leadership in Energy and Environmental Design) under the auspices of the U.S. Green Building Council. Its name is short for "Environmentally Sustainable Architecture." RMI/ENSAR Built Environment will create, develop, and implement integrated solutions for the



The Institute's new RMI/ENSAR Built Environment team includes: Alexis Karolides, AIA, Victor Olgay, AIA, Cara Taverna Carmichael, Ashley Muse, and Greg Franta, FAIA.

building industry that will restore and regenerate natural systems while enhancing life-sustaining built environments. The team will offer businesses, public agencies, communities, and individuals strategies and methods for creating more

wealth and employment, protecting and enhancing natural and human capital, and increasing profit and competitive advantage.

According to Greg, the purpose of joining forces is to provide a more compre-

What's Inside...

Getting Straight: Institute supporters often ask us why we work with big companies, wealthy yacht owners, and, regularly, the military. Good end-use energy efficiency is indiscriminate. Here, RMI CEO Amory Lovins explains our work with the military. See p. 4.

Ethanol Schmethanol?: There's been a whole lot of talk about ethanol lately, and much of it is misleading, inconclusive, or simply wrong. Here RMI energy researchers Nate Glasgow and Lena Hansen explain the value of "cellulosic" ethanol. Hint: It's not made from corn. See p. 6.

A Party with a Purpose: During 15–18 July, the Institute hosted its first National Solutions Council Weekend in Old Snowmass, Colo. Here's a brief description of the grand time that was had by all. See p. 8.

Nukes Redux: RMI CEO Amory Lovins expands the economic and policy arguments against nuclear energy he made in our summer issue. See p. 10.

New New Orleans?: Hurricane Katrina was a devastating tragedy, no matter how you look at it. In a special section (starting on p. 18, Institute friend Jonathan Rose and Senior Fellow Bill Browning offer their thoughts on reconstruction, and *RMI Solutions* editor Cam Burns shares the story of Soldiers Grove, Wis.



hensive approach to green development, from notions developed at the “think-and-do-tank” level through on-the-ground implementation, resulting in a larger impact on the building industry than either RMI or ENSAR could achieve on its own. The current services of both organizations will remain intact with a new market development opportunity for more comprehensive services and a broader range of clients, he noted. RMI/ENSAR Built Environment will be based in Snowmass and Boulder, Colo., under Greg’s leadership.

“I am truly looking forward to being more effective in creating sustainable developments around the world,” Greg said. “Our joint effort will allow us to provide more comprehensive services in environmental quality and energy efficiency, not only for the building industry, but for communities, businesses, NGOs, and governments.”

As ENSAR Group’s principal architect, Greg has tremendous experience in the green building sector and has pioneered environmentally sustainable architecture around the world since the early 1970s. As an international consultant to other design professionals and developers, Greg has led ENSAR Group in providing services on more than 800 energy-efficient and environmentally sound projects, including offices, laboratories, educational buildings, health facilities, libraries, homes, and other buildings—many, including RMI’s 1984 headquarters, considered among the most energy-efficient in the country. He has also assisted in the creation of sustainable communities, from EcoVillage in Virginia to Gaia Village in Brazil.

Additionally, Greg has shown extensive leadership in the green building community. He has served on the National Board of Directors for the American Institute of Architects and

cofounded the AIA’s Committee on the Environment (he also founded the Committee’s predecessor, the Energy & Environmental Quality Committee). He is the chairman of the Sustainable Building Industries Council and very active in the U.S. Green Building Council. He helped to develop the LEED Green Building Rating System, is part of the LEED certification team, and

ENSAR Group was founded by Robert Clarke in 1977 under the name Solar Pathways.

is a national LEED faculty member. From 1977 to 1982, Greg led the Commercial Buildings Group at the Solar Energy Research Institute (now the National Renewable Energy Laboratory), where he developed new design resources and tools for energy-conscious architects.

ENSAR Group was founded by Robert Clarke in 1977 under the name Solar Pathways. Greg joined Mr. Clarke in 1982 and they changed the name to ENSAR Group. At the time, part of ENSAR Group was focused on the research, development, and commercialization of building products for energy efficiency. Alpen, Inc., a high-performance glass company in Boulder, was created under the auspices of ENSAR Group and Mr. Clarke branched out with Alpen. Today he remains Alpen’s president and an ENSAR Group board member. Other key ENSAR Group staff members who are joining RMI/ENSAR Built Environment include Victor Olgay, AIA, Cara Taverna Carmichael, and Ashley Muse.

Victor also has a long history in environmental architecture, and is renowned for his skills in climate-responsive design, daylighting, and energy efficiency. He is the coauthor of *Architectural Lighting*, has done extensive research on related topics, and teaches climate-responsive architectural design. Victor is also very active in the U.S. Green Building Council and is a member of the national LEED faculty.

Cara has considerable experience with sustainable design, energy analysis, charrette development, computer modeling, and natural daylighting techniques. She has consulted on a range of projects including daylighting and energy studies for schools, retail and national park facilities, and has developed sustainable design guidelines internationally. Cara has also managed project data for an in-depth laboratory case study evaluated by the Green Building Tool, an international green building rating system, and she is a LEED 2.0–accredited professional.

Ashley is an environmental designer and consultant with experience in LEED standards, sustainable design, daylighting, and materials selection. Before joining ENSAR Group, Ashley worked at several Colorado architectural firms participating in design, master planning, and historic preservation. She has also worked as an assistant teacher for green building classes at the University of Colorado at Denver’s Graduate School of Architecture and Planning, where she helped to develop the school’s green materials resource guide. Ashley is a LEED 2.0–accredited professional, and is founder and co-chair of the USGBC Colorado Chapter’s Emerging Green Builders’ Committee. She is also part of the LEED project certification review team for the USGBC.

Greg, Victor, Cara, and Ashley join RMI Principal Alexis Karolidis, AIA, in

the new consultancy. Alexis, an architect and LEED 2.0–accredited professional, has been a senior consultant and researcher with RMI for seven years, leading the Institute’s former Green Development Services team’s health care and university projects, working with corporate clients, and providing educational seminars and presentations nationally and internationally. Alexis will also lead the new group’s research in *biomimicry*—innovation inspired by nature (a field synthesized by RMI Trustee Janine Benyus) and in *biophilia*—the hypothesis, now drawing strong experimental support, that people are healthier, happier, and more productive when in buildings that embrace nature and remind us of the natural habitats in which our species evolved.

Bill Browning, Hon. AIA, who found-

ed RMI’s Green Development Services in 1991, will remain a Senior Fellow active in RMI projects while developing his new firm, Browning + Bannon, LLC, with former RMI researcher Jeff Bannon, in Washington DC.

continuous flow of innovation and vision across boundaries.

“Having worked closely with Greg and ENSAR Group for three decades, we think they’re the best in the world at helping design professionals create

high-performance buildings with superior economics and aesthetics,” said RMI CEO Amory Lovins. “Their practice is complementary to RMI’s, emphasizing detailed end-to-end design support that turns early-stage conceptual designs (the traditional focus of RMI’s buildings work) into finished projects with measured results. Combining forces is a longstanding dream come true for all of us. It will greatly strengthen the Institute and help us

advance the state of the art more rapidly.”

To contact RMI/ENSAR Built Environment, call 970-927-3851 or e-mail kwright@rmi.org.

“Having worked closely with Greg and ENSAR Group for three decades, we think they’re the best in the world at helping design professionals create high-performance buildings with superior economics and aesthetics...”

Amory B. Lovins, RMI CEO

Combining RMI’s green development consultancy with ENSAR Group is expected to strengthen the integration among RMI’s three practice areas. All of RMI’s thought leadership depends on a

RMI in the news

Amory Wins 2005 Benjamin Franklin Medal

In July, RMI CEO Amory Lovins, a U.K. resident 1967–81, won the Benjamin Franklin Medal of Britain’s 251-year-old Royal Society for the encouragement of Arts, Manufactures & Commerce. “The Medal is conferred on individuals, groups, and organizations who have made profound efforts to forward Anglo-American understanding in areas closely linked to the RSA’s agenda,” explains www.rsa.org.uk. “It can also be awarded to recognize those that have made a significant contribution to global affairs through cooperation and collaboration between the United States and the

United Kingdom.” The Medal is awarded annually, alternately to citizens of the United States and the United Kingdom. In a letter alerting RMI to the award, RSA Chairman Sir Paul Judge noted that the Institute’s efforts toward one of the RSA’s Manifesto Challenges (“moving toward a zero waste society”) was a major reason Amory was selected. Past recipients of the Medal include Dames Judi Dench and Margot Fonteyn, Hon. Philip Lader, Senators George Mitchell and J. William Fulbright, Rt. Hon. Harold Macmillan, Sir David Attenborough, and Alistair Cooke.



Why We Work with the Military

By Amory B. Lovins, CEO

From the day I cofounded Rocky Mountain Institute in 1982, security has been the first purpose in its mission: fostering the efficient and restorative use of resources to make the world secure, just, profitable, and life-sustaining. As Hal Harvey and Mike Shuman explained in their 1988–1993 RMI book *Security Without War* (see www.rmi.org/images/other/Security/S93-23_SecurityWoutWar.pdf), and I summarized in 2002 (see www.rmi.org/images/other/Security/S02-13_HowRealSecurity.pdf), “security” means freedom from fear of privation or attack, and freedom from fear of attack is best achieved at least cost by combining conflict prevention, conflict resolution, and nonprovocative defense (which reliably defeats aggressors without threatening others).

Since the 1970s, I’ve spread this message at military staff colleges and in private discussions with the civilian and uniformed leadership. RMI’s integrative approach to building real security—to being safe and feeling safe—has struck a chord, because it would work better

and cost less than present arrangements; can be achieved from the bottom up as much as from the top down; is the province of every citizen, not the monopoly of national governments; makes others more secure, not less; and doesn’t rely on the use or threat of violence, which most military professionals, based on intimate knowledge, abhor and strive to avoid. As the officers we’ve influenced get promoted, the military doctrine they’re crafting increasingly reflects our emphasis on conflict prevention or “preponse.” They also like our solid research: though our 1977–83 nonproliferation strategy was too far ahead of its time and got ignored until too late, our 1981 Pentagon study *Brittle Power: Energy Strategy for National Security* (www.rmi.org/sitepages/pid1011.php) strongly influenced thought on domestic energy vulnerability and resilience. Modern thinking is also starting to catch up with our profitable, business-led, efficiency-based approach to climate protection and global development.

Yet it’s always seemed odd not to engage warfighters more directly in preventing conflict. They have the biggest

stake and often the strongest tools. They serve worldwide, often supplanting diplomats as America’s main face to the world. Conflict-preventing “nation-building” (now more fashionably thought of as “preventive humanitarian missions”) has an honorable record of success and is starting, after a period of disfavor, to be rebuilt as a vital element of waging peace. Globe-girdling logistical reach makes military forces the key to disaster response, as in the recent tsunami. The military’s technology base is extraordinary, its effect on economies pervasive. For all its shortcomings, the military remains among the most functional, focused, and powerful institutions in our society. And both in service and later in civilian life, military people and the skills and discipline learned in their cultures continue to help build a better and safer world.

In the past decade, after careful reflection, we’ve accepted three opportunities to deepen our involvement with the Pentagon: helping to make Naval building design integrated and efficient (1995–98, see *RMI Solutions*, Fall 01), serving on a Defense Science Board task force that found enormous scope for



Soldiers from the 25th Infantry patrol an area near Mosul, Iraq in their Humvee armored vehicles.

Photo courtesy of U.S. Army

saving fuel in land, sea, and air platforms (see www.acq.osd.mil/dsb/reports/fuel.pdf), and uncovering major energy waste in the Navy's crew-supporting "hotel loads"—lights, chillers, pumps, fans, etc. (see *RMI Solutions*, Fall 01). These successes have created credibility and respect on which we continue to build.

We did this military work for three main reasons. First is sheer scale. The Department of Defense (DoD) is reportedly the nation's largest and oldest organization. Its budget, \$0.4 trillion a year or \$14,000 a second, exceeds the GDP of Russia. It has three million people, 600,000 structures on 30 million acres in 6,000 locations in 146 countries, 550 public utility systems, hundreds of thousands of land vehicles, hundreds of ships, and more than 20,000 aircraft. The Pentagon is the world's largest buyer of oil and the nation's largest single user of energy—five billion gallons a year, enough to drive every civilian car coast to coast every fourth year. If DoD were a country, it'd rank in the top third of energy users worldwide. Most of that fuel is wasted and can be profitably saved.

To be sure, military use of oil is only 1.6 percent of the national total, and DoD's energy use, though 85 percent of all government energy, is only 1.1 percent of the U.S. total (vs. ~40 percent in World War II). But the Pentagon's technology leadership and political influence give it a vastly disproportionate potential to help lead our nation to a post-oil economy, because it can greatly speed massive shifts in civilian technology, as it did by creating the microchip industry, the Internet, the Global Positioning System, and modern jet engines. That's our second big reason for military involvement. Our new study *Winning the Oil Endgame*



U.S. Navy photo by Photographer's Mate Airman Jeremy L. Grisham

The amphibious assault ship *USS Bataan (LHD 5)* shown underway with eight *MV-22 Osprey* assigned to the Navy's Marine Tiltrotor Operational Test—and now aiding in New Orleans disaster relief.

(www.oilendgame.com; see *RMI Solutions*, Fall 04) showed how the Pentagon's science and technology investments can help create the advanced-materials industrial cluster needed to commercialize ultralight carbon-fiber cars, superefficient airplanes, and the other gamechangers that can get the U.S. completely off oil at a profit.

Hence our third and most fundamental reason for military engagement: wars are increasingly fought over oil. Tactical success and conflict prevention both depend on the Pentagon's ability to lead the United States and the world beyond oil dependence. The military leaders we work with don't enjoy fighting in the Middle East (or anywhere else); they'd prefer negamissions in the Gulf—Mission Unnecessary. They don't want to be turned into an oil protection service: they signed up to protect fellow-citizens in America, not pipelines in

Faroffistan. Military professionals would like a world where oil is no longer precious, oil doesn't drive malignant geopolitical rivalries (especially with China), oil money no longer destabilizes friends and arms enemies, countries with oil can be treated the same as countries without oil, and other countries have no reason to believe everything the United States does is about oil. Those are all good reasons for the Pentagon to have supported *Winning the Oil Endgame's* research, and for RMI in turn to be encouraging DoD to help business lead the off-oil transition. The same logic will then naturally extend to water, or any other resource where rivalry sparks conflict.

Despite these compelling benefits, some RMI staff and supporters of RMI dislike our military collaboration, for these reasons (with my initial reactions):

It's fine to save fuel in civilian buildings, vehicles, and industries, but not in military ones. What's the difference? A molecule of oil burned or carbon dioxide released has the same consequences no matter who used it. RMI doesn't design weapons systems, do classified work, or otherwise apply its knowledge to making violence more effective. But so long as military platforms drive, swim, and fly, they should be as efficient as their civilian counterparts, for all the same reasons. That the military may have *extra* reasons of its own doesn't make the nonmilitary public benefits any less valid: I care more about results than motivations.

RMI should be working to create the most security with the least military

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Setting the Record Straight on Ethanol

By Nathan Glasgow and
Lena Hansen

Biofuels, and specifically ethanol, have been the subject of a great deal of criticism in recent months by detractors claiming that more energy is required to produce ethanol than is available in the final product, that it is too expensive, and that it produces negligible carbon reductions. These critiques are simply not accurate. State-of-the-art technologies have been competently forecasted—even proven in the market—to produce ethanol that is far more cost-effective and less energy-intensive than gasoline. We'll explore why, and why the critics have gotten it wrong.

When we say *biofuels*, we mean liquid fuels made from biomass—chiefly biodiesel and ethanol, which can be substituted for diesel fuel or for gasoline, respectively. The technology used to produce biodiesel is well understood, although its biomass feedstocks are limited and production today is fairly expensive. We will instead focus on ethanol, which we believe has significantly greater potential.

Ethanol, which can be substituted for or blended with gasoline, has traditionally been produced from either corn or sugarcane feedstocks. In fact, Brazil currently meets more than 25 percent of its gasoline demand with ethanol made from sugarcane. (The sugar is so cheap that the resulting ethanol sells in New York for \$1.10 a gallon—with about 81 percent the energy content of a gallon of gasoline—after paying a 100 percent duty, illegal under WTO rules, to protect U.S. corn farmers. Undeterred, the Brazilians are merrily expanding their ethanol exports to Asia.) Even gasoline in the United States contains, on average, 2 percent ethanol (used as a substitute for

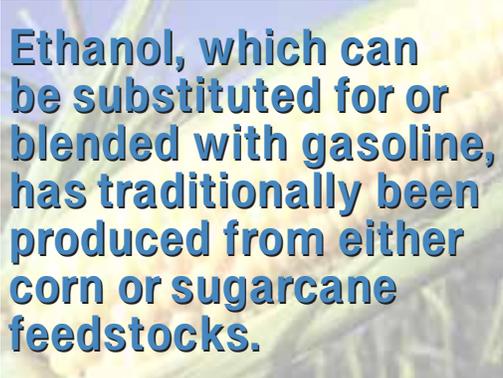
MTBE to oxygenate fuel). American ethanol is almost exclusively made from the kernels of corn, accounting for about 7 percent of the corn crop. But conventional processes and feedstocks used to make ethanol are not feasible in the United States on a large scale for three reasons: they're not cost-competitive with long-run gasoline prices without subsidies, they compete with food crops for land, and they have only marginally positive energy balances.

Happily, in addition to starch-based feedstocks, ethanol can be produced from “cellulosic” feedstocks, including biomass wastes, fast-growing hays like switchgrass, and short-rotation woody crops like poplar. While not cost-competitive today, already observed advances in technology lead us to believe that in the next few years, ethanol made from these crops will become cost-competitive, won't compete with food for cropland, and will have a sizeable positive energy balance. Indeed, because these crops are expected to have big biomass yields (~10–15 dry tons/acre, up from the current ~5 dry tons/acre), much less land will be required than conventionally thought. Further, cellulosic ethanol will typically have twice the ethanol yield of corn-based ethanol, at lower capital cost, with far better net energy yield.

A common complaint about ethanol is that the quantity of feedstocks is limited and land used to grow feedstocks could be put to better use. For cellulosic feedstocks, the situation is quite the contrary.

Cellulosic feedstocks are plentiful: for example, municipal and agricultural wastes can be used to create ethanol, with the positive side-effect of reducing the quantity of waste we must dispose of. Using waste to produce fuel has the clear benefit of a virtually free feedstock, and because energy is generally expended to create the product, not the waste, this type of ethanol obviously has a positive energy balance.

Not quite as obvious is to what extent dedicated energy crops can be used to produce ethanol. We believe the answer is straightforward. Research by Oak Ridge National



Ethanol, which can be substituted for or blended with gasoline, has traditionally been produced from either corn or sugarcane feedstocks.

Laboratory shows that dedicated energy crops can be grown without competing with food crops because they can be grown in marginal areas unsuited for food crop production, or on about 17 million acres of Conservation Reserve Program land that is currently being withheld from agricultural use.

Cellulosic crops have additional environmental benefits for several reasons. First, because crops like switchgrass are deep-rooted perennials, growing them actually prevents soil erosion and restores degraded land. For this same reason, cellulosic crops also have significantly lower carbon emissions. While corn-based ethanol reduces carbon emissions by about 20 percent below gasoline, cellulosic ethanol is predicted to be carbon-neutral, or possibly even net-carbon-negative.

We can't remember how many times we've been asked the question: “But doesn't ethanol require more energy to produce than it contains?” The simple answer is no—most scientific studies, especially those in recent years reflect-

ing modern techniques, do not support this concern. These studies have shown that ethanol has a higher energy content than the fossil energy used in its production. Some studies that contend that ethanol is a net energy loser include (incorrectly) the energy of the sun used to grow a feedstock in ethanol's energy balance, which misses the fundamental point that the sun's energy is *free*. Furthermore, because crops like switchgrass are perennials, they are not replanted and cultivated every year, avoiding farm-equipment energy. Indeed, if polycultured to imitate the prairies where they grow naturally, they should require no fertilizer, irrigation, or pesticides either. So, according to the U.S. Department of Energy, for every one unit of energy available at the fuel pump, 1.23 units of fossil energy are used to produce gasoline, 0.74 of fossil energy are used to produce corn-based ethanol, and only 0.2 units of fossil energy are used to produce cellulosic ethanol.

Critics further discount cellulosic ethanol by ignoring the recent advancements of next-generation ethanol conversion technologies. A recent example that has received significant attention is David Pimentel's March 2005 paper in *Natural Resources Research*, which argues that ethanol production from cellulosic feed-

stocks requires more fossil energy to produce than the energy contained in the final product. However, Pimentel bases his analysis on only one technology used to produce ethanol, ignoring two other developing technologies. His chosen conversion technology, acid hydrolysis, is the least efficient of the three.

A superior option, thermal gasification, converts biomass into a synthesis gas composed of carbon oxides and hydrogen. The gas is then converted into ethanol via either a biological process using microorganisms or a catalytic reactor. Both of these processes show good potential for increased energy yields and reduced costs by using cellulosic feedstocks. This conversion technology is currently being tested in pilot plants in Arkansas and Colorado.

Still better, enzymatic reduction hydrolysis already shows promise in the marketplace. Such firms as Iogen and Novozymes have been developing enzymes, and "smart bugs," that can turn biomass such as corn residues (leaves, stalks, and cobs) into sugars that can then be converted into ethanol. Historically, the biggest cost component of this technology was the creation of enzymes. Earlier this year, though, in combination with the National Renewable Energy Laboratory, Novozymes announced a 30-fold reduction in the cost of enzyme production in laboratory trials. Expected benefits from this process include low energy requirements, high efficiency, and mild process conditions. A pilot plant exists in Ontario and another is planned in Hawai'i. The first commercial-scale enzymatic reduction hydrolysis plant is scheduled to be built and operational by Iogen within two years, producing ethanol at a targeted cost of \$1.30 per gallon.

No matter which of these conversion technologies ultimately wins, it is clear that cost-effective and efficient ethanol production from cellulose is on the horizon—which is good news for the United



Photo by Brett Hampton

States, where mobility consumes seven of every ten barrels of oil we use. Our voracious appetite for that oil comes at a cost—we have to buy it, we have to deal with the pollution that comes from using it, and, because 12 percent of our oil comes from the Middle East, we have to defend it. Because mobility consumes 70 percent of the oil we use, mostly by burning gasoline, it's the first place to look for a solution.

Our recent publication *Winning the Oil Endgame* shows that the critical first step to reducing our oil consumption is tripled automobile efficiency—which can improve safety, maintain or improve performance and comfort, and repay its extra cost (if any) within two years at today's U.S. gasoline prices. But there's no reason to stop there. Using biofuels instead of gasoline to power our cars has the potential to displace 3.7 million barrels per day of crude oil—that's a fifth of our forecasted consumption in 2025, after more efficient use. In fact, an 85/15 percent blend of ethanol/gasoline in the tank of RMI's designed 66-mpg SUV would result in the vehicle getting ~320 mpg per gallon of fossil fuel burned (because the majority of fuel burned is ethanol).

Clearly, focusing on the nexus of the agriculture and energy value chains will create huge opportunities for business and huge wins for our country. The critics simply have it wrong.

Nathan Glasgow and Lena Hansen are researchers/consultants at RMI.

More to explore:

- *Winning the Oil Endgame* (www.oilendgame.com) and the associated Chapter 18 *Biofuels Technical Annex* (*id.*).

- U.S. Department of Energy, *Ethanol: The Complete Energy Lifecycle Picture* at: www.eere.energy.gov/vehiclesandfuels/pdfs/program/2005_ethanol_brochure.pdf.

- P.C. Badger, *Ethanol from Cellulose: A General Review* at: www.hort.purdue.edu/newcrop/ncn02/v5-017.html.

National Solutions Council Launches Exciting Program

PARTICIPANTS STIMULATED BY SHARING IDEAS, MUSIC, AND NATURAL BEAUTY

DURING 15–18 JULY, THE INSTITUTE HOSTED its first National Solutions Council Weekend at our Old Snowmass headquarters, and everyone enjoyed it so much that we are now planning a second weekend. Stay tuned for details.

The weekend provided a whole-system integration of members' minds, bodies, and spirits. From a Friday evening concert with violinist Joshua Bell and the Aspen Concert Orchestra, to a hands-on biomimicry workshop with RMI Research Principal Alexis Karolides, AIA, to conversation with RMI staff during intermissions of a dance performance, to a Sunday morning hike with Amory along the Windstar Land Conservancy's restored alpine wetland—the opportunities to engage Amory and RMI staff members in informal discussion were deep and diverse.

One of the highlights of the weekend was a hands-on *biomimicry*¹ workshop with Alexis. Participants had an opportunity to try out the prototype biomimicry database (now in alpha testing) recently completed by RMI and the Biomimicry Guild. Weekend attendees then used their biomimetic insights to explore the Windstar property and identify items of nature that could help with the design of household items, building materials, even toys.

“As you might guess, some support-

¹ Biomimicry is innovation inspired by the design of natural systems. They achieve optimum material efficiency fine-tuned to a specific need; they operate with closed loops and run off current solar income; they neither pollute nor require extreme heat or toxic chemical inputs. Mimicking this natural wisdom in building design is a core element of RMI's work (see www.biomimicry.net).

ers of RMI, including me, who know what Amory's strengths are were eager to see the interests and accomplishments of some other RMI staffers,” said attendee Bob Schloss. “I was very impressed with Alexis's ability to take

technical ideas and present them simply to lay audiences. It was equally impressive to see that Alexis was aware of, tracking, and building on cutting-edge work in the broader sustainability and design communities.”



Above: NSC members explore the Windstar Land Conservancy with RMI CEO Amory Lovins and other RMI staff members.



Left: RMI's Alexis Karolides, AIA, explains the benefits of greening health care facilities to NSC members.



NSC Weekend attendees enjoyed a wonderful salon hosted by NSC member Irwin Blitt (far right) and his wife Rita (not pictured).

The weekend culminated on Monday with a wonderful evening get-together at the Aspen home of NSC members Rita and Irwin Blitt. Alexis and Amory discussed two of RMI's current projects: greening health care facilities, which can reduce the need for medication, speed healing, and cut hos-

pital bills, and profitable ways to cure the United States' addiction to oil.

About 100 old and new friends joined us at the Blitts' lovely residence for an evening of scintillating discussion and piano music by Amory—all surrounded by the beauty of Rita's sculptures and paintings and the Colorado Rockies.

"The sources and efficient use of energy over the next several decades are the fulcrums for the world economy and environment," said attendee Mike Johnston. "Mary and I couldn't find a better venue or better people to discuss those issues with than the NSC Weekend at RMI."

Doug Weiser Named National Solutions Council Co-chair

Doug Weiser, a Snowmass Creek Valley resident and longtime friend of the Institute, has been named Co-chair, with Elaine LeBuhn, of RMI's National Solutions Council (NSC)—one of the fastest-growing organizations that supports and promotes RMI's work. Kathy Farver will move from Co-Chair to Honorary Chair.

"There are so many worthy causes that need and deserve our support today, but I can think of none more important than Rocky Mountain Institute, whose work is proving to be instrumental in the very survival of our planet," he said. "I feel very fortunate to have this world-renowned organization as my neighbor and I'm thrilled to be even a small part of the RMI team."

Doug is married with two children and lives in Old Snowmass. For nearly a decade he was Senior Vice President of development for Continental Hospitality Holdings, LLC (CHH), a Miami-based hotel management and development company. At CHH, Doug coordinated and directed the develop-

ment and marketing of the Grand Bay Resort & Residences project and the Ritz-Carlton Hotel on Key Biscayne. Prior to his work in the real estate and hospitality industries, he pursued a career in New York and Hollywood as a writer, producer, and actor (he has appeared in episodes of *Miami Vice* and *All My Children*, and in the film *Midnight Crossing*, starring Faye Dunaway, which Doug co-wrote and produced.) He has recently written two screenplays that he plans to produce in 2006.

Doug is actively involved in several nonprofit organizations and sits on the boards of Summerbridge Miami, Tomorrow's Voices, Aspen Country Day School,

Theater Aspen, and the University of Miami's President's Council. Like a long string of RMI staff members over two decades, he is also a volunteer firefighter with the Basalt and Rural Fire District.

For more information about the Council, please contact Ginni Galicinao in RMI's Development Department at (970) 927-3851 or develop@rmi.org.



Left to right: Kathy Farver, Doug Weiser, Elaine LeBuhn

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Nuclear Follies Meet Market Realities

By Amory B. Lovins, CEO

Ingenuous advocates conjure up a vision of a vibrant nuclear industry poised for rapid growth, with no serious rivals in sight. A credulous press accepts this supposed new reality. Politicians endorse it. Yet industry data (*RMI Solutions*, Summer 05) reveal just the opposite—a dying industry already fading from the marketplace (Fig. 1). In 2004 alone, Spain and Germany each added as much wind capacity—two billion watts—as nuclear power is adding worldwide in each year of this decade. This year, nuclear construction starts will probably add less capacity than solar cells. And in the year 2010, nuclear power is projected by the International Atomic Energy Agency to add only 1/177th as much net capacity as the decentralized electricity industries project their technologies will add.

That astonishing ratio isn't just because micropower is growing so fast from a base that already exceeds nuclear power; it's also because the aging of nuclear plants is about to send global installed nuclear capacity into a long decline. An analysis by Mycle Schneider and Antony Froggatt, summarized in the June 2005 *Nuclear Engineering International*, shows that the world's average reactor is 21 years old. (Coincidentally, so is the average of the 107 units already permanently retired.) If the reactors now operating run for 40 years (32 under German law), then during the next decade, 80 more will retire than are planned to start up; in the following decade, 197; in the following, 106; and so on until they're all gone around 2050. Even if China built 30 billion watts of nukes by 2020, it'd replace only a tenth of the overall shut-downs. No other nation contemplates such an ambitious effort, and China seems unlikely to complete it either as its

power market becomes more competitive and its polity more transparent.

The nuclear enterprise has been soundly beaten by its decentralized com-

petitors, even though the competitors received 24 times smaller U.S. federal subsidies per kWh in FY1984 (RMI Publications #CS85-7 and -22) and were

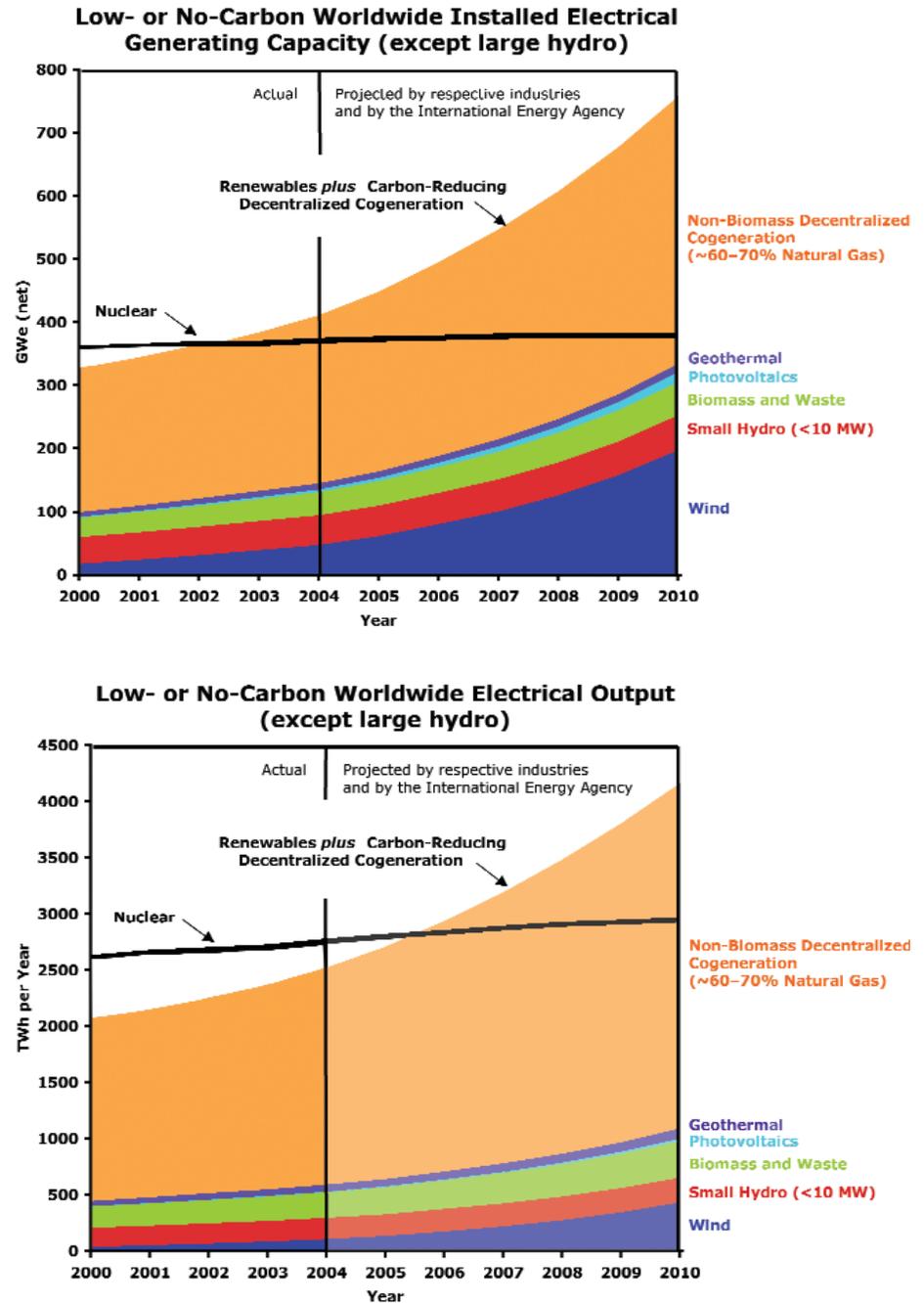


Fig. 1. Low- and no-carbon decentralized sources of electricity worldwide surpassed nuclear power in capacity in 2002 and in output in 2005, and in 2004, added 5.9x as much capacity and 2.9x as much annual output. (RMI analysis documented at www.rmi.org/sitepages/pid171.php#E04-05. A detailed compilation by Dr. Eric Martinot of Tsinghua University, to be published in September by Worldwatch Institute, independently reaches similar conclusions.)

often blocked from fairly connecting to the grid. Electric efficiency may well have saved even more electricity, but isn't tracked, so it can't be rigorously plotted on the same graph. As a rough indication, though, the 2003 drop in U.S. electric intensity saved (at constant load factor) ~14 GW and the 2004 drop saved over 16 GW, plus 1 GW/y of utility load management. Since the U.S. uses only a fourth of the world's electricity, it's hard to imagine that global annual savings

from all causes don't rival or exceed decentralized capacity additions (23 GW in 2003, 28 GW in 2004), so their total would exceed nuclear additions by an order of magnitude.

This is no freak result. It reflects nuclear power's gross and fundamental uncompetitiveness. But compared with what?

Standard studies compare a new nuclear plant only with another centralized plant burning coal or natural gas.

They conclude that nuclear's marked cost disadvantage might be overcome if it became far cheaper to build or were even more heavily subsidized, and if carbon were heavily taxed. But these central thermal power stations are all the wrong competitors. None of them can compete even with windpower (and some other renewables), let alone with two far cheaper resources: cogeneration of heat and power, and efficient use of electricity (Fig. 2). The results are incontrovertible. As

Nuclear power's fatal competitors

Levelized cost of **delivered** electricity or end-use efficiency (**zero distributed benefits**)
(at 2.75¢/kWh 1996 embedded IOU average delivery cost, including grid losses, for remote sources)

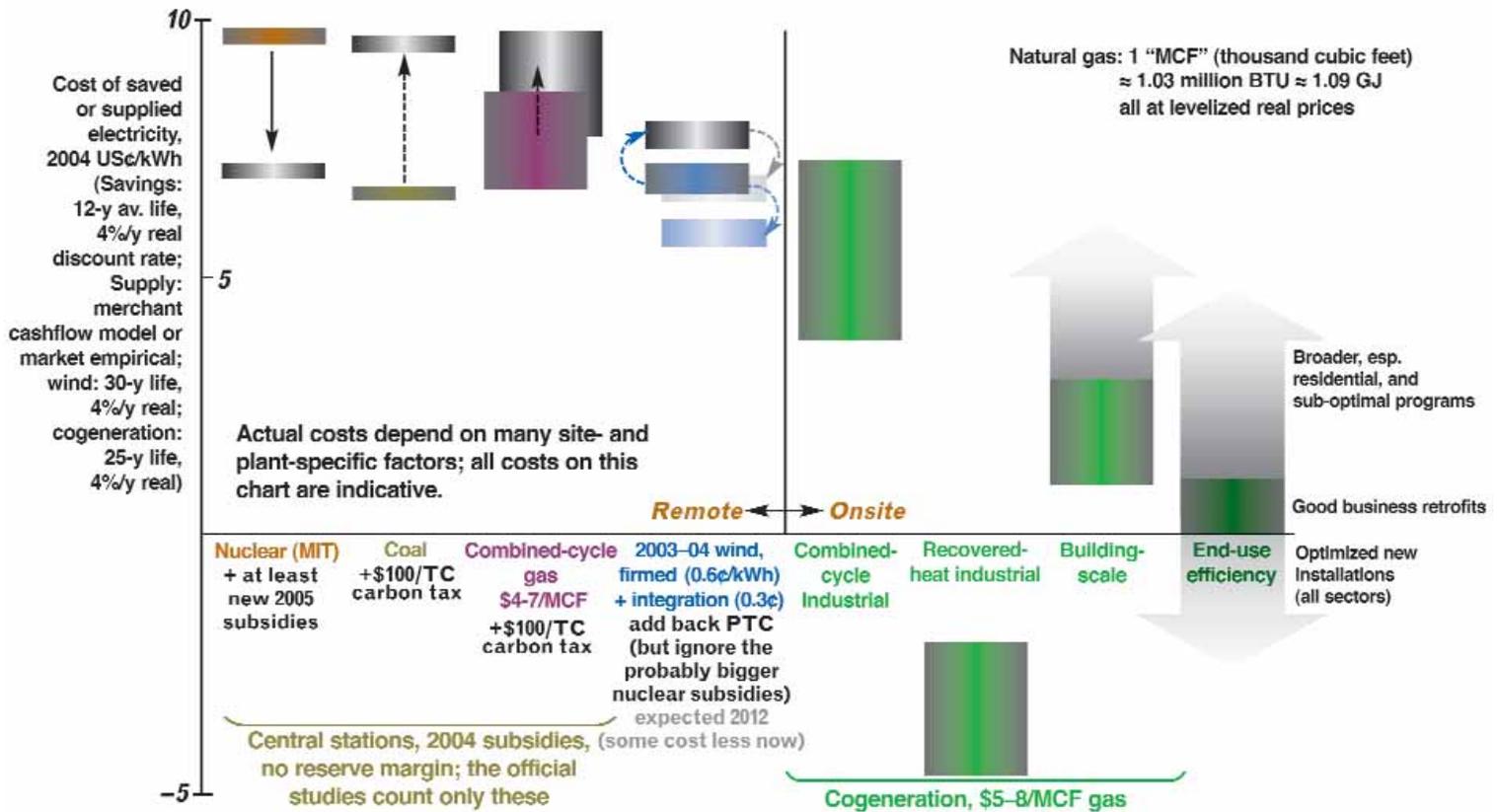


Fig. 2. The canonical 2003 MIT study, whose results now look increasingly conservative, says a new nuclear plant running 40 years at 85% capacity factor, would produce electricity for about 7.0¢/kWh (2004 \$). Adding delivery cost to customers (at least 2.75¢/kWh) yields 9.8¢ per delivered kWh. The competitors' delivered costs shown are those typically observed in the U.S. marketplace, and exclude their modest subsidies, while nuclear's larger subsidies are included. The cost of "firming" windpower to make it dispatchable even when becalmed is included, but reserve margins for nuclear, coal, and central gas plants are not.

Apples-to-apples comparisons would thus make nuclear look even worse. And the competitors' often tenfold economic advantage from the 207 "distributed benefits" documented in RMI's 2002 *Economist* book of the year *Small is Profitable* (www.smallisprofitable.org) aren't counted at all. Industrial cogeneration using waste heat has a negative cost because its fuel is free. The cost of saving electricity tends to be much smaller (often <1¢/kWh) in businesses than in homes, and is often negative in new buildings or factories using integrative design, which very few utility programs yet apply.

the Italian proverb says, *L'aritmetica non è opinione* (arithmetic is not an opinion).

Nothing can save nuclear power from its dismal economics. Not regulatory change: the U.S. industry has enjoyed a regulatory system of its own design for a quarter-century with zero orders. Not new kinds of reactors: if they were *free*, the rest of the plant would still cost too much. Not carbon taxes: they'd help efficiency and renewables equally and cogeneration partially. Not hydrogen: nuclear energy is a hopelessly costly way to split water. And not the roughly \$13 billion of extra subsidies just approved by Congress—markets ultimately prevail. In fact, Standard & Poor's just concluded (*Nucl. Eng. Intl. News*, 18 August 2005) that nuclear developers' credit ratings won't gain much, because the most basic risks remain unresolved—and S&P wasn't even talking about this sort of market competition.

Cost *trends* make nuclear's prospects even bleaker. Windpower is expected to get at least one-third cheaper by 2020, then cheaper still. Cogen continues to mature and gain economies of mass-production. Efficiency gets ever bigger and cheaper as new and improved technologies, offshore and high-volume production, competition, streamlined delivery, and (above all) integrative design outpace the using up of potential savings. (California and the Pacific Northwest confirm these trends with falling utility program costs.) And all these technologies are empirically manifold quicker to build than similar capacity in nuclear plants.

How about the ultimate potential *size* of the competing resources? At less than the delivered cost of just *running* a nuclear plant, even if building it cost nothing, potential U.S. electricity savings range from about twice to four times the 20 percent U.S. market share of nuclear power, according to the utilities' Electric Power Research Institute and to RMI, respectively, in their joint September

1990 *Scientific American* article. (The difference is largely methodological, not substantive.) Lawrence Livermore National Laboratory found a negative-cost waste-heat cogeneration potential about as big as nuclear power today, not counting other big opportunities in industry and buildings. Windpower's U.S. potential on readily available rural land—equivalent to a few Dakota counties—exceeds twice national electrical usage. European experience confirms that windpower's intermittence is entirely manageable if renewables are properly dispersed, diversified, forecast, and integrated with the existing grid.

For all these reasons, a portfolio of least-cost investments in efficient use and in decentralized generation will beat nuclear power in cost, speed, and size by a large and rising margin. This isn't hypothetical; it's what today's market is proving. To be sure, all technologies have a certain dry-hole or non-completion risk, and all have implementation hassles. But observed market behavior proves that this risk has been far smaller for the competitive portfolio than for nuclear power.

This widening gap between market reality and nuclear theology raises some pointed policy questions. Why divert additional public resources from market winners to the market loser? Why pay a premium to incur nuclear power's uniquely disagreeable problems? (No other energy technology spreads do-it-yourself kits and innocent disguises for making weapons of mass destruction, nor creates terrorist targets or potential for mishaps that can devastate a region, nor creates wastes so hazardous, nor is unable to restart for days after an unexpected shutdown.) Why incur the opportunity cost of buying a costlier option that both saves less carbon per dollar and is slower per megawatt to deploy? And if, unsupported by analysis, you think we need everything, then how will you avoid the problem of the Chinese-restaurant

diner who orders one of each expensive entree from the menu, spends the other half of his money on a small bowl of shark-fin soup, can't afford rice, and goes away hungry?

A popular euphemism holds that we need to "keep nuclear energy on the table." What exactly does this mean? Continued massive R&D investments for a "mature" technology that has taken the lion's share of energy R&D for decades (39 percent in OECD during 1991–2001, and 59 percent in the United States during 1948–98)? Ever bigger taxpayer subsidies to divert investment away from the successful competitors? Heroic life-support measures? We've been trying to make nuclear power cost-effective for a half-century. Are we there yet? When will we be? How will we know? And would nuclear advocates agree to de-subsidize the entire energy sector, so all options can compete on a level playing-field?

Lord Keynes said, "If a thing is not worth doing, it is not worth doing well." Nuclear power has already died of an incurable attack of market forces, with no credible prospect of revival. Current efforts to deny this reality will only waste money, distort markets, and reduce and retard carbon dioxide displacement. The cheaper, faster, abundant alternatives are now empirically bigger. Since nuclear power is therefore unnecessary and uneconomic, we needn't debate whether it's safe. And if you're worried about climate change, then it's vital to invest judiciously, not indiscriminately—best buys first, not the more the merrier (Fig.3).

The 2005 Energy Policy Act is festooned with lavish subsidies and regulatory shortcuts for favored technologies that can't compete unaided. Nuclear expansion, for example, gets about \$13 billion in new gifts from the taxpayer: 80 percent loan guarantees (if appropriated), about \$3 billion in "R&D" boondoggles, 50 percent licensing-cost subsidies, \$2 billion of public insurance against legal or

| New electrical resource purchased | kWh of coal-fired electricity displaceable per dime (\$ 0.10) |
|---|---|
| Nuclear power (2004 subsidies and costs) | 1.0 |
| Gas-fired industrial cogeneration (\$ 5–8/MCF) | ~0.9–1.7+ |
| Windpower (no or 2004 subsidies, 2005–12 costs) | 1.2–1.7+ |
| Gas-fired building-scale cogeneration | ~2.2–6.5+ |
| Recovered heat industrial cogeneration | ∞ |
| End-use efficiency | several to ∞ |

Fig. 3. The reciprocal of the costs in Fig. 2 shows how much coal-fired electricity can be displaced by buying one dime's (\$0.10) worth of each option. Energy inputs

to build and decommission equipment, enrich nuclear fuel, and store nuclear wastes aren't counted; carbon emitted by gas-fired cogeneration is (conservatively).

regulatory delays, a 1.8¢/kWh increase in operating subsidies (equivalent to about \$6 billion or \$840/kW—about two-fifths of likely capital cost), liability for mishaps capped (and largely evadable through shell companies), payments for late acceptance of nuclear waste (which there's no place to put and little prospect of any place to put), free offsite security, and a new \$1.3-billion tax break for decommissioning funds. The total new subsidies approximate the total capital cost of six big new plants. Taxpayers assume nearly all the costs and risks they don't already have; the promoters, who aren't willing to risk their own capital (despite \$447 billion of 2003 revenues), pocket any upside. Yes, this boost may yield slight twitches from the moribund nuclear industry, but no authentic revival. And nuclear isn't the only beneficiary. Coal gasification, for example, is also richly aided even though the proposed program will yield 8–10 times less gas than efficient use could save, and will cost 4–5 times as much per unit.

Such foolishness masks a deeper danger to our economy. U.S. energy policy in 2005 is eerily similar to that of the early 1980s. President Reagan then sought, with modest success, to push centralized supply expansions with subsidies and federal overruling of local siting objections. But he didn't notice that the market—thanks to Ford/Carter efficiency policies

reinforced by the second oil price shock in 1979—was quietly producing a gusher of efficiency. For a time, these two trains, one saving energy and the other producing more, ran down the same track in opposite directions. They met in 1984–85. That almighty trainwreck glutted supplies, crashed prices, and bankrupted suppliers. Efficiency was among the victims too: attention wandered, and Americans, having spent twenty years learning how to save energy, spent the next twenty years forgetting.

We may see this very bad movie all over again. Persistently high and jittery oil prices are eliciting major vehicle and bio-fuel innovations. Micropower is booming. Energy and electric intensity have respectively been falling 2.3 and 1.5 percent a year for a decade, providing 78 percent of the increase in delivered energy services. Yet energy statistics focus only on the increases in physical supply that fuel the other 22 percent of the growth in services. Thus 78 percent of the action is invisible to policymakers and investors. This has already had grave consequences. Merchant firms lately built about \$100 billion worth of combined-cycle capacity, now standing three-fourths idle—because they swallowed the lie (created by the Western Fuels Association in a successful effort to head off climate protection) that the Internet was a huge and soaring gobler of electricity. Chasing that imaginary

demand made most of the builders insolvent. It served them right.

The basic lessons of the mid-1980s crash remain seemingly unlearned. Markets do work, invisibly but inexorably. Demand does respond to price. Supply and demand do equilibrate. Small, fast technologies—those with short lead times, deployable by diverse market actors without specialized institutions—reach customers before big, slow ones can, and hence can grab the revenue streams and bankrupt the suppliers. In the early 1980s, efficiency won the race for revenue; today, bet on the twin-threat team of efficiency plus micropower. In the early 1980s, federal policy drove efficiency gains; today, the drivers are smart corporate decisions and state policies. The details differ. The result will be nearly identical.

These powerful forces continue to operate whether we perceive them or not. In this decade, as in the 1980s, those who believe they are helping the nuclear, coal, and hydrocarbon industries will prove to be their worst enemies, while those whom those industries might consider their foes will turn out to have done the most to try to save them from federally-created disaster.

Amory Lovins is CEO of RMI.

For details and documentation see www.rmi.org/sitepages/pid171.php#E05-08.

Building Our Capacity



Marty Pickett,
Executive
Director

OVER THE PAST YEAR, we have been focusing on increasing our capacity to deliver more and better research and consulting services. As a result of our advisory meeting in September 2004, and business planning for our Research & Consulting division (R&C) recently completed by our staff and Board, we have a three-year plan to build capacity in R&C, and to integrate our most recent work, *Winning the Oil Endgame*, into our mission execution.

As part of this plan, we have made some changes in positions within R&C, welcomed new staff members, and are searching to fill several positions. We are delighted that as of

1 July, Dr. Joel Swisher, PE has been promoted to the position of managing director. Kyle Datta has become a senior director and Alexis Karolides, AIA, has been named a research principal. On 1 August we also welcomed Greg Franta, FAIA, as the leader of our newly named team, RMI/ENSAR Built Environment. This team replaces RMI's Green Development Services and is named to better describe the broad and integrated work it will bring to environmental design.

Although Greg is a new employee at RMI, he is a long-time, trusted and respected friend and colleague. RMI has collaborated with ENSAR Group, a company Greg led for more than 25 years, on many different projects since the Institute's early days. Joining RMI with Greg are Victor Olgay, AIA, Cara Carmichael, and Ashley Muse (see article on p. 1 for more details about

them and the expertise they bring to RMI).

In mid September, John V. Anderson, PE will join RMI as our Energy & Resources services team leader, a position that was vacated when Joel became Managing Director. John brings expertise and leadership from his distinguished 20-year career with the National Renewable Energy Laboratory and the past six years' involvement with several start-ups, including a fuel-cell company and an investment fund for clean energy technologies.

We're excited about the growth and increasing depth within our Research & Consulting team. Our work continues to have excellent traction in the market and we're continually getting attention and respect for our research and consulting services, for which we see a growing demand, both in the United States and abroad.

Residential Energy Savings for the Rest of Us

RMI's headquarters building is a familiar image for many green design professionals and energy efficiency enthusiasts. Since its completion in 1984, it has welcomed more than 70,000 visitors who want to experience whole-system design and green building principles firsthand. By designing in the right order—optimal siting and orientation, superefficient building envelope, and calculated thermal mass—the structure's builders were able to eliminate the need for a central heating system while reducing construction cost. Throughout the years, RMI has applied this design philosophy to hundreds of new and renovated buildings, yet we're always interested in exploring what the average homeowner can do—after all, there are more than 76 million residential structures in the U.S. alone.

Supported by a grant from Aspen's Community Office for Resource Efficiency (CORE, www.aspencore.org), RMI's facilities team recently performed an energy efficiency retrofit on the "Duplex."

A stone's throw from RMI's headquarters, the Duplex—which houses five employees and our maintenance office—was hardly a model of energy efficiency. The victim of typical 1970s-era construction practices, the building had electric resistance heat, minimal natural lighting, and inefficient appliances. In an effort to get it to perform like its younger neighbor, this spring the Duplex underwent a low-cost energy retrofit.

In typical RMI fashion, the crew's first priority was to decrease the energy lost as a result of heated air leaking out decrepit exterior doors. They were replaced with insulated doors boasting double-paned windows that let in natural light; also added were storm doors with screens.

More impressive is the tremendous amount of light brought into the building via Solatubes—cylinders with Fresnel lenses on their top ends and extremely reflective insides that penetrate the roof and bounce daylight deep inside a structure (while, of course, using no electricity).

Prior to the remodel, the Duplex was fairly dark and dingy—not a stimulating place to live or work. However, the recent renovations now provide warm natural light to much of the interior space.

The antiquated electric resistance heating system was replaced with a higher-efficiency propane boiler, hydronic baseboard radiators, and programmable thermostats.

Finally, the Duplex's inefficient washer, dryer, and two dishwashers were all replaced with water- and energy-efficient Energy Star Appliances that were, on average, twice as efficient. Toilets were also retrofitted to 1.6-gallons-per-flush models and showerheads to Energy Technology Laboratory high-performance models.

While we don't expect the Duplex to attract the same following as our headquarters building, the recent upgrades are a good example of what can be done in almost any home. Our intent was to decrease the utility bills (freeing money for programs) and reduce carbon dioxide emissions; in the process, we also created a space that is healthier and comfier to live and work in.

—Tomakin Archambault



A Small but Encouraging Step Toward Making Light Trucks

By Amory B. Lovins

A major policy recommendation of RMI's *Winning the Oil Endgame* (pp. 58, 136, 206–208) has been tentatively adopted by the National Highway Traffic Safety Administration for light trucks—SUVs, vans, minivans, and pickup trucks. On 23 August 2005, in the first basic structural change in three decades, NHTSA proposed that its Corporate Average Fuel Economy (CAFE) regulations switch from a flat-rate fleet-average miles-per-gallon (mpg) requirement to a sliding scale based on vehicles' *size*, with different targets for each of six size classes—not based on their *weight* as the original proposal had emphasized. This new system will be optional from Model Year (MY) 2008 and mandatory from MY2011. The proposed rule is open for public comment until 23 November 2005, and is to be finalized by 1 April 2006. It applies only to light trucks, since NHTSA says it's not sure it has authority to do the same for cars, but it merits extension to cars. Meanwhile, light trucks are a great place to start, because they're not only 56 percent of U.S. light-vehicle sales but also the cause of 55 percent of the total projected increase in U.S. oil use to 2025.

NHTSA's proposal was predictably greeted by automakers as challenging (but broadly acceptable—they're glad it wasn't tougher) and by environmentalists as timid. It would boost the light-truck standard from 20.7 mpg in MY2004 and 22.2 in MY2007 to a new range of 21.3–28.4 in MY2011, depending on vehicle size, while the 27.5-mpg car standard would stay unchanged. NHTSA has a statutory duty to require “maximum feasible fuel economy” as cost-effective technology improves, but Congress has

long blocked action, even prohibiting study of tightened CAFE standards during 1995–2000. Powertrains got one-third more efficient during 1981–2003 while the standards held steady and 99 percent of the potential fuel saving vanished into ever faster acceleration and a shift from cars to light trucks. The Energy Information Administration, whose forecasts must reflect existing rules, projects that this perverse trend will continue, so light vehicles will spend the next twenty years becoming only 0.5 mpg more efficient than they were in 1987.

Critics also note that the biggest vehicles, like *Hummer H2*, *Excursion*, GMC's *Yukon XL*, and *F-250/2500* or larger pickups, remain exempt from mpg regulation (or even disclosure) under the proposed NHTSA rule because they weigh more than 8,500 pounds. (Light trucks already have laxer safety and emissions regulations and are exempt from the gas-guzzler tax that applies to the least efficient cars. The statute authorizes CAFE coverage up to 10,000 pounds.) The plan projects the lifetime savings in light trucks sold during 2008–2011, compared to the MY2007 standard of 22.2 mpg, as ten billion gallons. But that savings spread over nearly two decades (light vehicles last about 14 years) is only what today's light-truck fleet uses every two months, or a quarter of what the largely CAFE-driven improvements already achieved in cars and light trucks now save

each year (about \$75 billion a year at today's gasoline prices, or about \$400 per household per year). In contrast, *Winning the Oil Endgame* showed a very profitable potential for uncompromised cars and light trucks to save 70 billion gallons in the year 2025 alone, at an average cost of 57¢ per saved gallon. Whatever exists is possible: doubled-efficiency hybrids like Toyota's 55-mpg midsize *Prius*, which continues to blow the doors off non-hybrids' sales, are clearly both feasible and cost-effective as judged by the marketplace.

Yet lost in all the sniping about the numbers is the critical point that NHTSA's new plan also creates a vital incentive to use lighter materials and better designs, decoupling vehicles' size from their weight to create greater customer utility and protection without incurring other penalties. Modern light-but-strong materials permit vehicles that are big—hence comfortable and protective; but not heavy—hence hostile and inefficient. Rewarding lightweight materials will advance public health, national security, climate protection, and the competitiveness of U.S. automakers: our



analysis found that carbon-fiber thermo-plastic composites could halve the weight and fuel use of today's cars and light trucks, with better safety but no greater cost. (Ultralight steels could also provide impressive gains with similar economics; the market will sort out the winning materials.) NHTSA's proposal also ensures inter-manufacturer equity and expands customer choice.

In contrast, NHTSA's original weight-based proposal would have deliberately rewarded making vehicles heavier (except for the very heaviest) and penalized making them lighter: indeed, making them lighter would have forced automakers to meet an even higher mpg standard, further decreasing the cost-effectiveness of lightweight materials and disincentivizing the most effective single

way to save oil, lives, and money simultaneously. It would also have damaged the Big Three's export prospects, because major markets increasingly require more efficient and lighter vehicles. And it would have intensified the old CAFE system's incentives to make big vehicles heavy and light vehicles small. Whatever one thinks of NHTSA's numbers, the new size-based structure of light-truck

The Spreading Myth of Inefficient Hybrid Cars

By Amory B. Lovins

Since I published in RMI's Summer 05 newsletter (p. 26) some handy hints for getting hybrid vehicles to perform at very nearly their EPA-rated efficiencies, the common misconception that hybrids inherently fall short of those ratings by more than nonhybrids do was echoed by an erroneous *New York Times* story. By now many people wrongly believe that hybrids can't save much fuel (a view not discouraged by U.S. automakers lacking attractive hybrid models). My corrective letter of 19 July, which the *Times* didn't publish, explained:

"Your normally accurate reporter Matt Wald writes ("Hybrid Cars Burning Gas in the Drive for Power," 17 July) that a popular new hybrid-electric car, Honda's *Accord*, gets just two more miles per gallon than its non-hybrid equivalent—only one-fourth the difference in their EPA ratings.

"This urban myth is based on *Consumer Reports* tests which, like the *Times*'s own tests, mistakenly drive hybrids the same way as non-hybrids. *Consumer Reports* refuses to disclose, and might not realize, that this uniform and hence seemingly reasonable test method unfairly disadvantages hybrids, for reasons inherent in their design.

"Contrary to what we were taught in pre-hybrid driver's education classes, hybrids use less fuel by attaining cruising speed quickly. Brisk acceleration, gentle braking far in advance of a stop (to recover maximum braking energy for reuse), and

other simple driving tactics to exploit hybrids' unique features all enable properly driven hybrids to get closer to their EPA mpg ratings than non-hybrids can. I'm one of hundreds of Honda and Toyota hybrid owners who consistently get within 1–2 mpg of EPA ratings, despite my area's cold climate, mountainous terrain, and reliance on efficiency-lowering snow tires. The similar powertrain in the hybrid *Accord* (too new to have a user database yet) should do the same, but non-hybrids can't.

"I hope the *Times* will re-test hybrids the way they're meant to be driven, then report the results, thus teaching readers how to enable these inherently far more efficient vehicles to do their best."

Note also that a hybrid-electric car will accelerate faster than a non-hybrid with identical weight and total horsepower. That's because part of the hybrid's horsepower comes from an electric motor, which has higher low-speed torque than a gasoline engine. In theory, automakers could design hybrids as pure muscle cars, sacrificing most or all of the hybrid powertrain's potential efficiency gain for performance, as has happened with non-hybrid cars. But there's no reason to do this, and little reason to believe any automaker has. Rather, with a well-designed and well-driven hybrid, you can have it all: with one concept car (Opel's 2002 two-seat carbon-fiber diesel hybrid *Eco-Speedster*), 155 mph, 0–60 mph in 7.4 seconds, and 94 mpg.

CAFE will avoid these serious problems.

Of course, the devil's in the details. Any metric will be gamed, and achieving NHTSA's safety and fuel economy goals will require vigilance. We suggested a size-based rule based probably on interior volume as the most meaningful surrogate for customer utility and preference. NHTSA proposes instead to measure size by footprint (wheelbase times average track width), which is probably easier to game. (Critics note, for example, that adding less than an inch to *Explorer Sport Trac's* wheelbase would shift it from the 24.5- to the 23.3-mpg category among the six size classes of MY2011 light trucks. One may expect to see wheels move toward the corners of the vehicle.) The footprint metric seems to offer no safety advantages that aren't otherwise achievable.

Some abused loopholes, such as the just-extended CAFE credits for flexible-fuel vehicles, unfortunately persist; fuel efficiency and flexibility should both be encouraged without trading one for the other. The "flat-floor" loophole based on seat design that lets minivans and the car-like *PT Cruiser* be classified as trucks would be enlarged. There'd be less

incentive to exploit it, since a vehicle that size would have to achieve only 0.8 mpg less as a truck than as a car; nonetheless, that loophole, and indeed the whole distinction between car and light-truck standards, should be abolished. Many numerical details remain hazy, and much could still change as NHTSA considers public comments. But a major policy blunder, based on a common misconception equating weight with safety, seems happily to have been avoided.

RMI's recommendations to NHTSA were presented not only in *Winning the Oil Endgame*, published 20 September 2004, but also in the Institute's 26 April 2004 written technical comments for the rulemaking (RMI Publication #E04-10, www.rmi.org/sitepages/pid171.php) and in two private senior briefs in Washington. Some other sections, such as the aluminum industry, also recommended size-based CAFE rules. The Aluminum Association praised the NHTSA decision, noting that "vehicle size—more than weight—is a better determinant of vehicle safety. As such, size-based standards may create incentives for automakers to make even greater use of aluminum and other low-weight, high-strength materials

to keep or even increase vehicle size for safety, while decreasing their weight for better performance and fuel economy. Under that scenario, everybody wins." We agree.

Without commenting further on details, we find the new size-based policy a gratifying step in the right direction. To be sure, the low mpg standards proposed fall lamentably short of what's possible and cost-effective: we found (*WTOE*, pp. 61–72) that an ultralight-hybrid midsize SUV could get 66 mpg and repay its \$2,511 extra retail price (2000 \$) in two years at today's gasoline price. But we also found that well-designed size- and revenue-neutral "feebates" (pp. 186–190) can be a far more powerful, effective, and attractive policy instrument than CAFE-like standards or fuel taxes. Perhaps feebates will emerge as the next big innovation in state and federal policy, accelerating such big efficiency gains that the whole CAFE debate becomes moot. That too is part of RMI's implementation strategy, now underway, for getting America off oil, led by business for profit.

Amory B. Lovins is CEO of RMI.

Profitable Climate Protection Explained in *Scientific American*



RMI CEO Amory Lovins's ten-page article "More Profit from Less Carbon" in the September special issue of *Scientific American* shows that the debate over whether the cost of climate protection is small and worthwhile or big and prohibitive misses

a basic point: the number at issue is *negative*. That is, climate protection is not costly but profitable, because saving fuel costs less than buying fuel. Innovations in technology, public policy, community and building design, efficiency engineering, and good ol' American business acumen are already proving their worth. The article is posted at www.sciam.com/media/pdf/Lovinsforweb.pdf. It is also available at www.rmi.org/sitepages/pid173.php#C05-05.

Rebuilding the Big Easy, RMI Style

HURRICANE KATRINA WAS NOT A SURPRISE, BUT HIT US ALL HARD.

Since before it hit, we've been striving to put to work what we've learned over the years about refugee camps and humanitarian assistance—sending not just money and sympathy but also practical ideas and information. RMI Senior Fellow Dr. Eric Rasmussen activated his tsunami-seasoned network (see *RMI Solutions*, Summer 05; Fall 01) before Katrina hit, and brings that community's immense experience to his new deployment as the Navy Fleet Surgeon to the Joint Task Force relieving the stricken area. RMI/ENSAR Built Environment (p. 1) is working with other design and construction leaders to help devise better ways of rebuilding. Our energy, water, and community economic renewal experience is also coming in handy.

That said, we are sending money and sympathy too. When Executive Director Marty Pickett handed out the year's bonus checks a few weeks ago, they came with encouragement to give generously (Mississippi native Missy Morgan has collected \$1,000 in staff donations for the Red Cross—to be tripled by matching donors). Additionally, so staff members can contribute blocks of

uninterrupted time to the relief effort, the Institute made an important exception to its community service policy (before Katrina, community service was limited to eight hours per month). Now, staffers helping with the relief effort may use up to 80 hours, all of which can be taken during a two-week period. "This is because the commitment needed for assistance in the hurricane aftermath is for days and weeks," Marty noted, "not hours."

In this special section, we offer two perspectives on rebuilding's first steps—reflections by our friend and colleague Jonathan Rose, a leading green real-estate developer, and a "first thoughts" memo drafted by RMI Senior Fellow Bill Browning. Also included is a brief description of what happened to Soldiers Grove, Wisc., a community whose story offers a very applicable lesson to the situation along the Gulf Coast.

After a disaster like this, there is a tendency to want to rebuild—the same structures in the same locations—quickly. With New Orleans flooded and evacuated, there's more time to think about what gets built, where, and how.

—Cameron M. Burns, Editor

What Should Be Done in New Orleans?

By Jonathan F. P. Rose

IN THE SHORT TERM, THE FASTEST WAY TO house poor people is to give them Section 8 certificates, which they can use to rent private housing. It is essential that *new* Section 8 certificates be issued, otherwise they will be taken from other poor people throughout America.

In the long run, there needs to be a serious planning effort. We have an amazing opportunity to plan the right way to rebuild the city, drawing on its historic culture, but adding everything we know about what makes cities great—and that starts with infrastructure: education, transportation, healthcare, culture, open space, energy, security, employment, communications. There also

needs to be an honest conversation about where to build and where not to build.

And then there is how to build. It is essential that planners start defining what is "New Orleans" about New Orleans, or we will end up with the sameness—homogenous, franchised development—

that we see in so much of the new building in the South, and across the country. We need to recognize that the issues before us are both local and regional—it was not just New Orleans that was devastated. We need a regional plan to connect and coordinate the local and the regional rebuilding. We need to rebuild the natural ecological systems that could better absorb intense weather. And we need to recognize that with climate change, the sea will rise, weather patterns will be more volatile, and we need to accommodate them. What a great opportunity to build a new, thriving garden city.

So now for the mid-term, which throws up a challenge just as daunting as long-term planning and our immediate response to built-environ-



Winrock building, Little Rock, Ark.

Photo by Craig Dugall/courtesy of Jonathan Rose

ment issues. The first task is to build places, not houses. Sprawling, disconnected housing projects, without access to jobs, education, health care, etc. condemn their residents rather than support them, even if the buildings are green. So we need to plan real places, whole communities, and we should use this process to expand and enrich existing communities. We should thus use the building/settlement process to strengthen, not undermine communities.

Where we build needs a great deal of thought. It needs to be in places that can accommodate or benefit from an onslaught of children, of the aged, etc. The bargain with local communities needs to be a commitment to infrastructure—if a community takes on displaced residents, it should be given the resources to build permanent new schools, hospitals, job-training centers, and other amenities to accommodate not only new citizens, but perhaps to help older communities get caught-up in terms of infrastructure. This includes wireless or other high-speed data systems and facilities. (Of course, we will have to start with temporary facilities, but if there is not a commitment to permanent ones, then these communities will be degraded, not enhanced.)

There must also be a serious commitment to building mixed-income communities, or we will create new ghettos. We

¹ Hope VI projects are mixed-income communities built, with federal money, to replace ghettos around the country. As Susan J. Popkin, Bruce Katz, Mary K. Cunningham, Karen D. Brown, Jeremy Gustafson, and Margery Austin Turner note in a paper about the Hope VI program: “Launched in 1992, the \$5 billion Hope VI program represents a dramatic turnaround in public housing policy and one of the most ambitious urban redevelopment efforts in the nation’s history. It replaces severely distressed public housing projects, occupied exclusively by poor families, with redesigned mixed-income housing and provides housing vouchers to enable some of the original residents to rent apartments in the private market.” For more information, please visit: www.urban.org.

have learned much from the history of failed housing projects, and the success of the Hope VI projects¹ that replaced them. We must integrate this knowledge into the new housing that gets built.

Speaking of jobs, we need to make a commitment in the rebuilding to employ as many of the dispossessed as possible.

We need to build houses not just *for* people but *with* people from the region. There must be a serious economic and employment plan. It isn’t hard to plan well and quickly if you have the right people at the table. Again, I would look to the planners who have worked on Hope VI projects.

Then, there are the housing types themselves. For quick delivery of single-family homes, I would look to the manufactured housing industry. But first, we need to write green specifications, and through this opportunity to do mass purchasing, we can improve the environmental quality of materials used in manufactured housing.

Below is a photo of an affordable “green” manufactured home that is part of a new street of Energy Star-rated homes in New Haven, Ct., which my firm recently developed. A typical home in New Haven requires \$1,600 a year for utilities. The owners of these homes will pay only \$800. For higher densities, I’d focus on using SIPs (structural insulated panels, a



Energy-efficient home in New Haven, Ct.



Live/work incubator studios in Santa Fe, N.M.

great resource-efficient system for making well-insulated buildings out of pre-fabricated panels) for four-story multifamily complexes, with careful thought as to where retail and other services should be on the ground floor.

Finally, we should also look at building type. Above is a photo of some live/work incubator studios that we have built in Santa Fe, N.M.—cheap, high-ceilinged, skylit spaces built in barn-like structures. These are places that can nurture the entrepreneurial talent that keeps America growing. Also, on p. 18 is a photo of the Winrock building, just certified LEED™ Gold, which my firm built in Little Rock; it offers a model of what a regional green office building can be.

These are just initial ideas. What actually happens along the Gulf Coast might not look like any of the buildings you see on this page or follow any of the ideas herein—no matter. What’s important that there be a vision of the possibilities for creating a sustainable community from the remains of a tragedy.

Jonathan Rose is the founder and president of Jonathan Rose Companies, LLC, a national network of companies that repairs the fabric of communities through green work, including planning, project management, development, and a smart-growth real estate investment fund.



Photos courtesy of Nora and Pete Krapik

Solar buildings in Soldiers Grove, Wisc. The buildings at left are a medical clinic and a senior housing complex, respectively.

The Story of Soldiers Grove

By Cameron M. Burns

ONE OF THE BEST EXAMPLES WE KNOW OF A sustainable rebuilding effort is the story of the village of Soldiers Grove, situated on the Kickapoo River, in southwestern Wisconsin. After decades of repeated flooding, members of this community of nearly 600 decided to relocate the town center—to higher ground.

The U.S. Army Corps of Engineers had suggested building a \$3.5-million levee around the town, but, according to the Trust for Public Land, “maintenance expenses would have been double the town’s annual property tax receipts.” Instead, residents decided to work *with* the river, by, essentially, moving out of its way. The surprising thing is how they did it.

As the DOE’s Smart Communities Network website (www.sustainable.doe.gov/freshstart/case/soldiers.htm) notes: “Soldiers Grove saw the relocation project not just as an opportunity to duplicate their old town, but as a chance to create something *much better*. Rather than rush to get buildings up and running as quickly as possible, the villagers took their time. Perhaps the most dramatic outcome of that careful planning process was the decision to make all of the new town-center buildings energy-efficient and solar-heated. Soldiers Grove became the first business district of its kind in the nation. The village passed ordinances stipulating

that new buildings be built to specific thermal performance standards and obtain at least 50 percent of their heating needs with solar systems. Residents also passed a solar access ordinance to ensure that future buildings don’t block the sun for existing structures.”

Additionally, the townspeople used the relocation opportunity to address a number of community challenges.

“The energy efficiency and solar ordinances helped to keep valuable energy dollars from escaping the local economy,” notes the Smart Communities Network website. “The old floodplain was developed into a well-used municipal park. The town center was once again adjacent to the state highway, which had bypassed the old town in the 1950s, hurting businesses. A second municipal well and reservoir were built outside the floodplain, and sewer and water services were extended into new areas, paving the way for future growth.”

The new town—completed in 1983—took on the appropriate nickname of “Solartown” and boasted a business district that was at least 70 percent powered by solar energy, according to www.fortunecity.com. Eight years later, in 1991, a University of Wisconsin graduate student made a study of the solar systems in a number of Soldiers Grove’s commercial buildings. He wanted to determine if the systems were cost-effective. He found that the majority (seven

out of ten) were, and the ones that weren’t sized properly for the application.

Soldiers Grove has since become a model of community redevelopment, an example of what people can do when they put their hearts and minds into a worthwhile effort. One of the more notable aspects of the relocation of this small Wisconsin town was that the process was transparent and inclusive.

“...[A]lthough today’s disaster-prone towns have better tools at their disposal, there remains much to be learned from Soldiers Grove in the area of organizing people,” notes the Smart Communities Network website. “Even the most progressive and well-thought-out sustainable development plans will fail without the full support of the community. Soldiers Grove learned the importance of citizen involvement throughout the entire relocation process. Using both the formal channels of citizen committees and the informal, ‘open door’ approach of the project coordinator, the people of Soldiers Grove were deeply involved in the creation of their new town center.”

Another great outcome was the savings in disaster mitigation. As the Trust for Public Land website notes, “It cost the U.S. Department of Housing and Urban Development \$1 million to move the town, saving an estimated \$127,000 a year in flood damage.”

A Temporary/Transitional Solution for Post-Katrina Settlements

By Bill Browning

ONE OF THE CHALLENGES WITH TEMPORARY structures is that in many cases they become permanent. There are still people living in some of the temporary cottages that were built after the 1906 San Francisco earthquake. So, either we do it right the first time, or we look at a truly mobile home or tent strategy.

First, the mobile home strategy. One of the best approaches may be to have the manufactured housing industry crank out service modules (bathrooms/kitchens) that can serve several families in the short-term, and then be used as the cores for subsequent new house construction. This strategy has been discussed for modular construction, and it results in hybrid modular/site-built structures. While we might consider tents this fall, they don't represent a very-long-term solution (winter will be upon us in a few short months). An alternative might be to use trailers (similar to the ones used for schools and construction sites) as dorms, paired with manufactured service units.

There have been a number of designers who have been working with converting shipping containers into housing units. Shipping containers are sturdy structures, but they need insulation and an overhead structure for shading. They can also be used to create very large temporary structures, the most notable recent example being the Nomad Museum, designed by Shigeru Ban, on a pier in Manhattan. This Museum consisted of parallel rows of stacked shipping containers roofed by a structure largely made of Sonotubes (thick cardboard tubes used as concrete forms). Ban is famous for the cardboard cabins he designed for Kobe earthquake victims, which can be seen on

Cameron Sinclair's Architecture for Humanity website, along with a number of designs for transitional housing.

The lesson of the San Francisco earthquake cottages is that well-designed small transitional structures can be durable. Given the level of skill within the homebuilding industry, this may be a good route—cranking out 800-square-foot homes. These could be done with manu-

I think one key question is how many units need to be built and how do we tap into existing manufacturing and homebuilding industries? Then there's the question of when people start to return, and what percentage of the displaced population will choose to not return.

factured service cores and site-built additions. Also, there are numerous vernacular architectural styles in the Gulf area that can guide the design of climatically-appropriate houses that require lower energy loads.

I think one key question is: how many units need to be built and how do we tap into existing manufacturing and homebuilding industries? Then there's the question of when people start to return, and what percentage of the displaced population will choose to not return. Most of the submerged houses will be structurally unsound and many will wind up with levels of microbial growth that will render them uninhabitable.

Providing housing is not the only issue; basic utilities need to be rebuilt.

Rebuilding the electrical grid to allow for distributed generation will be essential. Given the likely failure of the water and wastewater systems, it would seem prudent to look at distributed solutions here as well. Small-scale applications of living machines coupled with algal turf scrubbers would be a quick biological solution for wastewater. The algal turf scrubber can also be used to sequester toxins in water.

Similar to what RMI learned during our 2002 Sustainable Settlements Charrette (www.rmi.org/sitepages/pid560.php), we will need to look at environmental restoration. Much of the canopy in the hurricane-damaged areas will be lost either as a result of exposure to salt, or as a result of being submerged, or both. Tree canopy loss will increase the heat island effect, wind exposure, and storm water runoff. So tree planting—indeed, all natural ecosystem restoration—is vital to rebuilding.

These are just a few preliminary thoughts. There is much to examine, much to ponder, but if we delve into the lessons already learned about sustainable redevelopment, we shall undoubtedly find many interconnected solutions to this devastating event.

William D. Browning, Hon. AIA, is one of the world's leading practitioners and spokespersons for sustainable building design and real estate development. Bill has held key roles in creating both the U.S. Green Building Council and its LEED™ rating system, and is active on the USGBC Board and LEED committees. He is currently a Senior Fellow at Rocky Mountain Institute and a partner in a new green development consulting firm, Browning + Bannon, LLC.

Mineral Acquisition Partners, Inc.

Weaving a Tapestry of Philanthropy

There are very few instances in society where an organization supports the growth of industries that appear to run counter to its own self-interest. But the folks at the Palo Alto-based Mineral Acquisition Partners, Inc. (MAP) have somehow managed to merge their core, fossil-fuel-based business with a dedication to next-generation energy solutions like few others. MAP's bread and butter comes from natural gas partnerships in which hundreds of royalty interests are acquired in low-risk, long-lived gas accumulations in the onshore lower 48 states. But the organization then takes a hefty chunk of its profits (around 10 percent) and reinvests that cash on nurturing the next generation of energy leaders—and not just educating them about natural gas and other fossil fuels. Rather, they focus on sustainable energy education, sending eager Stanford University students interested in energy and resource issues off to places like the Natural Resources Defense Council, the Union of Concerned Scientists, Worldwatch Institute, Winrock International, and, of course, Rocky Mountain Institute.

Each year, MAP supports about ten MAP "Fellows" who leave Palo Alto to spend three to six months at a leading energy NGO where they delve into every major energy-related issue, from efficiency and renewables to demand-side management and biomimetic design, to clean coal and carbon sequestration technologies. Clearly, Jane Woodward, Peggy Propp, and their nearly fifty colleagues at Mineral Acquisition Partners, Inc. (MAP) aren't part of a typical energy company.

"I guess the word 'catalytic' describes me best," Jane said. "I like to be involved in solving problems. I like noticing little

market failures, then devising ways to bridge those gaps."

MAP was founded in 1989, and owes its existence to an interesting historical event. In 1953, a group of Stanford alumni/ae bequeathed a portfolio of mineral rights to Stanford's School of Earth Sciences. As part of the arrangement, the bulk of the royalties earned by the rights were to be reinvested in additional mineral rights, thereby building something of an endowment for the school. This gift of mineral rights had been long forgotten, but while Jane was in graduate school at Stanford, they were rediscovered. While completing a master's degree in petroleum geology and an MBA, Jane also helped solve the very difficult challenge of how to reinvest the millions of dollars in accumulated revenues generated from these mineral rights. Using the methods developed, Jane began building MAP, which focused on acquiring natural gas mineral rights and royalty interests in the most attractive natural gas accumulations in the United States.

Yet, bootstrapping a business in an energy-related field—and eventually achieving success—was not Jane's only interest. Being "part environmentalist, part educator, part businesswoman, and part scientist," as Jane describes herself, she wanted to play a bigger role in the way society understands and treats natural resources, including energy resources: she began teaching at Stanford's School of Earth Sciences in 1990.

"One of the most important ways I



The ladies behind MAP's Sustainable Energy Fellows program: Peggy Propp and Jane Woodward.

thought I could make a difference was through teaching," she said. "I see teaching as a philanthropic commitment, through which you can invigorate and inspire the next generation of leaders."

Not surprisingly, however, Jane—who was preaching the value of efficiency, renewables, distributed generation, and demand-side management on campus while deep in the natural gas investment world—presented something of a paradox to MAP's partners. "Our investors essentially asked if it was possible to break down the perceived wall between what MAP did and what I taught," Jane explained.

So about five years ago, Jane merged her life passions with her business, and began a program of supporting sustainable energy education and offsetting the impacts of the oil and gas industry. She hired an old friend, Peggy Propp—with whom she'd run a Bay-area nonprofit that designed done-in-a-day projects for people with limited time to spend volunteering—and they set up what has become one of the most extraordinary fellowship programs in academia: the MAP Sustainable

Energy Fellowship Program, which provides \$11,000 (per Fellow) to fund twelve-week Fellowships at NGO partner organizations selected by MAP.

“The Fellowship Program came about from what I perceived as a dual market failure,” Jane noted. “One of the biggest challenges I saw at Stanford was that Prof. Gil Masters’s and my students could not get the kinds of summer positions that were anywhere near their market compensation at places like RMI, NRDC, or other cutting-edge energy NGOs. A core problem was money.”

The second problem (which Jane calls the “yenta” problem) was the inability of many NGOs to be able to hand-pick the students best-suited for specific internships—again, a money- and resources-related issue.

“We realized that in order to maintain quality control on this, we needed Peggy’s position to nurture the [Fellow] process,” Jane explained. “We don’t just throw money at it.”

Indeed, while the folks at MAP *do* offer extraordinary financial support to Fellows, they take the process much further. MAP Fellows are interviewed several times about their interests before the Fellowships; MAP also performs mid-Fellowship reviews of how the Fellowship is progressing; and there is an

exit interview process. Interestingly, because the process is so well structured, some organizations—like RMI—end up accepting more Fellows than the official number of MAP slots, simply because the Fellows’ qualifications are so high and the selection process so exacting. RMI has acquired quite a few researchers as a result of the MAP fellowship program and the Institute’s relationship with Stanford (including current researchers Kitty Wang, Will Clift, and Nate Glasgow, and many former interns).

“We’re wringing all the value we can out of the investment in the Fellow and the NGO,” Jane said.

The merging of concern for energy, resources, the environment, and future leaders does not end with MAP’s Sustainable Energy Fellows. MAP also boasts a Recycling Research Fellowship, focusing on airport and airline recycling practices, its four-year-old MAP/Ming Visiting Professorship on Energy and Environment at Stanford University (RMI Managing Director Dr. Joel Swisher was the first MAP/Ming Professor in 2003, Senior Fellow Dr. Jon G. Koomey his 2004 successor), and the William W. Whitley Citizen Scholar Award, which honors a graduating Stanford earth systems student for academic achievement and contributions to Stanford, peers, and

the greater community.

Additionally, MAP (separate from the investments made by the Partnerships it manages) is involved in what it calls “program-related investment”—making investments in companies that are working on solutions to pressing sustainable energy issues. In 2004 and 2005, MAP invested in Fiberforge (formerly Hypercar), an RMI spinoff, and SunEdison, which is pioneering the financing of photovoltaics for the commercial sector by simplifying the financing process.

For many corporate organizations involved in philanthropy, the act of giving is simply that: a donation. For the folks at Mineral Acquisition Partners, philanthropy is a much more subtle and meticulous process—and it’s clearly working. RMI’s MAP interns have gone on to prominent positions in many sustainability-, earth-resources-, and energy-related industries and organizations around the globe. And by getting philanthropy and business to coexist seamlessly, MAP is redefining the very notion of philanthropy.

As Joel Swisher has noted: “With MAP, it isn’t about money so much as a fundamental approach to filling in gaps and weaving a rich tapestry of philanthropy.”

—Cameron M. Burns

Amory’s NatCap Course Offered at Esalen

If you’re anywhere near Monterey, Calif. the weekend of 9–11 December, you might consider attending RMI CEO Amory Lovins’s popular workshop “Introduction to Natural Capitalism and the Resource Efficiency Revolution” at the Esalen retreat center. The workshop will help innovators from business and civil society understand how natural capitalism plays with

a full deck—productively using and reinvesting in all four forms of capital (not just money and goods but also people and nature), creating striking competitive advantage and a better world. The workshops at Esalen can include a variety of options, from food and lodging to personal retreats and massages. For more information, please visit www.esalen.org.

Steve Swanson, Finance Director



SERENDIPITY. Not something you might immediately think of as running through the operations of Rocky Mountain Institute, an organization that

strives for solid strategic planning, meticulous research, and pragmatic solutions to energy and resource issues. But according to Steve Swanson, RMI's Finance Director, serendipitous discoveries and convergences of people and interests, time and events, are very much a part of what makes RMI successful.

Serendipity, in fact, is what brought Steve to RMI four years ago. In 2001, he was finance director for the Aspen Community Foundation. Steve had recently begun volunteering with the new Roaring Fork Valley chapter of Habitat for Humanity, which is based in Carbondale. One weekend, he found himself up on a scaffold, wielding dry-wall tools alongside RMI Development Director Dale Levy.

"We started talking—we had a common background with community foun-

dations," he said. "I told Dale I was looking to move; he suggested I talk to [RMI Executive Director] Marty Pickett about an open position. That was Saturday; I called on Monday, interviewed on Tuesday, and was hired on Wednesday."

Before coming to RMI, Steve had a distinguished 25-year career in health care administration with several hospitals and managed care organizations in Chicago, Denver, and Aspen. Raised in the east Denver area, the fifth of nine children, he worked his way through high school and an undergraduate degree in economics at the University of Colorado. He received an MBA from Southern Illinois University and spent several years in healthcare finance and consulting in Chicago and Cleveland before returning to Colorado in 1978. Though his work took him to different cities and brought positions with significant responsibility, Steve is glad to be at RMI. "Things are getting worse (in healthcare)—the difficulties I faced weren't commensurate with the rewards," he said. "There isn't a healthcare financing system in the United States. Eventually it's bound to explode."

What makes working at RMI rewarding? Steve cites the high caliber of the staff and Board of Trustees, and the mission-driven work with its relative "lack of egos or heavy political complexities." Upon joining RMI, he was charged with putting into place several financial systems, including new budgeting and accounting and cash management software. Since then he has worked with his staff of three to build and maintain this financial infrastructure that is so integral to the smooth workings of RMI's operations—from project management to development and general administration. "It can be a challenge," he said. "RMI is unique in that you see things you'd never see anywhere else here. We have to build a sound business model for an organization that is formally a nonprofit but also takes on some of the mentality of a for-profit. It can be complicated to make such a hybrid thrive."

Steve sees serendipity at work in the people who find their way to RMI to work or lend their support: "You have to want to be at a place like this. People—employees, donors—often self-select and find us. But some of the most amazing

Help RMI Get More Green from Working Assets

Recently, RMI received notification from Working Assets—the progressive San Francisco-based telecommunications firm that participates in activism and makes donations to various nonprofits—about a way to increase its donations to RMI: through supporters' votes. Current Working Assets long-distance, wireless, or credit card customers can visit www.workingassets.com/vote and vote for their favorite NGO or charity. The groups are organized by the following programmatic designations: "Peace &

International Freedom," "Education & Freedom of Expression," "Environment," "Economic & Social Justice," and "Civil Rights" (RMI is listed in the Environment group). Voting can be done in several ways, including the sharing of votes among groups, and customers who use all three Working Assets services will have their votes weighted accordingly. In 2003, RMI received \$59,592 in support from Working Assets, so please log on and help us do it again!

things that happen at RMI come together through serendipity.”

Steve’s leadership is part of the success RMI has enjoyed in recent years in securing new consulting projects and building a strong donor base. He works closely with Executive Director Marty Pickett and the Finance Committee of the Board of Trustees, chaired by Mike Curzan, to ensure that the organization’s financial systems are supporting strategic and institutional goals. This includes monthly meetings with the Committee and annual budget-setting. Later this year, a major project for Steve and the finance team will be the shift to a new accounting and project management software platform, with real-time project reporting and tracking. He is confident that implementation will further hone resource planning and project organization, and therefore boost overall productivity.

Outside his role as financial helmsman, Steve values time with his family of four. He met his wife Sandy, who is a registered nurse, when they both worked at Children’s Memorial Hospital in Chicago; she was Director of Ambulatory Services and he was a financial administrator. The pair suffered through “two of the coldest winters Chicago has ever

seen” before moving to Basalt, Colorado in 1978. Sandy has served as executive director of Family Visitor Program, an organization that teaches parenting skills and provides education on child development, for almost twenty years. The Swansons have two children, Dan, 24 and Thom, 22. Dan is completing studies in viticulture (the science and practice of growing grapes) at Cal Poly in San Luis Obispo, and Thom is currently working in Denver at the corporate headquarters for RockResorts, Inc. Steve considers his commitment to his family as paramount: “My goal in life is for my sons to be able to call me up at any time of day or night...and say, ‘Hey Dad, let’s go for a beer.’ We’re good friends.” Like his sons, Steve values Colorado’s access to outdoor activities and can be found biking, hiking, and golfing whenever time and opportunity allow.

In addition to being the serendipitous moment when he found his way to RMI, volunteerism is a big part of Steve’s life. As board secretary of the Roaring Fork Valley chapter of Habitat for Humanity, he is able to help families in economic hardship afford homes of their own—important, as he believes that one of the biggest challenges facing the region is the

rising price of homes and the ability to “sustain a vibrant community where all economic classes can live.” This makes site selection difficult, he noted, as securing outright donations of land amid such prime real estate is challenging. Recently, however, chapter volunteers worked with developers to secure a site for their third home construction project, in Carbondale. Groundbreaking began in September. Steve is actively involved with running the chapter’s Board meetings, heads the site selection committee, and, of course, offers his financial expertise when needed. But the best part for him is the hands-on work—“It’s a *lot* more fun to get out and hammer nails than to sit in meetings talking”—and the chance to help a family in need. He urges others to get involved: “It’s fun, and you meet a lot of good people.” And he reassures those who are new to the craft, “You don’t need to know much about construction. There are people in the trade who volunteer and tell the rest of us what to do.”

By embracing serendipity and hard work, Steve is helping an integral part of RMI’s operations to embrace change—and thrive.

—Karen S. Shishido

RMI in the news

Former RMIte Launches Ideal Bite, Inc. to “Make Green More Hip”

A former RMI intern recently launched a web-based business that steers consumers to sustainable choices in goods and services. Jennifer Boulden, who interned at RMI in autumn 2004 and helped with the Institute’s strategic planning efforts, recently launched Ideal Bite, Inc. to—as she puts it—“make green more hip.”

The company provides daily tips and newsletters (via email) and blogging space on www.idealbite.com where green consumers can exchange information and ideas about goods and services.

“So many people want to do something to make the world a healthier place for themselves and their children, but very few of us want to drastically change our lifestyles or daily routines,” noted Heather Stephenson, Jen’s partner in Ideal Bite.

Jen and Heather developed the idea for Ideal Bite while working together as marketing consultants for green businesses. They realized that there was no place for environmentally-minded companies (such as Aveda and Patagonia) to advertise to “conscientious consumers” on the Internet. For more information, visit www.idealbite.com.



What Are You Doing?

In this issue of RMI Solutions, we take a look at what some of our recent interns have been up to.

Pat Augustine



My work has focused on demand response programs for electric utilities that seek to control demand and provide value that would otherwise have to be realized through new supply. I worked on a project for the Hawai'iian Electric Company (HECO), investigating the economic feasibility of direct load-control programs depending on their cost and potential load reductions. I am also working on a California pricing pilot project, in which I'm attempting to quantify load reductions resulting from smart thermostat technology. I plan to continue this work as I complete my master's degree at Duke.

Lionel Bony



I am an MBA student at Harvard Business School working out of RMI's Kona office for the summer. My diverse projects have included research-

ing the impact of climate change on Japanese companies; evaluating the U.S. liquefied-natural-gas market for a white paper; holding a workshop on ecosystem services valuation; developing a financial model for a large solar-powered affordable housing project; and designing a smart growth strategy for the County of Hawai'i.

Eleanor Branch



I have been working with RMI's Research & Consulting team to develop a system dynamics model that lets utilities predict what future electric resource additions will be most

cost-effective, incorporating possible future carbon taxes and calculating each technology's associated carbon emissions. The model includes traditional and new technologies for fossil fuels, nuclear and hydropower, as well as wind, biomass, combined heat and power, and more efficient end-use.

Kenneth Davies



I came to RMI after earning two engineering degrees from Cornell and a brief experience on Capitol Hill.

Dismayed by the general lack of social consciousness among my engineering peers and by political gridlock, I'm thrilled to be working as Amory's executive intern, and contributing to the dissemination of RMI's philosophy. In the fall I will be entering a graduate program in Environmental Studies at the University of Colorado at Boulder, with a concentration on the social implications of science and technology policy.

Sarah Darley



I worked in Kona, Hawai'i, on several energy-related projects. I helped to prepare an educational workshop for several Hawai'iian

electric utilities. The aim was to describe and endorse methods for attributing reliability value to intermittent renewables like wind. I also helped assess the potential impact of a carbon tax in California. For this project, I created a model to compare levelized costs, including the costs of a carbon tax, across power generators.

Renaud des Rosiers



I spent the summer working on several projects with the RMI Integrated Design Practices team and getting a broad-based intro-

duction to RMI's organizational thinking, culture, and approach to research and consulting. The RMI internship has been a cornerstone of my graduate studies in business and environmental studies. I look forward to spending the coming year as an RMI Research Fellow and working on a carbon scenario planning tool to help utilities plan capacity additions for a carbon-constrained future.

Elk Glenn



I am from the Big Horn Mountains of the Crow Indian Reservation in southeastern Montana. At first with RMI's Energy & Resources

Services group, I worked on a model for a city utility that assessed its potential for distributed energy tri-generation—heating, cooling, and electrical power. More recently, I have worked on a model comparing—at the national level—the economics, emissions, and engineering for wind, coal, and gas under various carbon tax, gas price, and wind penetration scenarios. It is a great honor to work with the people at RMI.

Min Hou



I have been hoping to work at RMI since I took the *Natural Capitalism* course and met Amory B. Lovins three years ago at Peking University in

China. Now I am a master's degree candidate in environmental engineering at Stanford University. My work at RMI includes two parts: one is building the Chinese shell of RMI's website, which

will help Chinese visitors access the intense information more smoothly. The other one is data collection, strategic analysis, and recommendation of China's energy future.

Virginia Lacy



I am a graduating master's degree candidate at Yale's School of Forestry and Environmental Studies. This summer I was extremely fortunate to work with RMI's Senior Director of Research & Consulting, Kyle Datta, on several distributed generation and renewable energy projects on the Big Island of Hawai'i—a once-in-a-lifetime learning experience!

Cory Lowe



I've recently taken over the outreach desk at RMI, answering e-mail, phone, and mail inquiries about everything that RMI does. My other regular outreach duties include tracking media coverage, writing and distributing press releases, arranging interviews and speaking engagements, and managing RMI's contact database. I also research and write the bi-weekly column *Advanced Automotive News*, coordinate tours of our superefficient headquarters building, and maintain www.rmi.org's Calendar of Events page.

Billy Maynard



My work at RMI consists of managing the 957-acre Windstar Land Conservancy. In the past several years, land management at Windstar has implemented the goals of restoring native biodiversity to the ecosystem while maintaining the land's western agricultural heritage, doing so in a way that benefits

the health and recovery of the overall biotic community.

My day-to-day duties serve to meet these goals and center around the management of a 40-head cattle herd which we rotationally graze through the pasture that surrounds the valley's wetlands. I am also responsible for our aggressive weed control program, removing invasive species such as Canada thistle that choke out native biodiversity. Along with the restoration of the wetlands that occurred several years ago, these goals have provided the necessary conditions for the return of several native species of flora and fauna, some quite rare—obvious indicators of the returning health of an ecosystem.

Anna Ritzen



I'm a master's degree candidate in science and innovation management at the University of Utrecht in the Netherlands. As part of the program I have to do an internship, and an opportunity arose to do this with RMI. For the last two months I've been working in Snowmass on different energy-related projects. For the next four months I will be working in Kona, Hawai'i. This internship is both a great challenge and an opportunity, and I'm glad I got this chance!

Linda Shi



As the urban renewal intern, I work on RMI's project to regenerate Ohio's Cuyahoga Valley. To help stakeholders weigh restoration options for the Cuyahoga River and surrounding industrial zones, I research the costs and benefits of different choices concerning ecological restoration, stormwater management, and transportation. For this, I was able to travel to Cleveland to collect

data in the field. I also research case studies for a hedonic valuation, which examines the effect of ecological restoration on property values.

Karen Shishido



I was born and raised in Hawai'i and am currently a master's degree candidate in energy and environmental policy at the University of Delaware. I'm working with the Communications Department on projects related to RMI's intellectual capital and the ways to make the wealth of research done and information gathered over the years more readily accessible. This chiefly involves creating a CD-ROM with key publications and articles with a searchable user interface. I have also been researching and writing pieces for RMI's website and newsletter, and outside publications in which RMI has columns.

Eric Wanless



I'm working with RMI's Joel Swisher, PE, and Kitty Wang, PE, on a variety of projects. Primarily I've been focused on the Automated Demand Response System (ADRS) project, in which RMI is evaluating the benefit of a load-shifting technology with the three California utilities. I've also had the chance to look at carbon-offset options for a large California technology firm. In December I'll be heading back to Stanford to finish my master's degree in energy engineering. In my spare time I enjoy quiet walks with the office staff.

Craig Kennedy

RMI BOARD OF TRUSTEES

Cross-pollinating ideas has long been an important aspect of RMI's activities, and while the Institute is filled with creative people, the recent addition of Craig Kennedy to RMI's Board of Trustees¹ will give RMI's governing body an especially keen insight into public policy and social service.

Craig is the president of the German Marshall Fund (GMF), a Washington DC-based organization that shares ideas about better ways to do things—in foreign policy, trade, the environment, immigration, and other matters—between the United States and a number of European nations.

The Fund was created after World War II as a memorial to the Marshall Plan through a series of contributions from the German government. It is an American organization with a Board limited to Americans because, as Craig put it, “the founders did not want any suspicions that GMF was created to serve a foreign government.” The Fund started in the 1970s as a fairly conventional foundation, but evolved into a far



“I was focused on the environment during my first years at Joyce. I later developed a strong interest in education and served as an adviser to the mayor of Chicago on education reform.”

more complex institution that funds and operates diverse projects and programs around the globe.

But the most fundamental aspect of the Fund, Craig believes, is bringing people and ideas together.

“GMF is an odd place: one part think tank, one part foundation, one part convener/educational forum,” Craig said. “But the core ideas are: one, that Americans and Europeans can learn a great deal from one another on a range of issues, and two, that many of the major challenges facing the world can be addressed effectively only if the United States and Europe work in concert. Finding the right ideas and the right people who can help us achieve these two aims is the key to my job.”

Craig has been president of the Fund since 1995, and has been praised for his leadership through a period of significant expansion. Craig oversaw the extension of several Fund programs through Central and Eastern Europe, and the Balkans. In 2003, he spearheaded the launch of the Balkan Trust for Democracy, a \$27 million grantmaking initiative designed to strengthen civil society and democracy, created in partnership with the U.S., Dutch, and Greek governments and the Charles Stewart Mott Foundation. He also opened new offices in Paris, Bratislava,

Brussels, and Belgrade to complement efforts in Washington and Berlin. In addition, he established the Transatlantic Fellows program, providing journalists, policy analysts, and academics opportunities to pursue their research and writing interests in one of GMF's offices.

Craig didn't start out at the nexus of trans-Atlantic policy-making. Indeed, he grew up as far from international affairs as one could imagine—on a small farm in rural South Dakota, with three sisters. He went to a one-room school for the first eight grades of his academic life, and was active in 4-H and similar organizations.

Craig became involved with public service early on—his mother, a teacher, and his father, a farmer, were deeply involved in a range of nonprofit organizations in the community.

Craig left South Dakota to go to the University of Chicago, where he earned a BA in civilization studies, an MA in social service administration, and an MBA. He then took a position with the Joyce Foundation, where he first came to learn about RMI.

“I was focused on the environment during my first years at Joyce,” he said. “I later developed a strong interest in education and served as an adviser to the mayor of Chicago on

¹ RMI recently changed the name of its Board of Directors to “Board of Trustees.” The Institute's current business plan for its Research & Consulting division contemplates senior staff members with the title of “Senior Director.” The name change was made to ensure that there is no confusion between staff and our governance Board members. Further, use of “Trustees” is normally associated with the Board of a charitable organization and more appropriately reflects its fiduciary role.

education reform.”

Craig’s interest in international issues evolved later, after a trip to Europe with the Chicago Council on Foreign Relations. Craig had never been to Europe, so the trip was an eye-opening experience.

“I went on this eight-day study tour of Germany and came back with a whole new view of the world and especially of politics and public policy,” he said. “From that point on, international policy became a major interest.”

In 1992, Craig left the Joyce Foundation to work for Richard J. Dennis, a Chicago investor and philanthropist, before joining the German Marshall Fund in 1995. Craig was invited to join RMI’s Board of Trustees earlier this year as a result of his friendship with Trustee and longtime Institute friend Dr. Sue Woolsey.

“What I really enjoy is helping smart people make the most of their ideas,” he said. “I have worked with many different social and policy entrepreneurs over the years as they have

tried to take their ideas to ‘market.’ Helping them develop the best strategies for developing and promoting their ideas is something that gives me enormous satisfaction.”

Craig is not quite certain what aspects of RMI’s work he’d like to see better “marketed” (“it’s a bit too early for me to have an opinion yet,” he readily admits), but he’s eager to explore ways to boost the Institute’s efforts to bring insightful solutions to a range of challenges and audiences.

—Cameron M. Burns

Dear Editor,

In Amory’s otherwise terrific review of nuclear power succumbing to market forces, you suggest that the RMI study Will Keepin and I did in the late ’80s (“Greenhouse Warming: Comparative Analysis of Nuclear and Energy Efficiency Abatement Strategies,” *Energy Policy*, December 1988) did not have a significant impact—it actually had a large impact. In the United States, Will testified in Congress about our findings, and the report was widely debated in places like *Science* and contributed to a strong centrist consensus that nuclear power is not financially viable domestically. Abroad—where nuclear reactors were still being built, its impact was even larger. To cite a few examples:

- It was used as the basis of a very successful campaign in the UK by Friends of the Earth/Greenpeace and others to educate UK financial institutions about nuclear liabilities and cost problems, and led to a sea change in the UK financial community’s views about the value of nuclear power plants and its willingness to fund more nuclear reactors. The study played a large role in stopping the misguided Thatcherite effort to expand investment in nuclear power in the UK.

- In Hungary, which had been leaning nuclear, the study had broad repercussions. I testified about it to both the Economic and the Environment Committees

of the newly-seated Hungarian parliament, and the study provided a compelling argument that derailed the sophisticated and deceptive sales pitch that EDF and others were making at the time and that was hastening that country toward nuclear power investments.

- It prompted the British Billionaire Sir James Goldsmith (to whom I was advisor at the time) to provide initial funding for national energy efficiency centers in Eastern Europe. This resulted in, among other things, a national energy efficiency center in Ukraine (the Agency for Rational Energy Use and Ecology) which has had a very large impact on that country’s energy codes and advancing efficiency nationally, and the first (and very successful) energy efficient performance contracting firm in Romania, and—I believe—the first in Eastern and Central Europe.

Our RMI study did have a large impact (over 15 year later it is still probably the single most widely cited study on this issue), and is another reminder of why the work RMI does is so important.

Best,
Greg Kats

[Amory replies: “Wow! Special thanks to Greg—one of the finest innovators RMI’s ever had—for all this great news, previously unknown to us.”]

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Members of the National Solutions Council are:

* invited to participate in various discussions with RMI staff and/or Board of Trustees about global issues.

Several members attended our 22 April Blue Sky Session, led by Richard Kidd of the U.S. State Department. Mr. Kidd shared news of the State Department's work ridding certain war-torn regions of landmines, as well as America's role in the post-9/11, energy-precious world.

* special invitees to RMIQs (RMI's Quest for Solutions presentations) and other RMI events.

Environmental writer, designer, educator and RMI Trustee Prof. David Orr spoke in April at an RMIQ co-hosted with the Aspen Center for Environmental Studies.

* sponsors of regional RMIQ lectures or series.

NSC member Bud Konheim hosted an event in New York on 2 December 2004 that featured Amory Lovins and a discussion of the most recent outcomes of *Winning the Oil Endgame*. Amory also presented a RMIQ public lecture 22 August 2005 in Aspen's Paepcke Auditorium on "Nuclear Power: Is It Part of the Solution?"

* recipients of advance notification of key upcoming RMI publications.

The NSC extends an invitation to all RMI donors of \$1,500+ annually to join. Watch your mailbox for upcoming NSC events!

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The following people have notified us that they have included RMI in their wills and/or trusts. We are grateful to each of them.

Esther & Francis Bligh
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Anne Cooke
Richard Ford
Stanton Klose
Joel Shapiro
Marge Wurgel &
Keith Mesecher

Wills

Below is suggested wording for including RMI in your will. But we also suggest you consult your attorney.

"I hereby leave _____ percent of my estate (or a fixed amount, specific property, or the remainder of my estate) to Rocky Mountain Institute, a Colorado nonprofit corporation, whose purpose is to foster the efficient and restorative use of resources to make the world secure, just, prosperous, and life-sustaining."



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 at (970) 927-7201.

Military

(continued from p. 5)

force. We do that too, via the access and influence we've achieved. But where it becomes an issue of politics, RMI—as a scrupulously nonpartisan and apolitical nonprofit organization—simply can't go there.

“Don't help the military kill people more cheaply (by the way, I'm a vet).”

In essence, this asserts that any money DoD saves on fuel will be used to do

bad things. So should one make military buildings and platforms *less* efficient, turning *more* oil into “global weirding” in order to promote peace? I doubt it. The political forces that cause the civilian leadership to send platforms on military missions seem far stronger than penny-pinching over fuel—an afterthought for the logisticians to handle. Conversely, saving fuel—ultimately even fuel logistics worth tens of billions of dollars a year—seems unlikely to

make wars materially more attractive or likely...save perhaps in one respect:

More efficient platforms will make it easier to deploy and apply U.S. military force worldwide.

True, and a cornerstone of current efforts at “military transformation.” Heavy, gas-guzzling platforms are hard to deploy and sustain. If deployed anyway, they arrive later, move slower, put

Two F-15 Fighting Falcons from Spangdahlem Air Base, Germany await refueling en route to the Moscow International Aviation and Space Salon.



U.S. Air Force photo by Master Sgt. Val Gemplis

RMI *in the news*

AT&T Employees Support RMI

A group of AT&T employees recently showed their support for the Institute by donating \$1,000 they won through a work-based competition supported by AT&T. The competition calls for internal teams to submit environmentally-driven projects, ranging from recycling efforts to sustainable sourcing. Recently, AT&T's Global Network Technology Services (GNTS) Energy Team—a multidisciplinary, cross-organizational group focused on the implementation of cost-effective, energy-efficient measures—won the competition's coveted “Champions of the Environment Award” by implementing methods for reducing energy consumption throughout AT&T's network facilities. Many of their methods were based on RMI's work in energy-efficient buildings.

Between 2002 and 2004, the facilities' energy use fell more than 6 percent just through energy awareness and thermostat setpoint management.

According to Team members, AT&T Network Operations plans to reduce its energy consumption and resultant carbon dioxide emissions by 10 percent over the next five years, in both buildings and network operations, and from mobile sources.

According to Michele Blazek, AT&T Director of Technology and Environment, “the energy management system optimization program designed to help meet this goal includes air balancing, variable chilled water setpoints, optimization of outside air, air balancing, and fleet efficiency operations.”

far more troops in harm's way for a longer time to operate vulnerable supply lines, and ultimately increase combat risks and casualties. Those who favor these outcomes in the hope of gumming up the works are really objecting to the use of military force, either in particular cases or generally. At times I have personally disagreed with civilian leaders' choices about the use of military power. But the proper remedy lies in devising nonviolent paths to security, and ultimately in the voting booth. That's not a cop-out; it simply recognizes the difference between the purpose of this specific nonprofit organization and the civic duties of every citizen.

The Pentagon is an impenetrable bureaucracy in which no small organization or modest effort can make a difference. One of the finest public servants we know at DoD talks of “the tunnel at the end of the light” (and, in fairness, ascribes much of the mess to Congress's appetite for pork). But isn't it better to redirect a vast bureaucracy's supertanker-like

momentum so it's hard to stop from doing *good* things? Whether RMI's small but innovative and well-targeted effort can achieve this is an empirical question, but so far, I'm encouraged. Yes, military reform is slow and difficult. But someone has to do it and to help its internal advocates continue to gain strength, as they're now doing—often precisely because flawed policies prove so costly.

Adversarial muscle is the only possible and honorable path to military reform. The same was long said of improving major firms' behavior. Our Natural Capitalism practice showed otherwise: the industrial collaboration RMI has pioneered for more than two decades is now the hottest fashion among major environmental groups. And with the military as with industry, we've found it's often more effective to influence from within as a trusted partner than from outside as an adversary: working together on what we agree about often makes the rest superfluous. RMI's track record in such military col-

laboration is unusual if not unique, and is getting more so. Outside pressures for reform are important too, but they work better in combination with internal “trimtabs” than in isolation.

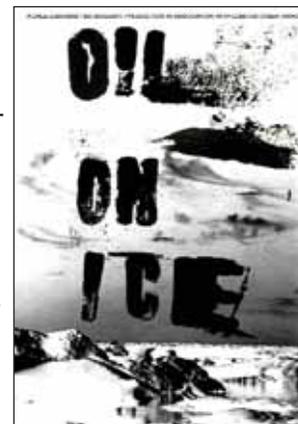
The military does many things of which you must strongly disapprove. Yes, as do many other organizations we work with: if we helped only corporations and individuals deemed free from sin (a tough test for any of us), our clientele and effectiveness would be tiny—or non-existent. While we have a sensitive moral compass and use specific criteria for choosing clients (see *RMI Solutions*, Summer 04), we also believe in the possibility of redemption and in the redeeming value of humble and compassionate dialogue without self-righteousness. When civilian or uniformed military leaders err, the judicial and political processes, propelled by the vitality of civil society, will ultimately fix responsibility, do justice, and drive learning. Meanwhile the need intensifies for the technical, institutional, and doctrinal improvements that RMI seeks to advance

RMI in the news

Amory Delivers Cold Truth in New Video

RMI CEO Amory Lovins was recently featured in a film about oil and the Arctic National Wildlife Refuge. Released 9 August by Lightyear Entertainment, *Oil on Ice* is considered one of the most controversial eco-political films in recent years. Produced and directed by Dale Djerassi and Bo Boudart, the award-winning documentary sets the issues of oil, consumer demand, global warming, Washington politics, and environmental concerns against the backdrop of the Arctic Refuge, the indigenous Gwich'in people, activities at Prudhoe Bay, and the *Exxon Valdez* disaster. The film explains how the fate of the Refuge is inextricably linked to energy policy and transportation choices, while the livelihood of Native Alaskans and

the survival of migratory wildlife are caught in the balance. Amory appears throughout the documentary. For more on *Oil on Ice*, please visit www.oilonice.org. For details of why drilling in the Refuge is uneconomic and would undercut national security—the two best-kept secrets of the debate—see the Lovinses' 2001 *Foreign Affairs* article at www.rmi.org/images/other/Energy/E01-04_FoolsGoldAnnnot.pdf.



Military

within the military and, through the military, within our whole society. I think the greater sin would be to ignore the opportunity to help influence such a potentially decisive ally for profound change.

It's inappropriate for promoters of peace and security to accept funds from military sources.

If one abhors all military activities in principle, one might want to take money away from them (or at least to pay in their stead). More seriously, we do think hard about this issue, because we don't take money or engagements from those who lie, cheat, steal, or greenwash. But so far we've been comfortable with our specific sources of DoD funding for specific activities, and with those activities' purpose, scope, and results. They all support our mission, both in detail and in the big picture; the funds come from people of high purpose and integrity; and our military partners are often people of extraordinary personal and professional quality whom we're proud to count as friends and mentors. (We're honored that two of them—retired Vice Admiral Denny McGinn, former Deputy Chief of Naval Operations, and serving Navy Medical Corps physician Commander Eric Rasmussen, one of the world's leading experts on humanitarian relief—are Senior Fellows of RMI.) Our personal experience does not support the view that military people are bad people—generally quite the contrary. We seek to work with people of honor and conscience no matter where they are found, and we distinguish between people and organizations.

An organization of conscience simply cannot have anything to do with the military.

Are *all* military activities bad—even humanitarian relief or force protection? (RMI's spinoff Fiberforge makes

advanced composite materials, good not only for making ultralight vehicles but also for stopping bullets, thus saving our fellow-citizens' lives and limbs. That sounds right even if one disagrees with how they got into combat.) Is force of arms *always* the wrong answer? (That is of course a principled pacifist position, which some of our staff and friends may hold; that is their private affair, and we respect their views as we would hope they would respect others.) There is much suffering in the universe, and we seek to reduce it in ways that feel right and play to our distinctive strengths. Our boundary is not in whom we talk to but in what we do. We don't glorify war, nor create ways to break things and kill people, but we do join with all kinds of partners, often unusual ones, to try to reduce the root causes of violence and to build authentic, durable, and universal security. For as Dr. Martin Luther King, Jr., remarked, "Peace is not the absence of war, it is the presence of justice." Many who wrongly blame the armed forces for the orders they receive from civilians would be astonished by the passionate and sophisticated drive for justice and peace that activates many who have made their careers in the military.

Military power is only one of many dimensions—such as political, diplomatic, informational, humanitarian, economic, and ideological—on which we must all struggle for a fairer and safer world.

Absolutely. RMI seeks to influence and integrate *all* these dimensions, not only the non-military ones.

The United States is overly militarized and spends far too much life and treasure

on war. Fair comment. RMI aims to support those in the military who want to change this and to eliminate war. Avoiding wars over oil seems to us an excellent place to start, and inclusiveness the best way to proceed. Leading the world off oil could be the Pentagon's greatest-ever contribution to its national-security mission—a message that resonates strongly within the senior leadership.

If you have the Pentagon's money, you don't need mine.

I wish it were so. RMI has lost money on every DoD engagement so far—because we thought the job was worth doing, because the Defense Science Board was an all-volunteer effort, and because DoD usually pays far below the market rates that we charge our industrial clients to help support our creation of new intellectual capital. I daresay our military work's results and influence have disproportionately fulfilled RMI's purpose, but this work continues to depend on the support of many friends who appreciate why we're doing it the way we are. If any feel unable to join us on this part of the journey, we are deeply sorry; but we hope others will feel that we are doing the right thing for the right reasons, not compromising but celebrating our shared values.

These are not easy times or easy issues. Executive Director Marty Pickett and I would welcome your thoughtful comments on whether my reactions are valid, what I might be missing, and how to do even better at creating abundance and security by design—an area whose staff and effort we continue to expand.

Amory B. Lovins is Cofounder and CEO of Rocky Mountain Institute.

A Welcome Correction on Utility Economics

Dear Amory,

The Summer 2005 *RMI Solutions* contains a generally excellent article by Lena Hansen entitled “Creating a Balanced Energy Policy.” It includes a discussion of “utility incentive structure” that is incorrect on one important point, however (and Lena is far from alone here). She says that “[u]nder the current rate-setting process, a utility makes a profit for every kilowatt-hour it sells (say, 2 cents profit on the 12 cents per kilowatt-hour you pay on your power bill), and loses that same 2 cents profit margin for every kilowatt-hour it doesn’t sell due to more efficient use.”

Editor’s note:

A valued colleague at Natural Resources Defense Council recently sent us this important correction. Thanks, Ralph!

This both understates and mischaracterizes the problem in an important respect. The issue is not solely or even primarily one of “lost profits,” but rather the typical linkage of a utility’s recovery of most or all of its authorized fixed costs to retail sales volumes (and, to be sure, for investor-owned utilities those fixed costs include an authorized return on the utility’s investments). The recovery of these fixed costs (reflecting previous capital investment in distribution, transmission and generation assets) typically accounts for more than half of an electric utility’s revenue requirement and electricity charges (not one-sixth as in the example), and of course fixed-cost recovery is equally a concern for public and private power (whereas “profits” are an issue only for investor-owned utilities). An investor-owned utility’s “profits” depend heavily on its success in controlling costs and are not recovered in a uniform charge per kWh; by contrast, a utility’s authorized fixed-cost revenue requirement is set by its regulators in each rate case, as is the amount of fixed costs included in the charge for each kWh, and the utility’s success in recovering that sum is tied directly to sales volumes, unless (as in California) regulators intervene to fix the problem with modest rate true-ups (reflecting the difference between authorized and actual recovery of fixed costs over specified periods). My most recent testimony on this issue (in Wisconsin)...[concludes that] five years of reasonably aggressive energy efficiency investment (saving about one percent of system use per year) would cost this average-sized utility about \$85 million in unrecovered fixed costs (split \$75 million/\$10 million between the electricity and natural gas businesses). This is about much more than “lost profits;” it goes straight to the heart of the fiscal integrity of the enterprise. Lena is absolutely right about the importance of the problem and the urgent need for solutions, of course, and equally right to point to California as a leader.

Best,

Ralph Cavanagh, NRDC

[Editor’s note: We’re sorry this error eluded us. Ralph is right—and one of the national leaders in diagnosing and fixing this key regulatory problem. See also www.raponline.org]

RMI Solutions

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LETTERS TO THE EDITOR

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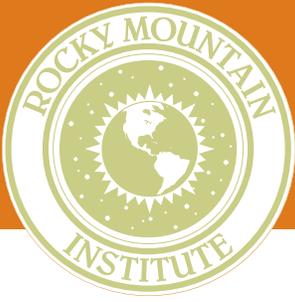
ABOUT THE INSTITUTE

RMI is an entrepreneurial nonprofit organization that fosters the efficient and restorative use of natural, human and other capital to make the world secure, just, prosperous, and life-sustaining. We do this by inspiring business, civil society, and government to design integrative solutions that create true wealth.

Our staff show 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.



RMI *Solutions*

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- 22** Donor Spotlight: Mineral Acquisition Partners, Inc.
- 24** Staff Spotlight: Steve Swanson, RMI Finance Director
- 26** What Are You Doing?
- 28** Board Spotlight: Craig Kennedy
- 31** RMI Supporters

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