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H.R. 1945

To Improve the Energy Efficiency of the United States

THE ENERGY FOR OUR FUTURE ACT

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With many thanks to our dedicated advisor Andrea Schmitz

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preface

This group's previous report focused on investigating the many significant environmental problems addressed by the Energy for Our Future Act (H.R. 1945). Additionally, the solutions to problems stemming from fossil fuel-based electricity production were examined and solar technologies were identified as having the greatest potential to alleviate those problems. While our previous efforts mainly addressed the scientific and technological aspects of these issues, this report takes a more in-depth look at H.R. 1945's provisions dealing specifically with solar technologies. We recommend strategies for implementing two sections of the bill in particular, and lay out plans for staffing, budgeting, and performance measurement.

executive summary

As of 2007, the United States uses more electricity than any other county in the world, and demand is rapidly increasing. Unfortunately, the majority of U.S. electricity is currently produced through the combustion of fossil fuels, primarily coal. This leads to a host of environmental and public health problems. The most notable of these problems include acid rain, mountaintop-removal mining, groundwater contamination, smog and ground-level ozone, the release and bio-magnification of toxic heavy metals, and human-induced global warming.

A traditional coal plant
source: think green

To this end, H.R. 1945 (The Energy for Our Future Act), was introduced in the House of Representatives to improve energy efficiency in the United States. This bill aimed to shift the means of electricity production away from non-renewable fossil fuels towards renewable energy sources like solar, wind, and biofuels. It has become increasingly apparent that, while a mix of many different types of renewable energy will be required, the rapid development and proliferation of solar energy technologies will be essential if the U.S. is to significantly alter its means of energy production in the next half-century (Hoffert et al, 2002). Although solar technologies are not yet cost-competitive when compared to coal and present some unique problems of their own, they do have many advantages. These include fewer environmental problems, the ability to operate on a small-decentralized scale, and the utilization of a limitless source of renewable energy.

a solar photovoltaic array
source: case electrical serv.

With this in mind, the following report will examine the background and details of two sections of H.R. 1945 which are crucial for the development of solar energy, followed by proposals for first-year implementation of both programs. While it is currently unclear whether the Energy for Our Future Act has enough political momentum to become enacted into law in the near future, it is nevertheless important to begin considering the initial steps required for its programs to be effectively implemented.

The two sections of the bill that we have chosen to focus on deal with research and development of solar technologies and a minimum renewable generation requirement for electric utilities. Specifically, section 503 of the bill deals with the research and development of advanced solar photovoltaic technologies, and directly appropriates $648 million to this program through 2012. Section 205, entitled the Renewable Portfolio Standard (RPS), is an amendment to the 1978 Public Utility Regulatory Policy Act (PURPA), and lays the groundwork for the establishment of minimum renewable generation requirements. These standards require that all utilities in the United States produce at least 20% of their electricity from renewable, non-fossil fuel sources by 2020.

Renewable Portfolio Standard - policies that require electricity providers to obtain a minimum percentage of their power from renewable energy resources by a certain date.
Source: U.S. Department of Energy Energy Efficiency and Renewable Energy

Minimum Renewable Generation Requirement – the renewable energy credits in an amount equal to the required annual percentage specified in H.R. 1945, section 611, subsection (b). These credits are to be submitted to the Secretary, no later than April 1, for each calendar year beginning in calendar year 2009. (Source: H.R. 1945)

While H.R. 1945 stipulates that both of these new programs will be carried out by the Department of Energy, significant discretion is allowed as to the specific details. Therefore, based on similarities of tasks, goals, and procedures, we decided that the Office of Electricity Delivery and Energy Reliability (OE) would execute within the Renewable Portfolio Standards program, while the Office of Energy Efficiency and Renewable Energy (EERE) would manage Solar Research & Development (R&D). With regards to the Renewable Portfolio Standards program in particular, we selected a "hands-off" option for implementation, modeled on the U.S. Environmental Protection Agency's successful Sulfur Dioxide Trading Program. This approach minimizes government involvement and instead relies on a high degree of utility self-reporting/monitoring and the increased use of incentives to drive market innovation and productivity.

Since many of the tasks and program goals of the Solar Research & Development program are already being carried out by the EERE, our implementation plan calls for additional staff and resources to be added to that office in order to avoid creating a redudant division. The major goals for the first year of the R&D program are to dispurse more than $88 million in solar technology research and development grants, issue approximately $14 million in rebates for solar installations, develop an annual solar energy competition, and design/begin a $14 million solar marketing campaign.

The Renewable Portfolio Standards program, on the other hand, was very new and unrelated to other programs currently being implemented by the Office of Electricity Delivery and Energy Reliability (OE). We therefore decided to create an entirely new section within the OE, specifically charged with implementing the Renewable Portfolio Standards program. First-year tasks for this program included developing a legal framework for future enforcement, initiating an industry outreach program, and designing/constructing an electronic energy credit trading system.

The staffing plans for both programs reflected these differences in initial organization. Only four new employees were allocated to the EERE office, (which was already set up to dispurse research grants and rebates) while twelve employees were allocated to the OE (though some of these would not be hired until midway through the year). First year budgets for the two programs also reflect these dissimilarities. Internal operations of the Solar Research & Development program would require a total budget of $436,513, while the Renewable Porfolio Standards program would require an estimated $911,099.

Since continuing analysis, strategic planning, and performance measurement for these two programs will also be crucial for their success, a number of benchmarks have been recommended in order to assure effective implementation. In accomplishing the first year goals laid out for these two programs, the U.S. will hopefully be able to move one step closer towards achieving clean, sustainable, and reliable sources of energy.

Introduction:
Current Trends in U.S. Electricity Production

Americans currently use vast amounts of electricity in their day to day lives. In 2005, an estimated 4,103,484 megawatt hours of electricity were consumed, and projections show that this need is expected to rise significantly in coming years (EIA, 2007).

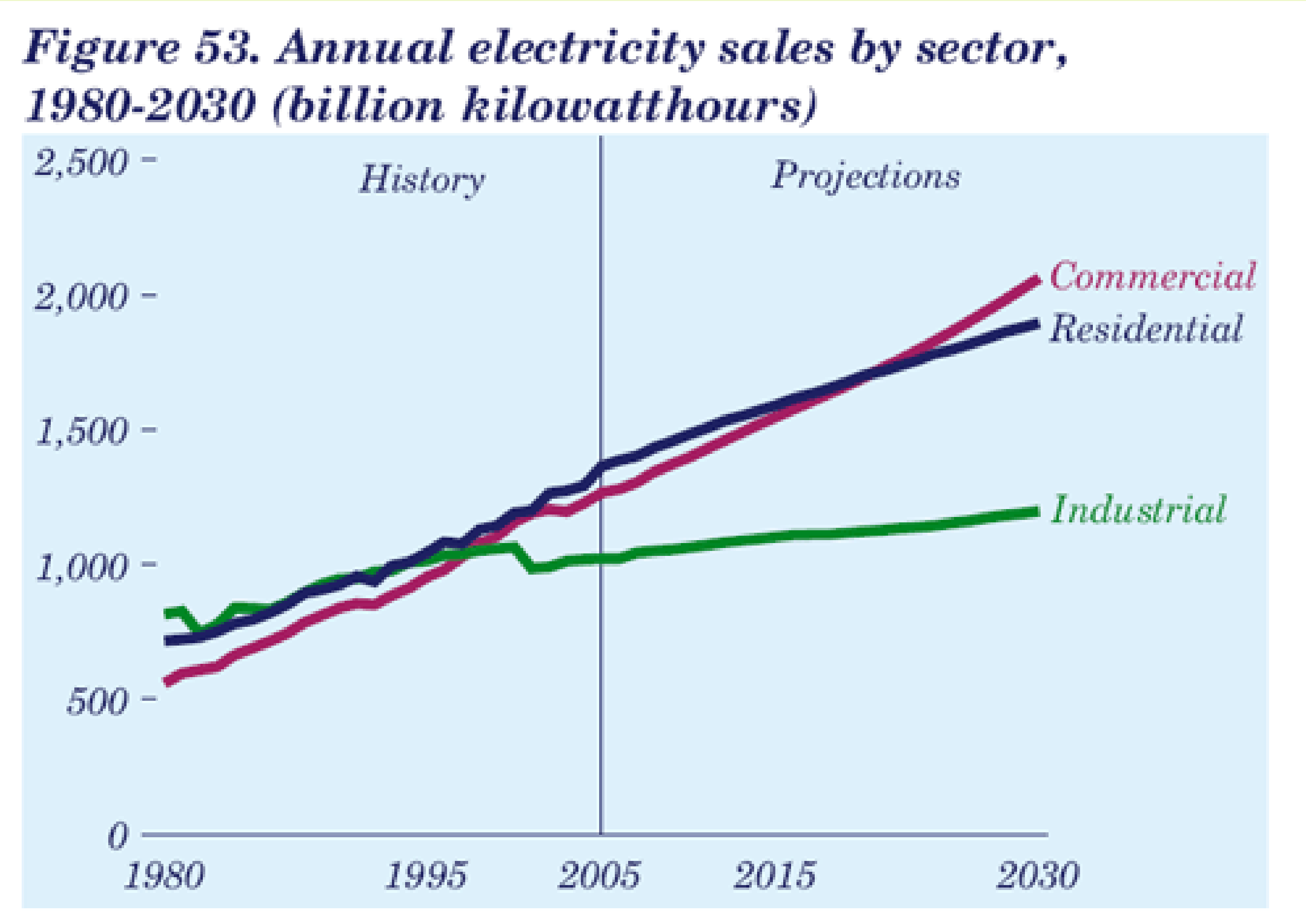


Figure 1:
Annial electricity sales by sector, 1980 -1030 (billion kilowatthours)

Source: Energy Information Administration

Issues with status quo

As of 2007, approximately 72% of all electricity was produced from fossil fuel combustion, with almost 50% attributed to coal please refer to Figure 2(EIA, 2007). Thus, of all fossil fuels, coal has by far the largest impact on U.S. energy policy, and this report will therefore consider coal as the primary source of fossil-fuel-based electricity production.

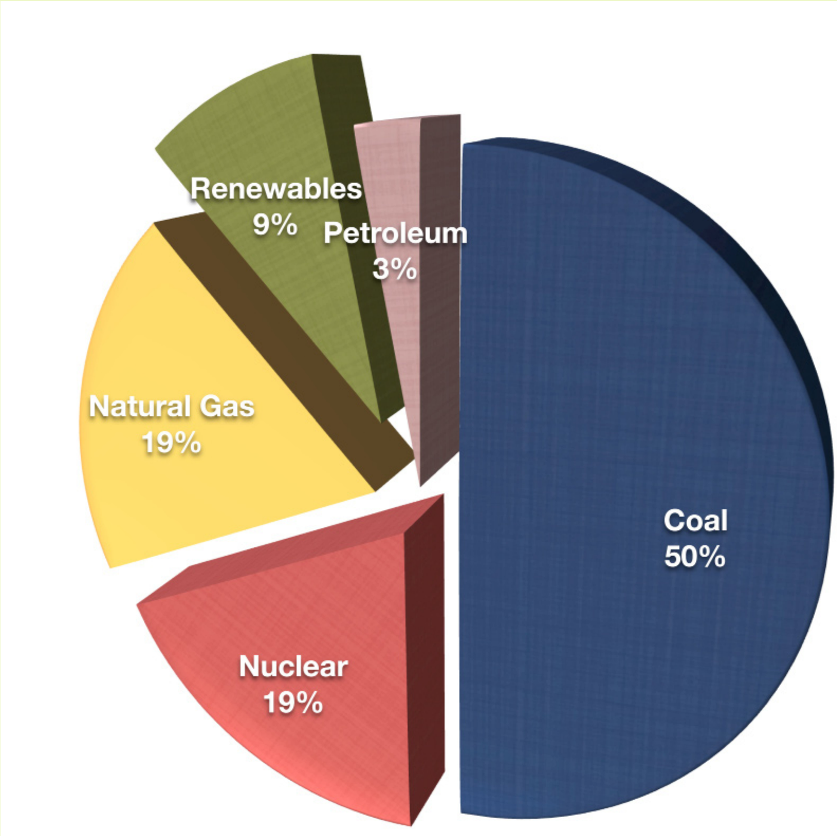


Figure 2:
U.S. Electric Power Generation by Fuel Source, 2007

Source: Energy Information Administration

Unfortunately, there are two major drawbacks associated with current patterns of electricity consumption in the U.S., and both are related to our heavy dependence on fossil fuels for energy production.

The first problem is that nonrenewable energy resources like coal, oil, and natural gas are finite; they cannot be replaced once depleted. Though many experts claim that there are enough fossil fuels to power the U.S. for centuries, these estimates are subject to a high degree of uncertainty. As an example, if yearly production and consumption patterns of coal (the most heavily utilized fossil fuel in the U.S.) remained the same as the year 2000 for the indefinite future, it is estimated that coal reserves in the U.S. would last until approximately the year 2255 (EIA, 2005). This however, is a mischaracterization of how much coal the U.S. can dependably rely upon, since there is an inverse relationship between increasing coal use and projected future availability. From 2000 to 2006 alone, consumption of coal for electricity generation climbed 8.5%, reducing the projected amounts of coal available for use in the future (EIA, 2007). Because U.S. consumption of coal is accelerating every year, previous coal reserve estimations become increasingly overstated.

The second set of problems associated with burning coal for electricity production consists of the many detrimental effects on public health and the environment inherent throughout the coal production and combustion processes.

Surface, strip, or mountaintop-removal mining disrupts and destroys local ecosystems, while huge underground mining operations are particularly dangerous for workers (either because of respiratory illness, or the threat of cave-ins and explosions). Both types of mining can also produce contaminated surface runoff as a byproduct of excess material removed from the mine. If a mining operation bisects the water table, the resulting runoff can acidify and poison an entire aquifer. Highly acidic water will dissolve toxic heavy metals from surrounding soils, threatening plants, animals, and humans. In addition, mountaintop-removal mining contributes to conditions that can cause severe flooding.

Burning coal also emits a myriad of chemical pollutants, including sulfur oxides, nitrogen oxides, carbon oxides, heavy metals, volatile organic compounds and particulate matter, which are harmful to both humans and the environment (Keating, 2001). The environmental impacts of these pollutants include acid rain, ground level ozone (smog), biomagnifications of toxins such as mercury, and the greenhouse effect. Though the areas that are most directly affected by these pollutants can be local, many of these pollutants also have the ability to travel far downwind from the source. As the world is being made increasingly aware, carbon dioxide must be considered a truly global pollutant, and massive emissions from U.S. coal-fired power plants have the potential to harm people all over the world.

Reversing the trend of increasing electricity use by reducing the aggregate amount of energy used in the United States can help curtail these pollution problems to a certain extent. More importantly though, altering our sources of electricity production from nonrenewable fossil fuels to clean, renewable energy, such as solar, will help protect the environment from further degradation, and people from further harm.

Solar Energy:
A Proposed Solution

Currently, less than 0.1% of energy used in the United States is provided by solar power. Both industrial and residential applications of solar energy have the potential to meet a significantly higher percentage of our current energy needs: according to the Energy Efficiency and Renewable Energy division of the Department of Energy: "the solar energy resource available in a 100-mile-square area of Nevada could supply the United States with all its electricity (about 800 gigawatts) using modestly efficient (10%) commercial PV modules" (EERE, 2007).

Nevada Solar 1:
A solar thermal power plant. Although not photovoltaic, it is and example of a successful large sacle solar project in Nevada.

Source:sustainable design update

The total amounts of incoming solar radiation absorbed by the Earth are also vastly greater than worldwide energy needs. Every day the continental U.S. receives 500 times more incoming solar radiation than the total energy requirements of the entire nation (NREL, 2007). Thus, the controversy surrounding solar technologies stems from the question as to why a greater percentage of vastly accessible, clean, and renewable incoming solar radiation is not being captured and converted into energy. Though the answer to this question is multifaceted and includes public misconceptions, past historical developments, and political pressures, an analysis of the science reveals that it is mainly a matter of technological feasibility on a large and reliable scale.

Currently, the majority of photovoltaic modules in use achieve somewhere between a 7-10 % energy conversion efficiency. Energy conversion efficiency of a solar cell is the proportion of light energy striking a photovoltaic cell which is successfully converted to electricity. Conversion efficiency for coal, on the other hand, is the amount of chemical energy which is converted into electricity, as opposed to the amount lost through friction or waste heat energy. Traditional coal combustion processes achieve approximately a 35% conversion efficiency and newer integrated coal-gasification combined cycle units are expected to achieve 45% by 2010 (Penn State, 2006). This is the challenge that solar technologies are up against – raising efficiency.

A scientist working on impriving the efficiency of solar photovoltaic cells

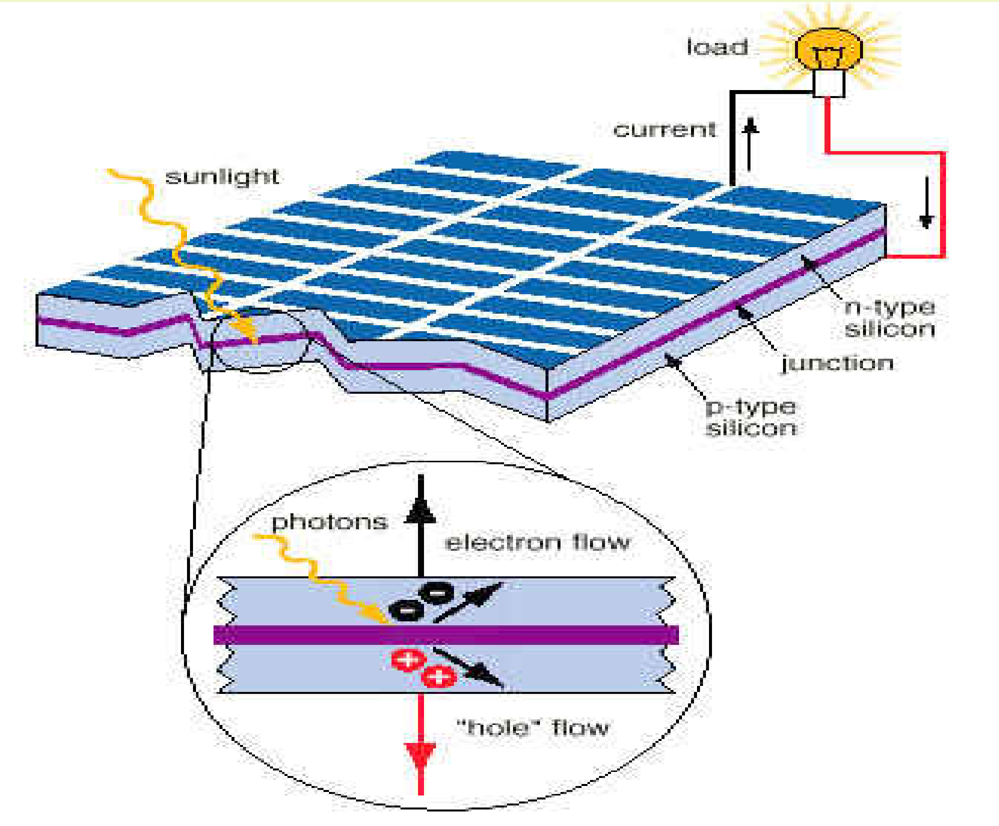
source:sciam

Looking back in the history of photovoltaics, by 1980 PV efficiency had peaked just under 10%, whereas some current multi-junction concentrators have achieved a conversion efficiency of approximately 34% (NREL). As of summer 2007, prototypes of two new technologies had achieved even higher conversion efficiencies. The University of Delaware and DuPont, under funding from the Defense Advanced Research Projects Agency (DARPA), recently achieved a conversion efficiency of 42.8%, and Boeing's Spectralab has achieved conversion efficiency rates of 36.9% by adapting the design of a solar cell that was previously used for satellites and space missions (Fairly, 2007). These units both achieve efficiency ratings that are competitive with traditional sources of electricity; the key to implementation requires building the technology to scale and at cost (Eurekalert & Boeing). DARPA is also currently attempting to develop Very High Efficiency Solar Cells (VHESC) with a minimum 50% conversion efficiency (DARPA, 2005).

Photovoltaic cells

Individual PV cells are made using metals known as “semiconductors” because they create little resistance to the flow of electrons (electricity). Currently, most photovoltaic cells use silicon as the primary material. Silicon is chemically altered usually by adding impurities, like other metals, to create a slightly negative electron field (n-type silicon). Another layer of silicon is similarly altered to create a slightly positive field (p-type silicon). These two layers are placed together and covered with a layer of non reflective glass. As light from the sun penetrates the glass, the photons of light incite the negatively charged particles to move to the positive layer through an external circuit, creating an overall current between the layers. The wire channeling this current carries the electricity which is harvested as the end-product of the process. Single cells are combined into increasingly complex modules, panels, and arrays.

Figure 3: Inside a Photovoltaic Cell



Source: NREL

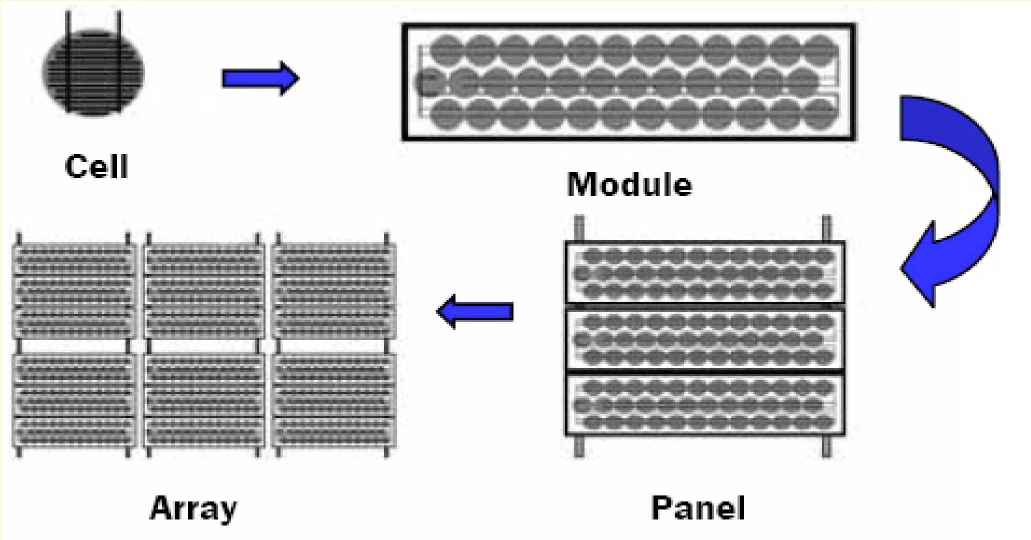


Figure 4: Various Levels of PV complexity

Source:
FVG Energy, Italy

What are the current political initiatives?

Up to the present, states rather than the national government, have shown the greatest support for the advancement of solar power. California in particular has demonstrated a great deal of initiative in promoting the widespread use of solar. In August 2006, Governor Schwarzenegger signed into law the California Solar Initiative, a bill that creates a $3.35 billion solar program that aims to install 3,000 megawatts of solar photovoltaic systems over the next decade. It is the second biggest solar program in the world, and is designed to bolster the solar industry to a point where it is considered mainstream, where it will no longer depend upon public subsidies. By incorporating net metering and reducing the need to build new power plants, it is estimated that the initiative will save Californians as much as $18 billion (Democratic Leadership Council, 2007). However, programs such as these are designed to expand markets for currentsolar technology, rather than providing opportunities to further effeciency-improving research.

What is net metering?

Net meting is a policy that allows small, geographically distributed producers of renewable electricty to feed electricity into their regional grid. A standard electricity meter in a home runs forward when electricity from a utility is used. With net metering, a home that feeds its renewable electricty into the grid can run the meter backwards equal to the amount of electricty they produce. At the end of the month, the home is billed for the total, or net, electricty use from the utility. If a home produces more electricity in a month than they use, a few things can happen depending on the policy: the user will receive credit for the electricty on the next month's bill; the user will receive a payment from the electricity company for the extra electricity: or the utility will absorb the extra electricity with no benefit to the small producer. There are other possibilities, but these are the most common.

Inputs and Production Technologies

Silicon is currently the most significant determinant of production cost for the photovoltaic industry. While silicon is a necessary component in most solar PV cells, it is also a key component of computer semiconductors, and consequently, the market price of silicon has largely been driven by the demand for computers. Thus, a boom in the computer/semiconductor industries in the past 15 years has resulted skyrocketing silicon prices for the PV industry. As a result, current demand for silicon far outstrips supply: worldwide silicon production averages about 40,000 tons/year, while the demand is about 75,000 tons/year (Solar Buzz, 2007). Prices reflect the supply imbalance as the silicon spot market has climbed approximately ten-fold in five years. Coal, by comparison, has experienced relatively few increases to input expenses over the last 15 years, with labor and machinery costs actually declining during the period from 1985-1993. (EIA, 2003). Despite these setbacks though, the price of solar energy has fallen by approximately 50% in the last decade, to about 3-4$ per watt, while the price of coal-based energy remains around 1$ per watt. (Jacobs, 2007).

However, a company called Reaction Sciences Inc. recently developed a new silicon manufacturing process which won the Massachusetts Institute of Technology's energy business plan contest and "Peoples Choice Award" (Sterling, 2007). This new process produces solar-grade silicon at a fraction of current costs. Hopefully, this new technology will help decouple the cost of PV manufacturing from worldwide semiconductor-quality silicon prices, which are sure to continue increasing in the future.

It must be noted that many of the apparent technological problems with solar technologies are rapidly disappearing. Although solar has yet to play a significant role in the domestic U.S. energy market, its potential appears increasingly bright. As solar technologies improve and the market develops competitive and efficient economies of scale, including a drop in price below $1/watt, there should be relatively little controversy surrounding the increased percentage of solar energy utilized in the general energy marketplace. The future of solar appears ready to receive greater political support in the form of subsidies and research funding/grants in order to help it achieve its full potential.

H.R. 1945: Enacting the Solution

To address and mitigate problems associated with fossil fuel-based sources of energy, on April 19, 2007 representative Christopher Shays, a Republican from Connecticut, introduced the House Resolution 1945 (H.R. 1945), the Energy for Our Future Act. It is a piece of legislation designed to promote renewable energy production and encourage overall energy efficiency. The bill seeks to achieve its goals through a number of mechanisms: its 33 sections include provisions to raise automobile fuel economy standards; establish a national tire efficiency program; reduce electric energy usage in corporate or residential buildings; expand renewable electricity production; shift the price of coal/oil/gas production back to true market levels; and research & develop renewable energy technologies.

H.R. 1945 was originally introduced as H.R. 4384 during the 109th Congress (Dec, 16th 2005) but languished in committees and never came up for debate.

Although the bill is supported by a number of environmental non-governmental organizations, such as the Sierra Club, League of Conservation Voters, Natural Resources Defense Council (NRDC), Union of Concerned Scientists, U.S. Public Interest Research Group (PIRG), Connecticut Public Interest Research Group (ConnPIRG), Environmental Action, Connecticut Fund for the Environment, Republicans for Environmental Protection and the Audubon Society, there is little open support in Congress. As the bill has not yet been brought up for debate, one can only speculate as to the course it will take.

Because of the great potential for solar energy and its prominence within H.R. 1945 our analysis has focused mainly on sections related to the promotion of solar technologies. Six sections within the bill pertain directly to solar and PV technologies, and together they receive the largest share of direct appropriations of any energy technology within the bill.

Solar Energy Provisions in the Energy for Our Future Act:

According to H.R. 1945, the Department of Energy (DOE) will administer the implementation of the following programs, all of which are introduced for the first time within this bill.

A retail development that has used net metering to gain extra revenue from the utilities

source: eggsolar

- **Renewable Portfolio Standards** – required **minimum levels of renewable energy** as a percentage of each electric utility's total electricity generation portfolio gradually increasing from 2% in 2010 to 20% in 2020.

- **Nationwide Net Metering** – a program enabling small-scale energy producers to sell excess electricity back into the power grid at or above market value.

- **Research & Development: Solar Photovoltaic** – $650 million appropriated through 2012 for the development and commercial application of solar-voltaic technologies, along with improvements in PV energy conversion efficiencies.

- **SUN Demonstration Grants** – $800 million in state level dem onstration grants through 2012 to stimulate the market for solar-voltaic technologies through increased awareness.

The Internal Revenue Service (IRS) will administer the implementation of the following programs detailed in the bill. These are currently in effect and are simply modified in the context of this legislation.

- **Extension of Tax credits for Commercial Solar Utility Projects** – tax incentives that aim to partially subsidize solar projects for businesses.

- **Extension of tax credits for Residential installation of Active and Passive Solar Technologies** - tax incentives that aim to partially subsidize residential solar projects.

While each section dealing with solar energy is extremely important, the rest of this report will focus exclusively on analyzing the possible implementation strategies for the minimum renewable generation requirement within the Renewable Portfolio Standards (RPS) program, and the Solar Research & Development program. The DOE will be responsible for implementing all aspects of both programs, with the Electricity Delivery and Energy Reliability (OE) division managing the RPS program, and the Energy Efficiency and Renewable Energy (EERE) division managing the Solar R&D program.

Legislative Mandates and Discretion:
RPS Program (Minimum Renewable Generation Requirements)

Section 205 is clear and efficient in setting up the Renewable Portfolio Standards program and mandating a MGMR for utilities. H.R. 1945 mandates that energy utilities produce a base percentage of their electricity from qualified renewables (eg. solar) and submit energy credits equal to that percentage every year. For each utility, 1% of generation must be produced by renewable sources in 2009, 2% in 2010 and an additional 2% every year untill a total of 20% is reached by 2020. Utilities are granted credits via application at the start of every annual credit cycle; one kilowatt-hour (kWh) of renewable electricity produced equals one credit. The bill outlines two exceptions to this rule: any renewable electricity generated, or any biofuels grown on "Native American Territories," shall receive two credits for every one kWh generated. If an energy company does not, or will not generate renewable energy, they are still responsible for submitting credits equaling the annual minimum renewable energy requirement for that year. Utilities can buy credits directly from the DOE for $.03/kWh or 200% of the market price of a renewable credit, whichever is less. The availability of credits from the DOE at a fixed price sets cap on the price of renewable credits in the market.

The legislation's second major mandate is the development of a renewable credit management, tracking, lending, and exchange market. The language leaves the specifics regarding design and development of this market entirely up to agency rule making. The market can monitor a utility's renewable generation percentage, or ability to reach that percentage via renewable credits. The market is also a place where energy utilities generating more renewable electricity than required by the minimum standard for the given year can sell their credits. This creates an incentive for energy utilities to produce more renewable electricity than required by the standard for a given year. Only sources of renewable energy which are constructed after the passage of this bill may be used to create credits eligible for exchange, and those credits will have a lifetime of four years. This provision ensures that new sources of renewable generation are continually constructed, and that credits can be carried over for a limited number of years as the requirements slowly increase. Existing renewable energy systems will still qualify for renewable credits, but may only be used by the utility that generates them, and expire after one year.

If a utility cannot comply with the standard because it did not acquire the appropriate number of credits, the legislation requires that they pay a fine of not more than the greater of $.03/kWh or 200% of the market price of a renewable credit, per kWh below compliance. This fine must only be paid if the Secretary of Energy brings suit against the offending utility in the appropriate Federal Court, and the Court rules in favor of the Secretary.

There are a limited number of areas in this section left up to agency discretion. The legislation allows the Department of Energy some freedom to develop a renewable credit market as the agency sees fit, and while utilities are required to submit an application to the department to receive their renewable credits, the design of this application is not specified. There is also no specification as to how to measure utilities' renewable electricity generation capacity.

Legislative Mandates and Discretion: Solar R&D Program

Section 503 of the bill details the mandates for Solar Research and Development. The legislations states that the Secretary of Energy, through the DOE, shall develop a program of research, development, demonstration and commercial application for advanced solar photovoltaic technologies. The program shall endevour to make electricity generated by solar photovoltaics cost competitive with fossil fuels by 2015 while enabling the widespread use of photovoltaic power generation. Additionally, the bill appropriates $648 million dollars over four years to achieve this goal. $148 million dollars of those appropriations is allocated to the first year of the program (2008). The DOE and Secretary of Energy are given complete discretion as to how they will achieve those objectives. Our program outlines a number elements designed to meet those goals, such as rebate subsidies on solar photovoltaic systems for residential and non-residential applications, marketing and awareness grants, and a solar technology design competition.

According to the Energy Information Administration, the purchase and installation price for equipping solar photovoltaics on an average U.S. residential home in 2005 was approximately $30,000 to $40,000.

Solar Rebates

Solar Rebates are a form of direct government subsidy used to lower the cost of purchasing/installing PV energy systems. The IRS currently administers rebate programs (using tax credits) for both commercial and residential applications, which covers up to $2,000 of the cost of purchase or installation during a one year period. The solar R&D Program would seek to make similar rebates available specifically to residential purchasers of solar technologies. However, instead of using tax credits (whereby savings might not be realized for an entire year) these rebates would be administered with direct mail-in rebate forms, so that customers could receive a rebate check within weeks of purchasing solar panels.

Program Options: Hands Off or Hands On

The two programs outlined above seek to achieve a number of goals within the first year of implementation. Some of these goals include creating a renewable credit application and exchange market, begining the lengthy process of networking with numerous utilities across the nation, increasing awareness and promoting incentives for purchasing solar photovoltaics, and improving solar photovoltaic efficiency. Two different sets of program options were considered to address these first year objectives: the "hands off" and the "hands on" option.

As of 2006, there were approximately 400 to 500 utility companies in the U.S. which generated more than 1,000,000 megawatts of electricity per year (EIA, 2006)

Hands Off

The first option is termed "hands off," because it involves little government interference with utilities and offers incentives to drive market innovation and productivity. In implementing the renewable generation requirements, the Department of Energy (DOE) will develop a simple application for renewable credits. Utilities will audit themselves to determine their renewable generation capacity and report their findings to the DOE. Much like the current tax structure, utilities will also be subject to DOE audits on occasion. Additionally, an online credit market infrastructure will be developed so that renewable credits can be exchanged. Lastly, a fund will be set up for monies collected from utilities that purchase credits from the DOE or pay fines for non-compliance.

Regarding the distribution of funds under the Research & Development program, $45 million dollars would be allocated to solar installation rebates, $65 million for marketing and awareness grants, $35 million will be allocated to research grants and the development of a solar photovoltaic design competition aimed at efficiency, while anywhere from $1-3 million will be reserved for administrative costs. These various allocations fit well with a "hands off" option, because any marketing campaign would largely be contracted out to private firms, and installation/purchase rebates are relatively easy to dispense. More complex and labor intensive tasks, such as requesting, reviewing, and disbursing grants, as well as designing a solar energy competition to improve cost effectiveness would be beyond the scope of program's first year, and would therefore be allocated fewer resources.

Hands On

The second option is refered to as "hands on" because it involves more government- oversight and regulation. The Department of Energy would develop an application process that would require highly detailed information from utilities (compared to the "hands off" option) in order to ensure more accurate reporting of renewable electricity generation capacities. Furthermore, DOE representatives would audit utilities on a much more frequent basis. Similar to the "hands off" option, the DOE will develop a fund for monies collected from government sale of credits and fines paid for non-compliance. Lastly, this option sets a limit on the amount of non-renewable electricity production allowed by a utility, based on population area served.

Under a "hands on" approach, distribution of funds within the R&D program would be shifted from rebates and marketing grants to research & development and the solar technology design competition (while incuring slightly higher administrative costs). The allocations would be approximately $88 million for research grants, $29 million for the solar design competition, and $14 million for each of the marketing and rebate initiatives respectively. This option allows research and innovation to spur expansion of the market, rather than letting the market demand for solar photovoltaics spur innovation. The solar technology developed from the design competition would hopefully be "open source." Winners of the competition will be compensated generously, while their innovations would be used to raise the efficiency/cost competitiveness of solar technology so that it could be more heavily distributed and promoted as part of longer term goals.

After careful consideration, the "hands off" option was selected with respect to the Renewable Portfolio Standards program, and the "hands on" option for the Solar Research & Development Program. We determined, that similar to the current sulfur-dioxide trading market, utilities already conduct a huge amount of very accurate self monitoring. Thus a large and expensive federal program would create many redundencies. In the case of renewable energy credits, it should be relatively easy to verify the numbers reported by utilities, and companies will have large financial incentives to participate and quickly integrate the new system into their operating procedures. With respect to the Solar Research and Development program, we determined that because of the five year time-span of the program, it will be most advantageous to focus on improving the energy efficiency and cost competitiveness of solar energy. While this will create a large workload for the first year of a new program division, we believe that this is the best course of action when considering the goal of making solar technologies cost competitive with fossil fuels by 2015.

EPA's Sulfur-Dioxide (SO2) Trading Market

In 1995, the Environmental Protection Agency began a program to limit SO2 emissions from coal-fired power plants through a system of "cap and trade" (whereby the total amount of emissions are capped, and utilities which emit less than their allowance are allowed to trade any remaining "emission credits" to others). The allowance trading system capitalizes on the power of the marketplace to reduce SO2 emissions in the most cost-effective manner possible. The permitting program allows utilities the flexibility to tailor and update their compliance strategy based on their individual circumstances. The General Accounting Office recently confirmed the benefits of this approach, projecting that the allowance trading system could save as much as $3 billion per year—over 50%—compared with a command and control approach typical of previous environmental protection programs (EPA Clean Air Markets Division, 2007). The programs' success in limiting emissions is also apparent from the figure shown in Figure 5 (next page).

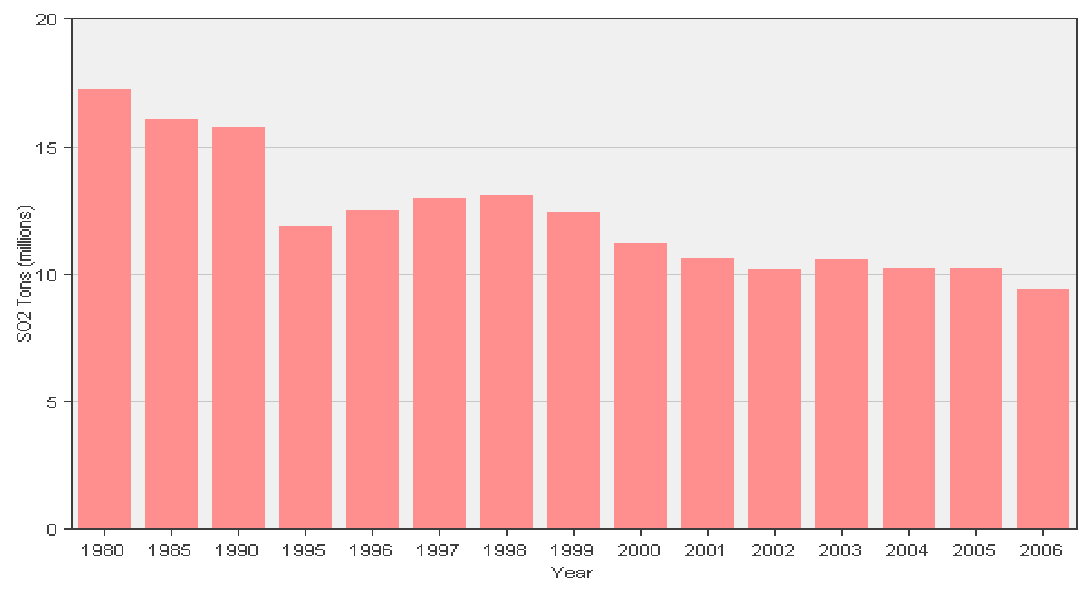


Figure 5: Annual SO2 Emissions from Regulated Utilities

Source: EPA Clean Air Markets Div.

Staffing:
Solar Research & Development

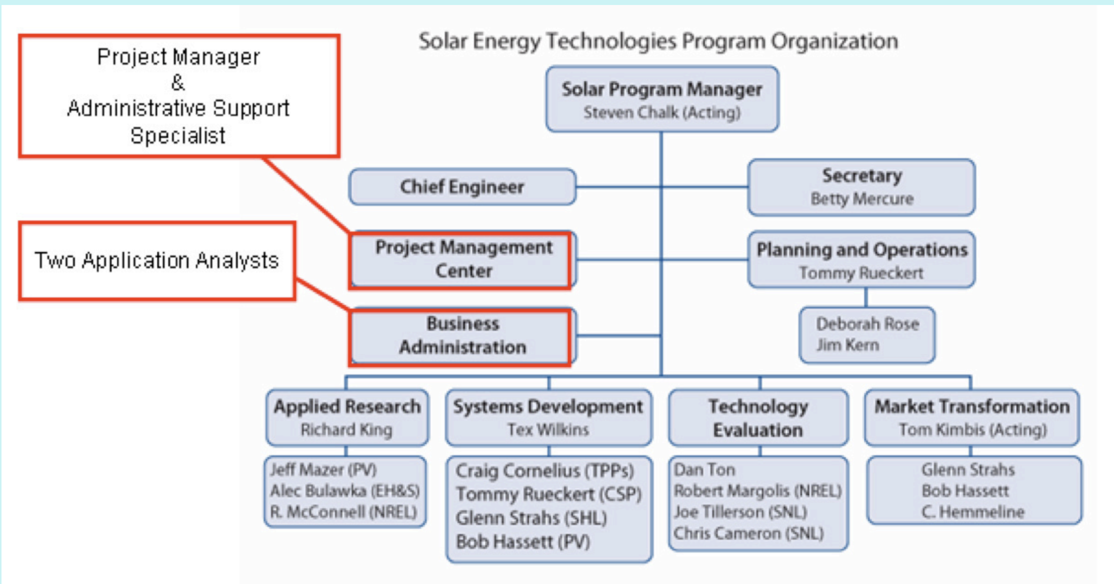
In order to fulfill the first year goals outlined above, the following four additional staff are to be added to the Energy Efficiency and Renewable Energy (EERE) office within the Department of Energy:

Project Manager - GS13 Federal Employee
The project manager is responsible for overseeing the three other new staffers as well as coordinating with existing Department of Energy support staff from other departments (such as the General Counsel, Management, and Budget Office departments).

Administrative Support Specialist – GS9 Federal Employee
This employee is responsible for many clerical and organizational tasks such as the making and keeping of calendars, setting up and maintaining the office, and conducting logistical planning for the solar competition.

Application Analyst – GS11 Federal Employee (2 employees)
These two employees are essential for the drafting of Requests for Proposals (RFPs), reviewing received applications, assisting in designing an online application, and assisting industry actors with the application process.

These four new employees are to be placed within the Solar Energy Technologies Program Office located within the EERE. This is indicated in the following organizational chart:



Staffing:
Renewable Portfolio Standards Program

Staffing needs for the RPS program are much greater than for the Solar R&D Program. Therefore, a new department will be created to manage this new work. We have settled on first year goals that are feasible, forward-thinking, and allow for departmental expansion as the duties outlined in the legislation increase. For the first year, this new department will focus on laying the groundwork: developing applications; creating a credit issuance system; assisting industry with information and credit-trading; and creating a monitoring and compliance framework. To accomplish all of the first year goals, the following staff will be needed:

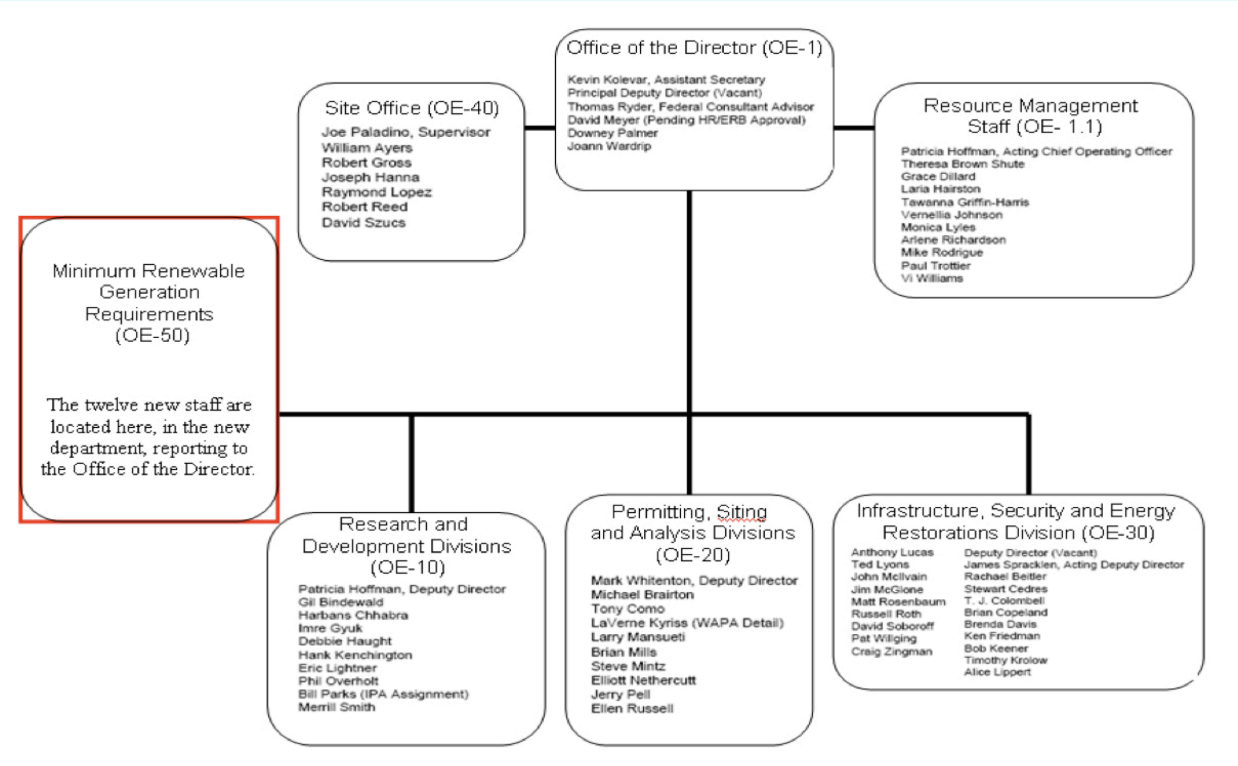
Project Manager - ES Federal Employee
This person oversees the entire Minimum Renewable Generation Requirement (MRGR) program. He or she will coordinate with other key areas of the DOE, directly manage staff, and also work with middle managers such as the IT Manager and Supervisory Compliance Officer in overseeing those tasks.

Administrative Support Specialist - GS9 Federal Employee
This employee will assist the Project Manager and other staff located within the central office. This person will assist in setting up the central office, managing office resources, facilitating interoffice communication, conducting meetings, planning office event logistics, and maintaining the utilities master list.

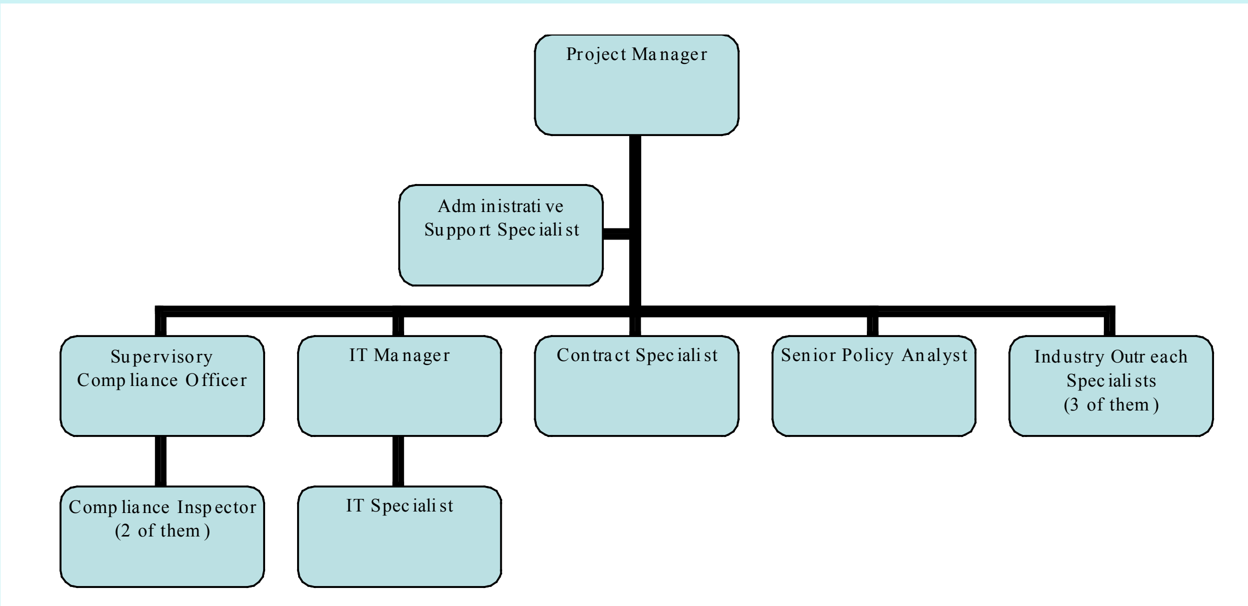
Supervisory Compliance Officer - GS15 Federal Employee
This employee is responsible for enforcement and industry-monitoring activities aimed at ensuring that utilities comply with MRGR. He or she is in charge of training and maintaining a squad of Compliance Inspectors and developing inspection Standard Operating Procedures. While actually conducting inspections is not a first year goal, it is important to create the framework for such inspections.

Compliance Inspector - GS10 Federal Employee (2 employees)
This employee is responsible for visiting utility sites and conducting inspections of their renewable electricity generating capacity. This travel-intensive position requires frequent contact with the Supervisory Compliance Officer. Also, additional Compliance Inspectors can be staffed depending on workload; as the MRGR Program matures, enforcement will become more important in the day-to-day operation of the department.

Industry Outreach Specialist - GS10 Federal Employee (3 employees)
This employee functions as a liaison between industry professionals and the government office. Most importantly, Industry Outreach Specialists will assist in making contact with utilities, guiding them through the regulations and credit applications, and scheduling industry summits to jumpstart awareness and credit-trading between utilities.



Below is an organizational chart of the newly created OE-50 (RPS) office, which includes our twelve new staff members.



Budget and Funding

Total estimated funding needs necessary to meet the objectives for these two programs within HR 1945 totals $148,911,099: with $911,099 to be allocated to the RPS section of the OE and $148,000,000 to be allocated for Solar R&D within the Office of Energy Efficiency and Renewable Energy (EERE).

Individual staff salary levels used for the following budget calculations were sourced from the Federal Government's 2007 General Schedule (GS) table. All personnel fringe benefits were calculated at an industry average of 25% of salary, and Other Than Personnel Services (OTPS) were calculated on a per position basis (generally between 20-30% of total personnel costs). OTPS represents office supplies, communications costs, technical devices, and other necessary operating expenses; differences in OTPS percentages are also reflective of the various travel needs per position.

The following table (T1) represents the funds allocated to both the OE and the EERE throughout the years of 2006-2008, as well as the proposed additional funding as part of H.R. 1945.

Table 1

DOE Divsion	FY 2006 Appropriations	FY 2007 Congressional Request Allocations	FY 2008 Congressional Request	FY 2008 HR 1945 Recommended	FY 2008 Total Allocations
OE	$158,178,000	$124,928,000	$114,937,000	$911,099	$115,848,099
EERE	$1,166,086,000	$1,176,421,000	$1,236,199,000	$148,000,000	$1,384,000,000
Totals	$1,324,264,000	$1,301,349,000	$1,351,136,000	$148,911,099	$1,499,848,099

Table 2: Total RPS Budget, 2008

FTE = Full Time Equivalent

Table 2 below highlights the program budget allocations for the OE's Renewable Portfolio Standards Program.

H.R. 1945 - OE Renewable Portfolio Standards Program Totals	
Total FTEs	6.5
Salary for OE	$535,162
Total Fringe (25% of Salary)	$133,790
Total Personnel Expenses (Salary + Fringe)	$668,952
Total OTPS	$242,147
Total Expenses (Salary + Fringe + OTPS)	$911,099

Table 3:
Line Item Budget
RPS Program

Table 3, below, is the line item budget for each of the positions responsible for implementing the RPS Program. Those FTE positions less than 1.00 indicate personnel that would be hired either in the beginning of the 2nd or 4th quarters of 2008.

Job Title	GS Level	#	Effective Annual FTE	Salary	Salary Allocated to OE-50	OTPS	OTPS %	Totals
Project Manager	ES	1	1.00	$111,676	$111,676	$55,838	50%	
Supervisory Compliance Officer	GS15	1	1.00	$110,363	$110,363	$55,182	50%	
Compliance Inspector	GS10	2	0.25	$47,030	$23,515	$11,758	50%	
Industry Outreach Specialist	GS10	3	0.25	$47,030	$35,273	$17,636	50%	
Contract Specialist	GS10	1	0.75	$47,030	$35,273	$14,109	40%	
Administration Support Specialist	GS9	1	1.00	$38,824	$38,824	$15,530	40%	
Senior Policy Analyst	GS11	1	1.00	$79,052	$79,052	$31,621	40%	
I.T. Manager	GS13	1	1.00	$85,000	$85,000	$34,000	40%	
I.T. Specialist	GS12	1	0.25	$64,746	$16,187	$6,475	40%	
Total FTEs and Salary			**6.50**		**$535,162**	**$242,147**		
Total Salary with Fringe (25%)								**$668,952**
Sum Total for OE-50 Department								**$911,099**

Table 4 represents the 2008 Program Budget for HR 1945's EERE Solar R&D Program. The table shows the $148 million appropriated minus the personnel expenses. The remaining funds will be allocated on a percentage basis that best meets the objectives of our selected program option.

Table 4:
EERE's PV Program Budget, 2008
1st Year only

H.R. 1945 Total Monies Allocated to EERE	$148,000,000
H.R. 1945 Monies minus personnel expenses	$147,562,488
R&D Grants - 60%	$88,537,493
Solar Competition - 20%	$29,512,498
Marketing - 10%	$14,756,249
Solar Rebates - 10%	$14,756,249

Table 5 represents H.R. 1945's 2008 Personnel Budget for the EERE Solar Program

Table 5:
EERE's Solar R&D Personnel Budget, 2008
1st Year only

H.R. 1945 - EERE Totals	
Total FTEs	4.00
Total Salary	$258,806
Total Fringe (25% of Salary)	$64,702
Total Personnel Expenses (Salary + Fringe)	$323,508
Total OTPS	$114,005
Total Expenses (Salary + Fringe + OTPS)	$437,513

Table 6:
Line-Item Budget for EERE's PV Project Management Center
1st year only

The following tables (6 &7) are the line-item budgets for the EERE's Project Management Center and Business Administration (respectively).

Project Management Center								
Job Title	GS Level	#	Effective Annual FTE	Salary	Salary Allocated to EERE	OTPS	OTPS %	Totals
Project Manager	GS13	1	1.00	$104,826	$104,826	$52,413	50%	
Administrative Support Specialist	GS9	1	1.00	$38,824	$38,824	$15,530	40%	
Total FTEs and Salary			2.00		$143,650	$67,943		
Total Salary with Fringe (25%)								$179,563
Sum Total: Project Mgt.								$247,505

Table 7:
Line-Item Budget for EERE's PV Business Administration Division
1st Year only

Business Administration								
Job Title	GS Level	#	Effective Annual FTE	Salary	Salary Allocated to EERE	OTPS	OTPS %	Totals
Application Analyst	GS11	2	1.00	$57,578	$115,156	$46,062	40%	
Total FTEs and Salary			2.00		$115,156	$46,062		
Total Salary with Fringe (25%)								$143,945
Sum Total: Business Administration								$259,101

Overleaf is the master calendar, outlining and scheduling the events that will be required in the first year.

Master Calendar for 2008

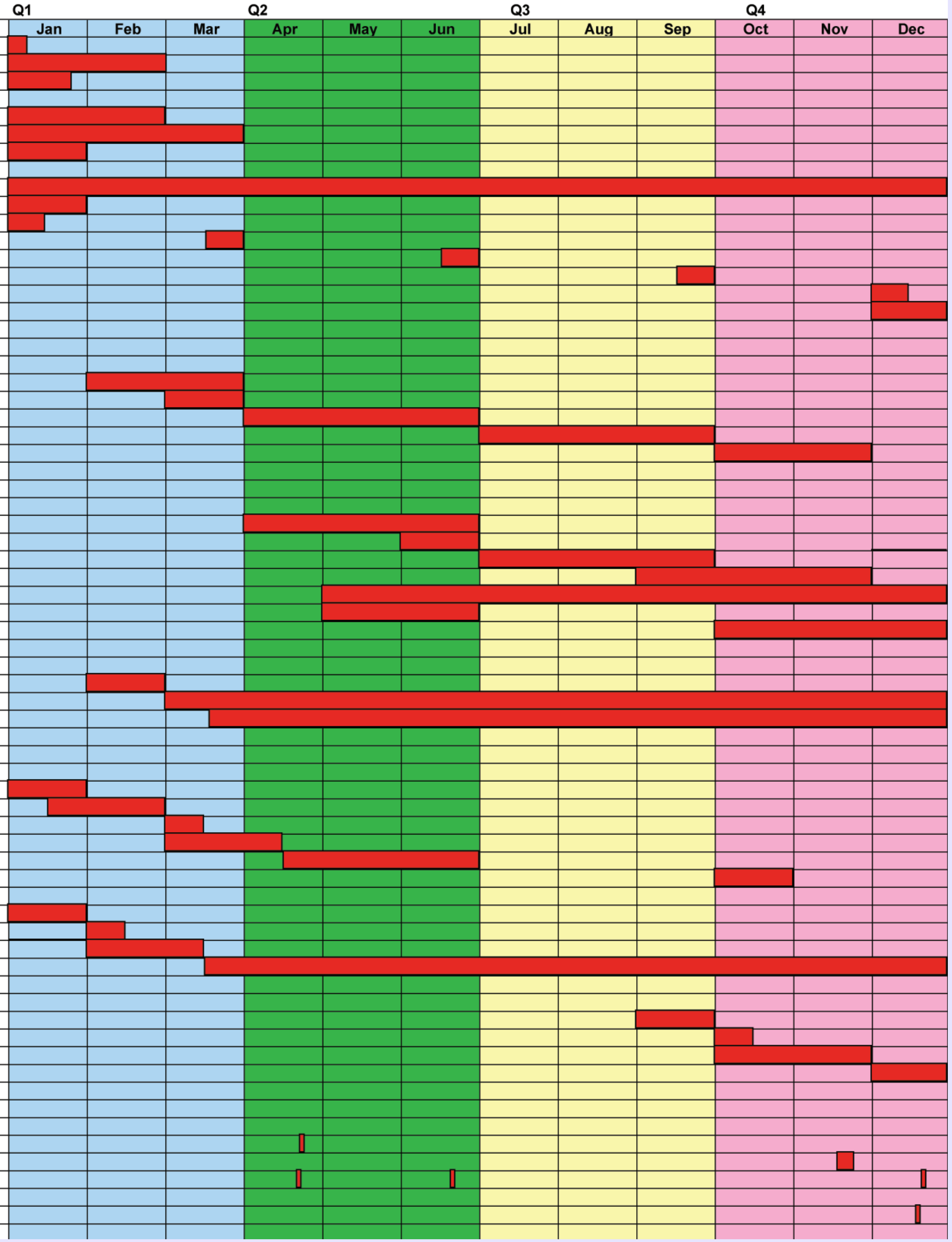
OE: Minimum Renewable Generation Requirement

			Q1			Q2			Q3			Q4		
Administrative Tasks	**Staff**	**Duration**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
1. On-board new personnel (5)	Director/Project Manager	1 week												
2. Training and team building period	Director/Project Manager	2 months												
3. Office set-up	Project Manager/Admin. Support Specialist	3 weeks												
4. Strategic planning														
a. Develop vision, mission statement, and goals	Director/Project Manager	2 months												
b. Year by year long-term plan (11-year horizon)	Director/Project Manager	3 months												
c. Develop and propose 2008 workplan	Director/Project Manager	1 month												
5. Budget														
a. General office finances	Accountant/Controller (DOE)	Ongoing												
b. 2009 allocation/proposal	Director/Project Manager	1 month												
6. Performance review		2 weeks												
a. Q1 Departmental	Director/Project Manager	2 weeks												
b. Q2 Departmental	Director/Project Manager	2 weeks												
c. Q3 Departmental	Director/Project Manager	2 weeks												
d. Q4 Departmental	Director/Project Manager	2 weeks												
e. Annual staff review	Director/Project Manager	1 month												
Function Tasks														
Develop Legal Framework														
1. Establish standards and applications	Senior Policy Analyst	4 months												
2. Design auditing framework	Senior Policy Analyst	6 months												
3. Design enforcement protocol	Project Manager/Senior Policy Analyst	6 months												
Industry Outreach Program														
1. Identify utilities master list	Admin. Support Specialist	2 months												
2. Hire outreach specialist (1)	Director/Project Manager	3 months												
a. Establish industry contacts	Outreach Specialist	4 months+												
b. Schedule and conduct meetings	Admin. Support Specialist/Outreach Specialist	4 months+												
3. Portfolio review	Senior Policy Analyst	2.5 months												
Credit Trading System (Online)														
1. Hire programmer (1)	Project Manager/IT Manager	1 month												
2. Develop IT infrastructure	Project Manager/IT Manager													
a. Design	Project Manager/IT Manager	8 months												
b. Analyze	Project Manager/IT Manager	8 months												
c. Code	Project Manager/IT Manager	3 months												
d. Test	Project Manager/IT Manager	3 months												
e. Implement/Launch	Project Manager/IT Manager	1/5/09												
3. Hire Contract Specialist (1) and design credit system	Contract Specialist	4 months												
4. Hire and train enforcement officers (2)	Director/Project Manager	4 months												
5. Launch Celebration Luncheon (1/5/09)	Admin. Support Specialist	1.5 months												
Other Important Dates														
Earth Day		4/22												
Solar Energy Awareness Week		11/17-11/23												
Equinox		4/20 & 9/22												
Solstice		6/20 & 12/21												
Annual office holiday party	All staff	12/18												

Master Calendar for 2008

EERE: Research & Development

Task	Staff	Duration
Administrative Tasks		
1. On-board new personnel (5)	Director/Project Manager	1 week
2. Training and team building period	Director/Project Manager	2 months
3. Office set-up	Project Manager/Admin. Support Specialist	3 weeks
4. Strategic planning	Director/Project Manager	
a. Develop vision, mission statement, and goals	Director/Project Manager	2 months
b. Year-by-year term plan (4-year horizon); secure add. funding	Director/Project Manager	3 months
c. Develop and propose 2008 workplan	Project Manager	1 month
5. Budget		
a. General office finances	Accountant/Controller (DOE)	Ongoing
b. 2009 allocation/proposal	Project Manager	1 month
6. Performance review		2 weeks
a. Q1 Departmental	Director/Project Manager	2 weeks
b. Q2 Departmental	Director/Project Manager	2 weeks
c. Q3 Departmental	Director/Project Manager	2 weeks
d. Q4 Departmental	Director/Project Manager	2 weeks
e. Annual staff review	Project Manager/Director	1 month
Function Tasks		
Research Grants		
1. Develop application process/form/criteria/feedback loop	Project Manager/Application Analyst A	2 months
2. Request for proposals (RFPs)	Admin. Support Specialist	1 month
3. Application period (deadline: 6/30/08)	Application Analyst A	3 months
4. Review applications	Application Analyst A	3 months
5. Disburse grants ($90 million)	Project Manager/Controller (DOE)	By 11/08
6. Feedback	Project Manager	2009
Solar Competition (held 3/5/09-3/15/09)		
1. Design competition/allocate staff	Project Manager	3 months
2. Request for proposals (RFPs)	Application Analyst B	1 month
3. Application period (deadline: 9/30/08)	Application Analyst B	3 months
4. Review proposals	Application Analyst B	3 months
5. Event Logistics	Admin. Support Specialist	8 months+
a. Location selection process	Project Manager	2 months
b. Determine staffing needs (administration and judges)	Project Manager	3 months+
Residential Rebate Program		
1. Design online application	Project Manager/Application Analyst A	1 month
2. Evaluate applications (ongoing)	Application Analyst A	10 months+
3. Disburse rebates ($14.7 million available)	Project Manager/Controller (DOE)	9.5 months+
Marketing		
Competition		
1. Allocate budget	Project Manager	1 month
2. Contact Ad Agency/Marketing firm	Admin. Support Specialist	1.5 months
3. Define scope	Project Manager	2 weeks
4. Design campaign	Project Manager	1.5 months
5. Launch (around Earth Day, 4/22)	Project Manager	2.5 months
6. Evaluate	Project Manager	1 month
Rebates	Same as *Competition campaign*	
1. Allocate budget		1 month
2. Define scope		2 weeks
3. Design campaign		1.5 months
4. Launch		9.5+
5. Evaluate		2009
General awareness	Same as *Competition campaign*	
1. Allocate budget		1 month
2. Define scope		2 weeks
3. Design campaign		2 months
4. Launch (around Solar Energy Awareness Week, 11/17-23)		1 month
5. Evaluate		2009
Other Important Dates		
Earth Day		4/22
Solar Energy Awareness Week		11/17-11/23
Equinox		4/20 & 9/22
Solstice		6/20 & 12/21
Annual office holiday party	All staff	12/18



Measuring success

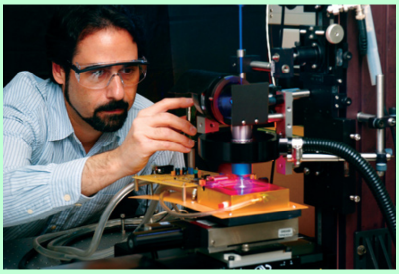
It will also be vital to monitor the implementation of these programs by collecting data on performance indicators. We have established performance indicators for each task related to the implementation of these programs within the first year of enactment of the bill. Based on the success of achieving the desired output from a task, we can measure how well the department is performing.

All project teams will be required to submit reports to the Secretary of Energy upon completion of each task and also submit monthly status reports. The department will also send a number of surveys to utilities and electricity end-users to gather feedback regarding all programs. Employees will submit anonymous surveys upon completion of tasks to gather data regarding how well the systems are functioning. This allows the Secretary to determine the best practices for implementation of programs in the bill and determine the most efficient way for staff to perform tasks in the future. Some programs will also require site visits to ensure that users are implementing programs correctly. This constant data collection provides an invaluable resource for the Secretary and project managers to improve the program in successive years.

Performance Management: Research Grants
We have allocated 60% of our budget after staffing costs, about $90 million, to fund research grants focused on improving efficiency and manufacturing of solar cells. We hope that these research grants will support emerging technologies that have the potential to vastly increase the efficiency of photovoltaic cells while making the technology more cost-competitive and accessible to the consumer. The preliminary plan in the first year to is dispense multiple small-sized seed grants to universities and research labs engaging in research on new photovoltaic technologies. Based on the progress of these projects in the first year, greater second-year funding may go towards those projects deemed to have the highest potential for efficiency improvements.


Source: Inhabitat

The process of dispensing research grants has been divided into four separate tasks: 1) developing the grant application and criteria for selection, 2) requesting grant proposals, 3) reviewing applications, and 4) issuing grants. The deliverable output for the first task is a completed application form. The performance indicator will be whether or not the application is completed and ready to distribute to potential applicants by the date set in the Master Calendar. After requesting proposals, the department will measure the success of the application processs and criteria by the number and quality of proposals recieved. When reviewing proposals, grant winners will be chosen based on criteria determined in Task 1 and the greatest potential for improving efficiency of photovoltaic cells. The number of grants issued will be a measure of the quality of applicant proposals. If proposals received are not deemed worthy of grant money, this feedback will influence criteria for the following year's research grant allocations, thus creating a feedback loop.


John Nocerino with the OBIC system, developed to help understand the nature of latent defects in solar cells.

The department also has the ability to gather feedback from universities, the solar industry, and research labs regarding the grant criteria. This information will be extremely valuable in determining the types of grants that will have the most beneficial impact in the industry and photovoltaic technology. In addition, this type of feedback can help the department design criteria for research grants that will attract the best proposals. It will also help the department to most efficiently allocate grant funding.

Table 10: Research Grants

Task	Output	Indicator
1. Develop Application, criteria for selection	Application form	Completed form, ready to disperse
2. Request For Proposals	Receive proposals	Quantity of proposals received
3. Review applications	Select grant winners	Quantity of proposals accepted
4 .Issue grants	Dispense money	Amount of money / number of grants issued

Performance Management:

Solar Competition

The first year program design calls for creating a solar competition which will award prizes to entrants with solar technologies that will make the most significant contributions toward reducing the cost of solar electricity cost to $0.01 per kWh. This is a longer-term goal, but manufacturers and research laboratories will need to seriously consider these objectives when designing and applying new technologies. Entrants will be accepted whose innovations could spur improvements at any point in the manufacturing process. Such innovations could include improvements in refining silicon, (which would reduce input costs), efficiency developments in photovoltaic assembly lines (which could reduce manufacturing costs), or efficiency gains for individual PV cells (which would increase the amount of electricity harvested per cell).

The primary task for the first year is to design the guidelines and criteria for this competition. A request for proposals will follow the completion of the competition design. The number of proposals for entry into the competition will be the performance indicator of this task. If few proposals are received, a re-design of the competition may be necessary. Otherwise, proposals will be reviewed and final competitors will be selected by the end of the first year. The actual competition and judging will take place in 2009 (Year 2). The performance indicator for reviewing and selecting proposals is the number of final competitors selected to compete in the solar competition. Further feedback regarding the design criteria can be solicited from user groups and industry. This will help in designing future competitions and ensuring this competition runs smoothly.

Table 11: Solar Competition

Task	Output	Indicator
1. Design competition	RFP (Requests for Proposals) Document	Number of proposals recieved
2. Review of proposals	Competitors selected	Number of competitors chosen

Performance Management:

Solar Installation Rebates

The third major program being implemented under the Research and Development Program is a direct rebate for residential purchase or installation of photovoltaic systems. This is a new rebate directly from the Department of Energy that will cover a certain percentage of purchase and installation costs up to a fixed dollar amount. It is similar to other incentives that exist at federal and state levels, thus making solar technology even more accessible than it was before. There has been $14.7 million allocated for these rebates in the first year of our program design. The first task associated with the rebate program is to design a rebate application that will be available both online and through direct mail. The performance indicator will be the number of applications received as a percentage of all individuals estimated to be eligible in the given year. The second task is to evaluate applications that are submitted to receive rebates. Rebates will be dispersed to qualified applicants and the performance metrics will be the number of rebates and the amount of money issued. We can perform user surveys to assess the success and ease of applying for the rebates. The department will also perform a small percentage of on-site audits to ensure the homeowner has completed installation in accordance with the guidelines. Depending on the success of this program in the first year, allocation of second year funds may be increased or decreased.

Table 12

Task	Output	Indicator
1. Design Application	Applications available to residents	Quantity of applications recieved
2. Evaluate applications	Rebates dispensed	Dollars dispursed and number of rebates issued

Performance Management:
Marketing

In an effort to increase general public awareness of solar technologies and other solar energy programs implemented in this first year, the Department of Energy will contract with a marketing firm for a series of marketing campaigns. Before and after the marketing campaigns, we will survey utility customers about their awareness of solar technologies and DOE programs. These surveys will allow the program to assess the success of its marketing campaigns.

Table 13

Task	Output	Indicator
1. Contract with Marketing firm	Marketing campaigns	Public awareness before and after campaign

Performance Management:
Minimum Renewable Generation Requirement

The Minimum Renewable Generation Requirement mandates that all utilities produce a certain percentage of their electricity from renewable sources like solar. Utilities that produce renewable electricity can apply for renewable energy credits that must be submitted back to the DOE at the end of each year. By the end of 2009, utilities must submit enough credits equivalent to the production of 1% of their generation from renewable sources. Any utility that cannot produce 1% renewable electricity in 2009 must purchase credits from a credit marketplace from utilities that are selling excess credits. Any utility unable to submit sufficient credits will be subject to fines as defined in the bill (not more than $.03/kWh or 200% of the market price of a renewable credit, per kWh below compliance). Because the minimum generation requirement is not mandated until 2009, the first year's tasks for this program deal with simply setting up the program and getting it ready for implementation in 2009.

The first of these tasks is to design the application that utilities must submit to receive renewable energy credits. The indicator for this task is a completed application form that is ready to distribute to utilities nationwide. The second task is to develop the online credit-trading marketplace. The output for this task is the technological infrastructure (computers and servers) which will form the physical backbone of the marketplace. The performance indicator for this task will be a completed and thouroughly tested online marketplace that will be ready to launch at the beginning of 2009.

There will also be an industry outreach program to inform utilities about the new regulations. This will involve contacting or meeting with between 400 and 500 utilities. The measure of success at the end of the year will be the number of utilities contacted. Because this is federal legislation that affects all utilities, the goal will be to have 100% of all utilities contacted by the beginning of 2009 (only the largest utilities would need to be met with). The final task is the development of an auditing system whereby DOE employees can monitor energy utilities to ensure that the minimum renewable generation requirement is being met as stated in the credit applications. Since no audits will take place until 2009, the 2008 performance indicator will be a completed set of guidelines for utility auditing. Feedback will come from surveys of utilities regarding the Renewable Portfolio Standards Program. The first year of this program will be successful if these tasks are accomplished by the end of 2008 and the regulations can be fully implemented beginning in 2009.

Table 14

Task	Output	Indicator
1. Design Credit Application	Credit Application Form	Completed and Ready to Distribute
2. Develop Credit Trading Marketplace	Technological Infrastructure	Tested and ready to launch
3. Industry Outreach	Utility Participation	# of Utilities contacted
4. Design Auditing System	Auditing Guidelines	Guidelines ready to implement in 2009

Conclusion

As the U.S. economy grows and energy use continues to increase, the various environmental and human health problems associated with our current means of electricity production will have larger and more detrimental impacts. Reducing energy consumption and improving efficiency can help the situation, but only a shift towards renewable, non-fossil fuel energy sources will truly solve the problem. To this end, the Energy for Our Future Act initiates a number of positive steps in the right direction, including a concerted effort to promote and develop solar technologies. This report has outlined how two particular programs outlined in the bill might be implemented, and considered a wide range of factors critical to their success. We can only hope that these recommendations might one day aid in the execution of similar programs or goals, and thus in doing so improve the greater state of our world.

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Washington. http://www.energy.gov/energysources/solar.htm

Glossary

Coal Gasification: "Unlike combustion processes, gasification is an oxygen-starved process that converts solid fuels (biomass, coal, etc.) into gaseous fuels (Hydrogen and Carbon Monoxide). Gasification is uniquely capable of producing not only heat and power, but also can be used with downstream catalysts to convert the syngas to liquid fuels and chemicals (diesel, ethanol, methanol); and, to hydrogen gas for fuel cell applications. When using biomass feedstocks, which are considered 'carbon-neutral' (i.e. no net added carbon emissions), gasification technology can concurrently mitigate wastes (i.e. municipal, industrial and agricultural) while producing renewable energy. When using coal feedstocks, gasification technology can achieve greater efficiencies compared to combustions processes while removing trace contaminants from the gas prior to combustion of the syngas."

Source: http://www.emeryenergy.com/

Domestic Energy Portfolio: In the U.S. Energy is produced and supplied by several diverse means - through burning coal and other fossil fuels, hydro electric power plants, photovoltaic cells, and so on. In aggregate, the sum of these types of energy production represents the domestic energy portfolio.

Economy of scale: The principle that larger production facilities have lower unit costs than smaller facilities.

Electric generator: A facility that produces only electricity, commonly expressed in kilowatthours (kWh) or megawatthours (MWh). Electric generators include electric utilities and independent power producers.

Greenhouse effect: The result of water vapor, carbon dioxide, and other atmospheric gases trapping radiant (infrared) energy, thereby keeping the earth's surface warmer than it would otherwise be. Greenhouse gases within the lower levels of the atmosphere trap this radiation, which would otherwise escape into space, and subsequent re-radiation of some of this energy back to the Earth maintains higher surface temperatures than would occur if the gases were absent.

Kilowatt (kW): One thousand watts.

Kilowatthour (kWh): A measure of electricity defined as a unit of work or energy, measured as 1 kilowatt (1,000 watts) of power expended for 1 hour. One kWh is equivalent to 3,412 Btu.

Common Questions and Answers about the Problems, Proposed Solutions, and Policies

Where is H.R. 1945 currently in Congress?

It has been referred to 5 House Committees (Energy and Commerce, Ways and Means, Natural Resources, House Transportation and Infrastructure, and Science and Technology) three of which have referred them to subcommittees (Subcommittee on Highways and Transit, Subcommittee on Energy and Mineral Resources, and Subcommittee on Energy and Environment).
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Who are the co-sponsors and what is their political affiliation?
15 Co-sponsors besides Rep Chris Shays (R) of Connecticut, 3 Republicans and 12 Democrats, mostly from east-coast and west-coast states.
Rep Baldwin, Tammy (DEM) [WI-2] - 5/24/2007
Rep Berkley, Shelley (DEM) [NV-1] - 6/20/2007
Rep Brown-Waite, Ginny (REP) [FL-5] - 5/8/2007
Rep Cohen, Steve (DEM) [TN-9] - 6/20/2007
Rep Delahunt, William D. (DEM) [MA-10] - 4/20/2007
Rep Ehlers, Vernon J. (REP) [MI-3] - 5/1/2007
Rep Gilchrest, Wayne T. (REP) [MD-1] - 5/8/2007
Rep Grijalva, Raul M. (DEM) [AZ-7] - 5/7/2007
Rep Hinchey, Maurice D. (DEM) [NY-22] - 4/19/2007
Rep Inslee, Jay (DEM) [WA-1] - 5/7/2007
Rep Lee, Barbara (DEM) [CA-9] - 5/3/2007
Rep Lowey, Nita M. (DEM) [NY-18] - 5/17/2007
Rep Maloney, Carolyn B. (DEM) [NY-14] - 4/25/2007
Rep Moran, James P. (DEM) [VA-8] - 5/3/2007
Rep Stark, Fortney Pete (DEM) [CA-13] - 5/1/2007

How much coal does the U.S. consume?

In 2000 U.S. consumption of coal was approximately 1.07 billion short tons (2,000 lbs)

How much energy does the typical coal plant generate?

A conventional electricity power plant can range in size from 500-3000 Megawatts

-Source: Department of Energy

Are there different types of coal? What are they?

The Rarest and Cleanest Burning: Anthracite Coal – Limited Deposits mostly located in Pennsylvania and Rhode Island. The second, and most abundant type of coal is Bituminous. This kind of coal is slightly softer (i.e. has not been buried as long). A result of this is that it does not burn as clean.
Two lesser types of coal are sub-bituminous coal and peat. Both consist of buried and compressed plant matter but have spent much less time subjected to the heat and pressure of higher forms of coal. These are the dirtiest burning forms of coal.

How much Carbon Dioxide is emitted from Coal Power Plants in the United States each Year?

According Energy Information Administration's International Energy Annual 2004 report, in 2004, the United States emitted 5,912.21 Million Metric Tons of Carbon Dioxide. Just to put this into perspective, the total emissions from all of the countries of Central and South America was 1,041.45 Million Metric Tons of Carbon Dioxide. Therefore, the total carbon emission from all of the Central and South American Countries is only 17.6 percent of U.S. carbon emissions.

Do you need full sunlight for photovoltaic cells to properly function?

As long as there is light, PV cells will function whether it is cloudy or not. They do not produce energy at night, but they will on a cloudy day. Battery storage is possible for electricity use at night. Commercial applications will especially benefit from PV because they typically only use electricity during sunlight hours.

Can PV cells work in areas with severe winters?

Yes: PV cells are black so that snow and ice can melt off. They are also situated at steep angles and snow and ice slides off more easily.