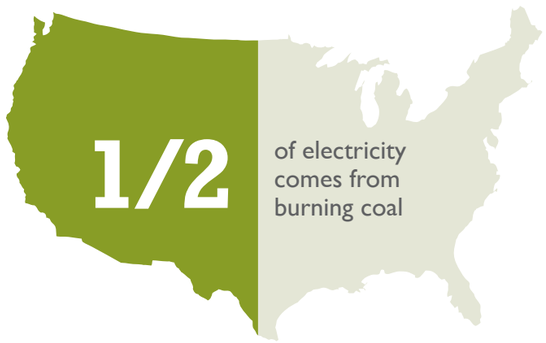
Re-Powering America

six

A look at the numbers...

See fact sources in notes section starting at page 416



Almost **half of America's electricity is produced by burning coal-** the country's greatest contributor to global warming.

10x

Amount of electricity wind power could provide compared to what the country requires today, according to a study by the US Department of Energy.

Today in the Appalachian region, more than

450 mountains

(an area estimated to be larger than **800 square miles**)

have been destroyed by mountaintop removal coal mining.

1/2

Amount of all new electricity generation projected to be from solar photovoltaic panels (PVs) by 2025.

1 million

New jobs that could be created by realizing our solar and wind potential in the US.

Today **we waste about the same amount of energy as we use,** so we produce twice the amount that we actually use.

Energy Used = Energy Wasted

11

Number of power plants worth of electricity that California saved through conservation efforts when faced with energy crunches in the earlier part of the decade.

Exemplifying the power of small acts, 84% of energy saved in California (when faced with an energy crisis) came from **simple behavioral modifications such as:**

+ Turning off lights + Unplugging electronics + Adjusting thermostats = 84% of energy saved

The non-profit Apollo Alliance estimates that a

$10 billion

federal investment in energy-efficient retrofit and conservation programs

would result in more than

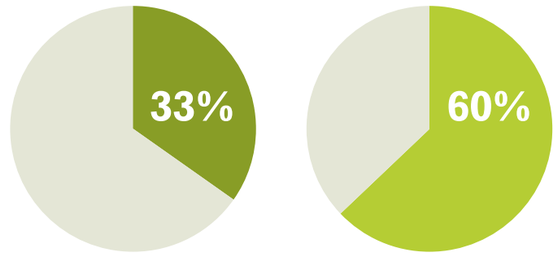
100,000 new jobs

&

would reduce energy use in new and existing buildings by

30%

Our driving is a major factor in climate change. **The US transportation sector is responsible for:**



of carbon dioxide emissions

of domestic oil consumption

10.4 billion

Gallons of gas we would save if every American used public transportation one day a week instead of driving.

100 mpg

Future goal for average US fuel economy. A 100 mpg fleet would eliminate the need to import foreign oil and drop domestic production by 800 million barrels/year, while saving every household $2,700 a year on gas.

Energy. How wisely we use it and how responsibly it is generated will define America for the foreseeable future. Our power lies in charting a new course rather than merely tinkering at the edges. Climate change grabs the headlines. But jobs, economic vitality, global stability, and the preservation of species and cultures are also connected to the energy decisions we make now and in the future.

From conservation initiatives that prevented the need for 11 new power plants in California and a simple light bulb change that could save enough energy to power 3 million homes to fuel efficiency standards that will save nearly a billion tons of greenhouse gases and growth in solar and wind that will create nearly a million new jobs, the possibilities are endless.

Even with steady progress, we still need to think big, invest in the right technologies, challenge status quo interests and make the most of our precious time.

There is no shortage of opportunity to…

Get even more aggressive when it comes to energy efficiency and conservation

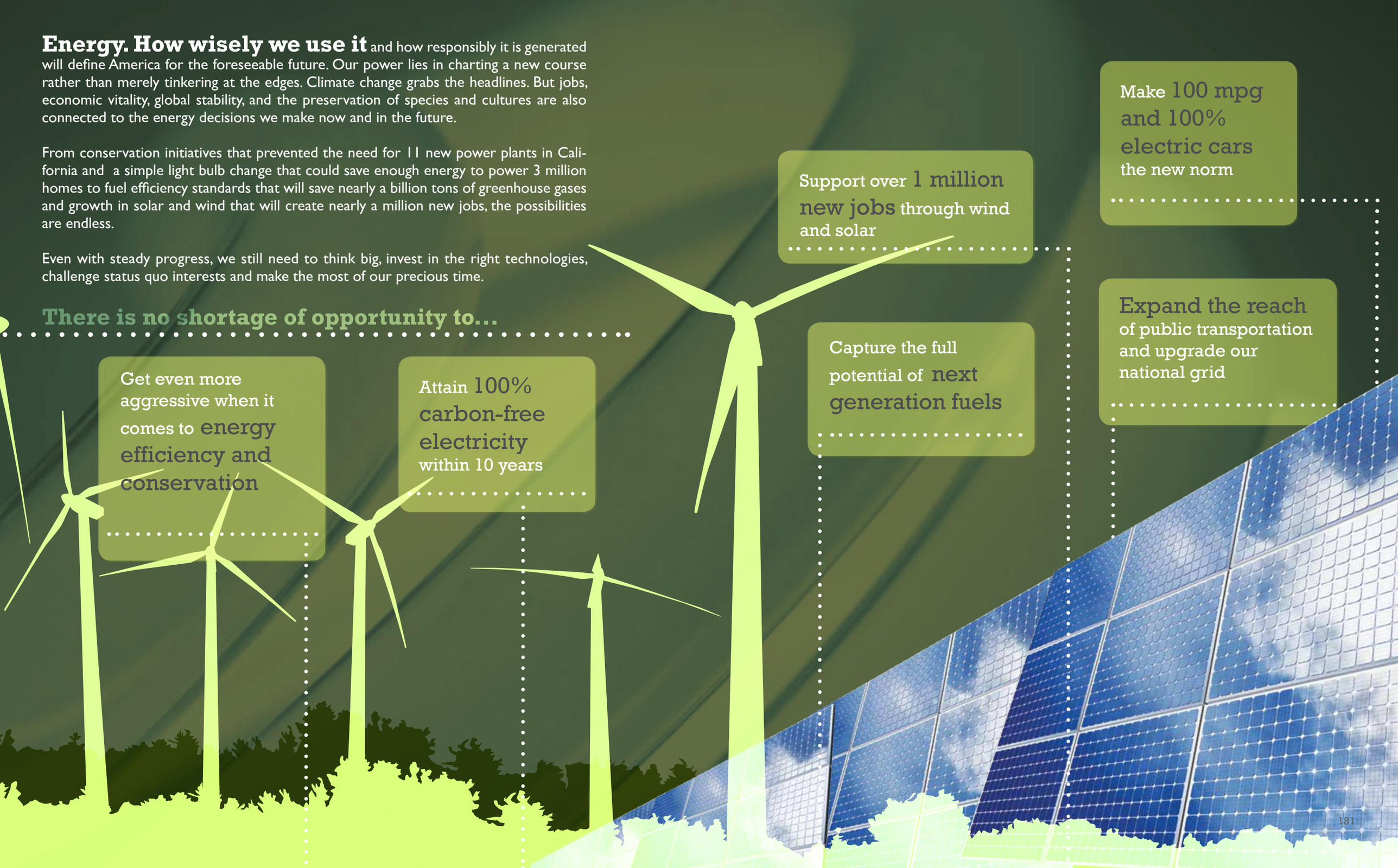
Attain 100% carbon-free electricity within 10 years

Support over 1 million new jobs through wind and solar

Capture the full potential of next generation fuels

Make 100 mpg and 100% electric cars the new norm

Expand the reach of public transportation and upgrade our national grid



100 Percent Carbon-Free Electricity Within 10 Years

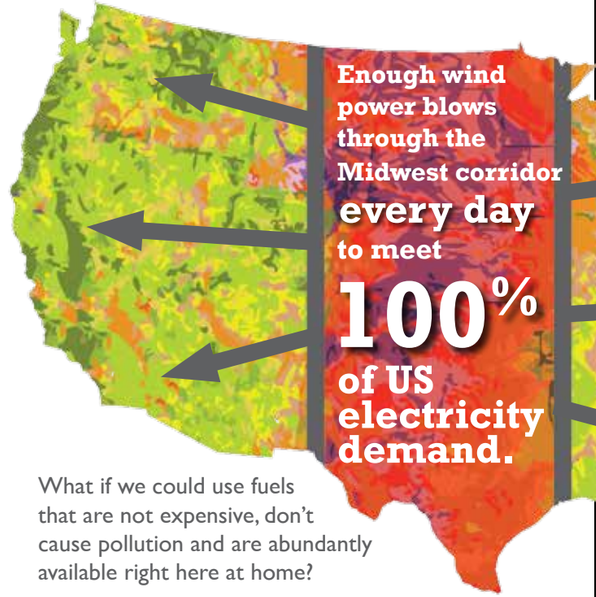
Photo courtesy Ken Opprann, and The Nobel Foundation.

Former Vice President Al Gore
(excerpt of speech to the nation, July 2008)

There are times in the history of our nation when our very way of life depends upon dispelling illusions and awakening to the challenge of a present danger. In such moments, we are called upon to move quickly and boldly to shake off complacency, throw aside old habits and rise, clear-eyed and alert, to the necessity of big changes. Those who, for whatever reason, refuse to do their part must either be persuaded to join the effort or asked to step aside. This is such a moment. The survival of the United States of America as we know it is at risk. And even more—if more should be required—the future of human civilization is at stake...

The answer is to end our reliance on carbon-based fuels.

In my search for genuinely effective answers to the climate crisis, I have held a series of "solutions summits" with engineers, scientists and CEOs. In those discussions, one thing has become abundantly clear: when you connect the dots, it turns out that the real solutions to the climate crisis are the very same measures needed to renew our economy and escape the trap of ever-rising energy prices. Moreover, they are also the very same solutions we need to guarantee our national security without having to go to war in the Persian Gulf.



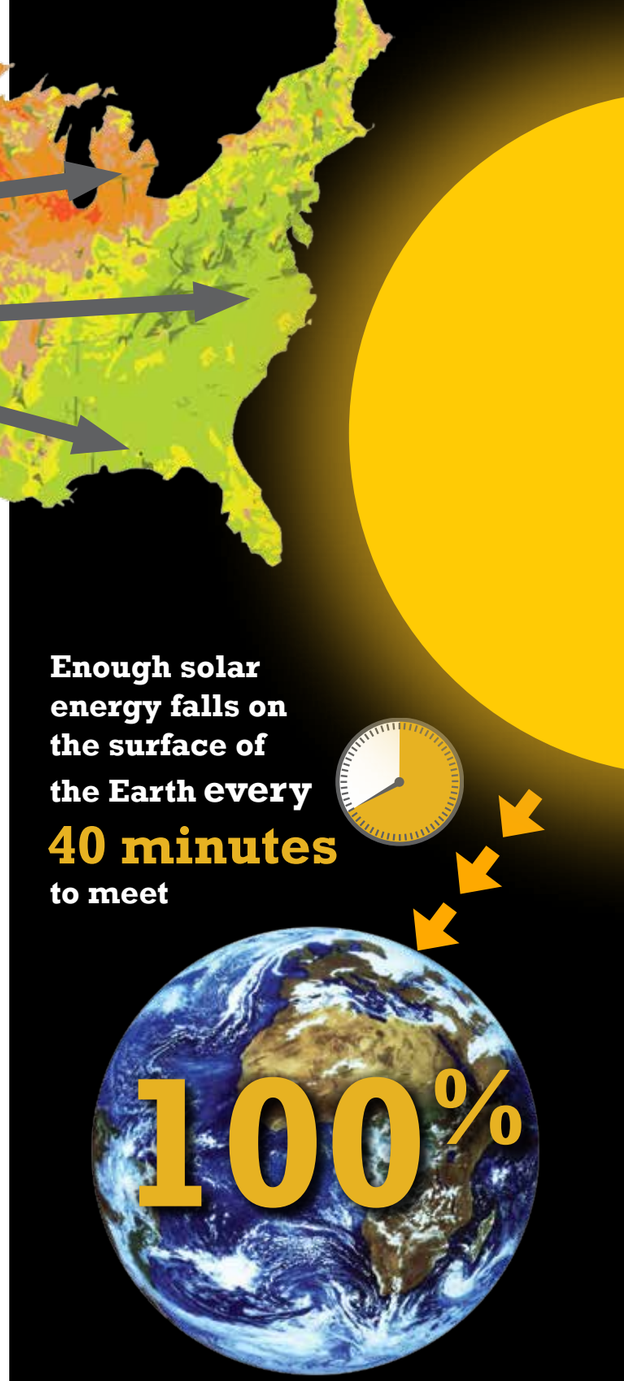
What if we could use fuels that are not expensive, don't cause pollution and are abundantly available right here at home?

We have such fuels. Scientists have confirmed that enough solar energy falls on the surface of the Earth every 40 minutes to meet 100 percent of the entire world's energy needs for a full year. Tapping just a small portion of this solar energy could provide all of the electricity America uses. And enough wind power blows through the Midwest corridor every day to also meet 100 percent of US electricity demand. Geothermal energy, similarly, is capable of providing enormous supplies of electricity for America.

The quickest, cheapest and best way to start using all this renewable energy is in the production of electricity…. But to make this exciting potential a reality, and truly solve our nation's problems, we need a new start. That's why I'm proposing a strategic initiative designed to free us from the crises that are holding us down and to regain control of our own destiny. It's not the only thing we need to do. But this strategic challenge is the lynchpin of a bold new strategy needed to re-power America.

The Challenge: Setting Our Targets High

I challenge our nation to commit to producing 100 percent of our electricity from renewable energy and truly clean carbon-free sources within 10 years. This goal is achievable, affordable and transformative. It represents a challenge to all Americans, in every walk of life: to our political leaders, entrepreneurs, innovators, engineers and to every citizen.



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A few years ago, it would not have been possible to issue such a challenge. But here's what's changed: the sharp cost reductions now beginning to take place in solar, wind and geothermal power coupled with the recent dramatic price increases for oil and coal have radically changed the economics of energy.…

Sure enough, billions of dollars of new investment are flowing into the development of concentrated solar thermal, photovoltaics, windmills, geothermal plants and a variety of ingenious new ways to improve our efficiency and conserve presently wasted energy. And as the demand for renewable energy grows, the costs will continue to fall.…

Defying the Status Quo: Focusing on What's Possible

To those who argue that we do not yet have the technology to accomplish these results with renewable energy: I ask them to come with me to meet the entrepreneurs who will drive this revolution. I've seen what they are doing, and I have no doubt that we can meet this challenge.

To those who say the costs are still too high: I ask them to consider whether the costs of oil and coal will ever stop increasing if we keep relying on quickly depleting energy sources to feed a rapidly growing demand all around the world.

When demand for oil and coal increases, their price goes up. When demand for solar cells increases, the price often comes down. When we send money to foreign countries to buy nearly 70 percent of the oil we use every day, they build new skyscrapers and we lose jobs. When we spend that money building solar arrays and windmills, we build competitive industries and gain jobs here at home.

Even those who reap the profits of the carbon age have to recognize the inevitability of its demise. As one OPEC oil minister observed, "The Stone Age didn't end because of a shortage of stones."

Of course there are those who will tell us this can't be done. Some of the voices we hear are the defenders of the status quo—the ones with a vested interest in perpetuating the current system, no matter how high a price the rest of us will have to pay. But even those who reap the profits of the carbon age have to recognize the inevitability of its demise. As one OPEC oil minister observed, "The Stone Age didn't end because of a shortage of stones."

To those who say 10 years is not enough time, I respectfully ask them to consider what the world's scientists are telling us about the risks we face if we don't act in 10 years. The leading experts predict that we have less than 10 years to make dramatic changes in our global warming pollution lest we lose our ability to ever recover from this environmental crisis. When the use of oil and coal goes up, pollution goes up. When the use of solar, wind and geothermal increases, pollution comes down.

To those who say the challenge is not politically viable: I suggest they go before the American people and try to defend the status quo. Then bear witness to the people's appetite for change. I for one do not believe our country can withstand 10 more years of the status quo. Our families cannot stand 10 more years of gas price increases. Our workers cannot stand 10 more years of job losses and outsourcing of factories. Our economy cannot stand 10 more years of sending $2 billion every 24 hours to foreign countries for oil. And our soldiers and their families cannot take another 10 years of repeated troop deployments to dangerous regions that just happen to have large oil supplies.

Looking Back: Inspiration for Moving Forward

What could we do instead for the next 10 years? What should we do during the next 10 years? Some of our greatest accomplishments as a nation have resulted from commitments to reach a goal that fell well beyond the next election: the Marshall Plan, Social Security, the interstate highway system. But a political promise to do something 40 years from now is universally ignored because everyone knows that it's meaningless. Ten years is about the maximum time that we as a nation can hold a steady aim and hit our target.

When President John F. Kennedy challenged our nation to land a man on the moon and bring him back safely in 10 years, many people doubted we could accomplish that goal. But 8 years and 2 months later, Neil Armstrong and Buzz Aldrin walked on the surface of the moon.

Overcoming the Obstacles and Rising to the Occasion

To be sure, reaching the goal of 100 percent renewable and truly clean electricity within 10 years will require us to overcome many obstacles. At present, for example, we do not have a unified national grid that is sufficiently advanced to link the areas where the sun shines and the wind blows to the cities in the East and the West that need the electricity.

When President John F. Kennedy challenged our nation to land a man on the moon and bring him back safely in 10 years, many people doubted we could accomplish that goal.

But 8 years and 2 months later, Neil Armstrong and Buzz Aldrin walked on the surface of the moon.

Photo courtesy NASA

I've begun to hear different voices in this country from people who are not only tired of baby steps and special interest politics, but are hungry for a new, different and bold approach.

Our national electric grid is critical infrastructure, as vital to the health and security of our economy as our highways and telecommunication networks.

Today, our grids are antiquated, fragile and vulnerable to cascading failure. Power outages and defects in the current grid system cost US businesses more than $120 billion a year. It has to be upgraded anyway. We could further increase the value and efficiency of a Unified National Grid by helping our struggling auto giants switch to the manufacture of plug-in electric cars. An electric vehicle fleet would sharply reduce the cost of driving a car, reduce pollution and increase the flexibility of our electricity grid.

At the same time, of course, we need to greatly improve our commitment to efficiency and conservation. That's the best investment we can make.

America's transition to renewable energy sources must also include adequate provisions to assist those Americans who would unfairly face hardship. For example, we must recognize those who have toiled in dangerous conditions to bring us our present energy supply. We should guarantee good jobs in the fresh air and sunshine for any coal miner displaced by impacts on the coal industry. Every single one of them.

Of course, we could and should speed up this transition by insisting that the price of carbon-based energy include the costs of the environmental damage it causes. I have long supported a sharp reduction in payroll taxes with the difference made up in CO_2 taxes. We should tax what we burn, not what we earn. This is the single most important policy change we can make.…

Of course the greatest obstacle to meeting the challenge of 100 percent renewable electricity in 10 years may be the deep dysfunction of our politics and our self-governing system as it exists today. In recent years, our politics has tended toward incremental proposals made up of small policies designed to avoid offending special interests, alternating with occasional baby steps in the right direction.…

But I've begun to hear different voices in this country from people who are not only tired of baby steps and special interest politics, but are hungry for a new, different and bold approach.…

So I ask you to join with me to accept this challenge: for America to be running on 100 percent zero-carbon electricity in 10 years.…We need to act now. This is a generational moment. A moment when we decide our own path and our collective fate.

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This contribution is an approved adaptation of Vice President Gore's challenge to the nation on July 17, 2008. Mr. Gore was the 45th vice president of the United States serving from 1993 to 2001. He is a Nobel laureate and global leader who has been engaging in research and coalition building for 30 years to halt the progression of climate change. He is currently the founder and chair of Alliance for Climate Protection, the cofounder and chair of Generation Investment Management, the cofounder and chair of Current TV, a member of the Board of Directors of Apple Inc., and a senior advisor to Google. In addition, Mr. Gore is on the faculty of Middle Tennessee State University as a visiting professor, and was a visiting professor at Columbia University Graduate School of Journalism, Fisk University and the University of California, Los Angeles.

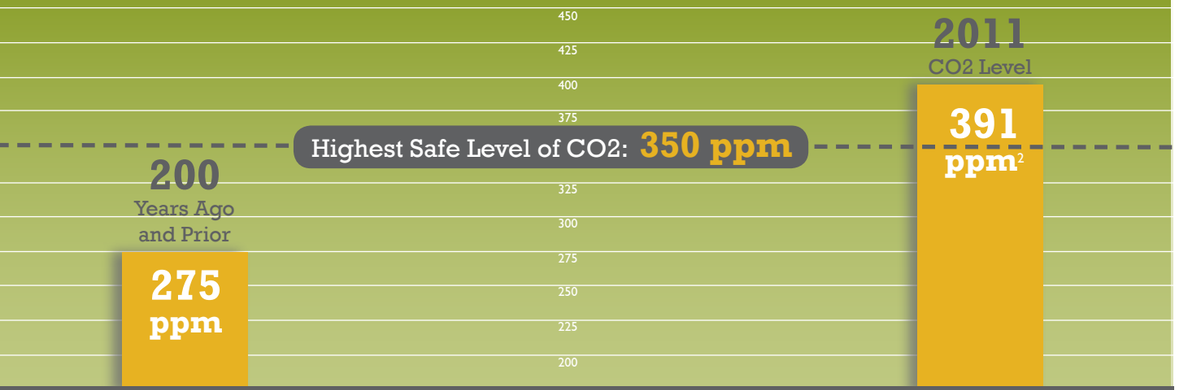

Photo courtesy NASA

Photo courtesy Flickr user jbaze, flickr


Photo courtesy 350.org

Atmospheric CO2 Concentrations

Prior to the Industrial Revolution of the late 19th and early 20th centuries, the carbon dioxide level was about 280 parts per million. That figure had changed very little over the prior 1,000 years. Today, the CO2 concentration is 391 ppm and rising about 2 ppm each year. The only time in history that we find evidence for carbon dioxide levels that high was 15 to 20 million years ago, when the planet was dramatically different.[1]



Scientists say that the increasing CO2 level is causing sea levels to rise, glaciers to melt, mosquitoes to spread, oceans to acidify and weather to become more severe. Getting back to 350 ppm is possible but will require phasing out fossil fuel use and adopting agricultural and forestry practices that sequester carbon.[3]

Pioneering organizations such as 350.org and the iMatter March are working to build global grassroots movements to solve the climate crisis through campaigns, organizing and public projects.[4]

from the editor

Youth Activism: Getting Serious About Climate Change

Alec Loorz, a 16-year-old activist is suing the federal government for failure to protect the atmosphere. "The time has now come for young people to stand up and hold our government accountable," said Loorz.[1]

In this landmark case against the government, Loorz along with youth climate activists in all 50 states and the District of Columbia, is asking the government to recognize that the atmosphere is a public trust that needs to be protected for future generations.[2]

"Our addiction to fossil fuels is messing up the perfect balance of nature and threatening the survival of my generation," wrote Loorz. "If we continue to hide in denial and avoid taking action, I and my generation will be forced to grow up in a world where hurricanes as big as Katrina are normal, people die every year because of heat waves, droughts, and floods, and entire species of animals we've come to know disappear right before our eyes."[3]

The lawsuit is backed by NASA climate scientist James Hansen and lawyers say there's precedence for such a case based on the Public Trust Doctrine, which states that common resources like water and air are held in trust by the government for the people and for future generations.[4]

Loorz wants to "let the world know that climate change is not about money, it's not about power, it's not about convenience. It's about our future. It's about the survival of this and every generation to come." He organized the iMatter March, a series of more than 100 marches across planet to empower youth to organize and be heard on the issue of global climate change.[5]

At 16 Loorz is no stranger to activism. At age 12 when his application to be a speaker with Gore's Climate Project was declined because of his age, he founded his own nonprofit organization, Kids Against Global Warming, and has since delivered climate change presentations to more than 200,000 youth and adults.[6]

Photo courtesy Alec Loorz and Kids vs Global Warming

"I'm always impressed with what young people can do before older people tell them it's impossible."

David Brower,
Founder Earth Island Institute


Photo courtesy Alec Loorz and Kids vs Global Warming

Building a Conservation Nation

What is the real potential of saving energy?

I love electricity. This may come as a surprise to those who have seen my documentary film "Kilowatt Ours." But it's true. Electricity provides a powerful service to me, my family and my work. This medium, as we experience it, is very clean. Its delivery to our light switches and outlets and appliances and electronics and toys is silent, instantaneous, seemingly magical.

The ostensibly clean, silent nature of electricity also contributes to the myth that it is free of negative consequences. So when people learn that mountains are being destroyed in the Appalachian region to generate power or that the 5.4-million-cubic-yard coal ash spill in Tennessee in 2008 was a direct consequence of generating electricity,[1] the usual response is dismay, surprise, shock and concern.

Jeff Barrie
Kilowatt Ours

Coal, Community Impacts and Vanishing Mountains

There are two methods of mining coal: underground and surface mining, more commonly called strip mining. Today, in the Appalachian region, more than 450 mountains, encompassing an area estimated to larger than 800 square miles, have been destroyed by an extreme form of strip mining. More than 7 percent of Appalachian forests have been cut down, and more than 1,200 miles of streams across the region have been buried or polluted. Mountaintop removal mining, if it continues unabated, is projected to destroy more than 1.4 million acres by the end of the decade.[2]

The process of mountaintop removal causes extreme flooding events, air and water pollution, a loss of biodiversity and disruption for impoverished communities in the valleys. The late Julia "Judy" Bonds, coal activist, Goldman Environmental Prize winner and daughter of a coal miner, called her communities of Southern Appalachia "America's sacrifice zone for cheap electricity." She and others have dedicated their life work to ending the destructive practice of mountaintop removal.[3]

America consumes more than one billion tons of coal annually, primarily for electric power.[4] A single train carrying this much coal would stretch across the US from coast to coast and back, then around the world three times.[5] The burning of coal for electricity is linked to acid rain, smog, global warming and toxic heavy metals circulating in the air we breathe.[6] Furthermore, coal-burning power plants are one of the largest users of water worldwide. Water withdrawals to produce electricity make up approximately 48 percent of total water use annually.[7]

Photo courtesy James Burling, Chase for Majora Carter Group, LLC

Top: An expanse of the Appalachian Mountains untouched by mining companies.
Bottom: The late Julia "Judy" Bonds looks on at a devastated area of the Appalachians.

Health Impacts of Burning Coal

Respiratory diseases in children and elderly are worsened by the pollution from coal-burning power plants. In recent years, scientists have shown that pollution from power plants is a major cause of asthma attacks, and one in five Americans lives within 10 miles of a coal-fired power plant.[8]

Mercury emissions from coal plants contaminate lakes and rivers. A recent US Environmental Protection Agency study examined fish from more than 200 streams, rivers and lakes nationwide and found 100 percent of the fish were contaminated with mercury and 25 percent

showed levels beyond the EPA minimum safety standards.[9] The consumption of fish with high levels of mercury can cause brain damage and developmental disorders in unborn children.[10]

Conserving Energy: The Simple Solution

My definition of "energy conservation" is any act that reduces the amount of conventional energy used to maintain our lifestyles, conveniences and economic well-being. Conservation includes using energy-efficient technologies along with changing our behaviors and choices. I believe conservation is our greatest untapped and readily available domestic energy supply. Today we waste about the same amount of energy as we use, so we produce twice the amount that we actually use.

We made small changes. Our upfront investment was less than $300. Our electricity bills dropped by half almost immediately.

ENERGY CONSERVATION

Any act that reduces the amount of conventional energy used to maintain our lifestyles, conveniences and economic well being.

Conservation includes using energy-efficient technologies along with changing our behaviors and choices.

I believe conservation is our greatest untapped and readily available domestic energy supply.

Can power strips, efficient light bulbs and seemingly tiny choices such as turning off a light switch make a difference in solving the great energy challenges of our day? The evidence I found says "absolutely!" Our individual choices make all the difference. In the US, residential and commercial buildings consume about half of all the energy used each day.[11] This is a major source of the problem and, at the same time, a clear starting point for a workable solution. To confirm this, I needed proof. So, I made a documentary film about it.

Conservation in the Home

I started in my home. My wife and I changed all of our light bulbs to energy-saving compact fluorescents. We replaced our 1970s model energy-hogging fridge with a used energy-efficient model we found at a local appliance store. We turned off lights and electronics when not using them. We made small changes. Our upfront investment was less than $300. Our electricity bills dropped by half immediately, begging the question, "What if every home in America were to implement these simple changes?" In my search for the answer, I discovered that I wasn't the only one striving to conserve.

Energy-Efficient Renovations in Buildings: A Look at Schools

I canvassed our nation to find the true potential of energy conservation. One of the greatest examples I found was Sullivan County School District in rural east Tennessee. Beginning in 2001, school officials spent $24 million to upgrade each of its 24 school and administration buildings with energy-saving measures and technologies. The magic of their program is that the hefty price tag was paid for over time with the savings from reduced operating costs, rather than paying for the project upfront. In other words, instead of paying for wasted energy, Sullivan County is now using that money to pay for its new windows, lighting, boilers and chillers and energy management systems.

Photo courtesy NCinDC

Sidwell Friends School in Washington, DC is one of the greenest schools in the US according to the US Green Building Council's Leadership in Energy and Environmental Design (LEED) green building certification system.

Currently Sullivan County School District is realizing a savings of 40 percent on power usage and costs, and nearly half of the upfront investment has been recouped. If one school district can do this, our entire nation of school buildings could do the same.

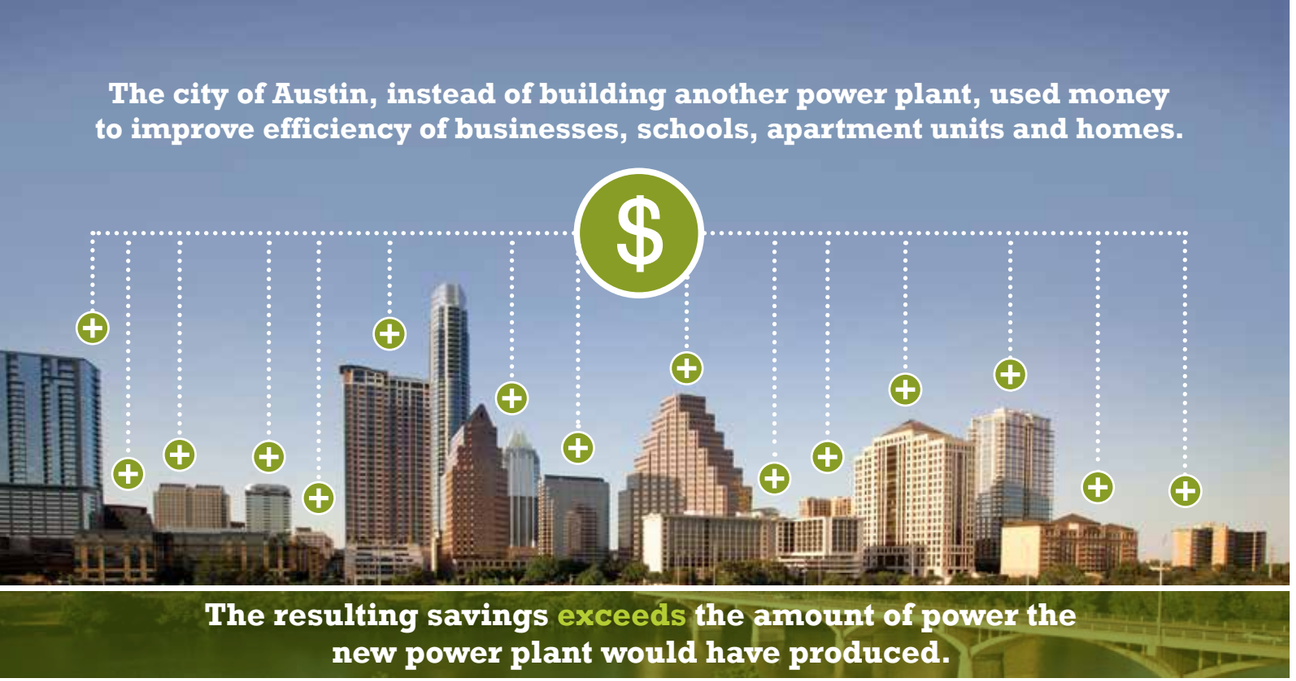
Can power strips, efficient light bulbs and seemingly tiny choices such as turning off a light switch make a difference in solving the energy challenges of our day? The evidence I found says "absolutely!"

In addition to recovering project costs and reduced utility bills, investments in energy efficiency have other benefits as well. The non-profit Apollo Alliance estimates that a $10 billion federal investment in energy-efficient retrofit and conservation programs would result in more than a 100,000 new jobs and reduce energy use in new and existing buildings by 30 percent.[12] Fortunately this investment is part of the American Recovery and Reinvestment Act.

City-wide Conservation

It's one thing to see a small-scale example, but if we are to build a conservation nation, it must work on a large scale. My search for bigger examples of energy savings took me to Austin, Texas. Instead of building a new $500 million coal-burning plant, the City created a "conservation power plant." Implemented since the 1980s, the energy conservation programs initiated by the City of Austin have eliminated more wasted energy than new demand, helped to create jobs, reduced energy costs, increased comfort in the built environment and kept all that coal in the mountains.

Austin Energy, the City-owned power company, used a portion of the money that was slated for the new coal plant to hire and train teams of inspectors to evaluate energy usage in businesses, schools, apartment units and homes. The energy inspectors found and repaired a wide variety of energy problems, including leaking duct work, inefficient lighting and appliances and poor insulation. Austin Energy provided rebates to its customers who



upgraded their inefficient technologies (refrigerators, lighting, etc.). Today, the City of Austin saves more than 700 megawatts of power each day, more than the output of one power plant.[13] This also exceeds the amount of power that the proposed new power plant would have produced (500 megawatts daily at best). They actually built a "conservation power plant!" Imagine if the Austin model were repeated in every city, town and community so that there was a "conservation power plant" worth of energy savings in every American city.

California Averts Energy Crisis with Conservation

In 2001, California faced massive power shortages, the supply of new energy had not kept pace with the demands of a booming population and economy. The state's leaders had a choice: Build new power plants or cut energy usage. The state government chose to conserve its way out of the crisis calling upon all citizens and businesses to do their part to reduce energy use. Through little more than widespread public education and incentives for energy conservation choices and behaviors, the state saved more than 5,500 megawatts of power that summer, or the equivalent of 11 power plants. Exemplifying the power of our small acts, 84 percent of the energy saved in California came from simple behavioral modifications such as turning off lights, unplugging electronics and adjusting thermostats. This offers more proof that conservation is a powerful resource, and abundant. The crisis was avoided without a single new power plant. I believe that a sustained education campaign on a national level can have similar results for America, and our globe, much faster than many would believe possible.

A universal law of action states "in crafting a solution to any problem, the simplest answer of least expense is the best one to adopt first." Conservation ought to be the top priority, and when we've exhausted all energy-saving opportunities, eliminated all the wasted energy we can reach, then and only then, it is time to invest in risky, capital-intensive new power plants. When we all dream, believe, then act, the world can change with the flip of a switch, to a degree greater than many believe is possible in the current reality. My dream is a nation where energy conservation is the centerpiece of our energy policy, all the way down to the individual choices each of us makes. If one household can, then all households can. If one school district can, then all schools can. If one city can, then every city can. If one state can, then so can a nation. Our nation will be strengthened as we become responsible stewards of the abundant energy resources available to us.

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Today, the city of Austin saves more than 700 megawatts of power each day. This exceeds the original power plant, which would have provided 500 megawatts daily at best.

In 2001, California saved more than 5,500 megawatts of power, or the equivalent of 11 power plants. Eighty four percent of the energy saved came from simple behavioral modifications such as turning off lights, unplugging electronics and adjusting thermostats.

TOP 6 steps to conserve

		SAVE $	Lbs coal
1	Replace the 5 most used lightbulbs with compact fluorescent bulbs	$90/yr	662 lbs
2	Plug into power strips and turn them off when not in use	$95/yr	720 lbs
3	Set hot water heater to 120° and use low-flow showerhead	$40/yr	225 lbs
4	Adjust the thermostat to 68° in winter and 78° in summer	$115/yr	864 lbs
5	Weatherize and seal windows, doors, air ducts, etc	$260/yr	1,872 lbs
6	Use a portion of your savings to pay for green power	$$$$$$	1,800 lbs

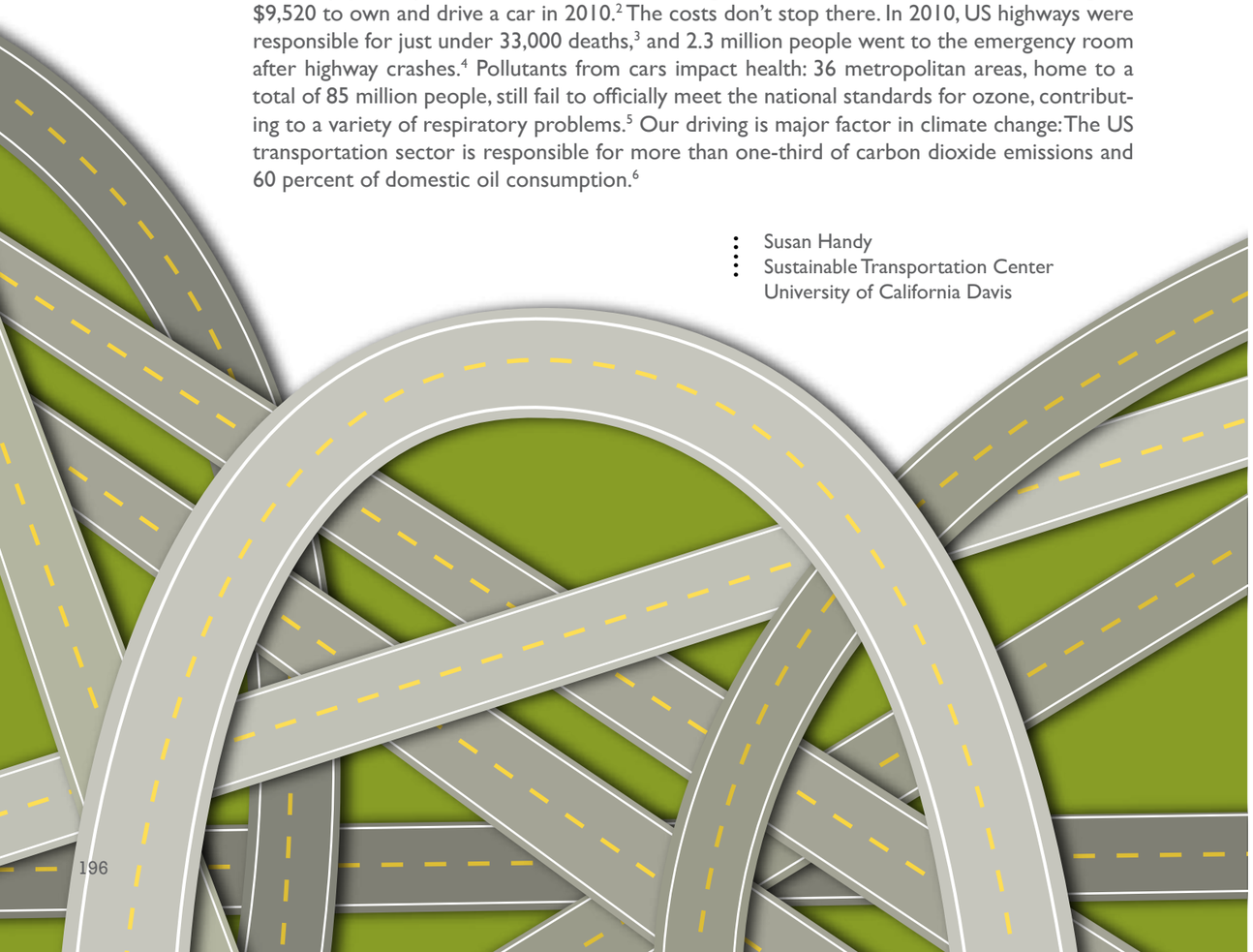
Jeff Barrie has been producing independent documentary films since 1993, films that show how we are all part of the solution to environmental challenges. His latest film and non-profit project Kilowatt Ours (www.kilowattours.org) features an award-winning documentary film, a curriculum for K-12 schools and an energy savings workshop series for low-income neighborhoods in partnership with NES (Nashville Electric Service) and Tennessee Valley Authority. Barrie is working on a new film project called Pedaling a Dream *which he hopes will motivate more people to become involved in creating the clean, green world of our dreams. Barrie lives in Nashville with his wife and co-star of* Kilowatt Ours, *Heather, and their daughters Lily and Antonina.*

A U-Turn on Transportation

Americans have unparalleled freedom to go where they want when they want, quickly and directly, thanks to an incomparable highway system built through a century of public investment. They make good use of this freedom. The average American household drives over 58 miles per day, totaling nearly 25,000 miles per year.[1] We are, without question, an automobile society.

But we pay dearly for the convenience of driving. American households spent an average of $9,520 to own and drive a car in 2010.[2] The costs don't stop there. In 2010, US highways were responsible for just under 33,000 deaths,[3] and 2.3 million people went to the emergency room after highway crashes.[4] Pollutants from cars impact health: 36 metropolitan areas, home to a total of 85 million people, still fail to officially meet the national standards for ozone, contributing to a variety of respiratory problems.[5] Our driving is major factor in climate change: The US transportation sector is responsible for more than one-third of carbon dioxide emissions and 60 percent of domestic oil consumption.[6]

Susan Handy
Sustainable Transportation Center
University of California Davis



The average American household drives over 58 miles per day, totaling nearly 25,000 miles per year.

It doesn't have to be this way. Imagine a future in which you can get to work and the store and all the other places you need or want to go to—but spend less time in your car to get there. Imagine a future in which your car, for those times when you still need it, does not pollute our air or hasten global climate change. Such a future is possible, but it will take both technological advances and policies that enable us to drive less.

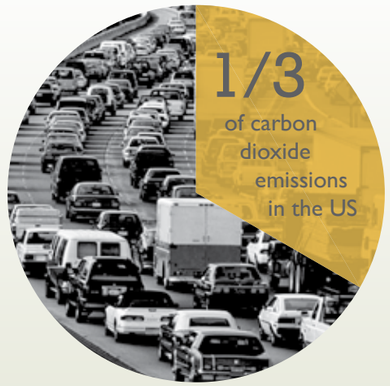
Technological Advances

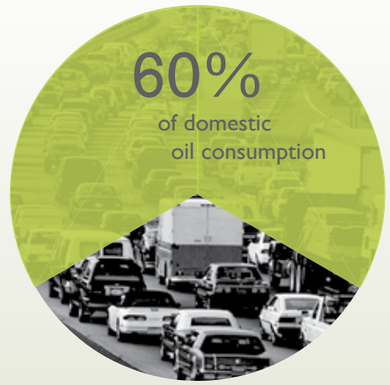
Reducing the environmental impacts of driving on a per-mile basis is largely a question of technology. US fuel-economy standards require all new vehicles, for each manufacturer, to average 34.1 miles per gallon (mpg) by 2016, up from 27.5 mpg for cars and 23.5 mpg for trucks. According to the White House, the new standard will reduce oil consumption by 1.8 billion barrels and reduce greenhouse gas emissions by 900 million metric tons.[7] While this is certainly an improvement, it doesn't yet match European Union and Japan standards, the most stringent in the world, at approximately 45 mpg and 43 mpg respectively.[8]

Reducing the use of petroleum fuels to propel our cars is also important. The next generation of plug-in hybrids and battery-electric vehicles are now coming into the market. Some plug-in hybrids can travel up to 100 miles on a fully charged battery, and new battery-electric cars can go more than 40 miles on a single charge before the gasoline engine takes over.[9] Hydrogen fuel cells, another way to provide electricity, are possible in 10 to 15 years,[10] though it may take a considerable investment of resources[11] before they would have meaningful impact on gasoline consumption and climate change.[12] Use of second-generation biofuels, derived from grasses, biomass waste and other sources like algae, could also be widespread within 10 to 15 years.[13] We don't yet know which technology, or which combination of technologies, will win out in the long run, but we do know that technology is going to change.

Costs of Convenience

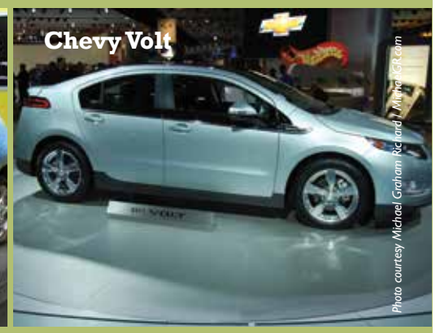
- The US transportation sector is responsible for 1/3 of CO2 emission in the US and 60% of domestic oil consumption.





- American households spent an average of $9,520 to own and drive a car in 2010.
- In 2010, US highways were responsible for about 33,000 deaths & 2.3 million injuries.

A 100 mpg fleet would eliminate the need to import foreign oil and drop domestic production by 800 million barrels/year, while saving every household $2,700 a year on gas.



The 100-MPG Car

The Rocky Mountain Institute, a national non-profit, has been working to accelerate electric vehicle technology for about two decades. Conceived of in 1991, the Hypercar vehicle concept combines ultra-light materials, a low-drag design and electric-drive architecture to create an efficient and financially viable vehicle.[1] With help from GM, Bright Automotive is turning the concept into reality with the Idea—a 100-mpg equivalent plug-in hybrid. The Idea will operate in all-electric mode for the first 30 miles before switching to hybrid mode for up to 400 miles.[2]

No longer a far-fetched dream, the all-electric car is a reality. The Nissan Leaf and the CODA sedan are the first two pure electric cars offered in the US. Neither requires gas to run although both use gas as the back up fuel and both claim to have a range of 100 miles from a full charge.[3] Although, it's not a pure electric vehicle, the Chevy Volt was named Car of the Year at the January 2011 Detroit Auto Show.[4] For the first time, consumers have viable options for kicking the oil habit.

from the editor

If every passenger vehicle in the US got 100 miles per gallon, the need to import oil would be eliminated.

Community Change

We must also find ways to reduce the amount of driving we do.[14] It is not easy for Americans to drive less, even when they want to. US communities are designed for driving, not for transit, walking or bicycling, and most Americans thus legitimately feel they need their cars. Reducing this need requires a comprehensive approach to community design and transportation policy that gives people the option to drive less and puts this option on more equal footing with driving.

Europe is much closer to achieving a reduction in driving. For example, Copenhagen has invested in major expansions of on- and off-street bicycle paths coupled with intersection improvements, protected bicycle parking and educational programs, resulting in a 70 percent increase in bicycle trips from 1970 to 2006.[15]

Minneapolis, which recently topped Bicycling magazine's list of the 50 most bike-friendly cities in America, launched the largest bike sharing program in the nation in 2010. It's called Nice Ride Minnesota. *This is one of 60 kiosks and 1,000 rental bikes sprouting up in high-traffic locations all around the Twin Cities.*

London implemented a congestion charging scheme in 2003 that requires drivers to pay a fee to enter the central area, with revenues used to improve transit service and bicycle infrastructure in the area. The scheme has reduced driving along with greenhouse gas emissions;[16] vehicle traffic in the charging area declined 16 percent in the first year,[17] while bicycle trips have grown by 17 percent per year.[18]

Models of reduced car use can be found outside of Europe as well. In Curitiba, Brazil, implementation of a well-planned bus system and an extensive network of bicycle routes transformed the city, producing a 30 percent reduction in car traffic, despite a doubling of population.[19] Bogota, Columbia, has followed a similar approach. Nearly 217 miles of bicycle lanes plus restrictions on motor vehicles at certain times and places generated an increase in the share of trips by bicycle.[20]

We can look to progress within the US too. Efforts in Portland, Oregon, to reduce auto dependence through expansions of light-rail and other transit service, investments in bicycle facilities and land-use policies that favor central city development over sprawl are paying off. The share of commuters bicycling to work more than tripled from less than 2 percent in 2000 to more than 6 percent in 2008,[21] while transit ridership has shown steady increases. In March 2010, Portland City Council unanimously passed the 2030 Bike Plan. The plan intends to make bicycling a cornerstone of Portland's sustainable transportation system with the ambitious goal of 25 percent of trips in the city by bike in 20 years.[22]

Policies to promote bicycling, walking and transit use will only succeed if land-use policies simultaneously encourage more compact development in which different land uses—residential, retail, offices, schools and so on—are within close proximity of one another. People can only walk and bicycle if their destinations are within walking and bicycling distance; transit works best if both people and destinations are clustered around stations. A number of different planning movements work toward this end: New Urbanism, Transit-Oriented Development and Smart Growth. As a key part of

Photo courtesy Manuel / Mario Roberto Duran Ortiz

Photo courtesy Felix Kramer

Carsharing: An Alternative to Owning a Vehicle

The carsharing concept can be traced back to 1948 in Switzerland.[1] The concept began gaining speed in the US in 2000 with the formation of Flexcar, which has since merged with Zipcar. Today small community-based, and even non-profit, carsharing programs are popping up across the US such as Boulder's eGo Carshare, Chicago's I-Go and San Francisco's City Carshare. Peer-to-peer carsharing services like Relay-Rides, Spride Share and WhipCar, which let you rent your car directly to strangers or share a single car among several friends are also becoming increasingly popular.[2] Carsharing works well in locales where public transit, walking, and cycling can be used most of the time and a car is only necessary for out-of-town trips, moving large items or special occasions. Today there are more than one thousand cities in the world where people can carshare.[3]

from the editor

Photo courtesy David Morgan

Stapleton's smart design allows for plenty of green space for the community.

An Urban Design Movement that Reduces Vehicle Usage

Developed on the site of Denver's former airport, Stapleton is one of the largest examples of New Urbanist design in the US. With nearly 10,000 residents, 6 schools, 500 acres of open space and 200 shops, restaurants and services, Stapleton is a mixed-use, walkable community with access to public transportation. Apartments and homes are priced for a wide range of incomes and are designed with street-facing front porches to encourage community interaction. The 25 miles of trails and bike paths promote a sense of community along with a reduced dependency on driving for day-to-day errands and activities.[1]

its effort to meet ambitious targets for reductions in greenhouse gas emissions, California is betting on such policies to help reduce driving, both by encouraging alternatives and by reducing distances when residents do drive.

Making it Happen

But how do we make this u-turn? These examples and others point to several possible triggers: federal mandates backed by targeted funding programs, state legislation that pushes change, visionary thinking in the private sector, farsighted leadership at the local level, strong advocacy from grassroots organizations, vocal demand from voters and consumers and individual commitment to action. It may take all of these forces to bring about a full reversal. While the US for the last century has been the model for building a car-dependent society, a model the rest of the world has been too eager to adopt, it can become a model for reversing this course in the century to come.

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Drive Less, Save More

If everyone in the US were to:	We could:
• Use public transportation one day per week	Save 10.4 billion gallons of gas[1] & reduce CO2 emissions by 1,040 lbs/person/yr[2]
• Walk 5 miles a week instead of driving	Save 2.6 billion gallons of gas/year[3] & cut CO2 emissions by 240 lbs/yr[4]
• Bike 25 miles a week instead of driving	Save 13 billion gallons of gas per year[5] and reduce CO2 emissions by more than 1,200 lbs/yr[6].

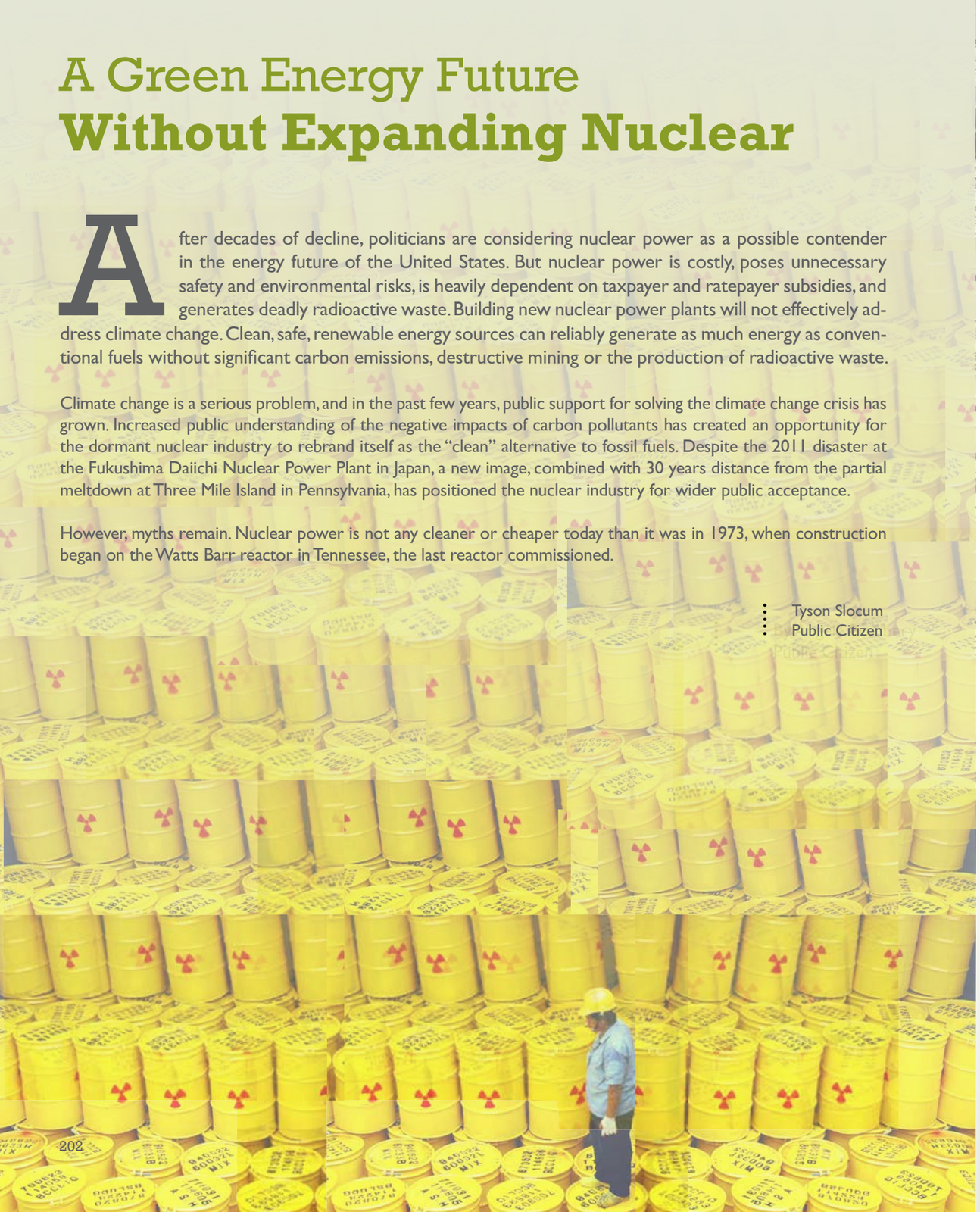
Dr. Susan Handy is a professor in the Department of Environmental Science and Policy and the director of the Sustainable Transportation Center at the University of California Davis (http://stc.ucdavis.edu). Her research on the link between the built environment and travel behavior has produced over 100 academic articles and other publications. Her current studies aim to improve understanding of the factors that influence the choice of bicycling as a mode of transportation. In recent years, she has worked with the Transportation Research Board, the Institute of Medicine, the World Health Organization, the American Planning Association and the Active Living by Design program on the role of city planning in creating communities supportive of walking and bicycling. She and her family have been happily bicycling in Davis, a widely acclaimed bicycle-friendly city, for the last eight years.

A Green Energy Future
Without Expanding Nuclear

After decades of decline, politicians are considering nuclear power as a possible contender in the energy future of the United States. But nuclear power is costly, poses unnecessary safety and environmental risks, is heavily dependent on taxpayer and ratepayer subsidies, and generates deadly radioactive waste. Building new nuclear power plants will not effectively address climate change. Clean, safe, renewable energy sources can reliably generate as much energy as conventional fuels without significant carbon emissions, destructive mining or the production of radioactive waste.

Climate change is a serious problem, and in the past few years, public support for solving the climate change crisis has grown. Increased public understanding of the negative impacts of carbon pollutants has created an opportunity for the dormant nuclear industry to rebrand itself as the "clean" alternative to fossil fuels. Despite the 2011 disaster at the Fukushima Daiichi Nuclear Power Plant in Japan, a new image, combined with 30 years distance from the partial meltdown at Three Mile Island in Pennsylvania, has positioned the nuclear industry for wider public acceptance.

However, myths remain. Nuclear power is not any cleaner or cheaper today than it was in 1973, when construction began on the Watts Barr reactor in Tennessee, the last reactor commissioned.



Tyson Slocum
Public Citizen

Clean, safe, renewable energy sources can reliably generate as much energy as conventional fuels without significant carbon emissions, destructive mining or the production of radioactive waste.

Myth 1: "Too Cheap to Meter"

Despite the promise nuclear proponents made more than 50 years ago that nuclear energy would be "too cheap to meter," the nuclear power industry continues to depend on taxpayer handouts to survive. Since its inception in 1948, the industry has received more than $145 billion in federal subsidies but remains unable to compete economically on its own.[1]

For instance, the industry could not survive without placing all the risk for new reactors on the shoulders of taxpayers via the Price-Anderson Act. An accident at a nuclear reactor could cost more than $600 billion, a financial risk no corporation would be willing to accept. Under this law, an operator's liability is capped at $10.5 billion.[2] Taxpayers would pick up the difference.

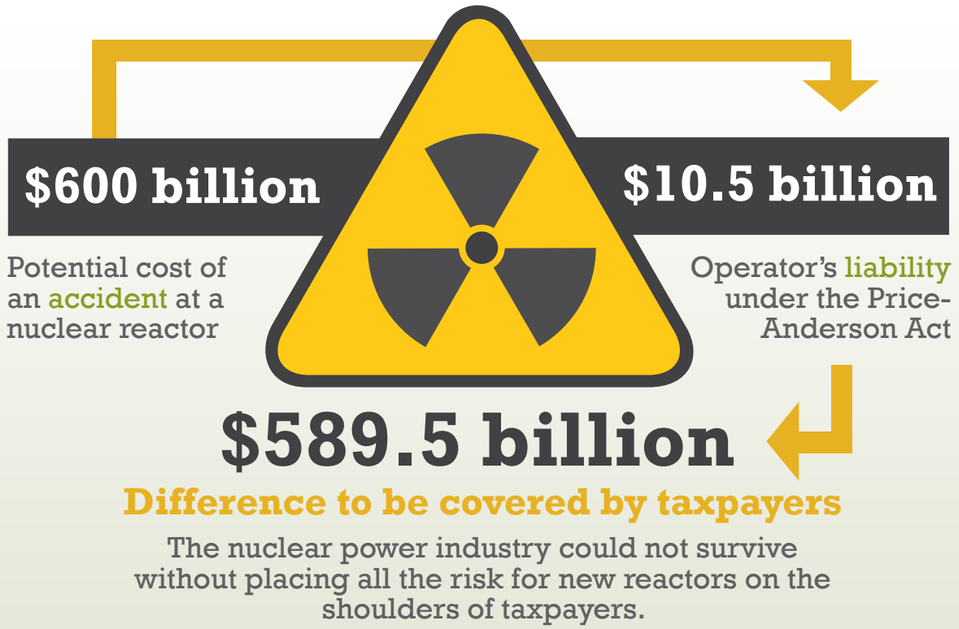
There is also the promise of loan guarantees that industry lobbyists secured in the Energy Policy Act of 2005. Under the program, the federal government promises to pay back loans used to build reactors in the event the builder defaults. Although initially designed to back "innovative energy technologies such as renewable wind and solar power," much of the money likely will be used to financially prop up nuclear reactors.

Using taxpayer money to financially back nuclear reactors puts taxpayers at a huge risk. The risk of default on loan guarantees for new nuclear plants is projected to "very high, well above 50 percent"[3]—not good odds for taxpayers. In fact, without the promise of loan guarantees, it's unlikely an energy company could secure a loan to build a new reactor, which can cost upwards of $10 billion.

Even with the subsidies, loan guarantees and limits on liability, some investors recognize that nuclear energy doesn't make financial sense. Early in 2008, financier Warren Buffett ended his pursuit of a nuclear power plant in Idaho after spending $10 million to evaluate the idea. Buffett's company, MidAmerican Energy, decided the numbers didn't add up to make the project viable.

Myth 2: "Environmentally Friendly"

The money Congress is still providing for the industry and the renewed interest in nuclear energy is based on the premise that relying on "low-emission" reactors will somehow address the global warming crisis because nuclear power is "environmentally friendly."



The nuclear power industry could not survive without placing all the risk for new reactors on the shoulders of taxpayers.

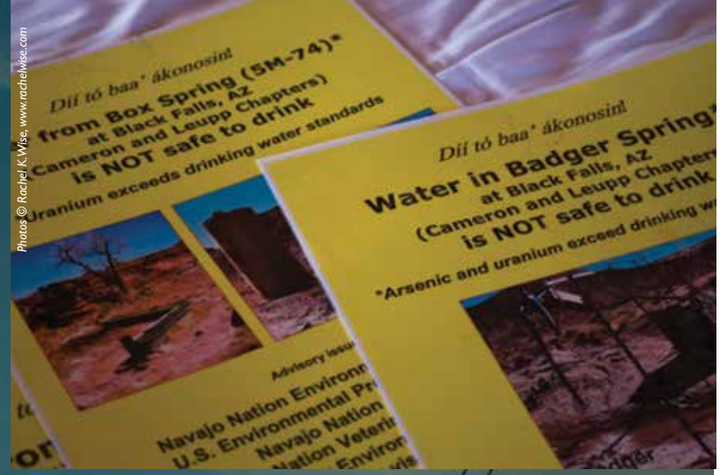
Photo courtesy Debra White Plume and Bring Back the Way www.bringbackthewy.com

The uranium deposit at Crow Butte in Nebraska was discovered in 1980. Now much of the region is contaminated.

During a 30-year period beginning in the 1950s, 3,000 members of the Navajo Nation worked in uranium mines; the consequences were devastating.

Thousands of uranium miners and their relatives lost their lives as a result of radioactive contamination.

Uranium mining on tribal lands continues today and Native communities continue to be exposed to the resulting pollution. Along with existing mines, abandoned and exploratory mines discharge radioactive waste into the groundwater, rivers and streams, that native people rely on.



Photos © Rachel K Wise, www.rachelwise.com

People of the Navajo Nation gather for a community meeting to discuss the water contamination problems in their area.

Photos © Rachel K Wise, www.rachelwise.com

Photos © Rachel K Wise, www.rachelwise.com

Residents collect water from their local spring, which is not fit for drinking because of uranium contamination from years of mining run-off.

Conventional uranium mining has caused dust and radon inhalation by workers, resulting in high rates of lung cancer and other diseases, and mining has caused serious contamination of groundwater.

Contrary to what the industry and its lobbyists want you to believe, nuclear power pollutes. Uranium, a finite resource like coal, fuels nuclear power. The process of mining, milling and enriching uranium produces radioactive waste and presents opportunities to contaminate soil, air and water. Uranium is mined by removing uranium ore or by extracting the uranium in a newer process known as in situ leaching. Most uranium mining in the United States takes place in Utah, Colorado, New Mexico, Arizona and Wyoming, and these areas of the

Alternative Fuels: Focusing on Smart Solutions

In our search for better, cleaner and more sustainable energy sources, we need to focus on the right solutions. Nearly all energy solutions carry inherent risk if not done correctly. Rather than promoting and subsidizing dangerous options, we need to make an unprecedented commitment to substantially increase energy efficiency in vehicles, homes, and factories and support clean, equitable sources of energy, such as solar and wind power. Here are just a few energy sources currently in use and under consideration.

Fuel	Potential Benefits	Dangers	Implications	Smart Alternatives
Natural Gas	Domestic fuel source Cleaner than other fossil fuels Efficient fuel source	"Fracking" (hydraulic fracturing) is used in 90 percent of drilling Drilling companies are exempt from the Safe Drinking Water Act[1]	Air, ground-water and well pollution Requires hundreds of toxic chemicals Each well uses millions of gallons of water	Regulation that prevents damage to the environment Require the gas industry to be accountable to the Safe Drinking Water Act
Corn-Based Ethanol	Domestic fuel source Renewable resource	Requires as much energy to produce than it generates when burned Soil erosion and water pollution from use of chemical fertilizers and pesticides	Maximum potential is only 12% of current US gasoline usage Expensive: anticipated cost to US tax payers is between $5.5 and $7.3 billion annually[2] Global food insecurity	Other forms of ethanol such as cellusosic which is derived from sugar cane waste, switch grass and other sustainable sources
Biomass	Domestic fuel source	Deforestation Now counted as carbon-neutral but could increase CO2 emissions substantially	Alters biodiversity, regional weather patterns, land use	Use sources that avoid deforestation such as switch grass, salvaged wood waste
Nuclear	Domestic fuel source Cleaner than other fuel sources	Requires uranium Processing results in radioactive waste	Groundwater, soil and air contamination from mining Mining is detrimental to the health of native communities Financially unsustainable: industry is subsidized by US government Radioactive waste leaks and spills	Renewable energy sources

Photo courtesy Tom Till Photography, www.tomtill.com

An aerial photo of the former Atlas tailings pile, lower right, next to the Colorado River near Moab, Utah. Tailings are often abandoned above ground and due to the proximity to the river, communities downstream are threatened with contamination.

country are now suffering from its effects. Conventional uranium mining has caused dust and radon inhalation by workers, resulting in high rates of lung cancer and other respiratory diseases, and mining has caused serious contamination of groundwater.

When conventionally mined, uranium metal must be separated from the rock in a process called milling, which forms large radon-contaminated piles of material known as tailings. These tailings are often abandoned aboveground. Twelve million tons of tailings are piled along the Colorado River near Moab, Utah, threatening communities downstream. In the process of in situ leaching, a solution is pumped into the ground to dissolve the uranium. When the mixture is returned to the surface, the uranium is separated and evaporated in slurry pools, and the remaining contaminated water has potential to seep underground and mix with drinking water sources.

Uranium mining has historically threatened the health and safety of tribal communities and continues to do so. A uranium mine in Nebraska has the Oglala Sioux Tribe concerned about the drinking water contamination. "Geo-chemically changed" contaminated water from the mining process is suspected of flowing into drinking-water aquifers.[4] During a 30-year period beginning in the 1950s, 3,000 members of the Navajo Nation worked in uranium mines, often walking home in ore-covered clothes. The consequences were devastating. Thousands of uranium miners and their relatives lost their lives as a result of radioactive contamination, and many families are still seeking compensation.[5]

In addition to the immediate effects, no country has found a permanent solution for the high- and low-level radioactive waste that nuclear energy creates. Generated throughout all parts of the fuel cycle, this waste poses a serious danger to human health. Currently, more than 2,000 metric tons of high-level radioactive waste and 12 million cubic feet of low-level radioactive waste are produced annually by the 103 operating reactors in the US.[6] This deadly waste, which is so radioactive it can't be moved for years, sits in more than 100 US facilities because there is nowhere to store it safely. Already, more than 54,000 metric tons of irradiated fuel has accumulated at the sites of commercial nuclear reactors in the US.[7]

from the editor

Photo courtesy US Navy, photo by Mass Communication Specialist 3rd Class Dylan McCord

An aerial view of damage to Sukuiso, Japan, a week after a 9.0 magnitude earthquake and subsequent tsunami devastated the region.

When an earthquake and tsunami caused explosions and nuclear reactor meltdowns at Fukushima Nuclear Power Plant on March 11, 2011, more than 1,600 plant workers were exposed to dangerous levels of radiation. Hundreds of thousands of residents were evacuated and tens of the thousands will never return to their homes. In the months following the incident, high levels of radioactive chemicals were found in food products from the area such as beef, tea, milk, seafood and many vegetables, which have since been recalled. High levels of radiation are suspected at elementary schools dozens of miles of way from the plant. Experts say it could take decades to clean up the area.[1]

Photo courtesy Derek Visser

Smoke at Fukushima-Daiichi nuclear power plant.

Photo courtesy Steve Herman

The Yamagata family has to deal with the damage done to their pharmacy along with concerns of radiation contamination after the 9.0 earthquake.

In response to the nuclear crisis in Japan, 250,000 people took to the streets demanding an end to nuclear power in Germany where 17 reactors provide 23 percent of the nation's energy. Under the enormous public pressure, the German government announced that all nuclear power plants would close and be replaced by wind and solar energy by 2022.[2]

Photo courtesy Cschirp

Start of the street protest against nuclear power in Essen Germany, April 2, 2011.

Trading one dirty energy source for another is not the only option. We don't have to choose between coal and nuclear.

The Answer

Trading one dirty energy source for another is not the only option. We don't have to choose between coal and nuclear. Renewable energy sources such as wind, solar and geothermal, along with increased energy efficiency, are better alternatives to meeting our energy needs than either coal or nuclear. It is technically and economically feasible to completely meet the energy needs of the US over the coming decades with them.[8]

Researchers at Stanford University recently evaluated the potential of wind power globally. After analyzing wind speeds in various locations around the world, the researchers concluded that wind could generate about one and a half times current annual world energy use.[9]

Existing solar electric technology could also make a significant contribution to energy production. According to a recent study, the US could accommodate about 1 million megawatts of photovoltaic (PV) panels by 2025, which would generate approximately half of current US electricity use.[10] With improvements in panel efficiency, the total long-term technical potential of solar PV in the US could provide more than three times current world energy use, according to a National Renewable Energy Laboratory analysis.[11]

Furthermore, a recent report out of Duke University by John Blackburn, professor emeritus, suggests that nuclear may be overtaking solar energy in its cost per kilowatt hour. The report, *Solar and Nuclear Costs: The Historic Crossover*, examines North Carolina's future energy costs using solar and nuclear sources. Their findings show that, at 16 cents per kilowatt-hour, solar energy becomes more affordable and a better investment. Nuclear plants take years to build, often with great delays. If solar energy can gain the same financial traction currently held by the nuclear industry, it will only become more financially accessible as demand grows.[12]

In addition to renewable technologies, using energy more efficiently is an important part of moving to a clean energy future. Efficiency is the cheapest and easiest way to reduce electricity use and facilitate the transition to renewable technologies.

Renewable energy opponents argue that renewable energy is far too variable and inconsistent to meet our energy needs because of weather conditions and natural cycles of availability. But a recent analysis by the International Energy Agency concluded that intermittency is not a technical barrier to renewable energy. Distributed generation, links across geographic areas, a diverse mix of technologies harnessing different resources and the continued development of storage technologies are potential solutions.[13] Renewable technology growth is steadily increasing its portion of the US energy portfolio. For instance, wind energy contributed up to 39 percent of all new US electric generating capacity in 2009.[14]

When you add up the safety and security risks, financial implications for taxpayers and environmental and community impact potentials, it is clear that nuclear power is not the answer to our future energy needs. It is time for a renewable energy revolution—one that is clean, secure, cost-effective and that will create the jobs and stability that we need.

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Tyson Slocum is director of Public Citizen's (www.citizen.org) Energy Program, where he promotes decentralized, sustainable energy and affordable clean-energy solutions. He also works to highlight the significant financial costs and safety risks associated with nuclear power and advocates legislative efforts to address climate change. In addition, Slocum serves on the Commodity Futures Trading Commission's Energy and Environmental Markets Advisory Committee. Prior to joining Public Citizen, Slocum was a policy analyst at the Institute on Taxation and Economic Policy. He received his BA from the University of Texas at Austin and grew up in Newport, Rhode Island.

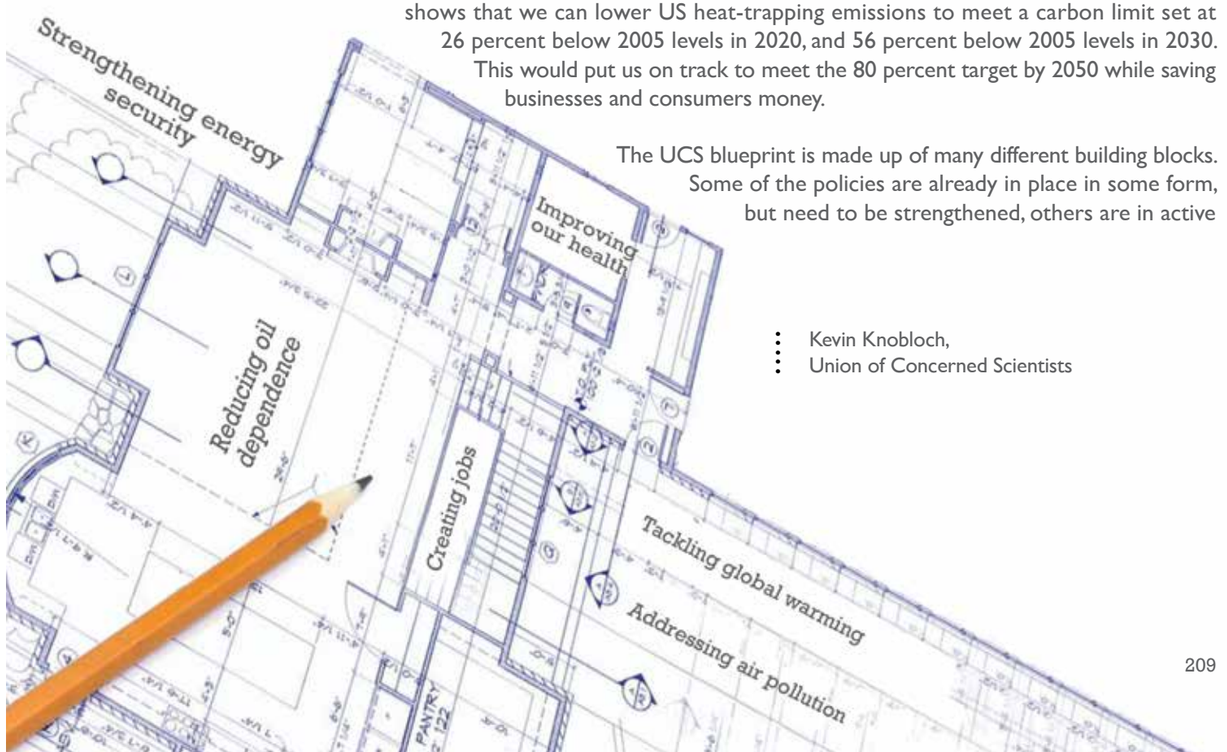
A Blueprint for a Clean Energy Economy

Reducing oil dependence. Strengthening energy security. Creating jobs. Tackling global warming. Addressing air pollution. Improving our health. These are just a few of the many reasons for the United States to move to a clean-energy economy, one that does not depend on oil, does not contribute to global warming and invests in technologies that will spur American innovation and entrepreneurship, create jobs and keep the US globally competitive. The transition to a clean-energy economy is under way, but the changes are still too gradual to reduce heat-trapping emissions sufficiently to protect the well being of our citizens and the health of our environment.

Recent analyses by the Union of Concerned Scientists (UCS) and other experts indicate that, even with aggressive action by other nations, the US must reduce its emissions by at least 80 percent below 2005 levels by 2050 to have a reasonable chance of avoiding some of the worst impacts of climate change. UCS has developed a comprehensive blueprint for the way forward. It shows that we can lower US heat-trapping emissions to meet a carbon limit set at 26 percent below 2005 levels in 2020, and 56 percent below 2005 levels in 2030. This would put us on track to meet the 80 percent target by 2050 while saving businesses and consumers money.

The UCS blueprint is made up of many different building blocks. Some of the policies are already in place in some form, but need to be strengthened, others are in active

Kevin Knobloch,
Union of Concerned Scientists



Recent analyses indicate that the US would need to reduce its emissions by 80% below 2000 levels by 2050 to have a reasonable chance of avoiding the worst impacts of climate change.

discussion, while still others may face large political hurdles, but are nonetheless finding opportunities through state, regional or administrative action. Meeting the blueprint's goals will require continued effort to foster further progress on all fronts. Every year we delay increases the risk of costly climate impacts.

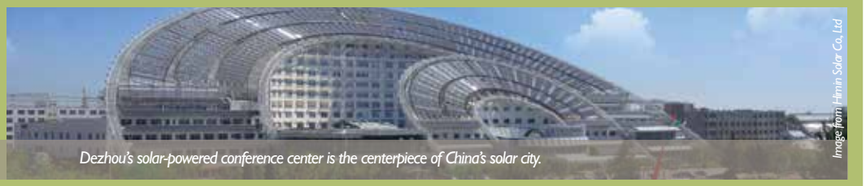
The Blueprint's Building Blocks

Energy efficiency: The energy used to power, heat and cool our homes, businesses and industries is responsible for nearly three-quarters of all US energy consumption and two-thirds of all US carbon emissions. Fortunately, some of the most significant and readily available global warming solutions can be applied in our industries and buildings. If every American home replaced one ordinary light bulb with an efficient one, we would save enough energy to light 3 million homes a year and prevent 9 billion pounds of greenhouse-gas emissions per year.[1] Weatherization programs, which will likely gain popularity with President Obama's "Cash for Caulkers" program, can reduce the average energy consumption of a single-family home by 12 to 23 percent or more.[2]

While installing energy-efficiency measures can reduce emissions and save consumers money, several market barriers are limiting their potential. Barriers include a lack of capital needed for upfront investments in more efficient technologies and a lack of information and expertise for purchasing and installing those technologies. The blueprint shows that increasing energy-efficiency standards for appliances, equipment and buildings and providing incentives for consumers to invest in efficiency are effective policies for overcoming market barriers.

Lower-carbon electricity: Almost half of America's electricity is produced by burning coal, helping to make heat-trapping emissions from power plants the country's greatest contributor to global warming. We can greatly reduce our reliance on fossil fuel–based electricity and create new jobs by shifting to clean, renewable energy sources that are commercially available and ready to be deployed today, such as wind, solar, geothermal and bioenergy. The

from the editor



Dezhou's solar-powered conference center is the centerpiece of China's solar city.

Image from Himin Solar Co, Ltd.

China's Solar Thermal City

In Dezhou, China almost everyone has a solar water heater. Of the city's 5.5 million residents about 90 percent of the homes have solar water heaters. A solar water heater in Dezhou costs about $190 and pays for itself in five and a half years. Solar thermal is much less expensive than gas or electric energy sources. A single-family sized unit can save 660 pounds of coal a year. Multiply that by 200 million families and that's 60 million tons of coal saving 500 million tons of carbon emissions annually, the equivalent of taking 42.5 million vehicles off the road.[1] Not coincidentally, Dezhou is home to the world's largest solar thermal manufacturer, Himin Group. The solar industry is a major employer in the city— about one-third of working-age residents have jobs in the industry— and that figure is only expected to increase. Himin Group company officials project that within 10 years 15 to 20 percent of the China's energy needs will be met by solar thermal energy.[2]

In the US, each Energy Star-certified solar water heater saves about 4,000 pounds of carbon emissions annually. If 40 percent of US homes installed solar thermal water-heating systems, the amount of CO2 saved would be the equivalent of shutting down every power plant in Mexico—about 104 million tons.[3]

Creating a Sustainable Energy Future With a Smart Grid

While much of the talk about our energy future has focused on renewable energy, a quiet revolution has begun that could reimagine our entire energy system. The idea is to marry information, automation and clean technology to create a "smart grid" that moves us toward the cleanest, cheapest and most reliable electricity choices.

In a smart grid world, home thermostats and appliances would adjust automatically depending on the current cost of power, and heating and cooling systems would be powered from the neighbor's rooftop solar panel. Business and facility managers would access a real-time display of energy costs through their cellphones and make adjustments remotely. Utilities would know instantly when the power goes out and would easily shift between conventional power plants and renewable sources.

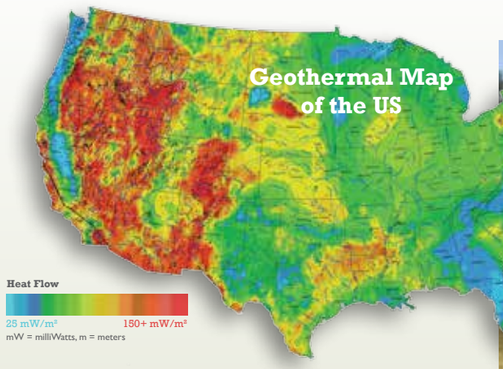
The US Department of Energy has calculated that smart grids could save about $75 billion and 135 gigawatts of energy over the next 20 years. That's about the same energy output of 170 standard size coal-fired power plants.

Ireland is a leader in smart grid innovation. The country obtains 20 percent of its electricity from wind turbines, and it recently built a smart grid that quickly switches to gas-fired generators when wind power lags.[1]

Plans for a smart grid and other clean energy technologies are underway in the US. The Obama administration's smart grid initiative was designed to speed development of a next-generation electrical network. Under the White House plan, administration will work closely with the nation's power companies as they invest in new power technologies, while a new Energy Department "research hub" will fund smart grid research and development.[2]

from the editor

"The US Department of Energy has calculated that smart grids could save about $75 billion and 135 gigawatts of energy over the next 20 years."



Hydrothermal sources on land across 13 western states have the potential capacity to produce an estimated 33,000 megawatts annually, enough to power about 7.5 million homes.

The Oregon Institute of Technology was the world's first university to be entirely powered from geothermal energy. Geothermal energy was chosen because Klamath Falls sits near a fault line, making it a relatively inexpensive and easily accessible resource.

blueprint shows that a national renewable electricity standard requiring electricity providers to produce at least 40 percent of the nation's power from sources like wind and solar power by 2030 is achievable and affordable for making this shift.

A study by the US Department of Energy found that wind power has the potential to provide more than 10 times the electricity that the country requires today. That study also showed that wind power could be expanded to 20 percent of the total by 2030 without affecting the reliability of the nation's power supply.[3] In fact, that level of wind power would create more than 500,000 new US jobs, displace 50 percent of the natural gas used to produce electricity, reduce coal use by 18 percent, reduce global-warming emissions from power plants by 20 percent and cost only 2 percent more than investing in new coal and natural gas plants (about 50 cents per month per household).

Installing solar photovoltaic panels, which use semiconducting materials to convert sunlight into electricity, on one percent of the nation's land area could potentially generate enough power to meet our entire annual electricity needs.[4] The National Renewable Energy Laboratory estimates that concentrating solar power (CSP) has the potential to generate roughly ten times the nation's entire current electricity capacity.[5] CSP, which works by using sunlight to heat a fluid that drives a turbine to produce electricity, is most often used in large utility-scale plants that are far from urban areas yet connected to the transmission grid. In 2010, the US solar energy industry employed more than 93,500 people—almost 10,000 more people than steel production.[6] One recent study estimates that the industry will create 440,000 permanent jobs and spur $325 billion in investments by 2016.[7]

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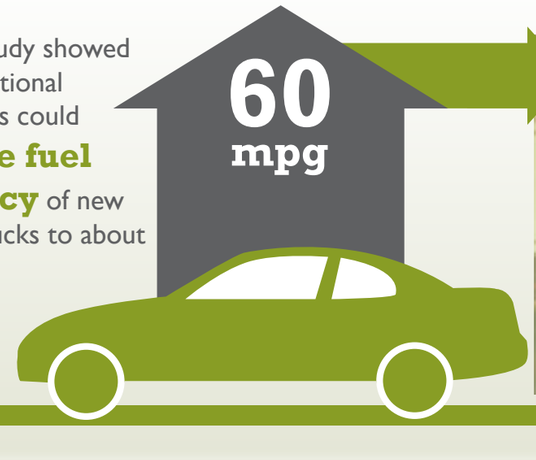
Geothermal energy—heat from the earth—can be used directly to heat and cool buildings and also to produce electricity in power plants. The US generates more electricity from geothermal power plants than any other country in the world, about two-thirds of it in California, where 43 geothermal plants currently provide nearly 5 percent of the state's electricity.[8] The US Geological Survey estimated that geothermal reservoirs of steam and hot water on private land and accessible public land in 13 western states have the potential capacity to produce an estimated 33,000 megawatts annually, enough to power about 7.5 million homes.[9]

Biomass energy, produced primarily from burning plants and organic residues generated by the agriculture and forest products industries, is the oldest source of renewable energy. The growth of biopower will depend on the availability of resources, land-use and harvesting practices and the amount of biomass used to make fuel for transportation and other uses. To account for potential land-use conflicts, to ensure sustainable production and to minimize the use of land that now grows food crops, UCS calculated that 367 million tons of biomass would be available to produce both electricity and biofuels, which has the technical potential to produce up to 19 percent of our current electricity needs.

to reduce annual premiums and create an incentive to drive less; and promoting the use of next-generation technologies such as high-speed rail and plug-in hybrid, battery and fuel-cell vehicles powered by renewable sources and lower-carbon electricity.

Each of these solutions will have an important impact, but the biggest savings in the next 20 years will come from more efficient cars and trucks. Recent studies from the US and California governments and UCS show that the average fuel efficiency of new cars and light trucks could reach as much as 60 mpg by 2025—

A recent study showed that conventional technologies could **raise the fuel efficiency** of new cars and trucks to about



which would cut carbon emissions **by more than one-half.**

Cleaner transportation: Transportation—commuting, traveling and shipping goods—produces the second-largest share of US global-warming emissions, increases air pollution and makes our nation dependent on the highly volatile oil market. Creating a more stable transportation system requires three steps: using technology to improve vehicle efficiency, shifting away from oil to cleaner alternatives and reducing the amount of time people spend stuck in traffic alone in their cars.

A broad suite of policies would help break our dependence on oil, including improving fuel economy in cars and trucks of all sizes; requiring the use of low-carbon fuels and supporting the launch of an industry to produce biofuels from grasses, wood waste, and even garbage; encouraging smart growth policies by insisting on more public transit in residential and commercial development; instituting pay-as-you-drive vehicle insurance an improvement that would more than double today's fuel economy, with most of that boost coming from conventional technology, including hybrids. Cars and trucks would cost about $3,000 more than the typical 34 mpg vehicle that will be required by 2016, but at future fuel prices ranging from about $3.50 to $4.50 per gallon, owners would save $6,000 to $7,000 over the average vehicle's lifetime, even after the initial technology costs are covered.[10] Additional research shows that even a fuel economy boost of about 12 mpg by 2018 would help create more than 200,000 jobs throughout the economy and more than 20,000 new jobs in the auto industry alone.[11] In other words, consumers would save thousands of dollars while cutting carbon emissions, reducing oil use and creating hundreds of thousands of new jobs.

A limit on carbon emissions: A limit on heat-trapping emissions in all sectors of the economy—


Photo courtesy Steve Ryan, flickr

"Burning entire forests is neither a solution to climate change nor a smart, efficient use of America's woodlands."

Being Smart About Biomass: Burning Forests Is Far From Clean Energy

As the nation recognizes the need for climate-friendly sources of energy, many options are being explored, including woody biomass—cutting and burning forests for electricity—as a renewable alternative to oil and coal. Proponents claim biomass is carbon-neutral because new tree growth absorbs the same amount of carbon as the old forest released when burned.

However, early experiments with biomass have a poor track record. A study commissioned by the state of Massachusetts found that over a 50 year period biomass and coal-fired power plants have roughly the same carbon footprint.[1] Over a longer period new trees may recapture some of those emissions, making biomass a more climate friendly choice than coal, but biomass will not be carbon-neutral any time soon.

Some critics have pointed out that the Massachusetts study only looks at biomass harvested from natural forests and that larger, industrial "tree farms" would absorb carbon faster. But a large biomass power plant would require turning enormous tracts of land into unproductive, monoculture forests. A single 200MW plant proposed in Ohio is estimated to require 730,000 acres of forest to fuel – an area roughly the size of Rhode Island. And even forests engineered for biomass are still estimated to take 40 years to regrow and absorb their carbon.[2]

Biomass is not all bad. Many smaller plants turn waste products into low-carbon energy, and many rural families run very energy efficient biomass furnaces with low-quality timber culled from local woods. But burning entire forests is neither a solution to climate change nor a smart, efficient use of America's woodlands.

from the editor

that puts a price on carbon and draws on the power of the marketplace to reduce emissions in a cost-effective and flexible manner – is a critical climate policy. The Blueprint's carbon limits were informed, and designed to be regularly updated, by the latest scientific information to ensure we are on the right track.

A carbon price would encourage companies to find ways to reduce these harmful emissions and would reward innovations in clean technology. We have successfully used this approach to curtail emissions of sulfur dioxide, a major component of acid rain. Those reduction goals were met three years early at a quarter of the anticipated cost and, most importantly, the billions of dollars of public health and environmental benefits outweighed the costs of the program by 40 to 1.[12]

Several states and regions in the country—including ten states in the Northeast and California—have implemented or are in the process of implementing carbon limits. There is strong interest in linking these initiatives to send a powerful, unified market signal favoring a clean and efficient energy system nationwide. The Environmental Protection Agency is also empowered to regulate global warming pollution under the Clean Air Act in order to protect public health and welfare. Beginning on Jan 2, 2011 it will, for the first time, be requiring some large power plants, oil refineries and industrial facilities to purchase permits for their emissions—a step that could prompt important improvements in energy efficiency at these facilities.

Smart Policies Bring Big Results

Taken together, the blueprint policies can help meet our emissions-reduction target in a cost-effective manner. Although they require upfront investment, the economic results are impressive, with consumers and businesses reaping a net annual savings of $255 billion in 2030. Consumers alone would save more than

Photo courtesy Takver

Thousands of cyclists gathered outside a museum in Melbourne as one of many events around the world to send a message to world leaders in Copenhagen in December, 2009.

$126 billion in 2030, about $900 per US household: $320 from lower costs for electricity, natural gas and heating oil and $580 from lower transportation costs.

Addressing climate change will require a concerted effort to show policy-makers and civic and business leaders that our climate and economy are intricately connected and that following the path toward a clean-energy future will not only help ensure a healthy climate for future generations but also encourage long-term economic prosperity. Implementing the approaches outlined in the blueprint is an important step down this path. And as recent climate and economic research shows, the most expensive thing we can do is nothing.

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Kevin Knobloch brings 32 years of experience in public policy, government, advocacy and media to his job as leader of Union of Concerned Scientists (www.ucsusa.org), the nation's leading science-based non-profit organization working for a healthy environment and a safer world. Knobloch was named president of UCS in December 2003, after four years as the executive director. In the 1980s, he was the legislative director for US Senator Timothy Wirth and legislative assistant for US Representative Ted Weiss. He began his career as an award-winning newspaper journalist.