International Energy Conservation®

The Economic and Environmental Importance of Energy Efficiency as a Resource; DSM in the Marketplace March 2008

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"Energy Conservation Saves More Than Energy"

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Preface

Energy Efficiency is the Rodney Dangerfield of energy resources. It just doesn't get enough respect and should be considered to have parity with renewable power generation in reducing fossil fuel generation.

The cleanest and least expensive power plant that you can build is the one you can avoid building because of reduction of demand.

Energy policy is often predicated on forecasting and modeling. However, "Prediction is very difficult, especially about the future."
Niels Bohr (Quantum Physicist who won the 1922 Nobel Prize—Physics; and worked on the Manhattan Project)

Historically, many of our country's leaders have posited for conservation and reduction of waste.
"Conservation means development as much as it does protection. I recognize the right and duty of this generation to develop and use the natural resources of our land, but I do not recognize the right to waste them, or to rob, by wasteful use, the generations that come after us." Theodore Roosevelt August 10, 1910

"At the time, the conventional wisdom among business and political leaders was that economic growth required constantly increasing electricity production. ….I thought we could meet the increased demand for electricity much less expensively through energy conservation….No matter how strong the evidence supporting it, conservation was viewed as a harebrained fantasy of fuzzy-headed intellectuals. Unfortunately, too many people still look at it that way." From "My Life" p.245 by former President Bill Clinton

As stated in a recent Southwest Energy Efficiency Project report: Efficiency and conservation are like the girls or boys next door we knew as kids—the neighbors we take for granted. Efficiency and conservation sit on the margins of our national dialogue about energy, quietly doing good work while advocates of more visible energy resources proclaim, declare, shout, and plead. The energy delivered by efficiency and conservation has the disadvantage of seeming invisible and immaterial. Efficiency does not come in barrels. You can't pipe conservation across state or national borders. We do not have highly publicized, acrimonious legal disputes over the siting of energy conservation plants on ecologically sensitive public lands in the West. We do not endure public flaps about the negative visual impact that energy efficiency will have for residents living along coastlines. Energy efficiency and energy conservation do not stir up the pulse or cause the heart to soar. They are silent, unobtrusive, and all too often ignored. On the other hand, energy efficiency and conservation present one of our best opportunities for creating a sustainable energy future that will both reduce our own troubles and earn us the admiration and gratitude of posterity.

Benefits of Energy Efficiency

There are significant benefits from employing greater energy efficiency. Among them are:

- Provides lower cost alternative to fossil fuel or renewable power generation
- Reduction of fossil fuel consumption
- Increase robustness of utility supply
- Reduce carbon footprints, greenhouse gas and other harmful emissions
- Exert deflationary effect on prices due to the price elasticity of demand
- Provide jobs in engineering, electrical installation, maintenance, commissioning, measurement and verification
- National Security
- Enhancement of security of energy supply
- Improve trade deficits, nationally and statewide in energy short states
- Provide societal benefits

Provides lower cost alternative to fossil fuel or renewable power generation

Cost comparison EE to Supply (per kWh)
Generation (CA)

DSM (Avg Cost 2000-2004)--$0.029

Supply Options

Base Load Generation $0.058
Shoulder Generation $0.118
Peak Generation $0.167

Reduce carbon footprints, greenhouse gas and other harmful emissions

- Energy efficiency (EE) and other low carbon resource options offer a hedge against carbon regulatory risks
- How carbon regulatory risk is analyzed and the manner in which EE is integrated into this analysis can potentially affect:
  - Whether the value of EE as a hedge against carbon risk is fully revealed
  - How much EE is acquired
  - How costly it ultimately is to comply with future carbon regulations

Recent data on carbon dioxide emissions from the Energy Information Administration:

CO2 Emissions, million metric tons

	1980	1997	2005
Europe	4672	4446	4675
US	4748	5544	5957
China	1455	3969	5323

1997 is significant because it's the year of the Kyoto Protocol. The United States and China — despite full knowledge of the risks to the climate — just keep pouring more and more GHG into the atmosphere. Future generations will not forgive us. Economic success often translates to an environmental disaster.

Provide societal benefits

Societal benefits are important—The increase in energy costs to low income and senior citizens energy costs emulate a regressive tax increase. They cause a disproportionate financial burden and hardship on those least able to bear it.

Enhancement of security of energy supply

There is a clear and present worldwide danger.
The global supply of power is tenuous.
Security of supply in the current environment is the No. 1 concern of utility companies worldwide, according to the first Utilities Global Survey produced by Price WaterhouseCoopers.
Supply concerns are heightened by the dramatic growth predicted for energy demand in the next three decades.
"Demand is now outstripping supply and world energy demand is expected to rise by two-thirds between 2003 and 2030," the PwC report said. "In the same period, global electricity sector investment needs are estimated at $US10 trillion, three times higher than the investment in the electricity sector during the last 30 years."

Quoting the 2004 PriceWaterhouseCoopers Global Energy Report

Security of supply tops the list of concerns

Energy supply is under threat. The industry is at a critical point. Unbundling has created both price and, more recently, supply uncertainty. The balancing act of generation, demand and transmission is under scrutiny. Demand is now outstripping supply and under-investment in infrastructure and grid capacity has led to blackouts in many countries. There is an urgent call to action from both utility companies and regulators to prevent further collapses.
Security of supply is now seen as the leading strategic aspect of the power market and industry and utility leaders around the globe are firmly focused on the issue. Respondents also point to increasing regulation and obligation and continuing wholesale price volatility as key aspects of the power market for the near future.

• Reducing energy use limits the destructive power of disasters, both natural and technological. In our current circumstances, the balance between energy supply and demand is a precarious one, and the slightest disruption in supply, such as that caused by hurricanes Rita and Katrina, will cause energy prices to shoot up. Reducing energy dependence will help us cope more effectively with these disruptions.

• Reducing energy use will play a crucial role in enhancing our national security in an age of terrorism and instability, decreasing our dependence on energy imports and thus making us

less vulnerable to the actions within unstable and unfriendly nations. Our demand for fossil fuels, particularly oil, puts our nation's security at risk. We import most of the oil we use, and much of it comes from unstable and volatile OPEC nations in the Persian Gulf. We are now importing twice as much oil as we did back in the 1970s, and it looks like this growth is set to continue into the future, even if we tap new domestic sources in Alaska, the Gulf of Mexico, and elsewhere. The Energy Information Administration projects that imported oil will account for 64 percent of the nation's oil supply by 2030. Increasing energy security is the bedrock of the nation's future well-being. Of all the practices that we can honor with the term "real patriotism," energy efficiency and conservation occupy a position right at the top.

Progressing climate change

The practical implementation of market-based solutions, as envisaged by the Kyoto protocol, is already starting to impact utility companies. The rapid introduction of the European Union Emissions Trading Scheme (EU-ETS) is shifting the value landscape for utilities in Europe and is providing a crucial test case for future market-based schemes to counter climate change. The impact on companies is still uncertain. But the need for new strategies and well-developed plans to address emissions is clear.

The timetable for the introduction of the EU-ETS has brought into sharp focus the need to accelerate planning, yet getting to grips with strategy in this new environment is proving challenging. In a survey, just 43 per cent of global respondents had a fully or partially operational strategy for climate change and a majority of 57 per cent had no operational strategy.

From the 2007 PriceWaterhouseCoopers Global Energy Report:

Power utility companies press the clean fuel and efficiency accelerator

A huge shift in thinking and action around energy efficiency and cleaner fuels is taking place in the power utilities sector, according to the ninth annual PricewaterhouseCoopers report "Energy and Efficiency: Utilities Global Survey 2007." The annual survey goes to the heart of boardroom thinking of 114 power companies in 44 countries and this year reveals a complete shift in the extent to which energy efficiency, renewables and nuclear power are at the top of company agendas.

Utilities companies world-wide expect wind and nuclear power to provide an increasing share of their market's energy consumption in the next five years. Last year, only 17% and 19% were looking toward these two fuel sources. By 2007, in the space of just 12 months, they were being mentioned by 48% and 45% of respondents. Climate change appears to have cemented its place in utility company strategies.

But the report warns that, without effective and consistent world-wide regulatory and market frameworks, actual progress may be limited.

Manfred Wiegand, global utilities leader, PricewaterhouseCoopers said:

It is clear that the climate of thinking and action around cleaner power, renewables and energy efficiency is shifting fast. The big question is the extent and pace of the actual shift that will take place in the energy mix. Economic signals and incentives will be critical for utility companies to be able to make a big shift. An effective signaling of carbon prices will need to

exist across all regions, crucially covering high-emitting and high-growth countries such as the US, India and China.

The survey shows an industry that believes that technological advances can take the world into a new era of energy efficiency. Expectations that technology can have an impact on energy efficiency have again shot up over the last 12 months from 22% to 81% among American respondents, from 33% to 43% in Europe and from 41% to 62% world-wide.
Utility companies believe that the greatest energy efficiency gains could come from end-users, of all kinds— industrial, commercial and, especially residential customers. Although utility companies feel that governments and end-users must set a lead on energy efficiency, companies are ready to invest significantly in efficiency, not just in their own production and transmission but also to help their customers become more energy efficient. Indeed, 72% of respondents from companies with supply businesses are making some investment in demand-side efficiency measures.
For the first time, the annual survey includes the viewpoints of top leaders from big industrial consumers of electricity in the metals, chemicals and paper sectors. Companies in these sectors are increasingly seeking to be in control of their own energy production and reduce dependence on utility companies. Investment in energy efficiency is a priority for all companies. In some instances, companies are considering moving production to lower price energy territories and many companies are stepping up investment in their own generation, often from renewable sources. There is also a view that utility companies could do more to structure their tariffs around the needs of their big energy consumers.

Security of supply concerns

Concerns about security of supply are intensifying. Utility companies across the world report that they expect to have to deal with supply and demand conditions that are significantly or, indeed, immensely' challenging. Seventy-one per cent of respondents rated the outlook in these terms a major rise from 51% in 2006. This includes 62% of North American respondents, 88% in South America, 70% in Europe, 76% in Australia and New Zealand , 66% in the BRIC countries and all respondents in the Middle East and Africa .

National supply endangered

As a separate and distinct danger, nuclear reactors across the Southeast could be forced to throttle back or temporarily shut down later this year because the drought is drying up the rivers and lakes that supply power plants with the huge amounts of cooling water they need to operate.

Methods and Technologies to achieve energy efficiency and peak demand

Although a decade ago, there were very few methods and technologies available to produce significant and cost-effective energy efficiency, there are now a plethora of choices. To name a few, there are technologies available in energy efficient lighting, higher efficiency motors and motor controllers, energy management systems, daylight harvesting, building envelope improvements, intelligent thermostats, and dispatchable load management. Building envelope improvements include such things as thermal barrier window coverings, better

insulation, reflective roofs. Dispatchable Load Management allows for control of customers' usage, frequently on a TOU basis, generally in order to reduce peak demand. For example, in Nevada, according to the utility provider's DSM Director Larry Holmes, an Air Conditioning Load Management DSM Program, is ramping up to reduce the need for a 100mW peaking plant. Dispatchable Load Management is often effectively outsourced to third-party providers.

End-user economic considerations for DSM Programs and Measures

Cost-Benefit Analysis

Traditionally, end-users have evaluated the economic viability and benefits of DSM measures by determining the "payback period"—dividing the cost of a measure by the annual savings. This yields a result expressed in "payback period," usually expressed in the number of years it will take to pay for the DSM measure. Typically, payback periods have been expressed in terms of a "simple payback". While this is reasonably useful, it is more accurate to use present values for the future year's savings. The "payback period" figure is important in determining source and application of funds for budgeting and debt service requirements.

Life-cycle Analysis

A more meaning measure of the true economic benefit of DSM measures is the "life-cycle analysis". This is determined by multiplying the annual savings times the number of years in which the DSM measure will have a useful service life. The delimiter is either the service life of the measure or the equipment that is controlled by the technology. In the event that the replacement equipment can be retrofitted within the EE controller, the delimiter of the service life of the measure can be used. The life-cycle analysis is important because it gives a true measure of the financial return on investment in the DSM measure.

The calculation should be based on the marginal cost of a DSM measure, calculating the difference between the less efficient technology and the more efficient technology.

Spillover benefit of increased retail sales and fewer sales returns from daylight harvesting

A recent study by the California Energy Commission noted a positive correlation between daylight harvesting and increased quality and quantity of sales. It noted that annual hours of useful daylight per retail store were strongly associated with increased sales. One study found that for a certain retail chain, all other things being equal, stores with skylights experienced 40% higher sales than those without skylights. Not all studies have shown as high an increase, albeit all do show measurable increases.

Due to better quality of color rendition—vividness and more naturally rendered appearance, any retailer whose products are distinguished by color, or where color is a key selection criteria can anticipate greater sales and possibly fewer returns due to poor color selection.

LEGISLATIVE AND REGULATORY INCENTIVES AND MANDATES

States should exercise leadership and set a conservation example.

Some Governors are adopting ambitious energy efficiency goals, usually 20% reduction of their energy consumption.

Energy efficiency initiatives are a key component of many state climate action plans

- Gov. Huntsman (UT) has adopted a goal of increasing energy efficiency 20% statewide by 2015; strategy for achieving the goal is nearing completion
- Gov. Ritter (CO) has adopted the WGA energy efficiency goal --20% increase in efficiency electricity use by 2020
- Other Governors are also considering adopting the WGA goal

Building Codes

There is an increasing contribution toward energy efficiency from building code requirements and appliance efficiency standards.

Mandates

The adoption of state climate plans is boosting support for energy efficiency initiatives
Utility energy efficiency (DSM) programs continue to grow

Rebates & DSM Incentives

As stated in the recent Southwest Energy Efficiency Project report:

- Reducing your energy use saves you money. Your energy bills shrink because you buy less of the product that energy companies sell. The savings can be substantial on every scale: for private homeowners, for renters paying their own energy bills, for small businesspeople, and owners and stockholders of large corporations. And there is a special value for low income families: energy efficiency and conservation reduce the burden of high energy costs, increasing a family's capacity to live comfortably, pay their utility bills, and avoid shutoffs.
- Reducing energy use, individually and collectively, leads to similar savings on a larger scale. For individuals, communities, and governments, saving energy will cost less than producing and distributing it. Turning natural resources – coal, oil, natural gas, biomass, geothermal heat, sunlight, and wind – into energy is an involved and expensive prospect. To fully calculate the cost of energy, to the expenses of finding and extracting the natural resources we have to add the expenses of transporting and transmitting the energy, the losses at each stage of energy conversion, the cost of building and maintaining the energy infrastructure, and the burdens of dealing with "externalities" (costs usually left out of the price paid for a commodity), including environmental damage, the human health consequences created by this whole process, and the protection of energy supplies from distant and in some cases hostile and unstable

lands. Energy efficiency and conservation save money at every level by reducing all these costs.

- Conserving energy means less environmental disruption and disturbance. Diminish our electricity use, and we need less coal mining and natural gas drilling.
- Reducing power plant operations reduces sulfur dioxide, nitrogen oxides, and mercury emissions, thereby cutting the air pollution and haze that affect public health and impair our views. Reducing the use of gasoline and diesel fuel improves urban – and rural – air quality. Less burning of fossil fuels of all types lowers our carbon dioxide emissions and thus the contributions we are making to global climate change. And less energy demand also means less water consumption by power plants and in our homes and workplaces. In the most down-to-earth way, energy efficiency and conservation will reduce our opportunities to quarrel, litigate, and accuse each other of bad behavior.

Evaluation, Measurement and Verification for efficacy and persistency

If Energy Efficiency is to be counted on as an energy efficiency resource, it is imperative that "negawatt" savings are measured accurately. Such accurate M&V and be accomplished by Certified Measurement and Verification Professionals (CM&V Professionals) using industry accepted standards. The M&V protocols of the Association of Energy Engineers is arguably the best current standard available.

Total Resource Cost ("TRC") Test

The TRC is generally used to determine the relative value of DSM measures versus the avoided costs of conventional fossil fuel generation. The Total Resource Cost test is a comparison of the costs and benefits of a demand-side management program to the cost and benefits of a comparable supply-side alternative from the perspective of the utility and program participants, including societal benefits. It is defined by the Federal Environmental Protection Agency as measuring the overall economic efficiency of a DSM program from the perspective of society. It measures net costs of a DSM program based on the total costs of the program, including both participant and utility costs.

Integrated Resource Planning ("IRP") Process

Not too many years ago, all electrical generation, other than Nuclear and Hydro-electric, was sourced from fossil fuel consumption. Now, because of the need to augment the traditional energy sources with renewables and energy efficiency, it is important to engage in the IRP process, performing a careful balancing of the various components of utility providers' production portfolio.

Energy Efficiency has gained importance in resource planning universally due to the fact that:

- Long-running programs have steadily increased the total impact in energy efficiency savings
- State mandated "stretch" EE goals sweeping the country
- Climate Action Plans/carbon management are gaining traction

Decoupling

Decoupling is a regulatory mechanism that removes the traditional disincentives for a utility to promote energy efficiency. It is gaining traction in more states. It disconnects how much money a utility makes from how much electrical power—its traditional core source of revenue— that it sells. In conventional utility regulation, utilities make money based on how much energy they sell. A utility's rates are set based largely on projected costs of providing service over a certain set time period, with an allowed profit margin, divided by a forecasted amount of unit sales over the same time period. If realized sales turn out to be as forecasted, the utility will recover all of its fixed costs and its set profit margin. If the actual sales exceeds the forecast, the utility will earn extra profit.

However, if actual sales fall below the forecast, the utility will earn less profit and may not be able to recover all of its fixed costs. Under traditional regulation, therefore, promoting any kind of energy efficiency measure is clearly against a utility's interest. Any type of measure to encourage green building or more energy efficiency appliances therefore often faces opposition from utilities because it would undermine their profit.

Decoupling breaks the nexus between the utility's ability to recover its agreed-upon fixed costs, including the profit margin, from the actual volume of sales that occur through a rate adjustment mechanism. If a utility promotes less energy use, they are rewarded rather than punished. Under decoupling, there are a different methods to compute the rate adjustment. The basic principle is that if the actual sales are less than what was forecasted, there is a slight upward adjustment in rates to compensate the utility. Adjustments typically would only be between 2-3 percent and some jurisdictions have applied caps on possible adjustments to protect consumers.

Any rate increase per kilowatt hour is usually offset by lower energy use and usually lower overall energy bills due to increased conservation and lower energy consumption. Typical rate changes due to current decoupling is almost imperceptible to consumers. Micro-economically, properly structured energy efficiency doesn't necessarily, in and of itself, reduce rates per kWh, but it should, and does, reduce customer bills. Macro-economically, however, the reduced energy consumption exerts a deflationary effect on energy costs, due to the price elasticity of demand. Furthermore, instead of utilities passing on the costs of building new plants to meet increased energy demand, under decoupling, consumers avoid the costs of new power plant construction and benefit instead from decreased energy consumption.

Portfolio Standard

More and more political entities are mandating utility providers to decrease traditional fossil fuel energy production. Probably the most common method of achieving this end is the imposition of a Portfolio Standard. Another method is expansion of utility DSM programs including performance-based incentives for utility shareholders and savings targets or standards, and continued emphasis on Energy Star® and beyond Energy Star® new construction In regions with high growth, this can accelerate the DSM portion of a utility's portfolio.

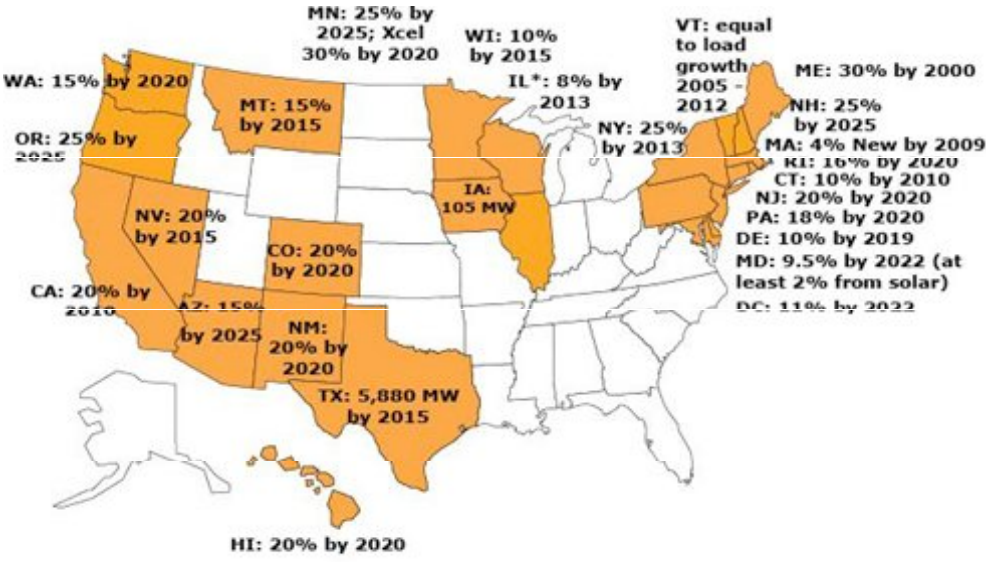
One of the regulatory and legislative "sticks" to reduce fossil fuel consumption is to require utilities to provide a portion of their energy portfolio from renewable (e.g. solar, wind, geo-thermal, tidal) sources. Such requisites are generally stated as a percentage of the utilities' overall resource portfolio. They are usually graduated, starting small and ratcheting up to a final target by a specific date. Historically, most states with such standards have started with a Renewable Portfolio Standard ("RPS"). In order to comply, utilities typically do so by one of the following methods:

- Own and operate "green" generating facilities
- Purchase renewable "green" energy from others
- Purchase credits "green tags" from those entities that are generating renewable power, usually under power purchase agreements ("PPAs") at reasonable and prudent costs.

Renewable Portfolio Standards States

The below map shows the states that have implemented an RPS, together with their targeted percentages and dates.

States with Standards for Electricity from Renewable Resources, 2007



* IL implements its RPS through voluntary utility commitments

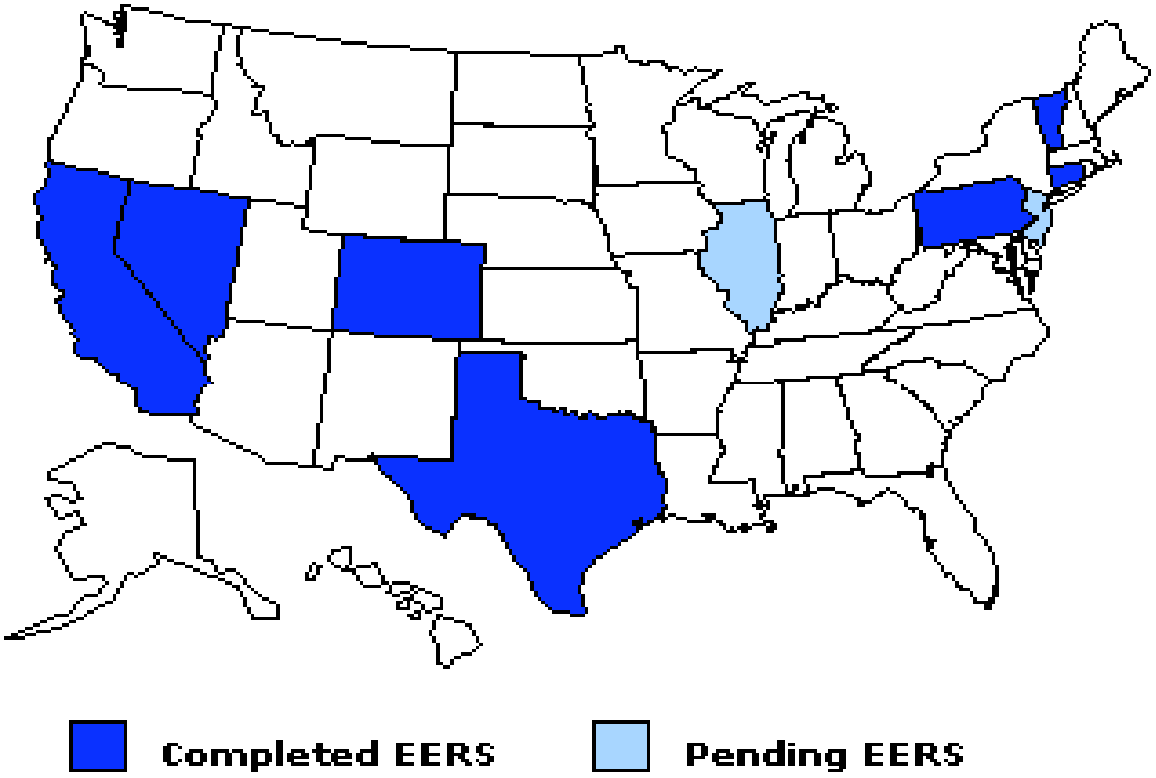
Source: Pew Center on Global Climate Change. 2007. "States with Energy Efficiency Resource Standards." March. Retrieved July 5, 2007, from http://www.pewclimate.org/what_s_being_done/in_the_states/ efficiency_resource.cfmSource; and "States with Renewable Portfolio Standards." June. Retrieved July 5, 2007, from http://www.pewclimate.org/what_s_being_done/in_the_states/rps.cfm.

Energy Efficiency Portfolio Standard States—Recognizing EE in the RPS process

Several states have recognized that energy efficiency is a co-equal with renewable power in reducing fossil fuel consumption, usually more cost-effective and faster to attain. Therefore, they have begun to include EE in their RPS, changing the nomenclature to "Portfolio Standard."

The below map shows the states that have, or are in the process of inserting Energy Efficiency as a component in their Portfolio Standard.

States with Standards for Energy Efficiency, 2006



Cap-and-trade Portfolio Credits

A substantial financial driver to provide the impetus for stakeholders to meet various environmental standards, including the implementation of DSM measures to meet portfolio standards is the availability of cap-and-trade programs. Such environmental credits as CO_2 and SO_2 have historically and routinely been traded, with the fledgling Chicago Climate Exchange even providing a marketplace for such credits. Renewable Portfolio Credits (commonly known as "Green Tags") have been gaining acceptance in the marketplace, with both mandatory purchasers (utilities satisfying their Renewable Portfolio Standard—"RPS") and voluntary purchasers (companies either enhancing their corporate image, or simply exercising responsible corporate governance by giving financial support to the "green" movement).

With the recent introduction in some states of Energy Efficiency measures into the [Renewable] Portfolio Standard, it is desirable for a Cap-and-trade market to develop for DSM Portfolio Credits (commonly known as "White Tags"—a registered service-mark for one of the country's leading Portfolio Credit brokers, Sterling Planet). This will provide a substantial financial driver for DSM, with the funding coming not from taxpayer-provided incentives, but rather as a trade-off ("avoided cost") of costly purchased power or more expensive fossil fuel generation.

In "Factor Four" Amory Lovins quotes Winston Churchill as saying that democracy is the worst system of government—except for all the rest. Similarly, markets are the worst way to implement something profitable—except for all the other ways. Markets, like democracy, require ceaseless effort by their participants to keep them working properly and to prevent them from being subverted, distorted or hijacked by those who wish them to work improperly. When they do work properly, they are phenomenally successful.

Legislative Incentives for Demand Side Management and Energy Efficiency

Federal Incentives

There has been substantial and fluid federal legislation aimed at providing incentives and standards to promote DSM.

A November 2007 analysis by the American Council for an Energy-Efficient Economy ("ACEEE") of the House Energy Bill (H. R. 3221) Renewable Electricity Standard (RES) provision shows that the RES reduces electricity rates, avoids the need for conventional power plant construction, and reduces carbon dioxide emissions. Part of these benefits stem from the RES allowance for energy efficiency to qualify for up to 27% of resource requirements. The analysis also looked at more aggressive renewable and efficiency RES targets, and examined RES policies against a climate policy framework. These scenarios showed even greater benefits from setting RES-type resource targets.

"This analysis dashes the notion that RES raises electricity rates. Our modeling shows that the RES reduces power prices, customer bills, and capacity needs in all parts of the United States," said Policy Director Bill Prindle. "Since renewable and efficiency resource standards also cut carbon emissions, they should be the cornerstones of U.S. energy and climate policy for the power sector."

Tax Credits and Tax Deductions

In the marketplace, most energy efficiency marketers have noted two main impediments to greater acceptance and adoption of energy efficiency retrofits—apathy and inertia of the status quo. Mere expense avoidance has not proved enough of a financial driver to effect the necessary change. Substantial tax credits and tax deductions help to provide the incentive to overcome these barriers.

There have been a variety of Federal Tax Credits and Tax Deductions. It should be noted that Tax Credits are more advantageous because they are dollar-for-dollar to the participant's bottom line, whereas tax deductions reduce taxable income, if any, against which is applied the taxpayer's taxable rate. If a program participant has no taxable income, there is no financial benefit to him. One of the significant such tax deductions is the $1.80 energy efficiency deduction. It is apportioned 1/3 each between HVAC, building envelope and lighting.

Tax Abatements and other Tax Incentives

In 2005, Nevada enacted a bill that gave companies that attain US Green Building Council LEED (Leadership in Energy and Environmental Design) Silver certification, or higher, a material reduction in property tax. It was initially approximately 50% for up to 10 years, and was reduced in 2007 to approximately 25% for up to 10 years, and requires a meeting of the LEED standard, plus supplemental energy efficiency credits. This type of credit reduces ongoing company expenses, regardless of whether or not the company is profitable, and is clearly a significant financial driver to induce companies to "go green."

Some members of Congress have strongly criticized the recent energy legislation, calling it the "non-energy bill' because it includes nothing to spur more domestic production of oil and natural gas or support for coal. Speaker Pelosi has responded, saying it was a "new direction" in energy away from fossil fuels toward more support for renewables and energy efficiency.

Many new energy efficiency and renewable energy technologies have been commercialized in recent years or are nearing commercialization. However, these technologies may never be produced or adopted on a significant scale due to their initial high cost, market uncertainty, lack of consumer awareness, and other barriers.

Tax credits and deductions provide incentives for manufacturers to initiate mass production and marketing for innovative energy efficiency technologies. Tax credits also help buyers offset the relatively high first cost premium for the new technologies, thereby helping to build sales and market share. Once the new technologies become widely available and are produced on a significant sale, costs and prices will doubtless decline and the tax credits can be phased out.

Tax credits are best applied where they will influence the choices made by consumers and producers, and where highly efficient products are eligible. However, if eligibility levels are set too low, then credits will go to those "free riders" who would have made the same choice without the incentive. Tax credits are properly sized if they influence decisions and the value of the incentive is not significantly greater than the cost to produce the technology.

Some desirable energy efficiency tax incentives include, but are not limited to:

- Appliances**:** a small tax credit—$100 or less—for manufacturers of highly efficient home appliances will help to produce the next generation of super-efficient appliances, thereby saving energy and water.

- Building equipment**:** an investment tax credit for innovative building technologies. Examples of appropriate products would be energy management systems, high efficiency motors and motor controllers, high-efficiency furnaces, distributed power and cogeneration plants, heat pumps, high-efficiency distribution transformers, solar-thermal water heaters.

- Commercial buildings**:** a tax deduction of investments in commercial buildings and multifamily residences that achieve a significant reduction in HVAC and other electrical costs compared to buildings meeting then current energy codes.

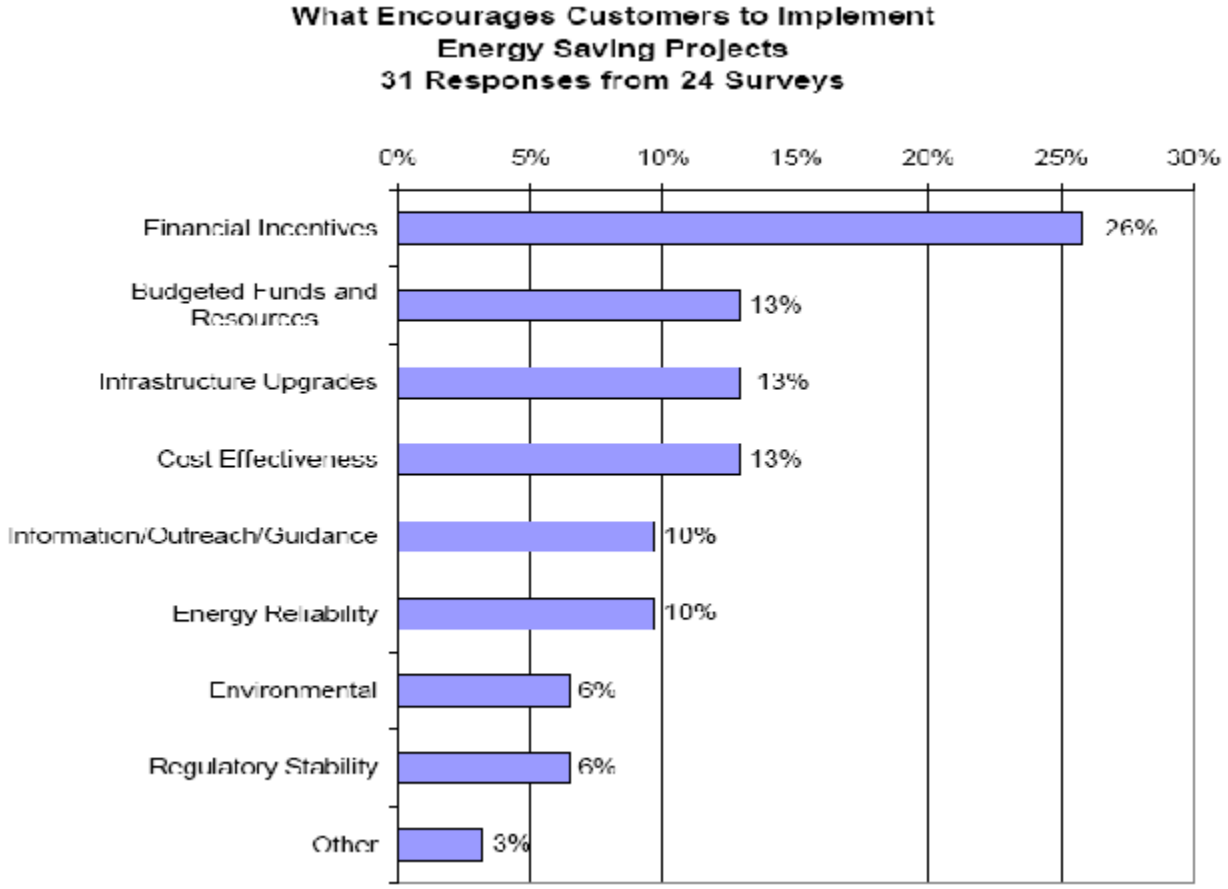
- Residences**:** a tax credit, with $1,000 for new homes exceeding current model energy codes by at least 30 percent and up to $2,500 for improvements that materially reduce energy use. These would stimulate efficiency and help lower housing costs for American families. They should be skewed in favor of lower income housing in order to provide appropriate societal benefits.

All such tax incentives should be assessed for reasonableness and affordability by the entity granting them, and appropriate caps should be put in place.

- The potential benefits of tax incentives for energy-efficient technologies include all of the benefits include all of the above enumerated benefits of energy efficiency (e.g. saving consumers and businesses money—estimated at $200Billion+/- over the next twenty years, reducing costs and risks for new technology manufacturers and distributors, increasing supply reliability, reducing foreign energy dependence, reducing demand for new power plants, improving air quality, slowing global warming and reducing GHG emissions.

C.E.C. Study: Financial Incentives are the #1 reason for implementation of energy efficiency

A recent study by the California Energy Commission surveyed reasons that customers were encouraged to implement energy saving projects. Traditionally, energy efficiency stakeholders have marketed energy efficiency projects based on their cost effectiveness. More recently, marketing has also focused on the environmental good citizenry that can be demonstrated by companies reducing fossil fuel consumption and their carbon footprint. However, the survey revealed that cost effectiveness was twice as important as environmental concerns. Even more telling, was that financial incentives such as utility rebates and government subsidies were considered to be twice as important as cost effectiveness (often referred to as cost avoidance).

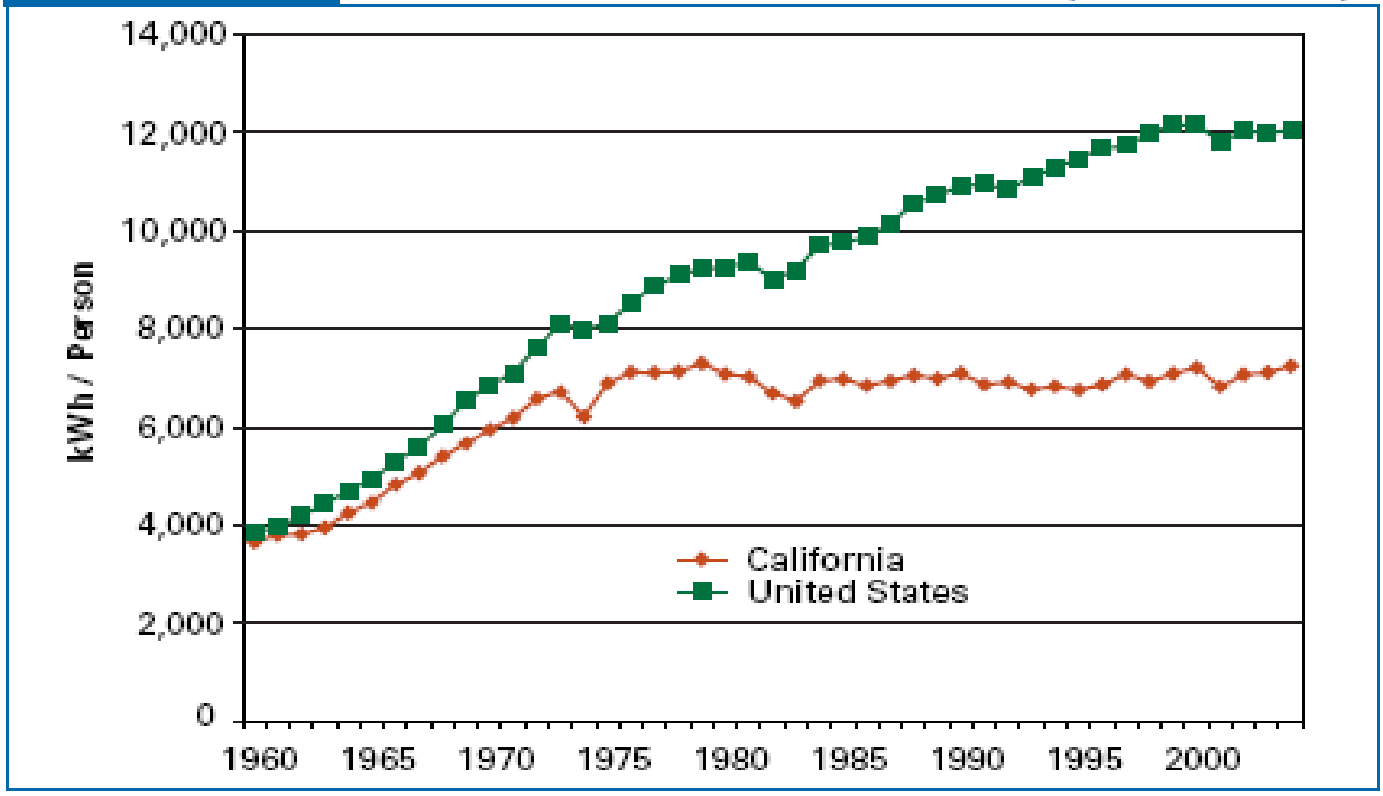


Utility Sector Energy Efficiency Programs and GHG Policies

Per capita electricity use—United States and California

Since energy efficiency appeared on our collective national radar screen with the energy crisis of the mid-1970's, only one state in the union has managed to reduce per-capita energy consumption—California. Because of its energy efficiency standards and program investments, electricity use per person in California has remained relatively stable over the past 30 years, while nationwide electricity use has increased by almost 50 percent.

Figure 1 Per Capita Electricity Use in the United States and California (1960-2004)

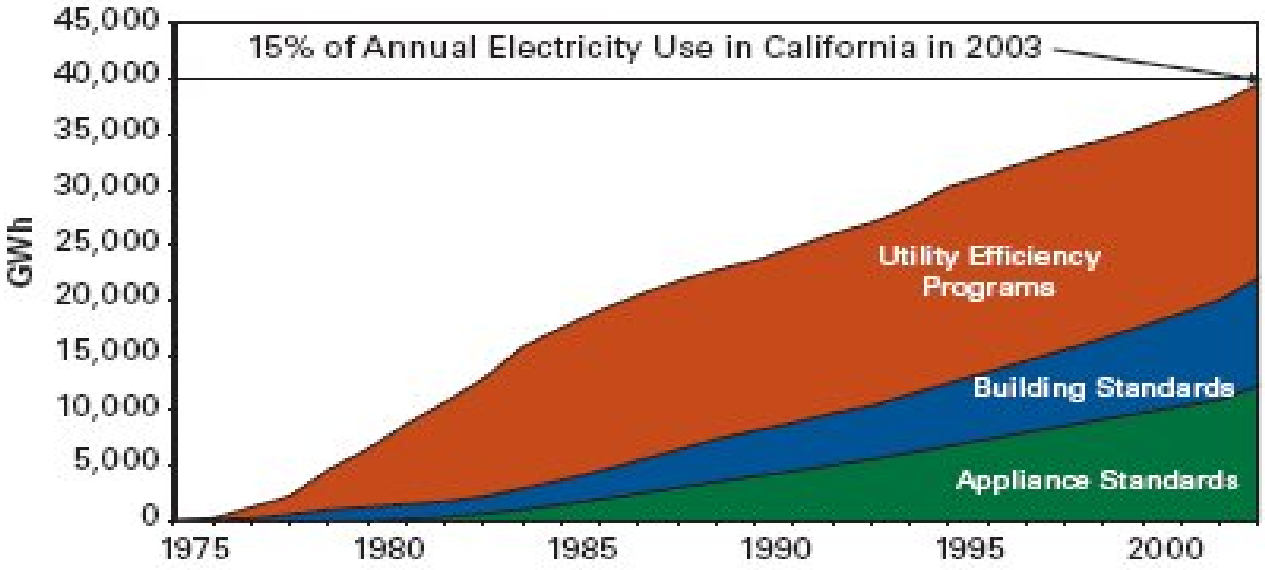


Source: CEC 2005c

Cumulative Savings by energy efficiency program drivers--California

California's building and appliance standards help businesses and consumers save energy through more efficient appliances, building design, equipment, and building materials. As of 2003, the amount of energy saved by these standards, along with the state's other energy efficiency programs, was equal to 15 percent of the energy used in California during that year. The California standards have served as a model for other states' appliance and building standards and for federal appliance standards.

Figure 2 Cumulative Savings from California's Energy Efficiency Programs (1975–2003)



Efficiency Mandates and Policies—State and Regional levels

Much of this has been accomplished with the "carrot and stick" approach. While utility rebate programs and tax incentives often promote efficiency "carrots," it has also been effective to provide mandates—"sticks." Building efficiency standards such as California Title 24 have proved effective.

One such mandate is requiring energy efficient lighting, favoring high efficiency incandescents, LED (Light Emitting Diode) or fluorescents (e.g. favoring CFL 60 Lumen/Watt over 15 Lumen/Watt incandescents.)

California

California expects to meet approximately half of its demand growth with energy efficiency through 2013 with net savings of $10Billion

Dian Grueneich (CA Public Utilities Commissioner) has stated that Energy Efficiency is California's highest priority resource to meet energy needs, save money, and reduce GHG emissions. The California EE Program 2004-2013 eliminates the need for 10 new power plants, eliminates 9 million tons of CO_2 emissions annually (equivalent to 1.8 million cars), with a net savings to consumers of $10 Billion. She has stated that Energy Efficiency is #1 in California's loading order. Their state has developed an integration of policy, standards, funding and EM&V. Furthermore, over the past thirty years, California's energy conservation and energy efficiency policies have saved more than 40,000 gWh (gigawatt-hours) of electricity and 12,000 mW (megawatts) of demand—avoiding the need to build 24 large 9i.e. 500 mW) power plants, and equal to the energy required to power 3.8 million homes.

Commisioner Grueneich lists their general areas of accomplishment as the following:

- Decoupling (2001) –(1stDecoupling in 1982)
- Public Benefits Charge (2002)
- California Energy Action Plan (2003)
- Energy Efficiency Goals (2004) –10yr goals
- Administration (2005) –EE portfolios
- California's Energy Action Plan II (2005)
- Policy Rules (2005)
- Avoided Costs (2005)
- Adoption of 2006-2008 Programs ('05-'06)
- EM&V Framework (2005-2006)
- Energy Efficiency Incentives* (2007)

Northeast Energy Efficiency Northeast Policy

The Northeastern United States is faced with several challenges. They include:

- Highest energy prices ever (30-60% increase)
- Gas supply shortage concerns
- Increased pressure for new LNG facilities
- ISOs/RTOsdo not view efficiency as a significant resource in wholesale markets
- "Artificial cap" on ratepayer efficiency funding, not likely to increase (VT is exception)
- DSM Programs are oversubscribed

ISO New England Statement of Commitment:

National Action Plan for Energy Efficiency

July 31, 2006 - ISO New England is pleased to serve as a partner with the U. S. Department of Energy (DOE) and U.S. Environmental Protection Agency (U.S. EPA) in their efforts to achieve greater energy efficiency through the National Action Plan for Energy Efficiency ("Action Plan") and its Leadership Group of stakeholders. ISO New England supports the five recommendations being advanced by the Action Plan and is particularly focused on achieving greater efficiency during peak periods, particularly in the summer months.

Background

Between 2006 and 2015, consumer electricity use in New England is expected to grow by about 1.3% per year. During the summer when consumer electricity use is at its highest or "peak", demand grows 1.9% annually. To maintain a reliable supply of electricity to accommodate this expected growth, New England would need to add the equivalent of one new 500-megawatt (MW) power plant each year. Further, given that peak electricity use is growing much faster than overall use, about a third of the power grid's total generating capacity of approximately 30,000 MW is required just to meet consumer demand during the summer season. Increased energy efficiency and conservation can slow this growth-deferring the need to build new power plants and infrastructure, ultimately reducing overall consumer costs.

Energy Efficiency in New York

New York has historically proactive in promoting energy efficiency as a means of economically meeting the energy needs of their populace.

At a recent meeting, New York Public Utilities Commissioner Cheryl Buley reported the following:

Where We've Been:

- Energy efficiency programs were utility run in 1980s and 1990s
- New York State Energy Research & Development Authority (NYSRDA) centralized efforts in 1998
- Systems Benefits Charge (SBC)

NYSERDA programs save $450 million per year in energy costs

- Lowers energy use by over 2,900 GWh and reduces peak demand by 1,140 MWreduces MW
- Annual SBC funding is currently $175 million
- Cumulative SBC authorized funding exceeds $1.1 Billion
- NYPA, LIPA, DHCR, & Con Edison all have programs
- Governor Eliot Spitzer implemented a 15 x 15 Target—15% energy reduction goal by 2015. Despite such programs, power usage in New York grew 1.6% annually over the past decade—15.4 percent in that recent ten-year period.
- Mandatory Time of Use Tariffs (April 2006)
- Utilities directed by the New York PUC to file tariffs transferring largest commercial and industrial TOU customers to hourly pricing for commodity
- Revenue Decoupling (April 2007)
- New York has attempted to break the link between sales and delivery revenues, thus eliminating the traditional disincentive for its utilities to promote DSM.
- Future financial drivers include raising funds from RGGI (Regional Greenhouse Gas Initiative) auctioning credits. This is projected to be approximately $250 million annually, all or part of which could be used for energy efficiency.

Cap and Trade Auction

New York along with nine other northeastern states is creating its own greenhouse gas "cap, auction and trade" system in an effort to reduce carbon dioxide emissions from power plants using fossil fuel. This regional initiative, known as RGGI, was begun in the absence of any national carbon tax or national cap and trade system. Regulations to implement a New York greenhouse gas allowance auction system have been proposed by NYSERDA and the New York State Department of Environmental Conservation, DEC. DEC will require utilities emitting carbon dioxide to purchase allowances, and NYSERDA will conduct the auctions. Subsequently, the allowances may be traded in essentially unregulated secondary markets.

BARRIERS AND IMPEDIMENTS

Negative mind-set in the investment community

Merrill Lynch Power & Gas Conference—September 26, 2007•Energy Efficiency viewed as having *limited impact*–"Nearly every presenting company addressed the growing emphasis on energy efficiency initiatives. We think it's worth noting that most companies (the major generation owners in particular) believe that energy efficiency will have only a minor impact on demand growth, potentially reducing growth by only tenths of a percent."

Marketplace barriers

A series of recent documents on the topic highlight some of the critical barriers that are likely to retard or forestall the adoption and implementation of energy-efficient systems. The four most commonly cited barriers are:

- lack of awareness and information regarding the benefits, costs and availability of new technologies
- perceived risks associated with early adoption
- financial costs
- lack of standards for some technologies

To this, we add apathy and inertia of the status quo. Management often has daily operations and long-term planning and energy efficiency just isn't on its radar screen. Facilities managers have historically adopted an "if it ain't broke, don't fix it!" approach. A corollary to this is that when "it breaks," replace it with what was there before because of familiarity, expedience, elimination of the need to develop new specifications, and ease of retrofit installation.
There has also been a general failure to fully account for the effect of fossil fuel reduction on avoided costs such as carbon emission costs and increased natural gas prices.

In the Harvard Business Review on "Business and the Environment", it is questioned why, if large resource savings are available and profitable, haven't they all been captured? The

answer: "scores of common practices in both the private and public sectors systematically reward companies for wasting natural resources and penalize them for boosting resource productivity. For example, most companies expense their consumption of raw materials through the income statement but pass resource-saving investment through the balance sheet. That distortion makes it more tax efficient to waste fuel than to invest in improving fuel efficiency. In short, even though the road seems clear, the compass that most companies use to direct their journey is broken."

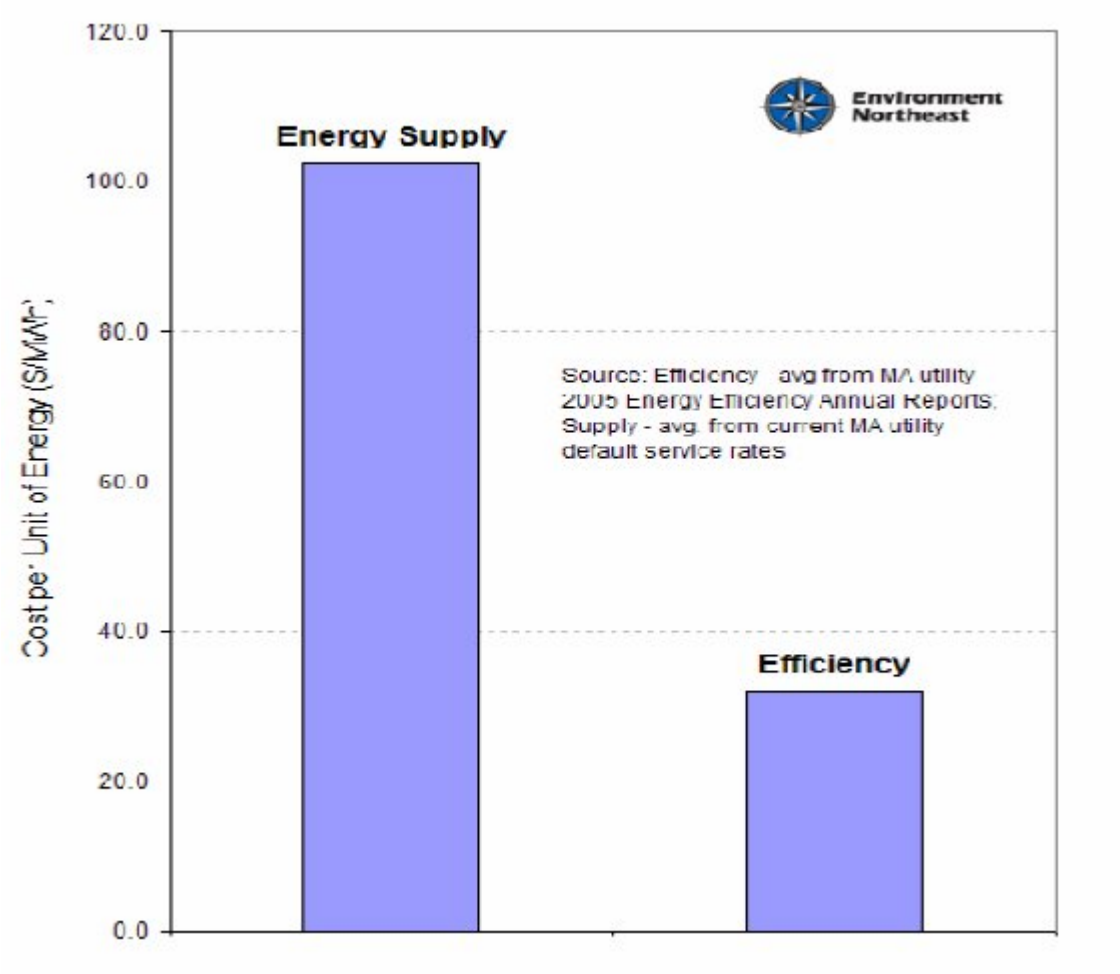
Shift policy paradigms from System Benefit Charge to Cost-Effective Efficiency

Policy paradigms should be shifted from System Benefit Charge to the concept that Cost-Effective Efficiency is Cheaper than Supply

- System Benefit Charge (SBC). It is a very difficult path politically to increase EE investments
- Many policy makers and businesses see SBC as a tax/surcharge that is costly and vigorously oppose an increase
- The concept that all EE is Cheaper than Supply provides a large opportunity to increase EE investments
- Policymakers and businesses recognize EE investments reduce energy costs if they are cheaper than supply and support proposal.

Costs of traditional energy supply versus those of energy efficiency in the N/E United States.

The below chart shows the relative costs of traditional energy supply versus those of energy efficiency in the Northeastern United States.



NEVADA ISSUES

Because it has developed and been active in the State of Nevada, IEC has an historical nexus to Nevada issues. Ernie Niemi, Senior Policy Analyst with ECONorthwest recently published an excellent research paper under the auspices of the Nevada Clean Energy Campaign—a coalition of grassroots organizations supporting energy efficiency and clean renewable energy development in Nevada. ECONorthwest, of Eugene, Oregon, is highly respected as the oldest and largest economic consulting firm in the Pacific Northwest. In his paper, Mr. Niemi makes several important observations.

In reading the below, IEC states that it is important to note that Sierra Pacific and Nevada Power only produce approximately 50% of their $3Billion annual electrical energy sales. They have often been faulted for failure to bring enough electrical generation on line to reduce their dependence on out-of-state power purchases. They have been severely penalized for making what were deemed to be imprudent purchases of power. Clearly, it is in the best interests of both the utility shareholders and its ratepayers for Nevada to become energy autonomously independent.

Coal Plants and growth demand

Sierra Pacific Power Company and Nevada Power Company, the state's two major electric utilities, estimate that demand for electricity will grow by about 2,000 megawatts (MW) over the next decade. Nevadans soon must choose between two alternatives for accommodating this growth.

One alternative involves generating electricity by burning coal. The utilities' parent company, Sierra Pacific Resources, seeks to build one 750-MW coal-fired generator near Ely, in White Pine County, by 2011 and another by 2013. Its preliminary estimate of the total cost is $3.2 billion. Two other independent power producers also have proposed building new coal-fired generators in the state, and to sell the output to customers in Nevada and other states. LS Power Group proposes to build a 1,590-MW generator near Ely, and Sithe Global Power, LLC, proposes a 750-MW generator near Toquop, in Lincoln County. In each case, the coal for the generators probably would be shipped in by rail from Wyoming.

The other alternative does not involve burning coal. Instead, it entails investing in energy efficiency, so that energy savings could be used to meet new demands, and in new generators powered by wind, geothermal heat, and other renewable resources.

FOSSIL FUEL (COAL) PLANTS versus ENERGY EFFICIENCY

Environmental Consequences

There are adverse environmental consequences from two coal plants proposed by the Nevada utility providers. The two proposed generators would annually emit:

- 3,044 tons of sulfur dioxide

- 3,044 tons of nitrogen oxides
- 760 tons of particulate matter
- 88 pounds of mercury
- 10,434,198 metric tons of carbon dioxide and consume
- 3.26 billion gallons of water.

- The pollutants, water use, and operation of the generators would have important
- environmental consequences:
- Increased illness, injury and premature deaths Change in climate
- More frequent and severe droughts Harm to crops and livestock
- Reduced visibility in scenic areas Increased toxicity of fish
- Harm to threatened or endangered species Increased dust
- Change in soils, water, flora, fauna Winter fog/haze
- Growth in population and traffic Boom-bust economic and social change
- Degradation of recreational opportunities Noise and light pollution
- Industrialization of public lands Damage to historic and cultural sites
- Exposure to hazardous inputs Disposal of waste products

Impacts on Jobs

Investments in energy efficiency and renewable resources probably will create more jobs in Nevada than investments in coal-fired generators. A review of recent research compared the average number of jobs created over their operational lifetimes by different types of generating facilities. It found that, after adjusting for differences in their operating characteristics, a coal-fired generator creates, on average, 1.01 jobs per megawatt of capacity, whereas a solar (photovoltaic) generator creates 7.41 – 10.56 jobs and a wind-powered generator creates 0.71 – 2.79 jobs. Other evidence indicates that the long-run job creation for operations and maintenance by the energy-efficiency/renewable-resources alternatives likely would be 2 – 10 times the job creation by the coal-fired alternative. Moreover, by degrading the environment, the emissions from coalfired generators probably would have an adverse impact on many jobs in the surrounding communities.

- Reducing energy use can create more jobs. Producing, marketing, and promoting energy efficiency measures prove to be relatively labor-intensive activities, while coal mining, natural gas production, and electricity generation and distribution employ comparatively few workers. And when a family or business spends the money it saved by conserving energy, it bolsters the economy and supports more jobs. Thus putting effort into energy efficiency and conservation, rather than expanding conventional energy supplies, can lead to a net increase in jobs in a community, state, or region.
- Reducing energy use can increase productivity in the workplace. Energy purchases account for a portion of the cost of manufacturing goods in factories, developing natural resources, and operating offices, schools, and retail establishments. Conserving energy and improving energy efficiency reduces these costs and lowers overall production costs accordingly. Businesses that consume less energy are more competitive in the national and global market.

Costs to Ratepayers

Investments in energy efficiency and renewable resources probably would meet Nevada's future demands for electricity at a significantly lower cost to ratepayers than investments in coal-fired generators. There are substantial opportunities to increase the efficiency of existing electricity uses, with the saved electricity available to meet new demands at a cost of about $0.02 to $0.03 per kilowatthour (kWh). If additional generating capacity is needed, electricity from wind and geothermal resources is expected to cost consumers $0.05 – $0.06 per kWh, about the same as coal-fired electricity, under base-case scenarios. Analysis presented to the Nevada Public Utility Commission shows that, under base-case conditions, replacing Nevada Power Company's share of the first proposed Ely coal plant, 600 MW, with a portfolio of energy efficiency, wind energy, and geothermal energy would save about $198 million (present value for 2007 to 2041).

Economic Risks

Every strategy for meeting Nevada's future demand for electricity embodies some risk, but a decision to rely on new coal-fired generators would create extraordinary risks for ratepayers, shareholders, families, landowners, and businesses. Ratepayers and shareholders would face considerable risk that the cost of coal-fired electricity would outstrip the developers' preliminary estimates. This risk would arise from several factors: construction costs have been growing as much as 40 percent per year at generators being built elsewhere, coal prices have been and likely will be highly volatile, and actions by state and local governments indicate utilities burning coal soon will incur additional costs for their emissions of carbon dioxide. Estimates developed by Nevada Power Company, Sierra Pacific Power Company, and other western utilities indicate that the carbon dioxide costs for the two generators Sierra Pacific Resources proposes to build at Ely would be at least $94 million, and perhaps as large as $730 million, per year. There is some probability that the increase in costs would render a coal-fired generator obsolete, so that ratepayers and/or shareholders would have to swallow the costs of the unproductive plant and equipment and the accelerated costs of decommissioning the facility Everyone who lives in or cares about the southwestern states would bear additional risk that the region would experience future droughts made more frequent and intense by the emissions of carbon dioxide from burning coal. Those living or caring about other regions would bear risks of the emissions' contributions to other climate changes, which may include higher incidence of severe hurricanes and other storms, flooding, extinctions of species, wildfires, spread of insects and diseases, and numerous other undesirable outcomes.

A decision to implement the energy-efficiency/renewable-resources alternative would avoid most of these risks. This alternative would not consume coal or other fuel to generate electricity, so there would be no risk that the future cost of electricity would jump to cover rising fuel costs. It would have minor emissions of carbon dioxide relative to those from coal-fired generators so there would be no or little risk that the cost of electricity would jump to cover carbon dioxide costs. It would produce minimal or no emissions to harm human health, crops and livestock, or the ecosystem, to degrade visibility, or to adversely affect water supplies, property values, and the amenities that contribute to economic growth.

Impacts on jobs

The report compares:
(1) the impacts on energy-related employment opportunities, and
(2) the impacts on jobs arising from environmental and other effects that would alter the spending patterns of Nevadans and visitors.

Economic costs

The report also compares the direct costs of implementing the coal option with the clean-energy option (energy efficiency and electricity from renewable energy).
It also accounts account for the spillover costs Nevadans would bear, for example, as coal-fired pollutants increase the levels of illness and premature death, lower property values, and increase the incidence and severity of future droughts in the state.

Economic risk

The report describes differences between the coal option and the clean-energy option in terms of risks that might lead to increases in costs and/or to jumps in future electricity rates.

POTENTIAL NEGATIVE ECONOMIC CONSEQUENCES (SUMMARY)

The proposed coal-fired plant at the Ely Energy Center would have negative as well as positive economic consequences. The negative consequences fall into three categories:

Negative impacts on jobs

Pollution from the burning of coal would degrade the surrounding environment and diminish the ability of nearby communities to derive jobs and income from the area's natural-resource amenities, such as the Great Basin National Park and the region's hunting and fishing opportunities. It also would impede or preclude meeting Nevada's energy requirements via alternatives that promise a greater number of new job opportunities.

Costs

Electricity from the proposed coal-fired generators would be costly. The $3.2 billion construction costs estimated by Sierra Pacific Resources is just the beginning. Utilities building coal-fired generators elsewhere are finding that construction costs are growing at unexpected high rates. In addition, national initiatives to rein in the emission of carbon dioxide could significantly increase the cost of burning coal. Moreover, the direct costs of developing and operating the coal-fired generators constitute only a portion of the total costs. Through the generators' emission of pollutants and other factors, spillover costs would materialize through increases in the incidence of human illness and premature death, diminished production of crops and livestock, reduced visibility, changes in the region's ecosystem, and contributions to global climate change.

Increased risks

A commitment now to burn coal to generate electricity over the next several decades would generate considerable risk for ratepayers, investors, local communities, and Nevada's overall economy. Some of this risk stems from the generators' large size. Once they are built, a substantial portion of the state's economy will be handcuffed for several decades to their technology and cost structure, subject to potential rises in the price of coal and unable to take advantage of newer, cheaper technologies that emerge in the future. Or, alternatively, the new technologies would render them obsolete. Perhaps more important, there is a high likelihood that utilities burning coal soon will have to bear liability for their substantial emissions of carbon dioxide and contributions to climate change. If the utilities are successful in passing this liability to their customers, then Nevada's households and businesses could be paying markedly higher rates.

The report describes these negative economic consequences below. Many of these, but by no means all, would accompany the negative environmental effects of mining, transporting, and burning coal. Hence, we first provide a quick overview of these potential environmental effects, and then provide additional detail as we describe the associated economic consequences.

POTENTIAL NEGATIVE ENVIRONMENTAL IMPACTS

Sierra Pacific Resources correctly points out that, because of changes in combustion and other technologies, the new generators would emit much smaller levels of pollutants, and have smaller environmental impacts per unit of electricity generated than the region has experienced with old coal-fired generators. The emissions and impacts would be far from zero, however. Although the details regarding the emissions and their impacts have yet to be assessed by Sierra Pacific Resources and relevant regulators, the preliminary evidence described below indicates the impacts would be considerable. Such negative impacts include, but are not necessarily limited to, the emission of harmful pollutants, contributions to climate change, impacts on water resources, increased accidents, visibility and ecological impacts, diminished natural-resource amenities, and other negative environmental effects. They are addressed separately below.

1. EMISSION OF HARMFUL POLLUTANTS

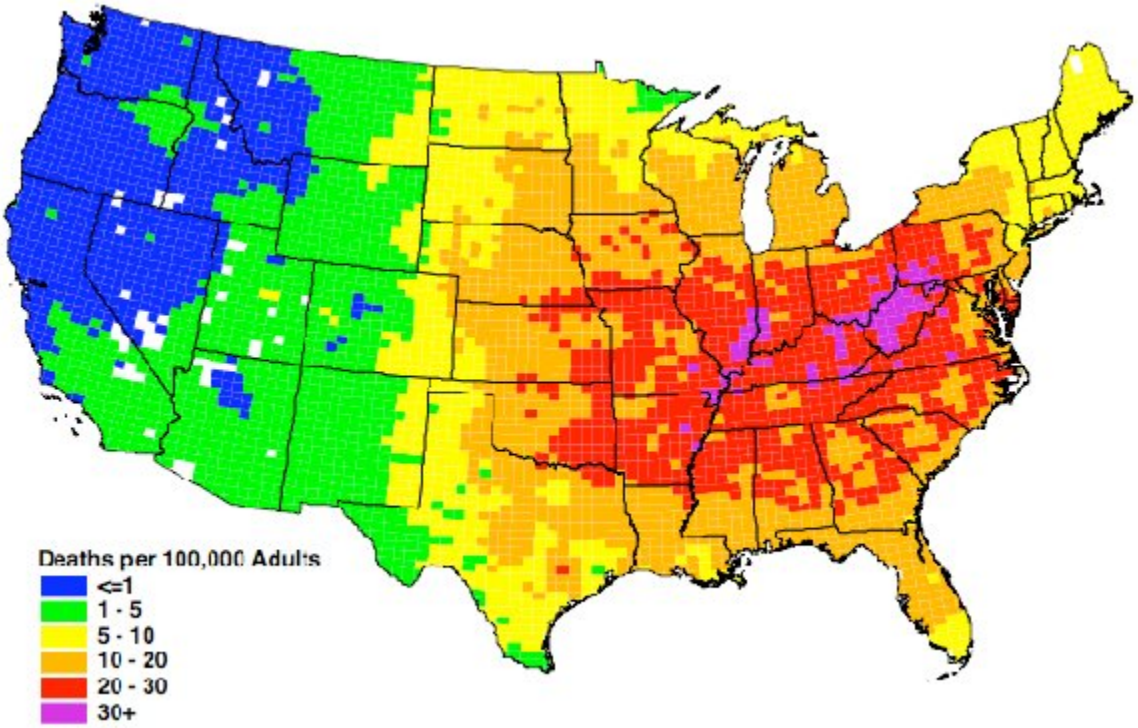
Burning coal to generate electricity produces several pollutants that have important harmful effects. These include increased incidence of illness and premature death among humans, livestock, and fish and wildlife exposed to the pollutants, as well as changes in vegetation in the surrounding region. The pollutants that have received the greatest attention are: sulfur dioxide, nitrogen oxides, particulates, ozone, carbon monoxide, volatile organic compounds, lead, and mercury.

Nevadans already experience significant adverse health effects of existing coal-fired power plants. Researchers have estimated that the small particles emitted from power plants shorten the lives of 26 Nevadans per year. Related illnesses cause residents to have 680 asthma attacks, of which 10 require visits to an emergency room, and workers to miss 3,987

days of work. There are significant human-health effects in Nevada of burning fossil fuels to generate electricity.

The map below shows a simulation, published in 2004, of the premature deaths in 2010 that would be attributable to emissions of just one pollutant, particulate matter, from power plants in the United States.

Premature Mortality Risk Attributable to Particulate Matter from Power Plants, 2010



Source: Abt Associates Inc. 2004. *Power Plant Emissions: Particulate Matter-Related Health Damages and the Benefits of Alternative Emission Reduction Scenarios*. Clean Air Task Force, Boston, MA. June, p. 6-6. Retrieved June 15, 2007, from http://www.cleartheair.org/dirtypower/docs/abt_powerplant_whitepaper.pdf.

2. CONTRIBUTIONS TO CLIMATE CHANGE

Scientists and governments around the world have concluded that emissions of carbon dioxide and other gases are contributing to increases in temperature and changes in climate around the globe.8 These effects, in turn, have begun to have numerous negative economic consequences, which scientists predict will intensify in the future. The list of actual and potential economic harm stemming from climate change is long and includes increases in the incidence of intense storms and droughts, rise in deaths associated with high temperatures, spread of temperature-related insects and diseases, reductions in some regions' agricultural production, increased flooding from rising sea levels, increased risk of species going extinct, increased costs of insurance, and setbacks to the rate of economic development in many countries.

The proposed coal-fired generators would contribute to these effects by emitting about 10 million tons of carbon dioxide annually. A consortium of western electric utilities, including Nevada Power Company and Sierra Pacific Power Company, found that the damages

attributable to future carbon dioxide emissions are likely to be between $9 and $70 per ton. If the coal-fired generators were built and Nevada's ratepayers were made liable for these damages, they could see their rate payments rise $94 million – $730 million per year. The findings also indicate that, under climate-related actions proposed by California and others, the liability would be about $417 million per year.

3. NEGATIVE IMPACTS ON WATER RESOURCES

Construction and operation of the proposed coal-fired generators likely would have negative impacts on the quantity and quality of water resources available for other uses, as well as on the surrounding area's water-related ecosystems.

4. INCREASED ACCIDENTS

The mining, transportation, and combustion of coal inevitably result in accidents that injure or kill workers as well as others. So too do the construction of coal-fired generators and ancillary facilities, the disposal of waste materials, and the decommissioning of generators and other facilities once they no longer are being used. The injuries and deaths from accidents depend on many factors, and current information does not allow us to predict with precision how many of each would occur if the coal-fired plants at Ely were built and operated. An extensive investigation into the potential spillover costs of coal-fired electricity in the early 1990s concluded, however, that the spillover costs associated with the human-health effects of accidents that accompany the shipment of coal to power plants were "of the same order of magnitude" as those that were caused by airborne pollutants.

5. VISIBILITY AND ECOLOGICAL IMPACTS

Airborne pollutants emitted from the coal-fired generators would alter the visibility in the surrounding region and induce changes in the region's ecosystem. The full extent of the potential changes is not known, but some insights are available from a preliminary assessment of another coal-fired generator that LS Power Group, an independent power producer, has proposed to build near Ely. In its assessment of the proposal, the National Park Service concluded that the generator's coal-fired emissions would have negative effects on the Great Basin National Park and the proposed Great Basin National Preserve, located to the southeast of Ely.

6. OTHER NEGATIVE ENVIRONMENTAL CONSEQUENCES

Construction and operation of the proposed coal-fired generators could have numerous other, potentially significant, negative impacts. These include: reductions in the productivity of agricultural crops and livestock, increased fog and haze during winter months, increased levels of airborne dust, harm to threatened or endangered species, boombust impacts on local communities, noise and light pollution, industrialization of public lands, and damage to cultural resources. These impacts have yet to be measured.

POTENTIAL NEGATIVE CONSEQUENCES: EXCESSIVE COSTS

The total costs of electricity from the Ely Energy Center will be the sum of the direct costs and the spillover costs:

Total Costs = Direct Costs + Spillover Costs
The direct costs are those that would be borne by Sierra Pacific Power Company or Nevada Power Company and, hence, by their shareholders or ratepayers. The spillover costs are those that would be borne by others.

1. DIRECT COSTS OF COAL-FIRED ELECTRICITY

Sierra Pacific Resources has described the direct costs in these terms: “Preliminary estimates indicate a final cost of the first phase at approximately $3.2 billion, including the cost of permitting, water, rail, and other ancillary facilities, but excluding the cost of electric transmission facilities. The project cost will be finalized as the design is finalized. Other evidence suggests that costs could be considerably higher, however. For example, construction costs for other coal-fired plants in the U.S. have been rising as much as 40 percent per year.

2. SPILLOVER COSTS OF COAL-FIRED ELECTRICITY

Economists and others have long recognized that extensive spillover costs accompany the production, transmission, and consumption of electricity, especially when it is generated by burning coal. Economists often use another term, “negative externalities”, to describe spillover costs. This term arises
because the costs impinge on people, firms, and communities that are outside, or external to those who make the decisions that yield the costs.

There are many different pathways along which spillover costs materialize; mainly, human health, climate change, water, and other.

Human-Health-Related Spillover Costs

Coal-fired production of electricity adversely affects human health via two major routes: accidents and exposure to harmful pollutants. The mining, transportation, and combustion of coal inevitably result in accidents that injure or kill workers and others. So too do the construction of coal-fired generators and ancillary facilities, the disposal of waste materials, and the decommissioning of generators
and other facilities once they no longer are being used. These activities, and especially the burning of coal, also emit into the air several pollutants that cause illness and accelerated death among those exposed to them.

Climate-Related Spillover Costs

Extensive scientific evidence leads scientists throughout the world to conclude that emissions of carbon dioxide and other gases, collectively known as greenhouse gases, are causing the atmosphere to warm and climate to change. Related research shows that these changes will have both economic benefits and economic costs, but the latter will far outweigh the former. The net adverse effects represent spillover costs imposed on current and future generations.

Water-Related Spillover Costs

The construction and operation of the proposed coal-fired generators would impose water-related spillover costs on Nevadans and others through several mechanisms. These costs could materialize as the utilities consume water and
reduce the supply available for other uses. They also would arise as emissions from the generators intensify the probability that Nevada and the surrounding region will experience severe drought conditions. Additional costs could appear as emissions from burning coal change the quality of water in the surrounding area and change the area's water-related ecosystems.

Other Spillover Costs

The construction and operation of the coal-fired generators, together with the activities and development that would accompany them, could impose spillover costs through numerous pathways other than those we have already discussed.
Here are some of them:
Pollutants emitted into the air by the generators likely would harm crops and
livestock.

1. Emissions could form fog or haze during winter months, especially if the proposal to build a high smokestack to avoid this problem proves inadequate.
2. Emissions could increase the risk to threatened or endangered species, by altering their habitat, reducing water supplies, or inducing more intense and frequent droughts.
3. Degradation of the environment could diminish the area's attractiveness to visitors and jeopardize the area's tourism and recreation sectors. A full description of these sectors does not exist, but insights are provided by the National Park Service, which has estimated that the Great Basin National Park supports 144 jobs and contributes $5.8 million in annual revenue to the Baker–Ely area.
4. Development of the Ely Energy Center could bring about changes in the rural character of the Ely area that some would see as a reduction in the quality of life available in the area. They might see a significant expansion in population and traffic as an intrusion, especially if the newcomers have different sets of social values. The sense of intrusion might be most intense during the construction phase, when the population would be greatest, but also afterward, if those remaining have to cope with the downside of a boom-bust cycle. Extended deterioration of the quality of life might materialize insofar as the generating facility, the train and other traffic, and the added population produce unwanted noise and light pollution, industrialization of public lands, and degradation of historic and cultural resources.
5. The downstream potential for environmental fines to clean up plants or environmental damage exists. In 2007, State and Federal Government environmental officials announced a record $90 million settlement with Nevada Power Co. over alleged air pollution and pollution record-keeping violations at three coal-fired power plant units northeast of Las Vegas. The affected plants generate a combined 300 mW of power. Although there were approximately $5 million in sanctions, which will be borne by the utility's stockholders, the lion's share--$84..2 million—will cover the cost of upgrades to

pollution reduction equipment at the Reid Gardner Generating Station approximately 50 miles northeast of Las Vegas. Those will be paid for by ratepayers.

Western Governors Association Task Force

For example, a task force acting at the direction of an advisory committee to the Western Governors' Association reviewed seven major studies of the current potential for energy-efficiency investments and found:

[T]here is considerable cost-effective and achievable electricity savings potential in the Western states. … The studies that examined potential net economic benefits all found that more aggressive, multi-year energy efficiency efforts could save consumers and businesses billions of dollars over the lifetime of the measures, with very favorable benefit-cost ratios. The advisory committee to the governors concluded that investments in clean energy would create "tens of thousands of new jobs" and stimulate new economic growth in the region. It also offered this conclusion regarding the economic importance of investments in energy efficiency.

EE and conservation—our cheapest, cleanest, least risky energy strategies

Energy efficiency and conservation are our cheapest, cleanest, least risky and least controversial energy strategies.

Increasing the efficiency of energy use in Western states, without reducing productivity, will provide a broad range of benefits, including: saving consumers and businesses money on their energy bills; reducing vulnerability to energy price spikes; reducing peak demand and improving the utilization of the electricity system; reducing the risk of power shortages; supporting local businesses and stimulating economic development; reducing water consumption and reducing pollutant emissions by reducing the need to construct new power plants.

POTENTIAL ECONOMIC CONSEQUENCES: MORE JOBS

With a decision to implement the energy-efficiency/renewable-resource alternative, Nevada would forgo the jobs associated with the Ely Energy Center. In exchange, however, it would realize an even greater number of new job opportunities. Support for this conclusion comes from several directions. Table 6, for example, summarizes and compares estimates of the jobs that would be created with 1,500 MW of coal-fired generating capacity at the Ely Energy Center, a comparable amount of generating capacity powered by wind and geothermal resources, and a comparable amount of energy savings from investments in energy efficiency. The left column shows the number of jobs predicted for the Ely Energy Center. Construction would take about 4 years and employ up to 1,200 – 1,500 workers; operations would employ more than 100 workers. The middle column shows the jobs that likely would be created with the development in northern Nevada of windpowered generators with a total capacity of 1,000 megawatts (MW) and geothermalpowered generators with a capacity of more than 800 MW.48 Even though the total capacity would exceed the sum of the two 750-MW coal-fired generators proposed for the Ely Energy Center, the authors of the report determined that the amount of electricity produced per year would be comparable after

accounting for the amount of time that generators would not be operational. The construction of the renewable-energy capacity would take about three years and require 3,354 person-years of employment. On-going operations would provide jobs totaling 580 person-years of employment per year. These numbers indicate that, during construction, the coal-fired generators probably would employ more workers, but, during on-going operations, the wind- and geothermal-powered generators would employ at least 5 times more workers. These are direct jobs associated with each alternative. Additional jobs might be created indirectly elsewhere in the economy.

Table of Potential Job Creation, by Alternative

	Coal*		Wind+Geothermal**		Increased Efficiency ***	
	Duration	**Jobs**	**Duration**	**Jobs**	**Duration**	**Jobs**
Construction	~ 4 years	up to 1,200 – 1,500	~ 3 years	3,354 person years	Folded into operations	
	Jobs		**Jobs**		**Jobs**	
Operations	100+		580		200 – 1,000	

*For two 750-MW generators. Sierra Pacific Resources. "Ely Energy Center FAQs." Retrieved June 29, 2007, from http://www.sierrapacificresources.com/projects/ely/FAQ.cfm.
** For 1,000 MW of wind-powered capacity and 840 MW of geothermal-powered capacity, with an average output similar to what is expected from the coal-fired generators. Western Resource Advocates. 2005. *Economic Impacts of Clean Energy Development in Northern Nevada: Potential Geothermal and Wind Energy Project Impacts for Washoe County and Environs.* Retrieved June 29, 2007, from http://www.nevadacleanenergy.org/FINALeconomicReport2.pdf.
*** For cost-effective programs that would enable Nevada to reach the energy-efficiency standard established by the Western Governors' Association. Geller, H., C. Mitchell, and J. Schlegel. 2005. *Nevada Energy Efficiency Strategy.* Southwest Energy Efficiency Project. Retrieved July 2, 2007, from http://www.swenergy.org/pubs/Nevada_Energy_Efficiency_Strategy.pdf.

POTENTIAL ECONOMIC CONSEQUENCES: LOWER RISK

The report describes the economic risks that would accompany development of the coal-fired generators proposed for the Ely Energy Center. Many of these risks would be borne by ratepayers. Substantial evidence indicates that electricity from coal-fired generators probably would be more expensive than estimated by Sierra Pacific Resources. Recent rapid rises in the cost of developing coal-fired generators suggest that ratepayers would be responsible for costs far greater than current estimates. Once the generators are built, rate shocks could materialize if coal prices are higher than expected. They also could occur if Sierra Pacific Resources were to incur significant costs for their emissions of carbon dioxide. Indeed, the company, itself, has recognized this risk.

Future changes in environmental regulations governing emissions reductions could make certain electric generating units uneconomical to construct, maintain, or operate. In addition,

any legal obligation that would require [Nevada Power Company and Sierra Pacific Power Company] to substantially reduce [their] emissions beyond present levels could require extensive mitigation efforts and, in the case of CO2 legislation, would raise uncertainty about the future viability of fossil fuels, particularly coal, as an energy source for new and existing electric generating facilities. In other words, the company is saying that anticipated regulations to curtail emissions of carbon dioxide could make coal no longer viable as a fuel from which to generate electricity, so that it would be uneconomical to construct new coal-fired generators, and/or uneconomical to maintain or operate a generator already in place.

Summary

Risks associated with rising electricity rates.

Coal-fired generators have large upfront construction costs and these have been growing rapidly at plants being built elsewhere. They also have an expected operating life of several decades, during which fuel (coal) prices may increase markedly and the utilities may become liable for large costs associated with the emission of greenhouse gases. Obligations to repay the construction costs may preclude Nevada from taking advantage of opportunities for meeting future demand for electricity at lower cost.

Risks associated with imposing spillover costs on families, landowners, and businesses.

These costs arise from emission-related negative impacts on human health, water resources, crops and livestock, ecosystem structure and productivity, recreational opportunities and other natural-resource amenities, visibility, and other resources.

Risks associated with adopting a technology that promises to create fewer jobs.

Nevadans' expenditures on energy will yield fewer jobs if spent on coal-fired electricity than if spent on energy efficiency and renewable resources.

Energy Efficiency and Renewables Ability to meet Nevada demand more cheaply than coal

Investments in energy efficiency and renewable resources probably will meet Nevada's future demands for electricity at a lower cost to ratepayers than investments in coal-fired generators.

Electricity made available through investments in efficiency is expected to cost consumers about $0.02 to $0.03 per kilowatt-hour (kwh). Electricity from wind and geothermal resources is expected to cost consumers about $0.05 - $0.06, about the same as the currently expected cost of coal-fired electricity, although the latter overlooks potential jumps in construction costs, fuel costs, and emission-related costs. Analysis presented to the Nevada Public Utility Commission shows that, under base case conditions, replacing Nevada Power Company's share, 600 MW, of the first proposed Ely coal plant with a portfolio of energy efficiency, wind energy, and geothermal energy would save about $198 million (present value over the period 2007 to 2041). Expectations of the region's utilities, including Sierra Pacific Power Company and Nevada Power Company, indicate that complying with California's potential regulations to curtail greenhouse gases would raise the cost of coal-fired electricity by $0.04 per kwh. The potential additional cost to ratepayers from Sierra Pacific Resources' proposed coal-fired generators is about $400 million per year.

Important spillover costs of coal-fired electricity

The two generators proposed by Sierra Pacific Resources would annually emit:

- 3,044 tons of sulfur dioxide
- 3,044 tons of nitrogen oxides
- 760 tons of particulate matter
- 88 pounds of mercury
- 10,434,198 metric tons of carbon dioxide and consume:
- 3.26 billion gallons of water.

The pollutants, water use, and operation of the generators would impose costs on families, landowners, and businesses. These costs would materialize through multiple mechanisms:

- Increased illness, injury and premature deaths
- Change in climate
- More frequent and severe droughts
- Harm to crops and livestock
- Reduced visibility in scenic areas
- Increased toxicity of fish
- Harm to threatened or endangered species Increased dust
- Change in soils, water, flora, fauna Winter fog/haze
- Growth in population and traffic
- Boom-bust economic and social change
- Degradation of recreational opportunities Noise and light pollution
- Industrialization of public lands
- Damage to historic and cultural sites
- Exposure to hazardous inputs
- Disposal of waste products

Most of these costs have not been quantified, but data for just the human-health costs of sulfur dioxide, nitrogen oxides, and particulate matter indicate that persons exposed to emissions from the Sierra Pacific Resources' generators would incur costs of about $38 million per year. Analysis by the region's electric utilities indicates the annual costs from the emission of carbon dioxide could be $94 million – $730 million per year.

Energy efficiency and renewable resources will create more jobs than coal-fired generators.

Investments in energy efficiency and renewable resources probably will create more jobs in Nevada than investments in coal-fired generators. A recent review of 13 studies compared the jobs created over their operational lifetimes by different types of generating facilities. It found that, after adjusting for differences in their operating characteristics, a coal-fired generator creates, on average, 1.01 jobs per megawatt (MW) of capacity, whereas a solar photovoltaic) generator creates 7.41 –10.56 jobs and a wind-powered generator creates 0.71 – 2.79 jobs. Other evidence indicates that, looking beyond the peak construction period, the long-run job creation by energy efficiency and renewable resources likely would be 2–10 times the job creation by coal-fired generators. Moreover, by degrading the environment, the

emissions from a coal-fired generators probably would have an adverse impact on many jobs in the surrounding communities. Further investigation is required to understand in full detail the relative economic consequences of the two strategies for meeting Nevada's future growth in demand for electricity: (1) by building coal-fired generators or (2) by increasing energy efficiency and relying on generators powered by renewable resources. The information currently available strongly indicates, however, that the latter would yield more jobs, lower costs, and less risk.

ENVIRONMENTAL PROTECTION AGENCY

The EPA has historically approached many related energy issues from a standpoint of protection of our environment. However, it is assessing increasing significance to the part that energy efficiency can play.

Portfolio Standard

According to Kathleen Hogan, the EPA is in the process of examining cost effective ways to meet 15% reduction from forecasted 2015 levels, as well as setting target goals and timetables for natural gas. For more information on this, see www.epa.gov/eeactionplan.

Challenges

The EPA has stated that Energy Efficiency is Part of the Solution, but notes the following challenges:

- Growing energy demand
- Aging infrastructure
- Rising utility bills
- Increasing generation costs–Gas and coal prices–Building cleaner generation
- Reliability issues
- Volatile prices
- Carbon risk
- Pending large transmission and generation investments in uncertain investment world

Opportunities

However, the EPA sees significant present EE opportunity for the United States

- Significant benefits from extending leading EE programs to the entire country over next 15 years:
    - Control load growth by 50 % --electricity and gas
    - Save $20 billion/yr on energy bills
    - $250 billion in net societal benefits
    - Avoid 30,000 MW --60 new 500 MW power plants
    - Avoid 400 million tons of CO2/yr
- Regulators and utilities have critical roles in creating and delivering energy efficiency

It notes commitments to Energy Efficiency within 99 organizations across 49 states, with the below a partial list of initiatives in process:

- State Utility Commissions–AR, CA, CT, FL, HI, IA, KS, MN, NJ, NY, OR, VT, WA, WI
- Commission Associations–SEARUC, WCPSC, NECPUC, MARC
- Utilities–Austin Energy, BPA, Dominion Virginia Power, Duke Energy, Entergy, Exelon, New Jersey Natural Gas, PNM, Santee Cooper, Southern Company, United Cooperative Services, Xcel Energy, et al
- Other state agencies–OH and CT Consumers' Counsel; CA agencies; CT DEP; HI, MN, and OR energy departments; Governors in CA, IA, OR, and UT
- ISO-NE and MISO
- End-users–Dow, Eastman Kodak, Food Lion, Wal-Mart, etc
- Additional partner organizations
- Establishing state-level collaborative processes to explore how best to increase investment in energy efficiency
- Investigating increased funding for cost-effective efficiency
- Conducting formal investigation on ways utilities can remove the link between revenues and sales volume
- Including energy efficiency on a consistent and comparable basis with supply-side resources in future resource planning activities
- Meeting energy savings goals within the range of 10-35%
- Proactively educating consumers on the benefits

Energy Efficiency in the European Union

Historically Expensive and Scarce Power Supply

Energy has been relatively costly and in short supply in Europe for much longer than it has been in the United States. It is generally conceded in the EE industry that most facilities—both private and public—have significant energy waste and inefficiency. A generally accepted reasonable target appears to be 20% reduction of energy usage. The EU has implemented a 20x20 goal—20% reduction by 2020.

Climate change and energy efficiency is a top priority for the European Parliament (EP).

As one of the richest and most technologically advanced regions of the world, the European Union has expanded its economic output by nearly 40 percent since 1990. Per capita incomes are also one-third larger today compared to incomes in 1990. Notably, however, the demand for energy and power resources grew by only 11 percent during the same period. This decoupling of economic growth and energy consumption is a function of increased energy productivity; in effect, the ability to generate more energy services from each unit of energy consumed. But how has this decoupling been achieved?

Among the principal drivers of increased energy productivity during the past 15-20 years is the emergence and widespread adoption of advanced technologies, including high-tech electronics and an array of information and communications technologies (ICT). These technological drivers of energy efficiency span the range from stand alone products, such as

computers and cell phones, to numerous types of sensors, microprocessors and other technologies embedded in everyday products such as cars, lighting systems, and appliances.

Among other studies and documents that recognize the importance of efficiency is an independent study by Vattenfall, the Swedish electric utility, indicating that cost-effective efficiency investments could reduce overall greenhouse gas emissions by 25 percent. Moreover, the United Nations Foundation now refers to energy efficiency as "the resource of first choice" and called on the G-8 to double the historical rate of energy efficiency improvements by 2012 through 2030. Compared to IEA projections, energy efficiency gains would return the world economy to 2004 levels of energy consumption while still allowing the world economy to more than double in size.8 As Lars Josefsson (Vattenfall's Chief Executive) notes, "the future is in our hands."

The tendency to overlook the full potential of the energy efficiency resource is perhaps all too common in calls to reduce greenhouse gas emissions. In those instances in which the role of energy efficiency has been acknowledged, it has often been discussed in vague terms and portrayed as a resource that might be available at some point in the future. Predominant among the future technologies that are emphasized in these reports are big supply-side options such as "clean coal" technology or advanced nuclear power. However, given the historical contributions that energy efficiency (in all of its different forms) has already made toward reducing the EU-27's energy intensity – down significantly from a projected demand of 224 tonnes of oil equivalent per 1 million Euros in 1990 to 178 tonnes today—future energy productivity gains clearly deserve more recognition as a critical energy resource.

Technology examples

The six broad types of technologies identified include:

- integrated energy management systems,
- advanced communications systems,
- advanced sensors, meters and controls,
- digitally addressable devices,
- high energy efficiency end-use devices, and
- design and simulation tools

In reality, each of these technology categories represents a multitude of actual products. For example, there are a wide variety of digitally addressable devices and sensors that are used in an even wider variety of consumer appliances and commercial products to meet an undefined number of objectives. Moreover, these technologies might be combined and integrated in diverse ways that result in unique technology configurations. In short, the promise of these technologies is so broad, that it is difficult to foresee the entire array of potential energy-saving applications. Nevertheless, we can begin to imagine the potential they hold by multiplying the six basic types of technologies by the hundreds of small devices and larger energy management systems which they represent. The product would then be multiplied by the dozens of energy service demands (lighting, heating, cooling, refrigeration, DVD players, computer services, industrial processes, etc) and by the divergent ways in which they are employed. This type of assessment quickly leads to the conclusion that there

may be a million or more potential advanced technology configurations that could be applied to reduce energy consumption while maintaining our economic well-being and quality of life.

Energy Efficiency Opportunities—The Technologies

Some of the main areas in which energy efficiency can be achieved include the following:

- Lighting
  - Higher efficiency lighting
  - Daylighting
    - Active skylights
    - Passive skylights
    - Fenestration (window)
  - Energy management systems
- Telecommuting
- Dispatchable Load Management
- Smart grid systems
- Building optimization
  - Energy management systems
  - Envelope
    - Thermal barriers
    - Weatherstripping
  - Occupancy Sensors
- Manufacturing process energy optimization
- HVAC
  - Chillers
  - Intelligent thermostat controllers
  - Free cooling
  - Plate and frame heat exchanges
- Motors
  - High efficiency motors
  - Intelligent motor control
  - Variable frequency drives
- Cogeneration
- Supermarket energy conservation technology
  - Anti-sweat devices
  - Cooler-freezer covers

Measurement and Verification of Energy Efficiency Measures

If energy efficiency is to be counted upon in an Integrated Resource Plan as a “negawatt” resource, it must be accurately measured, and re-verified periodically for persistency (continued efficacy).

The most reliable independent verification is generally accepted to be available from Certified Measurement and Verification Professionals ("CMVP") in accordance with the protocols of the Association of Energy Engineers (AEE)

- Evaluation of large energy efficiency programs has been around for nearly 20 years
- There is a body of accepted practice, methodologies, and tools, and an understanding of the issues related to estimating energy (kWh) savings
- The focus of the EE programs has remained on energy savings, and the application of the evaluation methodologies has thus focused on estimating energy savings
- Interest in ensuring the reality of the claimed savings led to regulatory directives regarding confidence and precision of the evaluated savings
- The most stringent was from the Massachusetts DPU, requiring that samples be designed with a confidence level of 90 +/-10%.
- Over the years a body of third-party derived evaluation results has developed to provide planners, decision-makers, and others with savings estimates about which there is a high degree of confidence
- These studies often included estimates of demand reductions associated with the energy savings, but there generally was less focus on the time differentiation of the demand reductions
- Typically the levels of demand reduction were estimated as occurring during seasonal on-peak and off-peak periods.

Impacts on M&V Practice in New England –

Meeting Statistical Confidence Levels

- The confidence and precision level of the overall demand resource portfolio bid into the FCA must equal or exceed 80+/-10% (not just target the level, as is the case with evaluation of energy savings).
- The demand resources bid in to the auction must be submitted by load zone (Massachusetts has three zones)
- The bid can be a single energy efficiency program or a portfolioof programs
- To ensure that the confidence level is met, higher evaluation costs may need to be incurred to draw larger samples.

Estimating the Right Demand Reduction Values

- The definitions of peak and critical peak hours are different from those used in the past -this has made it difficult to estimate the demand reductions from evaluation studies of past EE programs.

- Data underlying past EE studies have been examined to develop reliable factors that can be applied to the demand savings estimates –in particular, coincidence factors (lighting, HVAC) and measure lives.
- For the remainder, program administrators have had to plan new evaluation studies to estimate demand savings from EE programs across the new peak hours or to enhance existing data
- M&V studies continue to be needed, to support energy efficiency programs that produce savings at a cost of less than 3.2¢/lifetime-kWh
- reduce customer bills
- reduce the need for additional baseload generation
- support state level regulatory requirements

Issues of Bias and Accuracy

- The M&V Manual permits use of results from one load zone to another, or from outside the region, so long as homogeneity of the populations in the two areas can be demonstrated and bias in claimed demand reductions is not introduced into the bid.
- The Manual specifies the standards which the demand resource metering equipment must meet to ensure their accuracy. Evaluation contractors have had to address this more than had been anticipated.
- *Ceteris paribus* (“all else being equal”)

The Forward Capacity Market (FCM)

- For decades, regional system dispatch relied solely on supply resources to meet the forecasted loads
- In recent years the ISO-NE has added a demand-response contract program, to acquire load shedding commitments from individual customers.
- With the FCM, for the first time in New England, demand-side resources can be bid into the regional resource procurement system intended to meet the system peak and critical peak hours needs of the region.
- Objective: capacity (seasonal peak demand reductions)
- Pay for performance over measure life

Demand Resource Types

- FCM Market Rules define Demand Resources by the way in which they reduce load

GEOECONOMIC STRATEGY

Green should be renamed to be geostrategic, geoeconomic, capitalistic and patriotic

A recent article in the New York Times by columnist Thomas Friedman (award-winning author of “The Earth Is Flat” makes strong arguments emphasizing the importance of fossil fuel consumption in the United States.

Thomas Friedman says rename “green” to be geostrategic, geoeconomic, capitalistic and patriotic because living, working, designing, manufacturing and projecting America in a green way can be the basis of a new unifying political movement for the 21st century. A redefined, broader and more muscular green ideology is not meant to trump the traditional Republican and Democratic agendas but rather to bridge them when it comes to addressing the three major issues facing every American today: jobs, temperature and terrorism.

How do our kids compete in a flatter world? How do they thrive in a warmer world? How do they survive in a more dangerous world? Those are, in a nutshell, the big questions facing America at the dawn of the 21st century. But these problems are so large in scale that they can only be effectively addressed by an America with 50 green states — not an America divided between red and blue states.

Because a new green ideology, properly defined, has the power to mobilize liberals and conservatives, evangelicals and atheists, big business and environmentalists around an agenda that can both pull us together and propel us forward.

Post-WWII Development of U.S. Car Culture

After World War II, President Eisenhower responded to the threat of Communism and the “red menace” with massive spending on an interstate highway system to tie America together, in large part so that we could better move weapons in the event of a war with the Soviets. That highway system, though, helped to enshrine America’s car culture (atrophying our railroads) and to lock in suburban sprawl and low-density housing, which all combined to get America addicted to cheap fossil fuels, particularly oil. Many in the world followed our model.

Today, we are paying the accumulated economic, geopolitical and climate prices for that kind of America. I am not proposing that we radically alter our lifestyles. We are who we are — including a car culture. But if we want to continue to be who we are, enjoy the benefits and be able to pass them on to our children, we do need to fuel our future in a cleaner, greener way. Eisenhower rallied us with the red menace. The next president will have to rally us with a green patriotism. Hence Friedman’s new motto: “Green is the new red, white and blue.”

But here’s the bad news: While green has hit Main Street — more Americans than ever now identify themselves as greens, or what I call “Geo-Greens” to differentiate their more muscular and strategic green ideology — green has not gone very far down Main Street. It certainly has not gone anywhere near the distance required to preserve our lifestyle. The dirty little secret is that we’re fooling ourselves. We in America talk like we’re already “the greenest generation,” as the business writer Dan Pink once called it. But here’s the really inconvenient truth: We have not even begun to be serious about the costs, the effort and the scale of change that will be required to shift our country, and eventually the world, to a largely emissions-free energy infrastructure over the next 50 years.

Post-9/11 Attack--Evolution of “Green” to be Strategically Geo-economic

Sometime after 9/11 — an unprovoked mass murder perpetrated by 19 men, 15 of whom were Saudis — green went geo-strategic, as Americans started to realize we were financing both sides in the war on terrorism. We were financing the U.S. military with our tax dollars; and we were financing a transformation of Islam, in favor of its most intolerant strand, with our gasoline purchases. How stupid is that?

More Americans have concluded that conserving oil to put less money in the hands of hostile forces is now a geo-strategic imperative.
According to Dan Nolan, who oversees energy projects for the U.S. Army's Rapid Equipping Force "Energy independence is a national security issue," Nolan said. "It's the right business for us to be in."

Global Warming and GHG

Montana Gov. Brian Schweitzer: "We don't get as much snow in the high country as we used to, and the runoff starts sooner in the spring. The river I've been fishing over the last 50 years is now warmer in July by five degrees than 50 years ago, and it is hard on our trout population." In Moscow people celebrated the first Moscow Christmas in their memory with no snow. In London last February, residents didn't need an overcoat. In 2006, the average temperature in central England was the highest ever recorded since the Central England Temperature (C.E.T.) series began in 1659. In the summer of 2007, a man swam at the North Pole, that was formerly covered year around with a Polar Ice Cap

Let's say you invented the first internet-phone. You could charge people $2,000 for each one because lots of people would be ready to pay lots of money to have a computer they could carry in their pocket. With those profits, you, the inventor, could pay back your shareholders and plow more into research, so you keep selling better and cheaper internet-phones. But energy is different. "If I come to you and say, 'Today your house lights are being powered by dirty coal, but tomorrow, if you pay me $100 more a month, I will power your house lights with solar,' you are most likely to say: 'Sorry, but I don't really care how my lights go on, I just care that they go on. I won't pay an extra $100 a month for sun power. A new internet-phone improves my life. A different way to power my lights does nothing.'

Building an emissions-free energy infrastructure is not like sending a man to the moon. With the moon shot, money was no object — and all we had to do was get there. But today, we already have cheap energy from coal, gas and oil. So getting people to pay more to shift to clean fuels is like trying to get funding for NASA to build a spaceship to the moon — when Southwest Airlines already flies there and gives away free peanuts! I already have a cheap ride to the moon, and a ride is a ride. For most people, electricity is electricity, no matter how it is generated.

If we were running out of coal or oil, the market would steadily push the prices up, which would stimulate innovation in alternatives. Eventually there would be a crossover, and the alternatives would kick in, start to scale and come down in price. But what has happened in energy over the last 35 years is that the oil price goes up, stimulating government subsidies and some investments in alternatives, and then the price goes down, the government loses interest, the subsidies expire and the investors in alternatives get wiped out.

Summing up the problem, Immelt of G.E. said the big energy players are being asked "to take a 15-minute market signal and make a 40-year decision and that just doesn't work. ... The

U.S. government should decide: What do we want to have happen? How much clean coal, how much nuclear and what is the most efficient way to incentivize people to get there?"

He's dead right. The market alone won't work. Government's job is to set high standards, let the market reach them and then raise the standards more. That's how you get scale innovation at the China price. Government can do this by imposing steadily rising efficiency standards for buildings and appliances and by stipulating that utilities generate a certain amount of electricity from renewables — like wind or solar. Or it can impose steadily rising mileage standards for cars or a steadily tightening cap-and-trade system for the amount of CO2 any factory or power plant can emit. Or it can offer loan guarantees and fast-track licensing for anyone who wants to build a nuclear plant. Or — my preference and the simplest option — it can impose a carbon tax that will stimulate the market to move away from fuels that emit high levels of CO2 and invest in those that don't. Ideally, it will do all of these things. But whichever options we choose, they will only work if they are transparent, simple and long-term — with zero fudging allowed and with regulatory oversight and stiff financial penalties for violators.

President Bush Pushed for Texas Renewable Portfolio Standard in 1999

The politician who actually proved just how effective this can be was a guy named George W. Bush, when he was governor of Texas. He pushed for and signed a renewable energy portfolio mandate in 1999. The mandate stipulated that Texas power companies had to produce 2,000 new megawatts of electricity from renewables, mostly wind, by 2009. What happened? A dozen new companies jumped into the Texas market and built wind turbines to meet the mandate, so many that the 2,000-megawatt goal was reached in 2005. So the Texas Legislature has upped the mandate to 5,000 megawatts by 2015, and everyone knows they will beat that too because of how quickly wind in Texas is becoming competitive with coal. Today, thanks to Governor Bush's market intervention, Texas is the biggest wind state in America.

The Challenge to become not the "Greatest" but the "Greenest" Generation

An unusual situation like this calls for the ethic of stewardship. Stewardship is what parents do for their kids: think about the long term, so they can have a better future. It is much easier to get families to do that than whole societies, but that is our challenge. In many ways, our parents rose to such a challenge in World War II — when an entire generation mobilized to preserve our way of life. That is why they were called the Greatest Generation. Our kids will only call us the Greatest Generation if we rise to our challenge and become the Greenest Generation.

Conclusions

It is apparent that there are important economic and environmental reasons to implement as many energy efficiency measures as rapidly as possible, expanding the use of energy efficiency as a resource. Lowering demand and peak electricity usage exerts a deflationary effect on energy costs, lowering bills for customers, as well as improving the robustness and reliability of energy services. In addition, water consumption is reduced, jobs are created, the economy is strengthened, and the environment is improved by components such as reduction of greenhouse gases and air pollution. The need to build as many additional plants to meet a growing economy as might otherwise be needed can be reduced or eliminated.

There are significant and numerous barriers to implementation of energy efficiency measures in the marketplace. Among these are general apathy and inertia of the status quo. In addition, there are financial disincentives for the utilities to promote less use of their stock-in-trade. These barriers must be overcome for energy efficiency to most effectively become a significant part of the utilities' total resources. Traditional disincentives must be mitigated with such mechanisms as de-coupling, if public utilities are to continue their profitability, which will in turn ensure that they have reasonable access to capital markets to continue to supply their customer's needs.

As we pointed out, many common practices in both the private and public sectors systematically reward companies for wasting natural resources and penalize them for boosting resource productivity.

Portfolio standards for the utilities—both renewable and energy efficiency—are important tools, but often they allow for a painfully slow phase-in. If there is a recognized wasteful energy use, and the means to cost-effectively eliminate such waste, it is clearly to the benefit of all stakeholders to reduce the waste sooner, rather than later. Such ratcheting up to a desired level of energy efficiency should be accelerated whenever and wherever possible. Portfolio standards should be regarded as a floor, not a ceiling.

Public facilities should set an example. After all, it is bad public policy for governmental entities to waste taxpayer dollars on energy inefficient buildings.

Utility rebates and tax incentives have proved to be the #1 financial factor driving implementation of energy efficiency measures. However, the financial burden of rebates is borne by the other ratepayers. Tax incentives are borne by the other taxpayers. Utility rebates, DSM programs and tax incentives provide powerful financial drivers to "kick-start" energy efficiency. However quasi-free market cap and trade of energy efficiency Portfolio Credits are funded by the partial avoidance of expensive, often exorbitant, purchased power—thus reducing the ratepayers' burden. Therefore, cap and trade provide a long-term solution, with owners of energy efficiency portfolio credits selling them in the same way in which owners of renewable portfolio credits bring them to market—usually through the vehicle of a power purchase agreement.

Paraphrasing Winston Churchill, markets are the worst way to implement something profitable—except for all the other ways.

It is important to change the perception of energy efficiency to be co-equal with other resources—renewable, fossil, nuclear and hydro—in order to harvest this important resource.

We should all be involved in this process. We close with the quote attributed to Senate Chaplain Lloyd Ogilvie:
You may be able to make only a small difference, but that does not relieve you of the responsibility to make that small difference.