The Energy Policy Act of 2005 (H.R. 1640): Clean Coal Power Initiative Implementation Plan

"To enact an energy research and development program to ensure reliable energy and job security"

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Disclaimer

This report is the culmination of a two semester workshop course in the Master of Public Administration in Environmental Science and Policy program at Columbia University. The purpose of this workshop is to explore real legislation that has not yet been enacted. The summer semester explored the scientific components behind the environmental problems and the technological solutions that H.R. 1640 offers. The fall semester focused on an implementation plan for the legislation. The plan detailed in this report is a recommendation by this graduate class team. Our simulated implementation plan is as real as feasible within our academic constraints.

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Executive Summary

The Energy Policy Act of 2005 (EPAct) addresses the need of the United States to ensure secure, reliable, and affordable energy. While the primary motivations of the bill give priority to economic and energy reliability concerns, many portions of the bill also provide opportunities for environmental improvements in the energy sector. The Clean Coal Power Initiative (CCPI), Title IV of the bill, is one such opportunity. This report will examine the background of CCPI followed by a proposal for its implementation.

The CCPI's primary goal is to promote wide-scale commercialization of advanced coal power technologies needed to meet the observed and foreseen increase in domestic electricity demand. Some of these technologies, such as coal gasification and gasification based fuel cells are capable of reducing key environmental pollutants, including sulfur dioxide (SO_2), nitrogen oxides (NO_x), mercury (Hg) and carbon dioxide (CO_2). Serious environmental and human health problems, such as acid rain, smog, mercury poisoning and global warming are associated with these pollutants.

The EPAct provides financial incentives for the development and application of clean coal technologies. It allocates $1.8 billion for the CCPI to distribute over the next nine years, at least 60% of which must be directly allocated for gasification projects. We have elected to allocate 80% (or $1.44 billion) of the total grant amount to gasification technologies while 20% (or $360 million) will go towards "end-of-pipe" technologies, such as scrubbers[a]. The $1.44 billion for gasification technologies will contribute to the complete construction of five coal power plants, of which three are to be an established gasification technology, Integrated Gasification Combined Cycle (IGCC) plants, and two are to be of a less-explored technology, gasification Hydrogen Fuel Cell plants. The funding will be broken up into 70% (or $1.008 billion) for IGCC technology and 30% (or $432 million) for Hydrogen Fuel Cell technology, accordingly.

In this implementation plan, we have situated a new CCPI program division within the Department of Energy's (DOE) Office of Fossil Energy, one of the department's main program offices. Specifically, the CCPI will be run out of the National Energy Technology Laboratory (NETL), a wholly-owned DOE Laboratory dedicated exclusively to fossil energy research. The CCPI will be broken up into five divisions: Office of the Director, Grants and Funding, Project Oversight, Compliance and Monitoring, and Industry Liaison.

Funding allocation for the deployment of new technologies accepted by the CCPI program will consider project description, viability, and environmental and economic impacts of proposed infrastructure. After the projects are selected, the CCPI must oversee each project to make sure it

[a] Scrubbers are "end-of-pipe" pollution control devices that can be installed in the smokestacks of power plants to prevent harmful emissions generated during combustion from being released to the environment. Powdered lime mixed with water traps particulate matter forming a paste. The compound can then be properly removed and treated as toxic waste. Particulate matter trapped by the scrubber depends on the type of fuel being combusted and can include chromic acid, hydrogen sulfide, ammonia, chlorides, fluorides, sulfur dioxide and mercury. For further information see: "Remediation Technologies Screening Matrix" <http://www.frtr.gov>.

is carried out in accordance with the proposed budgets and timelines. This function entails oversight starting with the citing and environmental permitting processes through the supervision of plant construction and operation. Private developers will be responsible for the technical development and operations of the plants: ensuring that all requested information is submitted to the CCPI in accordance with proposed timelines, obtaining the appropriate environmental, construction and operating permits, and maintaining the facilities to comply with safety standards.

Internal operations will require a total budget of $2.5 million for the first year of the CCPI program, which includes human resources that amount to 27 FTEs. In the first year of the program a total of $112 million will be disbursed for one small trial project after a request-for-proposal round. Construction on the trial project will begin before the end of the first year.

The deployment of these high-tech gasification projects will foster a new era of environmental achievement for coal combustion in the United States. With more stringent emission standards and increased thermal efficiency, under the initiatives supported by the CCPI, cleaner coal is both economically and environmentally possible.

1. Introduction

House Resolution (H.R.) 1640, the Energy Policy Act of 2005 (EPAct), was introduced by House Energy and Commerce Committee Chairman Joe Barton on April 14, 2005 "to enact an energy research and development program to ensure reliable energy and job security"[1]. While the main priorities of the bill address energy on the basis of economic concerns, there are many opportunities for environmental improvement as well. The broad act addresses issues concerning the provision and consumption of energy across multiple disciplines including: Energy Efficiency; Renewable Energy; Oil and Gas; Clean Coal Technologies; Nuclear Energy; Vehicles and Fuels – Ethanol; Energy Tax Incentives. It provides for the use of incentives rather than strict regulation in order to promote the supply of domestic and clean energy sources. Due to the breadth of the bill, we have chosen to focus explicitly on the implementation of the coal gasification programs within the Clean Coal Power Initiative (Title IV).

The Clean Coal Power Initiative (CCPI) primary goal is to promote wide-scale commercialization of advanced coal power technologies to meet the observed and foreseen increase in domestic electricity demand[2]. Originally introduced by President George W. Bush in 2002, the CCPI is one of the U.S. government's primary clean coal research and development programs

Coal-fired electricity will continue to play a leading role in electricity generation in the United States. The United States has 27% of the world's recoverable coal reserves[3]. The Energy Information Administration predicts that these reserves will play a crucial role in meeting American electricity demand, which is anticipated to increase by 50% above 2004 levels by 2030[4]. Currently, coal supplies less than 30% of electricity generated in the US; this share is anticipated to grow to 52% by 2030[5]. Figure 1 below shows projected electricity production by energy sector for both 2015 and 2030. Furthermore, exploiting domestic coal reserves and encouraging technological development of new coal technologies create employment opportunities.

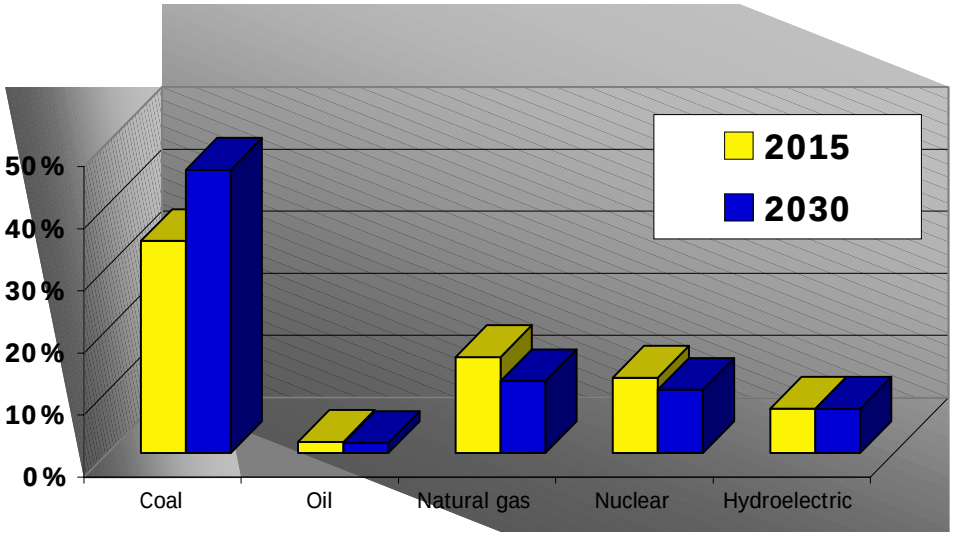


Figure 1: Net Electricity Load Projection by energy sector for 2015 (yellow) and 2030 (blue)[6]

The EPAct calls for the allocation of an additional $1.8 billion to the existing CCPI program over the next nine years, to be divided between gasification and non-gasification projects. Gasification technologies are a cleaner way of burning coal in electricity generation (Appendix B). At minimum, 60% ($1.08 billion) of this allocation must go to the development of gasification technologies. Funding control is designated to the Secretary of the Department of Energy (DOE). The CCPI is one of the three coal programs included in EPAct.

Pollution related to coal combustion is a key force restraining the expansion of coal as an electrical energy source. Several environmental regulations control emissions, including the Clean Air Act, Clean Water Act, and Acid Rain Program. Additionally, cap and trade mechanisms associated with emission allowance trading restrict the construction of new facilities in areas that are already at the upper limits of their pollutant allowances. As a result, significant steps need to be taken in order to reduce emissions from coal combustion and position coal as a viable electricity source for the future. Coal gasification technologies have the potential to allow the United States to utilize its coal resources in an environmentally friendly way.

2. Background

The *Clean Coal Power Initiative* (CCPI) provides for the allocation of a minimum of $1.08 billion over 9 years for projects incorporating coal-based gasification technologies. For a project to be eligible for funding, it must demonstrate advances in energy efficiency, environmental performance, and must also be cost competitive for coal-based electricity generation. Appropriate technologies specified by EPAct include: gasification combined cycle; gasification fuel cells; gasification co-production; hybrid gasification/combustion; and carbon capture and storage (sequestration). Projects must also demonstrate that a market exists for the technology. The initiative also includes the award of grants to universities for the advancement of new clean coal technologies.

This report focuses on the funding of gasification technologies, particularly Integrated Gasification Combined Cycle and Gasification Fuel Cells.

2.1 Science Background

Environmental and Health Issues

Traditional coal powered plants produce carbon dioxide (CO_2), sulfur dioxide (SO_2) and mercury (Hg) as by-products of combustion which in turn contribute to global warming, ozone production and acid rain formation. CO_2 is the main contributor to global warming, whose consequences include myriad global climatic changes. SO_2 is a key component of acid rain which causes acidification of water bodies and terrestrial ecosystems leading to uninhabitable environments for aquatic and vegetative life. The bioaccumulation of Hg in the tissues of fish and other animals used for human consumption is a serious health issue, contributing to significant neurological impacts (see Appendix A).

Gasification Solution

Gasification technologies largely mitigate these environmental problems as compared to traditional coal fired powered plants. In the gasification process, coal is first combusted in a gasifier where it is exposed to steam and oxygen under high temperature and pressure. This sets off a chain of chemical reactions, which produce a mixture of carbon monoxide, hydrogen and other gaseous compounds called syngas. Once separated, the components of the syngas can be separated and environmental pollutants more easily removed and disposed of. Industrial filters capture SO_2 and Hg, reducing the release of these pollutants by 93% and 99% respectively[7] (see Appendix B).

Carbon Sequestration Solution

The primary environmental benefit that coal gasification offers is the ability to separate and capture gases that are normally released as emissions from coal-fired power plants, such as CO_2.

Once CO_2 is captured, it can be prevented from entering the Earth's atmosphere through carbon sequestration. This process, as it is considered in the context of advanced coal gasification, involves the long-term storage of CO_2 underground in depleted oil and gas reserves, coal seams, and saline aquifers[9] (Figure 2). This process has been used to facilitate oil extraction for over 30 years. According to the DOE, carbon sequestration costs range from $100 to $300/ton of carbon emissions. The DOE aims to promote the reduction of prices to $10/ton of carbon emissions by the year 2015.

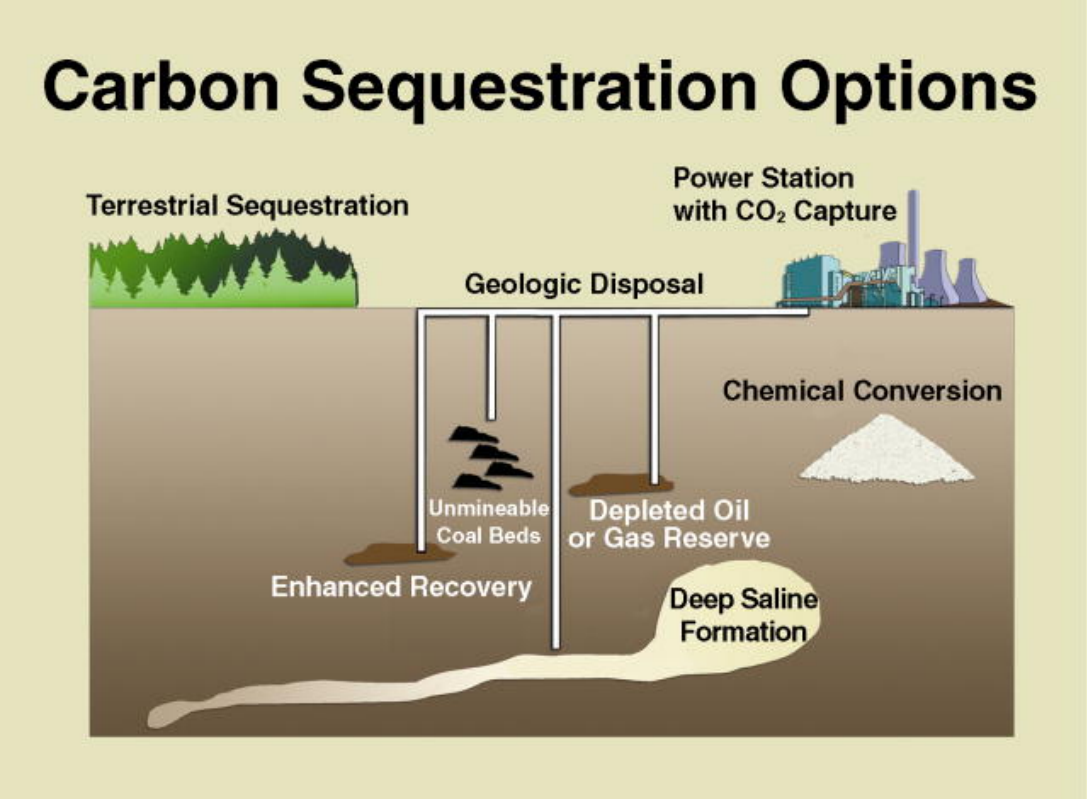


Figure 2: CO_2 sequestration options. Depleted oil and gas reserves, coal seams, and saline aquifers are options during the coal gasification process.

2.2 Consequences of Coal Mining

Although the Clean Coal Power Initiative addresses environmental and human health impacts related to the combustion of coal, there are additional consequences from the mining process that extracts this coal which must be considered. In total there are 1,379 coal mines operating throughout the United States[8]. These are divided into two types of mines: surface and mountaintop or underground. Surface mining is used when coal deposits are close enough to the surface that they can be accessed by removing only the top layers of soil or mountain top[9]. When the coal deposits are located deeper below the surface and are thick enough to enable worker entry, the underground method of digging deep access tunnels is used[10].

Surface mining has the greatest visible environmental effects, as it can involve the removal of entire mountain tops and surface vegetation. However, all types of mines result, to some degree, in contamination of waterways with acidic and metallic leachates. Through a process called acid mine drainage, sulfuric acid is generated from the oxidation of mine tailings exposed to air and water.[11] This runoff causes acidification of nearby streams, which results in loss of ecosystem health, including complete loss of fish in some waterways.

Historically, coal mining has been a very dangerous profession, though several improvements made by the industry over the last century have greatly improved the working environment for miners. Legislation such as the 1969 Coal Mine Health and Safety Act (SMHSA) and the Surface Mining Control and Reclamation Act of 1977 has helped to increase the protection of coal miners. Despite these improvements, coal mining still has the second highest rate of fatal occupational injuries (25.6 per 100,000 workers), only topped by the agricultural, forestry and fisheries sectors. (32.5 per 100,000 workers) (Figure 3)[12]. As with most physically intensive industries, mining involves health hazards such as back injuries, falls and equipment related injuries. The most serious health issues among coal miners is respiratory problems associated with the coal dust in mines, 30% of coal miners have some kind of respiratory problem, the most common being pneumoconiosis, or *black lung*. This is a condition in which dust accumulates in the lungs causing chronic shortness of breath, low blood oxygen levels, and can ultimately lead to heart failure. SMHSA requires that all workers have access to free x-rays in order to detect black lung at an early stage.

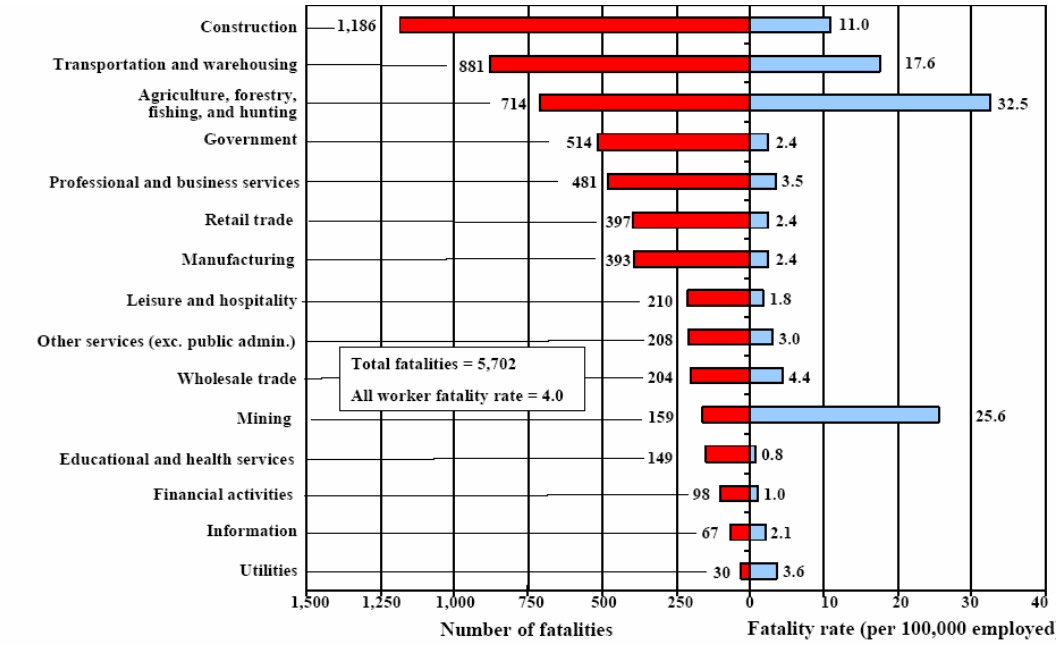


Figure 3: Number and rate of fatal occupational injuries by industry sector, 2005.

2.3 Political Context

EPAct 2005 was introduced into the 109th Congress in April 2005. The Republican-led Congress favored discussion of energy security, independence, and technological innovation, as is evidenced by the wording of the legislation. See Appendix C for the political climate regarding environmental issues at the time of this legislation.

Support for the Legislation

Coal's abundance and relatively inexpensive extraction and combustion costs in the United States have prompted wide support for EPAct across industry and government groups. Coal reserves represent a long-term domestic source of energy and consequently, foreign energy independence. Extensive mining, transportation, and coal-combustion facilities are already in place throughout the United States and coal consumption could proceed without further investment to infrastructure.

Political support for the bill came largely from Republicans in the House of Representatives. It was sponsored by Joe Barton, the Chairman of the House Committee on Energy and Commerce, and was cosponsored by twelve Republican Representatives. Members of industry also endorsed the bill, including the National Mining Association. Coal gasification technologies have also been supported by environmental organizations such as Environmental Defense and the NRDC (Natural Resources Defense Council) due to the decrease in Hg and SO_2 emissions that IGCC affords.

Additional information is available concerning the roots of support in political campaign contribution records. Figure 4 below displays campaign contributions to political parties by the Energy and Natural Resources Industry. It is apparent that since 1996 this industry has contributed more than twice the campaign funding to members of the Republican Party as it has to the Democratic Party ($39,681,234 vs. 13,009,931 in the most recent election cycle 2004). Industry's interests, therefore, have traditionally been represented by Republicans in Congress.

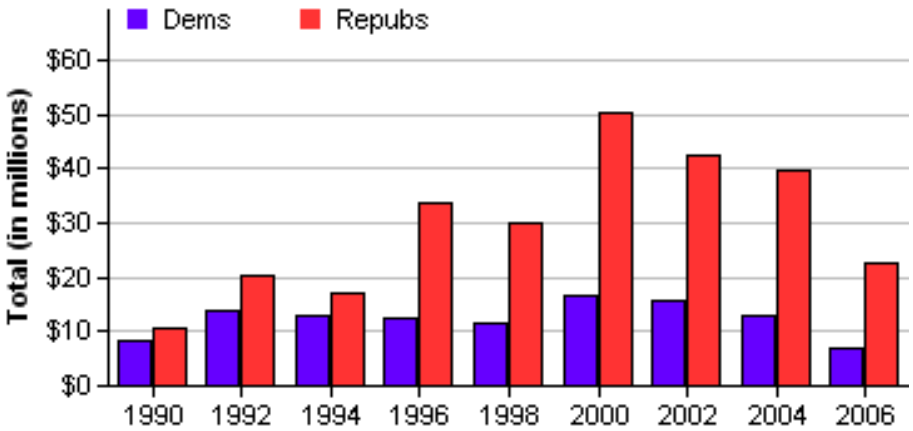


Figure 4: Campaign contributions by the Energy/Natural Resources industry broken into major political parties.

Opposition to the Legislation

Investment Imbalance

The Clean Coal Power Initiative is one of the largest programs within EPAct. It provides for the investment of $1.08 billion into gasification technology, which addresses some coal related environmental problems. However, environmental groups who oppose this legislation point to the large imbalance between investment in coal and in renewable technologies such as wind and solar. The legislation provides $10 million for research into renewable energy plus non-dollar specific regulations such as federal procurement rules to purchase renewable energy. Without adequate investment into renewable technologies, the development and infrastructure of these will not support a paradigm shift to renewable energy sources.

Congressional testimony by an environmental advocate from the U.S. Public Interest Research Group (USPIRG), pointed to continuing environmental problems with reliance on fossil-fuel based energy sources and lack of investment in new technologies. This testimony quoted an Energy Information Administration (EIA) statistic that "the U.S. has the technical potential to generate four times our total current electricity use from renewable energy" but currently utilizes only 2% from sources such as wind and solar[13]. This testimony further emphasized the need for addressing global warming and argued that the current proposed legislation did not have the right focus to accomplish that.

Viability of Carbon Sequestration

The economic viability of sequestration is crucial to the success of advanced coal gasification related technologies in providing a solution to the problem of America's power plant emissions. Without the ability to sequester carbon, the world's massive coal supply poses a major threat to Earth's ecosystems in the form of greenhouse gases and contributions to global warming. Many groups in opposition to the EPAct 2005 point out that carbon sequestration is an unproven technology and until carbon sequestration has demonstrated viability, caution should be taken when promoting any increase in the use of fossil energy.

Coal-Mining

While gasification provides a solution to some of the pollutants associated with the combustion of coal, the coal-extraction process is still fraught with environmental controversy. Opponents of EPAct point out that coal extraction has devastating consequences to the environment. They find unacceptable any legislation that would encourage an increase in coal extraction.

3. Program Design

The CCPI legislation has several provisions, the first of which is a 10-year plan report designed to serve as a blueprint for the duration of the program. This report must include a determination of whether the allocated funding is appropriate, a description of project proposal solicitation and

evaluation, a list of technical milestones to be pursued in the program, and a description of how the initiative will avoid problems observed in similar coal technology programs.

3.1 Legislative Provisions[14]

The following provisions determine how the allocated funding can be disbursed:

- Grant Allocation: The recipient of funds must
  - Be financially viable without the receipt of additional funding,
  - Provide sufficient information to ensure that funds are spent effectively and efficiently,
  - Indicate the existence of a market for the technology being demonstrated or applied.
- Project criteria: The projects must exhibit a likelihood to
  - Reduce overall costs in coal-based energy generation.
  - Improve the competitiveness of coal as an energy source for electricity generation.
  - Be applicable to 25% of generating facilities that use coal as the primary feedstock.
- Technical milestones: Periodic milestones must be set on all projects in order to achieve (by 2020) technologies and methods that will
  - Achieve 99% removal of sulfur dioxide,
  - Emit no more than 0.5 lbs of nitrogen oxides per million Btu generated,
  - Achieve substantial reductions in mercury emissions,
  - Achieve thermal efficiency standards of
    - 60% for coal of more than 9000 Btu
    - 59% for coal of between 7000 and 9000 Btu
    - 50% for coal of less than 7000 Btu
  - Projects at existing plants require thermal efficiency improvements of
    - 7% for coal of more than 9000 Btu
    - 6% for coal of between 7000 and 9000 Btu
    - 4% for coal of less than 7000 Btu
  - Thermal efficiency goals can be waved for those projects that receive funding if they separate and capture at least 50% of carbon dioxide emissions

3.2 Discretionary Items

Despite having such specific requirements, the bill gives discretion to the DOE in four critical areas. First, the funding allotment of the initial $1.8 billion is completely controlled by the DOE; a lower bound on gasification funding is set at $1.08 billion, but as much as the entire $1.8 billion can be allotted for such projects, depending upon the program decisions of the DOE.

Second, the DOE can determine the federal share of funded projects. The legislation limits the share of funding the DOE can offer to 50% of total project cost. However, the DOE has the discretion to fund any percentage below 50%, depending on how much they care to participate in any one particular project and the number of projects they wish to fund.

Third, selecting which particular types of gasification technologies to fund also rests with the DOE. Possible technologies outlined in the legislation include gasification combined cycle, gasification fuel cells, gasification co-production, and hybrid gasification/combustion. Gasification combined cycle and co-production are the most well-researched while fuel cell and hybrid plants represent technologies that have not yet been as extensively explored. Table 1 below describes these four options.

Proven Technologies	**Integrated gasification combined cycle (IGCC)** Power plants which combust gasification derived syngas as a source of clean fuel and utilize its waste heat to produce steam, powering additional electricity generating turbines.
	Gasification fuel cells These use the hydrogen produced as waste from the gasification process to generate electricity from fuel cells through reaction with oxygen molecules.
Cutting-edge Technologies	**Gasification coproduction** Combines production of syngas through coal gasification, the combustion of syngas to produce electric power, and the conversion of a portion of the syngas to high-value products such as liquid fuels and chemicals[15].
	Hybrid gasification/combustion Uses a pressurized gasifier to produce syngas from lignite for combustion in a gas turbine combined cycle. This is coupled with an atmospheric-pressure circulating fluidized bed boiler to burn unconverted carbon in char and ash residue from the gasifier. This process produces steam driving additional turbines for electricity generation, while recovering exhaust heat from the gas turbine[16].

Table 1: Gasification technologies suggested in H.R. 1640

Finally, the methods of consultation and milestone setting are left for the DOE to decide. The DOE is required to consult with interested parties for the purpose of setting milestones, but DOE can decide which interested parties would lend appropriate expertise to the discussion. Additionally, the DOE can elect to set milestones for rapid achievement of the mandated emission improvements or can allow the pace of technological innovation to inform decisions on periodic milestones.

3.3 Alternatives for Program Design

The points of discretion explained above enable the DOE to direct the program in accordance with their projections for the future of coal energy use. Our workshop group has considered the legislation and discretionary items in order to outline the two program options. These include “risk-averse” and “progressive” options, which represent opposing extremes in interpretation of the bill and planning.

The risk-averse option would minimally fund gasification technologies in general, and would focus on recovering expenses by funding the more reliable of those technologies. It would also require strict milestone setting to achieve mandated pollution reductions.

The more progressive alternative would heavily fund the development of gasification capacity and the more uncertain gasification technologies. It would force these technologies to compete for cost competitiveness in energy production on the open market and would include more flexible milestones designed to promote development and innovation.

Risk-Averse Option

This policy option favors a low-risk policy alternative that seeks to ensure strong support for commercially available and reliable gasification technologies. Under this option, 60% of the funding allocated for the CCPI will be conferred for gasification projects that include proven gasification technologies such as integrated gasification combined cycle (IGCC) and, to a lesser extent, gasification co-production. Existing IGCC facilities have capacities below 300 MW. CCPI funded projects would stay at or below that output level. Eligible projects must rely on technologies already demonstrated for commercial service. This alternative will offer funding to cover 50% of the overnight costs (costs of building a plant without interest charges) for the construction of new IGCC plants in order to overcome funding shortages anticipated with such relatively new technologies. In doing so, the DOE can support favorable financial conditions for the initiation of commercial-scale deployment of such technologies.

The ability to bear the long-term financial burden associated with debt liability determines financial viability for power plants. Given that electric utilities operate under a monopoly-like market scheme, Federal and State utility regulatory commissions are generally required by law to establish "just and reasonable rates" at which electricity can be sold. In consideration of such revenue potential schemes, funding allocation in this case will be granted to such projects operating under Federal and State rate-setting schemes that enable stable revenues for overhead costs-recovery[b].

In order to meet the 2020 technical performance targets stipulated in Section 402 of the EPAct, DOE must adopt a plan to set technical milestones periodically. This plan will be specified in the mandated report to Congress. Under the risk-averse option, these milestones would be

[b] Traditional utility regulation commissions apply two main schemes for accounting costs related to capital when establishing rates for power companies in the market. In general, the cost-of-service ratemaking sets rates such that the company's total revenues are sufficient to cover the costs of service, including the return on the company's capital investment, and the operation costs. To determine which capital investment costs the rates can be covered, the commissions can apply two approaches. One approach defines capital costs based on a "prudent investment test", meaning that capital costs were prudently determined at the time that they were executed. A second approach is based on the idea of "used and useful test", which includes rates based only on investments that were reasonably foreseen when investment decisions were made. Rates are determined after plants have been built. The latter would be applied as financial criteria to the low-risk option. For further information see: Rosenberg, William G., Dwight C. Alpern, and Michael R. Walker. "Financing IGCC – 3Party Covenant," *BSCIA Working Paper 2004-01*, Energy Technology Innovation Project, Belfer Center for Science and International Affairs. Harvard University, Cambridge, MA.

established based on research conducted by industry and academia as well as consultations with third party technical experts. For the first six years of the program (through 2012), the milestones would be based on progress expected to be made through investment primarily in IGCC and gasification co-production technologies. After that point, the milestones would be reevaluated and changed as necessary to accommodate any shifts in CCPI's program direction.

Progressive Option

The progressive policy option looks to push gasification to a new level in terms of technological advance and market competitiveness. This policy option aggressively supports gasification technologies that are being developed and that can potentially operate at commercial scales within the time frame of the program. Under this option a total of 90% of the funding allocated for CCPI will be granted for various gasification technologies such as IGCC, fuel cell gasification technologies, gasification fuel cells, gasification co-production, and hybrid gasification/combustion. This alternative offers funding of up to 50% of the overnight costs for the construction of new plants, as well as for partial coverage of the project's financial costs during the construction phase.

In addition, the progressive option will also give a larger push to gasification technological improvements by favoring projects that ensure rapid deployment of such technologies. Project selection will weigh technological improvements more heavily over long-term financial conditions. Under this option, projects would be regulated under a "prudent investment test" rate-setting scheme[17]. This implies that if markets don't make investment recovery feasible in some years after initial capital investments, projects could be cancelled. Therefore, funding allocation in this case will be granted to such projects operating under Federal and State rate-setting schemes that allow for more market competition in electricity rates.

Under the progressive option, milestones would be set aggressively with input coming primarily from the electric power industry. From the start, the milestones would incorporate progress expected from the immediate deployment of a mix of plants, including IGCC on the large commercial scale (as opposed to the small scale being promoted by the risk-averse plan), gasification co-production, hybrid gasification/combustion, and gasification fuel cell projects. This option would also be more likely to fund projects attempting carbon capture and storage. In 2012, after the first six years of project funding, the milestones would be reassessed. If certain technologies are struggling at this time, decisions on continued funding would be re-evaluated. Those technologies that are successful could potentially lead to raised performance targets and altered milestones.

3.4 Option Implications

Upon implementation, both of these options have considerable implications that are necessary to consider in planning and setting the course of the program.

Environmental Implications

The risk-averse option is nearly guaranteed to comply with environmental mandates. The technologies to be applied are well studied and documented. In addition, only minor changes must be made to reduce pollutant emissions below their current levels in order to comply with the legislative mandates. This guarantee of environmental compliance grants the coal industry short term environmental gains in electricity generation. However, because the advanced gasification technologies are effectively discouraged from deployment, potential environmental and efficiency gains represented by these technologies will go undiscovered in a risk-averse setting.

The progressive option, on the other hand, would encourage the deployment of the more unfamiliar advanced gasification technologies. These technologies are not as well-known, and, as a result, environmental compliance and increased electricity generation capacity are not guaranteed, particularly within the timeline of the program. In addition, because 90% of funding is used for gasification technologies and only 10% is diverted to non-gasification technologies, pollution at existing plants will go largely untreated. If advanced gasification technologies do not prove effective as sources of energy generation, we will continue to get our energy from the inefficient traditional coal-fired plants.

An implication that may be relevant in the future is that the progressive option (because it is interested in advancing technologies) would be more likely to fund projects that look at carbon capture and storage; these techniques would be especially important as energy companies look for ways to reduce their carbon impact.

Economic Implications

Both options would spur domestic economic growth and job creation. In either case, electricity-generation facilities would be built domestically, requiring large investment and the employment of many workers. Both options also provide for lower-cost pollution disposal. Currently, captured pollution is treated as a waste and disposed of accordingly. The mechanisms for removing pollutants during the gasification process convert pollutants into marketable commodities; the sulfur impurities in coal are currently being sold by gasification facilities to chemical companies. An important secondary implication of pollutant extraction is that these chemicals are removed from the waste stream, reducing stress on the hazardous waste disposal system.

The risk-averse option may be more viable economically speaking. Investors are more likely to provide funding for the more familiar and well documented of the gasification technologies. This will allow easier market integration.

The progressive option, however, has the potential for huge gains from a relatively small investment. The advanced gasification technologies represent significant increases in efficiency and pollution reduction. With a relatively small investment from the federal government, these technologies may be properly explored and applied, bringing huge gains to our energy sector. Further, by spearheading the advancement of gasification technologies, the U.S. may generate an intellectual export commodity valuable on the world market to foreign governments and energy generation companies.

Sociopolitical Implications

One primary goal of the EPAct 2005 is to provide secure and reliable energy. By discovering more efficient and cost-effective ways to use our vast coal reserves, we can become energy independent in the electricity sector. Reducing our dependence on fuel imports in favor of domestic sources will provide a huge economic benefit and will require far less government intervention in ensuring reliable fuel sources.

One implication of the risk-averse option is that it promotes the status-quo of the gasification industry; this is far more politically convenient and will incite less opposition in the implementation process. On the other hand, the facilities that this option promotes would have a relatively small capacity for commercial electricity generation, and more plants would have to be cited to meet growing electricity demand. The more plants that must be cited, the more opposition will occur from local communities who cry "not in my backyard" (NIMBY). Local communities will inevitably attempt to prevent construction. Though Americans want the benefits from increased generation capacity, few want to deal with the negative impact of an unsightly and highly-trafficked facility in their neighborhood.

The progressive option may fall short in meeting increased electricity demand. None of the technologies this option would promote have been proven on the commercial level, and their ability to meet the rising American electricity demand is uncertain. This will require us to continue to get our electricity from the more polluting traditional coal facilities. On the other hand, if investment in these technologies proves to be fruitful, we can meet rising demand and promote a paradigm shift toward technological optimism. If Americans can get their energy in an environmentally friendly manner without a significant cost to the consumer, they may be more willing to accept large technological changes that benefit the environment; it may open the doors for more aggressive green technology approaches in many sectors of the economy.

3.5 Selected Program Design for Implementation

We have outlined risk-averse and progressive policy options; they represent the extremes of a continuum of program options concerning how aggressively DOE wishes to promote the development and implementation of cutting edge gasification technologies. We have determined that the most suitable program is between these extremes.

The chosen program design will allocate 80% of the $1.8 billion to gasification projects, using more than the minimum 60% legislated in order to invest further in these technologies for new plants. Of this 80%, there will be a 70/30 split allocation between the more established IGCC technology and the less developed hydrogen fuel cell technology. This will ensure continued progress in researching new breakthroughs while adequately funding the proven technology for immediate implementation.

Since previous IGCC plants were on the smaller scale of 20-150 MW, the IGCC funding allocation will favor larger projects of 550 MW. This will promote investment in proving IGCC technology for larger plants which will be critical to meet long term energy demand growth.

Technical milestones will be set at 3-year intervals. Consultation with the Environmental Protection Agency (EPA), industry, academia and environmental organizations will take place on a regular basis to ensure stakeholder support.

Compliance with legislated environmental targets for reducing emissions of Hg, SO_2, and NO_x will be followed. In addition, the energy intensity guidelines will also be mandated.

This program design will foster large strides towards clean-coal energy technologies, favoring long-term pollution abatement benefits over the short-term. Further, this program option advances the development of innovative technologies such as hydrogen fuel cells, and will have positive economic implications in support of the technologies that are likely to be commercialized in the near future. The trade potential for gasification by-products is a potential boost to the economic equations of these technologies. The primary risk associated with this program design lies in the uncertainty of meeting energy demand as well as environmental requirements due to larger support of unproven future technologies. In addition, the "NIMBY" syndrome will be an issue in the citing of the numerous new coal powered plants needed.

4. Organization, Staffing and Contracting Plan

The DOE must also perform several functions to carry out the CCPI program. They must submit the 10-year plan to Congress by March 31, 2007 and must submit biannual update reports throughout the duration of the program. For each round of project undertakings, DOE must develop the solicitations, review proposals, enter into contracts with the award winners, and disburse funding. This process will take roughly nine months per round, including about three months to develop the solicitation and approximately two months to review proposals. Following the solicitation process, DOE must oversee each project to make sure it is carried out in accordance with the proposed budgets and timelines. This function entails oversight of the citing and environmental permitting processes as well as supervision of plant construction and operation. DOE must also communicate with stakeholders throughout the various stages of the program, track the success of the CCPI program, and track individual project status with regard to meeting the environmental milestones.

The private sector teams must develop the technical design for the plants, submit proposals to DOE, obtain siting and environmental permits, construct, operate and maintain the plants, ensure plant safety, and hire security contractors.

4.1 Organization

CCPI will be situated within the DOE's Office of Fossil Energy, one of the department's main program offices. Specifically, it will be run out of the National Energy Technology Laboratory (NETL), a wholly-owned DOE laboratory dedicated exclusively to fossil energy research. NETL's main facilities are based in Pittsburgh, PA, and Morgantown, WV.

Placing CCPI within NETL enables the potential for synergies with existing staff and agency structure already present. The goals of the CCPI—to develop commercial-scale gasification and other cutting edge coal technologies—align well with the stated goals of NETL. NETL's experience in public-private partnerships in fossil energy technology is invaluable to the CCPI. Agency employees possess bureaucratic and technical expertise that the CCPI may draw upon in implementing its mandates. Furthermore, NETL has been the primary group in charge of past efforts to fund "clean coal" technologies. Therefore NETL personnel have work experience that is most relevant to CCPI's goals. This organizational structure should allow for a high rate of skills transfer and synergy between the CCPI and NETL. CCPI will be partitioned into five divisions: the CCPI's Program Director, who will be housed in the main Program Office, and four Division Managers in charge of the program's core function areas of Grants and Funding, Project Oversight, Industry Liaison, and Compliance and Monitoring (Figure 5).

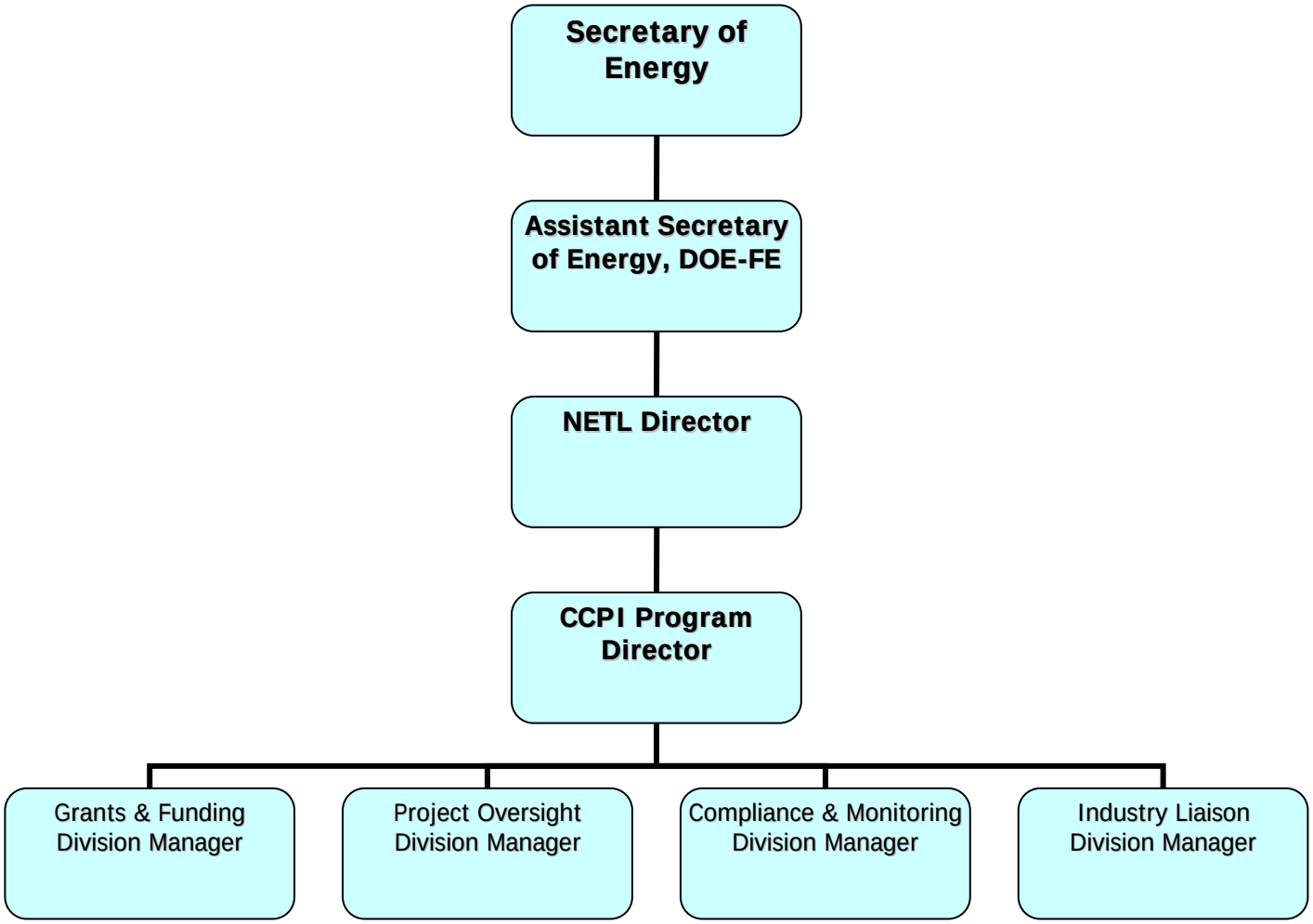


Figure 5: Organization chart of the Clean Coal Power Initiative Program.

4.2 Staffing

Office of the Director

The Assistant Secretary for Fossil Energy heads the DOE's Office of Fossil Energy. Below this position is the Director of NETL, to whom the CCPI Program Director will report.

The CCPI Program Office will have five full-time equivalent (FTE) employees. The CCPI Program Director and his or her Executive Assistant will be the only two full-time staff in this office. The other employees will change according to the needs of the office. The Office will be billed for additional periodic use of DOE staff such as human resources staff, internal affairs staff, as well as budget analysts, policy analysts, and research staff to assist in compiling the reports for Congress. This office will handle planning, administrative aspects of the program, and general accounting.

Grants and Funding Division

The Grants and Funding Division will oversee the funding allocation process. This will involve writing project solicitations, reviewing project applications, reaching contracts, and awarding and disbursing funds. This process will require approximately 25 part-time employees, as the functions progress in stages with one year allocated for solicitation generation and six months allocated for proposal review. In total, the office will have 11.6 FTE employees, including NETL technical experts, scientists, industry representatives, manufacturer representatives, financial analysts, researchers, and a contract attorney, environmental compliance attorney, paralegal, and administrative assistant. During the first year this division has the largest percentage of staff and budget within the CCPI since the request for proposal process is the primary task during the year.

Project Oversight Division

The Project Oversight Division will be charged with ensuring on time and on budget construction of projects. This group will also oversee day-to-day operations of completed projects. Twenty part-time employees will be required to oversee the various projects under development and in operation, for a total of 3.75 FTEs. Staff for this division will include project managers for both IGCC and fuel cell projects, technical experts, on-site inspectors, technical experts, financial analysts, and an administrative assistant.

Compliance and Monitoring Division

The Compliance and Monitoring Division will play the role of internal auditor, verifying and tracking program spending and ensuring that funding recipients meet environmental regulations as well as DOE targets during the projects. This division will require 3.5 FTEs including project managers, technical experts, scientists, financial analysts, environmental analysts, environmental compliance attorneys, a paralegal, and an administrative assistant.

Liaison Division

The Liaison Division will develop dialogues with industry, local government, environmental groups, and other stakeholders in project areas, in order to ease conflict surrounding “not in my back yard” (NIMBY) issues. By communicating frequently with industry, this division will also import institutional knowledge that is essential to the solicitation process. This division will require 3.5 FTE employees, including DOE liaisons and industry representatives.

By attending to these four function areas, CCPI’s staff will manage the entire lifecycle of selected clean-coal programs from initial funding allocation and disbursement to implementation and review.

4.3 Contracting

In order to identify feasible projects and capable private sector teams, DOE will issue funding solicitations to interested parties. The teams that succeed in securing this funding will likely include a mix of utility companies, architecture and engineering firms, technology developers and/or public service commissions. Following the issuance of the requests for proposals (RFPs), applicant teams will submit proposals to DOE, which will be carefully reviewed by CCPI staff.

5. Budget Plan

The budget plan shown here is for the first year of the program and covers the internal CCPI program budget needed for these new activities and the grant money that will be disbursed in the first year. The five divisions shown in the organization chart will require 62 people accounting for 27 FTEs and a total budget of $162 million.

The following is a detailed outline of the budget for the first year of this program. The first nine months of the year will be spent on the request for proposal (RFP) process. $160 million will be allocated for gasification technologies, of which $112 million (70%) will be allocated for a small IGCC trial project. Grants will be disbursed and actual project construction will begin only in the last three months of the year after a trial project has been selected. During the last three months, construction operations, such as monitoring and oversight and operations and liaison, will begin. The budget is broken up between personnel, other than personnel services (OTPS) and full time equivalents (FTE). Appendix B shows the detailed spreadsheets with monthly FTE estimates.

Salary levels were taken from the 2006 GS pay schedule[18] and grade level estimates were based on a list of DOE open positions[19]. Other Than Personnel Services (OTPS) includes office supplies, travel, and other office expenses. OTPS amounts were calculated as a percentage of the overall CCPI OTPS budget, which is based on a percentage of the total personnel budget. A summary of the total budget is shown in Table 2.

Total FTEs	**27.375**		
Salary for CCPI		**$1,773,000.00**	
Total Fringe for CCPI (25%)		**$443,250.00**	
Total Personnel Expenses for CCPI			**$2,216,250.00**
Total OTPS for CCPI			**$321,356.25**
Grants			**$112,000,000.00**
Grand Total Budget for CCPI			$114,537,606.25

Table 2: Grand total budget for first year of CCPI

5.1 Budget of the Office of the Director

The Office of the Director will oversee the entire CCPI program. The Director will work on budget issues, analyze policy perspectives, and undertake research on each project's viability. The staff positions in this office include the director, executive assistant, budget analyst, policy analyst, and executive researcher. There are five first year budget FTEs spread among five people; the budget allocation is shown in Table 3 below.

Of the OTPS budget, program "direction and administration" is allocated 5% of supplies, 5% of travel and 10% of office expenses, while "reports to congress" is allocated 10% of supplies, 5% of travel and 10% of office expenses. These percentages are based on the expected supplies and travel needs of this division.

Office of the Director	#	Effective Annual FTE	Salary level	Salary (Allocated by CCPI)	Totals
Director	**1**	1	110,000.00	110,000.00	
Executive Assistant	1	1	32,500.00	32,500.00	
Budget Analyst	1	1	54,000.00	54,000.00	
Policy Analyst	1	1	65,000.00	65,000.00	
Executive Researcher	1	1	65,000.00	65,000.00	
Total FTEs and Salary		**5**		**326,500.00**	
Total Salary with Fringe					**$408,125.00**
Total Other Than Personnel Services					**$79,785.00**
Grand Total for Office of Director					**$487,910.00**

Table 3: Budget for Office of the Director

5.2 Budget of Grants and Funding Division

The Grants and Funding Division will oversee the request for proposal (RFP) and funding allocation processes. This will involve writing project solicitations, reviewing project applications, finalizing contracts, and awarding and disbursing funds. The staff positions necessary for this process include contract attorney, environmental compliance attorney, paralegals, environmental analysts, technical experts, scientists, researchers, financial analysts, as well as the manager overseeing the division and his or her administrative assistant.

First year budget FTEs are approximately 11.6 spread between approximately 27 people (see Table 4 below). Most of the work for this division will be in the first 9 months, which is the assumed time period for the RFP process. Most of this staff will be involved on a part time basis, with some current DOE staff sharing their time with this new program; while others will be new hires for the program, sharing their time between this division and other CCPI divisions.

Of the OTPS budget, "RFP" is allocated 15% of supplies, 5% of travel and 20% of office expenses; while "Grants allocation" is allocated 3% of supplies, 5% of travel and 20% of office expenses. These percentages are based on the long time period that the personnel are working in

this division as compared to the other CCPI divisions. The percentage of travel funds is low, as a minimal amount will be required for a few personnel to visit project proposal sites.

Grants & Funding Division	#	Effective Annual FTE	Salary level	Salary (Allocated by CCPI)	Totals
Grants/Funding Manager	**1**	1	**90,000.00**	**90,000.00**	
Assistant	1	0.5	28,500.00	**14,250.00**	
Contract Attorney	1	0.375	80,000.00	**30,000.00**	
Environmental Compliance Attorney	1	0.375	80,000.00	**30,000.00**	
Environmental Analyst	2	1.5	52,000.00	**78,000.00**	
Paralegal	2	0.75	40,000.00	**30,000.00**	
Technical expert	4	2.25	77,000.00	**173,250.00**	
Scientist	5	1.5	70,000.00	**105,000.00**	
Researcher	5	1.875	50,000.00	**93,750.00**	
Financial Analyst	5	1.5	65,000.00	**97,500.00**	
Total FTEs and Salary		**11.625**		**$741,750.00**	
Total Salary with Fringe (25%)					**$927,187.50**
Total Other Than Personnel Services					**$46,541.25**
Grand Total for Grants/Funding					**$973,728.75**

Table 4: Budget of Grants and Funding Division

5.3 Budget of Project Oversight Division

The Project Oversight Division will be charged with ensuring on time and on budget construction of projects. This group will also oversee day-to-day operations of completed projects. This will require budget analysis and the establishment of realistic deadlines for industry that meet the overall time schedule of CCPI. Project managers for IGCC plants and Fuel Cell construction will be directly in charge of projects that fall within those categories. Staff for this division will include a manager, project managers-IGCC, project manager-Fuel Cell, on-site inspectors, technical experts, financial analyst, and an administrative assistant.

First year budget FTEs are approximately 3.75 spread between approximately 14 people (see Table 5 below). Most of the work for this division will be in the last three months of the year when the actual construction of projects is initiated. Thirteen members of the staff will have a part-time schedule. Twelve of these employees would have participated under the CCPI Grants and Funding Division (mostly on the review of proposals), which will enable them to be acquainted with the each of the projects, the review process, and to gain knowledge of the actual projects that will be constructed before construction begins. This increases division efficiency by ensuring that all employees understand all aspects of a project. The only new hire would be the manager for the division.

Of the OTPS budget, “construction and operations” is allocated 10% of supplies, 30% of travel and 15% of office expenses. These percentages are based on the relatively small portion of the year that personnel are working under this division in comparison with the other CCPI divisions. Project Oversight is given a large portion of the travel funding, as a substantial amount will be required for most of the personnel to travel back and forth from project sites and headquarters.

Project Oversight Division	#	Effective Annual FTE	Salary level	Salary (Allocated by CCPI)	Totals
Construction/Operations Manager	**1**	1	90,000.00	90,000.00	
Assistant	1	0.5	28,500.00	14,250.00	
PM IGCC	2	0.5	65,000.00	32,500.00	
PM Fuel Cell	1	0.25	65,000.00	16,250.00	
On-site inspector	6	0.75	35,000.00	26,250.00	
Technical expert	2	0.5	77,000.00	38,500.00	
Financial Analyst	1	0.25	65,000.00	16,250.00	
Total FTEs and Salary		**3.75**		**$234,000.00**	
Total Salary with Fringe					**$292,500.00**
Total Other Than Personnel Services					**$72,028.13**
Grand Total for Construction/Operations					**$364,528.13**

Table 5: Budget of Project Oversight Division

5.4 Budget of Compliance and Monitoring Division

The Compliance and Monitoring Division will play the role of internal auditor to verify and track program spending. This division will also ensure that funding recipients meet environmental regulations as well as DOE targets during the projects. This will require visits to the project sites and data gathering and analysis. Additionally, recommendations will be suggested to bring projects into compliance when problems are encountered. Staff for this division will include a manager, financial analysts, environmental analysts, technical experts, scientists, an environmental compliance attorney, a paralegal, and an administrative assistant.

First year budget FTEs are approximately 3.5 spread between approximately 12 people (see Table 6 below). Most of the work for this division will be in the last three months of the year, when grant money allocations (up to $160 million) have been disbursed to the initial trial project. Eleven members of the staff will have a part-time schedule, of which ten will have participated under the CCPI Grants and Funding Division in the review of proposals, ensuring projects are viable in scientific, economic and technical terms. The only new staff member will be the manager for the division.

Of the OTPS budget, “oversight and monitoring” is allocated 15% of supplies, 30% of travel and 15% of office expenses. These percentages are based on the comparatively low portion of the year that personnel are working under this division. Travel funding is high, as a substantial amount will be required for most of the personnel to visit project proposal sites and report back to headquarters.

Compliance & Monitoring Division	#	Effective Annual FTE	Salary level	Salary (Allocated by CCPI)	Totals
Compliance/Monitoring Manager	**1**	1	90,000.00	90,000.00	
Assistant	1	0.5	28,500.00	14,250.00	
Environmental Analyst	2	0.5	52,000.00	26,000.00	
Technical expert	2	0.5	77,000.00	38,500.00	
Scientist	3	0.25	70,000.00	17,500.00	
Financial Analyst	1	0.25	65,000.00	16,250.00	
Environmental Compliance Attorney	1	0.25	80,000.00	20,000.00	
Paralegal	1	0.25	40,000.00	10,000.00	
Total FTEs and Salary		**3.5**		**$232,500.00**	
Total Salary with Fringe					**$290,625.00**
Total Other Than Personnel Services					**$73,136.25**
Grand Total for Compliance/ Monitoring					**$363,761.25**

Table 6: Budget for Compliance and Monitoring

5.5 Budget of Liaison Division

The Liaison Division will develop dialogues with industry, local government, environmental groups, and other stakeholders in project areas in order to ease conflict surrounding NIMBY issues. By communicating frequently with industry, this division will also import institutional knowledge that is essential to the solicitation process. The staff positions necessary for this process include the liaison manager, his/her assistant and an industry liaison professional. First year budget FTEs are approximately 3.5 spread among approximately 4 people (see Table 7 below).

"Liaison" is allocated 15% of supplies, 20% of travel and 10% of office expenses. Travel is expected to be significant for this division, as the liaisons work with stakeholders nationwide and must travel to meet with them.

Liaison Division	#	Effective Annual FTE	Salary level	Salary (Allocated by CCPI)	Totals
Liaison Manager	**1**	1	90,000.00	90,000.00	
Assistant	2	0.5	28,500.00	14,250.00	
Industry Liaison	1	2	67,000.00	134,000.00	
Total FTEs and Salary		**3.5**		**238,250.00**	
Total Salary with Fringe					**$297,812.50**
Total Other Than Personnel Services					**$49,865.63**
Grand Total for Liaison					**$347,678.13**

Table 7: Budget of Liaison Division

6. Performance Management and Quality Improvement Analysis

The EPAct of 2005 sets forth the CCPI's long-term goals and mandates that the $1.8 billion granted under the act should be disbursed by 2014. The grants should contribute to the complete construction of five coal fired power plants, of which three should be IGCC plants and two should be gasification fuel cell plants. By the completion of these projects the CCPI should achieve environmental improvements within the power industry in terms of more stringent emission standards and increased thermal efficiency. The emission standards for the projects should meet a decrease in sulfur dioxide emissions by 99%, nitrogen oxides emissions should be less than 0.05 lbs/million Btu, and the emission of mercury should be decreased 'substantially'. Energy efficiency should be increased by 50-60%, depending on the grade of coal combusted in the plant.

One of the short term goals is that after one year of the program, one request for proposal (RFP) process should be completed and the construction of a trial plant project should have started. The RFP process is estimated to last over nine months, which leaves three months of the first year to start the construction of the project chosen during the proposal process. The CCPI is also required to produce several reports for the U.S. Congress as described more fully below. The first of these Congressional reports should be completed by the end of the first year.

Each of the five divisions within the CCPI program has its own short-term goals along with indicators for measuring their performance in achieving these goals. The *input* indicator is a measure of the division's budget and staff size (in FTEs). Two types of indicators are used for measuring performance: *output* and *outcome* indicators. The output indicator is a measure of whether the division has completed its tasks (a quantitative indicator); the outcome indicator is a measure of how well the task was completed (a qualitative indicator).

In order to reach EPAct's goal of ensuring 'jobs for the future with secure and reliable energy', the CCPI will measure the performance of each of its five divisions. If each one performs satisfactorily the CCPI will, in the end, complete biannual program reports to Congress (by the Office of the Director), complete five coal gasification plants (by the Grants and Funding Division and by the Construction and Operation Division), and improve industry pollutant emission and thermal efficiency standards (Compliance and Monitoring Division). The Liaison Division will ensure that the program communicates with the stakeholders for each project and plant in order to avoid issues which may adversely affect overall progress while also enhancing the CCPI's activities.

6.1 Performance Management: Office of the Director

The Office of the Director is charged with the preparation and completion of the Congressional reports. These include a 10-year plan due March 31, 2007 outlining the plan for the CCPI program overall as well as biannual status reports. The 10-year plan, as mentioned, will address

funding issues, define the solicitation process, identify past mistakes to be avoided, and set technical milestones.

The biannual reports to Congress will include updates on project status, how the CCPI projects are progressing towards meeting the technical milestones, and program staffing needs. These reports are estimated to require an input of 5 FTEs in addition to a portion of the division's $488,000 budget. Thus, the output indicator for this task will be the production and presentation of the report to Congress no later than March 31, 2007. The outcome indicators will be that the report meets all of the requirements outlined in HR 1640 and also that a successful relationship has been cultivated between the DOE and Congress. The success of the relationship will be determined by taking opinion surveys of the relevant committees in Congress and groups in DOE to measure their satisfaction with the reports.

The directorate is also responsible for the hiring of personnel for the program. The inputs for this task include the staff in this division in addition to the budget. The output indicator for this task is the hiring of 1 fully qualified manager for each division: Grants and Funding, Construction and Operations, Compliance and Monitoring, and Liaison, who will, in turn, hire their own staff. The outcome indicator for this task is the placement of managers with relevant experience with respect to their divisions ensuring successful leadership of the program. In addition, the suitability of the mangers will be measured through peer reviews by the staff of each division at the end of the first year.

6.2 Performance Management: Grants and Funding

The Grants and Funding Division will oversee the funding allocation process. This will involve, among other tasks, reviewing project applications and awarding and disbursing funds. The inputs required for these tasks will be the office's 12 FTEs employees and the division's budget of $974,000. The review of project applications will occur in the first nine months of the year, and the output indicator will be that all proposals are reviewed in a standard format and captured into a database, ensuring that the process is well organized and streamlined. The outcome indicator for this task will be that proposals are reviewed in an efficient manner, and completed no later than nine months after the start of the program. Efficiency will be measured by the manager and peer surveys within the Division and the Office of the Director. This will be supplemented by survey comparisons with those taken by other Grants and Funding divisions in other programs within DOE that have more experience performing these tasks.

With regard to the disbursement of the grants, the output indicator will be that funds are disbursed for one small trial project. The outcome indicator for this project will be that the trial project meets the requirements for projects as stipulated in EPAct, which includes cost competitiveness, as well as the technical milestones for emission standards and thermal efficiency, as specified for year one in the first Congressional report.

6.3 Performance Management: Project Oversight

The Project Oversight Division will be charged with ensuring the on-time and on-budget construction of the three IGCC project facilities and the two gasification fuel cells. The Division will also oversee day-to-day construction activities and will evaluate operation performance of completed projects. The first year's allocation of $112 million will be given for a small IGCC trial project. The inputs indicators for this division will be a budget of $365,000 and a staff of 3.75 FTE. The division will have two output indicators for the last three months of the year. The first of these will be the measure of whether or not the task of creating a Standard Operation Procedures (SOPs) for inspectors has been accomplished. It will be up to the Technical Expert and Financial Analyst within the Division to establish standards, create a list of rules on how to do an inspection and communicate this to the project managers. Once the final set of SOPs is available, on-site inspectors and project managers will evaluate it with regard to its comprehensiveness and usefulness. A positive rating will mean that the SOPs are clear in what is expected from project managers and inspectors and are useful enough to enhance performance.

The Project Oversight Division's second task will be to maintain project expenditures in line with the CCPI's allocated budget for each project. This will require industry feedback as well as flexibility to account for possible unforeseen needs. The output indicators for this task will involve measuring the expenditures of the projects quarterly. In addition, the number of project deadlines (e.g. project start date, project end date, and midway date) will be measured. This data will be used for setting benchmarks, deadlines, and budgets for future projects, as well as to re-evaluate the current project's deadlines and budget. Therefore, the number of times that this data is used as consultation in budget and deadline setting will be measured and will be an indicator for success of this division.

6.4 Performance Management: Compliance and Monitoring

The input indicators for the Compliance and Monitoring Division are a budget of $364,000 and 3.5 FTEs. The Compliance and Monitoring Division will play the role of internal auditor, verifying and tracking program spending and ensuring that funding recipients comply with environmental regulations and meet DOE targets during the projects. Additionally, they will have the responsibility of making recommendations to projects that are not in compliance. The information gathered on program spending will be examined in a one-year internal audit report. The report will be sent to the CCPI's Director for revision before being sent to the NETL and the Office of Fossil Energy for further review. In addition, the Division will evaluate and recommend to industry procedures that may be undertaken to meet environmental standards. The output indicators will be that (1) the procedures for meeting the relevant environmental standards as well as the procedures for the Division to monitor emissions and thermal efficiency are set, (2) all appropriate environmental permits are obtained and (3) that a one-year internal audit of the program spending is completed.

For the compliance and monitoring procedures to be successful, they need an understanding of what EPAct environmental objectives are deemed feasible by industry. Relevant members of

industry will be invited to discuss technologies available for emission control, the benefits of self-audit systems versus inspections and the proper frequency for inspections and/or self-audit reports. The outcome indicators are designed to measure the relevant industry's opinion of the emission monitoring process through opinion polls.

The outcome indicator for the internal audit will measure whether the Division is adhering to GAAP (Generally Accepted Accounting Principles), meeting its internal deadlines for the audit process, and whether or not the Division is providing an overview of the finances for all five division within the CCPI.

6.5 Performance Management: Liaison Division

The Liaison Division will engage in dialogues with industry, local government, environmental groups and other stakeholders in project areas in order to ease conflict surrounding NIMBY issues. The input indicators for this division are a budget of $348,000 and a staff of 3.5 FTE. By communicating frequently with industry, this division will also import institutional knowledge that is essential to the solicitation process. This Division will work year-round and will have two specific tasks. The first will be to organize meetings with different stakeholders to share information about CCPI and to inform them of the Department's plans. The most important part of these meetings is to sensitize the Department's administration to stakeholder issues to avoid NIMBY problems. As a result, one output indicator will measure the frequency of meetings held. The outcome indicator for this task will measure the success of the communication seeking the stakeholders' opinions about their satisfaction with the process through surveys. Areas of inquiry will include whether or not key questions were addressed properly, if stakeholders actively participate, if their concerns were "heard", and whether or not they saw change result from their suggestions. Participants at the meetings will be asked to fill out the same form. The stakeholders' perception of the meetings will be compared to that of the Division members' and any discrepancies will be addressed by the Division.

The Division's second task will be to send reports to the Director of CCPI on a quarterly basis delineating key stakeholder issues and recommending how to address them. The second output indicator measures whether or not these reports have been completed and if they were done so in a sufficient manner. As head of the CCPI, the Director will be its highest representative and it is therefore important for her/him to have personal contact with stakeholders to ensure that their concerns are taken into account by the top levels of management. To measure whether the reports truly identify the key issues of the meeting, representatives from each stakeholder group will be allowed to comment on the report before it is sent to the Director. A lack of negative comments from stakeholders will be an indicator of the success of the reports. A further indicator of success of the liaison Division would be a similar lack of "bad press" about the CCPI, NIMBY issues, or complaints from industry about the CCPI setting "non-achievable" standards.

7. Year One Master Calendar

The master calendar is designed for the CCPI based on overall program design, the organizational and staffing plan, and the program budget for the first fiscal year of operations. It delineates those tasks and subtasks required from each division in order to meet the primary program objectives. Appendix D provides a detailed chart for each of the tasks and proposed time frames for all five divisions within CCPI. Note that length of time frame does not necessarily indicate the required amount of energy for each task. For parameters on resource expenditure for the individual divisions and tasks please refer to the Performance Management and Quality Analysis section.

7.1 Office of the Director Calendar

TASK 1: Completion of Congressional Reports

TASK 1A: Ten-Year Plan:
TIME FRAME: *January 1, 2006 ~ December 31, 2006*

TASK 1B: Compile information for biannual status report to Congress:
TIME FRAME: *March 1, 2006 ~ October 31, 2006*

TASK 1C: Write up biannual status report to Congress:
TIME FRAME: *October 1, 2006 ~ December 31, 2006*

7.2 Grants and Funding Calendar

TASK 1: Generate and Disseminate Request for Proposals:
TIME FRAME: *January 1, 2006 ~ March 31, 2006*

TASK 2: Submission period for proposals:
TIME FRAME: *April 1, 2006 ~ May 31, 2006*

TASK 3: Review and process proposals received:
TIME FRAME: *June 1, 2006 ~ August 31, 2006*

TASK 4: Award and disburse funds to a trial project:
TIME FRAME: *September 1, 2006 ~ October31, 2006*

7.3 Construction and Operations Calendar

TASK 1: Project Design and Pre-Construction Meetings:
TIME FRAME: *January 1, 2006 ~ December 31, 2006*

TASK 2: Create Standard Operating Procedure (SOP) for inspectors:
TIME FRAME: *October 1, 2006 ~ November 31, 2006*

TASK 3: Evaluation of SOP by outside stakeholders:
TIME FRAME: *November 1, 2006 ~ December 31, 2006*

TASK 4: Set financial milestones for trial plant:
TIME FRAME: *October 1, 2006 ~ December 31, 2006*

7.4 Compliance and Monitoring Calendar

TASK 1: Environmental Permitting Preparation:
TIME FRAME: *July 1, 2006 ~ September 31, 2006*

TASK 2: Environmental Permitting submittal:
TIME FRAME: *October 1, 2006 ~ December 31, 2006*

TASK 3: Annual audit of program spending in all divisions:
TIME FRAME: *October 1, 2006 ~ December 31, 2006*

TASK 4: Evaluate trial project to ensure compliance with environmental regulations and DOE targets:

TASK 4A: Planning
TIME FRAME: *February 15, 2006 ~ June 30, 2006*

TASK 4B: Evaluation of Proposal
TIME FRAME: *July 1, 2006 ~ September 1, 2006*

TASK 4C: Pre-construction reviews
TIME FRAME: *September 1, 2006 ~ December 31, 2006*

7.5 Liaison Calendar

TASK 1: Plan and conduct bi-monthly stakeholder meetings
TIME FRAME: *Ongoing January 1, 2006 ~ December 31, 2006*

MEETING DATES
February 1, 2006
April 1, 2006
June 1, 2006
August 1, 2006
October 1, 2006
December 1, 2006

TASK 2: Conduct stakeholder surveys on satisfaction with program and bi-monthly meetings
TIME FRAME: *Ongoing January 1, 2006 ~ December 31, 2006*

SURVEY DATES
February 1, 2006 ~ February 15, 2006
April 1, 2006 ~ April 15, 2006
June 1, 2006 ~ June 15, 2006
August 1, 2006 ~ August 15, 2006
October 1, 2006 ~ October 15, 2006
December 1, 2006 ~ December 15, 2006

TASK 3: Compile report for presentation to director on stakeholder satisfaction and productivity of bi-monthly meetings
TIME FRAME: Ongoing: *January 1, 2006 ~ December 31, 2006*

MEETING DATES
March 31, 2006
June 31, 2006
September 31, 2006
December 31, 2006

TASK 4: Create report/newsletter for agency-wide dissemination:
TIME FRAME: *Report One: June 1, 2006 ~ June 30, 2006*
Report Two: December 1, 2006 ~ December 31, 2006

8. Conclusion

The United States' ability to continue to utilize coal is inextricably tied to the success with which it can address emissions issues. As this report has demonstrated, coal is an abundant and inexpensive domestic source of energy, which is projected to become an increasingly large component of U.S. energy supply. However, the threats that pollutants in coal emissions pose to human health and the environment are serious hurdles that must be addressed for this resource to be used responsibly. Traditional coal-fired power plants produce a broad range of harmful emissions, including sulfur dioxide (SO_2), nitrous oxides (NO_x), mercury (Hg), and carbon dioxide (CO_2). These emissions are responsible for health and environmental threats such as acid rain, ozone formation, mercury poisoning, and global warming. The Clean Coal Power Initiative, as it is created in the Energy Policy Act of 2005 (EPAct), aims to support and commercialize advanced coal technologies to enable more environmentally benign utilization of coal.

This project team has assessed the mandates and provisions of the CCPI and created a possible plan for its implementation. The centerpiece of this program is an allocation of $1.8 billion over 9 years (fiscal year 2006 – 2014) mandated to support the development of traditional and advanced coal technologies. EPAct requires that a minimum of 60% of this allocation be spent on advanced technologies and the remaining portion on installing traditional coal technologies such as scrubbers. This plan allocates 80% ($1.44 billion) of this funding to promote advanced coal technologies. Of this $1.44 billion, 70% will be used to fund IGCC technologies and 30% will be used to fund hydrogen fuel cell projects. This allocation of funds represents a balance of pragmatism and aggressiveness in promoting advanced coal technologies. IGCC technologies have been proven in the power industry and will be made more widely commercialized with the aid of this funding. Hydrogen Fuel Cell technology represents the next wave of coal technology, and thus is in the earlier stages of development. Funding from the initiative will aid in promoting fuel cell technology in its nascent state and the market for these cutting edge systems.

The CCPI will be housed within the National Energy Technology Laboratory, which itself is a part of the Department of Energy's Office of Fossil Energy. The initiative will staff and execute tasks associated with dispersing grants, overseeing construction and operation of power plants, ensuring compliance and monitoring of their performance, and serving as a liaison to stakeholders involved in the projects. In its first year, CCPI will aim to complete a request for proposal process and grant funds to selected projects. It will also begin the permitting process for these projects, develop a ten year plan report to Congress, and maintain constructive stakeholder relations. The success of this CCPI will be measured in three ways: the reports to congress meet requirements mandated in EPAct; trial projects meet emissions reductions requirements; no complaints are received from stakeholders.

There are impacts of using coal that are not addressed by the CCPI. These include carbon dioxide (CO_2) emissions that contribute to global warming and the environmental and occupational threats stemming from coal mining. Though coal gasification allows for the capture of CO_2, it alone does not solve the problem of CO_2 emissions. Research and development is still required to make solutions such as carbons sequestration viable.

Additionally, the program does not provide any solutions to the environmental damage or occupational hazards involved in coal mining.

The effective implementation of the CCPI will promote more environmentally benign methods of generating power from coal. It will improve thermal efficiency of coal power generation, cut emissions levels from coal-fired power plants, and fund technologies that may lead to larger solutions for global warming. As issues dealing with energy and the environment are inherently tied, the CCPI can be considered as an investment in the future of America's environment, the health of its citizens, the health of its economy, and the ability of the power industry to meet the growing public pressures of demand and emissions issues.

Appendix A: Environmental and Health Problems Related to Coal Combustion

Sulfur Dioxide (SO_2): acid rain formation and human health effects

The environmental impacts of sulfur dioxide (SO_2) are related to deposition of acid rain or sulfate particles. Reaction of SO_2 with other gases in the air produces sulfuric acid. When this acid precipitates with rain, snow, fog, or as dry particles, it causes the acidification of freshwater and soils, as well as damage to vegetation. Non-acid sulfate particles can also precipitate to the ground; this process causes nutrient loading and eutrophic effects. (See Figure 6)

Bodies of water with a weak or non-existent ability to neutralize acids are particularly susceptible to both wet and dry acid deposition. Some bodies of water have a higher buffering capacity than others; however, when the buffering capacity is exceeded, the pH of the water will drop (become more acidic), reducing dissolved oxygen, and affecting plant and aquatic life. Certain species, for example, rainbow trout, snails and clams, are highly sensitive to minimal changes in pH. A drop in pH will affect their ability to reproduce, grow, and survive.[20] In some acidified lakes and streams, entire fish populations have disappeared. For example, many lakes in the Adirondack Mountains of New York and many streams in the Appalachian mountain region have experienced losses of trout and other aquatic life due to acid rain.[20]

Acids also act to release aluminum, which is an environmental toxin. Aluminum and pH levels are inversely related so that as pH decreases, aluminum concentration increases. Acidification of lakes and soils therefore contributes to an increase in environmental aluminum concentration. Chronic exposure to sub-lethal aluminum levels and reduced pH levels causes reproductive stress and depressed growth among fish populations and aquatic vegetation. In terrestrial environments, these stressors result in loss of foliage, increased susceptibility to weather and disease, and depressed growth and reproduction.[21]

Acid rain also damages trees by stunting their growth, removing essential nutrients from the soils, and limiting their ability to prevent disease. Forests affected by acid rain are easily recognized, as the leaves and needles have turned brown and have fallen off, as opposed to healthy green trees.[22] Many buildings are affected by the sulfurous, sulfuric, and nitric acids in acid rain, which act to corrode buildings made of materials such as marble and limestone. They contain calcite, which is dissolved by the acids, leading to removal of material and carvings at the surface.[23]

Sulfur dioxide emissions can also affect human health, principally through inhalation. Direct inhalation of the gas causes respiratory illness in susceptible populations such as the very young, the elderly, and individuals with heart and lung disease, with chronic inhalation of SO_2 contributing to the development of these ailments in otherwise healthy populations. High levels of SO_2 in the air have been proven to cause and aggravate various types of lung disorders. These lung disorders, which affect some people's ability to breathe, have led to both increased disease

rates and mortality in young children and the elderly. When reacting with particles and other gases in the air, SO_2 generates sulfate particles. Chronic inhalation of these particles can cause a build up of residue in the lung, which causes lingering respiratory dysfunction and illness.[30] Furthermore, short-term exposures to high levels of SO_2 around 100 ppm are considered dangerous to human health. In one study, previously healthy and non-smoking miners who breathed SO_2 released as a result of an explosion in an underground copper mine developed burning of the nose and throat, breathing difficulties, and severe airway obstructions.[24]

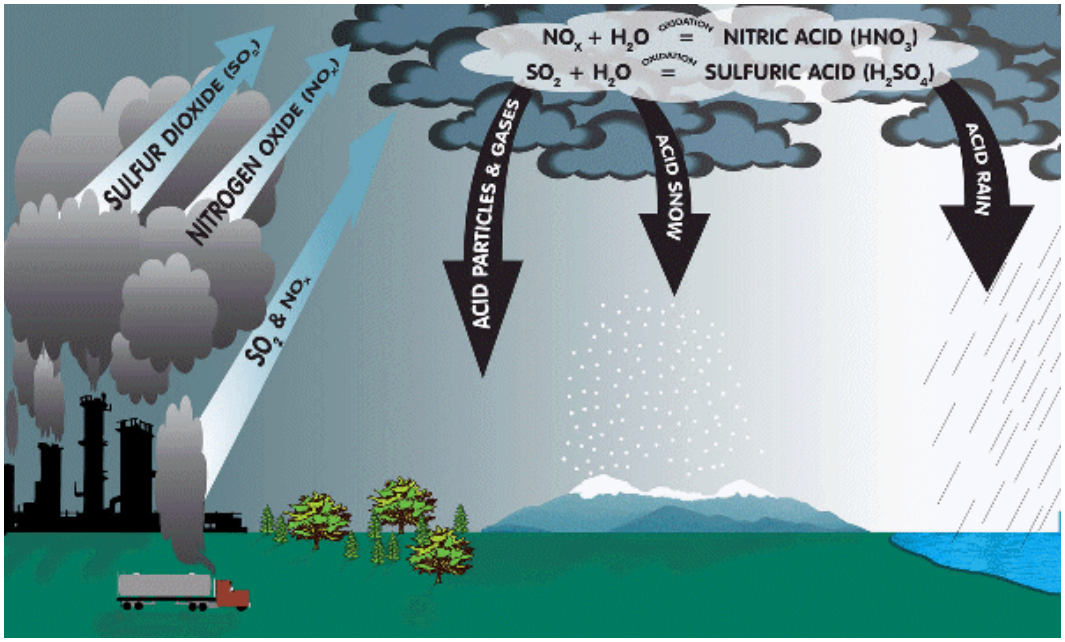


Figure 6: Diagram illustrating the process of acid rain as a result of SO_2 and NO_x emissions from coal-fired power plants and internal engine combustion in automobiles

<u>Nitrogen Oxides (NO_x): smog formation and human health effects</u>

Nitrogen oxides have environmental and health impacts very similar to those of SO_2, particularly related to acid rain, nutrient deposition and particle inhalation. Ground-level ozone (O_3), also known as "smog" is common in urban areas with dense traffic congestion. NO_x is a key component in the formation of smog. When NO_x and volatile organic compounds (VOCs), usually hydrocarbons, come into contact with heat and UV light, the molecules combine to form ozone in the lower layers of the atmosphere. Because of the importance of heat and sunlight in the chemical reaction, smog is most prevalent in the summer months, when there is the most sunlight and temperatures are the highest.[25]

Smog (ground-level ozone) has health effects when it enters the lungs through respiration and can cause up to a 20 percent decrease in lung function, exacerbating asthma, causing bronchitis and chronic lung inflammation. Smog is a large problem in urban environments where many automobiles are driven, and thus there are increased levels of NO_x and hydrocarbons in the air. This has resulted in increased childhood asthma rates in some U.S. cities, including Los Angeles

and Houston. Researchers have found an increased risk of premature death associated with increased levels of ozone in the U.S. They estimated that over 3,700 deaths annually could be attributed to a 10 ppb increase in ozone levels.[26]

Mercury (Hg): effects on the environment and human health

Mercury emissions are problematic to the environment and to human health ultimately because of the process of bioaccumulation (see Figure 7). Mercury is released into the air as a result of coal combustion and is easily transported in the atmosphere. Mercury often precipitates with snow and rainfall and is deposited on land and water flowing into rivers and lakes. Trace amounts of mercury are soluble in bodies of water, and in the anoxic (oxygen-deprived) conditions at the bottoms of lakes and estuaries. Methane-producing bacteria methylate mercury upon ingestion by binding a carbon atom to the mercury, creating methylmercury (MeHg), a more toxic form of mercury that is readily accumulated in fat and muscle tissues.[27]

Once MeHg enters the environment, it accumulates in organisms over time through the process of bioaccumulation. Fish absorb the MeHg when they feed on microorganisms that contain MeHg, or directly from the water as it passes over their gills when they breathe. These fish are consumed by higher order predators and the MeHg is so transferred up the food chain. As a result, the fish at the top of the aquatic food chain contain the highest concentrations of MeHg. The process by which organisms higher on the food chain accumulate ever greater amounts of contaminants is referred to as biomagnification. Consequently, when human beings eat top predator fish they also ingest the concentrated MeHg. [28]

In the human body, mercury contaminates the brain and nervous system. The nervous system is very sensitive to all forms of mercury, but MeHg and metallic mercury vapors are more damaging because of their effect on the neurological system. In adults, mercury poisoning can adversely affect fertility and blood pressure regulation, cause memory loss, tremors and vision loss, and permanently damage the brain, kidneys, and developing fetus.[29] Pregnant women and children are especially susceptible. Children poisoned by mercury may develop problems of their nervous and digestive systems, and kidney damage. Pregnant women may pass mercury's harmful effects to the fetus resulting in brain damage, mental retardation, a lack of coordination, blindness, seizures, and inability to speak. [30] It can also pass to a nursing infant through breast milk.[31]

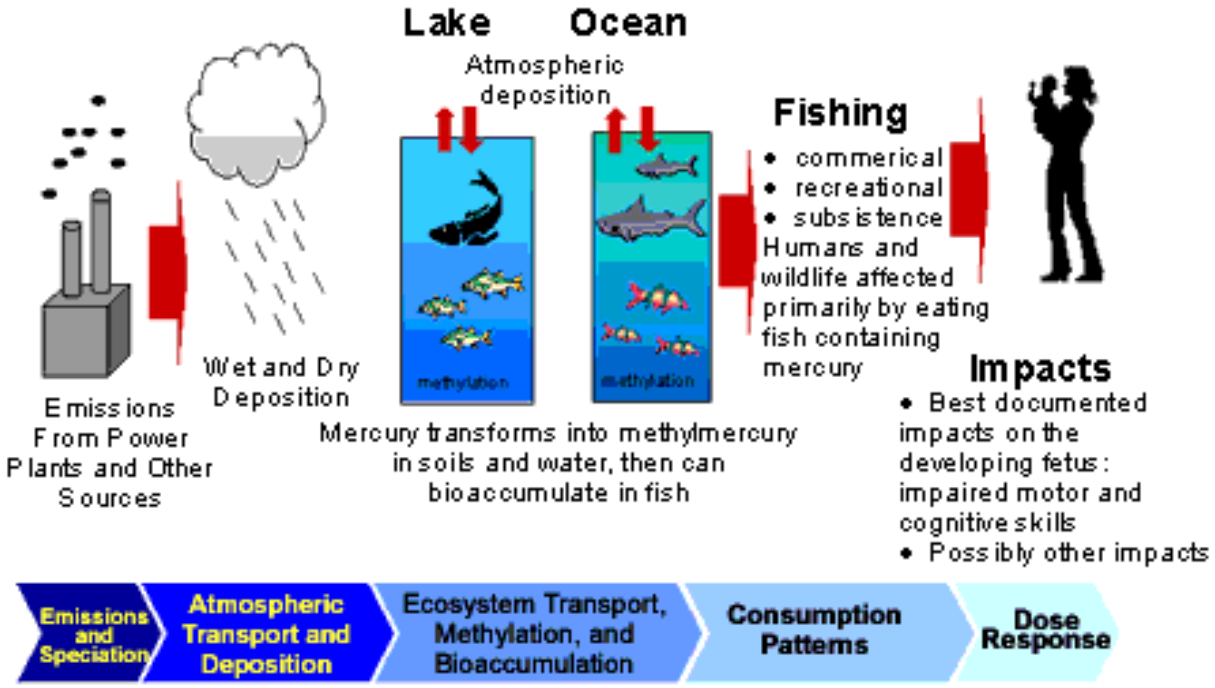


Figure 7: The cycle of mercury in the environment from power plant emissions, deposition in the environment, and bioaccumulation in humans from the consumption of fish. (Source: U.S. Environmental Protection Agency)

Carbon dioxide (CO_2) emissions and global warming

Release of carbon dioxide (CO_2) from the combustion of fossil fuels in both coal-fired power plants and gasoline combustion from mobile sources constitutes the largest anthropogenic contribution to global warming (see Figure 8). The principal environmental effect of increased CO_2 quantities in the atmosphere is an elevation in average global temperature. This rise in temperature is expected to trigger such impacts as sea level rise, increased incidence of extreme weather phenomena, regional climate pattern shifts, and the disruption of major ocean currents, which act to regulate climate and weather in many regions of the world. Environmental effects include increased ocean acidity, ice melting (at the poles and glaciers), forest fires, and other positive feedbacks to the climate change pattern conditions.[32] Health effects to humans are related to these environmental impacts. Elevated temperatures can cause more heat waves and heat-related illness in humans. Higher temperatures may also expand the habitat range for disease vectors, such as mosquitoes.[33]

Increasing levels of CO_2 in the atmosphere exact a toll on the Earth's climate through the process of global warming. Incoming sunlight heats the Earth's surface throughout the day. At night, the surface cools, releasing this energy as infrared waves, which are absorbed by CO_2 molecules in the atmosphere, trapping the energy near the Earth's surface. CO_2 molecules persist in the atmosphere over time so that the process reinforces itself; it operates in a positive feedback mechanism. According to the UN Framework on Climate Change Convention, carbon dioxide is responsible for over 60 percent of the human-induced greenhouse effect, through the incineration of coal, oil, and natural gas at an exponential rate, releasing the carbon stored in the fuels into the

atmosphere and altering the balanced carbon cycle by which carbon is exchanged between the atmosphere, oceans, and vegetation on land. Currently, atmospheric levels of carbon dioxide are rising by over 10 percent every 20 years." [34]

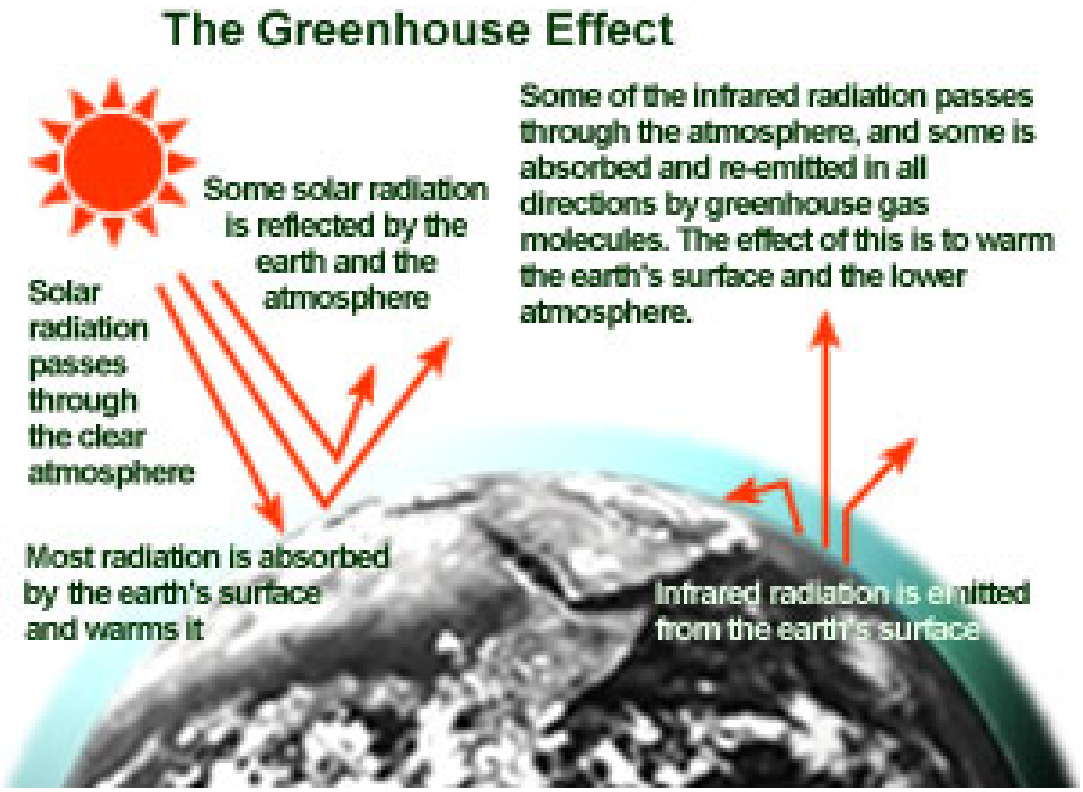


Figure 8: The greenhouse effect, and its contribution to global warming, in which carbon dioxide plays a major role. [35]

Appendix B: Gasification Technologies

Integrated Coal Gasification Combined Cycle Process

Integrated Gasification Combined Cycle (IGCC) combines coal gasification with a more efficient turbine system (combined cycle) for the purpose of energy generation. IGCC drastically reduces emissions of greenhouse gases (CO_2, CH_4), mercury (Hg), and acid rain-causing gases (NO_x and SO_2) that are produced during coal combustion (Figure 9).[36]

Coal Gasification: Raw coal is placed in a gasifier and subjected to high temperature and pressure under controlled amounts of oxygen and water vapor. This causes solid coal to be converted into its constituent gases. Methane, the molecule burned in combustion, is converted to carbon monoxide (CO) and hydrogen (H_2). This resulting syngas also includes any impurities found naturally in the coal source.[37]

Combined Cycle: Syngas is used to drive a gas or combustion turbine. This turbine is propelled by the force resulting from gas combustion. This combustion is extremely hot, and the high heat release is used to generate steam. Steam is then used to run a secondary and more conventional steam turbine.[38]

This process contributes to alleviating pollution in two ways. First, pollutants in the syngas derived from coal impurities are easily removed. Mercury is removed using an activated charcoal filter that exhibits removal efficiencies around 90%. Sulfur is removed as hydrogen sulfide (H_2S); this unoxidized sulfur form is sold to chemical manufacturers as a marketable byproduct of coal consumption. Sulfur removal can exceed 99%. Nitrogen is converted to ammonia (NH_3) and easily removed from syngas by conventional chemical filtration systems. Thermal nitrogen oxide (NO_x) is the nitrogen pollution formed during the combustion process. This NO_x is reduced by controlling combustion conditions and is removed from the exhaust by end-of-pipe filters used on all fossil-fuel-fired electric generation plants. Total NOx reduction depends on the combination of technologies used, but emissions of 0.02lb/million BTU have been documented with IGCC.[39] Second, IGCC plants exhibit energy conversion efficiencies of 20 to 35% higher than conventional coal burning power plants; these efficiency improvements make coal burning as energy efficient as natural-gas burning. As a result, less coal is needed to generate the same electrical energy, and pollutant removal is much more efficient per unit of energy produced (Table 8).[40]

Pollutant	**Traditional Coal Plant**	**IGCC Plant**	**Reduction**
Sulfur Dioxide (SO_2) (lb/106 Btu)	**31.25**	**<0.15**	**99%**
Mercury (Hg) (lb/109 Btu)	**21.4**	**1.5**	**93%**

Table 8: A comparison of the emissions of pollutants sulfur dioxide and mercury from traditional and IGCC coal plants[41]

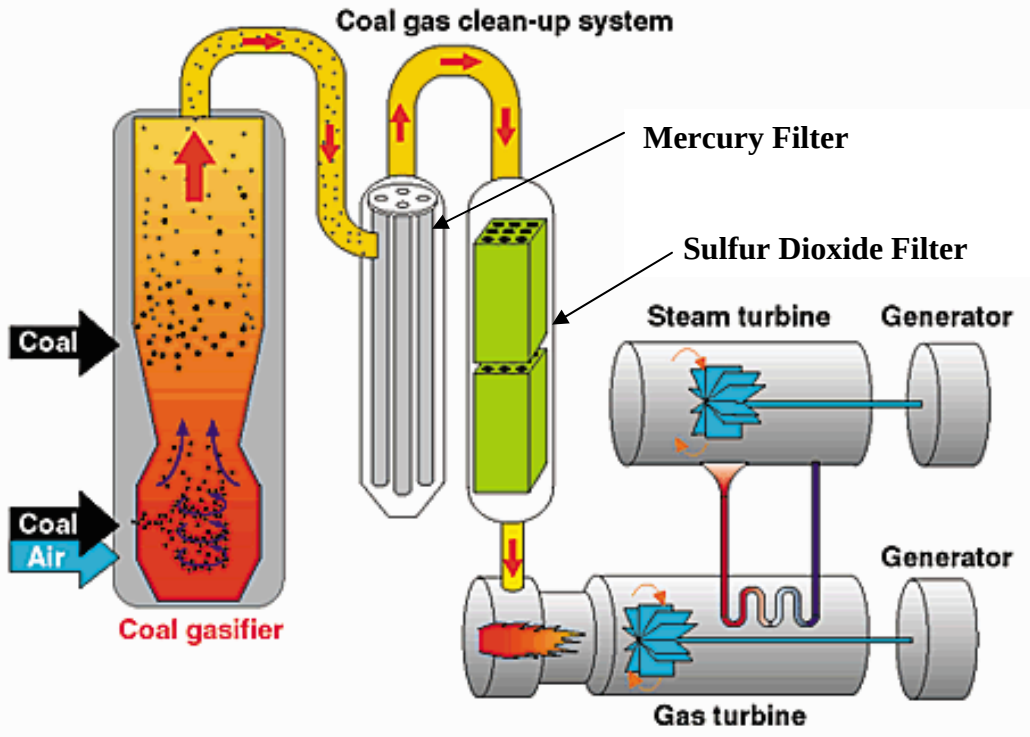


Figure 9: Integrated Coal Gasification Combined Cycle. In coal gasification, raw coal is placed in a gasifier converting solid coal into its constituent gases. This resulting gas, known as syngas also includes any impurities found naturally in the coal source, such as mercury and sulfur. Mercury is removed using an activated charcoal filter (shown in grey) and sulfur is converted to hydrogen sulfide (H_2S) using limestone (shown in green).

Hydrogen Fuel Cells

Hydrogen fuel cells are a method of utilizing hydrogen to produce electricity. (See Figure 10) The cell can be pictured as a "sandwich" of different materials. On one of the outside walls is a positive cathode, on the other a negative anode, centered around a catalyst in the middle. When hydrogen (H_2) is introduced to this catalyst in the presence of oxygen (O_2) it oxidizes to form hydrogen protons, giving up its electrons. This causes a buildup of negative charge on one side of the cell. When this negative charge build up flows toward the cathode, electricity is produced. The hydrogen protons react with oxygen, forming water[42]. As long as these charge flows are maintained, electricity production continues.

The IGCC separates gases in carbon combustion, including hydrogen, which could be used as fuel for a fuel cell. An example of such a fuel cell can be the Molten Carbonate Fuel Cell, which uses simulated coal gasification products to feed the fuel cell and requires carbon dioxide and

oxygen to be delivered to the cathode. The FutureGen[c] coal power plant will also use fuel cells to achieve its zero emissions standard.

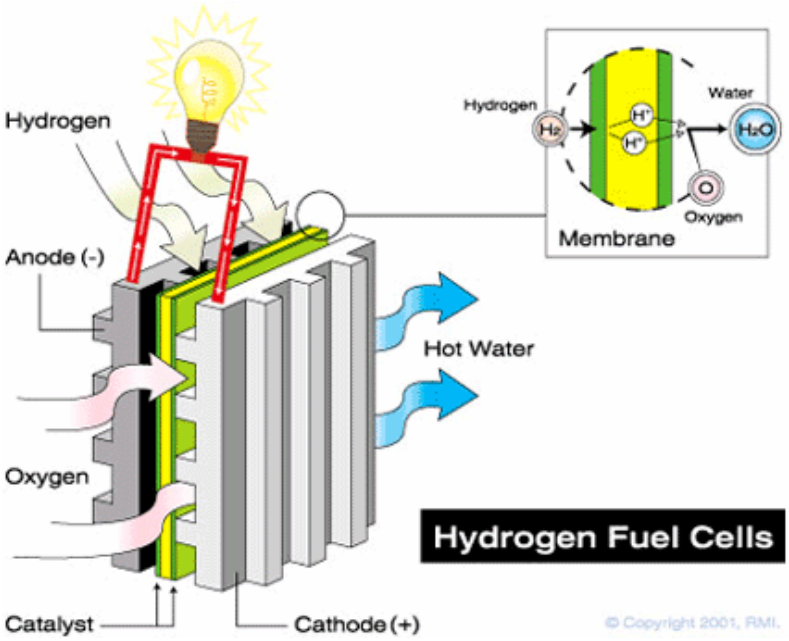


Figure 10: Schematic of a Hydrogen Fuel Cell. Source: Source: Rocky Mountain Institute.

[c] FutureGen will be the first prototype coal fired power plant that will produce hydrogen while capturing and sequestering the CO_2 emissions produced. For further information see: Department of Energy FutureGen <http://www.fossil.energy.gov/programs/powersystems/futuregen/>

Appendix C. Political Climate

To provide an idea of the political climate's shift away from issues of environmental concern, research results from McCright and Dunlap are included here. This research regarding climate change policy showed that since 1992 there has been a shift in Congressional testimony, such that scientific testimony declined while testimony from industry allies increased (Figure 11)[43]. Further, beginning in 1994 there has been a huge shift from peer-reviewed conventional scientists to climate change skeptic scientists testifying in Congress (Figure 12)[44].

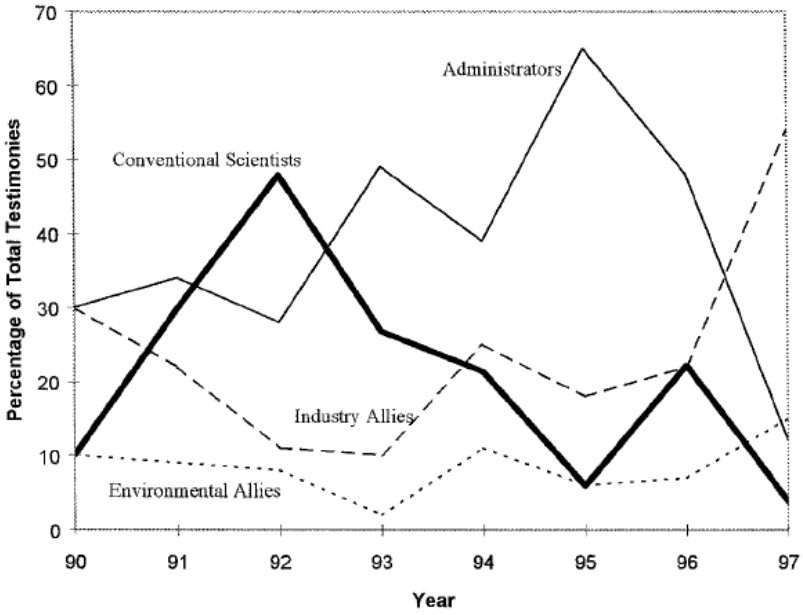


Figure 11: Percentage of testimonies presented each year.

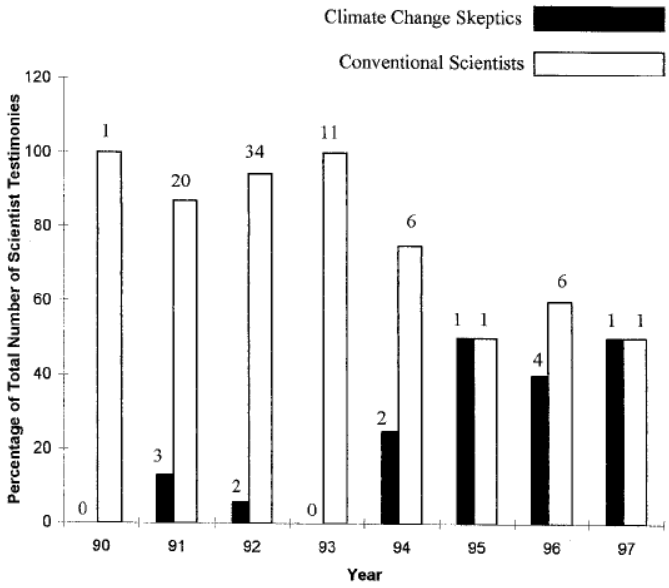


Figure 12: Percentage of testimonies delivered to Congress by conventional (peer-reviewed) scientists and climate change skeptics. The number of testimonies by each group is listed at the top of each column.

Appendix D: First Year Budget Spreadsheets

First Year Budget by Division

Office of the Director	#	Effective Annual FTE	Salary level	Salary (Allocated by CCPI)	Totals	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Director	**1**	1	110,000.00	110,000.00		1	1	1	1	1	1	1	1	1	1	1	1
Executive Assistant	1	1	32,500.00	32,500.00		1	1	1	1	1	1	1	1	1	1	1	1
Budget Analyst	1	1	54,000.00	54,000.00		1	1	1	1	1	1	1	1	1	1	1	1
Policy Analyst	1	1	65,000.00	65,000.00		1	1	1	1	1	1	1	1	1	1	1	1
Executive Researcher	1	1	65,000.00	65,000.00		1	1	1	1	1	1	1	1	1	1	1	1
Total FTEs and Salary		**5**		**326,500.00**		**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**
Total Salary with Fringe					**$408,125.00**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**
Total Other Than Personnel Services					**$79,785.00**												
Grand Total for Office of Director					**$487,910.00**												

Grants & Funding Division	#	Effective Annual FTE	Salary level	Salary (Allocated by CCPI)	Totals	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Grants/Funding Manager	**1**	1	90,000.00	90,000.00		1	1	1	1	1	1	1	1	1	1	1	1
Assistant	1	0.5	28,500.00	14,250.00		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Contract Attorney	1	0.375	80,000.00	30,000.00		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5			
Environmental Compliance Attorney	1	0.375	80,000.00	30,000.00		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5			
Environmental Analyst	2	1.5	52,000.00	78,000.00		2	2	2	2	2	2	2	2	2			
Paralegal	2	0.75	40,000.00	30,000.00		1	1	1	1	1	1	1	1	1			
Technical expert	4	2.25	77,000.00	173,250.00		3	3	3	3	3	3	3	3	3			
Scientist	5	1.5	70,000.00	105,000.00		2	2	2	2	2	2	2	2	2			
Researcher	5	1.875	50,000.00	93,750.00		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5			
Financial Analyst	5	1.5	65,000.00	97,500.00		2	2	2	2	2	2	2	2	2			
Total FTEs and Salary		**11.625**		**$741,750.00**		**15**	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**1.5**	**1.5**	**1.5**
Total Salary with Fringe					**$927,187.50**	**24.5**	**24.5**	**24.5**	**24.5**	**24.5**	**24.5**	**24.5**	**24.5**	**24.5**	**1.5**	**1.5**	**1.5**
Total Other Than Personnel Services					**$46,541.25**												
Grand Total for Grants/Funding					**$973,728.75**												

Liaison Division	#	Effective Annual FTE	Salary level	Salary (Allocated by CCPI)	Totals	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Liaison Manager	**1**	1	90,000.00	90,000.00		1	1	1	1	1	1	1	1	1	1	1	1
Assistant	2	0.5	28,500.00	14,250.00		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Industry Liaison	1	2	67,000.00	134,000.00		2	2	2	2	2	2	2	2	2	2	2	2
Total FTEs and Salary	**4**	**3.5**		**238,250.00**		**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**	**3.5**
Total Salary with Fringe					**$297,812.50**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**
Total Other Than Personnel Services					**$49,865.63**												
Grand Total for Liaison					**$347,678.13**												

Energy Policy Act of 2005 (H.R. 1640): Clean Coal Power Initiative Implementation Plan

Construction & Operations Division	#	Effective Annual FTE	Salary level	Salary (Allocated by CCPI)	Totals	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Construction/Operations Manager	**1**	1	90,000.00	90,000.00		1	1	1	1	1	1	1	1	1	1	1	1
Assistant	1	0.5	28,500.00	14,250.00		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
PM IGCC	2	0.5	65,000.00	32,500.00											2	2	2
PM Fuel Cell	1	0.25	65,000.00	16,250.00											1	1	1
On-site inspector	6	0.75	35,000.00	26,250.00											3	3	3
Technical expert	2	0.5	77,000.00	38,500.00											2	2	2
Financial Analyst	1	0.25	65,000.00	16,250.00											1	1	1
Total FTEs and Salary		**3.75**		**$234,000.00**		**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**10.5**	**10.5**	**10.5**
Total Salary with Fringe					**$292,500.00**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**17.5**	**17.5**	**17.5**
Total Other Than Personnel Services					**$72,028.13**												
Grand Total for Construction/Operations					**$364,528.13**												

Compliance & Monitoring Division	#	Effective Annual FTE	Salary level	Salary (Allocated by CCPI)	Totals	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Compliance/Monitoring Manager	**1**	1	90,000.00	90,000.00		1	1	1	1	1	1	1	1	1	1	1	1
Assistant	1	0.5	28,500.00	14,250.00		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Environmental Analyst	2	0.5	52,000.00	26,000.00											2	2	2
Technical expert	2	0.5	77,000.00	38,500.00											2	2	2
Scientist	3	0.25	70,000.00	17,500.00											1	1	1
Financial Analyst	1	0.25	65,000.00	16,250.00											1	1	1
Environmental Compliance Attorney	1	0.25	80,000.00	20,000.00											1	1	1
Paralegal	1	0.25	40,000.00	10,000.00											1	1	1
Total FTEs and Salary		**3.5**		**$232,500.00**		**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**9.5**	**9.5**	**9.5**
Total Salary with Fringe					**$290,625.00**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**	**15.5**	**15.5**	**15.5**
Total Other Than Personnel Services					**$73,136.25**												
Grand Total for Compliance/ Monitoring					**$363,761.25**												
Total FTEs and Salary for CCPI		**27.375**		**$1,773,000.00**		**26.5**	**26.5**	**26.5**	**26.5**	**26.5**	**26.5**	**26.5**	**26.5**	**26.5**	**30**	**30**	**30**
Total Fringe for CCPI				**$443,250.00**													
Total Personnel Expenses for CCPI					**$2,216,250.00**												
Total OTPS for CCPI					**$321,356.25**												
Grants					**$112,000,000.00**												

Grand Total Budget for CCPI	**$114,537,606.25**

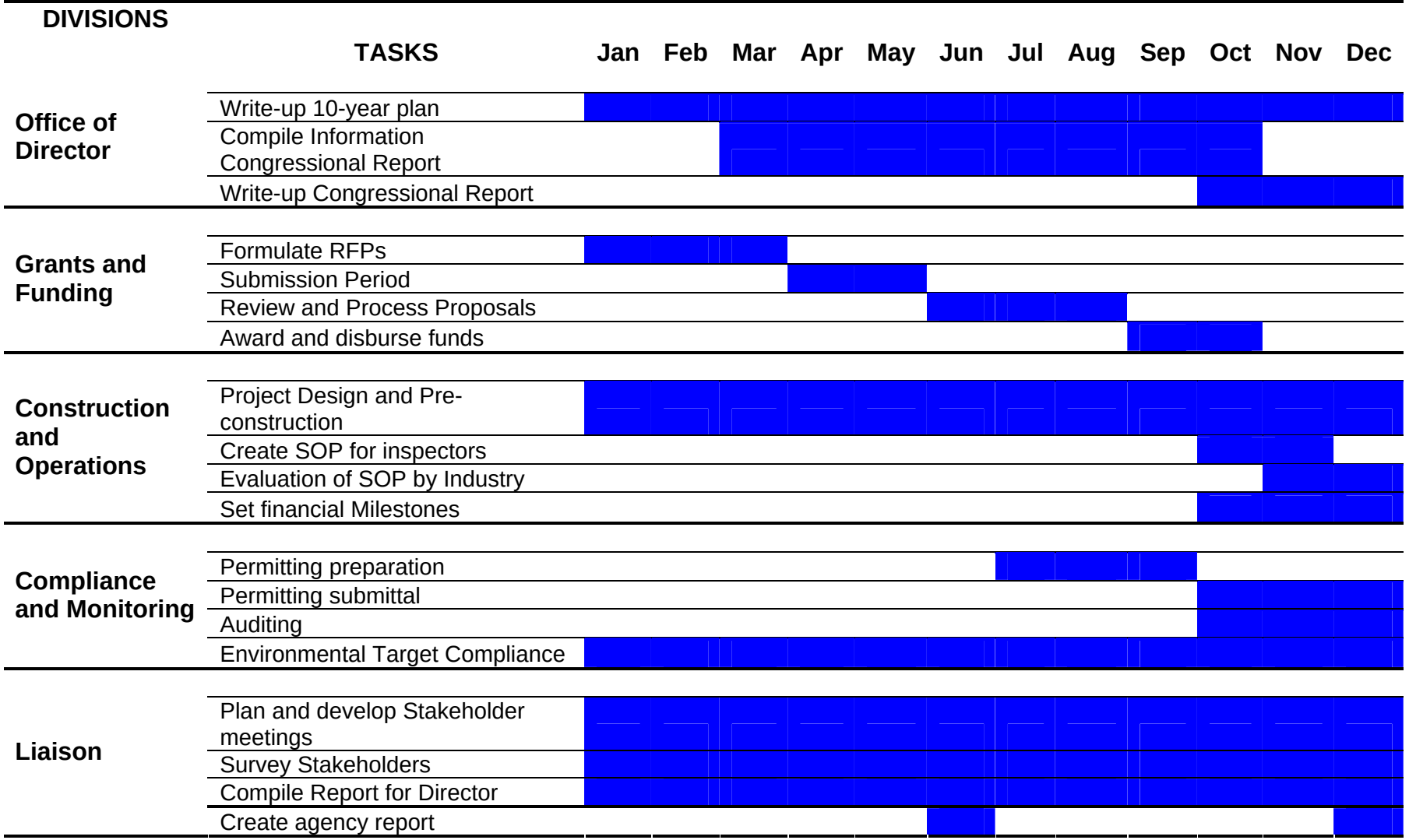
First Year Budget Personnel Costs by Position and Task

Position	#	Annual FTEs	%CCPI time	Salary	Salary Allocated by CCPI	RFP's	Funding Allocation	Reports for Congress	Program Direction and Administration	Liaison	Compliance and Monitoring	Construction and Operations	Total
Assistant	2	2.000	100%	28,500.00	57,000.00		14,250.00			14,250.00	14,250.00	14,250.00	57,000.00
Budget Analyst	1	1.000	100%	54,000.00	54,000.00		10,800.00	21,600.00	21,600.00				54,000.00
Construction Manager	1	1.000	100%	90,000.00	90,000.00							90,000.00	90,000.00
Contract Attorney	1	0.375	38%	80,000.00	30,000.00		30,000.00						30,000.00
Director	1	1.000	100%	110,000.00	110,000.00			22,000.00	88,000.00				110,000.00
Environmental Analyst	2	2.000	100%	52,000.00	104,000.00	36,400.00	36,400.00				31,200.00		104,000.00
Environmental Compliance Attorney	1	0.625	63%	80,000.00	50,000.00	17,500.00	17,500.00				15,000.00		50,000.00
Executive Assistant	1	1.000	100%	32,500.00	32,500.00			6,500.00	26,000.00				32,500.00
Executive Researcher	1	1.000	100%	65,000.00	65,000.00			13,000.00	52,000.00				65,000.00
Financial Analyst	6	2.000	33%	65,000.00	130,000.00	45,500.00	45,500.00					39,000.00	130,000.00
Grants/Funding Manager	1	1.000	100%	90,000.00	90,000.00	45,000.00	45,000.00						90,000.00
Industry Liaison	2	2.000	100%	67,000.00	134,000.00					134,000.00			134,000.00
Liaison Manager	1	1.000	100%	90,000.00	90,000.00					90,000.00			90,000.00
Monitoring Manager	1	1.000	100%	90,000.00	90,000.00						90,000.00		90,000.00
On-site inspector	6	0.750	13%	35,000.00	26,250.00							26,250.00	26,250.00
Paralegal	2	1.000	50%	40,000.00	40,000.00	14,000.00	14,000.00				12,000.00		40,000.00
PM IGCC	1	0.250	25%	65,000.00	16,250.00							16,250.00	16,250.00
PM Fuel Cell	1	0.250	25%	65,000.00	16,250.00							16,250.00	16,250.00
PM R&D	1	0.250	25%	65,000.00	16,250.00							16,250.00	16,250.00
Policy Analyst	1	1.000	100%	65,000.00	65,000.00			13,000.00	52,000.00				65,000.00
Researcher	5	1.875	38%	50,000.00	93,750.00	46,875.00	46,875.00						93,750.00
Scientist	5	1.750	35%	70,000.00	122,500.00	42,875.00	42,875.00				36,750.00		122,500.00
Technical expert	4	3.250	81%	77,000.00	250,250.00	87,587.50	87,587.50				37,537.50	37,537.50	250,250.00
Total		**27.375**			**1,773,000.00**	**335,737.50**	**390,787.50**	**76,100.00**	**239,600.00**	**238,250.00**	**236,737.50**	**255,787.50**	**1,773,000.00**
Fringe Benefits (25%)					**443,250.00**	**83,934.38**	**97,696.88**	**19,025.00**	**59,900.00**	**59,562.50**	**59,184.38**	**63,946.88**	**443,250.00**
Total Personnel Services					**2,216,250.00**	**419,671.88**	**488,484.38**	**95,125.00**	**299,500.00**	**297,812.50**	**295,921.88**	**319,734.38**	**2,216,250.00**
% Salary by Task						**18.94%**	**22.04%**	**4.29%**	**13.51%**	**13.44%**	**13.35%**	**14.43%**	**100.00%**
FTEs by Task						**5.16**	**6.23**	**1.20**	**3.60**	**3.50**	**3.60**	**4.09**	**27.38**

First Year Budget Other Than Personnel Services (OTPS) and Total by Task

OTPS Category	Total	RFP's	Funding Allocation	Reports for Congress	Program Direction and Administration	Liaison	Compliance and Monitoring	Construction and Operations	Total
Supplies	22,162.50	3,324.38	6,648.75	2,216.25	1,108.13	3,324.38	3,324.38	2,216.25	22,162.50
Travel	166,218.75	8,310.94	8,310.94	8,310.94	8,310.94	33,243.75	49,865.63	49,865.63	166,218.75
Office Expenses	132,975.00	26,595.00	26,595.00	13,297.50	13,297.50	13,297.50	19,946.25	19,946.25	132,975.00
Total OTPS	321,356.25	38,230.31	41,554.69	23,824.69	22,716.56	49,865.63	73,136.25	72,028.13	321,356.25
Total CCPI Cost		**457,902.19**	**530,039.06**	**118,949.69**	**322,216.56**	**347,678.13**	**369,058.13**	**391,762.50**	**2,537,606.25**

Appendix E: First Year Master Calendar



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