COMMONWEALTH OF KENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION

In The Matter Of:

APPLICATION OF KENTUCKY POWER COMPANY FOR APPROVAL OF ITS 2011 ENVIRONMENTAL COMPLIANCE PLAN, FOR APPROVAL OF ITS AMENDED ENVIRONMENTAL COST RECOVERY SURCHARGE TARIFF, AND FOR THE GRANTING OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR THE CONSTRUCTION AND ACQUISITION OF RELATED FACILITIES

CASE NO. 2011-00401

RECEIVED
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PUBLIC SERVICE COMMISSION

TOM VIERHELLER, BEVERLY MAY, AND THE SIERRA CLUB'S OBJECTIONS AND RESPONSES TO KENTUCKY POWER COMPANY'S FIRST DATA REQUESTS

Intervenors Tom Vierheller, Beverly May, and Sierra Club (collectively "Environmental Intervenors") hereby submit their responses and objections to Kentucky Power Company's ("KPC") first Requests for Information.

GENERAL OBJECTIONS

A. Environmental Intervenors object to Requests that are not relevant to the above-referenced proceedings, Kentucky Rule of Evidence 401.

B. Environmental Intervenors object to Requests that are not "reasonably calculated to lead to the discovery of admissible evidence," Kentucky Civil Rule 26.02(1).

C. Environmental Intervenors object to Requests that are protected because it is a trade secret and/or confidential and proprietary commercial and financial information.

D. Environmental Intervenors object to Requests that are protected by the First Amendment.

E. Environmental Intervenors object to Requests that are overly broad, unduly burdensome, oppressive, and calculated to take Sierra Club and its staff away from normal work activities, and require them to expend significant resources to provide complete and accurate answers to KPC's Request, which are only of marginal value to KPC, Kentucky Civil Rule 26.02.

F. Environmental Intervenors reserve all of its evidentiary objections or other objections to the introduction or use of any response at any hearing in this action.

G. Environmental Intervenors do not, by any response to any Request, waive any objections to that Request.

H. Environmental Intervenors do no admit to the validity of any legal or factual contention asserted or assumed in the text of any Request.

I. Environmental Intervenors reserve the right to assert additional objections as appropriate, and to amend or supplement these objections and responses as appropriate.

J. The foregoing general objections shall apply to each of the following Requests whether or not restated in the response to any particular response.

Specific Objections and Responses

REQUEST NO. 1. Please identify all terms, conditions, requirements, agreements, or understandings between Sierra Club and Chesapeake regarding the approximately $26 million in contributions made by Chesapeake to the Sierra Club beginning in 2007 and identified by Mr. Michael Brune, Executive Director of the Sierra Club, in the February 2, 2012 blog post that may be found at the following URL: http://sierraclub.typepad.com/michaelbrune/2012/02/the-sierra-club-and-natural-gas.html ("Blog Post.")

a. Please produce any documents in the possession or control of the Sierra Club relating to the contributions referenced by Mr. Brune in the Blog Post;

b. To the extent not otherwise required to be produced in response to data request 1(a), please produce any documents in the possession or control of the Sierra Club relating to or evidencing the terms, conditions, requirements, agreements, or understandings between Sierra Club and Chesapeake regarding the contributions referenced by Mr. Brune in the Blog Post.

RESPONSE NO. 1:

Sierra Club objects to this request as it seeks information that is not relevant to and outside the scope this proceeding and is not "reasonably calculated to lead to the discovery of admissible evidence," Kentucky Civil Rule 26.02(1). Sierra Club further objects to this request as it calls for disclosure of its trade secrets or confidential and proprietary commercial and financial information. Sierra Club also objects to this request as it impinges on Sierra Club's and

possibly others' First Amendment rights and privileges. Finally, Sierra Club objects to this request as it is overly broad, unduly burdensome, oppressive, and calculated to take Sierra Club and its staff away from normal work activities, and require them to expend significant time and resources to determine how to respond to a request that impinges on its Constitutional rights and to provide complete and accurate answers to KPC's request for information, which are only of marginal value to KPC, Kentucky Civil Rule 26.02. Sierra Club intends to file a Motion for a Protective Order after fulfilling its meet and confer obligations, if necessary.

Respondent: Kristin Henry, Sierra Club Counsel

REQUEST NO. 2. Please identify any communications between Sierra Club and Chesapeake regarding the subject matter of this proceeding, including, but not limited to, the application, testimony, data requests, data request responses, or other filings made by any party in this proceeding.

a. Please produce any documents in the possession or control of the Sierra Club relating to or evidencing the communications required to be identified in this data request.

RESPONSE NO. 2:

Sierra Club objects to this request as it seeks information that is not relevant to and outside the scope of this proceeding and is not "reasonably calculated to lead to the discovery of admissible evidence," Kentucky Civil Rule 26.02(1). Sierra Club objects to this request as it calls for disclosure of its trade secrets and/or confidential and proprietary commercial and financial information. Sierra Club also objects to this request as it impinges on Sierra Club's and possibly others' First Amendment rights and privileges. Subject to and without waiving the foregoing objections, Sierra Club states that it has had no communication with Chesapeake regarding this proceeding.

Respondent: Kristin Henry, Sierra Club Counsel and Bruce Nilles, Sierra Club Deputy Conservation Director

REQUEST NO. 3. Please identify any contributions to Sierra Club totaling $100,000 or more in the aggregate from any natural gas exploration, production, transport, pipeline, sales, or distribution utility, any trade association related to such entities, or any executive officers or directors of such entities or trade associations during the period January 1, 2007 to the date the response to this data request is filed. For each such contribution please provide the following information:

a. The identity of the person(s) or entit(ies) making the contribution;

b. The amount of the contribution;

c. Any terms, conditions, requirements, agreements, or understandings between the Sierra Club and the donor of the gift(s) that are the subject of this data request.

RESPONSE NO. 3:

Sierra Club objects to this request as it seeks information that is not relevant to and outside the scope of this proceeding and is not "reasonably calculated to lead to the discovery of admissible evidence," Kentucky Civil Rule 26.02(1). Sierra Club further objects to this request as it calls for disclosure of its trade secrets and/or confidential and proprietary commercial and financial information. Sierra Club also objects to this request as it impinges on Sierra Club's and possibly our others' First Amendment rights and privileges. Finally, Environmental Intervenors object to this request as it is overly broad, unduly burdensome, oppressive, and calculated to take Sierra Club and its staff away from normal work activities, and require them to expend significant resources to determine how to respond to a request that impinges on its Constitutional rights and to provide complete and accurate answers to KPC's request for information, which are only of marginal value to KPC, Kentucky Civil Rule 26.02. Sierra Club intends to file a Motion

for a Protective Order after fulfilling its meet and confer obligations, if necessary.

Respondent: Kristin Henry, Sierra Club Counsel

REQUEST NO. 4. Please refer to the Sierra Club's Beyond Coal initiative or program that is referenced at the following URL: http://www.beyondcoal.org/ Please provide all documents discussing, describing, or evidencing the goals and objectives of Sierra Club's Beyond Coal initiative or program.

RESPONSE NO. 4:

Environmental Intervenors object to this request as it is overly broad, unduly burdensome, oppressive, and calculated to take Sierra Club and its staff away from normal work activities, and require them to expend significant resources to provide complete and accurate answers to KPC's request for information, which are only of marginal value to KPC, Kentucky Civil Rule 26.02. Subject to and without waiving these objections, Sierra Club is providing documents responsive to this request, see attached.

Respondent: Kristin Henry, Sierra Club Counsel and Bruce Nilles, Sierra Club Deputy Conservation Director

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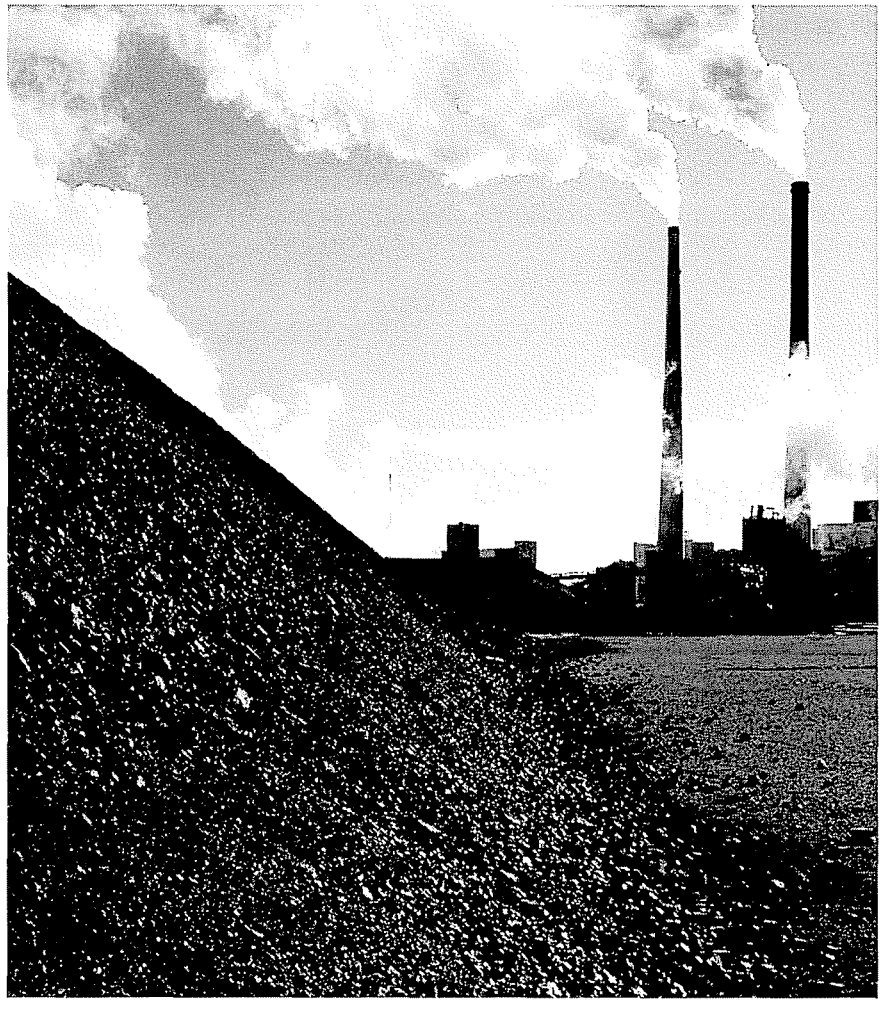
THE DIRTY TRUTH ABOUT COAL:

Why Yesterday's Technology Should Not Be Part of Tomorrow's Energy Future

INTRODUCTION

It was more than 100 years ago on the shores of the lower East River in New York City that Thomas Edison opened the Pearl Street Station, the first centralized coal-fired power plant to come on line. More than a century later, coal-fired power plants produce about half of our nation's electricity,[1] and in 2006 a record 1.161 billion tons of coal was mined, most of which went directly to electricity generation.[2] Unfortunately, coal is also one of the most polluting sources of energy available, jeopardizing our health and our environment.



Pollution created by generating electricity from coal does not start or stop at the power plant. It stretches all the way from the coal mine to long after coal is burned and the electricity has been used in our homes and businesses. Mining and burning coal scars lungs, tears up the land, pollutes water, devastates communities, and makes global warming worse.

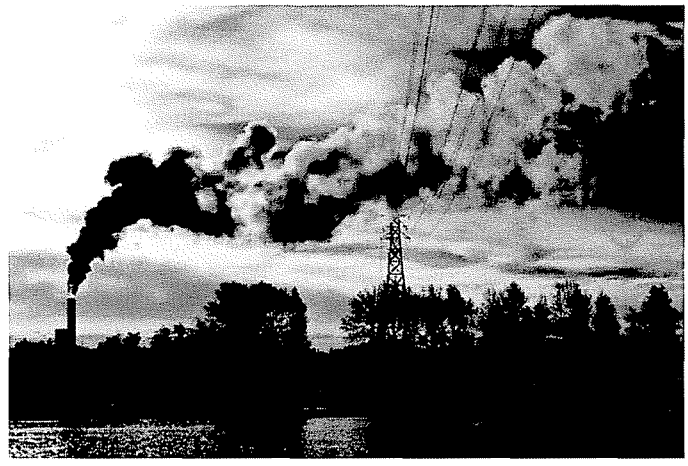
MINING HAZARDS

Coal mining causes irreparable harm to our lands, water, and air, and also jeopardizes the health, safety, and economy of nearby communities. In the most destructive type of coal mining, known as mountaintop removal coal mining, a coal company literally blasts apart the tops of mountains to reach thin seams of coal buried below and then, to minimize waste disposal costs, dumps millions of tons of waste rock into the valleys and streams below, causing permanent damage to the ecosystem and landscape. This destructive practice has damaged or destroyed approximately 1,200 miles of streams, disrupted drinking water supplies, flooded communities, damaged homes, eliminated forests, and jeopardizes tourism and recreation.[3]

Coal mining is a major source of water pollution, causing acid mine drainage which occurs when abandoned mines fill with water that mixes with heavy metals and then leaks out into groundwater and streams.[4] Coal preparation, or "washing," also causes water pollution when chemicals and water are used to separate impurities from mined coal. Up to 90 million gallons of coal preparation slurry are produced every year in the U.S., most of which are stored in large waste pits known as impoundments.[5] Impoundments leak into local water supplies and can even burst dramatically, sending millions of gallons of wastes barreling down in mudflows and destroying property and lives.

Additionally, coal mining causes air pollution, including dust and particle pollution that can cause respiratory problems like black lung in coal miners. Coal-laden railcars blow coal dust into the air, causing breathing problems and dirtying the landscape of local communities. Coal mining also causes global warming pollution when it releases heat-trapping methane found in coal seams.[6]

BURNING COAL: OUR NATION'S POWER PLANTS



Coal-fired power plants are one of the largest sources of air pollution in the U.S. The consequences for human health are staggering, especially with regards to particle pollution or soot, one of the most deadly types of air pollution in our country. Soot can trigger heart attacks and strokes, worsen asthma, cause irregular heartbeat, and lead to premature death.[7] Many scientific studies have also shown that communities of color are disproportionately exposed to harmful air pollution, including pollution from coal-fired power plants. The damages from particle pollution continue after it has settled to the ground, where it causes acidification of waters, soil nutrient depletion, and destruction of forests and crops.[8]

Not only are coal-fired power plants a major source of soot pollution, they are also one of the largest contributors to smog in the nation.[9] In addition to health effects like increased risk of asthma attacks, permanent lung damage, and premature death,[10] smog also harms plants and trees. Persistent smog pollution can alter and disrupt plant growth over time, leading to an estimated $500 million loss due to reduced crop production in the U.S. every year.[11]

Additionally, coal-fired power plants emit large quantities of toxic air pollutants such as lead and arsenic, and are one of the largest sources of man-made mercury pollution in the U.S.[12] Mercury, which enters our food chain after it rains down into our streams and lakes, poisons fish and seafood and accumulates in the animals and people who eat them. Mercury pollution causes brain damage, mental retardation, and other developmental problems in unborn children and infants,[13] and has been linked to a greater risk of coronary heart disease in men.[14] The mercury problem in the U.S. is so widespread that every year one in six women of childbearing age has mercury levels in her blood high enough to put her baby at risk.[15]

Burning coal also releases carbon dioxide (CO2) pollution, a primary culprit in global warming. Even though coal-fired power plants generate just about half of our nation's electricity, they account for almost 40 percent of our nation's carbon dioxide pollution from all sources including transportation.[16] In fact, coal-fired power plants have the highest output rate of carbon dioxide (or carbon intensity) per unit of electricity among all fossil fuels.[17]

WHAT REMAINS: THE LEGACY OF COAL COMBUSTION WASTES

Burning coal for electricity also creates several different types of liquid and solid wastes that are known collectively as coal combustion wastes. Taken together, the amount of coal combustion wastes produced is staggering: more than 120 million solid tons every year.[18] This waste alone is enough to fill a million railcars every year, or a train that is 9,600 miles long.[19]

Not only is it challenging to find a place to store so much coal combustion waste safely, but even after it is stored coal combustion waste can leak out and pollute the surrounding environment and groundwater. Containing elements like lead, mercury, and arsenic in toxic doses,[20] coal combustion wastes and their pollution have been shown to cause illness and death in plants and animals. In humans, where the greatest exposure risk is from polluted groundwater and drinking water,[21] the toxins have been linked to organ disease, increased cancer, respiratory illness, neurological damage, and developmental problems.[22] In one study, the EPA estimated that more than 21 million people, including more than six million children, lived within five miles of a coal-fired power plant,[23] a daunting figure considering that most coal combustion wastes are stored onsite.

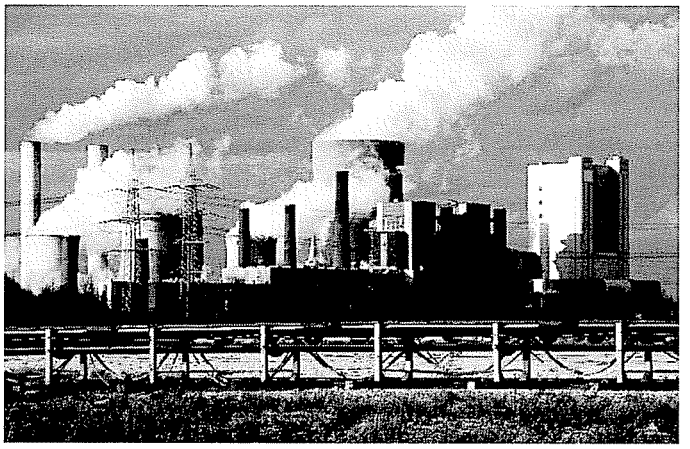
CONCLUSION: "CLEAN COAL", OR AMERICA'S LEAD ENERGY MISNOMER

The coal industry knows it must change or it will be out of business—that is why it is pushing "clean" coal. But, coal as it exists today is anything but clean.

The supposedly "clean coal" technologies that have attracted the most attention in recent years are carbon capture and sequestration (CCS) and Integrated Gasification Combined Cycle (IGCC). As of now, CCS remains an unproven technology, and experts disagree as to how long it will take for this technology to be available for commercial and wide-scale use.[24] IGCC unfortunately emits just as much global warming pollution as other coal plants.

The coal industry is also pushing liquid coal as a clean alternative, yet liquid coal creates almost double the carbon dioxide emissions per gallon as regular gasoline, and replacing just 10 percent of our nation's fuel with it would require a more than 40 percent increase in coal mining.[25, 26]

The truth is that promises of these and other future technological innovations that will allow us to use coal cleanly are not available today.



The challenge of cleaning up the way we mine and use coal is not small by any means. On average, our country consumes more than three million tons of coal every day, or about 20 pounds of coal for every person in the nation every day of the year.[27] The good news is that we can reduce our dependence on coal by increasing efficiency and relying more on clean energy power like wind and solar, and we can minimize the damage coal causes by ensuring it is mined responsibly, burned cleanly, and does not take us backward on global warming.

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1 Energy Information Administration, "Electric Power Annual: Summary Statistics for the United States," October 2006.

2 Energy Information Administration, "Quarterly Coal Report: October - December 2006," March 22, 2007.

3 U.S. Environmental Protection Agency, "Draft Programmatic Environmental Impact Statement," 2003 and "Final Programmatic Environmental Impact Statement," October 2005.

4 U.S. EPA, "Mid-Atlantic Integrated Assessment: Acid Mine Drainage," updated March 3, 2006.

5 Id.

6 U.S. EPA, "Coalbed Methane Outreach Program," accessed April 4, 2007 at http://www.epa.gov/cmop/

7 Id.

8 Id.

9 U.S. EPA, "NOx: How Nitrogen Oxides Affect the Way We Live and Breathe," September 1998.

10 American Lung Association, "State of the Air: 2006."

11 Id.

12 U.S. Environmental Protection Agency, "EPA to Regulate Mercury and Other Air Toxics Emissions from Coal- and Oil-Fired Power Plants." December 14, 2000.

13 Agency for Toxic Substances and Disease Registry, "ToxFAQs for Mercury." April 1999.

14 American Heart Association, "Mercury, Fish Oils, and Risk of Acute Coronary Events and Cardiovascular Disease, Coronary Heart Disease, and All-Cause Mortality in Men in Eastern Finland." November 11, 2004.

15 U.S. Environmental Protection Agency, "Methylmercury: Epidemiology Update," presentation by Kathryn Mahaffey, PhD at the National Forum on Contaminants in Fish, San Diego, CA, January 25-28, 2004.

16 U.S. Environmental Protection Agency, "Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005," April 2007. Based on calculation of CO2 emissions from tables 3-1 and 3-3.

17 U.S. Department of Energy and U.S. Environmental Protection Agency, "Carbon Dioxide Emissions from the Generation of Electric Power in the United States." July 2000.

18 National Research Council, "Managing Coal Combustion Residues in Mines," 2006.

19 Id.

20 Id.

21 Id.

22 Id.

23 Id.

24 See for example, MIT, "The Future of Coal," March 2007.

25 Williams, Robert et al., "Synthetic fuels in a world with high oil and carbon prices," 8th International Conference on Greenhouse Gas Control Technologies, June 2006.

26 The National Coal Council, "Coal: America's Energy Future," March 2006.

27 Calculation based on U.S. coal consumption (see EIA "Quarterly Coal Report: October – December 2006") and U.S. population. Inspired by similar calculation performed by the Union of Concerned Scientists.

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For more information: 408 C STREET, NE, WASHINGTON, DC 20002 (202) 547-1141
www.sierraclub.org/coal

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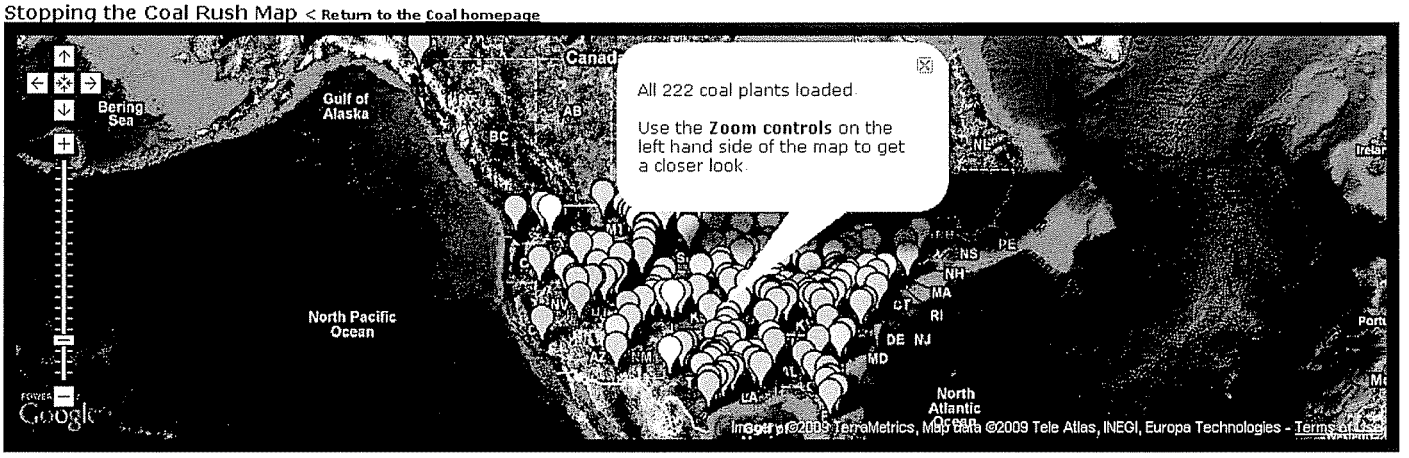
THE SIERRA CLUB BEYOND COAL CAMPAIGN

From the mine to the plant, coal is our dirtiest energy source. Coal is the source of more than 30% of our global warming pollution; it causes asthma and other health problems, and mining it destroys our mountains and releases toxic mercury into our communities.

THE SIERRA CLUB BEYOND COAL CAMPAIGN IS WORKING HARD TO:

1. Stop the construction of dirty, new coal plants by educating investors and decision makers about the economic and environmental risks of investing in new coal.
2. Retire old plants that are the worst contributors to health-harming soot and smog pollution and replace them with clean energy solutions.
3. Work with communities to protect our mountains, lands and waters by keeping our vast coal reserves in the ground.



OUR COAL PLANT TRACKER keeps you up to date on the coal rush.

Continuing our dependence on coal chains us to dirty energy and prevents us from making the changes we need to bring about a clean, secure energy future. The Sierra Club Beyond Coal Campaign is committed to working for clean energy.

Our campaign is far-reaching and effective: This summer marked the milestone of 100 coal plants abandoned or defeated since the start of the coal rush in 2001 – all thanks to our amazing network of staffers, organizers and volunteers.

THE CURRENT PUSH: OUR "BIG PICTURE" CAMPAIGN

President Obama sees the Big Picture – that we can create economic prosperity, reduce our dependence on oil and coal, and tackle global warming at the same time. Achieving his vision requires a strong grassroots base willing to take on the millions of dollars Big Oil and Coal spend lobbying Washington. That's why we created the Big Picture Campaign. www.sierraclub.org/bigpicture

www.sierraclub.org/coal

OUR WEBSITE INCLUDES THESE RESOURCES:

COAL PLANT TRACKER — A map and database with information and the latest status on proposed coal plants across the country.

MOUNTAINTOP REMOVAL PERMIT TRACKER — A list of the pending permits in Appalachia and possible impacts on the environment and nearby communities.

COAL ASH SITES MAP — A map showing every coal ash storage facility in the country.

FACT SHEETS — Learn about every facet of the coal industry, from liquid coal to mountaintop removal coal mining.

GRASSROOTS COAL BLOGGING — Insight and news from Beyond Coal Campaign Director Bruce Nilles and others.

In 2002, we got word that then-Vice President Dick Cheney was holding secret backroom meetings with the coal industry to plan a new "Coal Rush" — a massive effort to build over 150 new coal-fired power plants across the country.

Mary Ann Hitt,
Director, Sierra Club's Beyond Coal campaign

Coal plants last only about 50 years, and since it was clear that the country's aging fleet of dirty power plants would soon be retired, industry lobbyists wanted to lock-in our nation's reliance on coal before solar, wind, and clean power would have a chance to step in.

This made no sense to us — coal is an outdated, backward, 19th-century technology. It's the single biggest source of global-warming and mercury pollution, and it causes hundreds of thousands of asthma attacks every year. In my home region of Appalachia, mountaintop-removal coal-mining operations have blown up 500 mountains, buried 2,000 miles of streams, and turned small towns into ghost towns. Why would we want to lock ourselves in to a future of dirty energy — especially just as new technologies and innovation are making solar and wind cheaper?

People said we were crazy to take on one of the most powerful special interests in the country. But we decided to launch a campaign that would move the conversation out of backrooms in Washington and challenge every one of these new coal plants, doing what the Sierra Club does best — grassroots community organizing, powerful communications, and litigation.

Our small, start-up campaign quickly grew into a force to be reckoned with. And I'm proud to say that, so far, together we have stopped over 150 proposed coal-fired power plants.

People said it couldn't be done, but we are doing it. We have brought the coal rush to a halt.

Now we're turning our efforts to making sure that the existing fleet of outdated coal plants gets cleaned up or phased out — and is replaced by solar and wind energy that's ready to fill our energy needs, create new jobs, and jump-start the green economy.

As a new mom, I know that this fight is the single biggest thing I can do to protect my daughter's future. But we can't do it alone. The chance to move our nation beyond coal and toward clean energy is in our hands. Join us.

Coal ash
Factsheets and resources

For a full

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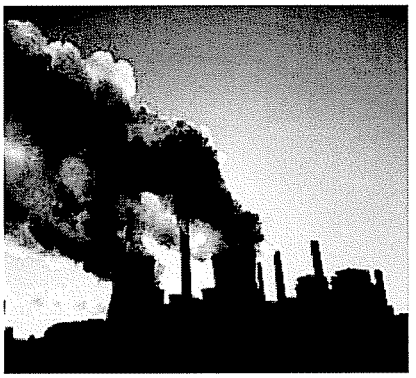
CARBON POLLUTION: An Urgent Threat from Coal



Carbon pollution is the main contributor to climate disruption and is linked to life-threatening air pollution like the smog that causes asthma attacks, making it a serious threat to Americans' health and future.

During the summer of 2011, Texas' historic extreme heat and dry climate contributed to an unprecedented fire season that destroyed 2,909 homes and killed 10 people.(1) Dangerous wildfires in the west, record-breaking heat in the Southwest and Midwest, and melting glaciers in Alaska all point towards a disturbing trend. Scientists have settled the argument; climate disruption is happening and carbon pollution is a major contributor.

Yet even though doctors and scientists confirm that carbon pollution poses serious threats to Americans' health, our economy, and our children's future, there are currently no federal limits on the amount of carbon being spewed into the air by the nation's largest sources of carbon pollution – dirty coal-fired power plants.

President Obama and EPA Taking Action

The Supreme Court ruled that the Environmental Protection Agency (EPA) must take action to address carbon pollution. In March 2012, EPA is expected to establish new safeguards under the Clean Air Act to protect Americans from dangerous carbon pollution produced by new coal plants.

The air quality protections that EPA is poised to unveil will allow EPA to focus on industries that create the lion's share of the nation's carbon pollution. The protections will also help reduce life-threatening air pollutants like dangerous soot and toxic mercury, which are released with carbon when power plants burn coal.

Take Action! Thank President Obama and tell him to keep up the good work!
(https://secure.sierraclub.org/site/Advocacy?cmd=display&page=UserAction&id=8105)

Carbon Pollution Safeguards Protect Public Health and Spur Innovation

By setting up carbon pollution protections, EPA is moving to clean up and modernize the way we power our country. These protections will ensure our kids, our families and America's workforce is healthier, while creating much-needed jobs and fighting climate disruption. By transitioning from dangerous, outdated coal to 21st-century clean energy technologies, America will become a leader in innovation, increasing global competitiveness and producing long-term, American-made jobs.

21st-Century Jobs

Generating electricity with solar creates seven times more jobs than doing so with coal.(2) We cannot accept more dangerous coal while our friends and family miss days of school and work, sometimes ending up in the emergency room instead.

According to the Solar Energy Industries Association, there are 285 solar companies creating jobs in Colorado.(3) In Indiana, a planned solar panel factory will create 850 new jobs by next year.(4) In Pennsylvania, there is enough solar energy to power 10,800 homes, and in New York, there is enough solar energy to power 10,900 homes.(5)

Check out the power of solar (http://www.solarworksforamerica.com/States/) in your state!

1. Campbell, Steve. "Historic fire season ends this week in Texas, but officials brace for worse." Star-Telegram 12 Nov 2011.
2. Kammen, David M et al, 2004, Report of the Renewable and Appropriate Energy Lab, Putting Renewables to Work: How Many Jobs Can the Clean Energy Industry Create?, Energy Resources Group, Goldman School of Public Policy, University of California, Berkeley. Wei, Max et al, 2010, Putting Renewables to Work: How Many Jobs Can the Clean Energy Industry Create?, Energy Resources Group, Goldman School of Public Policy and the Haas School of Business, University of California, Berkeley, in Energy Policy, vol 38, issue 2, February 2010.
3. Solar Energy Industries Association. "Solar Across America." Web. 5 March 2012.
4. Solar Energy Industries Association. "Solar Across America." Web. 5 March 2012.
5. Solar Energy Industries Association. "Solar Across America." Web. 5 March 2012..

Clean energy careers are jobs that create, run and support a clean energy economy and which pay fair wages and provide benefits that can support a family.

Our Program

Whether it's producing the steel blades for wind turbines, manufacturing clean energy products, installing solar panels, conducting energy audits or engaging in sustainable construction, clean energy careers protect our health, fight climate disruption and move the United States towards energy independence.

The Sierra Club's **Clean Energy Careers Campaign** is focused on:

1. Working with Congress and the President to advance policies that will create jobs by facilitating the creation of a clean energy economy.
2. Work with labor unions to ensure the fair and respectable treatment of workers.
3. Protecting public health and our climate through the creation of a clean energy economy that is good for our families and the environment.

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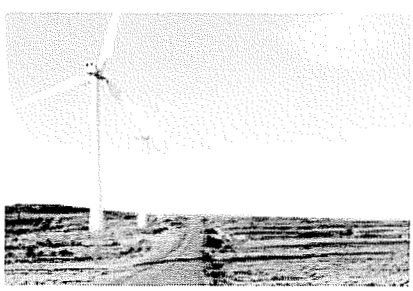
RENEWABLE ENERGY
(HTTP://WWW.BEYONDCOAL.ORG/SOLUTIONS/RENEWABLE-ENERGY)



Clean energy is the smart phone of electricity -- it is sleeker and cheaper every day and making lives better. Iowa already gets 20% of its energy from wind, and Texas has enough wind turbines to power 2 million homes. The solar industry is one of the fastest growing industries in America. People aren't waiting for Washington; Homeowners, renters, and businesses are turning to an infinite and free source of power to save money.

MORE ON CLEAN ENERGY
(/SOLUTIONS/RENEWABLE-ENERGY)

CLEAN ENERGY CAREERS
(HTTP://WWW.BEYONDCOAL.ORG/SOLUTIONS/CAREERS)

The wind and solar industries each already employ more people in the U.S. than the coal-mining industry, with thousands of clean energy companies putting people to work in every state in the Union. . And with more than one out of every four people working in clean energy working in manufacturing and exports, clean energy is one of the best ways to continue seeing "Made in the U.S.A" stamped on products.

MORE ON CLEAN ENERGY CAREERS
(/SOLUTIONS/CAREERS)

ENERGY EFFICIENCY
(HTTP://WWW.BEYONDCOAL.ORG/SOLUTIONS/EFFICIENCY)

The cleanest way to meet our electricity needs is by getting the most out of the energy we already use. By planning well and using today's technology, we can cut our electricity consumption, save homeowners and businesses money and create thousands of new jobs. Improving energy efficiency lowers energy bills, eliminates the need for new power plants, increases our energy security, and puts people to

work.

MORE ON EFFICIENCY (/SOLUTIONS/EFFICIENCY)

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What is Coal Ash?

In addition to health hazards caused by mining and burning coal, disposing of coal waste puts communities at risk as well. Every year, the nation's coal plants produce 140 million tons of coal ash, the toxic waste that is left over after the coal is burned. All that ash has to go somewhere—so it's dumped in thousands of open-air pits across the nation. At these waste sites, chemicals like arsenic, lead and selenium [1 (#footnote-1)], can leak into the groundwater.

Coal ash is not subject to federal protections [2 (#footnote-2)], and state laws governing coal combustion waste disposal are usually weak or non-existent. The result: millions of tons of coal ash are being stored in ponds, landfills and abandoned mines. Many of these sites lack adequate safeguards, leaving nearby communities at risk from potential large scale disasters like the 2008 coal ash spills which contaminated Tennessee and Alabama.

The Hazards of Coal Ash

Living near a wet coal ash storage pond is significantly more dangerous than smoking a pack of cigarettes a day, according to a risk assessment done by EPA. [3 (#footnote-3)]

The toxins found in coal ash have been linked to organ disease, cancer, respiratory illness, neurological damage and developmental problems. People living with 1 mile of unlined coal ash ponds can have a 1 in 50 risk of cancer [4 (#footnote-4)] —that's more than 2,000 times higher than what EPA considers acceptable.

Exposure to toxic coal ash can lower birth rates, cause tissue disease, slow development and even kill plants and animals, leading to changes in wildlife concentrations and disruptions in entire ecosystems. The toxic pollution from coal ash builds up in exposed animals and plants, causing the pollution to make its way up the food chain when they are eaten. Children are more susceptible to the health impacts of coal ash—and, according to the EPA, 1.54 million children live near coal ash storage sites.

Every part of coal's life cycle, from mining to burning to disposing of the leftover waste, presents hazards to human health. We need to develop clean energy and reduce our reliance on dirty energy. Join us as we work to move America beyond coal. Take action (/act-now) !

1 http://pubs.usgs.gov/fs/1997/fs163-97/FS-163-97.pdf

2 http://www.epa.gov/osw/nonhaz/industrial/special/fossil/ccr-rule/index.htm

3 http://earthjustice.org/sites/default/files/library/reports/epa-coal-combustion-waste-risk-assessment.pdf

4 *ibid.*

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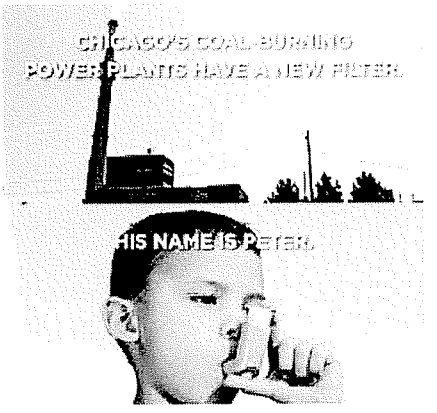
Coal Plant Pollution Triggers Asthma Attacks and Makes Kids Sick



Asthma strikes 1 out of every 10 school children and is the number one illness that causes kids to miss school in the United States. Children are at the greatest health risk from air pollution because they are more likely to be active outdoors and their lungs are still developing.

Soot and Smog Threaten Our Health

In the United States, there is a 50 percent chance that your air is not safe to breathe [1 (#footnote-1)] -- thanks to dangerous levels of air pollution like smog and soot.

Smog is not just an eyesore. It irritates our lungs, triggers asthma attacks, increases emergency room visits, [2 (#footnote-2)] and can lead to irreversible lung damage or even death.

Soot pollution, meanwhile, causes an estimated 9,700 hospitalizations and more than 20,000 heart attacks each year. Dangerous soot pollution is linked to irregular heartbeat, chronic bronchitis, decreased lung function, and irritation of the airways.

Check our air pollution map (http://www.sierraclub.org/airpollutionmap) to see how dirty air threatens health where you live.

Clean Air Means a Healthy Economy

Coal pollution leads to approximately 12,000 emergency room visits each year.

Continuing to allow high levels of coal pollution in our air could result in more than $100 billion per in annual health costs.

There is a better way. Clean energy sources like wind and solar can protect our health and boost our economy. No one has ever had an asthma attack triggered by a solar panel.

EPA Action

Late in the summer of 2011, the Obama administration directed the EPA to delay its long-overdue smog protections, which would have required coal plants to install pollution controls and protect public health. In spite of this delay, the Sierra Club is working to keep

up the pressure on President Obama and to support the EPA in addressing the smog pollution that triggers asthma attacks.

Show your support for families and children affected by asthma from coal plants:

Tell President Obama to clean up our air!
(https://secure2.convio.net/sierra/site/Advocacy?cmd=display&page=UserAction&id=6357&JServSessionIdr004=1rvx9lwyc1.app220a&s_src=611LSCZZ04)

1 http://www.stateoftheair.org/2011/key-findings/ (http://www.stateoftheair.org/2011/key-findings/)

2 http://www.stateoftheair.org/2011/health-risks/health-risks-ozone.html (http://www.stateoftheair.org/2011/health-risks/health-risks-ozone.html)

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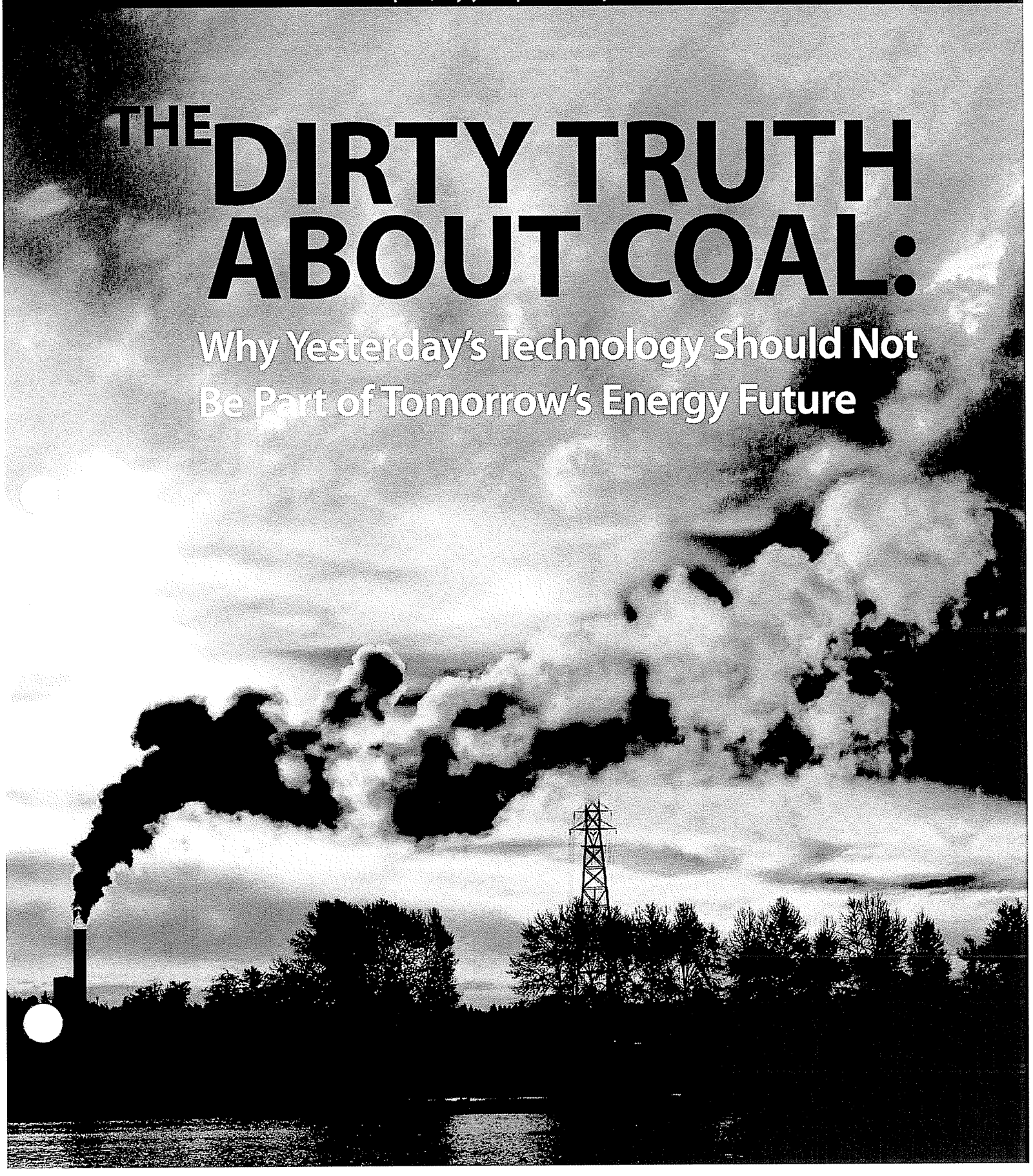
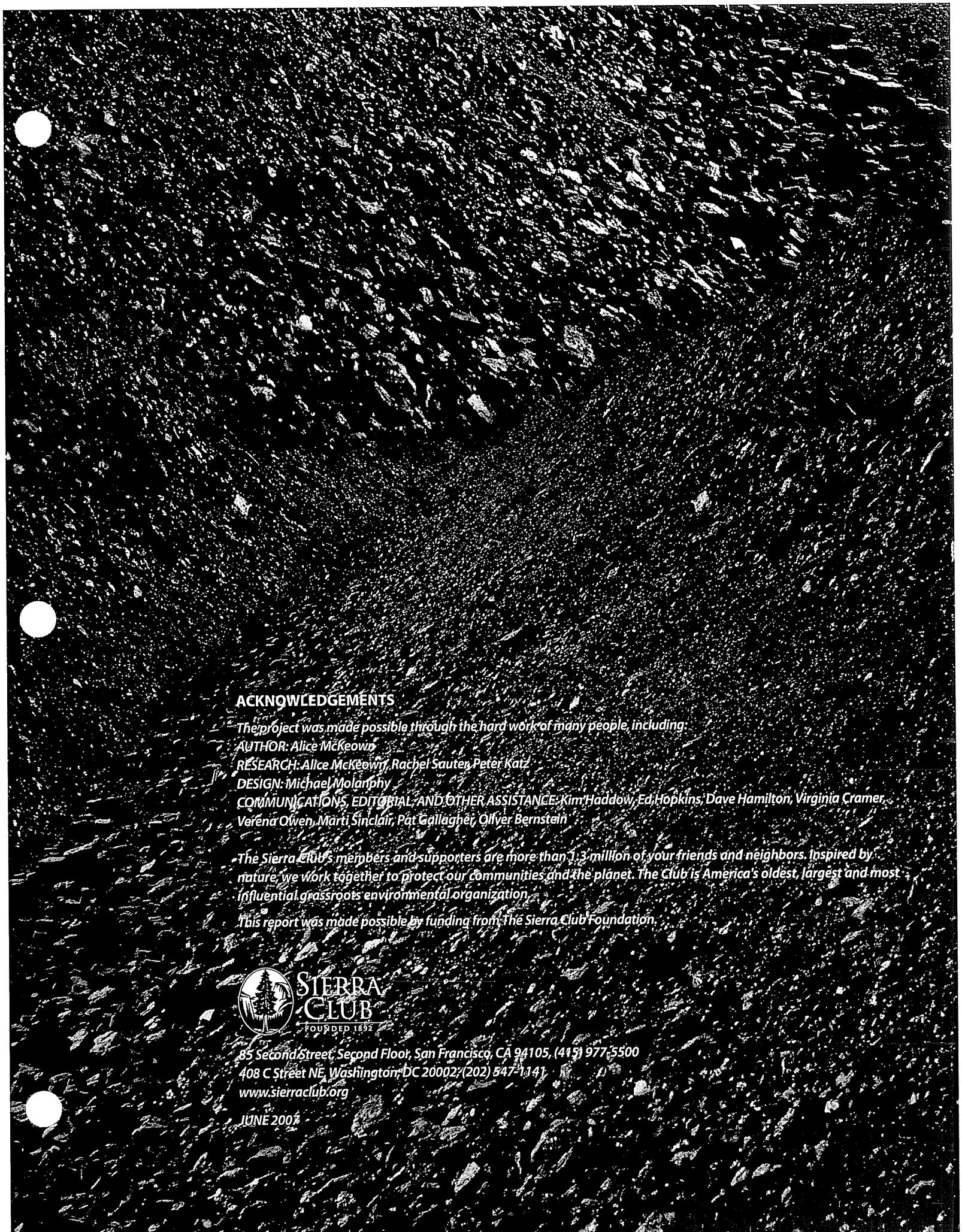
Explore, enjoy and protect the planet

THE DIRTY TRUTH ABOUT COAL:

Why Yesterday's Technology Should Not Be Part of Tomorrow's Energy Future





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The Sierra Club's members and supporters are more than 1.3 million of your friends and neighbors. Inspired by nature, we work together to protect our communities and the planet. The Club is America's oldest, largest and most influential grassroots environmental organization.

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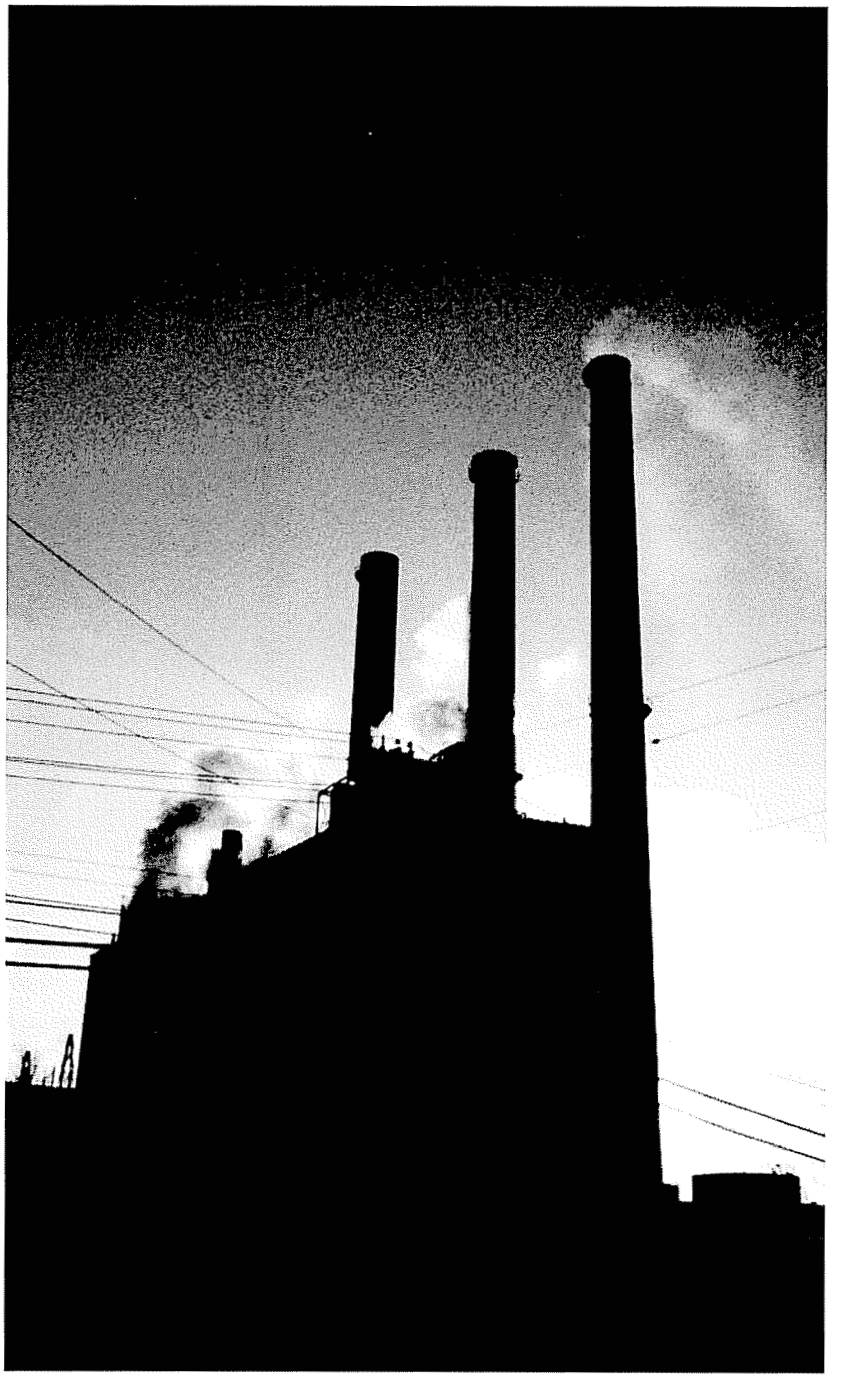
JUNE 2007

THE DIRTY TRUTH ABOUT COAL:

Why Yesterday's Technology Should Not Be Part of Tomorrow's Energy Future

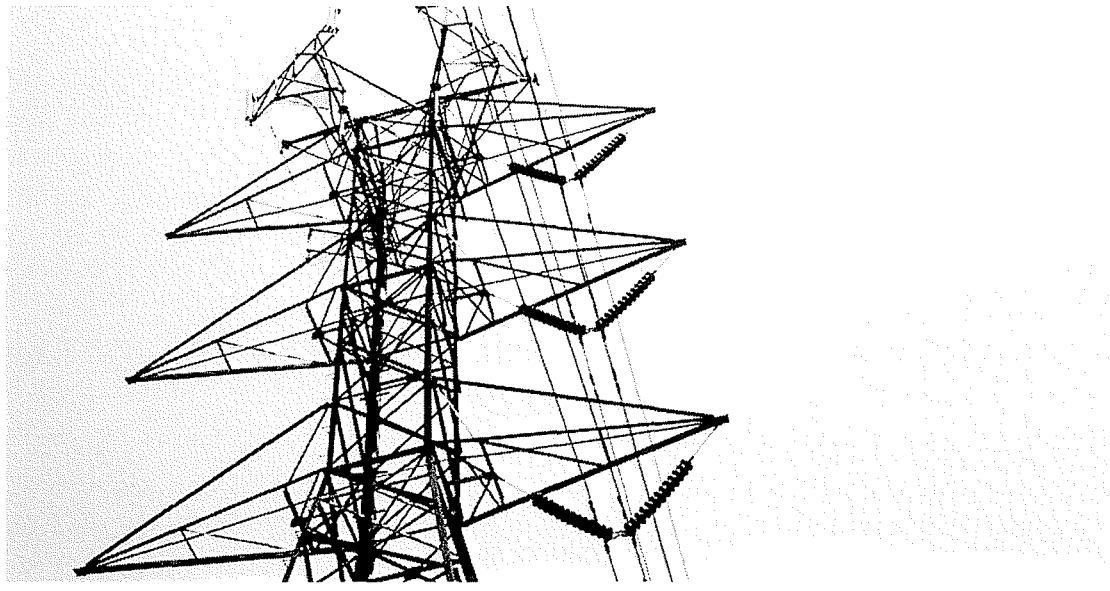
INTRODUCTION

It was more than 100 years ago on the shores of the lower East River in New York City that Thomas Edison opened the Pearl Street Station, the first centralized coal-fired power plant to come on line. Although this new plant served just a few blocks, Edison had jumpstarted a new industry and set off a wave of power plant building across America. From that moment on, burning coal fueled our Industrial Revolution and forever changed the landscape of energy production.



Today, 125 years later, coal continues to play a huge role in fueling America. Coal-fired power plants produce about half of our nation's electricity,[1] and in 2006 a record 1.161 billion tons of coal was mined, most of which went directly to electricity generation.[2] Unfortunately, coal is also one of the most polluting sources of energy available, jeopardizing our health and our environment.

Long known as a major source of air pollution, coal-fired power plants are also major contributors to global warming, accounting for almost 40 percent of our nation's carbon dioxide pollution (CO_2), the prime global warming pollutant.[3] But the truth is that the pollution created by generating electricity from coal does not start or stop at the power plant. It stretches all the way from the coal mine to long after coal is burned and the electricity has been used in our homes and businesses. Mining and burning coal scars lungs, tears up the land, pollutes water, devastates communities, and makes global warming worse.



Many of these environmental and societal consequences have devastating characteristics that may never be remedied. Consider these numbers:

260 million	Gallons of water used for coal mining in the U.S. every day
120 million	Tons of solid wastes produced every year by burning coal
90 million	Gallons of waste slurry produced every year while preparing coal to be burned
21 million	People in the U.S. who live within five miles of a coal-fired power plant
12 million	Gallons of water used per hour at an average coal-fired power plant
12,000	Miners who died from black lung disease between 1992 and 2002
1,200+	Miles of streams that have been buried or polluted in Appalachia because of mountaintop removal mining
47	U.S. states and territories with mercury fish consumption advisories for at least some of their waters
150+	New coal-fired power plants proposed for the U.S.
55	Percent decrease in number of coal miners employed from 1985–2000
22	Percent increase in coal mining production from 1985–2005

Unfortunately, the list is much longer. As this report documents, our current use of coal is neither sustainable nor cheap. Claims of "clean coal" and "carbon free" coal are misleading, serving more as a marketing tool than as an honest change in dirty practices.

The good news is that we do not have to continue making these sacrifices in the name of meeting our energy needs. We can reduce our dependence on coal by increasing efficiency and relying more on clean energy power, and we can minimize the damage coal causes by ensuring it is mined responsibly, burned cleanly, and does not take us backward on global warming.

As we choose our energy future, we need to make sure that we consider the full impact of each decision. When it comes to coal, that means considering all of the damages incurred by our society and our environment. We must shift from the polluting fossil fuels of the past to new sources of energy like clean fuels and energy efficiency that will meet our energy needs and save us money, cut pollution, improve public health, employ new technologies, create new industries and jobs, and put us on a path that will stabilize our climate.

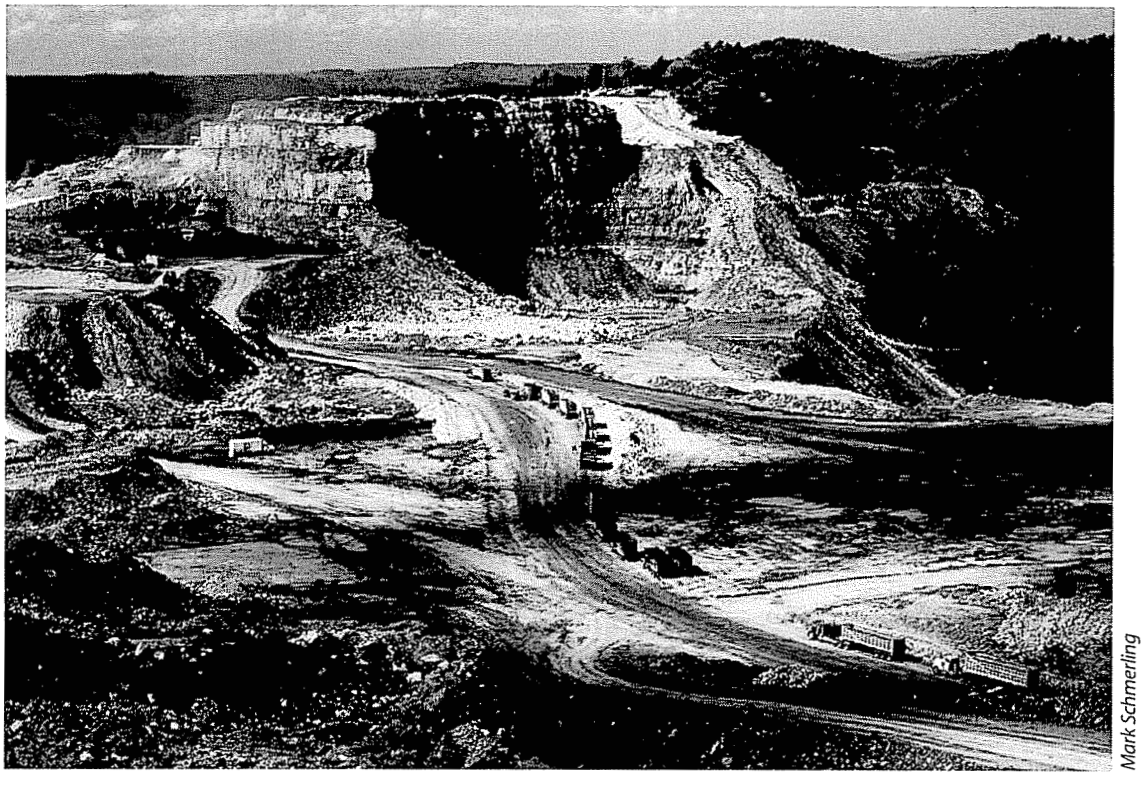
MINING: FROM GROUND TO TRAIN

The first stage in the dirty life cycle of coal begins when it is mined irresponsibly from the earth. Beyond the damage to our lands, water, and air, coal mining also jeopardizes the health and safety of workers and nearby communities. Unfortunately, these costs of coal are only one part of a larger story.

Ernie Sistek/ Kennametal

Coal is mined from the earth by one of two mining techniques. Surface mining, which is used for coal that is relatively near the surface of the ground, involves scraping away earth and rocks to access coal seams buried below. Underground mining is used for coal that is buried deep in the earth, and usually involves a system of tunnels and enormous underground rooms. About two-thirds of U.S. coal is from surface mining, while the other third comes from underground mining.[4]

Coal mining can cause irreparable harm to the natural landscape, both during mining and after. Trees, plants, and topsoil are cleared from the mining area, destroying forests and wildlife habitat, encouraging soil erosion and floods, and stirring up dust pollution that can cause respiratory problems in local communities. In mountaintop removal mining, a coal company literally blasts apart the tops of mountains to reach thin seams of coal buried below. Underground mining, including an intensive method known as longwall mining, leaves behind empty underground spaces which can collapse and cause the land above to sink. Known as subsidence, this process can cause serious structural damage to homes, buildings, and roads when the land collapses beneath them.[5] It can also lower the water table and change the flow of groundwater and streams. Like mountaintop removal, longwall mining has become increasingly popular because of low costs and high yields, and in spite of growing environmental destruction.[6]



Mark Schmerling

MOUNTAINTOP REMOVAL MINING DESTROYS APPALACHIA

One of the most devastating types of coal mining is known as mountaintop removal mining, a technique common in Appalachia. Mining companies literally blow the tops off mountains to reach thin seams of coal and then, to minimize waste disposal costs, dump millions of tons of waste rock into the valleys and streams below, causing permanent damage to the ecosystem and landscape. This destructive practice has damaged or destroyed approximately 1,200 miles of streams, disrupted drinking water supplies, flooded communities, eliminated forests, and destroyed wildlife habitat.[7] Coal companies have created at least 6,800 fills to hold their mining wastes, and the government estimates that if this mining continues unabated in Appalachia it will destroy 1.4 million acres of land by 2020—the date when the coal is expected to run out.[8]

Mark Schmerling

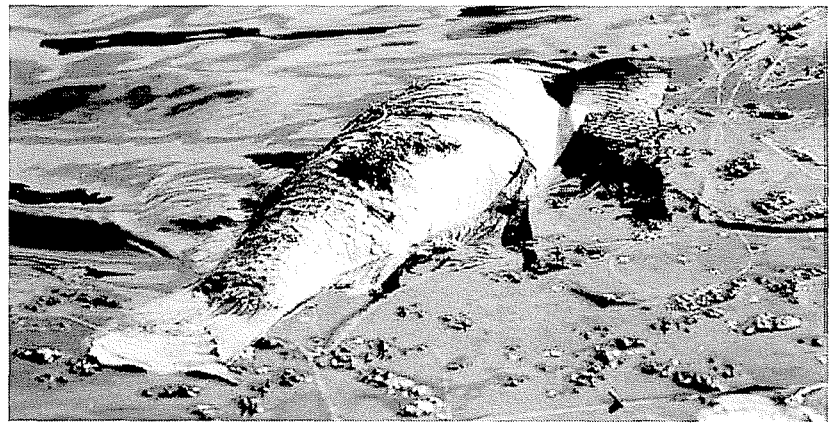
Beyond these environmental concerns, mountaintop removal mining poses other dangers to local communities as well. One stunning example is Sundial, West Virginia, where Marsh Fork Elementary School lies a mere 400 yards downhill from a massive coal waste impoundment containing 2.8 billion gallons of toxic sludge.[9] The state acknowledges the facility would likely cause deaths if it fails,[10] and estimates students and teachers would have only about three minutes to escape if a breach occurred.[11] Alarmingly, almost a third of impoundments in the state built since 1972 have ruptured, spilling more than 170 million gallons of sludge.[12] Even worse is the track record of the parent company, Massey Energy, which owns the impoundment; it is responsible for over half of the state's spills. Impoundment dam breaks have caused widespread devastation in West Virginia before, like the Buffalo Creek disaster that killed 125 people and left thousands more homeless.[13]

Central Appalachia is home to some of the poorest counties in the nation.[14] Interestingly, while mining production rose in West Virginia 32 percent over a ten-year period, the number of mining jobs dropped by 29 percent because mountaintop removal mining relies on machinery and explosives rather than experienced miners.[15] Mountaintop removal mining has also caused the value of some homes to drop 90 percent, and is responsible for cracking the foundations and walls of nearby houses.[16] This mining also jeopardizes the much needed income brought into the region from tourism. Mountaintop removal mining is simply the most destructive—and irresponsible—mining technique used today.

Marsh Fork Elementary School, shown to the right of the silo pictured above, lies only 400 yards downhill from a coal waste impoundment.

Vivian Stockman / www.ohvec.org. Flyover courtesy SouthWings

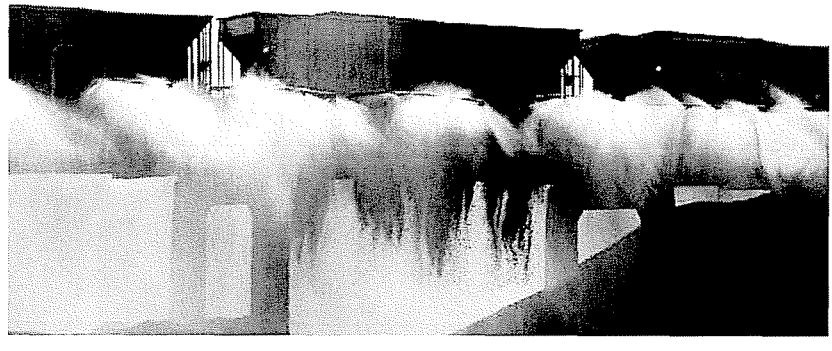
Coal mining is frequently associated with water pollution, including acid mine drainage. One source of acid drainage is from gobs, or piles of waste coal and other rocks that are cast aside during mining.[17] Another more common source of mine drainage is abandoned mines that fill with water that becomes acidic and mixes with heavy metals and minerals.[18] When this toxic water leaks out, it combines with groundwater and streams, causing water pollution and damaging soils. Acid mine drainage can harm plants, animals, and humans. For example, in Pennsylvania alone acid mine drainage has polluted more than 3,000 miles of streams and ground waters, which affects all four major river basins in the state.[19] The toxic pollution has even led to places termed "no fish," or streams where fish cannot survive because the water is so polluted. Acid mine drainage has also been a problem for the past two decades in western Maryland, where officials have documented 342 leaks of toxic water and where a new discharge killed all of the fish in the Georges Creek in 2006.[20]



Other types of pollution are also caused by coal mining, including different types of air pollution. Explosives used during underground and surface mining release carbon monoxide pollution, a health threat for workers.[26] Coal mining and coal washing both stir up small dust and coal particles, which combine with other chemicals in the air and can cause serious and potentially fatal respiratory problems like black lung.[27] Harmful air pollution is also released when coal is transported. About 75 percent of all coal shipments in the U.S. are made via railroads,[28] which are one of the nation's largest sources of soot and smog pollution.[29] Both soot and smog can cause health problems, including respiratory problems and increased risk of asthma attacks.[30] Coal-laden railcars also cause soot pollution when coal dust blows off into the surrounding air, a substantial problem considering that a typical coal plant requires 40 railcars per day to deliver the 1.4 million tons of coal needed each year.[31] The problem of blowing coal dust from trains and trucks is clearly seen in some communities where residents routinely wipe thick layers of coal dust off their houses.[32]

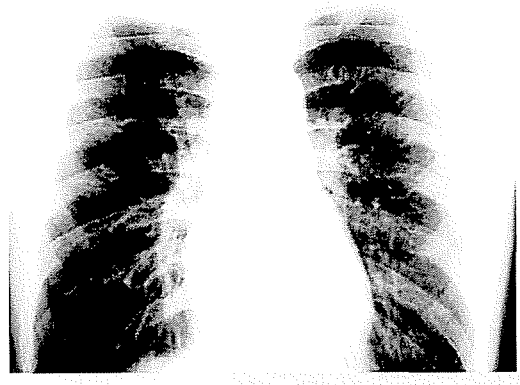
Coal preparation, or "washing," is another source of water pollution. Coal preparation uses large quantities of water and chemicals to separate impurities from mined coal to make it easier to burn. Using anywhere from 20 to 40 gallons of water per ton of coal,[21] coal washing separates out non-combustible components, which can be up to 50 percent of what is processed, and typically washes them away in a sludge known as slurry.[22] Up to 90 million gallons of slurry are produced every year in the U.S.[23] Coal slurry is stored in large waste pits known as impoundments that hold millions of gallons of coal mining wastes. Some of the risks involved with impoundments include seepage into local water supplies and impoundment breaks that can send wastes barreling down mudflows, destroying property and lives in its path. One such incident happened in 2000, when a 72-acre impoundment in Martin County, KY breached, killing fish and aquatic life in the Big Sandy River and disrupting public drinking water supplies.[24] All told, the spill dumped 250 million gallons of water and 31 million gallons of coal wastes into the local watershed—over twenty times the amount of oil spilled when the Exxon Valdez ran aground.[25]

Vivian Stockman / www.ohvec.org



BLACK LUNG PUTS COAL MINERS AT RISK

Black lung is a group of respiratory diseases in coal miners that can cause serious lung disease and death.[33] Known technically as pneumoconiosis or silicosis, black lung is caused by repeated exposure to coal dust and other small particles stirred up during coal mining. Symptoms include coughing, spitting up black material, shortness of breath, and eventual hardening and scarring of the lungs. Although some of the symptoms can be alleviated, there is no known cure for black lung and no reversal of the symptoms.



The Centers for Disease Control (CDC) estimate that about 12,000 miners died from black lung in the U.S. in the ten-year period ending in 2002,[34] while other estimates put the toll at about 1,500 per year.[35] There is a strong correlation between length of exposure (years in the mine) and prevalence of black lung, with about eight percent of long-term workers affected by the disease.[36] Although the prevalence of black lung has decreased since federal mining legislation was passed in 1969, a report released in August 2006 by the CDC showed a new resurgence of the disease, with many miners aged 30–60 developing a progressive form of the disease at a much higher rate than expected.[37] Mining regulations require that coal mining dust exposure be limited, but evidence suggests that these tests are faulty and sometimes even falsified.[38]

Beyond conventional air pollution, coal mining is also a source of global warming pollution. Methane, a global warming gas more than 20 times as potent as carbon dioxide, is found trapped around seams of coal.[39] It is released from the surrounding rocks when coal is mined, as well as during coal washing and transportation. Coal mining releases about 26 percent of all energy-related methane emissions in the U.S. each year.[40]

In addition to pollution and public health issues, coal mining can affect local communities and families in other ways, too. For example, coal mining can destroy sources of local revenue, including losses from tourism and recreation, such as the estimated $67 million lost annually in Pennsylvania from sport fishing because of streams too polluted from acid mine drainage.[41] Coal mining can also damage homes and decrease property value, making it hard for people to sell their houses and move. For people who remain, coal mining becomes a threat to local water supplies since it uses up to 260 million gallons of water per day.[42] Finally, every year dozens of people are seriously injured or killed near coal mines, including drowning and falling into mine shafts.[43]

Contrary to many claims, coal mining has been a decreasing source of jobs over the last two decades and is still considered to be one of the most dangerous jobs in America.[44] Estimates of mining production and working coal miners show that between 1985 and 2005 mining production in the U.S. increased 22 percent,[45] while the number of coal miners decreased by about 55 percent.[46] The average income of coal miners has also been on the decline, with estimates putting the average weekly wage of a coal miner in 2004 20 percent lower than it was in 1985 (adjusted for inflation).[47]

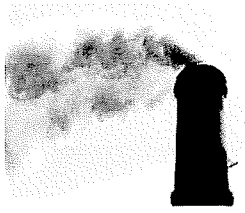
Finally, although federal and state laws require reclamation plans for coal mining sites, there is little evidence to show that these programs are effective at undoing all of the environmental harm caused during the mining process. Damages to water supplies, destroyed habitats, and poor air quality are often hard to remedy in the short term, and require intense investments over the long term to solve. Additionally, in the 25 years since the abandoned mine provisions of the Surface Mining Control and Reclamation Act have been in place, only about one third of the known mine sites have been restored.[48] And an estimated 3.5 million Americans are currently living within one mile of an abandoned mine.[49]

From polluted water to damaged communities, coal mining is leaving a legacy of destruction in its wake.

BURNING COAL: OUR NATION'S POWER PLANTS

About 90 percent of the coal that is mined and produced in the U.S. is destined for our nation's power plants, where coal is used to generate about half of our energy.[50, 51] Unfortunately, from toxic air and waters to global warming, burning coal continues to be one of the dirtiest sources of electricity used today.

From smog to mercury to carbon dioxide, coal-fired power plants are one of the largest sources of air pollution in the U.S. The consequences for human health are staggering, especially with regards to particle pollution, one of the most dangerous—and deadly—types of air pollution in our country. Particle pollution, also known as soot, can be released directly from smokestacks or indirectly through other pollutants like sulfur dioxide (SO_2) that react in the air to form tiny particles. Soot is particularly dangerous to people because it can be inhaled deep into the lungs where the smallest of particles cross directly into the blood stream just like oxygen.[52] Soot can trigger heart attacks and strokes, worsen asthma, cause irregular heartbeat, and lead to premature death.[53] Particle pollution also harms the environment, and is the leading cause of haze and reduced visibility in the U.S., including in our National Parks.[54] The damages from particle pollution continue after it has settled to the ground, where it causes acidification of waters, soil nutrient depletion, and destruction of forests and crops.[55]



NREL

In addition to being the largest source of sulfur dioxide pollution,[56] coal-fired power plants are the second largest source of nitrogen oxides (NOx) in the nation, earning them a reputation as a major contributor to smog.[57] Smog, or ground level ozone, forms when nitrogen oxides emitted by the plants react with sunlight and other chemicals in the air. Smog causes a wide range of symptoms like shortness of breath, increased risk of asthma attacks, permanent lung damage, and premature death.[58] Scientists have compared exposure to smog to getting a sunburn in the lungs.[59] In addition to its health effects, smog damages the environment and can destroy entire ecosystems.[60] Smog harms plants and trees, making it hard for them to make and store food, and can damage leaves, making them vulnerable to disease, insects, and extreme weather. Persistent smog pollution can alter and disrupt plant growth over time, leading to reductions in crop yields.[61, 62] In the U.S., smog pollution is estimated to cost $500 million in reduced crop production every year.[63]

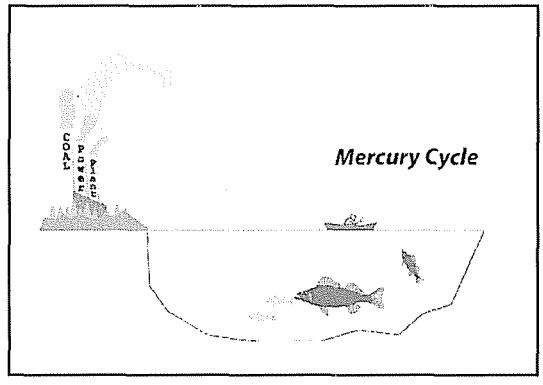
AIR POLLUTION AND COMMUNITIES OF COLOR

Many scientific studies have shown that communities of color are disproportionately exposed to harmful air pollution, including pollution from coal-fired power plants. Over half of the nation's population lives in counties that have unhealthy levels of air pollution like soot and smog.[64] Furthermore, one study found that 60 percent of Latinos and 50 percent of African-Americans live in areas that are failing two or more national air quality standards, as compared to only 33 percent of whites.[65]

One of the contributing factors may be that communities of color and low income communities tend to live in areas that are closer to harmful sources of pollution. African-Americans are more likely to live within 30 miles of a coal-fired power plant.[66] African-Americans and Latinos also tend to live closer to other sources of toxic pollution like waste sites and bus depots, which makes them more likely to develop health problems from air pollution.[67] In addition to living closer to coal-fired power plants, African-Americans also have one of the highest rates of asthma among any cultural group, and are three times as likely as whites to die from asthma.[68, 69] Numerous studies have shown that smog and soot pollution can trigger asthma attacks and increase the need for hospitalizations.[70]

The same air pollution that causes smog and soot also causes acid rain. Acid rain occurs when power plant emissions like sulfur dioxide and nitrogen oxides react with water and oxygen in the air to form acidic compounds that fall to the ground.[71] Acid rain falls onto plants and trees and eventually ends up in lakes, streams, and the soil. Once in the environment, the acidic compounds cause different kinds of environmental damage, including damage to trees, loss of aquatic life, and detrimental changes to the soil.[72] Although acid rain in the U.S. has decreased since air protections were put into place, emissions are still relatively high compared to normal conditions and continue to harm the environment.[73] And, unfortunately, repeated acid rain over time can suppress the resiliency of natural systems, meaning that over time it takes longer and longer for nature to recover.[74]

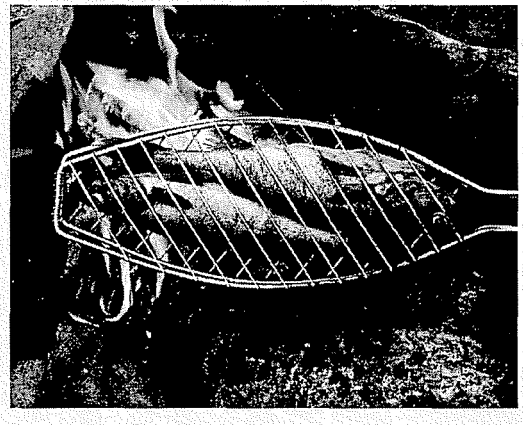
Additionally, coal-fired power plants emit large quantities of toxic air pollutants such as chromium, lead, arsenic, hydrogen chloride, and mercury. In fact, they are one of the largest sources of man-made mercury pollution in the U.S.[75] After mercury is released in the exhaust, it enters the air and then rains down into our streams, lakes, and other waters where it poisons the fish and seafood that eventually make their way to our dinner tables. Mercury accumulates in fish and the animals and people who eat them, causing brain damage, mental retardation, and other developmental problems in unborn children and infants.[76] It has also been linked to a greater risk of coronary heart disease in men.[77] The mercury problem in the U.S. is so widespread that every year one in six women of childbearing age has mercury levels in her blood high enough to put her baby at risk.[78] Moreover, in 2004, forty-seven U.S. states and territories had mercury fish consumption advisories for at least some of their waters.[79] Unfortunately, certain populations may be at greater risk from mercury pollution, including African-Americans and American Indians.[80] New plants that burn waste coal for energy will make the problem even worse because waste coal has much higher concentrations of mercury.[81]

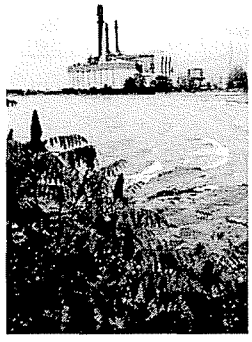


CULTURAL IDENTITY AND TAINTED FISH: MERCURY EXPOSURE AMONG AMERICAN INDIANS

Mercury exposure is directly linked to eating contaminated fish, and people who eat more fish have more mercury in their blood. In turn, this means that families who rely more heavily on fish in their diets are at greater risk from mercury pollution. In addition, studies have shown a correlation between fish consumption and ethnic identity, with African-Americans and Latinos topping the list for exposure.[82]

One group that may be at particular risk from mercury pollution exposure is American Indians, especially individuals who live on reservations or in communities that depend on fish for subsistence.[83] Studies of the Seminoles, Chippewa, and other native groups show that American Indians tend to eat many more fish meals per year than average, putting them and their families at greater risk from mercury pollution.[84] In addition to being a staple of the diet, fish and fishing among indigenous groups also may serve as part of a strong cultural identity, connecting the individuals with the land and the seasons. For instance, in Florida, Seminole Indians living near the Everglades continue to rely on fish as a major part of their traditional diet, even though studies have linked mercury pollution to the death of endangered Florida panthers and local bird populations.[85] Another example is in the Midwest, where Chippewa Indians depend heavily on fish for cultural identity, including during annual ritual ceremonies.[86] Every year the seasonal break up of ice is celebrated through a community-wide feast of walleye fish that are caught during a big spearfishing event.[87] Fish that is not eaten at the feast is often taken home and frozen for future meals.[88] In both examples, testing has shown that people in these areas who eat a lot of fish have mercury levels well above the safe limit. One sample from the Chippewa indicated that 36 percent were at risk.[89]





David Parsons/NREL

Coal-fired power plants also require huge amounts of water for cooling and other purposes. An average 500 megawatt (MW) coal-fired power plant uses more than 25 gallons of water for each kilowatt hour produced, which translates to 300 million gallons of water per day or 12 million gallons of water per hour.[90] In the U.S., electric power plants account for 48 percent of total water withdrawals every year—an astounding 195 billion gallons of water every day.[91] Coal-fired power plants use so much water that some have had to limit their operations because of water shortages, while other new plants have faced opposition due to local concerns about water use.[92] In addition to shortages, water use at coal-fired power plants can harm fish and shellfish both when water is withdrawn and when it is discharged after cycling through the plant.[93] Water that is discharged is typically much hotter than the water that it is discharged into, which raises the overall water temperature. Among fish, this can decrease fertility and cause changes in heart rates.[94] The discharged water can also contain chlorine and other harmful chemicals.[95]

Burning coal also releases carbon dioxide (CO_2) pollution, a primary culprit in global warming. Even though coal-fired power plants generate just about half of our nation's electricity, they account for over 80 percent of the carbon dioxide pollution from electricity production in the U.S.[96] In fact, coal-fired power plants have the highest output rate of carbon dioxide (or carbon intensity) per unit of electricity among all fossil fuels.[97] The dangers of carbon dioxide pollution and global warming are becoming clearer every day, and scientists continue to report on the effects of global warming that are already being observed around the world.[98] Left unchecked, these damages will continue to grow, and will lead to increased water shortages, widespread malnutrition, increased deaths from intense weather events, widespread flooding of coastal areas, increased rates of extinction and loss of biodiversity, and changes in precipitation patterns, among other problems.[99] Unaddressed global warming will have serious consequences on our health, food, water, ecosystems, and coasts.[100]

From deadly soot and smog to mercury pollution in our waters, coal exacts an expensive toll on our society and our environment. And, unfortunately, the damages do not stop after the coal is burned.

THE COAL RUSH

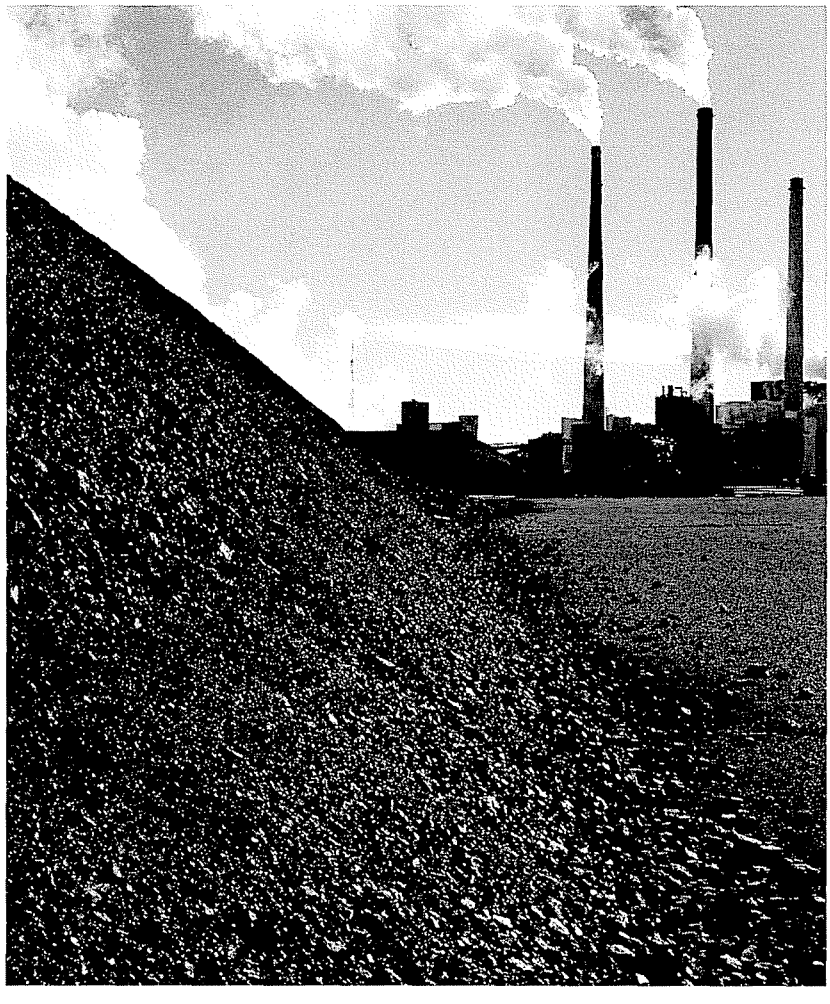
Even though coal-fired power plants already produce about half of our nation's electricity, there are plans on the drawing board to build more than 150 new plants in the next few years.[101] If they are all built, the new capacity would be 90 gigawatts (GW) of new power generation—an amount equal to about a fourth of all of the currently operating coal-fired power plants in the U.S.[102] Of these plants, a significant number are slated for the Midwest, with 16 proposed in Illinois alone.[103] The cost to build all of these plants is nearly $150 billion.[104]

Unfortunately, most of these new plants would use the same technology that was used to build coal-fired power plants a generation ago.[105] If all of these plants are built, they will increase carbon dioxide pollution from electricity production in the U.S. by more than 25 percent from 2004 levels and our nation's total carbon dioxide pollution by 10 percent.[106] The projected carbon dioxide pollution from only 72 of these new plants is equal to more than half of the emissions reductions expected under the Kyoto Treaty,[107] and to all of the emissions reductions that could be made if California's clean car standards were applied to the rest of the U.S. and Canada. Building just two of the biggest new plants would cancel out all of the reductions proposed by Northeast states as part of their Regional Greenhouse Gas Initiative. Add to this the fact that coal-fired power plants have a lifespan of 50–70 years, and the total carbon dioxide pollution of these plants will exceed 35 billion metric tons.[108]

WHAT REMAINS: THE LEGACY OF COAL COMBUSTION WASTES

The final stage of the life cycle of coal is the wastes that remain after coal is turned into electricity. Known collectively as coal combustion wastes, these toxic byproducts are a combination of solid and liquid wastes produced at coal plants. Although the chemical composition of coal wastes is dependent on a range of factors like coal origin and pollution controls,[109] the types of wastes produced are nearly identical at all coal-fired power plants. For example, these wastes include parts of the coal that do not fully burn during generation like fly ash (from the smokestacks) and bottom ash (from the bottom of the boiler).[110] They also include the particles and chemicals trapped by air pollution controls, like scrubber sludge or flue gas desulfurization sludge. Finally, they include many "low-volume" wastes, including runoff from coal reserve piles and liquid wastes that are formed during cleaning and routine operations.[111]

Taken together, the amount of coal combustion wastes produced every year is staggering: more than 120 million tons of solid wastes are produced every year.[112] This waste alone is enough to fill a million railcars every year, or a train that is 9,600 miles long.[113] In addition, the amount of wastes and their toxicity are expected to grow significantly every year as dirty old coal-fired power plants are forced to clean up and install modern pollution controls that convert air pollutants to solid wastes.[114]



Although some solid coal wastes can be used in construction materials, most coal wastes are destined for landfills or surface impoundments.[115] Surface impoundments are large open waste pits that are used to hold both liquid and solid coal wastes. Over time, the solids settle to the bottom of impoundments, where they may be removed and transferred to a landfill. Landfills are used to hold solid wastes, but water may be added to help reduce the amount of dust stirred up during disposal. The size of surface impoundments and landfills can be enormous, with some impoundments covering 1,500 acres—the size of over 1,100 football fields—and an average landfill holding 3.8 million cubic yards of wastes.[116] In 1999, there were at least 600 coal waste impoundments and landfills located onsite at 450 coal-fired power

plant facilities.[117] The majority of these waste facilities are concentrated in the Midwest, where there is a greater density of coal-fired power plants.[118]

Another destination for coal combustion wastes that has been gaining increasing attention is abandoned coal mine sites.[119] In theory, coal wastes applied in small amounts may help seal off old mine rooms and walls, forming a layer to help trap coal mining residues from leaking.[120] Coal wastes applied in large amounts may be used as backfill for mine sites, adding materials to help fill in the enormous voids formed when the coal was removed during mining.[121] However, because there has been little attention to this method the full environmental dangers of these applications remain undocumented and need to be studied.

Not only is it challenging to find a place to store so much coal combustion waste safely, but even after it is stored coal combustion waste can leak out and pollute the surrounding environment and groundwater. At landfills, leaks can occur when contaminated water percolates through the wastes or when water washes over exposed areas and carries off contaminants.[122] The opportunities for leaks at surface impoundments are even greater because they are often exposed, increasing the likelihood of polluted runoff into ground and surface waters.[123] In 2005, there were 24 acknowledged cases of environmental pollution from leaking landfills and impoundments, and many more suspected cases.[124]

These leaking coal wastes and polluted runoffs can be extremely toxic and dangerous. Containing elements like lead, mercury, and arsenic in toxic doses,[125] coal combustion wastes and their pollution have been shown to cause illness and death in plants and animals. Direct exposure to these toxins and others causes lower rates of reproduction, tissue disease, slower development, and even death.[126] These damages are significant both individually and collectively, where coal waste contamination has been linked to changes in wildlife concentrations and disruptions in entire ecosystems.[127] Vegetation growing on or nearby coal waste disposal sites also exhibit signs of damage, including reduced growth and die offs.[128] These toxic compounds can accumulate in exposed animals and plants, causing the toxics to make their way up the food chain when they are eaten.[129]

The same toxics that harm plants and wildlife also pose serious health risks to people.[130] People are exposed to these wastes through contact with contaminated soils, inhaling polluted dust, and eating plants and animals that have been exposed.[131] Some coal combustion wastes are applied directly to agricultural fields, and evidence suggests that subsistence farmers and their families may have greater risks of exposure than other people.[132] However, the single greatest threat of human exposure is from polluted groundwater and drinking waters sources.[133] The toxins found in coal wastes have been linked to organ disease, increased cancer, respiratory illness, neurological damage, and developmental problems.[134] Additionally, children who are exposed to coal combustion waste toxins are more likely to experience adverse reactions than adults.[135] In the mid-90s, the EPA estimated that more than 21 million people, including more than six million children, lived within five miles of a coal-fired power plant,[136] a daunting figure considering that most coal combustion wastes are stored onsite. Pollution has been so bad in some locations that sites were classified as hazardous and drinking water wells had to be closed.[137]

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COAL COMBUSTION WASTES AND THE CHISMAN CREEK SUPERFUND SITE

Located 15 miles northeast of Norfolk, Virginia, the Chisman Creek Superfund Site provides a good example of the hazards posed by coal combustion wastes.[138] More than 25 acres in size, the Chisman Creek property is part of the Chesapeake Bay watershed, including a tributary that drains into the bay.[139] The site was formerly a favorite recreation spot among local residents for fishing, gardening, and riding off-road vehicles.[140] Unfortunately, during a period spanning almost two decades, the site was used as a dumping ground for more than 500,000 tons of fly ash produced at a nearby power plant owned by Dominion Resources.[141]

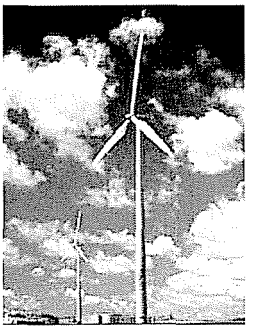
In 1980, six years after the site was abandoned, local residents noticed changes in the color of their drinking well water.[142] Testing revealed toxic levels of several metals, including arsenic, selenium, and vanadium, and in 1983 the site was listed as hazardous under the Superfund program.[143] Although Dominion tried unsuccessfully to challenge the listing, cleanup began three years later, starting with extending public drinking water lines to 55 homes and installing a water treatment system.[144] Other cleanup measures included covering and sealing off the fly ash pits and diverting part of the tributary.[145] In 1991 the site was partially rededicated as a local recreation site, but 25 years after Superfund designation there are still restrictions on groundwater use in the area.[146]

A significant factor in coal combustion waste pollution is the lack of stringent federal regulations and safety requirements. In 2000, the EPA reaffirmed a 20 year old decision not to regulate coal combustion wastes as hazardous, choosing to continue sidestepping meaningful protections by classifying them as "special wastes." One indication of the inadequacy of this approach is that many of these waste facilities continue to operate without any type of lining to prevent leakage, including about half of the landfills and over three fourths of the impoundments.[147] Furthermore, most states do not require groundwater monitoring, and many do not require waste facilities to obtain state permits.[148]

Unfortunately, this final act in the life cycle of coal does not come to a convenient conclusion. Most coal combustion wastes are stored indefinitely, and may continue to jeopardize the environment and humans for generations to come. Ironically, rather than returning neatly to its buried origins, coal that has passed through this life cycle is in the end converted into something more dangerous—and perhaps longer lasting.

CONCLUSION: "CLEAN COAL", OR AMERICA'S LEAD ENERGY MISNOMER

From cradle to grave, ground to ash, the damages coal causes to our environment and society are enormous. Unfortunately, the consequences of burning coal for electricity do not normally weigh into our national discussions about our energy future. As this report shows, the costs of using coal are high and are continuing to rise, especially as our understanding of the consequences of global warming grows.



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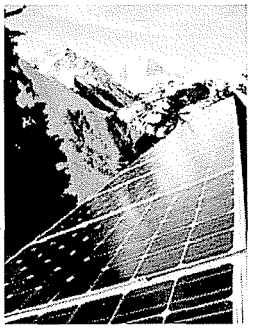

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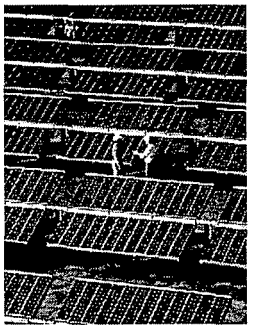


Sacramento Municipal Utility District

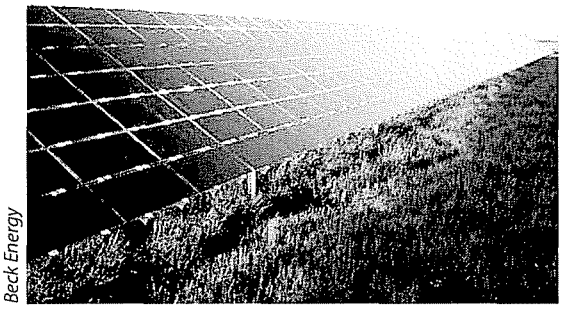
The coal industry knows that the equation must change or they will be out of business—that is why they are pushing putative "clean" coal. But, coal as it exists today is anything but clean. Ambiguously defined, "clean coal" has become little more than an empty technological promise of a different way of doing business. Coal advocates, including the people and politicians who benefit the most from Big Coal's checkbook, point to technological innovations they claim can help lessen the worst impacts of burning coal. Ironically, what they do not reveal is that industry has been fighting standards to clean up coal plants tooth and nail since the Clean Air Act was passed, and that a lot of older plants still do not have even the most basic—and readily available—pollution control devices. These coal advocates also fail to look at the full life cycle of coal, focusing their sight on the more well-known damages caused during the burn.

The two supposedly "clean coal" technologies that have attracted the most attention in recent years are carbon capture and sequestration (CCS) and Integrated Gasification Combined Cycle (IGCC). Carbon capture and sequestration is a process where carbon dioxide produced at coal-fired power plants is captured from the plant's exhaust and then stored underground to prevent it from entering the atmosphere. Although in theory CCS sounds promising, the challenges are enormous, ranging from separating out the CO_2 and transporting it to figuring out how to make sure it stays sealed off for thousands of years to come. In addition, the scale needed to store all of the carbon dioxide pollution from our nation's coal-fired plants is massive, and would require huge undertakings to ensure that it does not leak into the atmosphere. As of now, carbon capture and storage has not been demonstrated with anything approaching the emissions of a coal-fired power plant and remains an unproven technology. Experts also disagree as to how long it will take for this technology to be available for commercial and wide-scale use.[149]

The second technology, Integrated Gasification Combined Cycle (IGCC), is an alternative system for coal-fired power plants that converts coal to a gas that is burned to produce electricity. IGCC is

often promoted as the easiest system to retrofit to capture carbon dioxide emissions in the future should CCS work out. Proponents also like IGCC because it can emit lower amounts of soot and smog pollution. However, it emits just as much global warming pollution as other coal plants, not to mention the environmental and societal damages caused by mining the coal to fuel the plant and all of the additional coal combustion wastes. Until carbon capture and storage technologies are better developed, the carbon dioxide emissions will be much the same as any other coal plant.

Tom Hall, DOE



Beck Energy

Craig Miller Productions

The truth is that promises of these and other future technological innovations that will allow us to use coal with less pollution are not available today. Not surprisingly, these same "clean coal" advocates are also behind efforts to jumpstart a new "coal-to-liquids" industry. Liquid coal creates almost double the carbon dioxide emissions per gallon as regular gasoline, and replacing just 10 percent of our nation's fuel with it would require a more than 40 percent increase in coal mining.[150, 151] On top of these environmental damages, liquid coal needs billions of dollars of government subsidies and incentives to be viable, money that could be much better spent cleaning up our current use of coal and shifting toward cleaner sources of energy. Taxpayers gambled on liquid coal synfuels 30 years ago and lost billions of dollars, a lesson we should not have to learn twice.

Finally, as this report documents, the inescapable conclusion is that mining coal leads to environmental destruction, polluted waters, and devastated communities. Burning coal causes serious air pollution, jeopardizes our public health, and contributes substantially to global warming. Coal wastes also put our health at risk, polluting drinking water and harming people who live near landfills and impoundments. These dirty secrets have serious societal and economic impacts that need to be calculated into our decisions about the energy future we are building now.

The challenge of cleaning up the way we mine and use coal is not small by any means. On average, our country consumes more than three million tons of coal every day, or about 20 pounds of coal for every person in the nation every day of the year.[152] We mine more than 1.1 billion tons of coal a year, and generate about half of our electricity from coal. To minimize the devastating effects of the way we currently use coal, we need to strengthen our nation's laws and put policies into place to protect our communities and our environment. Some of these have already been proposed, like restoring the Clean Water Act's prohibition on filling streams and wetlands with waste.

We owe it to our children to consider smarter, cleaner, healthier options for meeting our energy needs rather than locking ourselves into using a polluting, backward technology for the next 50 years that harms people, damages our environment, and makes global warming much worse. At the same time, we need to be wary of continuing to hitch our future to nonrenewable resources or buying into false promises about dealing with pollution somewhere down the road. We must make sure that coal is mined responsibly, burned cleanly, and does not exacerbate global warming if it continues to be part of our nation's energy equation.

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140 Robert J. Williams, Dominion Resources Services, "Chisman Creek Superfund Site: A Retrospective Review," accessed May 2007 at http://www.mcrcc.osmre.gov/PDF/Forums/CCB5/3.1.pdf

141 U.S. Environmental Protection Agency, "Chisman Creek Case Study," March 1999, accessed at http://www.epa.gov/superfund/programs/recycle/success/casestud/chiscsi.htm

142 Id

143 Id.

144 Id.

145 Id.

146 Virginia Department of Environmental Quality, "Chisman Creek Superfund Program Site Fact Sheet," accessed May 2007 at http://www.deq.state.va.us/waste/pdf/superfund/chisman.pdf

147 U.S. Environmental Protection Agency, "Report to Congress: Wastes from the Combustion of Fossil Fuels Volume I," 1999.

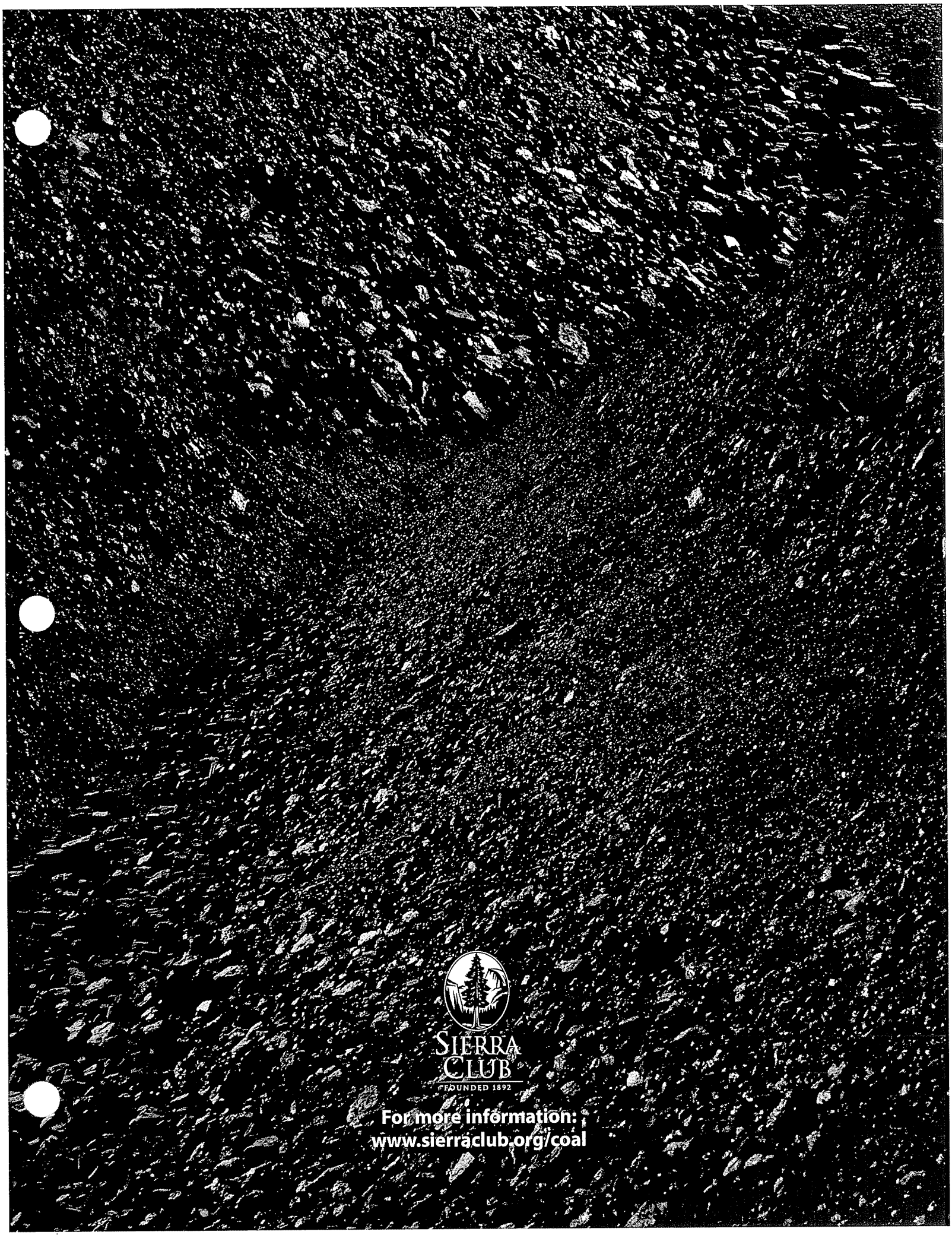
148 U.S. Environmental Protection Agency and Department of Energy, "Coal Combustion Waste Management at Landfills and Surface Impoundments: 1994-2004," August 2006.

149 See for example, MIT, "The Future of Coal," March 2007.

150 Williams, Robert et al., "Synthetic fuels in a world with high oil and carbon prices," 8th International Conference on Greenhouse Gas Control Technologies, June 2006.

151 The National Coal Council, "Coal: America's Energy Future," March 2006.

152 Calculation based on U.S. coal consumption (see EIA "Quarterly Coal Report: October - December 2006") and U.S. population. Inspired by similar calculation performed by the Union of Concerned Scientists.


SIERRA
CLUB
FOUNDED 1892
For more information:
www.sierraclub.org/coal

The cleanest way to meet our electricity needs is by getting the most out of the energy we already use. By planning well and using today's technology, we can cut our electricity consumption, save homeowners and businesses money and create thousands of new jobs. Improving energy efficiency lowers energy bills, eliminates the need for new power plants, increases our energy security, and puts people to work.

Energy efficiency is a source of energy like coal, gas, or nuclear — except instead of dangerously drilling huge holes in the ground or blowing the tops off mountains to look for fossil fuels, energy efficiency allows us to use today's technology to do more with the energy we generate. In every home, office, and factory we can prevent waste and save money by using energy more efficiently by putting to work readily available products like advanced lighting and windows that better insulate from the heat and cold.

Energy Efficiency in the Home

Lamps: Replace those old light bulbs
If every household in the U.S. replaced one outdated incandescent light bulb with a compact fluorescent light bulb (CFL), it would prevent the same amount of pollution as removing one million cars from the road.

Heating Ducts: Warm Your House, Not the Earth
If just one in ten households used current technology to upgrade their inefficient heating systems, we could keep 17 billion pounds of pollution out of the air and our lungs.

Windows: Tighten Windows and Loosen Your Budget
If all windows were as efficient as the best products now widely available in the marketplace, the average household would save $150 a year in heating and cooling costs, and reduce its carbon pollution by roughly 4,300 pounds per year.

Energy Efficiency at the Office

Office Lighting
By using the latest in commercial lighting, office buildings can reduce the energy needed for lighting by 60%, saving both energy and money.

Office Appliances that Ease Energy Expenses
Offices can reduce the energy their computers, copiers, and fax machines use by more than half with the latest in energy efficient office equipment.

Energy Efficiency In Factories

Steam Power Saves Money
Energy-producing facilities would save between 2-8% in costly fuel use if they changed to

boilers using steam. If the facilities that already use steam systems were to upgrade their plants, they could save $4 billion in fuel expenditures and keep 32 million metric tons of pollution out of our air.

Combined Heat and Power Turbine Systems Conserve Cash
By using the same facilities to generate both heat and energy, factories could improve their efficiency by a staggering 80%. Not only would this dramatically reduce pollution, but the upgrades would pay for themselves in less than seven years by saving the facilities money.

Energy Efficiency on Streets and Highways

Traffic Lights: Better Bulbs
Just like efficiency upgrades at home save families money and efficiency upgrades at work save businesses overhead costs, using power smarter can save your local government needed room in the budget. Something as simple as switching to more efficient LED bulbs in traffic lights can save cities and towns as much as 50% in energy costs.

Check out our Green Tips Page (http://www.sierraclub.org/tips/) for more Energy-Saving ideas!

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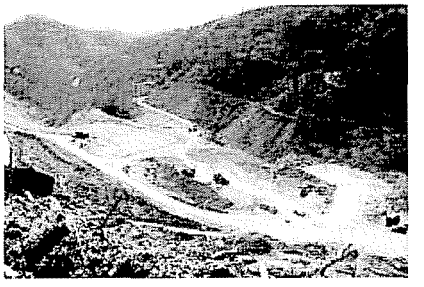
(#) 2 (#)



In Appalachia, mining companies blow the tops off mountains to reach a thin seam of coal. They then dump millions of tons of rubble and toxic waste into the streams and valleys below the mining sites.

This destructive practice, known as mountaintop-removal mining, has damaged or destroyed nearly 2,000 miles of streams and threatens to destroy 1.4 million acres of mountaintops and forests by 2020. The mining poisons drinking water, destroys beautiful forests and wildlife habitat, increases the risk of flooding and wipes out entire communities.

Who Gets Hurt

Mountaintop removal pollutes waterways and allows toxic heavy metals such as cadmium, selenium, and arsenic to leach into local water supplies -- the same water that Appalachia's people rely on. But the danger isn't limited to drinking water; mountaintop removal also causes air pollution that affects communities for miles around. Many of the toxins that pollute mountaintop-removal sites are carcinogens, and cancer rates are twice as high for people who live near mountaintop-removal sites.

The Future of Mountaintop Removal

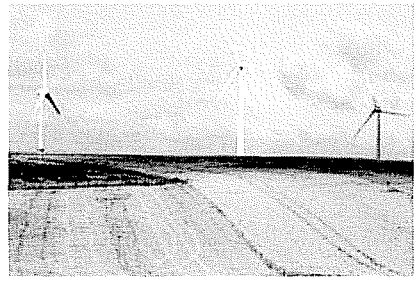
Ending mountaintop-removal mining and transitioning to clean energy will benefit Appalachia by creating good jobs in the clean-energy and tourism industries and by improving public health.

The EPA is evaluating the practice of mountaintop-removal mining and has slowed the permitting process for new mountaintop-removal sites. However, sites with existing permits continue to destroy Appalachian mountains, pollute waterways, and make people sick. You can get involved in the effort to stop mountaintop removal now and ensure protection for Appalachia and the families who call its mountains home.

(#) (#) (#) (#)
(#) 8 (#)

Clean and renewable energy presents an opportunity for America to become more energy independent and economically secure. Clean energy is the smart phone of electricity, it is sleeker and cheaper every day and it is making lives better by using today's technology to improve the way we live. As America's largest grassroots environmental organization, the Sierra Club is working to move America Beyond Coal – not just by retiring dirty, dangerous and increasingly expensive coal-fired power plants, but by making sure job-creating and money-saving clean energy solutions are being installed as coal rightly takes its place in our history books. Find out more about clean energy below.

Wind Energy



Wind energy is the fastest-growing source of power on the planet. With our tremendous wind resources - what some have deemed the 'Saudi Arabia of wind'- the United States can become a world leader in wind energy. It's no surprise that wind energy accounted for 93 percent of total installed renewable electricity capacity in 2008. In fact, in 2008 the United States surpassed Germany as the world leader in installed wind capacity. Iowa already gets 20 percent of its power from wind, and the Department of Energy says that we can get 20 percent of our power *as a nation* from wind energy alone by 2030.

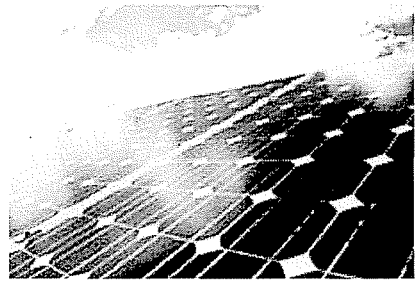
Wind is not only abundant; it is also an affordable and reliable source of energy. In the summer of 2011, when record heat waves in Texas threatened the reliability of the state's power grid, Texas turned to wind to provide the crucial power it needed to prevent blackouts.

As a growing power source, wind energy is a major sorce of economic development. Not only do farmers already harness the wind and sell the extra energy they generate for a profit, but wind farm development brings construction jobs, leasing royalties, and increased tax revenues to local communities. If the United States were to produce just 20 percent of its energy from the wind, roughly 800,000 jobs would be created, annual property tax revenues would increase to $1.5 billion, and annual payments to rural landowners would increase to $600 million by 2030.

How does it Work?

Standing as tall as 300 feet to capture the full force of the wind, modern wind turbines use state-of-the-art technology to turn wind into electricity. When the wind blows, the blades begin to spin, turning an electric generator to create electricity. This electricity is carried through the turbine tower underground, where it feeds into the electric grid.

Solar Energy



Solar energy is the cleanest, most abundant, renewable energy source available, and the U.S. has an ample and infinite supply of sun. With this tremendous potential, it is no surprise that solar is one of the fastest growing sectors of the American economy, with more than 5,500 solar companies employing people in every state in the Union. States across the country understand the promise of solar power and California, Nevada, New Jersey, and Colorado are all leading the way in domestic solar installations.

Solar is not only clean, it is affordable. In 2011, San Antonio discovered that solar had become so cost-effective that the city opted to scrap plans for a new coal-fired power plant and install a large-scale solar facility instead.

Solar is also a great way to create needed jobs in America. Generating power with solar creates seven times as many jobs as generating power with dirty, dangerous and increasingly expensive fossil fuels like coal.

How does it Work?

Solar technologies allow us to capture the sun's energy in two principal ways. Solar PV panels, which frequently sit atop buildings, convert sunlight directly into electricity. These solar panels are made of cutting-edge silicon materials, similar to those used in computer chips. As light passes through the panels, it creates a current which generates electricity. This process of converting light (photons) to electricity (voltage) gives us the photovoltaic effect.

Also currently in use are solar thermal systems, which use the sun's heat to warm water for our businesses and homes, and large-scale CSP systems, whichproduce energy at a central power plant using mirrors to reflect and concentrate sunlight onto receivers that collect the solar energy and convert it to heat. This heat can then be used to produce electricity via a steam turbine or heat engine driving a generator.

Geothermal Energy

Geothermal energy is right under our feet. The earth's core is like an inner sun, heating the earth's surface and warming the water and rocks beneath. This steaming water and rock can be used to generate heat and electricity. The uppermost six miles of the earth's crust alone contains more energy than all the oil and gas reserves in the world. Geothermal resources are reliable and are available 24 hours a day, 365 days a year.

The United States leads the world geothermal electricity capacity and generation, with most of that power installed in California. The U.S. Department of Energy estimates that geothermal power plants can provide15,000 MWs of new capacity within the next decade.

How does it work?

The most common form of geothermal power plant, a flash steam plant, uses high pressure pumps to send naturally heated water from under the ground to electricity generation equipment at the surface.

Getting Clean Energy Right. From the Start.

In order to end America's dependence on dirty, polluting energy like coal, we need to quickly expand all kinds of clean energy—from solar panels on homes to large-scale wind and solar projects located in places like California's desert.

Any large energy project brings potential to harm the wildlife and wild places the Sierra Club has worked to protect for more than a century. That's why we are working hard to ensure that the large clean energy projects we desperately need are built in the best possible way

—ensuring minimal damage to wildlife like desert tortoises and golden eagles. Sierra Club has worked closely with wildlife agencies and responsible developers to reconfigure energy projects and identify solutions to wildlife conflicts, and we will continue to do so.

Projects that are Smart from the Start are built on land that is already developed or disturbed—near roads and transmission lines, on degraded farmland or similar lands. They're designed so as to minimize conflict with sensitive plants and animals.

Developing large clean energy projects carefully won't always be easy—but it couldn't be more important. If we don't ramp up clean sources of energy quickly, we won't be able to impact climate disruption—*the single greatest threat to wildlife and wild places.* As the nation's oldest grassroots environmental organization, we have a responsibility and an important opportunity—to make sure that we get clean energy right, from the start.

DESIGNED BY UNION LABOR @ DESIGN ACTION
BUILT BY WORKER-OWNERS @ QUILTED

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Mercury is a potent neurotoxin that damages the brain and the nervous system. Exposure to mercury is especially dangerous for pregnant women and young children, as it can cause *developmental problems, learning disabilities, and delayed onset of walking and talking.*

President Obama and EPA Issue Strong Mercury Protections

On December 21, 2011, we are all applauding the Environmental Protection Agency and the Obama administration for issuing the first-ever nationwide protections against toxic mercury from dirty power plants. Hundreds of thousands of Americans spoke up for these vital safeguards via public comments, rallies, hearings, mercury teach-ins, and so much more. This is an epic victory we can all call our own.

These landmark protections will cut over 90 percent of this toxic pollutant from coal-fired power plants, and will dramatically clean up our nation's air and significantly reduce children's exposure to life-threatening and cancerous heavy metals and air toxics, including mercury, arsenic, and chromium.

Tell President Obama and EPA Administrator Lisa Jackson "thank you!" for putting families first and standing strong against the corporate polluters and industry lobbyists who tried to block these protections.

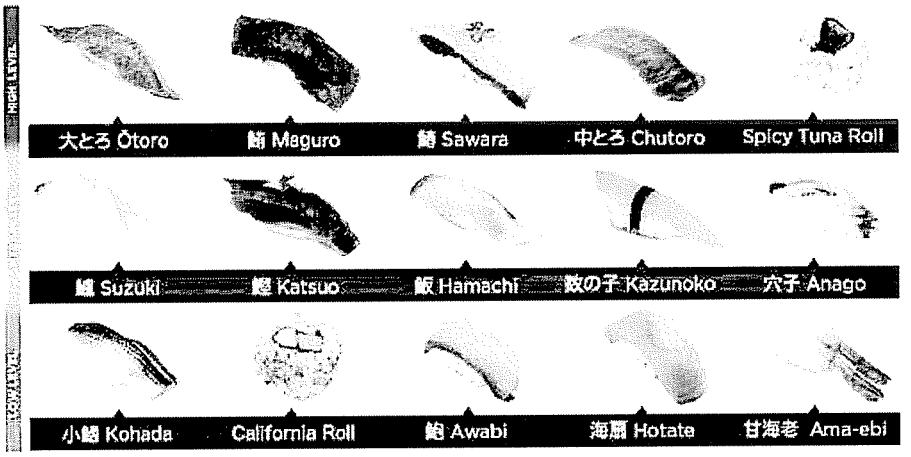
Thank President Obama!
(https://secure.sierraclub.org/site/Advocacy?cmd=display&page=UserAction&id=7555&s_src=611MSCZZ04)

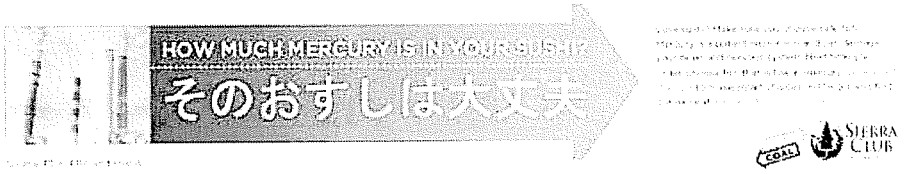
Safe Sushi

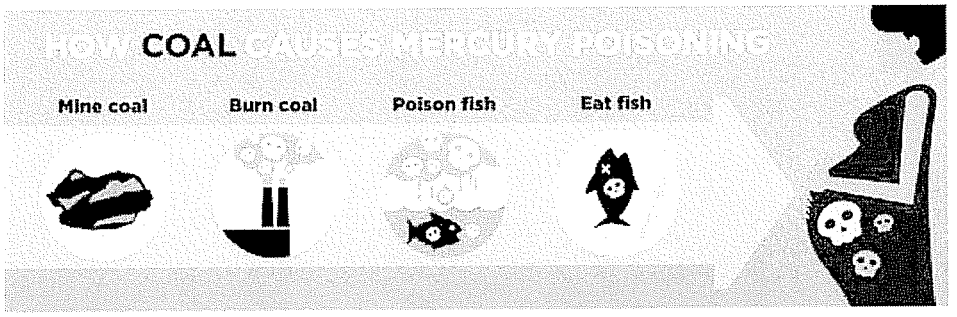
Love sushi? Next time you order, choose fish that is low in mercury. Check out our Safe Sushi poster (/sushiposter) and start making smart choices today!

Mercury Makes Us Sick

Coal-fired power plants are the largest domestic source of federally unregulated mercury pollution in the United States, emitting approximately 33 tons of toxic mercury each year [1 (#footnote-1)].







Find out more (http://www.sierraclub.org/sierra/201111/mercury.aspx).

[1] Madsen, Travis and L. Randall, "America's Biggest Mercury Polluters (http://www.environmentamerica.org/home/reports/report-archives/clean-air/clean-air/americas-biggest-polluters-how-cleaning-up-the-dirtiest-power-plants-will-protect-public-health)." Environment America Research & Policy Center and Frontier Group, November 2011. p. 12.

REQUEST NO. 5. Please produce all documents within the possession or control of the Sierra Club (subject to any legitimate claim of attorney-client privilege or work product protection) relating or referring to Big Sandy Unit 1 or Big Sandy Unit 2 or the subject matter of these proceedings.

RESPONSE NO. 5:

Sierra Club is providing documents responsive to this request, see attached.

Respondent: Kristin Henry, Sierra Club Counsel and Bruce Nilles, Sierra Club Deputy Conservation Director

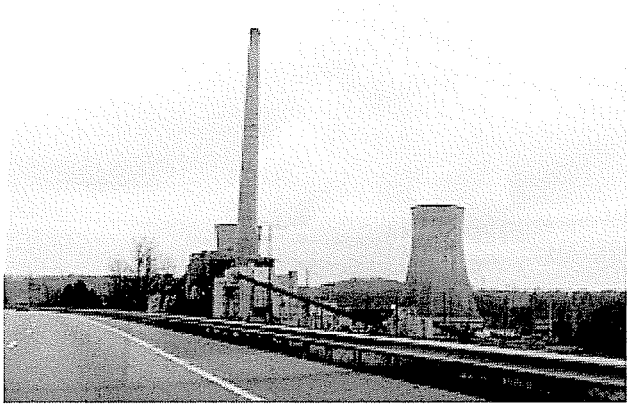
EARTHJUSTICE
Because the earth needs a good lawyer

Experts Challenge Decision to Retrofit Aging Coal-fired Power Plant

Conservation groups join Kentucky manufacturers, job creators, in urging retirement of Big Sandy coal plant
March 14, 2012
Frankfort, KY—
Conservation groups join Kentucky manufacturers, job creators, in urging retirement of Big Sandy coal plant
Frankfort, KY
Contact:
Shannon Fisk, Earthjustice, (215) 327-9922
Lauren McGrath, Sierra Club, (502) 742-4527
March 14, 2012

Sierra Club, represented by Earthjustice, submitted expert testimony challenging Kentucky Power Company's (KPC) plan to charge its ratepayers $940 million to retrofit the company's existing 816MW Big Sandy Unit 2 coal plant. The testimony from experts at Synapse Energy Economics was submitted to the Kentucky Public Service Commission which is considering KPC's plan. (Read testimony by Jeremy Fisher, Rick Hornby and Rachel Wilson.)

The experts found KPC made numerous errors in calculating that it would be most cost effective to pour close to one billion dollars into the aging Big Sandy plant. KPC initially claimed to agree that ratepayers would be best served if it closed the old, highly-polluting coal plant but later changed that decision. Customer rates will rise by more than 30 percent if the Kentucky Public Service Commission approves the plan to retrofit the Big Sandy coal plant.



Big Sandy coal plant. Expert testimony demonstrates that replacing the Big Sandy coal plant with energy efficiency, renewable energy, and cleaner natural gas generation would be a much better deal for ratepayers. (Chris M / Flickr)

Previously the Kentucky Industrial Utility Customers, a representative of major eastern Kentucky employers, including AK Steel, Air Products & Chemicals, and Marathon Petroleum, filed expert testimony similarly urging the Commission to reject Kentucky Power Company's proposal, given its impact on ratepayers. The Kentucky Attorney General also submitted testimony.

"There might not be many issues on which the Sierra Club agrees with the oil and chemical industry in eastern Kentucky," said Lauren McGrath, a representative of the Sierra Club. "But we agree on this—the best and cheapest way forward for Kentucky ratepayers is to retire the old Big Sandy plant."

Synapse Energy Economics' testimony demonstrates that replacing the Big Sandy coal plant with energy efficiency, renewable energy, and cleaner natural gas generation would be a much better deal for ratepayers.

"The evidence shows that Kentucky Power's $940 million rate increase would impose a large and unnecessary burden on Kentucky ratepayers," said Shannon Fisk, attorney for Earthjustice. "Let's save money and protect public health by retiring Big Sandy, replacing it with cleaner energy sources, and providing a fair transition for the Big Sandy workers and community."

A hearing in the proceeding is scheduled for April 16, 2012 at the Commission's offices in Frankfort, Kentucky.

The parties' testimony is available on the Commission's electronic docket, located at: http://psc.ky.gov/Home/Library?type=Cases&folder=2011%20cases/2011-00401

Contact:
Shannon Fisk, Earthjustice, (215) 327-9922
Lauren McGrath, Sierra Club, (502) 742-4527

URL: http://earthjustice.org/news/press/2012/experts-challenge-decision-to-retrofit-aging-coal-fired-power-plant

REQUEST NO. 6. Please refer to page 13, lines 5-7 of Mr. Hornby's testimony.

a. Please provide the bill number of the legislation proposing to establish a Renewable and Efficiency Portfolio Standard that is referenced in the identified testimony.

b. Has the identified legislation been enacted into law?

c. Are you aware of any bills introduced into prior sessions of the Kentucky General Assembly that would have established a state renewable or energy efficiency portfolio standard? If so, please identify any such bills and indicate whether they were enacted into law.

RESPONSE NO. 6:

a) House Bill 167, the Clean Energy Opportunity Act

b) No.

c) Yes. See attachment 1 – 6. In 2008 Governor Beshear proposed a seven point Energy Plan designed to achieve, among other objectives, a Renewable and Efficiency Portfolio Standard of 25 percent by 2025. In 2010, House Bill 3 was introduced to advance clean energy use and production. That bill was not enacted into law.

Witness: J. Richard Hornby

Governor Steve Beshear:
Intelligent Energy Choices for Kentucky's Future

CHALLENGES

- Kentucky's energy use is projected to grow by slightly more than 40 percent between now and 2025.
- Greenhouse gas (GHG) emissions could be more than 40 percent higher in 2025.
- Coal-fired power generation in the state will not sufficiently support Kentucky's coal industry if other states cease purchase of Kentucky coal.
- The nation's dependence on foreign energy supplies endangers our security.

STRATEGIES

Strategy 1: Improve the energy efficiency of Kentucky's homes, buildings, industries and transportation fleet.
Goal: Energy efficiency will offset at least 18 percent of Kentucky's projected 2025 energy demand.

Strategy 2: Increase Kentucky's use of renewable energy
Goal: By 2025, Kentucky's renewable energy generation will triple to provide the equivalent of 1,000 megawatts of clean energy while continuing to produce safe, abundant and affordable food, feed and fiber.

Strategy 3: Sustainably grow Kentucky's production of biofuels
Goal: By 2025, Kentucky will derive from biofuels 12 percent of its motor fuels demand, while continuing to produce safe, abundant and affordable food, feed and fiber.

Strategy 4: Develop a coal-to-liquids industry in Kentucky to replace petroleum-based liquids
Goal: Kentucky will develop a coal-to-liquids industry that will use 50 million tons of coal per year to produce four billion gallons of liquid fuel per year by 2025.

Strategy 5: Implement a major and comprehensive effort to increase gas supplies, including coal-to-gas in Kentucky
Goal: Kentucky will produce the equivalent of 100 percent of our annual natural gas requirement by 2025 by augmenting in-state natural gas production with synthetic natural gas from coal-to-gas processing.

Strategy 6: Initiate aggressive carbon capture/sequestration projects for coal-generated electricity in Kentucky
Goal: By 2025, Kentucky will have evaluated and deployed technologies for carbon management, with use in 50 percent of our coal-based energy applications.

Strategy 7: Examine the use of nuclear power for electricity generation in Kentucky
Goal: Nuclear power will be an important and growing component of the nation's energy mix and Kentucky must decide whether nuclear power will become a significant part of meeting the state's energy needs by 2025.

Strategies 1, 2 & 3 are designed to help the commonwealth achieve a proposed **Renewable and Efficiency Portfolio Standard**, whereby 25 percent of Kentucky's energy needs in 2025 will be met by reductions through energy efficiency and conservation and through the use of renewable resources.

Strategies 1, 3 & 4 include strategies to help the commonwealth achieve an **Alternative Transportation Fuel Standard** (ATFS) to help transition away from dependence on foreign petroleum, utilizing fuels such as those derived from biomass and coal, plug-in hybrid vehicles and compressed natural gas.

RESULTS

If enacted, the plan will:

- Provide 30,000-40,000 new Kentucky jobs as a result of a booming diversified energy sector.
- Achieve energy independence for Kentucky from imported oil.
- Produce annually approximately four billion gallons of liquid fuels from coal (utilizing about 50 million tons of coal annually).
- Produce annually 135 billion cubic feet of synthetic gas from coal (utilizing about nine million tons of coal annually) to augment Kentucky's natural gas supply.
- Reduce the net per capita carbon emissions into the atmosphere by 50 percent, while ensuring Kentucky's economic viability by protecting Kentucky's coal industry against negative impacts of federally mandated carbon management legislation.
- Optimize our renewable energy resources, utilizing wind, solar, hydropower, landfill gas, and biomass.
- Maintain current energy per capita use despite major energy growth requirements.

Kentucky Legislature

HB3

10RS

WWW Version

The hyperlink to a bill draft that precedes a summary contains the most recent version (Introduced/GA/Enacted) of the bill. If the session has ended, the hyperlink contains the latest version of the bill at the time of sine die adjournment. Note that the summary pertains to the bill as introduced, which is often different from the most recent version.

Includes opposite chamber sponsors where requested by primary sponsors of substantially similar bills in both chambers and jointly approved by the Committee on Committees of both chambers. Opposite chamber sponsors are represented in italics.

HB 3/LM (BR 465) - R. Adkins, T. Riner

AN ACT relating to the advancement of clean energy use and production.

Create new sections of KRS chapter 278 to define renewable energy resources and energy efficiency measures; set benchmarks for usage of efficiency measures, renewables and low-carbon resources; establish a market for clean energy certificates; permit deviation from the benchmarks under some circumstances; amend sections of KRS Chapter 42 to include renewable energy projects in the Bluegrass Turns Green program; amend sections of KRS chapter 154 to make energy storage and energy efficiency technology projects eligible to participate in Kentucky Alternative Fuel and Renewable Energy Fund Program; amend sections of KRS Chapter 154 to make facilities that make components or systems used in alternative fuel, gasification, renewable energy, or energy storage eligible to participate in the Incentives for Energy Independence Act; amend KRS 152.715 to include natural gas-derived liquid fuels in the definition of "alternative transportation fuels"; amend KRS 154.27-010, 154.27-020, and 154.27-060 to include natural gas or natural gas liquids as a permissible feedstock for an alternative transportation facility, and to establish a minimum investment level of $1,000,000 for such facilities; create a new section of KRS Chapter 143A to allow a severance tax credit for natural gas or natural gas liquids used as feedstock at an alternative transportation facility.

Mar 2-introduced in House
Mar 4-to Natural Resources & Environment (H)
Mar 5-posted in committee
Mar 17-taken from committee; 1st reading; returned to Natural Resources & Environment (H)

Legislature Home Page | Record Front Page

REQUEST NO. 7. Please refer to page 15 and Table 1 on page 17 of Dr. Fisher's testimony. Please provide all spreadsheets in electronic format—with all calculations operational and formulas intact and unprotected—that were utilized to determine the "Adjusted Off System Sales" value in Table 1. Also, please provide the specific Company source (i.e., filename and cell references) of the data from which it was derived.

RESPONSE NO. 7:

See Sierra Club response to KPSC 1-1b. Note that Dr. Fisher has revised his calculations to use an estimate of net revenues from OSS.

See attached workbook produced in both electronic and hard copy format entitled:

"Exhibit JIF-2, 3 & 6 Strategist_Compilation_Workbook_Synapse.xlsx"

Table 1 (also Exhibit JIF-3A) can be found on the tab titled "Exhibits JIF-3A-3F."

The lines with the header "Company Assumptions" are linked back to the tab entitled "Organization," which in turn draws from individual runs, which are compiled in tab "StratComp – Syn." This worksheet compiles output from Strategist runs and Company workbooks to create an analogous worksheet of those provided in the Company's response to KPSC discovery request #48, specifically file "Staff_1-48_(Ex SCW-4A-BASE Price Eval Detail)."

From Strategist, this worksheet draws in streams of:

- Fuel Costs (col Y),
- Contract Revenue (col Z),
- Market Revenue (col AA),
- total O&M (col AD, minus Base O&M-*see below*), and
- Value of Allowances consumed (col AG)

From other Company workbooks, re-produced in part here, the worksheet draws in:

- Carrying charges (col AC; source [1] below)
- Value of ICAP (col AI; source [2] below)
- Base O&M for calculating incremental O&M (col AD; source [3] below)

Company workbook sources:

1. Supplemental response to Sierra Club discovery request #69 "\FT-CSAPR 2-Pgrs\Levelized Retrofit Under FT_CSAPR.xls," tab "KPCO New Additions." Full Company tab functionality copied over to Synapse tab "Carrying Charges KPCO New Adds." Sections organized vertically in Company worksheet were organized horizontally in Synapse workbook. Finally, formula functionality was replicated for all sections of the Company tab "KPCO New Additions" except for rows 74-104, which were copied in full, including cell contents. The formula used to compile streams of carrying charges in Company cells R5:R34 was replicated and confirmed in the Synapse worksheet and appears in cells BC11:BC40. These carrying charges are carried into the Synapse tab "StratComp – Syn", column AC.

2. Supplemental response to Sierra Club discovery request #69 "\FT-CSAPR 2-Pgrs\Levelized Retrofit Under FT_CSAPR.xls", tab "KPCo": data in T12:T41 copied directly, formulas in S12:S41 replicated with correct columns. Columns of "minimum reserve margin" and "DRP_KPCO" are sourced from columns BP and J, respectively, in tab "Change3" of the same Company workbook.

3. Supplemental response to Sierra Club discovery request #69 "\FT-CSAPR 2-Pgrs\Levelized Retrofit Under FT_CSAPR.xls", tab "O&M" W34:W63.

For the purposes of the lines "Company Assumptions" in Table 1 (Exhibit 3A), the CPW is derived in cell AJ55, AJ102, AJ149, AJ196, and AJ243.

For lines "Adjusted Off System Sales", the CPW is derived from the same data as above, except Company assumed "Market Revenues" from Strategist are replaced with a formula adjusting gross or net OSS. As originally filed, the formulas for OSS sharing can be found in tab "StratComp-Syn" columns AT:AV. As corrected, the formulas for OSS sharing can be found in tab "StratComp-Syn" in columns AZ:BH.

Witness: Jeremy Fisher

Utility Discount Rate

8.64%

Run #	1
Name	Base - Option 1 (Syn Run)
Carrying Charge	1
Carrying Charge	1

Base - Option 1 (Syn Run)

		1	2
Base - Option 1 (Syn Run)			KPCO
Company Strategist Output - Direct ('000 Nominal $)			
Drop down menus to right ->		Total Fuel Cost (0)	Trans Purch Cost (0)
R	2011	198,123	(8,961)
S	2012	250,465	(18,972)
T	2013	227,817	(26,323)
U	2014	276,568	(34,021)
V	2015	275,723	(39,224)
W	2016	165,006	(39,465)
X	2017	236,355	(39,644)
Y	2018	254,318	(39,861)
R	2019	242,101	(40,083)
S	2020	257,392	(40,346)
T	2021	263,061	(54,808)
U	2022	252,602	(55,366)
V	2023	225,510	(55,937)
W	2024	255,531	(56,613)
X	2025	336,073	(57,117)
Y	2026	354,700	(57,727)
R	2027	351,083	(58,351)
S	2028	370,369	(59,090)
T	2029	370,732	(59,641)
U	2030	367,888	(60,308)
V	2031	388,156	(60,990)
W	2032	406,168	(61,798)
X	2033	411,019	(62,400)
Y	2034	394,818	(63,129)
R	2035	408,588	(63,875)
S	2036	413,597	(64,757)
T	2037	426,893	(65,416)
U	2038	423,004	(66,213)
V	2039	432,896	(67,028)
W	2040	431,457	(67,993)

Base - Option 2 (Syn Run)

Run #	2
Name	Base - Option 2 (Syn Run)
Carrying Charge	2
Carrying Charge	2

			1	2
		Base - Option 2 (Syn Run)		KPCO
		Company Strategist Output - Direct ('000 Nominal $)		
		Drop down menus to right ->	Total Fuel Cost (0)	Trans Purch Cost (0)
R		2011	198,123	(8,961)
S		2012	250,465	(18,972)
T		2013	227,817	(26,323)
U		2014	276,568	(34,021)
V		2015	275,723	(39,224)
W		2016	265,889	(39,465)
X		2017	264,882	(39,644)
Y		2018	276,542	(39,861)
R		2019	275,803	(40,083)
S		2020	281,619	(40,346)
T		2021	290,148	(54,808)
U		2022	302,092	(55,366)
V		2023	300,374	(55,937)
W		2024	313,032	(56,613)
X		2025	397,097	(57,117)
Y		2026	414,742	(57,727)
R		2027	421,946	(58,351)
S		2028	433,805	(59,090)
T		2029	441,579	(59,641)
U		2030	451,055	(60,308)
V		2031	460,422	(60,990)
W		2032	471,622	(61,798)
X		2033	475,881	(62,400)
Y		2034	490,443	(63,129)
R		2035	488,661	(63,875)
S		2036	497,150	(64,757)
T		2037	505,038	(65,416)
U		2038	504,709	(66,213)
V		2039	514,193	(67,028)
W		2040	515,003	(67,993)

Run #	3
Name	Base - Option 3 (Syn Run)
Carrying Charge	3
Carrying Charge	3

Base - Option 3 (Syn Run)

		1	2
	Base - Option 3 (Syn Run)		KPCO
	Company Strategist Output - Direct ('000 Nominal $)		
	Drop down menus to right ->	Total Fuel Cost (0)	Trans Purch Cost (0)
R	2011	198,123	(8,961)
S	2012	250,465	(18,972)
T	2013	227,817	(26,323)
U	2014	276,568	(34,021)
V	2015	306,568	(39,224)
W	2016	261,948	(39,465)
X	2017	261,110	(39,644)
Y	2018	272,816	(39,861)
R	2019	271,831	(40,083)
S	2020	277,705	(40,346)
T	2021	285,928	(54,808)
U	2022	297,848	(55,366)
V	2023	295,719	(55,937)
W	2024	308,264	(56,613)
X	2025	393,703	(57,117)
Y	2026	410,118	(57,727)
R	2027	417,943	(58,351)
S	2028	429,257	(59,090)
T	2029	436,546	(59,641)
U	2030	446,505	(60,308)
V	2031	455,573	(60,990)
W	2032	466,718	(61,798)
X	2033	473,614	(62,400)
Y	2034	483,685	(63,129)
R	2035	483,602	(63,875)
S	2036	491,883	(64,757)
T	2037	500,999	(65,416)
U	2038	499,784	(66,213)
V	2039	509,032	(67,028)
W	2040	511,478	(67,993)

Fuel Cost

Run #	4
Name	FT-CSAPR Option 4 to 2020
Carrying Charge	4
Carrying Charge	4A

FT-CSAPR Option 4 to 2020

		1	2
FT-CSAPR Option 4 to 2020			KPCO
Company Strategist Output - Direct ('000 Nominal $)			
Drop down menus to right ->		Total Fuel Cost (0)	Trans Purch Cost (0)
R	2011	198,123	(8,961)
S	2012	250,465	(18,972)
T	2013	227,817	(26,323)
U	2014	276,567	(34,021)
V	2015	275,723	(39,224)
W	2016	72,505	(39,465)
X	2017	69,730	(39,644)
Y	2018	76,949	(39,861)
R	2019	71,023	(40,083)
S	2020	281,618	(40,346)
T	2021	290,148	(54,808)
U	2022	302,092	(55,366)
V	2023	300,374	(55,937)
W	2024	313,032	(56,613)
X	2025	397,097	(57,117)
Y	2026	414,742	(57,727)
R	2027	421,946	(58,351)
S	2028	433,804	(59,090)
T	2029	441,578	(59,641)
U	2030	451,055	(60,308)
V	2031	460,422	(60,990)
W	2032	471,622	(61,798)
X	2033	475,880	(62,400)
Y	2034	490,443	(63,129)
R	2035	488,660	(63,875)
S	2036	497,150	(64,757)
T	2037	505,038	(65,416)
U	2038	504,709	(66,213)
V	2039	514,193	(67,028)
W	2040	515,003	(67,993)
		Fuel Cost	

Run #	5
Name	FT-CSAPR Option 4 to 2025

FT-CSAPR Option 4 to 2025

Carrying Charge 5
Carrying Charge 4B

		1	2
FT-CSAPR Option 4 to 2025			KPCO
Company Strategist Output - Direct ('000 Nominal $)			
Drop down menus to right ->		Total Fuel Cost (0)	Trans Purch Cost (0)
R	2011	198,123	(8,961)
S	2012	250,465	(18,972)
T	2013	227,817	(26,323)
U	2014	276,567	(34,021)
V	2015	275,723	(39,224)
W	2016	72,505	(39,465)
X	2017	69,730	(39,644)
Y	2018	76,949	(39,861)
R	2019	71,023	(40,083)
S	2020	75,257	(40,346)
T	2021	76,468	(54,808)
U	2022	76,760	(55,366)
V	2023	69,002	(55,937)
W	2024	72,372	(56,613)
X	2025	397,097	(57,117)
Y	2026	414,742	(57,727)
R	2027	421,946	(58,351)
S	2028	433,804	(59,090)
T	2029	441,578	(59,641)
U	2030	451,055	(60,308)
V	2031	460,422	(60,990)
W	2032	471,622	(61,798)
X	2033	475,880	(62,400)
Y	2034	490,443	(63,129)
R	2035	488,660	(63,875)
S	2036	497,150	(64,757)
T	2037	505,038	(65,416)
U	2038	504,709	(66,213)
V	2039	514,193	(67,028)
W	2040	515,003	(67,993)
		Fuel Cost	

Run #	6
Name	Syn Low CO2 - Option 1
Carrying Charge	1

Carrying Charge 1

Syn Low CO2 - Option 1

		1	2
Syn Low CO2 - Option 1			KPCO
Company Strategist Output - Direct ('000 Nominal $)			
Drop down menus to right ->		Total Fuel Cost (0)	Trans Purch Cost (0)
R	2011	198,123	(8,961)
S	2012	250,465	(18,972)
T	2013	227,817	(26,323)
U	2014	276,568	(34,021)
V	2015	275,723	(39,224)
W	2016	165,006	(39,465)
X	2017	236,355	(39,644)
Y	2018	254,318	(39,861)
R	2019	242,101	(40,083)
S	2020	246,299	(40,346)
T	2021	250,710	(54,808)
U	2022	249,051	(55,366)
V	2023	221,446	(55,937)
W	2024	249,751	(56,613)
X	2025	326,778	(57,117)
Y	2026	359,332	(57,727)
R	2027	337,306	(58,351)
S	2028	366,951	(59,090)
T	2029	372,003	(59,641)
U	2030	352,317	(60,308)
V	2031	386,052	(60,990)
W	2032	391,883	(61,798)
X	2033	394,418	(62,400)
Y	2034	386,954	(63,129)
R	2035	410,479	(63,875)
S	2036	413,180	(64,757)
T	2037	419,996	(65,416)
U	2038	431,000	(66,213)
V	2039	426,707	(67,028)
W	2040	440,821	(67,993)
		Fuel Cost	

Run #	7
Name	Syn Low CO2 - Option 2
Carrying Charge	2
Carrying Charge	2

Syn Low CO2 - Option 2

	Syn Low CO2 - Option 2	1	2
			KPCO
	Company Strategist Output - Direct ('000 Nominal $)		
	Drop down menus to right ->	Total Fuel Cost (0)	Trans Purch Cost (0)
R	2011	198,123	(8,961)
S	2012	250,465	(18,972)
T	2013	227,817	(26,323)
U	2014	276,568	(34,021)
V	2015	275,723	(39,224)
W	2016	265,889	(39,465)
X	2017	264,882	(39,644)
Y	2018	276,542	(39,861)
R	2019	275,803	(40,083)
S	2020	273,375	(40,346)
T	2021	280,376	(54,808)
U	2022	298,588	(55,366)
V	2023	296,332	(55,937)
W	2024	307,854	(56,613)
X	2025	346,492	(57,117)
Y	2026	344,473	(57,727)
R	2027	354,743	(58,351)
S	2028	354,127	(59,090)
T	2029	346,743	(59,641)
U	2030	349,187	(60,308)
V	2031	354,218	(60,990)
W	2032	359,419	(61,798)
X	2033	352,935	(62,400)
Y	2034	357,865	(63,129)
R	2035	361,746	(63,875)
S	2036	363,735	(64,757)
T	2037	364,209	(65,416)
U	2038	370,426	(66,213)
V	2039	374,502	(67,028)
W	2040	374,833	(67,993)
		Fuel Cost	

Run #	8
Name	Syn Low CO2 - Option 4a
Carrying Charge	4
Carrying Charge	4A

Syn Low CO2 - Option 4a

		1	2
	Syn Low CO2 - Option 4a		KPCO
	Company Strategist Output - Direct ('000 Nominal $)		
	Drop down menus to right ->	Total Fuel Cost (0)	Trans Purch Cost (0)
R	2011	198,123	(8,961)
S	2012	250,465	(18,972)
T	2013	227,817	(26,323)
U	2014	276,568	(34,021)
V	2015	275,723	(39,224)
W	2016	72,505	(39,465)
X	2017	69,730	(39,644)
Y	2018	76,949	(39,861)
R	2019	71,023	(40,083)
S	2020	273,375	(40,346)
T	2021	280,376	(54,808)
U	2022	298,588	(55,366)
V	2023	296,332	(55,937)
W	2024	307,854	(56,613)
X	2025	376,884	(57,117)
Y	2026	391,240	(57,727)
R	2027	394,266	(58,351)
S	2028	399,309	(59,090)
T	2029	413,258	(59,641)
U	2030	431,608	(60,308)
V	2031	439,927	(60,990)
W	2032	449,620	(61,798)
X	2033	451,687	(62,400)
Y	2034	447,932	(63,129)
R	2035	438,492	(63,875)
S	2036	439,990	(64,757)
T	2037	457,574	(65,416)
U	2038	452,526	(66,213)
V	2039	457,901	(67,028)
W	2040	459,170	(67,993)
		Fuel Cost	

3	4	5	6	7	8
Trans Sales Rev. (0)	Emer Energy Cost (0)	Econ Energy Purch (0)	Econ Energy Sales (0)	Fixed O&M Cost (0)	Var. O&M Cost (0)
3,788	(7,614)	(11,563)	52,478	38,825	12,073
3,923	(6,135)	(2,465)	98,389	30,755	14,140
1,783	(5,613)	(25,321)	62,692	39,524	11,695
872	(5,073)	(20,926)	79,152	46,569	14,063
1,235	(13,099)	(12,039)	57,102	180,128	19,051
1,141	(9,730)	(123,927)	38,706	60,787	48,827
1,744	(15,927)	(16,990)	45,362	101,878	69,665
2,411	(17,407)	(9,295)	60,402	110,859	76,021
2,393	(19,218)	(19,742)	42,560	103,412	73,309
2,344	(20,753)	(11,095)	61,123	102,052	70,890
2,398	(20,449)	(9,712)	67,203	105,154	73,134
2,458	(20,985)	(24,039)	68,111	108,774	70,397
2,519	(19,113)	(57,931)	30,750	113,764	61,640
2,588	(23,422)	(27,681)	48,955	116,140	73,413
2,647	(6,400)	(11,525)	147,664	128,020	78,676
2,713	(6,847)	(8,358)	165,337	130,509	86,625
2,781	(7,290)	(19,987)	154,502	134,343	82,006
2,856	(7,510)	(10,355)	166,958	137,335	90,286
2,921	(8,342)	(12,773)	154,577	141,743	87,110
2,995	(7,002)	(37,295)	155,475	145,027	84,866
3,069	(8,933)	(14,027)	158,856	99,738	95,093
3,153	(8,454)	(9,175)	179,061	98,216	96,843
3,225	(9,266)	(13,121)	176,763	97,830	99,009
3,305	(9,615)	(37,534)	147,960	99,253	90,770
3,388	(12,254)	(21,276)	144,082	101,730	96,670
3,480	(12,723)	(24,185)	144,617	100,983	102,350
3,560	(12,851)	(21,951)	154,908	100,057	102,946
3,649	(15,011)	(24,725)	131,734	101,954	104,671
3,740	(14,855)	(25,648)	139,177	102,544	105,363
3,841	(16,039)	(38,074)	127,580	343,122	107,438

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Trans Sales Rev. (0)	Emer Energy Cost (0)	Econ Energy Purch (0)	Econ Energy Sales (0)	Fixed O&M Cost (0)	Var. O&M Cost (0)
3,788	(7,614)	(11,563)	52,478	38,825	12,073
3,923	(6,135)	(2,465)	98,389	30,755	14,140
1,783	(5,613)	(25,321)	62,692	39,524	11,695
872	(5,073)	(20,926)	79,152	46,569	14,063
1,235	(13,099)	(12,039)	57,102	180,128	19,051
1,141	(9,867)	(27,945)	22,784	33,678	32,797
1,744	(8,527)	(37,217)	17,458	42,117	34,280
2,411	(9,244)	(31,252)	20,564	43,036	37,746
2,393	(9,039)	(42,590)	17,866	43,505	37,480
2,344	(9,515)	(32,225)	22,257	45,181	32,243
2,398	(9,602)	(30,439)	25,439	46,219	33,674
2,458	(10,479)	(35,413)	29,556	48,062	33,814
2,519	(9,917)	(53,908)	20,843	51,185	31,423
2,588	(10,257)	(52,436)	22,549	52,006	35,769
2,647	(3,564)	(22,834)	127,556	62,251	43,299
2,713	(4,111)	(18,575)	125,504	63,007	46,025
2,781	(4,159)	(21,977)	131,760	64,880	45,916
2,856	(4,587)	(22,127)	126,000	66,064	48,088
2,921	(5,660)	(24,554)	118,331	68,777	44,873
2,995	(5,132)	(24,436)	130,655	70,040	49,227
3,069	(6,076)	(28,316)	124,931	71,066	51,491
3,153	(5,675)	(25,787)	140,262	70,862	51,760
3,225	(6,480)	(26,861)	134,750	73,144	53,348
3,305	(7,351)	(23,155)	134,483	73,195	53,859
3,388	(8,690)	(33,781)	115,512	74,847	51,150
3,480	(9,466)	(33,003)	116,043	74,121	56,299
3,560	(9,093)	(29,372)	119,278	73,244	56,065
3,649	(10,336)	(37,460)	106,128	75,435	57,634
3,740	(10,482)	(35,825)	108,854	75,493	57,688
3,841	(11,367)	(45,498)	97,876	138,998	59,487

3	4	5	6	7	8
Trans Sales Rev. (0)	Emer Energy Cost (0)	Econ Energy Purch (0)	Econ Energy Sales (0)	Fixed O&M Cost (0)	Var. O&M Cost (0)
3,788	(7,614)	(11,563)	52,478	38,825	12,073
3,923	(6,135)	(2,465)	98,389	30,755	14,140
1,783	(5,613)	(25,321)	62,692	39,524	11,695
872	(5,073)	(20,926)	79,152	46,569	14,063
1,235	(7,531)	(5,177)	98,751	224,035	20,667
1,141	(9,482)	(30,700)	20,280	33,858	32,523
1,744	(8,121)	(40,288)	15,530	42,470	33,919
2,411	(8,721)	(34,024)	18,344	43,567	37,351
2,393	(8,141)	(46,131)	15,840	44,226	37,149
2,344	(8,874)	(35,154)	19,871	46,089	31,912
2,398	(9,116)	(33,250)	22,767	47,318	33,322
2,458	(10,058)	(38,674)	26,764	49,364	33,425
2,519	(9,217)	(58,391)	18,563	52,694	31,001
2,588	(9,548)	(56,915)	20,119	53,727	35,344
2,647	(3,842)	(22,785)	122,441	64,190	42,962
2,713	(4,422)	(19,305)	119,845	65,153	45,616
2,781	(4,434)	(22,120)	126,154	67,253	45,526
2,856	(4,879)	(22,793)	120,350	68,670	47,650
2,921	(5,971)	(25,628)	112,598	71,621	44,348
2,995	(5,502)	(24,863)	124,712	73,128	48,751
3,069	(6,396)	(29,234)	119,064	74,410	50,984
3,153	(6,065)	(26,494)	134,021	74,463	51,249
3,225	(6,875)	(25,967)	129,032	77,019	52,985
3,305	(7,675)	(24,481)	126,515	77,336	53,139
3,388	(9,123)	(34,802)	109,147	79,262	50,612
3,480	(9,895)	(33,997)	109,347	78,645	55,737
3,560	(9,485)	(29,665)	113,204	77,893	55,613
3,649	(10,677)	(38,671)	99,712	80,196	57,101
3,740	(10,996)	(37,115)	102,244	80,376	57,133
3,841	(11,873)	(46,189)	92,515	174,015	59,082
Contract Revenue		Market Revenue / Cost		O&M	

3	4	5	6	7	8
Trans Sales Rev. (0)	Emer Energy Cost (0)	Econ Energy Purch (0)	Econ Energy Sales (0)	Fixed O&M Cost (0)	Var. O&M Cost (0)
3,788	(7,614)	(11,563)	52,477	38,825	12,073
3,923	(6,135)	(2,465)	98,389	30,755	14,140
1,783	(5,613)	(25,321)	62,692	39,524	11,695
872	(5,073)	(20,926)	79,152	46,569	14,063
1,235	(13,099)	(12,039)	57,101	180,128	19,051
1,141	(1,610)	(262,595)	0	11,859	21,255
1,744	(421)	(276,013)	0	14,529	19,611
2,411	(471)	(270,260)	0	15,022	22,840
2,393	(489)	(290,487)	0	15,056	22,191
2,344	(9,536)	(32,209)	22,257	45,181	32,243
2,398	(9,602)	(30,439)	25,439	46,219	33,674
2,458	(10,479)	(35,413)	29,556	48,062	33,813
2,519	(9,917)	(53,908)	20,842	51,185	31,423
2,588	(10,280)	(52,417)	22,548	52,006	35,769
2,647	(3,564)	(22,834)	127,555	62,251	43,299
2,713	(4,111)	(18,575)	125,504	63,007	46,025
2,781	(4,159)	(21,977)	131,759	64,880	45,916
2,856	(4,587)	(22,127)	126,000	66,064	48,088
2,921	(5,660)	(24,554)	118,331	68,777	44,873
2,995	(5,132)	(24,436)	130,654	70,040	49,227
3,069	(6,076)	(28,316)	124,931	71,066	51,491
3,153	(5,675)	(25,787)	140,261	70,862	51,760
3,225	(6,480)	(26,861)	134,749	73,144	53,348
3,305	(7,351)	(23,155)	134,483	73,195	53,859
3,388	(8,690)	(33,781)	115,511	74,847	51,150
3,480	(9,466)	(33,003)	116,042	74,121	56,299
3,560	(9,093)	(29,372)	119,277	73,244	56,065
3,649	(10,336)	(37,460)	106,127	75,435	57,634
3,740	(10,482)	(35,825)	108,853	75,493	57,688
3,841	(11,367)	(45,498)	97,876	138,998	59,487
Contract Revenue		Market Revenue / Cost		O&M	

3	4	5	6	7	8

Trans Sales Rev. (0)	Emer Energy Cost (0)	Econ Energy Purch (0)	Econ Energy Sales (0)	Fixed O&M Cost (0)	Var. O&M Cost (0)
3,788	(7,614)	(11,563)	52,477	38,825	12,073
3,923	(6,135)	(2,465)	98,389	30,755	14,140
1,783	(5,613)	(25,321)	62,692	39,524	11,695
872	(5,073)	(20,926)	79,152	46,569	14,063
1,235	(13,099)	(12,039)	57,101	180,128	19,051
1,141	(1,610)	(262,595)	0	11,859	21,255
1,744	(421)	(276,013)	0	14,529	19,611
2,411	(471)	(270,260)	0	15,022	22,840
2,393	(489)	(290,487)	0	15,056	22,191
2,344	(13)	(279,386)	0	16,283	16,598
2,398	(538)	(279,891)	0	16,856	17,657
2,458	(322)	(327,351)	0	18,227	17,205
2,519	(24)	(360,111)	0	20,862	14,425
2,588	(1,511)	(367,599)	0	21,172	18,252
2,647	(3,564)	(22,834)	127,555	62,251	43,299
2,713	(4,111)	(18,575)	125,504	63,007	46,025
2,781	(4,159)	(21,977)	131,759	64,880	45,916
2,856	(4,587)	(22,127)	126,000	66,064	48,088
2,921	(5,660)	(24,554)	118,331	68,777	44,873
2,995	(5,132)	(24,436)	130,654	70,040	49,227
3,069	(6,076)	(28,316)	124,931	71,066	51,491
3,153	(5,675)	(25,787)	140,261	70,862	51,760
3,225	(6,480)	(26,861)	134,749	73,144	53,348
3,305	(7,351)	(23,155)	134,483	73,195	53,859
3,388	(8,690)	(33,781)	115,511	74,847	51,150
3,480	(9,466)	(33,003)	116,042	74,121	56,299
3,560	(9,093)	(29,372)	119,277	73,244	56,065
3,649	(10,336)	(37,460)	106,127	75,435	57,634
3,740	(10,482)	(35,825)	108,853	75,493	57,688
3,841	(11,367)	(45,498)	97,876	138,998	59,487

Contract Revenue	Market Revenue / Cost	O&M

3	4	5	6	7	8
Trans Sales Rev. (0)	Emer Energy Cost (0)	Econ Energy Purch (0)	Econ Energy Sales (0)	Fixed O&M Cost (0)	Var. O&M Cost (0)
3,788	(7,614)	(11,563)	52,478	38,825	12,073
3,923	(6,135)	(2,465)	98,389	30,755	14,140
1,783	(5,613)	(25,321)	62,692	39,524	11,695
872	(5,073)	(20,926)	79,152	46,569	14,063
1,235	(13,099)	(12,039)	57,102	180,128	19,051
1,141	(9,730)	(123,927)	38,706	60,787	48,827
1,744	(15,927)	(16,990)	45,362	101,878	69,665
2,411	(17,407)	(9,295)	60,402	110,859	76,021
2,393	(19,218)	(19,742)	42,560	103,412	73,309
2,344	(17,166)	(18,221)	44,044	102,052	67,175
2,398	(16,473)	(17,724)	48,337	105,154	69,011
2,458	(20,105)	(26,809)	62,420	108,774	69,188
2,519	(17,056)	(64,036)	26,299	113,764	60,260
2,588	(20,445)	(35,238)	41,351	116,140	71,454
2,647	(5,983)	(37,879)	124,569	128,020	63,257
2,713	(6,736)	(18,449)	141,998	130,509	74,169
2,781	(7,040)	(44,373)	118,710	134,343	65,210
2,856	(7,222)	(28,763)	133,267	137,335	74,828
2,921	(8,159)	(28,944)	123,003	141,743	72,540
2,995	(6,691)	(62,638)	114,426	145,027	68,349
3,069	(8,270)	(35,489)	124,587	99,738	79,750
3,153	(7,698)	(41,511)	133,990	98,216	77,627
3,225	(8,233)	(43,064)	122,042	97,830	79,056
3,305	(8,512)	(63,788)	112,458	99,253	75,677
3,388	(10,028)	(44,567)	106,504	101,730	81,137
3,480	(10,521)	(49,533)	101,469	100,983	85,288
3,560	(10,860)	(54,836)	107,121	100,057	83,900
3,649	(12,518)	(49,923)	95,697	101,954	88,971
3,740	(12,457)	(68,069)	95,469	102,544	85,029
3,841	(12,543)	(63,136)	87,120	343,122	91,225
Contract Revenue		Market Revenue / Cost		O&M	

3	4	5	6	7	8
Trans Sales Rev. (0)	Emer Energy Cost (0)	Econ Energy Purch (0)	Econ Energy Sales (0)	Fixed O&M Cost (0)	Var. O&M Cost (0)
3,788	(7,614)	(11,563)	52,478	38,825	12,073
3,923	(6,135)	(2,465)	98,389	30,755	14,140
1,783	(5,613)	(25,321)	62,692	39,524	11,695
872	(5,073)	(20,926)	79,152	46,569	14,063
1,235	(13,099)	(12,039)	57,102	180,128	19,051
1,141	(9,867)	(27,945)	22,784	33,678	32,797
1,744	(8,527)	(37,217)	17,458	42,117	34,280
2,411	(9,244)	(31,252)	20,564	43,036	37,746
2,393	(9,039)	(42,590)	17,866	43,505	37,480
2,344	(7,833)	(38,955)	16,630	45,181	31,538
2,398	(7,763)	(38,114)	18,649	46,219	32,847
2,458	(9,726)	(38,522)	27,197	48,062	33,522
2,519	(9,040)	(58,196)	18,912	51,185	31,087
2,588	(9,136)	(57,936)	20,125	52,006	35,345
2,647	(878)	(43,035)	31,507	58,141	38,965
2,713	(857)	(55,643)	25,761	58,783	40,127
2,781	(879)	(52,505)	26,658	60,538	40,201
2,856	(764)	(70,815)	22,859	61,601	40,787
2,921	(713)	(103,292)	16,727	64,190	33,196
2,995	(735)	(107,871)	16,288	65,326	34,013
3,069	(821)	(122,056)	14,641	66,219	37,141
3,153	(729)	(115,958)	14,848	65,877	35,258
3,225	(736)	(142,174)	12,135	68,015	33,057
3,305	(655)	(149,068)	11,211	67,917	33,352
3,388	(713)	(169,899)	9,889	69,418	34,095
3,480	(775)	(179,934)	9,799	68,536	37,525
3,560	(715)	(186,634)	9,831	67,495	34,933
3,649	(702)	(198,437)	9,805	69,518	38,161
3,740	(645)	(208,444)	10,559	69,404	36,345
3,841	(602)	(229,954)	11,235	132,731	38,997
Contract Revenue		Market Revenue / Cost		O&M	

3	4	5	6	7	8
Trans Sales Rev. (0)	Emer Energy Cost (0)	Econ Energy Purch (0)	Econ Energy Sales (0)	Fixed O&M Cost (0)	Var. O&M Cost (0)
3,788	(7,614)	(11,563)	52,478	38,825	12,073
3,923	(6,135)	(2,465)	98,389	30,755	14,140
1,783	(5,613)	(25,321)	62,692	39,524	11,695
872	(5,073)	(20,926)	79,152	46,569	14,063
1,235	(13,099)	(12,039)	57,102	180,128	19,051
1,141	(1,610)	(262,595)	0	11,859	21,255
1,744	(421)	(276,013)	0	14,529	19,611
2,411	(471)	(270,259)	0	15,022	22,840
2,393	(488)	(290,487)	0	15,056	22,191
2,344	(7,833)	(38,955)	16,630	45,181	31,538
2,398	(7,763)	(38,114)	18,649	46,219	32,847
2,458	(9,726)	(38,522)	27,197	48,062	33,522
2,519	(9,040)	(58,196)	18,912	51,185	31,087
2,588	(9,136)	(57,936)	20,125	52,006	35,345
2,647	(3,376)	(32,969)	111,169	62,251	41,673
2,713	(3,819)	(29,420)	105,407	63,007	44,037
2,781	(3,795)	(36,372)	108,616	64,880	43,197
2,856	(4,137)	(46,135)	100,665	66,064	43,702
2,921	(4,983)	(55,177)	95,391	68,777	38,026
2,995	(4,488)	(53,237)	101,667	70,040	39,626
3,069	(5,439)	(65,615)	95,526	71,066	39,891
3,153	(4,912)	(59,233)	104,272	70,862	40,344
3,225	(5,184)	(67,241)	89,821	73,144	38,577
3,305	(5,496)	(74,089)	80,147	73,195	37,853
3,388	(6,196)	(100,222)	66,747	74,847	37,022
3,480	(6,182)	(114,994)	58,497	74,121	37,811
3,560	(6,118)	(114,932)	56,574	73,244	39,489
3,649	(6,522)	(140,145)	46,758	75,435	39,225
3,740	(6,583)	(148,132)	44,491	75,493	39,663
3,841	(6,364)	(170,487)	38,728	138,998	40,050
Contract Revenue		Market Revenue / Cost		O&M	

9	10	11	12	13
Total Emiss. Cost (0)	Total Sys. Cost (0)	Installed Capacity (MW)	Peak Load (MW)	Reserve Margin (MW)
7,418	228,313	1,115	1,033	82
86,954	307,574	1,316	1,251	65
51,659	323,476	1,317	1,257	60
102,595	419,791	1,387	1,243	144
29,797	510,724	1,108	1,234	(126)
2,302	410,197	373	1,213	(840)
1,511	434,864	1,116	1,198	(82)
626	445,573	1,115	1,207	(92)
572	453,484	1,119	1,218	(99)
0	439,059	1,117	1,224	(107)
0	456,718	1,131	1,238	(107)
108,290	569,884	1,131	1,249	(118)
96,073	596,699	1,131	1,255	(124)
106,998	608,256	1,131	1,264	(133)
116,552	584,052	1,538	1,281	257
122,595	599,312	1,538	1,293	245
119,821	615,600	1,538	1,305	233
125,870	631,000	1,538	1,315	223
124,788	647,630	1,538	1,324	214
121,007	664,924	1,538	1,335	203
128,489	633,501	1,538	1,348	190
135,793	634,232	1,538	1,357	181
136,812	649,471	1,530	1,372	158
127,901	671,756	1,530	1,378	152
133,275	690,198	1,534	1,389	145
135,608	706,106	1,534	1,399	135
141,194	712,843	1,534	1,415	119
139,015	739,210	1,534	1,427	107
143,353	748,770	1,534	1,438	96
141,291	1,013,992	1,534	1,436	98

|Value -Emissions|

9	10	11	12	13
Total Emiss. Cost (0)	Total Sys. Cost (0)	Installed Capacity (MW)	Peak Load (MW)	Reserve Margin (MW)
7,418	228,313	1,115	1,033	82
86,954	307,574	1,316	1,251	65
51,659	323,476	1,317	1,257	60
102,595	419,791	1,387	1,243	144
29,797	510,724	1,108	1,234	(126)
1,730	387,446	1,277	1,213	64
983	408,446	1,276	1,198	78
398	415,105	1,278	1,207	71
356	428,597	1,286	1,218	68
0	416,527	1,288	1,224	64
0	437,052	1,303	1,238	65
65,933	519,145	1,303	1,249	54
61,817	541,199	1,303	1,255	48
63,787	558,763	1,303	1,264	39
75,723	531,683	1,710	1,281	429
75,810	551,780	1,710	1,293	417
78,712	561,401	1,710	1,305	405
77,680	582,586	1,710	1,315	395
76,755	600,586	1,710	1,324	386
81,114	607,664	1,710	1,335	375
79,339	629,699	1,710	1,348	362
85,113	629,203	1,710	1,357	353
85,772	645,910	1,702	1,372	330
87,547	660,891	1,702	1,378	324
83,055	685,159	1,706	1,389	317
85,148	700,421	1,706	1,399	307
90,083	705,473	1,706	1,415	291
87,914	729,925	1,706	1,427	279
91,723	739,840	1,706	1,438	268
89,527	826,155	1,706	1,436	270

|Value -Emissions|

9	10	11	12	13
Total Emiss. Cost (0)	Total Sys. Cost (0)	Installed Capacity (MW)	Peak Load (MW)	Reserve Margin (MW)
7,418	228,313	1,115	1,033	82
86,954	307,574	1,316	1,251	65
51,659	323,476	1,317	1,257	60
102,595	419,791	1,387	1,243	144
35,151	538,366	1,364	1,234	130
1,727	388,283	1,153	1,213	(60)
981	409,259	1,152	1,198	(46)
397	415,981	1,154	1,207	(53)
356	429,683	1,162	1,218	(56)
0	417,863	1,164	1,224	(60)
0	438,577	1,179	1,238	(59)
65,479	520,993	1,179	1,249	(70)
61,326	543,203	1,179	1,255	(76)
63,294	560,998	1,179	1,264	(85)
75,378	534,890	1,586	1,281	305
75,338	555,122	1,586	1,293	293
78,308	565,000	1,586	1,305	281
77,225	586,357	1,586	1,315	271
76,259	604,494	1,586	1,324	262
80,663	612,015	1,586	1,335	251
78,857	634,311	1,586	1,348	238
84,626	634,239	1,586	1,357	229
85,546	652,149	1,578	1,372	206
86,876	666,503	1,578	1,378	200
82,550	691,291	1,582	1,389	193
84,625	706,713	1,582	1,399	183
89,675	711,982	1,582	1,415	167
87,425	736,707	1,582	1,427	155
91,212	746,907	1,582	1,438	144
89,166	863,439	1,582	1,436	146

Value -Emissions

9	10	11	12	13
Total Emiss. Cost (0)	Total Sys. Cost (0)	Installed Capacity (MW)	Peak Load (MW)	Reserve Margin (MW)
7,418	228,313	1,115	1,033	82
86,954	307,574	1,316	1,251	65
51,659	323,476	1,317	1,257	60
102,595	419,791	1,387	1,243	144
29,797	510,724	1,108	1,234	(126)
1,596	409,744	373	1,213	(840)
895	419,100	372	1,198	(826)
359	423,351	374	1,207	(833)
317	437,252	382	1,218	(836)
0	416,533	1,288	1,224	64
0	437,052	1,303	1,238	65
65,933	519,145	1,303	1,249	54
61,817	541,199	1,303	1,255	48
63,787	558,767	1,303	1,264	39
75,723	531,683	1,710	1,281	429
75,810	551,780	1,710	1,293	417
78,712	561,401	1,710	1,305	405
77,680	582,586	1,710	1,315	395
76,755	600,586	1,710	1,324	386
81,114	607,665	1,710	1,335	375
79,339	629,700	1,710	1,348	362
85,113	629,203	1,710	1,357	353
85,772	645,910	1,702	1,372	330
87,547	660,891	1,702	1,378	324
83,055	685,159	1,706	1,389	317
85,148	700,422	1,706	1,399	307
90,083	705,474	1,706	1,415	291
87,914	729,925	1,706	1,427	279
91,723	739,840	1,706	1,438	268
89,527	826,155	1,706	1,436	270

Value -Emissions

9	10	11	12	13
Total Emiss. Cost (0)	Total Sys. Cost (0)	Installed Capacity (MW)	Peak Load (MW)	Reserve Margin (MW)
7,418	228,313	1,115	1,033	82
86,954	307,574	1,316	1,251	65
51,659	323,476	1,317	1,257	60
102,595	419,791	1,387	1,243	144
29,797	510,724	1,108	1,234	(126)
1,596	409,744	373	1,213	(840)
895	419,100	372	1,198	(826)
359	423,351	374	1,207	(833)
317	437,252	382	1,218	(836)
0	425,538	384	1,224	(840)
0	443,819	399	1,238	(839)
41,846	534,619	399	1,249	(850)
37,415	555,258	399	1,255	(856)
38,892	573,822	399	1,264	(865)
75,723	531,683	1,710	1,281	429
75,810	551,780	1,710	1,293	417
78,712	561,401	1,710	1,305	405
77,680	582,586	1,710	1,315	395
76,755	600,586	1,710	1,324	386
81,114	607,665	1,710	1,335	375
79,339	629,700	1,710	1,348	362
85,113	629,203	1,710	1,357	353
85,772	645,910	1,702	1,372	330
87,547	660,891	1,702	1,378	324
83,055	685,159	1,706	1,389	317
85,148	700,422	1,706	1,399	307
90,083	705,474	1,706	1,415	291
87,914	729,925	1,706	1,427	279
91,723	739,840	1,706	1,438	268
89,527	826,155	1,706	1,436	270

Value -Emissions

9	10	11	12	13
Total Emiss. Cost (0)	Total Sys. Cost (0)	Installed Capacity (MW)	Peak Load (MW)	Reserve Margin (MW)
7,418	228,313	1,115	1,033	82
86,954	307,574	1,316	1,251	65
51,659	323,476	1,317	1,257	60
102,595	419,791	1,387	1,243	144
29,797	510,724	1,108	1,234	(126)
2,302	410,197	373	1,213	(840)
1,511	434,864	1,116	1,198	(82)
626	445,573	1,115	1,207	(92)
572	453,484	1,119	1,218	(99)
131,922	576,793	1,117	1,224	(107)
146,832	609,978	1,131	1,238	(107)
161,467	625,883	1,131	1,249	(118)
154,920	658,600	1,131	1,255	(124)
185,380	691,082	1,131	1,264	(133)
185,512	677,330	1,538	1,281	257
218,270	720,481	1,538	1,293	245
215,137	740,269	1,538	1,305	233
246,166	784,232	1,538	1,315	223
260,808	817,914	1,538	1,324	214
259,287	837,198	1,538	1,335	203
298,000	840,633	1,538	1,348	190
321,633	863,223	1,538	1,357	181
338,826	898,561	1,530	1,372	158
345,590	927,140	1,530	1,378	152
378,137	980,061	1,534	1,389	145
397,265	1,016,578	1,534	1,399	135
426,538	1,050,924	1,534	1,415	119
451,065	1,102,300	1,534	1,427	107
465,621	1,128,246	1,534	1,438	96
495,179	1,423,056	1,534	1,436	98

Value -Emissions

9	10	11	12	13
Total Emiss. Cost (0)	Total Sys. Cost (0)	Installed Capacity (MW)	Peak Load (MW)	Reserve Margin (MW)
7,418	228,313	1,115	1,033	82
86,954	307,574	1,316	1,251	65
51,659	323,476	1,317	1,257	60
102,595	419,791	1,387	1,243	144
29,797	510,724	1,108	1,234	(126)
1,730	387,446	1,277	1,213	64
983	408,446	1,276	1,198	78
398	415,105	1,278	1,207	71
356	428,597	1,286	1,218	68
79,268	497,522	1,288	1,224	64
88,113	527,192	1,303	1,238	65
98,978	553,110	1,303	1,249	54
100,588	580,935	1,303	1,255	48
111,833	608,010	1,303	1,264	39
133,715	644,190	1,720	1,281	439
138,989	668,124	1,720	1,293	427
155,136	692,914	1,720	1,305	415
157,776	719,244	1,720	1,315	405
151,106	739,232	1,720	1,324	396
159,324	757,482	1,720	1,335	385
165,714	789,447	1,720	1,348	372
184,841	805,879	1,720	1,357	363
182,269	826,227	1,712	1,372	340
195,973	853,444	1,712	1,378	334
197,864	884,334	1,716	1,389	327
208,393	910,375	1,716	1,399	317
223,134	929,148	1,716	1,415	301
235,019	965,024	1,716	1,427	289
246,814	988,881	1,716	1,438	278
252,249	1,082,282	1,716	1,436	280

Value -Emissions

9	10	11	12	13
Total Emiss. Cost (0)	Total Sys. Cost (0)	Installed Capacity (MW)	Peak Load (MW)	Reserve Margin (MW)
7,418	228,313	1,115	1,033	82
86,954	307,574	1,316	1,251	65
51,659	323,476	1,317	1,257	60
102,595	419,791	1,387	1,243	144
29,797	510,724	1,108	1,234	(126)
1,596	409,744	373	1,213	(840)
895	419,099	372	1,198	(826)
359	423,350	374	1,207	(833)
317	437,252	382	1,218	(836)
79,268	497,522	1,288	1,224	64
88,113	527,192	1,303	1,238	65
98,978	553,110	1,303	1,249	54
100,588	580,935	1,303	1,255	48
111,833	608,010	1,303	1,264	39
139,857	600,311	1,710	1,281	429
148,925	630,056	1,710	1,293	417
162,887	652,351	1,710	1,305	405
165,552	680,467	1,710	1,315	395
164,939	706,489	1,710	1,324	386
175,412	730,059	1,710	1,335	375
172,778	757,110	1,710	1,348	362
199,926	779,270	1,710	1,357	353
198,961	804,147	1,702	1,372	330
210,167	828,408	1,702	1,378	324
202,490	853,008	1,706	1,389	317
199,077	874,956	1,706	1,399	307
205,366	902,006	1,706	1,415	291
198,884	928,543	1,706	1,427	279
207,787	954,356	1,706	1,438	268
202,078	1,042,571	1,706	1,436	270

Value -Emissions

Carrying Charge Column	*Adopted from KPCO "New Additions" in ...\FT-CSAPR 2-Pgrs\Levized Retrofit Under FT_CSAPR.xls* **Carrying Charges**	*W34-W63 of "O&M" in ...\FT-CSAPR 2-Pgrs\Levized Retrofit Under FT_CSAPR.xls* **Base O&M Costs**	*Column BP of "Change3" in ...\FT-CSAPR 2-Pgrs\Levized Retrofit Under FT_CSAPR.xls* **MINIMUM RESERVE MARGIN: : : : KPCO : :**
1	0	50,898	-100.00
1	0	44,895	-100.00
1	0	51,219	-100.00
1	607	60,632	8.04
1	607	199,178	8.04
1	147,762	33,114	8.04
1	147,762	34,140	8.04
1	147,762	37,862	8.04
1	147,762	37,247	8.04
1	155,093	32,881	8.04
1	155,093	34,513	8.04
1	155,093	35,432	8.04
1	155,093	35,287	8.04
1	155,093	39,424	8.04
1	257,945	39,793	8.04
1	257,945	40,630	8.04
1	257,945	41,522	8.04
1	257,945	42,793	8.04
1	257,945	40,594	8.04
1	257,945	45,033	8.04
1	146,766	45,982	8.04
1	146,766	44,991	8.04
1	146,766	47,578	8.04
1	146,766	46,064	8.04
1	146,766	43,180	8.04
1	146,766	46,130	8.04
1	146,766	44,117	8.04
1	146,766	46,225	8.04
1	146,766	44,890	8.04
1	146,766	108,293	8.04

	Carrying Charges	
2011 NPV	**1,257,570**	**611,615**

Carrying Charge Column	**Carrying Charges**	**Base O&M Costs**	**MINIMUM RESERVE MARGIN: : : : KPCO : :**
2	0	50,898	-100.00
2	0	44,895	-100.00
2	0	51,219	-100.00
2	607	60,632	8.04
2	607	199,178	8.04
2	219,322	33,114	8.04
2	219,322	34,140	8.04
2	219,322	37,862	8.04
2	219,322	37,247	8.04
2	226,653	32,881	8.04
2	226,653	34,513	8.04
2	226,653	35,432	8.04
2	226,653	35,287	8.04
2	226,653	39,424	8.04
2	329,505	39,793	8.04
2	329,505	40,630	8.04
2	329,505	41,522	8.04
2	329,505	42,793	8.04
2	329,505	40,594	8.04
2	329,505	45,033	8.04
2	329,505	45,982	8.04
2	329,505	44,991	8.04
2	329,505	47,578	8.04
2	329,505	46,064	8.04
2	329,505	43,180	8.04
2	329,505	46,130	8.04
2	329,505	44,117	8.04
2	329,505	46,225	8.04
2	329,505	44,890	8.04
2	329,505	108,293	8.04

	Carrying Charges	
2011 NPV	**1,927,380**	**611,615**

Carrying Charge Column	Carrying Charges	Base O&M Costs	MINIMUM RESERVE MARGIN: : : : KPCO : :
3	0	50,898	-100.00
3	0	44,895	-100.00
3	0	51,219	-100.00
3	607	60,632	8.04
3	607	199,178	8.04
3	216,791	33,114	8.04
3	216,791	34,140	8.04
3	216,791	37,862	8.04
3	216,791	37,247	8.04
3	224,122	32,881	8.04
3	224,122	34,513	8.04
3	224,122	35,432	8.04
3	224,122	35,287	8.04
3	224,122	39,424	8.04
3	326,974	39,793	8.04
3	326,974	40,630	8.04
3	326,974	41,522	8.04
3	326,974	42,793	8.04
3	326,974	40,594	8.04
3	326,974	45,033	8.04
3	326,974	45,982	8.04
3	326,974	44,991	8.04
3	326,974	47,578	8.04
3	326,974	46,064	8.04
3	326,974	43,180	8.04
3	146,766	46,130	8.04
3	146,766	44,117	8.04
3	146,766	46,225	8.04
3	146,766	44,890	8.04
3	146,766	108,293	8.04
	Carrying Charges		
2011 NPV	**1,812,173**	**611,615**	

Carrying Charge Column	**Carrying Charges**	**Base O&M Costs**	**MINIMUM RESERVE MARGIN: : : : KPCO : :**
4	0	50,898	-100.00
4	0	44,895	-100.00
4	0	51,219	-100.00
4	607	60,632	8.04
4	607	199,178	8.04
4	36,583	33,114	8.04
4	36,583	34,140	8.04
4	36,583	37,862	8.04
4	36,583	37,247	8.04
4	238,249	32,881	8.04
4	238,249	34,513	8.04
4	238,249	35,432	8.04
4	238,249	35,287	8.04
4	238,249	39,424	8.04
4	341,101	39,793	8.04
4	341,101	40,630	8.04
4	341,101	41,522	8.04
4	341,101	42,793	8.04
4	341,101	40,594	8.04
4	341,101	45,033	8.04
4	341,101	45,982	8.04
4	341,101	44,991	8.04
4	341,101	47,578	8.04
4	341,101	46,064	8.04
4	341,101	43,180	8.04
4	341,101	46,130	8.04
4	341,101	44,117	8.04
4	341,101	46,225	8.04
4	341,101	44,890	8.04
4	341,101	108,293	8.04
	Carrying Charges		
2011 NPV	**1,556,036**	**611,615**	

Carrying Charge Column	**Carrying Charges**	**Base O&M Costs**	**MINIMUM RESERVE MARGIN: : : : KPCO : :**
5	0	50,898	-100.00
5	0	44,895	-100.00
5	0	51,219	-100.00
5	607	60,632	8.04
5	607	199,178	8.04
5	36,583	33,114	8.04
5	36,583	34,140	8.04
5	36,583	37,862	8.04
5	36,583	37,247	8.04
5	43,914	32,881	8.04
5	43,914	34,513	8.04
5	43,914	35,432	8.04
5	43,914	35,287	8.04
5	43,914	39,424	8.04
5	356,636	39,793	8.04
5	356,636	40,630	8.04
5	356,636	41,522	8.04
5	356,636	42,793	8.04
5	356,636	40,594	8.04
5	356,636	45,033	8.04
5	356,636	45,982	8.04
5	356,636	44,991	8.04
5	356,636	47,578	8.04
5	356,636	46,064	8.04
5	356,636	43,180	8.04
5	356,636	46,130	8.04
5	356,636	44,117	8.04
5	356,636	46,225	8.04
5	356,636	44,890	8.04
5	356,636	108,293	8.04
	Carrying Charges		
2011 NPV	**1,207,804**	**611,615**	

Carrying Charge Column	**Carrying Charges**	**Base O&M Costs**	**MINIMUM RESERVE MARGIN: : : : KPCO : :**
1	0	50,898	-100.00
1	0	44,895	-100.00
1	0	51,219	-100.00
1	607	60,632	8.04
1	607	199,178	8.04
1	147,762	33,114	8.04
1	147,762	34,140	8.04
1	147,762	37,862	8.04
1	147,762	37,247	8.04
1	155,093	32,881	8.04
1	155,093	34,513	8.04
1	155,093	35,432	8.04
1	155,093	35,287	8.04
1	155,093	39,424	8.04
1	257,945	39,793	8.04
1	257,945	40,630	8.04
1	257,945	41,522	8.04
1	257,945	42,793	8.04
1	257,945	40,594	8.04
1	257,945	45,033	8.04
1	146,766	45,982	8.04
1	146,766	44,991	8.04
1	146,766	47,578	8.04
1	146,766	46,064	8.04
1	146,766	43,180	8.04
1	146,766	46,130	8.04
1	146,766	44,117	8.04
1	146,766	46,225	8.04
1	146,766	44,890	8.04
1	146,766	108,293	8.04
	Carrying Charges		
2011 NPV	**1,257,570**	**611,615**	

Carrying Charge Column	**Carrying Charges**	**Base O&M Costs**	**MINIMUM RESERVE MARGIN: : : : KPCO : :**
2	0	50,898	-100.00
2	0	44,895	-100.00
2	0	51,219	-100.00
2	607	60,632	8.04
2	607	199,178	8.04
2	219,322	33,114	8.04
2	219,322	34,140	8.04
2	219,322	37,862	8.04
2	219,322	37,247	8.04
2	226,653	32,881	8.04
2	226,653	34,513	8.04
2	226,653	35,432	8.04
2	226,653	35,287	8.04
2	226,653	39,424	8.04
2	329,505	39,793	8.04
2	329,505	40,630	8.04
2	329,505	41,522	8.04
2	329,505	42,793	8.04
2	329,505	40,594	8.04
2	329,505	45,033	8.04
2	329,505	45,982	8.04
2	329,505	44,991	8.04
2	329,505	47,578	8.04
2	329,505	46,064	8.04
2	329,505	43,180	8.04
2	329,505	46,130	8.04
2	329,505	44,117	8.04
2	329,505	46,225	8.04
2	329,505	44,890	8.04
2	329,505	108,293	8.04
	Carrying Charges		
2011 NPV	**1,927,380**	**611,615**	

Carrying Charge Column	Carrying Charges	Base O&M Costs	MINIMUM RESERVE MARGIN: : : : KPCO : :
4	0	50,898	-100.00
4	0	44,895	-100.00
4	0	51,219	-100.00
4	607	60,632	8.04
4	607	199,178	8.04
4	36,583	33,114	8.04
4	36,583	34,140	8.04
4	36,583	37,862	8.04
4	36,583	37,247	8.04
4	238,249	32,881	8.04
4	238,249	34,513	8.04
4	238,249	35,432	8.04
4	238,249	35,287	8.04
4	238,249	39,424	8.04
4	341,101	39,793	8.04
4	341,101	40,630	8.04
4	341,101	41,522	8.04
4	341,101	42,793	8.04
4	341,101	40,594	8.04
4	341,101	45,033	8.04
4	341,101	45,982	8.04
4	341,101	44,991	8.04
4	341,101	47,578	8.04
4	341,101	46,064	8.04
4	341,101	43,180	8.04
4	341,101	46,130	8.04
4	341,101	44,117	8.04
4	341,101	46,225	8.04
4	341,101	44,890	8.04
4	341,101	108,293	8.04
	Carrying Charges		
2011 NPV	**1,556,036**	**611,615**	

Column J of "Format" in ...\FT-CSAPR 2-Pgrs\Levelized Retrofit Under FT_CSAPR.xls

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Annual Costs	Fuel Cost (A)	Contract Revenue (B)
2011	198,123	(12,787)
2012	250,465	(21,184)
2013	227,817	(30,153)
2014	276,568	(38,222)
2015	275,723	(51,088)
2016	165,006	(48,054)
2017	236,355	(53,827)
2018	254,318	(54,857)
2019	242,101	(56,908)
2020	257,392	(58,755)
2021	263,061	(72,859)
2022	252,602	(73,893)
2023	225,510	(72,531)
2024	255,531	(77,447)
2025	336,073	(60,870)
2026	354,700	(61,861)
2027	351,083	(62,860)
2028	370,369	(63,744)
2029	370,732	(65,062)
2030	367,888	(64,315)
2031	388,156	(66,854)
2032	406,168	(67,099)
2033	411,019	(68,441)
2034	394,818	(69,439)
2035	408,588	(72,741)
2036	413,597	(74,000)
2037	426,893	(74,707)
2038	423,004	(77,575)
2039	432,896	(78,143)
2040	431,457	(80,191)

		+	-
2011 Net Present Value			
Period of 2011-2040		**3,169,746**	(535,631)

DRP_KPCO	Annual Costs	Fuel Cost (A)	Contract Revenue (B)
0	2011	198,123	(12,787)
0	2012	250,465	(21,184)
0	2013	227,817	(30,153)
0	2014	276,568	(38,222)
0	2015	275,723	(51,088)
0	2016	265,889	(48,191)
0	2017	264,882	(46,427)
0	2018	276,542	(46,694)
0	2019	275,803	(46,729)
0	2020	281,619	(47,517)
0	2021	290,148	(62,012)
0	2022	302,092	(63,387)
0	2023	300,374	(63,335)
0	2024	313,032	(64,282)
0	2025	397,097	(58,034)
0	2026	414,742	(59,125)
0	2027	421,946	(59,729)
0	2028	433,805	(60,821)
0	2029	441,579	(62,380)
0	2030	451,055	(62,445)
0	2031	460,422	(63,997)
0	2032	471,622	(64,320)
0	2033	475,881	(65,655)
0	2034	490,443	(67,175)
0	2035	488,661	(69,177)
0	2036	497,150	(70,743)
0	2037	505,038	(70,949)
0	2038	504,709	(72,900)
0	2039	514,193	(73,770)
0	2040	515,003	(75,519)
	2011 Net Present Value		
	Period of 2011-2040	**3,582,750**	(540,513)

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Annual Costs	Fuel Cost (A)	Contract Revenue (B)
2011	198,123	(12,787)
2012	250,465	(21,184)
2013	227,817	(30,153)
2014	276,568	(38,222)
2015	306,568	(45,520)
2016	261,948	(47,806)
2017	261,110	(46,021)
2018	272,816	(46,171)
2019	271,831	(45,831)
2020	277,705	(46,876)
2021	285,928	(61,526)
2022	297,848	(62,966)
2023	295,719	(62,635)
2024	308,264	(63,573)
2025	393,703	(58,312)
2026	410,118	(59,436)
2027	417,943	(60,004)
2028	429,257	(61,113)
2029	436,546	(62,691)
2030	446,505	(62,815)
2031	455,573	(64,317)
2032	466,718	(64,710)
2033	473,614	(66,050)
2034	483,685	(67,499)
2035	483,602	(69,610)
2036	491,883	(71,172)
2037	500,999	(71,341)
2038	499,784	(73,241)
2039	509,032	(74,284)
2040	511,478	(76,025)
2011 Net Present Value Period of 2011-2040	**3,574,132**	(535,074)

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Annual Costs	Fuel Cost (A)	Contract Revenue (B)
2011	198,123	(12,787)
2012	250,465	(21,184)
2013	227,817	(30,153)
2014	276,567	(38,222)
2015	275,723	(51,088)
2016	72,505	(39,934)
2017	69,730	(38,321)
2018	76,949	(37,921)
2019	71,023	(38,179)
2020	281,618	(47,538)
2021	290,148	(62,012)
2022	302,092	(63,387)
2023	300,374	(63,335)
2024	313,032	(64,305)
2025	397,097	(58,034)
2026	414,742	(59,125)
2027	421,946	(59,729)
2028	433,804	(60,821)
2029	441,578	(62,380)
2030	451,055	(62,445)
2031	460,422	(63,997)
2032	471,622	(64,320)
2033	475,880	(65,655)
2034	490,443	(67,175)
2035	488,660	(69,177)
2036	497,150	(70,743)
2037	505,038	(70,949)
2038	504,709	(72,900)
2039	514,193	(73,770)
2040	515,003	(75,519)
2011 Net Present Value Period of 2011-2040	**3,118,999**	(520,827)

DRP_KPCO	Annual Costs	Fuel Cost (A)	Contract Revenue (B)
0	2011	198,123	(12,787)
0	2012	250,465	(21,184)
0	2013	227,817	(30,153)
0	2014	276,567	(38,222)
0	2015	275,723	(51,088)
0	2016	72,505	(39,934)
0	2017	69,730	(38,321)
0	2018	76,949	(37,921)
0	2019	71,023	(38,179)
0	2020	75,257	(38,015)
0	2021	76,468	(52,948)
0	2022	76,760	(53,230)
0	2023	69,002	(53,442)
0	2024	72,372	(55,536)
0	2025	397,097	(58,034)
0	2026	414,742	(59,125)
0	2027	421,946	(59,729)
0	2028	433,804	(60,821)
0	2029	441,578	(62,380)
0	2030	451,055	(62,445)
0	2031	460,422	(63,997)
0	2032	471,622	(64,320)
0	2033	475,880	(65,655)
0	2034	490,443	(67,175)
0	2035	488,660	(69,177)
0	2036	497,150	(70,743)
0	2037	505,038	(70,949)
0	2038	504,709	(72,900)
0	2039	514,193	(73,770)
0	2040	515,003	(75,519)
	2011 Net Present Value Period of 2011-2040	**2,669,717**	(501,625)

DRP_KPCO	Annual Costs	Fuel Cost (A)	Contract Revenue (B)
0	2011	198,123	(12,787)
0	2012	250,465	(21,184)
0	2013	227,817	(30,153)
0	2014	276,568	(38,222)
0	2015	275,723	(51,088)
0	2016	165,006	(48,054)
0	2017	236,355	(53,827)
0	2018	254,318	(54,857)
0	2019	242,101	(56,908)
0	2020	246,299	(55,168)
0	2021	250,710	(68,883)
0	2022	249,051	(73,013)
0	2023	221,446	(70,474)
0	2024	249,751	(74,470)
0	2025	326,778	(60,453)
0	2026	359,332	(61,750)
0	2027	337,306	(62,610)
0	2028	366,951	(63,456)
0	2029	372,003	(64,879)
0	2030	352,317	(64,004)
0	2031	386,052	(66,191)
0	2032	391,883	(66,343)
0	2033	394,418	(67,408)
0	2034	386,954	(68,336)
0	2035	410,479	(70,515)
0	2036	413,180	(71,798)
0	2037	419,996	(72,716)
0	2038	431,000	(75,082)
0	2039	426,707	(75,745)
0	2040	440,821	(76,695)
	2011 Net Present Value Period of 2011-2040	**3,138,923**	(577,440)

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Annual Costs	Fuel Cost (A)	Contract Revenue (B)
2011	198,123	(12,787)
2012	250,465	(21,184)
2013	227,817	(30,153)
2014	276,568	(38,222)
2015	275,723	(51,088)
2016	265,889	(48,191)
2017	264,882	(46,427)
2018	276,542	(46,694)
2019	275,803	(46,729)
2020	273,375	(45,835)
2021	280,376	(60,173)
2022	298,588	(62,634)
2023	296,332	(62,458)
2024	307,854	(63,161)
2025	346,492	(55,348)
2026	344,473	(55,871)
2027	354,743	(56,449)
2028	354,127	(56,998)
2029	346,743	(57,433)
2030	349,187	(58,048)
2031	354,218	(58,742)
2032	359,419	(59,374)
2033	352,935	(59,911)
2034	357,865	(60,479)
2035	361,746	(61,200)
2036	363,735	(62,052)
2037	364,209	(62,571)
2038	370,426	(63,266)
2039	374,502	(63,933)
2040	374,833	(64,754)
2011 Net Present Value Period of 2011-2040	**3,283,275**	(522,375)

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Annual Costs	Fuel Cost (A)	Contract Revenue (B)
2011	198,123	(12,787)
2012	250,465	(21,184)
2013	227,817	(30,153)
2014	276,568	(38,222)
2015	275,723	(51,088)
2016	72,505	(39,934)
2017	69,730	(38,321)
2018	76,949	(37,921)
2019	71,023	(38,178)
2020	273,375	(45,835)
2021	280,376	(60,173)
2022	298,588	(62,634)
2023	296,332	(62,458)
2024	307,854	(63,161)
2025	376,884	(57,846)
2026	391,240	(58,833)
2027	394,266	(59,365)
2028	399,309	(60,371)
2029	413,258	(61,703)
2030	431,608	(61,801)
2031	439,927	(63,360)
2032	449,620	(63,557)
2033	451,687	(64,359)
2034	447,932	(65,320)
2035	438,492	(66,683)
2036	439,990	(67,459)
2037	457,574	(67,974)
2038	452,526	(69,086)
2039	457,901	(69,871)
2040	459,170	(70,516)
2011 Net Present Value Period of 2011-2040	**3,013,145**	(514,481)

KENTUCKY POWER COMPANY
KPCo Capacity Resource Optimizati
Costs and Emissions Summary
Synapse Re-Analysis of Base - Option 1 (S

Optimal Plan Cost Summary ($000)

Market Revenue/(Cost	Fuel & Transactions	Base Rate Impacts: Carrying Charges	Base Rate Impacts: Incremental O&M	Base Rate Impacts: Total	Total Cost	Market Value of Allowances Consumed
(C)	D)=(A)-(B)-(C	(E)	(F)	(G)=(E)+(F)	(H)=(D)+(G)	(I)
40,915	169,995	0	(0)	(0)	169,995	7,418
95,924	175,725	0	0	0	175,725	86,954
37,371	220,599	0	0	0	220,599	51,659
58,226	256,564	607	(0)	607	257,171	102,595
45,063	281,748	607	1	608	282,356	29,797
(85,221)	298,281	147,762	76,500	224,262	522,543	2,302
28,372	261,810	147,762	137,403	285,165	546,975	1,511
51,107	258,068	147,762	149,018	296,780	554,848	626
22,818	276,191	147,762	139,474	287,236	563,427	572
50,028	266,119	155,093	140,061	295,154	561,273	0
57,491	278,429	155,093	143,775	298,868	577,297	0
44,072	282,423	155,093	143,739	298,832	581,255	108,290
(27,181)	325,222	155,093	140,117	295,210	620,432	96,073
21,274	311,704	155,093	150,129	305,222	616,926	106,998
136,139	260,804	257,945	166,903	424,848	685,652	116,552
156,979	259,582	257,945	176,504	434,449	694,031	122,595
134,515	279,428	257,945	174,827	432,772	712,200	119,821
156,603	277,510	257,945	184,828	442,773	720,283	125,870
141,804	293,990	257,945	188,259	446,204	740,194	124,788
118,180	314,023	257,945	184,860	442,805	756,828	121,007
144,829	310,181	146,766	148,849	295,615	605,796	128,489
169,886	303,381	146,766	150,068	296,834	600,215	135,793
163,642	315,818	146,766	149,261	296,027	611,845	136,812
110,426	353,831	146,766	143,959	290,725	644,556	127,901
122,806	358,523	146,766	155,220	301,986	660,509	133,275
120,432	367,165	146,766	157,203	303,969	671,134	135,608
132,957	368,643	146,766	158,886	305,652	674,295	141,194
107,009	393,570	146,766	160,400	307,166	700,736	139,015
113,529	397,510	146,766	163,017	309,783	707,293	143,353
89,506	422,142	146,766	342,267	489,033	911,175	141,291

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700,354	1,257,570	1,078,616	721,661

Base Case O&M 2011-2040
Utility Cost Present Value 2011-2040

KENTUCKY POWER COMPANY
KPCo Capacity Resource Optimizati
Costs and Emissions Summary
Synapse Re-Analysis of Base - Option 2 (S

Optimal Plan Cost Summary ($000)

Market Revenue/(Cost	Fuel & Transactions	Base Rate Impacts: Carrying Charges	Base Rate Impacts: Incremental O&M	Base Rate Impacts: Total	Total Cost	Market Value of Allowances Consumed
(C)	D)=(A)-(B)-(C	(E)	(F)	(G)=(E)+(F)	(H)=(D)+(G)	(I)
40,915	169,995	0	(0)	(0)	169,995	7,418
95,924	175,725	0	0	0	175,725	86,954
37,371	220,599	0	0	0	220,599	51,659
58,226	256,564	607	(0)	607	257,171	102,595
45,063	281,748	607	1	608	282,356	29,797
(5,161)	319,241	219,322	33,361	252,683	571,924	1,730
(19,759)	331,068	219,322	42,257	261,579	592,647	983
(10,688)	333,924	219,322	42,920	262,242	596,166	398
(24,724)	347,256	219,322	43,738	263,060	610,316	356
(9,968)	339,104	226,653	44,543	271,196	610,300	0
(5,000)	357,160	226,653	45,380	272,033	629,193	0
(5,857)	371,336	226,653	46,444	273,097	644,433	65,933
(33,065)	396,774	226,653	47,321	273,974	670,748	61,817
(29,887)	407,201	226,653	48,351	275,004	682,205	63,787
104,722	350,409	329,505	65,757	395,262	745,671	75,723
106,929	366,938	329,505	68,402	397,907	764,845	75,810
109,783	371,892	329,505	69,274	398,779	770,671	78,712
103,873	390,753	329,505	71,359	400,864	791,617	77,680
93,777	410,182	329,505	73,056	402,561	812,743	76,755
106,219	407,281	329,505	74,234	403,739	811,020	81,114
96,615	427,804	329,505	76,575	406,080	833,884	79,339
114,475	421,467	329,505	77,631	407,136	828,603	85,113
107,889	433,647	329,505	78,914	408,419	842,066	85,772
111,328	446,290	329,505	80,990	410,495	856,785	87,547
81,731	476,107	329,505	82,817	412,322	888,429	83,055
83,040	484,853	329,505	84,290	413,795	898,648	85,148
89,906	486,081	329,505	85,192	414,697	900,778	90,083
68,668	508,941	329,505	86,844	416,349	925,290	87,914
73,029	514,934	329,505	88,291	417,796	932,730	91,723
52,378	538,144	329,505	90,192	419,697	957,841	89,527
457,915		**1,927,380**	**406,823**			**541,384**

KENTUCKY POWER COMPANY
KPCo Capacity Resource Optimizati
Costs and Emissions Summary
Synapse Re-Analysis of Base - Option 3 (S

Optimal Plan Cost Summary ($000)

Market Revenue/(Cost	Fuel & Transactions	Base Rate Impacts: Carrying Charges	Base Rate Impacts: Incremental O&M	Base Rate Impacts: Total	Total Cost	Market Value of Allowances Consumed
(C)	D)=(A)-(B)-(C	(E)	(F)	(G)=(E)+(F)	(H)=(D)+(G)	(I)
40,915	169,995	0	(0)	(0)	169,995	7,418
95,924	175,725	0	0	0	175,725	86,954
37,371	220,599	0	0	0	220,599	51,659
58,226	256,564	607	(0)	607	257,171	102,595
93,574	258,514	607	45,524	46,131	304,645	35,151
(10,420)	320,174	216,791	33,267	250,058	570,232	1,727
(24,758)	331,889	216,791	42,249	259,040	590,929	981
(15,680)	334,667	216,791	43,056	259,847	594,514	397
(30,291)	347,953	216,791	44,128	260,919	608,872	356
(15,283)	339,864	224,122	45,120	269,242	609,106	0
(10,483)	357,937	224,122	46,127	270,249	628,186	0
(11,910)	372,724	224,122	47,357	271,479	644,203	65,479
(39,828)	398,182	224,122	48,408	272,530	670,712	61,326
(36,796)	408,633	224,122	49,647	273,769	682,402	63,294
99,656	352,359	326,974	67,359	394,333	746,692	75,378
100,540	369,014	326,974	70,139	397,113	766,127	75,338
104,034	373,913	326,974	71,257	398,231	772,144	78,308
97,557	392,813	326,974	73,527	400,501	793,314	77,225
86,970	412,267	326,974	75,375	402,349	814,616	76,259
99,849	409,471	326,974	76,846	403,820	813,291	80,663
89,830	430,060	326,974	79,412	406,386	836,446	78,857
107,527	423,901	326,974	80,721	407,695	831,596	84,626
103,065	436,599	326,974	82,426	409,400	845,999	85,546
102,034	449,150	326,974	84,411	411,385	860,535	86,876
74,345	478,867	326,974	86,694	413,668	892,535	82,550
75,350	487,705	146,766	88,252	235,018	722,723	84,625
83,539	488,801	146,766	89,389	236,155	724,956	89,675
61,041	511,984	146,766	91,072	237,838	749,822	87,425
65,129	518,187	146,766	92,619	239,385	757,572	91,212
46,326	541,177	146,766	124,804	271,570	812,747	89,166
449,476		**1,812,173**	**452,327**			**543,393**

KENTUCKY POWER COMPANY
KPCo Capacity Resource Optimizati
Costs and Emissions Summary
Synapse Re-Analysis of FT-CSAPR Option

Optimal Plan Cost Summary ($000)

Market Revenue/(Cost	Fuel & Transactions	Base Rate Impacts: Carrying Charges	Base Rate Impacts: Incremental O&M	Base Rate Impacts: Total	Total Cost	Market Value of Allowances Consumed
(C)	D)=(A)-(B)-(C	(E)	(F)	(G)=(E)+(F)	(H)=(D)+(G)	(I)
40,914	169,996	0	(0)	(0)	169,996	7,418
95,924	175,725	0	0	0	175,725	86,954
37,371	220,599	0	0	0	220,599	51,659
58,226	256,563	607	(0)	607	257,170	102,595
45,062	281,749	607	1	608	282,357	29,797
(262,595)	375,034	36,583	(0)	36,583	411,617	1,596
(276,013)	384,064	36,583	(0)	36,583	420,647	895
(270,260)	385,130	36,583	(0)	36,583	421,713	359
(290,487)	399,689	36,583	0	36,583	436,272	317
(9,952)	339,108	238,249	44,543	282,792	621,900	0
(5,000)	357,160	238,249	45,380	283,629	640,789	0
(5,857)	371,336	238,249	46,443	284,692	656,028	65,933
(33,066)	396,775	238,249	47,321	285,570	682,345	61,817
(29,869)	407,206	238,249	48,351	286,600	693,806	63,787
104,721	350,410	341,101	65,757	406,858	757,268	75,723
106,929	366,938	341,101	68,402	409,503	776,441	75,810
109,782	371,893	341,101	69,274	410,375	782,268	78,712
103,873	390,752	341,101	71,359	412,460	803,212	77,680
93,777	410,181	341,101	73,056	414,157	824,338	76,755
106,218	407,282	341,101	74,234	415,335	822,617	81,114
96,615	427,804	341,101	76,575	417,676	845,480	79,339
114,474	421,468	341,101	77,631	418,732	840,200	85,113
107,888	433,647	341,101	78,914	420,015	853,662	85,772
111,328	446,290	341,101	80,990	422,091	868,381	87,547
81,730	476,107	341,101	82,817	423,918	900,025	83,055
83,039	484,854	341,101	84,290	425,391	910,245	85,148
89,905	486,082	341,101	85,192	426,293	912,375	90,083
68,667	508,942	341,101	86,844	427,945	936,887	87,914
73,028	514,935	341,101	88,291	429,392	944,327	91,723
52,378	538,144	341,101	90,192	431,293	969,437	89,527
(150,316)		**1,556,036**	**312,509**			**541,200**

Base Case O&M 2011-2040
Utility Cost Present Value 2011-2040

KENTUCKY POWER COMPANY
KPCo Capacity Resource Optimizati

Costs and Emissions Summary
Synapse Re-Analysis of FT-CSAPR Option

Optimal Plan Cost Summary ($000)

Market Revenue/(Cost	Fuel & Transactions	Base Rate Impacts: Carrying Charges	Base Rate Impacts: Incremental O&M	Base Rate Impacts: Total	Total Cost	Market Value of Allowances Consumed
(C)	D)=(A)-(B)-(C	(E)	(F)	(G)=(E)+(F)	(H)=(D)+(G)	(I)
40,914	169,996	0	(0)	(0)	169,996	7,418
95,924	175,725	0	0	0	175,725	86,954
37,371	220,599	0	0	0	220,599	51,659
58,226	256,563	607	(0)	607	257,170	102,595
45,062	281,749	607	1	608	282,357	29,797
(262,595)	375,034	36,583	(0)	36,583	411,617	1,596
(276,013)	384,064	36,583	(0)	36,583	420,647	895
(270,260)	385,130	36,583	(0)	36,583	421,713	359
(290,487)	399,689	36,583	0	36,583	436,272	317
(279,386)	392,658	43,914	(0)	43,914	436,572	0
(279,891)	409,307	43,914	0	43,914	453,221	0
(327,351)	457,341	43,914	0	43,914	501,255	41,846
(360,111)	482,555	43,914	(0)	43,914	526,469	37,415
(367,599)	495,507	43,914	0	43,914	539,421	38,892
104,721	350,410	356,636	65,757	422,393	772,803	75,723
106,929	366,938	356,636	68,402	425,038	791,976	75,810
109,782	371,893	356,636	69,274	425,910	797,803	78,712
103,873	390,752	356,636	71,359	427,995	818,747	77,680
93,777	410,181	356,636	73,056	429,692	839,873	76,755
106,218	407,282	356,636	74,234	430,870	838,152	81,114
96,615	427,804	356,636	76,575	433,211	861,015	79,339
114,474	421,468	356,636	77,631	434,267	855,735	85,113
107,888	433,647	356,636	78,914	435,550	869,197	85,772
111,328	446,290	356,636	80,990	437,626	883,916	87,547
81,730	476,107	356,636	82,817	439,453	915,560	83,055
83,039	484,854	356,636	84,290	440,926	925,780	85,148
89,905	486,082	356,636	85,192	441,828	927,910	90,083
68,667	508,942	356,636	86,844	443,480	952,422	87,914
73,028	514,935	356,636	88,291	444,927	959,862	91,723
52,378	538,144	356,636	90,192	446,828	984,972	89,527
(763,335)		**1,207,804**	**218,932**			**514,015**

Base Case O&M 2011-2040

Utility Cost Present Value 2011-2040

Optimal Plan Cost Summary ($000)

Market Revenue/(Cost	Fuel & Transactions	Base Rate Impacts: Carrying Charges	Base Rate Impacts: Incremental O&M	Base Rate Impacts: Total	Total Cost	Market Value of Allowances Consumed
(C)	D)=(A)-(B)-(C	(E)	(F)	(G)=(E)+(F)	(H)=(D)+(G)	(I)
40,915	169,995	0	(0)	(0)	169,995	7,418
95,924	175,725	0	0	0	175,725	86,954
37,371	220,599	0	0	0	220,599	51,659
58,226	256,564	607	(0)	607	257,171	102,595
45,063	281,748	607	1	608	282,356	29,797
(85,221)	298,281	147,762	76,500	224,262	522,543	2,302
28,372	261,810	147,762	137,403	285,165	546,975	1,511
51,107	258,068	147,762	149,018	296,780	554,848	626
22,818	276,191	147,762	139,474	287,236	563,427	572
25,823	275,644	155,093	136,346	291,439	567,083	131,922
30,613	288,980	155,093	139,652	294,745	583,725	146,832
35,611	286,453	155,093	142,530	297,623	584,076	161,467
(37,737)	329,657	155,093	138,737	293,830	623,487	154,920
6,113	318,108	155,093	148,170	303,263	621,371	185,380
86,690	300,541	257,945	151,484	409,429	709,970	185,512
123,549	297,533	257,945	164,048	421,993	719,526	218,270
74,337	325,579	257,945	158,031	415,976	741,555	215,137
104,504	325,903	257,945	169,370	427,315	753,218	246,166
94,059	342,823	257,945	173,689	431,634	774,457	260,808
51,788	364,533	257,945	168,343	426,288	790,821	259,287
89,098	363,145	146,766	133,506	280,272	643,417	298,000
92,479	365,747	146,766	130,852	277,618	643,365	321,633
78,978	382,848	146,766	129,308	276,074	658,922	338,826
48,670	406,620	146,766	128,866	275,632	682,252	345,590
61,937	419,057	146,766	139,687	286,453	705,510	378,137
51,936	433,042	146,766	140,141	286,907	719,949	397,265
52,285	440,427	146,766	139,840	286,606	727,033	426,538
45,774	460,308	146,766	144,700	291,466	751,774	451,065
27,400	475,052	146,766	142,683	289,449	764,501	465,621
23,984	493,532	146,766	326,054	472,820	966,352	495,179
492,020		**1,257,570**	**1,026,639**			**1,407,794**

Base Case O&M 2011-2040

Utility Cost Present Value 2011-2040

KENTUCKY POWER COMPANY

KPCo Capacity Resource Optimizati

Costs and Emissions Summary

Synapse Re-Analysis of Syn Low CO2 - O

Optimal Plan Cost Summary ($000)

Market Revenue/(Cost	Fuel & Transactions	Base Rate Impacts: Carrying Charges	Base Rate Impacts: Incremental O&M	Base Rate Impacts: Total	Total Cost	Market Value of Allowances Consumed
(C)	D)=(A)-(B)-(C	(E)	(F)	(G)=(E)+(F)	(H)=(D)+(G)	(I)
40,915	169,995	0	(0)	(0)	169,995	7,418
95,924	175,725	0	0	0	175,725	86,954
37,371	220,599	0	0	0	220,599	51,659
58,226	256,564	607	(0)	607	257,171	102,595
45,063	281,748	607	1	608	282,356	29,797
(5,161)	319,241	219,322	33,361	252,683	571,924	1,730
(19,759)	331,068	219,322	42,257	261,579	592,647	983
(10,688)	333,924	219,322	42,920	262,242	596,166	398
(24,724)	347,256	219,322	43,738	263,060	610,316	356
(22,325)	341,535	226,653	43,838	270,491	612,026	79,268
(19,465)	360,014	226,653	44,553	271,206	631,220	88,113
(11,325)	372,547	226,653	46,152	272,805	645,352	98,978
(39,284)	398,074	226,653	46,985	273,638	671,712	100,588
(37,811)	408,826	226,653	47,927	274,580	683,406	111,833
(11,528)	413,368	329,505	57,313	386,818	800,186	133,715
(29,882)	430,226	329,505	58,280	387,785	818,011	138,989
(25,847)	437,039	329,505	59,217	388,722	825,761	155,136
(47,956)	459,081	329,505	59,595	389,100	848,181	157,776
(86,565)	490,741	329,505	56,792	386,297	877,038	151,106
(91,583)	498,818	329,505	54,306	383,811	882,629	159,324
(107,415)	520,375	329,505	57,378	386,883	907,258	165,714
(101,110)	519,903	329,505	56,144	385,649	905,552	184,841
(130,039)	542,885	329,505	53,494	382,999	925,884	182,269
(137,857)	556,201	329,505	55,205	384,710	940,911	195,973
(160,010)	582,956	329,505	60,333	389,838	972,794	197,864
(170,135)	595,922	329,505	59,931	389,436	985,358	208,393
(176,803)	603,583	329,505	58,311	387,816	991,399	223,134
(188,632)	622,324	329,505	61,454	390,959	1,013,283	235,019
(197,885)	636,320	329,505	60,859	390,364	1,026,684	246,814
(218,719)	658,306	329,505	63,435	392,940	1,051,246	252,249
(118,732)		**1,927,380**	**354,386**			**928,631**

Base Case O&M 2011-2040

Utility Cost Present Value 2011-2040

KENTUCKY POWER COMPANY

KPCo Capacity Resource Optimizati

Costs and Emissions Summary

Synapse Re-Analysis of Syn Low CO2 - O|

Optimal Plan Cost Summary ($000)

Market

Market Revenue/(Cost	Fuel & Transactions	Base Rate Impacts: Carrying Charges	Base Rate Impacts: Incremental O&M	Base Rate Impacts: Total	Total Cost	Value of Allowances Consumed
(C)	D)=(A)-(B)-(C	(E)	(F)	(G)=(E)+(F)	(H)=(D)+(G)	(I)
40,915	169,995	0	(0)	(0)	169,995	7,418
95,924	175,725	0	0	0	175,725	86,954
37,371	220,599	0	0	0	220,599	51,659
58,226	256,564	607	(0)	607	257,171	102,595
45,063	281,748	607	1	608	282,356	29,797
(262,595)	375,034	36,583	(0)	36,583	411,617	1,596
(276,013)	384,064	36,583	(0)	36,583	420,647	895
(270,259)	385,129	36,583	(0)	36,583	421,712	359
(290,487)	399,688	36,583	0	36,583	436,271	317
(22,325)	341,535	238,249	43,838	282,087	623,622	79,268
(19,465)	360,014	238,249	44,553	282,802	642,816	88,113
(11,325)	372,547	238,249	46,152	284,401	656,948	98,978
(39,284)	398,074	238,249	46,985	285,234	683,308	100,588
(37,811)	408,826	238,249	47,927	286,176	695,002	111,833
78,200	356,530	341,101	64,131	405,232	761,762	139,857
75,987	374,086	341,101	66,414	407,515	781,601	148,925
72,244	381,387	341,101	66,555	407,656	789,043	162,887
54,530	405,150	341,101	66,973	408,074	813,224	165,552
40,214	434,747	341,101	66,209	407,310	842,057	164,939
48,430	444,979	341,101	64,633	405,734	850,713	175,412
29,911	473,376	341,101	64,975	406,076	879,452	172,778
45,039	468,138	341,101	66,215	407,316	875,454	199,926
22,580	493,466	341,101	64,143	405,244	898,710	198,961
6,058	507,194	341,101	64,984	406,085	913,279	210,167
(33,475)	538,650	341,101	68,689	409,790	948,440	202,490
(56,497)	563,946	341,101	65,802	406,903	970,849	199,077
(58,358)	583,906	341,101	68,616	409,717	993,623	205,366
(93,387)	614,999	341,101	68,435	409,536	1,024,535	198,884
(103,641)	631,413	341,101	70,266	411,367	1,042,780	207,787
(131,759)	661,445	341,101	70,755	411,856	1,073,301	202,078
(389,156)		**1,556,036**	**284,364**			**937,614**

Base Case O&M 2011-2040

Utility Cost Present Value 2011-2040

on

Syn Run)

Grand Total	Value of ICAP	Grand Total		Surplus	ICAP Value
(J)=(H)+(I)	(K)	(L)=(J)-(K)		MW	$/MW-Wk
177,413	0	177,413	2011	0	958
262,679	0	262,679	2012	0	388
272,258	0	272,258	2013	0	161
359,766	1,366	358,400	2014	44	595
312,153	(17,642)	329,794	2015	(225)	1,507
524,845	(96,202)	621,047	2016	(937)	1,973
548,486	(15,313)	563,799	2017	(178)	1,652
555,474	(13,786)	569,260	2018	(189)	1,403
563,999	(16,093)	580,093	2019	(197)	1,572
561,273	(18,947)	580,220	2020	(205)	1,774
577,297	(21,049)	598,346	2021	(206)	1,960
689,545	(24,178)	713,724	2022	(218)	2,129
716,505	(26,660)	743,164	2023	(225)	2,280
723,924	(29,422)	753,346	2024	(235)	2,412
802,204	20,220	781,984	2025	154	2,524
816,626	19,188	797,439	2026	141	2,615
832,021	17,886	814,135	2027	128	2,685
846,153	16,661	829,492	2028	117	2,731
864,982	15,390	849,592	2029	108	2,751
877,835	13,664	864,171	2030	96	2,745
734,285	11,743	722,543	2031	82	2,765
736,008	10,419	725,588	2032	72	2,785
748,657	6,964	741,694	2033	48	2,805
772,457	6,062	766,396	2034	41	2,825
793,784	4,939	788,845	2035	33	2,845
806,742	3,364	803,378	2036	23	2,866
815,489	794	814,696	2037	5	2,887
839,751	(1,160)	840,911	2038	(8)	2,907
850,646	(2,978)	853,624	2039	(20)	2,928
1,052,466	(2,668)	1,055,134	2040	(17)	2,949

	-	
6,112,869	(114,652)	**6,227,521**
611,615		**611,615**
6,724,483		**6,839,135**

Base - Option 1 (Syn Run)

on

Syn Run)

Grand Total	Value of ICAP	Grand Total		Surplus	ICAP Value
(J)=(H)+(I)	(K)	(L)=(J)-(K)		MW	$/MW-Wk
177,413	0	177,413	2011	0	958
262,679	0	262,679	2012	0	388
272,258	0	272,258	2013	0	161
359,766	1,366	358,400	2014	44	595
312,153	(17,642)	329,794	2015	(225)	1,507
573,654	(3,435)	577,089	2016	(33)	1,973
593,630	(1,570)	595,199	2017	(18)	1,652
596,564	(1,896)	598,460	2018	(26)	1,403
610,672	(2,442)	613,115	2019	(30)	1,572
610,300	(3,170)	613,470	2020	(34)	1,774
629,193	(3,516)	632,709	2021	(34)	1,960
710,366	(5,134)	715,501	2022	(46)	2,129
732,565	(6,267)	738,831	2023	(53)	2,280
745,992	(7,849)	753,841	2024	(63)	2,412
821,394	42,796	778,599	2025	326	2,524
840,655	42,578	798,077	2026	313	2,615
849,383	41,897	807,486	2027	300	2,685
869,297	41,086	828,211	2028	289	2,731
889,498	39,991	849,507	2029	280	2,751
892,134	38,216	853,918	2030	268	2,745
913,223	36,472	876,751	2031	254	2,765
913,716	35,327	878,389	2032	244	2,785
927,838	32,051	895,788	2033	220	2,805
944,332	31,329	913,003	2034	213	2,825
971,484	30,388	941,095	2035	205	2,845
983,796	28,997	954,799	2036	195	2,866
990,861	26,611	964,250	2037	177	2,887
1,013,204	24,843	988,361	2038	164	2,907
1,024,453	23,212	1,001,240	2039	152	2,928
1,047,368	23,711	1,023,657	2040	155	2,949
6,540,936	**77,502**	**6,463,434**			

611,615	**611,615**	
7,152,551	**7,075,048**	Base - Option 2 (Syn Run)

on

Syn Run)

Grand Total	Value of ICAP	Grand Total		Surplus	ICAP Value
(J)=(H)+(I)	(K)	(L)=(J)-(K)		MW	$/MW-Wk
177,413	0	177,413	2011	0	958
262,679	0	262,679	2012	0	388
272,258	0	272,258	2013	0	161
359,766	1,366	358,400	2014	44	595
339,796	2,416	337,380	2015	31	1,507
571,959	(16,160)	588,119	2016	(157)	1,973
591,910	(12,221)	604,131	2017	(142)	1,652
594,911	(10,941)	605,852	2018	(150)	1,403
609,228	(12,578)	621,807	2019	(154)	1,572
609,106	(14,611)	623,717	2020	(158)	1,774
628,186	(16,156)	644,342	2021	(158)	1,960
709,682	(18,864)	728,546	2022	(170)	2,129
732,038	(20,969)	753,006	2023	(177)	2,280
745,696	(23,402)	769,098	2024	(187)	2,412
822,070	26,521	795,550	2025	202	2,524
841,465	25,715	815,750	2026	189	2,615
850,452	24,587	825,865	2027	176	2,685
870,539	23,477	847,061	2028	165	2,731
890,875	22,256	868,620	2029	156	2,751
893,954	20,515	873,438	2030	144	2,745
915,303	18,644	896,659	2031	130	2,765
916,222	17,370	898,851	2032	120	2,785
931,545	13,965	917,581	2033	96	2,805
947,411	13,113	934,298	2034	89	2,825
975,085	12,041	963,044	2035	81	2,845
807,348	10,518	796,831	2036	71	2,866
814,631	7,999	806,633	2037	53	2,887
837,247	6,096	831,151	2038	40	2,907
848,784	4,331	844,453	2039	28	2,928
901,913	4,693	897,219	2040	31	2,949
6,467,622	(11,746)	**6,479,369**			
611,615		**611,615**			
7,079,237		**7,090,983**			Base - Option 3 (Syn Run)

on

4 to 2020

Grand Total	Value of ICAP	Grand Total		Surplus	ICAP Value
(J)=(H)+(I)	(K)	(L)=(J)-(K)		MW	$/MW-Wk
177,414	0	177,414	2011	0	958
262,679	0	262,679	2012	0	388
272,258	0	272,258	2013	0	161
359,765	1,366	358,399	2014	44	595
312,154	(17,642)	329,795	2015	(225)	1,507
413,213	(96,202)	509,415	2016	(937)	1,973
421,542	(79,219)	500,761	2017	(922)	1,652
422,072	(67,836)	489,908	2018	(930)	1,403
436,589	(76,338)	512,927	2019	(934)	1,572
621,900	(3,170)	625,070	2020	(34)	1,774
640,789	(3,516)	644,305	2021	(34)	1,960
721,961	(5,134)	727,096	2022	(46)	2,129
744,162	(6,267)	750,428	2023	(53)	2,280
757,593	(7,849)	765,442	2024	(63)	2,412
832,991	42,796	790,196	2025	326	2,524
852,251	42,578	809,673	2026	313	2,615
860,980	41,897	819,083	2027	300	2,685
880,892	41,086	839,806	2028	289	2,731
901,093	39,991	861,102	2029	280	2,751
903,731	38,216	865,515	2030	268	2,745
924,819	36,472	888,347	2031	254	2,765
925,313	35,327	889,986	2032	244	2,785
939,434	32,051	907,384	2033	220	2,805
955,928	31,329	924,599	2034	213	2,825
983,080	30,388	952,691	2035	205	2,845
995,393	28,997	966,396	2036	195	2,866
1,002,458	26,611	975,847	2037	177	2,887
1,024,801	24,843	999,958	2038	164	2,907
1,036,050	23,212	1,012,837	2039	152	2,928
1,058,964	23,711	1,035,253	2040	155	2,949
6,199,887	(106,020)	**6,305,907**			
611,615		**611,615**			
6,811,502		**6,917,522**			

on

4 to 2025

Grand Total	Value of ICAP	Grand Total		Surplus	ICAP Value
(J)=(H)+(I)	(K)	(L)=(J)-(K)		MW	$/MW-Wk
177,414	0	177,414	2011	0	958
262,679	0	262,679	2012	0	388
272,258	0	272,258	2013	0	161
359,765	1,366	358,399	2014	44	595
312,154	(17,642)	329,795	2015	(225)	1,507
413,213	(96,202)	509,415	2016	(937)	1,973
421,542	(79,219)	500,761	2017	(922)	1,652
422,072	(67,836)	489,908	2018	(930)	1,403
436,589	(76,338)	512,927	2019	(934)	1,572
436,572	(86,576)	523,148	2020	(938)	1,774
453,221	(95,667)	548,888	2021	(938)	1,960
543,101	(105,226)	648,327	2022	(950)	2,129
563,884	(113,450)	677,334	2023	(957)	2,280
578,313	(121,234)	699,548	2024	(967)	2,412
848,526	42,796	805,731	2025	326	2,524
867,786	42,578	825,208	2026	313	2,615
876,515	41,897	834,618	2027	300	2,685
896,427	41,086	855,341	2028	289	2,731
916,628	39,991	876,637	2029	280	2,751
919,266	38,216	881,050	2030	268	2,745
940,354	36,472	903,882	2031	254	2,765
940,848	35,327	905,521	2032	244	2,785
954,969	32,051	922,919	2033	220	2,805
971,463	31,329	940,134	2034	213	2,825
998,615	30,388	968,226	2035	205	2,845
1,010,928	28,997	981,931	2036	195	2,866
1,017,993	26,611	991,382	2037	177	2,887
1,040,336	24,843	1,015,493	2038	164	2,907
1,051,585	23,212	1,028,372	2039	152	2,928
1,074,499	23,711	1,050,788	2040	155	2,949
5,875,428	(304,304)	**6,179,732**			
611,615		**611,615**			
6,487,042		**6,791,347**			

on

)ption 1

Grand Total	Value of ICAP	Grand Total		Surplus	ICAP Value
(J)=(H)+(I)	(K)	(L)=(J)-(K)		MW	$/MW-Wk
177,413	0	177,413	2011	0	958
262,679	0	262,679	2012	0	388
272,258	0	272,258	2013	0	161
359,766	1,366	358,400	2014	44	595
312,153	(17,642)	329,794	2015	(225)	1,507
524,845	(96,202)	621,047	2016	(937)	1,973
548,486	(15,313)	563,799	2017	(178)	1,652
555,474	(13,786)	569,260	2018	(189)	1,403
563,999	(16,093)	580,093	2019	(197)	1,572
699,005	(18,947)	717,952	2020	(205)	1,774
730,557	(21,049)	751,606	2021	(206)	1,960
745,543	(24,178)	769,722	2022	(218)	2,129
778,407	(26,660)	805,066	2023	(225)	2,280
806,751	(29,422)	836,173	2024	(235)	2,412
895,482	20,220	875,262	2025	154	2,524
937,796	19,188	918,609	2026	141	2,615
956,692	17,886	938,806	2027	128	2,685
999,384	16,661	982,723	2028	117	2,731
1,035,265	15,390	1,019,875	2029	108	2,751
1,050,108	13,664	1,036,444	2030	96	2,745
941,417	11,743	929,675	2031	82	2,765
964,998	10,419	954,578	2032	72	2,785
997,748	6,964	990,785	2033	48	2,805
1,027,842	6,062	1,021,781	2034	41	2,825
1,083,647	4,939	1,078,708	2035	33	2,845
1,117,214	3,364	1,113,850	2036	23	2,866
1,153,571	794	1,152,778	2037	5	2,887
1,202,839	(1,160)	1,203,999	2038	(8)	2,907
1,230,122	(2,978)	1,233,100	2039	(20)	2,928
1,461,531	(2,668)	1,464,199	2040	(17)	2,949
6,916,346	(114,652)	**7,030,998**			
611,615		**611,615**			
7,527,961		**7,642,613**			

Syn Low CO2 - Option 1

on

)ption 2

Grand Total	Value of ICAP	Grand Total		Surplus	ICAP Value
(J)=(H)+(I)	(K)	(L)=(J)-(K)		MW	$/MW-Wk
177,413	0	177,413	2011	0	958
262,679	0	262,679	2012	0	388
272,258	0	272,258	2013	0	161
359,766	1,366	358,400	2014	44	595
312,153	(17,642)	329,794	2015	(225)	1,507
573,654	(3,435)	577,089	2016	(33)	1,973
593,630	(1,570)	595,199	2017	(18)	1,652
596,564	(1,896)	598,460	2018	(26)	1,403
610,672	(2,442)	613,115	2019	(30)	1,572
691,294	(3,170)	694,464	2020	(34)	1,774
719,333	(3,516)	722,849	2021	(34)	1,960
744,330	(5,134)	749,465	2022	(46)	2,129
772,300	(6,267)	778,566	2023	(53)	2,280
795,239	(7,849)	803,088	2024	(63)	2,412
933,901	44,108	889,793	2025	336	2,524
957,000	43,938	913,062	2026	323	2,615
980,897	43,293	937,604	2027	310	2,685
1,005,957	42,506	963,450	2028	299	2,731
1,028,144	41,422	986,723	2029	290	2,751
1,041,953	39,644	1,002,309	2030	278	2,745
1,072,972	37,910	1,035,062	2031	264	2,765
1,090,393	36,775	1,053,618	2032	254	2,785
1,108,153	33,509	1,074,644	2033	230	2,805
1,136,884	32,798	1,104,086	2034	223	2,825
1,170,658	31,868	1,138,790	2035	215	2,845
1,193,751	30,487	1,163,264	2036	205	2,866
1,214,533	28,112	1,186,421	2037	187	2,887
1,248,302	26,355	1,221,947	2038	174	2,907
1,273,498	24,735	1,248,763	2039	162	2,928
1,303,495	25,245	1,278,250	2040	165	2,949
7,134,779	**81,637**	**7,053,142**			
611,615		**611,615**			
7,746,394		**7,664,757**		Syn Low CO2 - Option 2	

on

ption 4a

Grand Total	Value of ICAP	Grand Total		Surplus	ICAP Value
(J)=(H)+(I)	(K)	(L)=(J)-(K)		MW	$/MW-Wk
177,413	0	177,413	2011	0	958
262,679	0	262,679	2012	0	388
272,258	0	272,258	2013	0	161
359,766	1,366	358,400	2014	44	595
312,153	(17,642)	329,794	2015	(225)	1,507
413,213	(96,202)	509,415	2016	(937)	1,973
421,542	(79,219)	500,761	2017	(922)	1,652
422,071	(67,836)	489,907	2018	(930)	1,403
436,588	(76,338)	512,926	2019	(934)	1,572
702,890	(3,170)	706,060	2020	(34)	1,774
730,929	(3,516)	734,445	2021	(34)	1,960
755,926	(5,134)	761,061	2022	(46)	2,129
783,896	(6,267)	790,162	2023	(53)	2,280
806,835	(7,849)	814,684	2024	(63)	2,412
901,619	42,796	858,824	2025	326	2,524
930,526	42,578	887,948	2026	313	2,615
951,930	41,897	910,033	2027	300	2,685
978,776	41,086	937,690	2028	289	2,731
1,006,996	39,991	967,005	2029	280	2,751
1,026,125	38,216	987,909	2030	268	2,745
1,052,230	36,472	1,015,758	2031	254	2,765
1,075,380	35,327	1,040,053	2032	244	2,785
1,097,671	32,051	1,065,621	2033	220	2,805
1,123,446	31,329	1,092,117	2034	213	2,825
1,150,930	30,388	1,120,541	2035	205	2,845
1,169,926	28,997	1,140,929	2036	195	2,866
1,198,989	26,611	1,172,378	2037	177	2,887
1,223,419	24,843	1,198,576	2038	164	2,907
1,250,567	23,212	1,227,354	2039	152	2,928
1,275,379	23,711	1,251,668	2040	155	2,949
6,694,796	(106,020)	**6,800,816**			
611,615		**611,615**			
7,306,411		**7,412,431**			

Syn Low CO2 - Option 4a

Modification: Corrected Carrying Charge

	Alternative Carrying Charges using Weaver Table 2 (p24) capital costs for FGD and NGCC (inc. AFUDC)	
	Carrying Charges	Alternative Grand Total
2011	0	177,413
2012	0	262,679
2013	0	272,258
2014	607	358,400
2015	607	329,794
2016	161,646	634,931
2017	161,646	577,683
2018	161,646	583,144
2019	161,646	593,977
2020	168,977	594,104
2021	168,977	612,230
2022	168,977	727,608
2023	168,977	757,049
2024	168,977	767,231
2025	271,829	795,868
2026	271,829	811,323
2027	271,829	828,019
2028	271,829	843,376
2029	271,829	863,476
2030	271,829	878,055
2031	146,766	722,543
2032	146,766	725,588
2033	146,766	741,694
2034	146,766	766,396
2035	146,766	788,845
2036	146,766	803,378
2037	146,766	814,696
2038	146,766	840,911
2039	146,766	853,624
2040	146,766	1,055,134

	Carrying Charges	
	1,339,646	**6,309,597**
		611,615
Utility Cost Present Value 2011-2040		**6,921,212**

Modification: Corrected Carrying Charge

	Alternative Carrying Charges using Weaver Table 2 (p24) capital costs for FGD and NGCC (inc. AFUDC)	
	Carrying Charges	Alternative Grand Total
2011	0	177,413
2012	0	262,679
2013	0	272,258
2014	607	358,400
2015	607	329,794
2016	164,822	522,589
2017	164,822	540,700
2018	164,822	543,960
2019	164,822	558,615
2020	172,153	558,970
2021	172,153	578,209
2022	172,153	661,001
2023	172,153	684,331
2024	172,153	699,341
2025	275,005	724,099
2026	275,005	743,577
2027	275,005	752,987
2028	275,005	773,711
2029	275,005	795,007
2030	275,005	799,418
2031	275,005	822,251
2032	275,005	823,889
2033	275,005	841,288
2034	275,005	858,503
2035	275,005	886,595
2036	275,005	900,299
2037	275,005	909,750
2038	275,005	933,861
2039	275,005	946,740
2040	275,005	969,157

	Carrying Charges	
	1,531,603	**6,067,656**

	611,615
Utility Cost Present Value 2011-2040	6,679,271

Modification: Corrected Carrying Charge

	Alternative Carrying Charges using Weaver Table 2 (p24) capital costs for FGD and NGCC (inc. AFUDC)	Alternative Grand Total
	Carrying Charges	
2011	0	177,413
2012	0	262,679
2013	0	272,258
2014	607	358,400
2015	607	337,380
2016	172,004	543,332
2017	172,004	559,343
2018	172,004	561,065
2019	172,004	577,020
2020	179,335	578,930
2021	179,335	599,555
2022	179,335	683,759
2023	179,335	708,219
2024	179,335	724,311
2025	282,187	750,763
2026	282,187	770,963
2027	282,187	781,078
2028	282,187	802,274
2029	282,187	823,833
2030	282,187	828,651
2031	282,187	851,872
2032	282,187	854,064
2033	282,187	872,793
2034	282,187	889,511
2035	282,187	918,257
2036	146,766	796,831
2037	146,766	806,633
2038	146,766	831,151
2039	146,766	844,453
2040	146,766	897,219
	Carrying Charges	
	1,510,994	**6,178,190**
		611,615
Utility Cost Present Value 2011-2040		**6,789,804**

Modification: Corrected Carrying Charge

	Alternative Carrying Charges using Weaver Table 2 (p24) capital costs for FGD and NGCC (inc. AFUDC)	
	Carrying Charges	Alternative Grand Total
2011	0	177,414
2012	0	262,679
2013	0	272,258
2014	607	358,399
2015	607	329,795
2016	36,583	509,415
2017	36,583	500,761
2018	36,583	489,908
2019	36,583	512,927
2020	180,291	567,112
2021	180,291	586,347
2022	180,291	669,137
2023	180,291	692,470
2024	180,291	707,484
2025	283,143	732,237
2026	283,143	751,715
2027	283,143	761,125
2028	283,143	781,847
2029	283,143	803,144
2030	283,143	807,556
2031	283,143	830,389
2032	283,143	832,028
2033	283,143	849,425
2034	283,143	866,641
2035	283,143	894,733
2036	283,143	908,438
2037	283,143	917,889
2038	283,143	942,000
2039	283,143	954,879
2040	283,143	977,294
	Carrying Charges	
	1,271,008	**6,020,879**
		611,615
Utility Cost Present Value 2011-2040		**6,632,494**

Modification: Corrected Carrying Charge

Alternative Carrying Charges using Weaver Table 2 (p24) capital costs for FGD and NGCC (inc. AFUDC)

	Carrying Charges	Alternative Grand Total
2011	0	177,414
2012	0	262,679
2013	0	272,258
2014	607	358,399
2015	607	329,795
2016	36,583	509,415
2017	36,583	500,761
2018	36,583	489,908
2019	36,583	512,927
2020	43,914	523,148
2021	43,914	548,888
2022	43,914	648,327
2023	43,914	677,334
2024	43,914	699,548
2025	294,045	743,139
2026	294,045	762,617
2027	294,045	772,027
2028	294,045	792,749
2029	294,045	814,046
2030	294,045	818,458
2031	294,045	841,291
2032	294,045	842,929
2033	294,045	860,327
2034	294,045	877,543
2035	294,045	905,635
2036	294,045	919,340
2037	294,045	928,791
2038	294,045	952,901
2039	294,045	965,781
2040	294,045	988,196
	Carrying Charges	
	1,026,633	**5,998,561**
		611,615
Utility Cost Present Value 2011-2040		**6,610,175**

Modification: Corrected Carrying Charge

	Alternative Carrying Charges using Weaver Table 2 (p24) capital costs for FGD and NGCC (inc. AFUDC)	
	Carrying Charges	Alternative Grand Total
2011	0	177,413
2012	0	262,679
2013	0	272,258
2014	607	358,400
2015	607	329,794
2016	161,646	634,931
2017	161,646	577,683
2018	161,646	583,144
2019	161,646	593,977
2020	168,977	731,836
2021	168,977	765,490
2022	168,977	783,606
2023	168,977	818,951
2024	168,977	850,058
2025	271,829	889,146
2026	271,829	932,493
2027	271,829	952,690
2028	271,829	996,607
2029	271,829	1,033,759
2030	271,829	1,050,328
2031	146,766	929,675
2032	146,766	954,578
2033	146,766	990,785
2034	146,766	1,021,781
2035	146,766	1,078,708
2036	146,766	1,113,850
2037	146,766	1,152,778
2038	146,766	1,203,999
2039	146,766	1,233,100
2040	146,766	1,464,199
	Carrying Charges	
	1,339,646	**7,113,075**
		611,615
Utility Cost Present Value 2011-2040		**7,724,689**

Modification: Corrected Carrying Charge

	Alternative Carrying Charges using Weaver Table 2 (p24) capital costs for FGD and NGCC (inc. AFUDC)	Alternative Grand Total
	Carrying Charges	
2011	0	177,413
2012	0	262,679
2013	0	272,258
2014	607	358,400
2015	607	329,794
2016	164,822	522,589
2017	164,822	540,700
2018	164,822	543,960
2019	164,822	558,615
2020	172,153	639,964
2021	172,153	668,349
2022	172,153	694,965
2023	172,153	724,066
2024	172,153	748,588
2025	275,005	835,293
2026	275,005	858,562
2027	275,005	883,105
2028	275,005	908,951
2029	275,005	932,223
2030	275,005	947,809
2031	275,005	980,563
2032	275,005	999,118
2033	275,005	1,020,144
2034	275,005	1,049,586
2035	275,005	1,084,290
2036	275,005	1,108,764
2037	275,005	1,131,921
2038	275,005	1,167,447
2039	275,005	1,194,263
2040	275,005	1,223,750
	Carrying Charges	
	1,531,603	**6,657,365**
		611,615
Utility Cost Present Value 2011-2040		**7,268,979**

Modification: Corrected Carrying Charge

	Alternative Carrying Charges using Weaver Table 2

	(p24) capital costs for FGD and NGCC (inc. AFUDC)	
	Carrying Charges	Alternative Grand Total
2011	0	177,413
2012	0	262,679
2013	0	272,258
2014	607	358,400
2015	607	329,794
2016	36,583	509,415
2017	36,583	500,761
2018	36,583	489,907
2019	36,583	512,926
2020	180,291	648,102
2021	180,291	676,487
2022	180,291	703,102
2023	180,291	732,204
2024	180,291	756,726
2025	283,143	800,865
2026	283,143	829,990
2027	283,143	852,075
2028	283,143	879,731
2029	283,143	909,047
2030	283,143	929,950
2031	283,143	957,800
2032	283,143	982,095
2033	283,143	1,007,662
2034	283,143	1,034,159
2035	283,143	1,062,583
2036	283,143	1,082,971
2037	283,143	1,114,420
2038	283,143	1,140,618
2039	283,143	1,169,396
2040	283,143	1,193,709
	Carrying Charges	
	1,271,008	**6,515,788**
		611,615
Utility Cost Present Value 2011-2040		**7,127,403**

Modification: Gross OSS Sharing.

40%

Net OSS to Shareholders	Ratepayer Benefit of Market Revenue / Cost	Total without Shareholder Revenue from OSS	Alternative Grand Total with OSS Deductions and Cap Cost Changes
20,991	19,924	198,404	198,404
39,356	56,568	302,035	302,035
25,077	12,294	297,335	297,335
31,661	26,565	390,061	390,061
22,841	22,222	352,635	352,635
15,482	(100,703)	636,529	650,413
18,145	10,227	581,944	595,828
24,161	26,946	593,421	607,305
17,024	5,794	597,117	611,001
24,449	25,579	604,669	618,553
26,881	30,610	625,227	639,112
27,244	16,828	740,968	754,852
12,300	(39,481)	755,464	769,349
19,582	1,692	772,928	786,813
59,066	77,073	841,050	854,934
66,135	90,844	863,573	877,458
61,801	72,714	875,936	889,820
66,783	89,820	896,275	910,159
61,831	79,973	911,423	925,307
62,190	55,990	926,361	940,245
63,542	81,287	786,085	786,085
71,624	98,262	797,213	797,213
70,705	92,937	812,399	812,399
59,184	51,242	825,580	825,580
57,633	65,173	846,478	846,478
57,847	62,585	861,225	861,225
61,963	70,994	876,659	876,659
52,694	54,315	893,605	893,605
55,671	57,858	909,295	909,295
51,032	38,474	1,106,166	1,106,166

Modification: OS

(A)
49

Therm Generation (GWH)
8,280
9,438
7,657
7,961
8,234
5,691
7,809
8,275
7,736
8,289
8,297
7,980
6,981
7,691
9,144
9,449
9,179
9,458
9,254
8,992
9,303
9,645
9,577
8,961
9,085
9,078
9,271
8,995
9,106
8,861

388,708	**6,616,229**	**6,698,305**
	611,615	**611,615**
	7,227,844	**7,309,920**

Modification: Gross OSS Sharing.

40%

Net OSS to Shareholders	Ratepayer Benefit of Market Revenue / Cost	Total without Shareholder Revenue from OSS	Alternative Grand Total with OSS Deductions and Cap Cost Changes
20,991	19,924	198,404	198,404
39,356	56,568	302,035	302,035
25,077	12,294	297,335	297,335
31,661	26,565	390,061	390,061
22,841	22,222	352,635	352,635
9,114	(14,275)	586,203	531,703
6,983	(26,742)	602,183	547,683
8,226	(18,914)	606,686	552,186
7,146	(31,870)	620,261	565,761
8,903	(18,871)	622,373	567,873
10,176	(15,176)	642,885	588,385
11,822	(17,679)	727,323	672,823
8,337	(41,402)	747,168	692,668
9,020	(38,907)	762,861	708,361
51,022	53,700	829,621	775,121
50,202	56,727	848,279	793,779
52,704	57,079	860,190	805,691
50,400	53,473	878,611	824,111
47,332	46,445	896,840	842,340
52,262	53,957	906,180	851,680
49,972	46,643	926,724	872,224
56,105	58,370	934,494	879,994
53,900	53,989	949,688	895,188
53,793	57,535	966,796	912,296
46,205	35,526	987,300	932,800
46,417	36,623	1,001,216	946,716
47,711	42,195	1,011,961	957,461
42,451	26,217	1,030,812	976,312
43,542	29,487	1,044,782	990,282
39,150	13,228	1,062,807	1,008,307
302,073		**6,765,506**	**6,369,729**

Modification: OS

(A)
49

Therm Generation (GWH)
8,280
9,438
7,657
7,961
8,234
7,136
6,935
7,146
6,928
7,248
7,237
7,279
6,929
7,032
8,615
8,734
8,786
8,736
8,633
8,807
8,724
8,955
8,892
8,989
8,661
8,701
8,830
8,614
8,716
8,519

			611,615	**611,615**	
			7,377,121	**6,981,344**	

Modification: Gross OSS Sharing.

40%

Net OSS to Shareholders	Ratepayer Benefit of Market Revenue / Cost	Total without Shareholder Revenue from OSS	Alternative Grand Total with OSS Deductions and Cap Cost Changes
20,991	19,924	198,404	198,404
39,356	56,568	302,035	302,035
25,077	12,294	297,335	297,335
31,661	26,565	390,061	390,061
39,500	54,074	376,880	376,880
8,112	(18,532)	596,231	551,444
6,212	(30,970)	610,343	565,555
7,338	(23,018)	613,190	568,402
6,336	(36,627)	628,143	583,356
7,948	(23,231)	631,665	586,878
9,107	(19,590)	653,449	608,662
10,706	(22,616)	739,252	694,464
7,425	(47,253)	760,432	715,644
8,048	(44,844)	777,146	732,358
48,976	50,680	844,526	799,739
47,938	52,602	863,688	818,901
50,462	53,572	876,327	831,540
48,140	49,417	895,201	850,414
45,039	41,931	913,659	868,872
49,885	49,964	923,323	878,536
47,626	42,204	944,285	899,498
53,608	53,919	952,460	907,673
51,613	51,452	969,193	924,406
50,606	51,428	984,904	940,117
43,659	30,686	1,006,703	961,915
43,739	31,611	840,569	840,569
45,282	38,257	851,914	851,914
39,885	21,156	871,035	871,035
40,898	24,231	885,351	885,351
37,006	9,320	934,225	934,225
303,075		**6,782,444**	**6,481,265**
		611,615	**611,615**
		7,394,059	**7,092,880**

Modification: OS

(A)
49

Therm Generation (GWH)
8,280
9,438
7,657
7,961
9,090
7,049
6,854
7,069
6,848
7,169
7,154
7,201
6,844
6,948
8,557
8,654
8,720
8,661
8,553
8,735
8,649
8,879
8,856
8,886
8,584
8,624
8,772
8,545
8,645
8,471

Modification: Gross OSS Sharing.

40%

Net OSS to Shareholders	Ratepayer Benefit of Market Revenue / Cost	Total without Shareholder Revenue from OSS	Alternative Grand Total with OSS Deductions and Cap Cost Changes
20,991	19,923	198,405	198,405
39,356	56,568	302,035	302,035
25,077	12,294	297,335	297,335
31,661	26,565	390,060	390,060
22,840	22,222	352,636	352,636
0	(262,595)	509,415	509,415
0	(276,013)	500,761	500,761
0	(270,260)	489,908	489,908
0	(290,487)	512,927	512,927
8,903	(18,855)	633,973	576,015
10,176	(15,176)	654,481	596,522
11,822	(17,679)	738,918	680,960
8,337	(41,403)	758,765	700,807
9,019	(38,888)	774,461	716,503
51,022	53,699	841,218	783,259
50,202	56,727	859,875	801,916
52,704	57,078	871,787	813,829
50,400	53,473	890,206	832,247
47,332	46,445	908,435	850,476
52,262	53,956	917,776	859,818
49,972	46,643	938,320	880,361
56,104	58,370	946,090	888,132
53,900	53,988	961,283	903,325
53,793	57,535	978,392	920,434
46,204	35,526	998,896	940,937
46,417	36,622	1,012,813	954,855
47,711	42,194	1,023,558	965,600
42,451	26,216	1,042,409	984,450
43,541	29,487	1,056,378	998,420
39,150	13,228	1,074,403	1,016,445
283,514		**6,589,421**	**6,304,393**
		611,615	**611,615**
		7,201,036	**6,916,008**

Modification: OS

(A)
49

Therm Generation (GWH)
8,280
9,438
7,657
7,961
8,234
2,797
2,659
2,900
2,658
7,248
7,237
7,279
6,929
7,032
8,615
8,734
8,786
8,736
8,633
8,807
8,724
8,955
8,892
8,989
8,661
8,701
8,830
8,614
8,716
8,519

Modification: Gross OSS Sharing.

Modification: OS

40%

Net OSS to Shareholders	Ratepayer Benefit of Market Revenue / Cost	Total without Shareholder Revenue from OSS	Alternative Grand Total with OSS Deductions and Cap Cost Changes	(A) 49 Therm Generation (GWH)
20,991	19,923	198,405	198,405	8,280
39,356	56,568	302,035	302,035	9,438
25,077	12,294	297,335	297,335	7,657
31,661	26,565	390,060	390,060	7,961
22,840	22,222	352,636	352,636	8,234
0	(262,595)	509,415	509,415	2,797
0	(276,013)	500,761	500,761	2,659
0	(270,260)	489,908	489,908	2,900
0	(290,487)	512,927	512,927	2,658
0	(279,386)	523,148	523,148	2,985
0	(279,891)	548,888	548,888	2,977
0	(327,351)	648,327	648,327	2,976
0	(360,111)	677,334	677,334	2,626
0	(367,599)	699,548	699,548	2,696
51,022	53,699	856,753	794,161	8,615
50,202	56,727	875,410	812,818	8,734
52,704	57,078	887,322	824,731	8,786
50,400	53,473	905,741	843,149	8,736
47,332	46,445	923,970	861,378	8,633
52,262	53,956	933,311	870,720	8,807
49,972	46,643	953,855	891,263	8,724
56,104	58,370	961,625	899,034	8,955
53,900	53,988	976,818	914,227	8,892
53,793	57,535	993,927	931,336	8,989
46,204	35,526	1,014,431	951,839	8,661
46,417	36,622	1,028,348	965,756	8,701
47,711	42,194	1,039,093	976,501	8,830
42,451	26,216	1,057,944	995,352	8,614
43,541	29,487	1,071,913	1,009,322	8,716
39,150	13,228	1,089,938	1,027,347	8,519
263,941		**6,443,674**	**6,262,502**	
		611,615	**611,615**	
		7,055,288	**6,874,117**	

Modification: Gross OSS Sharing.

Modification: OS

40%

Net OSS to Shareholders	Ratepayer Benefit of Market Revenue / Cost	Total without Shareholder Revenue from OSS	Alternative Grand Total with OSS Deductions and Cap Cost Changes	(A) 49 Therm Generation (GWH)
20,991	19,924	198,404	198,404	8,280
39,356	56,568	302,035	302,035	9,438
25,077	12,294	297,335	297,335	7,657
31,661	26,565	390,061	390,061	7,961
22,841	22,222	352,635	352,635	8,234
15,482	(100.703)	636,529	650,413	5,691
18,145	10,227	581,944	595,828	7,809
24,161	26,946	593,421	607,305	8,275
17,024	5,794	597,117	611,001	7,736
17,618	8,205	735,570	749,454	7,924
19,335	11,278	770,941	784,825	7,899
24,968	10,643	794,690	808,574	7,866
10,520	(48.257)	815,586	829,470	6,853
16,540	(10.427)	852,714	866,598	7,512
49,828	36,862	925,090	938,974	8,362
56,799	66,750	975,408	989,292	8,997
47,484	26,853	986,290	1,000,174	8,296
53,307	51,197	1,036,029	1,049,914	8,770
49,201	44,858	1,069,076	1,082,961	8,672
45,770	6,018	1,082,215	1,096,099	8,137
49,835	39,263	979,509	979,509	8,671
53,596	38,883	1,008,174	1,008,174	8,730
48,817	30,161	1,039,601	1,039,601	8,627
44,983	3,687	1,066,764	1,066,764	8,309
42,602	19,335	1,121,310	1,121,310	8,535
40,588	11,348	1,154,438	1,154,438	8,458
42,848	9,437	1,195,626	1,195,626	8,530
38,279	7,495	1,242,278	1,242,278	8,537
38,188	(10.788)	1,271,288	1,271,288	8,357
34,848	(10.864)	1,499,047	1,499,047	8,418
338,046		**7,369,044**	**7,451,121**	
		611,615	**611,615**	
		7,980,659	**8,062,735**	

Modification: Gross OSS Sharing.

40%

Modification: OS

Net OSS to Shareholders	Ratepayer Benefit of Market Revenue / Cost	Total without Shareholder Revenue from OSS	Alternative Grand Total with OSS Deductions and Cap Cost Changes	(A) 49 Therm Generation (GWH)
20,991	19,924	198,404	198,404	8,280
39,356	56,568	302,035	302,035	9,438
25,077	12,294	297,335	297,335	7,657
31,661	26,565	390,061	390,061	7,961
22,841	22,222	352,635	352,635	8,234
9,114	(14,275)	586,203	531,703	7,136
6,983	(26,742)	602,183	547,683	6,935
8,226	(18,914)	606,686	552,186	7,146
7,146	(31,870)	620,261	565,761	6,928
6,652	(28,977)	701,116	646,616	7,056
7,460	(26,925)	730,309	675,809	7,017
10,879	(22,204)	760,343	705,843	7,204
7,565	(46,849)	786,131	731,631	6,844
8,050	(45,861)	811,138	756,638	6,927
12,603	(24,131)	902,396	847,896	7,329
10,304	(40,186)	923,366	868,867	7,123
10,663	(36,510)	948,268	893,768	7,259
9,144	(57,100)	972,594	918,094	6,998
6,691	(93,256)	993,414	938,914	6,522
6,515	(98,098)	1,008,824	954,325	6,491
5,856	(113,271)	1,040,919	986,419	6,368
5,939	(107,049)	1,059,557	1,005,057	6,541
4,854	(134,893)	1,079,498	1,024,998	6,228
4,484	(142,341)	1,108,570	1,054,070	6,253
3,956	(163,966)	1,142,745	1,088,245	6,060
3,920	(174,055)	1,167,183	1,112,683	6,032
3,932	(180,735)	1,190,353	1,135,854	6,053
3,922	(192,554)	1,225,869	1,171,369	6,028
4,224	(202,109)	1,252,986	1,198,486	6,012
4,494	(223,213)	1,282,744	1,228,244	5,885
175,618		**7,228,760**	**6,832,983**	
		611,615	**611,615**	
		7,840,375	**7,444,597**	

Modification: Gross OSS Sharing.

40%

Modification: OS

(A)

Net OSS to Shareholders	Ratepayer Benefit of Market Revenue / Cost	Total without Shareholder Revenue from OSS	Alternative Grand Total with OSS Deductions and Cap Cost Changes	Therm Generation (GWH)
20,991	19,924	198,404	198,404	8,280
39,356	56,568	302,035	302,035	9,438
25,077	12,294	297,335	297,335	7,657
31,661	26,565	390,061	390,061	7,961
22,841	22,222	352,635	352,635	8,234
0	(262,595)	509,415	509,415	2,797
0	(276,013)	500,761	500,761	2,659
0	(270,259)	489,907	489,907	2,900
0	(290,487)	512,926	512,926	2,658
6,652	(28,977)	712,712	654,754	7,056
7,460	(26,925)	741,905	683,946	7,017
10,879	(22,204)	771,939	713,981	7,204
7,565	(46,849)	797,727	739,769	6,844
8,050	(45,861)	822,734	764,776	6,927
44,468	33,732	903,291	845,333	8,238
42,163	33,824	930,111	872,152	8,296
43,446	28,798	953,480	895,522	8,262
40,266	14,264	977,956	919,997	8,042
38,156	2,058	1,005,162	947,203	7,895
40,667	7,763	1,028,575	970,617	8,038
38,210	(8,299)	1,053,969	996,010	7,842
41,709	3,330	1,081,762	1,023,803	8,085
35,928	(13,348)	1,101,549	1,043,591	7,838
32,059	(26,001)	1,124,176	1,066,217	7,685
26,699	(60,174)	1,147,240	1,089,282	7,259
23,399	(79,896)	1,164,328	1,106,370	7,035
22,630	(80,988)	1,195,008	1,137,049	7,097
18,703	(112,090)	1,217,279	1,159,321	6,784
17,796	(121,437)	1,245,151	1,187,192	6,747
15,491	(147,250)	1,267,159	1,209,200	6,529
239,909		**7,040,725**	**6,755,697**	
		611,615	**611,615**	
		7,652,340	**7,367,312**	

S Sharing, Net of Production Costs

(B) 50	(C)=(B)/(A)	(D) = ((1)+(8)+(9)) * (C)	(E) 53	(F)=(E)-(D)	
Econ Energy Sales (GWH)	OSS Fraction of Total Energy Required + OSS	Variable Production Cost Allocated to OSS ('000 $)	Econ Energy Sales (0)	Net OSS ('000 $)	Net OSS to Shareholders ('000$)
1,247	15%	32,774	52,478	19,704	7,882
2,136	23%	79,565	98,389	18,824	7,530
1,172	15%	44,567	62,692	18,125	7,250
1,367	17%	67,522	79,152	11,630	4,652
1,242	15%	48,958	57,102	8,144	3,258
743	13%	28,218	38,706	10,488	4,195
855	11%	33,671	45,362	11,691	4,676
1,139	14%	45,555	60,402	14,847	5,939
772	10%	31,533	42,560	11,027	4,411
1,132	14%	44,832	61,123	16,291	6,516
1,223	15%	49,556	67,203	17,647	7,059
1,044	13%	56,424	68,111	11,687	4,675
450	6%	24,703	30,750	6,047	2,419
702	9%	39,791	48,955	9,164	3,666
1,775	19%	103,134	147,664	44,530	17,812
1,990	21%	118,764	165,337	46,573	18,629
1,832	20%	110,353	154,502	44,149	17,660
1,930	20%	119,686	166,958	47,272	18,909
1,720	19%	108,291	154,577	46,286	18,514
1,712	19%	109,239	155,475	46,236	18,494
1,683	18%	110,669	158,856	48,187	19,275
1,888	20%	125,045	179,061	54,016	21,606
1,829	19%	123,532	176,763	53,231	21,292
1,447	16%	99,065	147,960	48,895	19,558
1,349	15%	94,814	144,082	49,268	19,707
1,317	15%	94,525	144,617	50,092	20,037
1,410	15%	102,055	154,908	52,853	21,141
1,123	12%	83,234	131,734	48,500	19,400
1,169	13%	87,503	139,177	51,674	20,670
1,020	12%	78,297	127,580	49,283	19,713

S Sharing, Net of Production Costs

(B) 50	(C)=(B)/(A)	(D) = ((1)+(8)+(9)) * (C)	(E) 53	(F)=(E)-(D)	
Econ Energy Sales (GWH)	OSS Fraction of Total Energy Required + OSS	Variable Production Cost Allocated to OSS ('000 $)	Econ Energy Sales (0)	Net OSS ('000 $)	Net OSS to Shareholders ('000$)
1,247	15%	32,774	52,478	19,704	7,882
2,136	23%	79,565	98,389	18,824	7,530
1,172	15%	44,567	62,692	18,125	7,250
1,367	17%	67,522	79,152	11,630	4,652
1,242	15%	48,958	57,102	8,144	3,258
410	6%	17,260	22,784	5,524	2,209
316	5%	13,676	17,458	3,782	1,513
355	5%	15,633	20,564	4,931	1,972
311	4%	14,079	17,866	3,787	1,515
384	5%	16,628	22,257	5,629	2,251
436	6%	19,509	25,439	5,930	2,372
427	6%	23,573	29,556	5,983	2,393
298	4%	16,928	20,843	3,915	1,566
309	4%	18,130	22,549	4,419	1,768
1,465	17%	87,767	127,556	39,789	15,916
1,449	17%	89,020	125,504	36,484	14,594
1,502	17%	93,439	131,760	38,321	15,328
1,398	16%	89,547	126,000	36,453	14,581
1,286	15%	83,897	118,331	34,434	13,774
1,401	16%	92,487	130,655	38,168	15,267
1,319	15%	89,393	124,931	35,538	14,215
1,460	16%	99,207	140,262	41,055	16,422
1,359	15%	93,993	134,750	40,757	16,303
1,334	15%	93,769	134,483	40,714	16,286
1,099	13%	79,036	115,512	36,476	14,590
1,072	12%	78,678	116,043	37,365	14,946
1,078	12%	79,499	119,278	39,779	15,911
915	11%	69,072	106,128	37,056	14,822
920	11%	70,045	108,854	38,809	15,523
785	9%	61,187	97,876	36,689	14,676

S Sharing, Net of Production Costs

(B) 50	(C)=(B)/(A)	(D) = ((1)+(8)+(9)) * (C)	(E) 53	(F)=(E)-(D)	
Econ Energy Sales (GWH)	OSS Fraction of Total Energy Required + OSS	Variable Production Cost Allocated to OSS ('000 $)	Econ Energy Sales (0)	Net OSS ('000 $)	Net OSS to Shareholders ('000$)
1,247	15%	32,774	52,478	19,704	7,882
2,136	23%	79,565	98,389	18,824	7,530
1,172	15%	44,567	62,692	18,125	7,250
1,367	17%	67,522	79,152	11,630	4,652
1,927	21%	76,823	98,751	21,928	8,771
368	5%	15,463	20,280	4,817	1,927
284	4%	12,265	15,530	3,265	1,306
319	5%	14,015	18,344	4,329	1,732
279	4%	12,603	15,840	3,237	1,295
346	5%	14,943	19,871	4,928	1,971
393	5%	17,538	22,767	5,229	2,092
390	5%	21,488	26,764	5,276	2,111
268	4%	15,195	18,563	3,368	1,347
278	4%	16,281	20,119	3,838	1,535
1,408	16%	84,253	122,441	38,188	15,275
1,384	16%	84,932	119,845	34,913	13,965
1,439	17%	89,406	126,154	36,748	14,699
1,336	15%	85,477	120,350	34,873	13,949
1,223	14%	79,668	112,598	32,930	13,172
1,338	15%	88,217	124,712	36,495	14,598
1,259	15%	85,216	119,064	33,848	13,539
1,397	16%	94,810	134,021	39,211	15,684
1,307	15%	90,343	129,032	38,689	15,476
1,250	14%	87,736	126,515	38,779	15,511
1,038	12%	74,581	109,147	34,566	13,827
1,009	12%	73,972	109,347	35,375	14,150
1,024	12%	75,444	113,204	37,760	15,104
859	10%	64,770	99,712	34,942	13,977
864	10%	65,700	102,244	36,544	14,618
743	9%	57,865	92,515	34,650	13,860

S Sharing, Net of Production Costs

(B) 50	(C)=(B)/(A)	(D) = ((1)+(8)+(9)) * (C)	(E) 53	(F)=(E)-(D)	
Econ Energy Sales (GWH)	OSS Fraction of Total Energy Required + OSS	Variable Production Cost Allocated to OSS ('000 $)	Econ Energy Sales (0)	Net OSS ('000 $)	Net OSS to Shareholders ('000$)
1,247	15%	32,774	52,477	19,703	7,881
2,136	23%	79,565	98,389	18,824	7,530
1,172	15%	44,567	62,692	18,125	7,250
1,367	17%	67,521	79,152	11,631	4,652
1,242	15%	48,958	57,101	8,143	3,257
0	0%	0	0	0	0
0	0%	0	0	0	0
0	0%	0	0	0	0
0	0%	0	0	0	0
384	5%	16,628	22,257	5,629	2,251
436	6%	19,509	25,439	5,930	2,372
427	6%	23,573	29,556	5,983	2,393
298	4%	16,928	20,842	3,914	1,565
309	4%	18,130	22,548	4,418	1,767
1,465	17%	87,767	127,555	39,788	15,915
1,449	17%	89,020	125,504	36,484	14,594
1,502	17%	93,439	131,759	38,320	15,328
1,398	16%	89,547	126,000	36,453	14,581
1,286	15%	83,897	118,331	34,434	13,774
1,401	16%	92,487	130,654	38,167	15,267
1,319	15%	89,393	124,931	35,538	14,215
1,460	16%	99,207	140,261	41,054	16,421
1,359	15%	93,993	134,749	40,756	16,302
1,334	15%	93,769	134,483	40,714	16,286
1,099	13%	79,036	115,511	36,475	14,590
1,072	12%	78,678	116,042	37,364	14,946
1,078	12%	79,499	119,277	39,778	15,911
915	11%	69,072	106,127	37,055	14,822
920	11%	70,045	108,853	38,808	15,523
785	9%	61,187	97,876	36,689	14,676

S Sharing, Net of Production Costs

(B) 50	(C)=(B)/(A)	(D) = ((1)+(8)+(9)) * (C)	(E) 53	(F)=(E)-(D)	
Econ Energy Sales (GWH)	OSS Fraction of Total Energy Required + OSS	Variable Production Cost Allocated to OSS ('000 $)	Econ Energy Sales (0)	Net OSS ('000 $)	Net OSS to Shareholders ('000$)
1,247	15%	32,774	52,477	19,703	7,881
2,136	23%	79,565	98,389	18,824	7,530
1,172	15%	44,567	62,692	18,125	7,250
1,367	17%	67,521	79,152	11,631	4,652
1,242	15%	48,958	57,101	8,143	3,257
0	0%	0	0	0	0
0	0%	0	0	0	0
0	0%	0	0	0	0
0	0%	0	0	0	0
0	0%	0	0	0	0
0	0%	0	0	0	0
0	0%	0	0	0	0
0	0%	0	0	0	0
0	0%	0	0	0	0
1,465	17%	87,767	127,555	39,788	15,915
1,449	17%	89,020	125,504	36,484	14,594
1,502	17%	93,439	131,759	38,320	15,328
1,398	16%	89,547	126,000	36,453	14,581
1,286	15%	83,897	118,331	34,434	13,774
1,401	16%	92,487	130,654	38,167	15,267
1,319	15%	89,393	124,931	35,538	14,215
1,460	16%	99,207	140,261	41,054	16,421
1,359	15%	93,993	134,749	40,756	16,302
1,334	15%	93,769	134,483	40,714	16,286
1,099	13%	79,036	115,511	36,475	14,590
1,072	12%	78,678	116,042	37,364	14,946
1,078	12%	79,499	119,277	39,778	15,911
915	11%	69,072	106,127	37,055	14,822
920	11%	70,045	108,853	38,808	15,523
785	9%	61,187	97,876	36,689	14,676

S Sharing, Net of Production Costs

(B) 50	(C)=(B)/(A)	(D) = ((1)+(8)+(9)) * (C)	(E) 53	(F)=(E)-(D)	
Econ Energy Sales (GWH)	OSS Fraction of Total Energy Required + OSS	Variable Production Cost Allocated to OSS ('000 $)	Econ Energy Sales (0)	Net OSS ('000 $)	Net OSS to Shareholders ('000$)
1,247	15%	32,774	52,478	19,704	7,882
2,136	23%	79,565	98,389	18,824	7,530
1,172	15%	44,567	62,692	18,125	7,250
1,367	17%	67,522	79,152	11,630	4,652
1,242	15%	48,958	57,102	8,144	3,258
743	13%	28,218	38,706	10,488	4,195
855	11%	33,671	45,362	11,691	4,676
1,139	14%	45,555	60,402	14,847	5,939
772	10%	31,533	42,560	11,027	4,411
818	10%	45,979	44,044	(1,935)	(774)
883	11%	52,154	48,337	(3,817)	(1,527)
955	12%	58,240	62,420	4,180	1,672
382	6%	24,338	26,299	1,961	784
590	8%	39,788	41,351	1,563	625
1,437	17%	98,907	124,569	25,662	10,265
1,691	19%	122,501	141,998	19,497	7,799
1,336	16%	99,468	118,710	19,242	7,697
1,509	17%	118,370	133,267	14,897	5,959
1,355	16%	110,211	123,003	12,792	5,117
1,211	15%	101,195	114,426	13,231	5,292
1,325	15%	116,715	124,587	7,872	3,149
1,401	16%	126,963	133,990	7,027	2,811
1,233	14%	116,097	122,042	5,945	2,378
1,106	13%	107,581	112,458	4,877	1,951
1,025	12%	104,452	106,504	2,052	821
943	11%	99,867	101,469	1,602	641
999	12%	108,969	107,121	(1,848)	(739)
874	10%	99,413	95,697	(3,716)	(1,486)
838	10%	98,005	95,469	(2,536)	(1,014)
732	9%	89,324	87,120	(2,204)	(882)

S Sharing, Net of Production Costs

(B)	(C)=(B)/(A)	(D) = ((1)+(8)+(9)) * (C)	(E)	(F)=(E)-(D)	
50			53		
Econ Energy Sales (GWH)	OSS Fraction of Total Energy Required + OSS	Variable Production Cost Allocated to OSS ('000 $)	Econ Energy Sales (0)	Net OSS ('000 $)	Net OSS to Shareholders ('000$)
1,247	15%	32,774	52,478	19,704	7,882
2,136	23%	79,565	98,389	18,824	7,530
1,172	15%	44,567	62,692	18,125	7,250
1,367	17%	67,522	79,152	11,630	4,652
1,242	15%	48,958	57,102	8,144	3,258
410	6%	17,260	22,784	5,524	2,209
316	5%	13,676	17,458	3,782	1,513
355	5%	15,633	20,564	4,931	1,972
311	4%	14,079	17,866	3,787	1,515
282	4%	15,354	16,630	1,276	510
316	5%	18,074	18,649	575	230
390	5%	23,338	27,197	3,859	1,544
268	4%	16,760	18,912	2,152	861
273	4%	17,933	20,125	2,192	877
360	5%	25,502	31,507	6,005	2,402
285	4%	20,949	25,761	4,812	1,925
291	4%	22,052	26,658	4,606	1,843
240	3%	18,955	22,859	3,904	1,562
165	3%	13,435	16,727	3,292	1,317
147	2%	12,286	16,288	4,002	1,601
128	2%	11,197	14,641	3,444	1,377
129	2%	11,429	14,848	3,419	1,368
92	1%	8,394	12,135	3,741	1,496
82	1%	7,700	11,211	3,511	1,404
69	1%	6,760	9,889	3,129	1,252
65	1%	6,570	9,799	3,229	1,292
63	1%	6,477	9,831	3,354	1,342
59	1%	6,299	9,805	3,506	1,402
61	1%	6,673	10,559	3,886	1,554
60	1%	6,791	11,235	4,444	1,778

S Sharing, Net of Production Costs

(B)	(C)=(B)/(A)	(D) = ((1)+(8)+(9)) * (C)	(E)	(F)=(E)-(D)

50			53		
Econ Energy Sales (GWH)	OSS Fraction of Total Energy Required + OSS	Variable Production Cost Allocated to OSS ('000 $)	Econ Energy Sales (0)	Net OSS ('000 $)	Net OSS to Shareholders ('000$)
1,247	15%	32,774	52,478	19,704	7,882
2,136	23%	79,565	98,389	18,824	7,530
1,172	15%	44,567	62,692	18,125	7,250
1,367	17%	67,522	79,152	11,630	4,652
1,242	15%	48,958	57,102	8,144	3,258
0	0%	0	0	0	0
0	0%	0	0	0	0
0	0%	0	0	0	0
0	0%	0	0	0	0
282	4%	15,354	16,630	1,276	510
316	5%	18,074	18,649	575	230
390	5%	23,338	27,197	3,859	1,544
268	4%	16,760	18,912	2,152	861
273	4%	17,933	20,125	2,192	877
1,241	15%	84,121	111,169	27,048	10,819
1,174	14%	82,673	105,407	22,734	9,094
1,193	14%	86,688	108,616	21,928	8,771
1,068	13%	80,819	100,665	19,846	7,938
998	13%	77,896	95,391	17,495	6,998
1,038	13%	83,506	101,667	18,161	7,265
963	12%	80,139	95,526	15,387	6,155
1,034	13%	88,231	104,272	16,041	6,416
829	11%	72,897	89,821	16,924	6,770
703	9%	63,664	80,147	16,483	6,593
557	8%	52,025	66,747	14,722	5,889
457	6%	43,971	58,497	14,526	5,811
429	6%	42,460	56,574	14,114	5,645
332	5%	33,799	46,758	12,959	5,184
306	5%	31,990	44,491	12,501	5,000
246	4%	26,424	38,728	12,304	4,922

Ratepayer Benefit of Market Revenue / Cost ('000)	Total without Shareholder Revenue from OSS ('000$)	Alternative Grand Total with OSS Deductions and Cap Cost
33,033	185,295	185,295
88,394	270,209	270,209
30,121	279,508	279,508
53,574	363,052	363,052
41,805	333,052	333,052
(89,416)	625,242	639,126
23,696	568,475	582,359
45,168	575,199	589,083
18,407	584,504	598,388
43,512	586,736	600,621
50,432	605,405	619,289
39,397	718,398	732,282
(29,600)	745,583	759,468
17,608	757,012	770,896
118,327	799,796	813,680
138,350	816,068	829,952
116,855	831,794	845,679
137,694	848,400	862,284
123,290	868,107	881,991
99,686	882,666	896,550
125,554	741,817	741,817
148,280	747,195	747,195
142,350	762,986	762,986
90,868	785,954	785,954
103,099	808,552	808,552
100,395	823,415	823,415
111,816	835,837	835,837
87,609	860,311	860,311
92,859	874,294	874,294
69,793	1,074,847	1,074,847

	6,331,485	**6,413,562**
	611,615	**611,615**
	6,943,100	**7,025,177**

Ratepayer Benefit of Market Revenue / Cost ('000)	Total without Shareholder Revenue from OSS ('000$)	Alternative Grand Total with OSS Deductions and Cap Cost
33,033	185,295	185,295
88,394	270,209	270,209
30,121	279,508	279,508
53,574	363,052	363,052
41,805	333,052	333,052
(7,370)	579,299	524,799
(21,272)	596,712	542,212
(12,660)	600,433	545,933
(26,239)	614,629	560,130
(12,219)	615,722	561,222
(7,372)	635,081	580,581
(8,250)	717,894	663,394
(34,631)	740,397	685,897
(31,655)	755,609	701,109
88,806	794,514	740,014
92,335	812,671	758,171
94,455	822,815	768,315
89,292	842,792	788,292
80,003	863,281	808,781
90,952	869,185	814,685
82,400	890,967	836,467
98,053	894,811	840,311
91,586	912,090	857,591
95,042	929,289	874,789
67,141	955,686	901,186
68,094	969,745	915,245
73,995	980,162	925,662
53,846	1,003,183	948,683
57,506	1,016,764	962,264
37,702	1,038,332	983,832
	6,542,766	**6,146,989**

	611,615	**611,615**
	7,154,381	**6,758,604**

Ratepayer Benefit of Market Revenue / Cost ('000)	Total without Shareholder Revenue from OSS ('000$)	Alternative Grand Total with OSS Deductions and Cap Cost
33,033	185,295	185,295
88,394	270,209	270,209
30,121	279,508	279,508
53,574	363,052	363,052
84,803	346,151	346,151
(12,347)	590,045	545,258
(26,064)	605,436	560,649
(17,412)	607,584	562,797
(31,586)	623,102	578,314
(17,254)	625,688	580,901
(12,575)	646,434	601,647
(14,021)	730,656	685,869
(41,175)	754,353	709,566
(38,331)	770,633	725,846
84,381	810,825	766,038
86,575	829,715	784,928
89,335	840,565	795,777
83,608	861,010	816,223
73,798	881,792	837,005
85,251	888,036	843,249
76,291	910,199	865,411
91,843	914,536	869,748
87,589	933,056	888,269
86,523	949,810	905,022
60,518	976,870	932,083
61,200	810,981	810,981
68,435	821,737	821,737
47,064	845,127	845,127
50,511	859,071	859,071
32,466	911,079	911,079
	6,559,533	**6,258,354**
	611,615	**611,615**
	7,171,148	**6,869,969**

Ratepayer Benefit of Market Revenue / Cost ('000)	Total without Shareholder Revenue from OSS ('000$)	Alternative Grand Total with OSS Deductions and Cap Cost
33,033	185,295	185,295
88,394	270,209	270,209
30,121	279,508	279,508
53,574	363,051	363,051
41,805	333,052	333,052
(262,595)	509,415	509,415
(276,013)	500,761	500,761
(270,260)	489,908	489,908
(290,487)	512,927	512,927
(12,203)	627,322	569,363
(7,372)	646,677	588,719
(8,250)	729,489	671,531
(34,631)	751,994	694,035
(31,636)	767,209	709,251
88,806	806,111	748,152
92,335	824,267	766,308
94,454	834,411	776,453
89,292	854,387	796,429
80,003	874,876	816,917
90,951	880,781	822,823
82,400	902,563	844,604
98,053	906,407	848,449
91,586	923,686	865,728
95,042	940,885	882,926
67,140	967,281	909,323
68,093	981,342	923,383
73,994	991,758	933,800
53,845	1,014,780	956,822
57,505	1,028,360	970,402
37,702	1,049,928	991,970
	6,380,973	**6,095,945**
	611,615	**611,615**
	6,992,588	**6,707,560**

Ratepayer Benefit of Market Revenue / Cost ('000)	Total without Shareholder Revenue from OSS ('000$)	Alternative Grand Total with OSS Deductions and Cap Cost Changes
33,033	185,295	185,295
88,394	270,209	270,209
30,121	279,508	279,508
53,574	363,051	363,051
41,805	333,052	333,052
(262,595)	509,415	509,415
(276,013)	500,761	500,761
(270,260)	489,908	489,908
(290,487)	512,927	512,927
(279,386)	523,148	523,148
(279,891)	548,888	548,888
(327,351)	648,327	648,327
(360,111)	677,334	677,334
(367,599)	699,548	699,548
88,806	821,646	759,054
92,335	839,802	777,210
94,454	849,946	787,355
89,292	869,922	807,330
80,003	890,411	827,819
90,951	896,316	833,725
82,400	918,098	855,506
98,053	921,942	859,351
91,586	939,221	876,630
95,042	956,420	893,828
67,140	982,816	920,225
68,093	996,877	934,285
73,994	1,007,293	944,702
53,845	1,030,315	967,724
57,505	1,043,895	981,304
37,702	1,065,463	1,002,872
	6,250,552	**6,069,380**
	611,615	**611,615**
	6,862,167	**6,680,995**

Ratepayer Benefit of Market Revenue / Cost ('000)	Total without Shareholder Revenue from OSS ('000$)	Alternative Grand Total with OSS Deductions and Cap Cost
33,033	185,295	185,295
88,394	270,209	270,209
30,121	279,508	279,508
53,574	363,052	363,052
41,805	333,052	333,052
(89,416)	625,242	639,126
23,696	568,475	582,359
45,168	575,199	589,083
18,407	584,504	598,388
26,597	717,178	731,062
32,140	750,079	763,963
33,939	771,393	785,278
(38,521)	805,851	819,735
5,488	836,799	850,683
76,425	885,527	899,411
115,750	926,407	940,291
66,640	946,503	960,387
98,545	988,681	1,002,565
88,942	1,024,992	1,038,876
46,496	1,041,737	1,055,621
85,949	932,823	932,823
89,668	957,389	957,389
76,600	993,163	993,163
46,719	1,023,731	1,023,731
61,116	1,079,529	1,079,529
51,295	1,114,491	1,114,491
53,024	1,152,038	1,152,038
47,260	1,202,513	1,202,513
28,414	1,232,086	1,232,086
24,866	1,463,317	1,463,317
	7,082,028	**7,164,104**
	611,615	**611,615**
	7,693,643	**7,775,719**

Ratepayer Benefit of Market Revenue / Cost ('000)	Total without Shareholder Revenue from OSS ('000$)	Alternative Grand Total with OSS Deductions and Cap Cost
33,033	185,295	185,295
88,394	270,209	270,209
30,121	279,508	279,508
53,574	363,052	363,052
41,805	333,052	333,052
(7,370)	579,299	524,799
(21,272)	596,712	542,212
(12,660)	600,433	545,933
(26,239)	614,629	560,130
(22,835)	694,974	640,475
(19,695)	723,079	668,579
(12,869)	751,008	696,508
(40,145)	779,427	724,927
(38,688)	803,965	749,465
(13,930)	892,195	837,695
(31,807)	914,987	860,487
(27,690)	939,447	884,947
(49,518)	965,012	910,512
(87,882)	988,040	933,540
(93,184)	1,003,910	949,410
(108,792)	1,036,440	981,940
(102,478)	1,054,985	1,000,485
(131,535)	1,076,140	1,021,640
(139,261)	1,105,490	1,050,990
(161,262)	1,140,041	1,085,541
(171,427)	1,164,556	1,110,056
(178,145)	1,187,763	1,133,263
(190,034)	1,223,349	1,168,849
(199,439)	1,250,317	1,195,817
(220,497)	1,280,027	1,225,528
	7,090,621	**6,694,844**
	611,615	**611,615**
	7,702,236	**7,306,459**

Ratepayer Benefit of Market Revenue / Cost ('000)	Total without Shareholder Revenue from OSS ('000$)	Alternative Grand Total with OSS Deductions and Cap Cost
33,033	185,295	185,295
88,394	270,209	270,209
30,121	279,508	279,508
53,574	363,052	363,052
41,805	333,052	333,052
(262,595)	509,415	509,415
(276,013)	500,761	500,761
(270,259)	489,907	489,907
(290,487)	512,926	512,926
(22,835)	706,570	648,612
(19,695)	734,675	676,717
(12,869)	762,604	704,646
(40,145)	791,023	733,065
(38,688)	815,561	757,602
67,381	869,643	811,684
66,893	897,042	839,083
63,473	918,805	860,846
46,592	945,628	887,670
33,216	974,003	916,045
41,165	995,173	937,215
23,756	1,021,913	963,955
38,623	1,046,469	988,511
15,810	1,072,390	1,014,432
(535)	1,098,710	1,040,752
(39,364)	1,126,430	1,068,472
(62,308)	1,146,740	1,088,781
(64,003)	1,178,023	1,120,065
(98,571)	1,203,760	1,145,801
(108,641)	1,232,355	1,174,396
(136,681)	1,256,589	1,198,631
	6,850,737	**6,565,709**
	611,615	**611,615**
	7,462,351	**7,177,323**

REQUEST NO. 8. Please refer to page 41, and Figure 5 on page 42 of Dr. Fisher's testimony. Provide all spreadsheets in electronic format—with all calculations operational and formulas intact and unprotected—that were utilized to determine the Figure 5 chart data points. Also, please provide the specific Company source (i.e., filename and cell references) of the data from which it was derived.

RESPONSE NO. 8:

See attached workbook produced in both electronic and hard copy format entitled "Exhibit JIF-9 - Ex SCW-5 (Add'l Risk Modeling Summary).xlsx"

Figure 5 (also Exhibit JIF-9) can be found on the first tab. Data is based on two workbooks provided in response to discovery requests:

A. "Ex SCW-5 (Add'l Risk Modeling Summary).xls" provided in response to Sierra 1-69

B. "Staff 1-48 Ex SCW-4A-BASE Price Eval Detail.xls" provided in response to Staff 1-48

The two Company worksheets from which the Figure and Exhibit are derived are copied in full in the Synapse workbook. Formulas are fully operational and provide links to the Company worksheets and cell references.

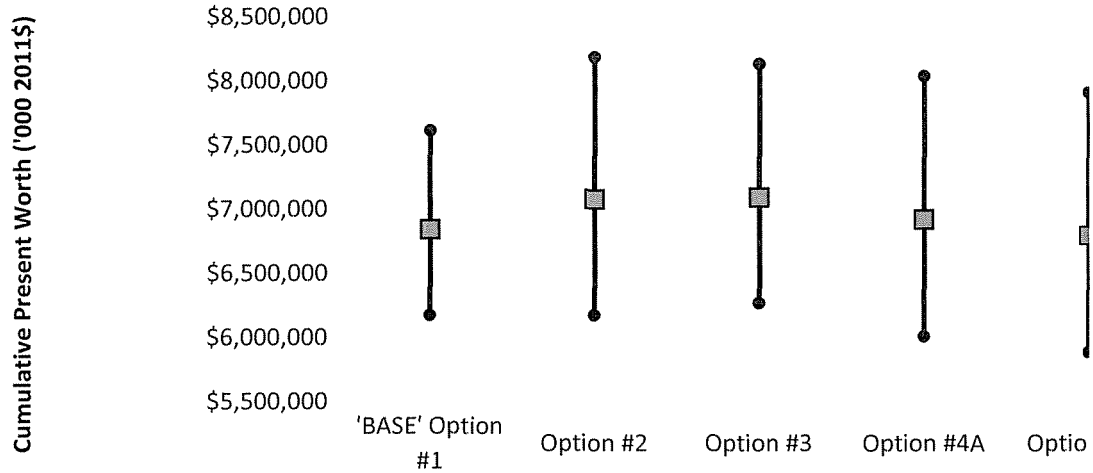
Witness: Jeremy Fisher

	'BASE' Option #	Option #2	Option #3
CPW of Revenue Requirements, Net	6,838,879	7,075,297	7,091,182

Difference from Average of 5th and 95th	BS2 Retrofit	NGCC Replace	BS1 CC-Repow
5%	(667,232)	(902,607)	(822,694)
95%	771,101	1,106,869	1,038,950

	'BASE' Option	Option #2	Option #3
95th % Aurora Risk	7,609,980	8,182,166	8,130,133
Strategist ("Base") Outcome	6,838,879	7,075,297	7,091,182
5th % Aurora Risk	6,171,648	6,172,690	6,268,489

Exhibit JIF-9



	'BASE' Option #1	Option #2	Option #3	Option #4A	Optio
95th % Aurora Risk	7,609,980	8,182,166	8,130,133	8,034,108	7,907
Strategist ("Base") Outcome	6,838,879	7,075,297	7,091,182	6,917,767	6,791
5th % Aurora Risk	6,171,648	6,172,690	6,268,489	6,008,162	5,881

Option #4A	Option #4B
6,917,767	6,791,587

er

Market Repl to 2025
(909,605)
1,116,341

Option #4A	Option #4B
8,034,108	7,907,927
6,917,767	6,791,587
6,008,162	5,881,981

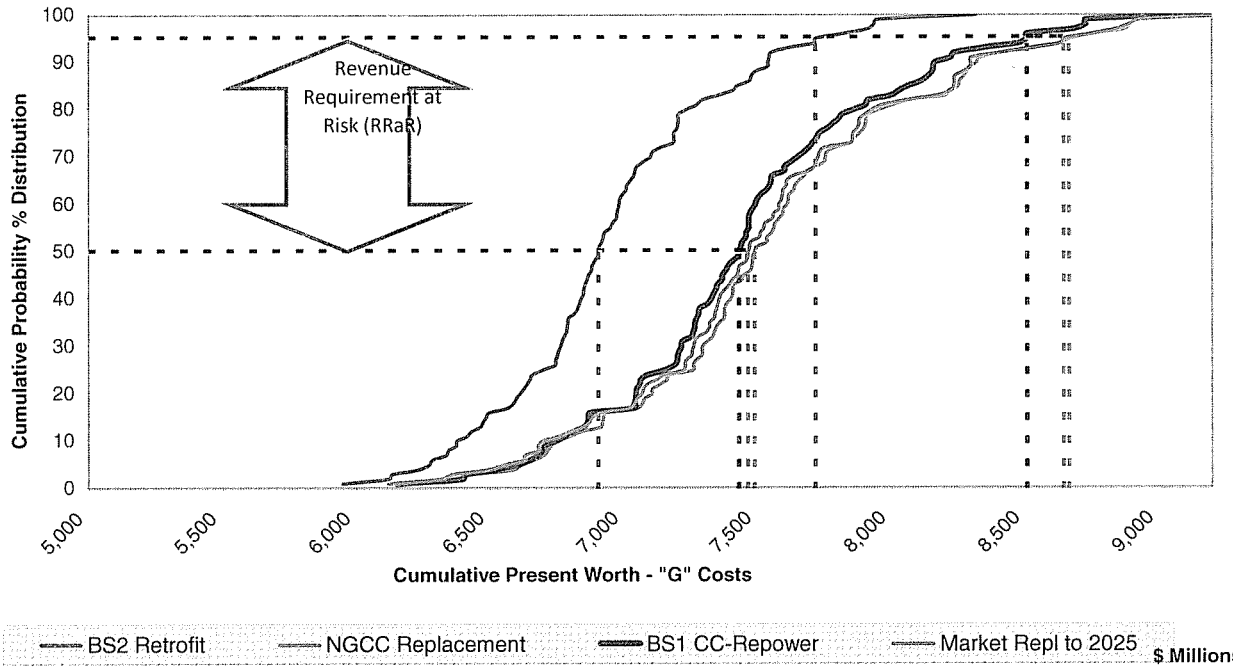
ion #4B

07,927

91,587

81,981

KPCo-BS2 Disposition Options -- Monte Carlo Risk Analysis



		Option #1	*Option #2*	*Option #3*	*Option #4B*			
CPW ($000)	*Cumul. Distribution Percentile*	BS2 Retrofit	NGCC Replacement	BS1 CC-Repower	Market Repl to 2025	*Delta* Retrofit - NGCC	*Delta* Retrofit - Repower	*Delta* Retrofit - Mkt to 2025
	50	6,907,015	7,492,590	7,433,656	7,469,125	(585,575)	(526,641)	(562,110)
						-8.5%	*-7.6%*	*-8.1%*
	95	7,722,158	8,666,036	8,508,691	8,647,851	(943,877)	(786,532)	(925,693)
						-12.2%	*-10.2%*	*-12.0%*
Relative Rank: ***CPW***		**1**	**4**	**2**	**3**			
RRaR ($000)								
	95th vs. 50th	815,143	1,173,446	1,075,034	1,178,726	(358,303)	(259,891)	(363,583)
						-44.0%	*-31.9%*	*-44.6%*
Relative Rank: ***RRaR***		**1**	**3**	**2**	**4**			

Simulated Outcomes -- Big Sandy 2 Retrofit (Option #1)					
Key Risk Factor	**All Outcomes**	**RRaR-Exceeding Outcomes (>95%)**			**Year**
	Mean	**Mean**	**Difference**	**%Diff**	
Coal prices (nominal $/MMBtu)	2.59	3.03	0.43	16.7%	2020
Natural Gas Prices (nominal $/MMBtu)	8.62	10.22	1.59	18.5%	2025
Power Prices (nominal $/Mwh - All Hrs)	54.06	67.38	13.32	24.6%	2020
CO2 Emission Price/Tax ($/Tonne)	13.97	17.23	3.26	23.3%	2022
Load (Gwh)	9,208	11,284	2,076	22.5%	2020
FOM, Constr Costs / MW	4.99	5.44	0.45	9.0%	2025

Big Sandy Unit 2 under BASE: "Fl

Kentucky CP(
Capacity
Resc

Resource Plan Year	**'BASE' Option #1** BS2 DFGD Retrofit 6/2016	**Option #2** **(1) RK Retires 1/2016 with (Brownfield) CC Replacement**
2011-2013		
2014		
2015	Big Sandy 1 Retire	Big Sandy 1&2 Retire
2016	**Big Sandy 2 Retrofit**	**1 -904 MW NGCC**
2017		
2018		
2019		
2020		
2021		
2022		
2023		
2024		
2025	**1- 407 MW CC,**	**1- 407 MW CC,**
2026		
~		
2040		
Life-Cycle Analysis Period (2011-2040)		
($000)		
CPW of Revenue Requirements	6,724,489	7,152,559
Less: ICAP Revenue	(114,391)	77,262
CPW of Revenue Requirements, Net	6,838,879	7,075,297
A. Cost/(Savings) Over 'BASE' Case		
CPW of Revenue Requirements		428,070
Less: ICAP / Pool Revenue		191,652
CPW of Revenue Requirements, Net		**236,418**
B. Cost/(Savings) Over 'BASE' Case		
Impact of 20-Year (vs. 15-Year) RETROFIT Cost Recovery		37,200
CPW of Revenue Requirements, Net		**273,618**

Note:

o The 'BASE' / Option 1 (Big Sandy 2 RETROFIT) analysis results assumes a 15-year recovery period
o Option #2 (Big Sandy 2 RETIRED & REPLACED w/ a [BS-site 'Brownfield'] CC) assumes a 30-year
o Option #3 (Big Sandy 2 RETIRED & REPLACED w/ a CC-Repowered Big Sandy U1) assumes a 20-
o All cases (except Option #3) assume that Big Sandy 1 retired 1/2015
o In all cases, effectively assumes replacement capacity & energy for BS1 would be 'delayed' until ~20
and b) assumed limited (PJM) market availability of reasonably-priced replacement capacity & ener(

- o Evalution economics (all cases) reflect KPCo's 30% share (~195-MW) Purchase Entitlement from af
- o "Retirement" options EXCLUDE costs associated w/ socio-economic impacts to the plant staff, supp
- o "G" Revenue Requirements established on a KPCo "stand-alone" (basis and is reflective of a 'cost-o

  Inclusive of:

  1) All KPCo (company-dispatched) Fuel, VOM and Emission Costs (incl. CO2); 2) on-going plant f
  3) FOM and Capital (carrying charges) on incremental investments (e.g. environmental retrofits ar

leet Transition-CSAPR" Commodity Pricing

CN Filing Economic Analysis
' Resource Optimization
)urce Plan Summary

Option #3 **(1) RK Retires 1/2016** **with BS2 CC Repwrng** **Replacement**	**Option #4A** **(1) RK Retires 1/2016** **w/ PJM-Mkt Replacmnt** **to 2020**	**Option #4B** **(1) RK Retires 1/2016** **w/ PJM-Mkt Replacmnt** **to 2025**
	45 MW- ICAP	45 MW- ICAP
Big Sandy 2 Retire	225 MW- ICAP	225 MW- ICAP
Big Sandy 1	938 MW- ICAP	938 MW- ICAP
1 -780 MW Repower,		
	922 MW- ICAP	922 MW- ICAP
	930 MW- ICAP	930 MW- ICAP
	934 MW- ICAP	934 MW- ICAP
	1 -904 MW NGCC	938 MW- ICAP
		939 MW- ICAP
		951 MW- ICAP
		957 MW- ICAP
		967 MW- ICAP
1- 407 MW CC,	**1- 407 MW CC,**	**1 -904 MW NGCC, 1-** **407 MW CC**
7,079,239	6,811,507	6,487,042
(11,944)	(106,260)	(304,545)
7,091,182	6,917,767	6,791,587
354,750	87,018	(237,447)
102,447	8,130	(190,154)
252,303	**78,888**	(47,293)
37,200	37,200	37,200
289,503	**116,088**	(10,093)

l for the incremental DFGD retrofit investment
recovery period for the new-build CCs in all analyses
-year recovery period in all analyses

)25 in recognition of a) the (incremental) financing/cost burden to KPCo and its customers;
gy during the interim (~150-300 MW)

ffiliate AEG Generating Cos.' 50% Ownership Share of both Rockport Units 1&2
ly vendors, or to the overall easten-Kentucky region
ptimized' resource plan necessary to achieve PJM minimum reserve margin criterion (sumr

FOM; and
nd/or new-build or repowered NG-CCs)

BS2 "Timing" Sensitivity

Option #1A

BS2 DFGD
Retrofit
Delayed until 1/2017
(~1-Yr EGU MACT Delay)

Big Sandy 1 Retire
Big Sandy 2 Mothball
(1-yr)
Big Sandy 2 Retrofit

6,721,898
(114,503)
6,836,401

(2,591)
(112)
(2,478)

37,200
34,722

ner peak)...

REQUEST NO. 9. Please refer to page 59 of Dr. Fisher's direct testimony. Provide in electronic format, with all calculations and formulas intact, unprotected, and operational, all calculations and source derivations for the commodity price correlations reflected in Table 9 under the "Correlations derived from Sierra DR 1-34b" heading.

RESPONSE NO. 9:

See workbook on the enclosed CD entitled:

"KPCO 1-9 – Aurora Q_34_b_distribution_for_risk_Factors.xlsx"

See tab "Syn Pivot Analysis" cells C1:H6.

Source workbook is "Q_34_b_distribution_for_risk_Factors.xls" provided in Company response to Sierra DR 2-34(b).

Witness: Jeremy Fisher

REQUEST NO. 10. Please refer to page 64 of Dr. Fisher's direct testimony. Please provide all support for, and demonstrate in electronic format, with all calculations operational and formulas intact and unprotected, the derivation of the commodity price correlations reflected in Table 10 under the "Synapse" heading

RESPONSE NO. 10:

See attached workbook produced in both electronic and hard copy format entitled: "Exhibit JIF-12 (Aurora Correlations) - Sierra 1-61 - Attachment 1.xlsx"

Tables 9 & 10 (also Exhibits JIF-12A and JIF-12B) can be found on the first tab. Data and formulations are based on Company workbook provided in response to Sierra 1-61 entitled "Sierra 1-61 - Attachment 1.xls" as well as ancillary data obtained from the U.S. Department of Energy, Energy Information Administration (EIA). Raw data, formulas, and final exhibits are all available in this workbook. Correlations and corrected futures data series are found in tab "correlation matrix." Synapse correlations are found in cells B95:G100. Additional time series deltas are found in tab "us coal & deltas." U.S. natural gas time series are found in the tab "Nat Gas – stb0607." U.S. average retail electric prices are found in tab "Retail Electric Price – stb0810."

Witness: Jeremy Fisher

Exhibit JIF-12A

Correlations provided by AEP in SCW-1, Table 1-4

	Natural Gas Price	Coal Price	Carbon Price	Market Power Price	Demand (Load Req)
Natural Gas Price	1.00	0.09	(0.23)	0.88	seasonal
Coal Price		1.00	0.69	0.19	0.74
Carbon Price			1.00	(0.14)	0.50
Market Power Price				1.00	0.75
Demand (Load Req)					1.00

Correlations derived from Company Response to Sierra DR 2-34b

Natural Gas Price	1.00	0.09	0.45	0.88	0.66
Coal Price		1.00	0.05	0.10	0.08
Carbon Price		0.00	1.00	0.53	0.68
Market Power Price		0.00		1.00	0.76
Demand (Load Req)		0.00			1.00

**Assumes CO2 is Generic Distribution 28*

Data Source		
Europe	US	Hypothesized

Difference

	Natural Gas Price	Coal Price	Carbon Price	Market Power Price	Demand (Load Req)
Natural Gas Price		0.00	-0.68	0.00	0.00
Coal Price			0.63	0.09	0.66
Carbon Price				-0.67	-0.18
Market Power Price					-0.01
Demand (Load Req)					

Exhibit JIF-12B

Correlations provided by AEP in SCW-1, Table 1-4

	Natural Gas Price	Coal Price	Carbon Price	Market Power Price	Demand (Load Req)
Natural Gas Price	1.00	0.09	(0.23)	0.88	seasonal
Coal Price		1.00	0.69	0.19	0.74
Carbon Price			1.00	(0.14)	0.50
Market Power Price				1.00	0.75
Demand (Load Req)					1.00

Synapse Estimates

	Natural Gas Price	Coal Price	Carbon Price	Market Power Price	Demand (Load Req)
Natural Gas Price	1.00	0.11	(0.43)	0.41	(0.15)
Coal Price		1.00	0.67	0.32	0.11
Carbon Price			1.00	(0.43)	0.00
Market Power Price				1.00	(0.51)

Demand (Load Req)					1.00

Data Source		
Europe	US	Hypothesized

Difference

	Natural Gas Price	Coal Price	Carbon Price	Market Power Price	Demand (Load Req)
Natural Gas Price		-0.03	0.20	0.46	0.81
Coal Price			0.01	-0.14	0.63
Carbon Price				0.30	0.50
Market Power Price					1.26
Demand (Load Req)					

Daily Volumes for ICE UK Natural Gas Futures (Monthly)
3-Mar-11

Month	Open	High	Low	Sett	Chg	Vol	EFP	EFS	Block	Open Int*	Prev Day Vol (02-Mar-2011)
Apr11	55.8	56.5	55.6	55.89	0.01	4,730	50	0	0	22,125	5,245
May11	55.75	56.35	55.55	55.79	-0.2	625	0	0	0	11,860	800
Jun11	55.87	56	55.72	56	0	270	20	0	0	9,070	80
Jul11				55.81	-0.08	0	0	0	0	9,090	0
Aug11				56.5	0.1	0	0	0	0	9,080	0
Sep11	56.35	56.7	55.75	56.14	-0.1	590	0	0	0	9,525	0
Oct11				60.4	-0.2	0	0	0	0	9,365	150
Nov11				64.12	0.05	0	0	0	0	10,920	0
Dec11				67.3	-0.15	0	0	0	0	9,445	250
Jan12				68.8	-0.12	0	0	0	0	9,120	0
Feb12				67.85	-0.2	0	0	0	0	9,145	0
Mar12				66.48	-0.07	0	0	0	0	9,495	100
Apr12				61.79	-0.4	0	0	0	0	4,380	0
May12				60.46	-0.31	0	0	0	0	4,355	0
Jun12				59.58	-0.32	0	0	0	0	4,355	0
Jul12				59.6	-0.31	0	0	0	0	4,245	0
Aug12				60.39	-0.29	0	0	0	0	4,245	0
Sep12				60.25	-0.29	0	0	0	0	4,245	0
Oct12				65.14	-0.21	0	0	0	0	4,880	0
Nov12				65.14	-0.21	0	0	0	0	4,880	0
Dec12				65.01	-0.21	0	0	0	0	4,880	0
Jan13				68.47	-0.17	0	0	0	0	4,680	0
Feb13				68.47	-0.17	0	0	0	0	4,680	0
Mar13				68.56	-0.17	0	0	0	0	4,680	0
Apr13				62.08	-0.18	0	0	0	0	3,610	0
May13				62.08	-0.18	0	0	0	0	3,610	0
Jun13				62.08	-0.18	0	0	0	0	3,610	0
Jul13				61.61	-0.22	0	0	0	0	3,610	0
Aug13				61.61	-0.22	0	0	0	0	3,610	0
Sep13				61.61	-0.22	0	0	0	0	3,610	0
Oct13				66.28	-0.15	0	0	0	0	3,640	0
Nov13				66.28	-0.15	0	0	0	0	3,640	0
Dec13				66.28	-0.15	0	0	0	0	3,640	0
Jan14				70.22	-0.15	0	0	0	0	3,780	0
Feb14				70.22	-0.15	0	0	0	0	3,780	0
Mar14				70.22	-0.15	0	0	0	0	3,780	0
Apr14				63.5	-0.4	0	0	0	0	815	0
May14				63.5	-0.4	0	0	0	0	815	0
Jun14				63.5	-0.4	0	0	0	0	815	0
Jul14				63.5	-0.4	0	0	0	0	815	0
Aug14				63.5	-0.4	0	0	0	0	815	0
Sep14				63.5	-0.4	0	0	0	0	815	0
Oct14				70.47	0.05	0	0	0	0	730	0
Nov14				70.47	0.05	0	0	0	0	730	0
Dec14				70.47	0.05	0	0	0	0	730	0
Jan15				70.59	0.05	0	0	0	0	730	0
Feb15				70.59	0.05	0	0	0	0	730	0
Mar15				70.59	0.05	0	0	0	0	730	0
Apr15				65.98	-0.21	0	0	0	0	320	0
May15				65.98	-0.21	0	0	0	0	320	0
Jun15				65.98	-0.21	0	0	0	0	320	0
Jul15				65.98	-0.21	0	0	0	0	320	0

Aug15	65.98	-0.21	0	0	0	0	320	0
Sep15	65.98	-0.21	0	0	0	0	320	0
Oct15	72.47	-0.01	0	0	0	0	230	0
Nov15	72.47	-0.01	0	0	0	0	230	0
Dec15	72.47	-0.01	0	0	0	0	230	0
Jan16	72.44	-0.01	0	0	0	0	230	0
Feb16	72.44	-0.01	0	0	0	0	230	0
Mar16	72.44	-0.01	0	0	0	0	230	0
Apr16	67.87	-0.12	0	0	0	0	0	0
May16	67.87	-0.12	0	0	0	0	0	0
Jun16	67.87	-0.12	0	0	0	0	0	0
Jul16	67.87	-0.12	0	0	0	0	0	0
Aug16	67.87	-0.12	0	0	0	0	0	0
Sep16	67.87	-0.12	0	0	0	0	0	0
Oct16	75.09	0.09	0	0	0	0	0	0
Nov16	75.09	0.09	0	0	0	0	0	0
Dec16	75.09	0.09	0	0	0	0	0	0
Jan17	75.09	0.09	0	0	0	0	0	0
Feb17	75.09	0.09	0	0	0	0	0	0
Mar17	75.09	0.09	0	0	0	0	0	0
Apr17	69.67	-0.12	0	0	0	0	0	0
May17	69.67	-0.12	0	0	0	0	0	0
Jun17	69.67	-0.12	0	0	0	0	0	0
Jul17	69.67	-0.12	0	0	0	0	0	0
Aug17	69.67	-0.12	0	0	0	0	0	0
Sep17	69.67	-0.12	0	0	0	0	0	0
Total:			**6,215**	**70**	**0**	**0**	**239,235**	**6,625**

* Open Interest is recorded against the monthly strip, inclusive, where possible, of monthly, quarterly, seasonal or calendar strips. Volume and Price data will be recorded against the traded strip.

Daily Volumes for ICE UK Base Electricity Futures (Monthly)
3-Mar-11

Month	Open	High	Low	Sett	Chg	Vol	EFP	EFS	Block	Open Int*	Prev Day Vol (02-Mar-2011)
Apr-11				48.7	0.2	0	0	0	0	420	0
May-11				48.79	0.13	0	0	0	0	420	0
Jun-11				49.12	0.14	0	0	0	0	420	0
Jul-11				49.01	-0.04	0	0	0	0	420	0
Aug-11				48.96	-0.09	0	0	0	0	420	0
Sep-11				49.52	0	0	0	0	0	420	0
Oct-11				53.85	-0.06	0	0	0	0	720	0
Nov-11				53.85	-0.06	0	0	0	0	720	0
Dec-11				53.85	-0.06	0	0	0	0	720	0
Jan-12				55.72	0.01	0	0	0	0	720	0
Feb-12				55.72	0.01	0	0	0	0	720	0
Mar-12				55.72	0.01	0	0	0	0	720	0
Apr-12				51.32	-0.21	0	0	0	0	180	0
May-12				51.32	-0.21	0	0	0	0	180	0
Jun-12				51.32	-0.21	0	0	0	0	180	0
Jul-12				51.32	-0.21	0	0	0	0	180	0
Aug-12				51.32	-0.21	0	0	0	0	180	0
Sep-12				51.32	-0.21	0	0	0	0	180	0
Oct-12				55.48	-0.13	0	0	0	0	270	0
Nov-12				55.48	-0.13	0	0	0	0	270	0
Dec-12				55.48	-0.13	0	0	0	0	270	0
Jan-13				55.48	-0.13	0	0	0	0	270	0
Feb-13				55.48	-0.13	0	0	0	0	270	0
Mar-13				55.48	-0.13	0	0	0	0	270	0
Apr-13				52.43	-0.25	0	0	0	0	90	0
May-13				52.43	-0.25	0	0	0	0	90	0
Jun-13				52.43	-0.25	0	0	0	0	90	0
Jul-13				52.43	-0.25	0	0	0	0	90	0
Aug-13				52.43	-0.25	0	0	0	0	90	0
Sep-13				52.43	-0.25	0	0	0	0	90	0
Oct-13				57	-0.22	0	0	0	0	115	0
Nov-13				57	-0.22	0	0	0	0	115	0
Dec-13				57	-0.22	0	0	0	0	115	0
Jan-14				57	-0.22	0	0	0	0	115	0
Feb-14				57	-0.22	0	0	0	0	115	0
Mar-14				57	-0.22	0	0	0	0	115	0
Apr-14				55.73	-0.25	0	0	0	0	240	0
May-14				55.73	-0.25	0	0	0	0	240	0
Jun-14				55.73	-0.25	0	0	0	0	240	0
Jul-14				55.73	-0.25	0	0	0	0	240	0
Aug-14				55.73	-0.25	0	0	0	0	240	0
Sep-14				55.73	-0.25	0	0	0	0	240	0
Oct-14				60.52	-0.29	0	0	0	0	30	0
Nov-14				60.52	-0.29	0	0	0	0	30	0
Dec-14				60.52	-0.29	0	0	0	0	30	0
Jan-15				60.52	-0.29	0	0	0	0	30	0
Feb-15				60.52	-0.29	0	0	0	0	30	0
Mar-15				60.52	-0.29	0	0	0	0	30	0
Apr-15				59.61	-0.25	0	0	0	0	0	0
May-15				59.61	-0.25	0	0	0	0	0	0

Jun-15	59.61	-0.25	0	0	0	0	0	0
Jul-15	59.61	-0.25	0	0	0	0	0	0
Aug-15	59.61	-0.25	0	0	0	0	0	0
Sep-15	59.61	-0.25	0	0	0	0	0	0
Total:			**0**	**0**	**0**	**0**	**12,390**	**0**

* *Open Interest is recorded against the* monthly strip, inclusive, where possible, of monthly, quarterly, seasonal or calendar strips. Volume and Price data will be recorded against the traded strip.

Daily Volumes for ICE ECX EUA Futures (Monthly)
3-Mar-11

Month	Open	High	Low	Sett	Chg	Vol	EFP	EFS	Block	Open Int*	Prev Day Vol (02-Mar-2011)
Mar11	15.25	15.25	15.1	15.17	-0.03	16	0	0	0	2,920	50
Jun11				15.25	-0.1	0	0	0	0	105	0
Sep11				15.36	-0.14	0	0	0	0	105	0
Dec11	15.57	15.63	15.41	15.45	-0.18	13,983	2,643	0	0	121,902	9,047
Mar12				15.61	-0.17	0	0	0	0	286	0
Jun12				15.77	-0.16	0	0	0	0	75	0
Sep12				15.93	-0.15	0	0	0	0	75	0
Dec12	16.19	16.23	16.07	16.08	-0.14	9,218	1,725	0	0	233,852	4,665
Mar13				16.38	-0.13	300	300	0	0	3,250	950
Jun13				17.07	-0.1	0	0	0	0	0	0
Dec13	17.38	17.4	17.26	17.28	-0.1	2,423	475	0	0	50,961	626
Dec14	18.3	18.3	18.24	18.18	-0.05	125	0	0	0	5,117	177
Dec15				19.08	-0.05	0	0	0	0	300	0
Dec16				19.98	-0.05	0	0	0	0	300	0
Dec17				20.88	-0.05	0	0	0	0	300	0
Dec18				21.78	-0.05	0	0	0	0	300	0
Dec19				22.7	-0.05	0	0	0	0	20	0
Dec20				23.65	-0.05	0	0	0	0	10	0
Total:						**26,065**	**5,143**	**0**	**0**	**419,878**	**15,515**

* Open Interest is recorded against the monthly strip, inclusive, where possible, of monthly, quarterly, seasonal or calendar strips. Volume and Price data will be recorded against the traded strip.

Daily Volumes for gC Newcastle Coal Futures (Monthly)
3-Mar-11

Month	Open	High	Low	Sett	Chg	Vol	EFP	EFS	Block	Open Int+	Prev Day Vol (02-Mar-2011)
Mar11				130.4	-0.2	0	0	0	0	1,443	0
Apr11				128.8	0.15	0	0	0	0	1,395	0
May11				127.45	0.4	0	0	0	0	1,370	0
Jun11				126.45	0.25	0	0	0	0	1,345	0
Jul11				125.6	0.15	0	0	0	0	939	0
Aug11				125.6	0.15	0	0	0	0	939	0
Sep11				125.6	0.15	0	0	0	0	939	0
Oct11				125.1	0.05	0	0	0	0	900	0
Nov11				125.1	0.05	0	0	0	0	900	0
Dec11				125.1	0.05	0	0	0	0	900	0
Jan12				124.2	0.5	0	0	0	0	605	0
Feb12				124.2	0.5	0	0	0	0	605	0
Mar12				124.2	0.5	0	0	0	0	605	0
Apr12				123.5	0.35	0	0	0	0	510	0
May12				123.5	0.35	0	0	0	0	510	0
Jun12				123.5	0.35	0	0	0	0	510	0
Jul12				123.1	0.1	0	0	0	0	495	0
Aug12				123.1	0.1	0	0	0	0	495	0
Sep12				123.1	0.1	0	0	0	0	495	0
Oct12				122.7	-0.1	0	0	0	0	495	0
Nov12				122.7	-0.1	0	0	0	0	495	0
Dec12				122.7	-0.1	0	0	0	0	495	0
Jan13				122.15	0.3	0	0	0	0	205	0
Feb13				122.15	0.3	0	0	0	0	205	0
Mar13				122.15	0.3	0	0	0	0	205	0
Apr13				122.2	0.3	0	0	0	0	205	0
May13				122.2	0.3	0	0	0	0	205	0
Jun13				122.2	0.3	0	0	0	0	205	0
Jul13				122.2	0.3	0	0	0	0	205	0
Aug13				122.2	0.3	0	0	0	0	205	0
Sep13				122.2	0.3	0	0	0	0	205	0
Oct13				122.2	0.3	0	0	0	0	205	0
Nov13				122.2	0.3	0	0	0	0	205	0
Dec13				122.2	0.3	0	0	0	0	205	0
Jan14				122.2	0.3	0	0	0	0	140	0
Feb14				122.2	0.3	0	0	0	0	140	0
Mar14				122.2	0.3	0	0	0	0	140	0
Apr14				122.2	0.3	0	0	0	0	140	0
May14				122.2	0.3	0	0	0	0	140	0
Jun14				122.2	0.3	0	0	0	0	140	0
Jul14				122.2	0.3	0	0	0	0	140	0
Aug14				122.2	0.3	0	0	0	0	140	0
Sep14				122.2	0.3	0	0	0	0	140	0
Oct14				122.2	0.3	0	0	0	0	140	0
Nov14				122.2	0.3	0	0	0	0	140	0
Dec14				122.2	0.3	0	0	0	0	140	0
Jan15				122.85	0.45	0	0	0	0	0	0
Feb15				122.85	0.45	0	0	0	0	0	0
Mar15				122.85	0.45	0	0	0	0	0	0
Apr15				122.85	0.45	0	0	0	0	0	0

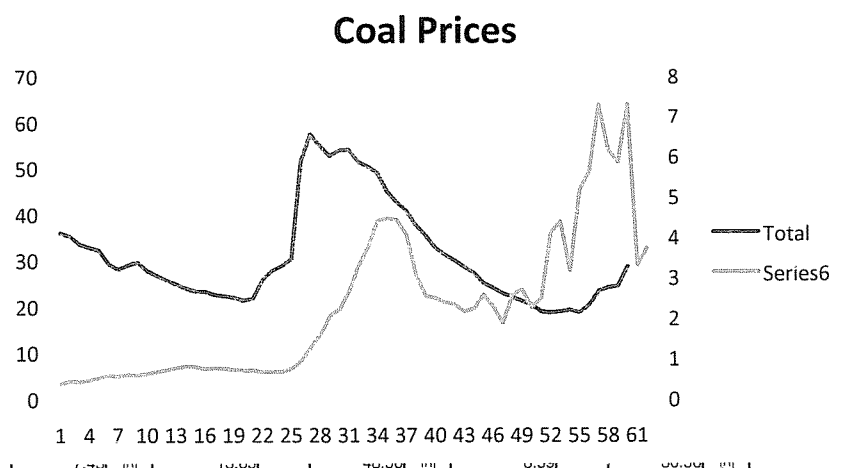
May15	122.85	0.45	0	0	0	0	0	0
Jun15	122.85	0.45	0	0	0	0	0	0
Jul15	122.85	0.45	0	0	0	0	0	0
Aug15	122.85	0.45	0	0	0	0	0	0
Sep15	122.85	0.45	0	0	0	0	0	0
Oct15	122.85	0.45	0	0	0	0	0	0
Nov15	122.85	0.45	0	0	0	0	0	0
Dec15	122.85	0.45	0	0	0	0	0	0
Jan16	123.4	0.4	0	0	0	0	0	0
Feb16	123.4	0.4	0	0	0	0	0	0
Mar16	123.4	0.4	0	0	0	0	0	0
Apr16	123.4	0.4	0	0	0	0	0	0
May16	123.4	0.4	0	0	0	0	0	0
Jun16	123.4	0.4	0	0	0	0	0	0
Jul16	123.4	0.4	0	0	0	0	0	0
Aug16	123.4	0.4	0	0	0	0	0	0
Sep16	123.4	0.4	0	0	0	0	0	0
Oct16	123.4	0.4	0	0	0	0	0	0
Nov16	123.4	0.4	0	0	0	0	0	0
Dec16	123.4	0.4	0	0	0	0	0	0
Total:			**0**	**0**	**0**	**0**	**21,525**	**0**

* Open Interest is recorded against the monthly strip, inclusive, where possible, of monthly, quarterly, seasonal or calendar strips. Volume and Price data will be recorded against the traded strip.

Table 7.8 Coal Prices, 1949-2009

(Dollars per Short Ton)

Year	Bituminous Coal		Subbituminous Coal		Lignite [1]		Anthracite		Total	
	Nominal [2]	Real [3]	Nominal [2]	Real [3]	Nominal [2]	Real [3]	Nominal [2]	Real [3]	Nominal [2]	Real [3]
1949	4.9 [4]	33.83 [4,R]	[4]	[4]	2.37	16.36 [R]	8.9	61.44 [R]	5.24	36.17 [R]
1950	4.86 [4]	33.19 [4,R]	[4]	[4]	2.41	16.46 [R]	9.34	63.78 [R]	5.19	35.44 [R]
1951	4.94 [4]	31.47 [4,R]	[4]	[4]	2.44	15.54 [R]	9.94	63.32 [R]	5.29	33.7 [R]
1952	4.92 [4]	30.81 [4,R]	[4]	[4]	2.39	14.97 [R]	9.58	59.99 [R]	5.27	33 [R]
1953	4.94 [4]	30.57 [4,R]	[4]	[4]	2.38	14.73 [R]	9.87	61.07 [R]	5.23	32.36 [R]
1954	4.54 [4]	27.84 [4,R]	[4]	[4]	2.43	14.9 [R]	8.76	53.72 [R]	4.81	29.49 [R]
1955	4.51 [4]	27.19 [4,R]	[4]	[4]	2.38	14.35 [R]	8	48.23 [R]	4.69	28.28 [R]
1956	4.83 [4]	28.15 [4,R]	[4]	[4]	2.39	13.93 [R]	8.33	48.55 [R]	5.01	29.2 [R]
1957	5.09 [4]	28.71 [4,R]	[4]	[4]	2.35					
1958	4.87 [4]	26.87 [4,R]	[4]	[4]	2.35					
1959	4.79 [4]	26.12 [4,R]	[4]	[4]	2.25					
1960	4.71 [4]	25.33 [4,R]	[4]	[4]	2.29					
1961	4.6 [4]	24.46 [4,R]	[4]	[4]	2.24					
1962	4.5 [4]	23.61 [4,R]	[4]	[4]	2.23					
1963	4.4 [4]	22.84 [4,R]	[4]	[4]	2.17					
1964	4.46 [4]	22.8 [4,R]	[4]	[4]	2.14					
1965	4.45 [4]	22.34 [4,R]	[4]	[4]	2.13					
1966	4.56 [4]	22.26 [4,R]	[4]	[4]	1.98					
1967	4.64 [4]	21.97 [4,R]	[4]	[4]	1.92					
1968	4.7 [4]	21.35 [4,R]	[4]	[4]	1.79					
1969	5.02 [4]	21.73 [4,R]	[4]	[4]	1.86					
1970	6.3 [4]	25.91 [4,R]	[4]	[4]	1.86					
1971	7.13 [4]	27.92 [4,R]	[4]	[4]	1.93					
1972	7.78 [4]	29.21 [4,R]	[4]	[4]	2.04					
1973	8.71 [4]	30.98 [4,R]	[4]	[4]	2.09					
1974	16.01 [4]	52.21 [4,R]	[4]	[4]	2.19	7.14 [R]	22.19	72.36 [R]	15.82	51.59 [R]
1975	19.79 [4]	58.96 [4,R]	[4]	[4]	3.17	9.44 [R]	32.26	96.12 [R]	19.35	57.65 [R]
1976	20.11 [4]	56.67 [4,R]	[4]	[4]	3.74	10.54 [R]	33.92	95.58 [R]	19.56	55.12 [R]
1977	20.59 [4]	54.54 [4,R]	[4]	[4]	4.03	10.68 [R]	34.86	92.34 [R]	19.95	52.85 [R]
1978	22.64 [4]	56.04 [4,R]	[4]	[4]	5.68	14.06 [R]	35.25	87.25 [R]	21.86	54.11 [R]
1979	27.31	62.41 [R]	9.55	21.82 [R]	6.48	14.81 [R]	41.06	93.83 [R]	23.75	54.27 [R]
1980	29.17	61.09 [R]	11.08	23.2 [R]	7.6	15.92 [R]	42.51	89.02 [R]	24.65	51.62 [R]
1981	31.51	60.34 [R]	12.18	23.32 [R]	8.85	16.95 [R]	44.28	84.79 [R]	26.4	50.55 [R]
1982	32.15	58.02 [R]	13.37	24.13 [R]	9.79	17.67 [R]	49.85	89.96 [R]	27.25	49.18 [R]
1983	31.11	54.01 [R]	13.03	22.62 [R]	9.91	17.2 [R]	52.29	90.78 [R]	25.98	45.1 [R]
1984	30.63	51.25 [R]	12.41	20.76 [R]	10.45	17.48 [R]	48.22	80.68 [R]	25.61	42.85 [R]
1985	30.78	49.99 [R]	12.57	20.41 [R]	10.68	17.34 [R]	45.8	74.38 [R]	25.2	40.93 [R]
1986	28.84	45.82 [R]	12.26	19.48 [R]	10.64	16.91 [R]	44.12	70.1 [R]	23.79	37.8 [R]
1987	28.19	43.53 [R]	11.32	17.48 [R]	10.85	16.75 [R]	43.65	67.4 [R]	23.07	35.62 [R]



1988	27.66		41.29	(R)	10.45		15.6	(R)	10.06		15.02	(R)	44.16		65.92	(R)	22.07		32.95	(R)
1989	27.4		39.41	(R)	10.16		14.61	(R)	9.91		14.26	(R)	42.93		61.75	(R)	21.82		31.39	(R)
1990	27.43		37.99	(R)	9.7		13.43	(R)	10.13		14.03	(R)	39.4		54.57	(R)	21.76		30.14	(R)
1991	27.49		36.77	(R)	9.68		12.95	(R)	10.89		14.57	(R)	36.34		48.61	(R)	21.49		28.75	(R)
1992	26.78		34.99	(R)	9.68		12.65	(R)	10.81		14.12	(R)	34.24		44.74	(R)	21.03		27.48	(R)
1993	26.15		33.43	(R)	9.33		11.93	(R)	11.11		14.2	(R)	32.94		42.11	(R)	19.85		25.38	(R)
1994	25.68		32.15	(R)	8.37		10.48	(R)	10.77		13.48	(R)	36.07		45.16	(R)	19.41		24.3	(R)
1995	25.56		31.35	(R)	8.1		9.93	(R)	10.83		13.28	(R)	39.78		48.79	(R)	18.83		23.09	(R)
1996	25.17		30.29	(R)	7.87		9.47	(R)	10.92		13.14	(R)	36.78		44.27	(R)	18.5		22.27	(R)
1997	24.64		29.14	(R)	7.42		8.78	(R)	10.91		12.9	(R)	35.12		41.54	(R)	18.14		21.45	(R)
1998	24.87		29.08	(R)	6.96		8.14	(R)	11.08		12.96	(R)	42.91		50.18	(R)	17.67		20.66	(R)
1999	23.92		27.57	(R)	6.87		7.92	(R)	11.04		12.72	(R)	35.13		40.49	(R)	16.63		19.17	(R)
2000	24.15		27.24	(R)	7.12		8.03	(R)	11.41		12.87	(R)	40.9		46.14	(R)	16.78		18.93	(R)
2001	25.36		27.98	(R)	6.67		7.36	(R)	11.52		12.71	(R)	47.67		52.59	(R)	17.38		19.17	(R)
2002	26.57		28.84	(R)	7.34		7.97	(R)	11.07		12.02	(R)	47.78		51.87	(R)	17.98		19.52	(R)
2003	26.73		28.41	(R)	7.73		8.21	(R)	11.2		11.9	(R)	49.87		53	(R)	17.85		18.97	(R)
2004	30.56		31.58	(R)	8.12		8.39	(R)	12.27		12.68	(R)	39.77		41.1	(R)	19.93		20.6	(R)
2005	36.8		36.8	(R)	8.68		8.68	(R)	13.49		13.49	(R)	41		41	(R)	23.59		23.59	(R)
2006	39.32		38.08	(R)	9.95		9.64	(R)	14		13.56	(R)	43.61		42.23	(R)	25.16		24.37	(R)
2007	40.8		38.41	(R)	10.69		10.06	(R)	14.89		14.02	(R)	52.24		49.18	(R)	26.2		24.67	(R)
2008	51.39	(R)	47.37	(R)	12.31	(R)	11.35	(R)	16.5	(R)	15.21	(R)	60.76	(R)	56.01	(R)	31.25	(R)	28.81	(R)
2009[E]	54.25		49.42		13.71		12.49		21.53		19.61		60.35		54.98		32.92		29.99	

[1]Because of withholding to protect company confidentiality, lignite prices exclude Texas for 1955-1977 and Montana for 1974-1978. As a result, lignite prices for 1974-1977 are for North Dakota only.

[2]See "Nominal Dollars" in Glossary.

[3]In chained (2005) dollars, calculated by using gross domestic product implicit price deflators in Table D1. See "Chained Dollars" in Glossary.

[4]Through 1978, subbituminous coal is included in "Bituminous Coal."

R=Revised. E=Estimate.

Note: Prices are free-on-board (F.O.B.) rail/barge prices, which are the F.O.B. prices of coal at the point of first sale, excluding freight or shipping and insurance costs. For 1949-2000, prices are for open market and captive coal sales; for 2001-2007, prices are for open market coal sales; for 2008 forward, prices are for open market and captive coal sales. See "Captive Coal," "Free on Board (F.O.B.)," and "Open Market Coal" in Glossary.

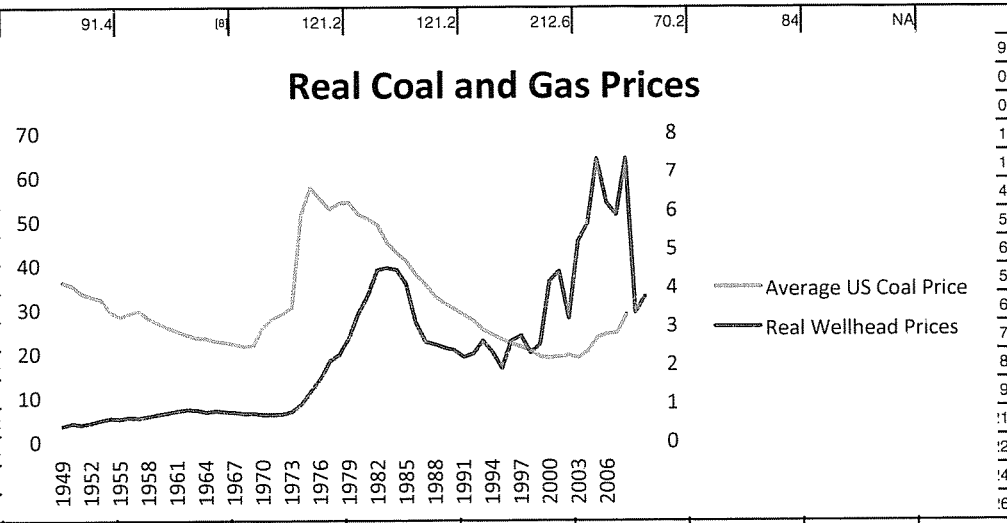
Web Page: For related information, see http://www.eia.gov/fuelcoal.html.

Sources: • 1949-1975□Bureau of Mines (BOM), *Minerals Yearbook.* • 1976□U.S. Energy Information Administration (EIA), Energy Data Report, *Coal□Bituminous and Lignite in 1976,* and BOM, *Minerals Yearbook.* • 1977 and 1978□EIA, Energy Data Reports, *Bituminous Coal and Lignite Production and Mine Operations,* and *Coal□Pennsylvania Anthracite.* • 1979□EIA, *Coal Production,* and Energy Data Report, *Coal□Pennsylvania Anthracite.* • 1980-1992□EIA, *Coal Production,* annual reports. • 1993-2000□EIA, *Coal Industry Annual,* annual reports and unpublished revisions. • 2001-2008□EIA, *Annual Coal Report,* annual reports. • 2009□EIA, Form EIA-7A, "Coal Production Report," and U.S. Department of Labor, Mine Safety and Health Administration, Form 7000-2, "Quarterly Mine Employment and Coal Production Report."

Table 7.3 Coal Consumption by Sector, 1949-2009

(Million Short Tons)

Year	Residential Sector [1]	Commercial Sector [1]			Industrial Sector				Transportation Sector	Electric Power Sector [2]			Total
		CHP [3]	Other [4]	Total	Coke Plants	Other Industrial		Total		Electricity Only	CHP	Total	
						CHP [5]	Non-CHP [6]						
1949	52.4	[7]	64.1	64.1	91.4	[8]	121.2	121.2	212.6	70.2	84	NA	84	483.2
1950	51.6	[7]	63	63									91.9	494.1
1951	47.7	[7]	53.8	53.8									05.8	505.9
1952	44.3	[7]	48	48									07.1	454.1
1953	39.6	[7]	39.6	39.6									15.9	454.8
1954	35.2	[7]	33.8	33.8									18.4	389.9
1955	35.6	[7]	32.9	32.9									43.8	447
1956	34.7	[7]	29.5	29.5									58.3	456.9
	27	[7]	22.1	22.1									60.8	434.5
	27.3	[7]	20.6	20.6									55.7	385.7
	23.7	[7]	17.1	17.1									68.4	385.1
	24.2	[7]	16.8	16.8									76.7	398.1
	22	[7]	15.3	15.3									82.2	390.4
	21.5	[7]	15	15									93.3	402.3
	18.2	[7]	13.2	13.2									11.3	423.5
	15.8	[7]	11.4	11.4									25.4	445.7
	14.6	[7]	11	11									44.8	472
	14.6	[7]	11	11									66.5	497.7
	12.6	[7]	9.5	9.5	92.8	[8]	101.8	101.8	194.6	0.5	274.2	NA	274.2	491.4
	11.2	[7]	8.8	8.8	91.3	[8]	100.4	100.4	191.6	0.4	297.8	NA	297.8	509.8
	10.6	[7]	8.3	8.3	93.4	[8]	93.1	93.1	186.6	0.3	310.6	NA	310.6	516.4
	9	[7]	7.1	7.1	96.5	[8]	90.2	90.2	186.6	0.3	320.2	NA	320.2	523.2
	7.4	[7]	7.8	7.8	83.2	[8]	75.6	75.6	158.9	0.2	327.3	NA	327.3	501.6
	5	[7]	6.7	6.7	87.7	[8]	72.9	72.9	160.6	0.2	351.8	NA	351.8	524.3
1973	4.1	[7]	7	7	94.1	[8]	68	68	162.1	0.1	389.2	NA	389.2	562.6
1974	3.7	[7]	7.8	7.8	90.2	[8]	64.9	64.9	155.1	0.1	391.8	NA	391.8	558.4
1975	2.8	[7]	6.6	6.6	83.6	[8]	63.6	63.6	147.2	(s)	406	NA	406	562.6
1976	2.6	[7]	6.3	6.3	84.7	[8]	61.8	61.8	146.5	(s)	448.4	NA	448.4	603.8
1977	2.5	[7]	6.4	6.4	77.7	[8]	61.5	61.5	139.2	(s)	477.1	NA	477.1	625.3
1978	2.2	[7]	7.3	7.3	71.4	[8]	63.1	63.1	134.5	[8]	481.2	NA	481.2	625.2
1979	1.7	[7]	6.7	6.7	77.4	[8]	67.7	67.7	145.1	[8]	527.1	NA	527.1	680.5
1980	1.4	[7]	5.1	5.1	66.7	[8]	60.3	60.3	127	[8]	569.3	NA	569.3	702.7
1981	1.3	[7]	6.1	6.1	61	[8]	67.4	67.4	128.4	[8]	596.8	NA	596.8	732.6
1982	1.4	[7]	6.8	6.8	40.9	[8]	64.1	64.1	105	[8]	593.7	NA	593.7	706.9
1983	1.4	[7]	7.1	7.1	37	[8]	66	66	103	[8]	625.2	NA	625.2	736.7
1984	1.7	[7]	7.4	7.4	44	[8]	73.7	73.7	117.8	[8]	664.4	NA	664.4	791.3
1985	1.7	[7]	6.1	6.1	41.1	[8]	75.4	75.4	116.4	[8]	693.8	NA	693.8	818
1986	1.8	[7]	5.9	5.9	35.9	[8]	75.6	75.6	111.5	[8]	685.1	NA	685.1	804.2
1987	1.6	[7]	5.3	5.3	37	[8]	75.2	75.2	112.1	[8]	717.9	NA	717.9	836.9



Total

Series6

Company column. Reviews consumptio tons, rather than pr

0.09405
0.15125
0.01229
0.08217
0.02157
0.21453
0.10083
0.01579
-0.03172
0.08157
0.04929
0.03113
0.06092
0.09312
0.06673
0.08607
0.08864
0.02889
0.08607
0.04298
0.03091
0.02217
0.07485
0.10631
0.00668
0.03624
0.10443
0.06401
0.00859
0.09539
0.08006
0.04830
-0.00519
0.05306
0.06270
0.04425
-0.01254
0.04788

1988	1.6	[7]	5.6	5.6	41.9	[8]	76.3	76.3	118.1	[8]	758.4	NA	758.4	883.6
1989	1.3	1.1	3.7	4.9	40.5	24.9	51.3	76.1	116.6	[8]	767.4	4.8	772.2	895
1990	1.3	1.2	4.2	5.4	38.9	27.8	48.5	76.3	115.2	[8]	774.2	8.4	782.6	904.5
1991	1.1	1.2	3.8	5	33.9	27	48.4	75.4	109.3	[8]	773.2	10.7	783.9	899.2
1992	1.1	1.2	3.9	5	32.4	28.2	45.8	74	106.4	[8]	781.2	13.9	795.1	907.7
1993	1.1	1.4	3.7	5.1	31.3	28.9	46	74.9	106.2	[8]	816.6	15.1	831.6	944.1
1994	0.9	1.3	3.8	5.1	31.7	29.7	45.5	75.2	106.9	[8]	821.2	17.1	838.4	951.3
1995	0.8	1.4	3.6	5.1	33	29.4	43.7	73.1	106.1	[8]	832.9	17.3	850.2	962.1
1996	0.7	1.7	3.6	5.3	31.7	29.4	42.3	71.7	103.4	[8]	878.8	18.1	896.9	1,006.30
1997	0.7	1.7	4	5.8	30.2	29.9	41.7	71.5	101.7	[8]	904.2	17.1	921.4	1,029.50
1998	0.5	1.4	2.9	4.3	28.2	28.6	38.9	67.4	95.6	[8]	920.4	16.3	936.6	1,037.10
1999	0.6	1.5	2.8	4.3	28.1	27.8	37	64.7	92.8	[8]	924.7	16.2	940.9	1,038.60
2000	0.5	1.5	2.1	3.7	28.9	28	37.2	65.2	94.1	[8]	967.1	18.7	985.8	1,084.10
2001	0.5	1.4	2.4	3.9	26.1	25.8	39.5	65.3	91.3	[8]	946.1	18.4	964.4	1,060.10
2002	0.5	1.4	2.5	3.9	23.7	26.2	34.5	60.7	84.4	[8]	960.1	17.4	977.5	1,066.40
2003	0.6	1.8	1.9	3.7	24.2	24.8	36.4	61.3	85.5	[8]	983.5	21.6	1,005.10	1,094.90
2004	0.5	1.9	2.7	4.6	23.7	26.6	35.6	62.2	85.9	[8]	994.8	21.5	1,016.30	1,107.30
2005	0.4	1.9	2.4	4.3	23.4	25.9	34.5	60.3	83.8	[8]	1,015.60	21.8	1,037.50	1,126.00
2006	0.3	1.9	1.1	2.9	23	25.3	34.2	59.5	82.4	[8]	1,004.80	21.9	1,026.60	1,112.30
2007	0.4	1.9	1.2	3.2	22.7	22.5	34.1	56.6	79.3	[8]	1,022.80	22.3	1,045.10	1,128.00

0.05641
0.01187
0.00886
-0.00129
0.01035
0.04531
0.00563
0.01425
0.05511
0.02890
0.01792
0.00467
0.04585
-0.02171
0.01480
0.02437
0.01149
0.02091
-0.01063
0.01791

Table 2.1f Electric Power Sector Energy Consumption, 1949-2009

(Trillion Btu)

Year	Primary Consumption [1]											Electricity Net Imports [4]	Total Primary	Demand
	Fossil Fuels				Nuclear Electric Power	Renewable Energy [2]								
	Coal	Natural Gas [3]	Petroleum [5]	Total		Hydroelectric Power [6]	Geothermal	Solar/PV	Wind	Biomass	Total			
1949	1,995	569	415	2,979	0	1,349	NA	NA	NA	6	1,355	5	4,339	
1950	2,199	651	472	3,322	0	1,346	NA	NA	NA	5	1,351	6	4,679	0.07836
1951	2,507	791	400	3,697	0	1,361	NA	NA	NA	5	1,366	7	5,071	0.08378
1952	2,557	942	420	3,920	0	1,404	NA	NA	NA	6	1,411	8	5,338	0.05265
1953	2,777	1,070	514	4,362	0	1,356	NA	NA	NA	5	1,361	7	5,730	0.07344
1954	2,841	1,206	417	4,464	0	1,304	NA	NA	NA	3	1,307	8	5,780	0.00873
1955	3,458	1,194	471	5,123	0	1,322	NA	NA	NA	3	1,325	14	6,461	0.11782
1956	3,790	1,283	455	5,527	0	1,398	NA	NA	NA	2	1,400	16	6,942	0.07445
1957	3,855	1,383	498	5,737	(s)	1,480	NA	NA	NA	2	1,482	12	7,231	0.04163
1958	3,721	1,421	486	5,628	2	1,555	NA	NA	NA	2	1,557	11	7,198	-0.00456
1959	4,029	1,686	552	6,267	2	1,511	NA	NA	NA	2	1,513	12	7,794	0.08280
1960	4,228	1,785	553	6,565	6	1,569	1	NA	NA	2	1,571	15	8,158	0.04670
1961	4,355	1,889	557	6,801	20	1,621	2	NA	NA	1	1,624	8	8,453	0.03616
1962	4,622	2,035	560	7,217	26	1,780	2	NA	NA	1	1,784	2	9,029	0.06814
1963	5,050	2,211	585	7,846	38	1,737	4	NA	NA	1	1,743	(s)	9,627	0.06623
1964	5,380	2,397	634	8,411	40	1,853	5	NA	NA	2	1,859	7	10,316	0.07157
1965	5,821	2,395	722	8,938	43	2,026	4	NA	NA	3	2,033	(s)	11,014	0.06766
1966	6,302	2,696	883	9,881	64	2,028	4	NA	NA	3	2,036	4	11,985	0.08816
1967	6,445	2,834	1,011	10,290	86	2,311	7	NA	NA	3	2,321	-1	12,698	0.05949
1968	6,994	3,245	1,181	11,421	142	2,313	9	NA	NA	4	2,327	-2	13,887	0.09364
1969	7,219	3,596	1,571	12,386	154	2,614	13	NA	NA	3	2,630	4	15,174	0.09268
1970	7,227	4,054	2,117	13,399	239	2,600	11	NA	NA	4	2,615	7	16,259	0.07150
1971	7,299	4,099	2,495	13,893	413	2,790	12	NA	NA	3	2,806	12	17,124	0.05320
1972	7,811	4,084	3,097	14,992	584	2,829	31	NA	NA	3	2,864	26	18,466	0.07837
1973	8,658	3,748	3,515	15,921	910	2,827	43	NA	NA	3	2,873	49	19,753	0.06970
1974	8,534	3,519	3,365	15,418	1,272	3,143	53	NA	NA	3	3,199	43	19,933	0.00911
1975	8,786	3,240	3,166	15,191	1,900	3,122	70	NA	NA	2	3,194	21	20,307	0.01876
1976	9,720	3,152	3,477	16,349	2,111	2,943	78	NA	NA	3	3,024	29	21,513	0.05939
1977	10,262	3,284	3,901	17,446	2,702	2,301	77	NA	NA	5	2,383	59	22,591	0.05011
1978	10,238	3,297	3,987	17,522	3,024	2,905	64	NA	NA	3	2,973	67	23,587	0.04409
1979	11,260	3,613	3,283	18,156	2,776	2,897	84	NA	NA	5	2,986	69	23,987	0.01696
1980	12,123	3,778	2,634	18,534	2,739	2,867	110	NA	NA	5	2,982	71	24,327	0.01417
1981	12,583	3,730	2,202	18,516	3,008	2,725	123	NA	NA	4	2,852	113	24,488	0.00662
1982	12,582	3,312	1,568	17,462	3,131	3,233	105	NA	NA	3	3,341	100	24,034	-0.01854
1983	13,213	2,972	1,544	17,729	3,203	3,494	129	NA	(s)	4	3,627	121	24,679	0.02684
1984	14,019	3,199	1,286	18,504	3,553	3,353	165	(s)	(s)	9	3,527	135	25,719	0.04214
1985	14,542	3,135	1,090	18,767	4,076	2,937	198	(s)	(s)	14	3,150	140	26,132	0.01606
1986	14,444	2,670	1,452	18,566	4,380	3,038	219	(s)	(s)	12	3,270	122	26,338	0.00788
1987	15,173	2,916	1,257	19,346	4,754	2,602	229	(s)	(s)	15	2,846	158	27,104	0.02908
1988	15,850	2,693	1,563	20,106	5,587	2,302	217	(s)	(s)	17	2,536	108	28,338	0.04553
19897	16,137	3,173	1,703	21,013	5,602	2,808	308	3	22	232	3,372	37	30,025	0.05953
1990	16,261	3,309	1,289	20,859	6,104	3,014	326	4	29	317	3,689	8	30,660	0.02115
1991	16,250	3,377	1,198	20,825	6,422	2,985	335	5	31	354	3,710	67	31,025	0.01190
1992	16,466	3,512	991	20,968	6,479	2,586	338	4	30	402	3,360	87	30,893	-0.00425
1993	17,196	3,538	1,124	21,857	6,410	2,861	351	5	31	415	3,662	95	32,025	0.03664
1994	17,261	3,977	1,059	22,297	6,694	2,620	325	5	36	434	3,420	153	32,563	0.01680
1995	17,466	4,302	755	22,523	7,075	3,149	280	5	33	422	3,889	134	33,621	0.03249
1996	18,429	3,862	817	23,109	7,087	3,528	300	5	33	438	4,305	137	34,638	0.03025
1997	18,905	4,126	927	23,957	6,597	3,581	309	5	34	446	4,375	116	35,045	0.01175
1998	19,216	4,675	1,306	25,197	7,068	3,241	311	5	31	444	4,032	88	36,385	0.03824
1999	19,279	4,902	1,211	25,393	7,610	3,218	312	5	46	453	4,034	99	37,136	0.02064
2000	20,220	5,293	1,144	26,658	7,862	2,768	296	5	57	453	3,579	115	38,214	0.02903
2001	19,614	5,458	1,277	26,348	"8,029	2,209	289	6	70	337	2,910	75	37,362	-0.02230
2002	19,783	5,767	961	26,511	"8,145	2,650	305	6	105	380	3,445	72	38,173	0.02171
2003	20,185	5,246	1,205	26,636	7,959	2,781	303	5	115	397	3,601	22	38,218	0.00118
2004	20,305	5,595	1,212	27,112	8,222	2,656	311	6	142	388	3,503	39	38,876	0.01722
2005	20,737	6,015	1,235	27,986	"8,161	2,670	309	6	178	406	3,568	84	39,800	0.02377
2006	20,462	6,375	648	27,485	"8,215	2,839	306	5	264	412	3,827	63	39,590	-0.00528
2007	20,808	7,005	657	28,470	"8,455	2,430	308	6	341	423	3,508	107	40,540	0.02400
2008	"20,513	"6,829	"468	"27,810	"8,427	"2,494	"314	"9	"546	"435	"3,798	112	40,147	-0.00969
2009r	18,296	7,039	390	25,725	8,349	2,663	320	8	697	426	4,113	117	38,304	-0.04591

[1] See "Primary Energy Consumption" in Glossary

[2] See Table 10.2c for notes on series components

[3] Natural gas only; excludes the estimated portion of supplemental gaseous fuels. See Note 1 "Supplemental Gaseous Fuels" at end of Section 6

[4] See Table 5.14c for series components

[5] Conventional hydroelectric power

[6] Net imports equal imports minus exports

Through 1988, data are for electric utilities only. Beginning in 1989, data are for electric utilities and independent power producers.

R=Revised. P=Preliminary. NA=Not available. (s)=Less than 0.5 trillion Btu.

Notes: • Data are for fuels consumed to produce electricity and useful thermal output. • The electric power sector comprises electricity-only and combined-heat-and-power (CHP) plants within the NAICS 22 category whose primary business is to sell electricity, or electricity and heat, to the public. • See Note 3 "Electricity Imports and Exports" at end of Section 8. • Totals may not equal sum of components due to independent rounding.

Sources: Tables 5.14c, 6.5, 7.3, 8.1, 8.2b, 10.2c, A4, A5, and A6.

PAGE IS ORIGINAL COMPANY, WITH EXCEPTION OF REAL COSTS AND EXHIBITS

NOMINAL	UK Natural Gas Futures	Newcastle Coal Futures	ECX EUA	UK Base Electricity
2011 Jun11	56	126.45	15.25	49.12
2011 Sep11	56.14	125.6	15.36	49.52
2011 Dec11	67.3	125.1	15.45	53.85
2012 Mar12	66.48	124.2	15.61	55.72
2012 Jun12	59.58	123.5	15.77	51.32
2012 Sep12	60.25	123.1	15.93	51.32
2012 Dec12	65.01	122.7	16.08	55.48
2013 Mar13	68.56	122.15	16.38	55.48
2013 Jun13	61.61	122.2	17.07	52.43
2013 Dec13	66.28	122.2	17.28	57
2014 Dec14	70.47	122.2	18.18	60.52

1.50% Inflation, Assumed

REAL	UK Natural Gas Futures	Newcastle Coal Futures	ECX EUA	UK Base Electricity
Jun11	56.00	126.45	15.25	49.12
Sep11	56.14	125.60	15.36	49.52
Dec11	67.30	125.10	15.45	53.85
Mar12	65.50	122.36	15.38	54.90
Jun12	58.70	121.67	15.54	50.56
Sep12	59.36	121.28	15.69	50.56
Dec12	64.05	120.89	15.84	54.66
Mar13	66.55	118.57	15.90	53.85
Jun13	59.80	118.61	16.57	50.89

Percentage Changes

	UK Natural Gas Futures	Newcastle Coal Futures	ECX EUA	UK Base Electricity
Jun11				
Sep11	0.25%	-0.67%	0.72%	0.81%
Dec11	19.88%	-0.40%	0.59%	8.74%
Mar12	-1.22%	-0.72%	1.04%	3.47%
Jun12	-10.38%	-0.56%	1.02%	-7.90%
Sep12	1.12%	-0.32%	1.01%	0.00%
Dec12	7.90%	-0.32%	0.94%	8.11%
Mar13	5.46%	-0.45%	1.87%	0.00%
Jun13	-10.14%	0.04%	4.21%	-5.50%
Dec13	7.58%	0.00%	1.23%	8.72%
Dec14	6.32%	0.00%	5.21%	6.18%

REAL Percentage Changes

	UK Natural Gas Futures	Newcastle Coal Futures	ECX EUA	UK Base Electricity
Jun11				
Sep11	0.3%	-0.7%	0.7%	0.8%
Dec11	19.9%	-0.4%	0.6%	8.7%
Mar12	-2.7%	-2.2%	-0.5%	1.9%
Jun12	-10.4%	-0.6%	1.0%	-7.9%
Sep12	1.1%	-0.3%	1.0%	0.0%
Dec12	7.9%	-0.3%	0.9%	8.1%
Mar13	3.9%	-1.9%	0.4%	-1.5%
Jun13	-10.1%	0.0%	4.2%	-5.5%

	Natural Gas	Coal	Carbon	Power
Natural Gas	1.00	0.09	-0.23	0.88
Coal		1.00	0.69	0.19
Carbon			1.00	-0.14
Power				1.00

-0.52

	Natural Gas	Coal	Carbon	Power	Demand
Natural Gas	1	0.09	-0.23	0.88	seasonal
Coal		1	0.69	0.19	0.74
Carbon			1	-0.14	0.5
Power				1	0.75
Demand					1

European Futures
European Futures/US Data validated
US Data
Hypothesized

Exhibit JIF-12A

Correlations provided by AEP in SCW-1, Table 1-4

	Natural Gas Price	Coal Price	Carbon Price	*Market* Power Price	Demand (Load Req)
Natural Gas Price	1.00	0.09	(0.23)	0.88	seasonal
Coal Price		1.00	0.69	0.19	0.74
Carbon Price			1.00	(0.14)	0.50
Market Power Price				1.00	0.75
Demand (Load Req)					1.00

Correlations derived from Company Response to Sierra DR 2-34b

	Natural Gas Price	Coal Price	Carbon Price	*Market* Power Price	Demand (Load Req)
Natural Gas Price	1.00	0.09	0.45	0.88	0.66

Coal Price		1.00	0.05	0.10	0.08
Carbon Price			1.00	0.53	0.68
Market Power Price				1.00	0.76
Demand (Load Req)					1.00

**Assumes CO2 is Generic Distribution 28*

Data Source		
Europe	US	Hypothesized

Difference

	Natural Gas Price	Coal Price	Carbon Price	Market Power Price	Demand (Load Req)
Natural Gas Price		0.00	-0.68	0.00	
Coal Price			0.63	0.09	0.66
Carbon Price				-0.67	-0.18
Market Power Price					-0.01
Demand (Load Req)					

Exhibit JIF-12B

Correlations provided by AEP in SCW-1, Table 1-4

	Natural Gas Price	Coal Price	Carbon Price	Market Power Price	Demand (Load Req)
Natural Gas Price	1.00	0.09	(0.23)	0.88	seasonal
Coal Price	0.00	1.00	0.69	0.19	0.74
Carbon Price	0.00	0.00	1.00	(0.14)	0.50
Market Power Price	0.00	0.00	0.00	1.00	0.75
Demand (Load Req)	0.00	0.00	0.00	0.00	1.00

Synapse Estimates

	Natural Gas Price	Coal Price	Carbon Price	Market Power Price	Demand (Load Req)
Natural Gas Price	1.00	0.11	(0.43)	0.41	(0.15)
Coal Price		1.00	0.67	0.32	0.11
Carbon Price			1.00	(0.43)	0.00
Market Power Price				1.00	(0.51)
Demand (Load Req)					1.00

Data Source		
Europe	US	Hypothesized

Difference

	Natural Gas Price	Coal Price	Carbon Price	Market Power Price	Demand (Load Req)
Natural Gas Price		-0.03	0.20	0.46	0.81
Coal Price			0.01	-0.14	0.63
Carbon Price				0.30	0.50
Market Power Price					1.26
Demand (Load Req)					

Difference

	Natural Gas Price	Coal Price	Carbon Price
Natural Gas Price		-0.02	0.88
Coal Price			-0.62
Carbon Price			
Power Price			
Demand			

Dec11	15.57	15.63	15.41	15.45
Dec12	16.19	16.23	16.07	16.08
Dec13	17.38	17.4	17.26	17.28
Dec14	18.3	18.3	18.24	18.18
Dec15				19.08
Dec16				19.98
Dec17				20.88
Dec18				21.78
Dec19				22.7
Dec20				23.65
Jun11				15.25
Jun12				15.77
Jun13				17.07
Mar11	15.25	15.25	15.1	15.17
Mar12				15.61
Mar13				16.38
Sep11				15.36
Sep12				15.93

	Natural Ga	Coal	Carbon	Power
Jun11	1	1	1	1
Sep11	1.0025	0.993278	1.007213	1.008143
Dec11	1.201786	0.989324	1.013115	1.096295
Mar12	1.187143	0.982206	1.023607	1.134365
Jun12	1.063929	0.976671	1.034098	1.044788
Sep12	1.075893	0.973507	1.04459	1.044788
Dec12	1.160893	0.970344	1.054426	1.129479
Mar13	1.224286	0.965994	1.074098	1.129479
Jun13	1.100179	0.96639	1.119344	1.067386
Dec13	1.183571	0.96639	1.133115	1.160423
Dec14	1.258393	0.96639	1.192131	1.232085

	US Power	US Nat Ga	US Coal
2001	35.0	4	25.36
2002	27.0	2.95	26.57
2003	37.5	4.88	26.73
2004	43.2	5.46	30.56
2005	63.8	7.33	36.8
2006	56.2	6.39	39.32
2007	61.7	6.25	40.8
2008	72.7	7.97	51.39
2009	38.7	3.67	54.25
2010	47.2	4.16	44

	US Power	US Nat Ga	US Coal
2001			
2002	-0.229134	-0.2625	0.047713
2003	0.387767	0.654237	0.006022
2004	0.153458	0.118852	0.143285
2005	0.476613	0.342491	0.204188
2006	-0.120248	-0.12824	0.068478
2007	0.098162	-0.021909	0.03764
2008	0.178876	0.2752	0.259559
2009	-0.467223	-0.539523	0.055653
2010	0.219474	0.133515	-0.18894

Us Nat Gas	0.94
US Coal Po\	0.12

Power Price	Demand
0.46	0.81
-0.23	-0.03
0.96	0.68
	1.28

Table 6.7 Natural Gas Wellhead, City Gate, and Imports Prices, 1949-2010

(Dollars per Thousand Cubic Feet)

Year	Wellhead [1]		City Gate [2]	
	Nominal [3]	Real [4]	Nominal [3]	Real [4]
1949	0.06	0.41	NA	NA
1950	0.07	0.48	NA	NA
1951	0.07	0.45	NA	NA
1952	0.08	0.5	NA	NA
1953	0.09	0.56	NA	NA
1954	0.1	0.61	NA	NA
1955	0.1	0.6	NA	NA
1956	0.11	0.64	NA	NA
1957	0.11	0.62	NA	NA
1958	0.12	0.66	NA	NA
1959	0.13	0.71	NA	NA
1960	0.14	0.75	NA	NA
1961	0.15	0.8	NA	NA
1962	0.16	0.84	NA	NA
1963	0.16	0.83	NA	NA
1964	0.15	0.77	NA	NA
1965	0.16	0.8	NA	NA
1966	0.16	0.78	NA	NA
1967	0.16	0.76	NA	NA
1968	0.16	0.73	NA	NA
1969	0.17	0.74	NA	NA
1970	0.17	0.7	NA	NA
1971	0.18	0.7	NA	NA
1972	0.19	0.71	NA	NA
1973	0.22	0.78	NA	NA
1974	0.3	0.98	NA	NA
1975	0.44	1.31	NA	NA
1976	0.58	1.63	NA	NA
1977	0.79	2.09	NA	NA
1978	0.91	2.25	NA	NA
1979	1.18	2.7	NA	NA
1980	1.59	3.33	NA	NA
1981	1.98	3.79	NA	NA
1982	2.46	4.44	NA	NA
1983	2.59	4.5	NA	NA
1984	2.66	4.45	3.95	6.61

1985	2.51		4.08		3.75		6.09	
1986	1.94		3.08		3.22		5.12	
1987	1.67		2.58		2.87		4.43	
1988	1.69		2.52		2.92		4.36	
1989	1.69		2.43		3.01		4.33	
1990	1.71		2.37		3.03		4.2	
1991	1.64		2.19		2.9		3.88	
1992	1.74		2.27		3.01		3.93	
1993	2.04		2.61		3.21		4.1	
1994	1.85		2.32		3.07		3.84	
1995	1.55		1.9		2.78		3.41	
1996	2.17		2.61		3.27		3.94	
1997	2.32		2.74		3.66		4.33	
1998	1.96		2.29		3.07		3.59	
1999	2.19		2.52		3.1		3.57	
2000	3.68		4.15		4.62		5.21	
2001	4		4.41		5.72		6.31	
2002	2.95		3.2		4.12		4.47	
2003	4.88		5.19		5.85		6.22	
2004	5.46		5.64		6.65		6.87	
2005	7.33		7.33		8.67		8.67	
2006	6.39		6.19		8.61		8.34	
2007	6.25		5.88		8.16		7.68	
2008	7.97	[R]	7.34		9.18		8.45	[R]
2009	3.67	[R]	3.34	[R]	6.46	[R]	5.89	
2010	4.16	[E]	3.76	[E]	6.16	[P]	5.57	[P]

[1]See "Natural Gas Wellhead Price" in Glossary.

[2]See "City Gate" in Glossary.

[3]See "Nominal Dollars" in Glossary.

[4]In chained (2005) dollars, calculated by using gross domestic product implicit price deflators in Table D1. See "Chained Dollars" in Glossary.

R=Revised. P=Preliminary. E=Estimate. NA=N

Web Page: For related informati

Sources: **Wellhead** and **City Gate:** • 1949-200 *Natural Gas Annual (NGA),* annual reports. • 2 2011), Table 3. **Imports:** • 1972 and 1973: Fe *Exports of Natural Gas*; *Imports and Exports of L Exports of Natural Gas,* annual reports. • 1977 NGM (March 2011), Table 4.

Imports				Nat Gas Wellhead Price (Real, Chained 2005$)
Nominal [3]		Real [4]		
NA		NA		
NA		NA		0.17073
NA		NA		-0.06250
NA		NA		0.11111
NA		NA		0.12000
NA		NA		0.08929
NA		NA		-0.01639
NA		NA		0.06667
NA		NA		-0.03125
NA		NA		0.06452
NA		NA		0.07576
NA		NA		0.05634
NA		NA		0.06667
NA		NA		0.05000
NA		NA		-0.01190
NA		NA		-0.07229
NA		NA		0.03896
NA		NA		-0.02500
NA		NA		-0.02564
NA		NA		-0.03947
NA		NA		0.01370
NA		NA		-0.05405
NA		NA		0.00000
0.31		1.16		0.01429
0.35		1.25		0.09859
0.55		1.79		0.25641
1.21		3.61		0.33673
1.72		4.85		0.24427
1.98		5.24		0.28221
2.13		5.27		0.07656
2.49		5.69		0.20000
4.28		8.96		0.23333
4.88		9.34		0.13814
5.03		9.08		0.17150
4.78		8.3		0.01351
4.08		6.83		-0.01111

3.21		5.21		-0.08315
2.43		3.86		-0.24510
1.95		3.01		-0.16234
1.84		2.75		-0.02326
1.82		2.62		-0.03571
1.94		2.69		-0.02469
1.83		2.45		-0.07595
1.85		2.42		0.03653
2.03		2.6		0.14978
1.87		2.34		-0.11111
1.49		1.83		-0.18103
1.97		2.37		0.37368
2.17		2.57		0.04981
1.97		2.3		-0.16423
2.24		2.58		0.10044
3.95		4.46		0.64683
4.43		4.89		0.06265
3.15		3.42		-0.27438
5.17		5.49		0.62188
5.81		6		0.08671
8.12		8.12		0.29965
6.88		6.66		-0.15553
6.87		6.46	[R]	-0.05008
8.7		8.01	[R]	0.24830
4.19		3.82		-0.54496
4.52	[P]	4.08	[P]	0.12575

lot available.

on, see http://www.eia.gov/naturalgas/.

)5 U.S. Energy Information Administration (EIA),

006 forward EIA, *Natural Gas Monthly (NGM)* (March

ıderal Power Commission (FPC), *Pipeline Imports and*

LNG. • 1974-1976 FPC, *United States Imports and*

-2008 EIA, NGA, annual reports. • *2009 and 2010* EIA,

Table 8.10 Average Retail Prices of Electricity, 1960-2010

(Cents per Kilowatthour, Including Taxes)

Year	Residential		Commercial [1]		Industrial [2]		Transportation [3]	
	Nominal [5]	Real [6]	Nominal [5]	Real [6]	Nominal [5]	Real [6]	Nominal [5]	Real [6]
1960	2.6	14	2.4	12.9	1.1	5.9	NA	NA
1961	2.6	13.8	2.4	12.8	1.1	5.9	NA	NA
1962	2.6	13.6	2.4	12.6	1.1	5.8	NA	NA
1963	2.5	13	2.3	11.9	1	5.2	NA	NA
1964	2.5	12.8	2.2	11.3	1	5.1	NA	NA
1965	2.4	12.1	2.2	11	1	5	NA	NA
1966	2.3	11.2	2.1	10.3	1	4.9	NA	NA
1967	2.3	10.9	2.1	10	1	4.7	NA	NA
1968	2.3	10.5	2.1	9.5	1	4.5	NA	NA
1969	2.2	9.5	2.1	9.1	1	4.3	NA	NA
1970	2.2	9.1	2.1	8.6	1	4.1	NA	NA
1971	2.3	9	2.2	8.6	1.1	4.3	NA	NA
1972	2.4	9	2.3	8.6	1.2	4.5	NA	NA
1973	2.5	8.9	2.4	8.5	1.3	4.6	NA	NA
1974	3.1	10.1	3	9.8	1.7	5.5	NA	NA
1975	3.5	10.4	3.5	10.4	2.1	6.3	NA	NA
1976	3.7	10.4	3.7	10.4	2.2	6.2	NA	NA
1977	4.1	10.9	4.1	10.9	2.5	6.6	NA	NA
1978	4.3	10.6	4.4	10.9	2.8	6.9	NA	NA
1979	4.6	10.5	4.7	10.7	3.1	7.1	NA	NA
1980	5.4	11.3	5.5	11.5	3.7	7.8	NA	NA
1981	6.2	11.9	6.3	12.1	4.3	8.2	NA	NA
1982	6.9	12.5	6.9	12.5	5	9	NA	NA
1983	7.2	12.5	7	12.2	5	8.7	NA	NA
1984	7.15	11.96	7.13	11.93	4.83	8.08	NA	NA
1985	7.39	12	7.27	11.81	4.97	8.07	NA	NA
1986	7.42	11.79	7.2	11.44	4.93	7.83	NA	NA
1987	7.45	11.5	7.08	10.93	4.77	7.37	NA	NA
1988	7.48	11.17	7.04	10.51	4.7	7.02	NA	NA
1989	7.65	11	7.2	10.36	4.72	6.79	NA	NA
1990	7.83	10.84	7.34	10.17	4.74	6.57	NA	NA
1991	8.04	10.75	7.53	10.07	4.83	6.46	NA	NA
1992	8.21	10.73	7.66	10.01	4.83	6.31	NA	NA
1993	8.32	10.64	7.74	9.89	4.85	6.2	NA	NA
1994	8.38	10.49	7.73	9.68	4.77	5.97	NA	NA
1995	8.4	10.3	7.69	9.43	4.66	5.72	NA	NA
1996	8.36	10.06	7.64	9.2	4.6	5.54	NA	NA
1997	8.43	9.97	7.59	8.98	4.53	5.36	NA	NA
1998	8.26	9.66	7.41	8.67	4.48	5.24	NA	NA
1999	8.16	9.4	7.26	8.37	4.43	5.11	NA	NA

2000	8.24		9.3		7.43		8.38		4.64		5.23		NA		NA	
2001	8.58		9.46		7.92		8.74		5.05		5.57		NA		NA	
2002	8.44		9.16		7.89		8.57		4.88		5.3		NA		NA	
2003	8.72		9.27		8.03		8.53		5.11		5.43		7.54		8.01	
2004	8.95		9.25		8.17		8.44		5.25		5.43		7.18		7.42	
2005	9.45		9.45		8.67		8.67		5.73		5.73		8.57		8.57	
2006	10.4		10.07		9.46		9.16		6.16		5.97		9.54		9.24	
2007	10.65		10.02	[R]	9.65		9.08	[R]	6.39		6.01	[R]	9.7		9.13	
2008	11.26		10.37	[R]	10.36		9.54	[R]	6.83		6.29	[R]	10.74		9.89	[R]
2009	11.51	[R]	10.5	[R]	10.17	[R]	9.28	[R]	6.81	[R]	6.21	[R]	10.65	[R]	9.72	[R]
2010[P]	11.58		10.46		10.26		9.27		6.79		6.14		10.96		9.9	

[1]Commercial sector. For 1960-2002, prices exclude public street and highway lighting, interdepartmental sales, and other sales to public authorities.

[2]Industrial sector. For 1960-2002, prices exclude agriculture and irrigation.

[3]Transportation sector, including railroads and railways.

[4]Public street and highway lighting, interdepartmental sales, other sales to public authorities, agriculture and irrigation, and transportation including railroads and railways.

[5]See "Nominal Price" in Glossary.

[6]In chained (2005) dollars, calculated by using gr
D1. See "Chained Dollars" in Glossary.

R=Revised. P=Preliminary. NA=Not available.

Notes: • Beginning in 2003, the category "Othe
categories "Commercial" and "Industrial" have b
retail sales divided by electricity retail sales. • F
charges, customer service charges, environmen
miscellaneous charges applied to end-use custo
deferred charges, credits, or other adjustments,
previous reporting periods. • Through 1979, da
only. (Class A utilities are those with operating
with between $1 million and $2.5 million.) For 19
electric operating revenues were $100 million or
selected sample of electric utilities. Beginning ir
in 1996, data also include energy service provid

Web Page: For related informati

Sources: • 1960-September 1977 Federal Po
Electric Operating Revenues and Income." • O
Commission (FERC), Form FPC-5, "Monthly Sta
• March 1980-1982 FERC, Form FERC-5, "El
• 1983 U.S. Energy Information Administration
Statement." • 1984-1995 EIA, Form EIA-861,
Electric Power Monthly (March 2011), Table 5.3

Other [4]		Total			
Nominal [5]	Real [6]	Nominal [5]		Real [6]	
1.9	10.2	1.8		9.7	
1.8	9.6	1.8		9.6	
1.9	10	1.8		9.4	
1.8	9.3	1.8		9.3	
1.8	9.2	1.7		8.7	
1.8	9	1.7		8.5	
1.8	8.8	1.7		8.3	
1.8	8.5	1.7		8.1	
1.8	8.2	1.6		7.3	
1.7	7.4	1.6		6.9	
1.8	7.4	1.7		7	
1.9	7.4	1.8		7.1	
2	7.5	1.9		7.1	
2.1	7.5	2		7.1	
2.8	9.1	2.5		8.2	
3.1	9.2	2.9		8.6	
3.3	9.3	3.1		8.7	
3.5	9.3	3.4		9	
3.6	8.9	3.7		9.2	
4	9.1	4		9.1	
4.8	10.1	4.7		9.8	
5.3	10.2	5.5		10.5	
5.9	10.7	6.1		11	
6.4	11.1	6.3		10.9	
5.9	9.87	6.25		10.46	
6.09	9.89	6.44		10.46	
6.11	9.71	6.44		10.23	
6.21	9.59	6.37		9.84	
6.2	9.26	6.35		9.48	
6.25	8.99	6.45		9.28	
6.4	8.86	6.57		9.1	
6.51	8.71	6.75		9.03	
6.74	8.81	6.82		8.91	
6.88	8.8	6.93		8.86	
6.84	8.56	6.91		8.65	
6.88	8.44	6.89		8.45	
6.91	8.32	6.86		8.26	
6.91	8.17	6.85		8.1	
6.63	7.75	6.74		7.88	
6.35	7.32	6.64		7.65	

1961	-0.01042
1962	-0.02128
1963	-0.01075
1964	-0.06897
1965	-0.02353
1966	-0.0241
1967	-0.02469
1968	-0.10959
1969	-0.05797
1970	0.014286
1971	0.014085
1972	0
1973	0
1974	0.134146
1975	0.046512
1976	0.011494
1977	0.033333
1978	0.021739
1979	-0.01099
1980	0.071429
1981	0.066667
1982	0.045455
1983	-0.00917
1984	-0.04207
1985	0
1986	-0.02248
1987	-0.03963
1988	-0.03797
1989	-0.02155
1990	-0.01978
1991	-0.00775
1992	-0.01347
1993	-0.00564
1994	-0.02428
1995	-0.02367
1996	-0.023
1997	-0.01975
1998	-0.02792
1999	-0.03007

6.56	7.4	6.81		7.68		2000	0.003906
7.2	7.94	7.29		8.04		2001	0.044776
6.75	7.33	7.2		7.82		2002	-0.02813
- -	- -	7.44		7.91		2003	0.011378
- -	- -	7.61		7.86		2004	-0.00636
- -	- -	8.14		8.14		2005	0.034398
- -	- -	8.9		8.62		2006	0.055684
- -	- -	9.13		8.59	[R]	2007	-0.00349
- -	- -	9.74		8.97	[R]	2008	0.042363
- -	- -	9.82	[R]	8.96	[R]	2009	-0.00112
- -	- -	9.88		8.93		2010P	-0.00336

ross domestic product implicit price deflators in Table

- - =Not applicable.

er" has been replaced by "Transportation," and the

een redefined. • Data represent revenue from electricity

Prices include State and local taxes, energy or demand

ital surcharges, franchise fees, fuel adjustments, and other

mers during normal billing operations. Prices do not include

such as fuel or revenue from purchased power, from

ita are for Classes A and B privately owned electric utilities

revenues of $2.5 million or more; Class B utilities are those

980-1982, data are for selected Class A utilities whose

more during the previous year. For 1983, data are for a

1 1984, data are for a census of electric utilities. Beginning

ers selling to retail customers.

on, see http://www.eia.gov/electricity/.

wer Commission, Form FPC-5, "Monthly Statement of

ctober 1977-February 1980 Federal Energy Regulatory

atement of Electric Operating Revenues and Income."

ectric Utility Company Monthly Statement."

(EIA), Form EIA-826, "Electric Utility Company Monthly

"Annual Electric Utility Report." • 1996 forward EIA,

		Rand 1		3	8	7	7
		Rand 2		5	1	6	3
			1	3	8	7	7
			2	5	1	6	3
	ECX EUA			1	2	3	4
1	0.72%			1%		1%	1%
2	0.59%			1%	1%	1%	1%
3	1.04%				1%	1%	
4	1.02%			1%	1%	1%	1%
5	1.01%				1%	1%	1%
6	0.94%			1%	1%		1%
7	1.87%			2%	2%		
8	4.21%			4%		4%	4%
9	1.23%			1%	1%	1%	1%
10	5.21%			5%	5%	5%	5%
	UK Natural Gas Futures						
1	0.25%			0%		0%	0%
2	19.88%			20%	20%	20%	20%
3	-1.22%				-1%	-1%	
4	-10.38%			-10%	-10%	-10%	-10%
5	1.12%				1%	1%	1%
6	7.90%			8%	8%		8%
7	5.46%			5%	5%		
8	-10.14%			-10%		-10%	-10%
9	7.58%			8%	8%	8%	8%
10	6.32%			6%	6%	6%	6%
	-0.22881			-0.281693	0.017663	-0.199965	-0.261587

Min Correl **-67.8%**
Max Correl **33.7%**

8	8	1	2	3	4	9	3	8	4
9	9	2	10	5	3	6	1	4	7
8	8	1	2	3	4	9	3	8	4
9	9	2	10	5	3	6	1	4	7
5	6	7	8	9	10	11	12	13	14
1%	1%		1%	1%	1%	1%		1%	1%
1%	1%			1%	1%	1%	1%	1%	1%
1%	1%	1%	1%			1%		1%	1%
1%	1%	1%	1%	1%		1%	1%		
1%	1%	1%	1%		1%	1%	1%	1%	1%
1%	1%	1%	1%	1%	1%		1%	1%	1%
2%	2%	2%	2%	2%	2%	2%	2%	2%	
		4%	4%	4%	4%	4%	4%		4%
		1%	1%	1%	1%		1%	1%	1%
5%	5%	5%		5%	5%	5%	5%	5%	5%

0%	0%		0%	0%	0%	0%		0%	0%
20%	20%			20%	20%	20%	20%	20%	20%
-1%	-1%	-1%	-1%			-1%		-1%	-1%
-10%	-10%	-10%	-10%	-10%		-10%	-10%		
1%	1%	1%	1%		1%	1%	1%	1%	1%
8%	8%	8%	8%	8%	8%		8%	8%	8%
5%	5%	5%	5%	5%	5%	5%	5%	5%	
		-10%	-10%	-10%	-10%	-10%	-10%		-10%
		8%	8%	8%	8%		8%	8%	8%
6%	6%	6%		6%	6%	6%	6%	6%	6%
0.066193	0.066193	-0.082805	-0.471835	-0.281693	-0.437127	-0.172375	-0.301845	-0.041566	-0.371217

5	2	5	5	5	5	3	5	7	8
5	5	7	10	4	8	2	2	9	6
5	2	5	5	5	5	3	5	7	8
10	5	7	10	4	8	2	2	9	6
15	16	17	18	19	20	21	22	23	24
1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
1%		1%	1%	1%	1%			1%	1%
1%	1%	1%	1%	1%	1%		1%	1%	1%
1%	1%	1%	1%		1%	1%	1%	1%	1%
						1%		1%	1%
1%	1%	1%	1%	1%	1%	1%	1%	1%	
2%	2%		2%	2%	2%	2%	2%		2%
4%	4%	4%	4%	4%		4%	4%	4%	
1%	1%	1%	1%	1%	1%	1%	1%		1%
	5%	5%		5%	5%	5%	5%	5%	5%

0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
20%		20%	20%	20%	20%			20%	20%
-1%	-1%	-1%	-1%	-1%	-1%		-1%	-1%	-1%
-10%	-10%	-10%	-10%		-10%	-10%	-10%	-10%	-10%
						1%		1%	1%
8%	8%	8%	8%	8%	8%	8%	8%	8%	
5%	5%		5%	5%	5%	5%	5%		5%
-10%	-10%	-10%	-10%	-10%		-10%	-10%	-10%	
8%	8%	8%	8%	8%	8%	8%	8%		8%
	6%	6%		6%	6%	6%	6%	6%	6%

-0.527844	-0.069626	-0.24426	-0.527844	-0.408325	0.036323	-0.095928	-0.069626	-0.213404	0.081459

8	9	5	9	4	1	7	3	4	8
9	9	1	10	2	3	1	1	7	6
8	9	5	9	4	1	7	3	4	8
9	3	1	10	2	3	1	1	7	6
25	26	27	28	29	30	31	32	33	34
1%	1%		1%	1%				1%	1%
1%	1%	1%	1%		1%	1%	1%	1%	1%
1%		1%	1%	1%		1%		1%	1%
1%	1%	1%	1%		1%	1%	1%		1%
1%	1%		1%	1%	1%	1%	1%	1%	1%
1%	1%	1%	1%	1%	1%	1%	1%	1%	
2%	2%	2%	2%	2%	2%		2%		2%
	4%	4%	4%	4%	4%	4%	4%	4%	
		1%		1%	1%	1%	1%	1%	1%
5%	5%	5%		5%	5%	5%	5%	5%	5%

0%	0%		0%	0%				0%	0%
20%	20%	20%	20%		20%	20%	20%	20%	20%
-1%		-1%	-1%	-1%		-1%		-1%	-1%
-10%	-10%	-10%	-10%		-10%	-10%	-10%		-10%
1%	1%		1%	1%	1%	1%	1%	1%	1%
8%	8%	8%	8%	8%	8%	8%	8%	8%	
5%	5%	5%	5%	5%	5%		5%		5%
	-10%	-10%	-10%	-10%	-10%	-10%	-10%	-10%	
		8%		8%	8%	8%	8%	8%	8%
6%	6%	6%		6%	6%	6%	6%	6%	6%
0.066193	-0.241315	-0.280434	-0.516934	-0.245458	-0.301845	-0.259824	-0.301845	-0.371217	0.081459

9	4	7	2	8	1	7	5	5	8
4	7	4	3	4	2	7	10	7	3
9	4	7	2	8	1	7	5	5	8
4	7	4	3	4	2	10	10	7	3
35	36	37	38	39	40	41	42	43	44
1%	1%	1%	1%	1%		1%	1%	1%	1%
1%	1%	1%		1%		1%	1%	1%	1%
1%	1%	1%		1%	1%	1%	1%	1%	
			1%		1%	1%	1%	1%	1%
1%	1%	1%	1%	1%	1%	1%			1%
1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
2%			2%	2%	2%		2%		2%
4%	4%	4%	4%		4%	4%	4%	4%	
	1%	1%	1%	1%	1%	1%	1%	1%	1%
5%	5%	5%	5%	5%	5%			5%	5%

0%	0%	0%	0%	0%		0%	0%	0%	0%
20%	20%	20%		20%		20%	20%	20%	20%
-1%	-1%	-1%		-1%	-1%	-1%	-1%	-1%	
			-10%		-10%	-10%	-10%	-10%	-10%
1%	1%	1%	1%	1%	1%	1%			1%
8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
5%			5%	5%	5%		5%		5%
-10%	-10%	-10%	-10%		-10%	-10%	-10%	-10%	
	8%	8%	8%	8%	8%	8%	8%	8%	8%
6%	6%	6%	6%	6%	6%			6%	6%
-0.356022	-0.371217	-0.371217	-0.095928	-0.041566	-0.082805	-0.547524	-0.527844	-0.24426	0.023956

3	3	5	2	4	4	9	6	9	6
1	3	6	3	2	4	2	8	9	9
3	3	5	2	4	4	9	6	9	6
1	5	6	3	2	1	2	8	1	9
45	46	47	48	49	50	51	52	53	54
	1%	1%	1%	1%		1%	1%		1%
1%	1%	1%			1%		1%	1%	1%
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4%	4%	4%	4%	4%	4%	4%		4%	4%
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5%	5%	5%	5%	5%	5%	5%	5%	5%	5%

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		-1%		-1%	-1%	-1%	-1%	-1%	-1%
-10%	-10%	-10%	-10%			-10%	-10%	-10%	-10%
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8%	8%		8%	8%	8%	8%		8%	
5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
-10%	-10%	-10%	-10%	-10%	-10%	-10%		-10%	-10%
8%	8%	8%	8%	8%	8%		8%		
6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
-0.301845	-0.281693	-0.21028	-0.095928	-0.245458	-0.437813	-0.01618	0.081459	-0.238115	-0.172375

2	8	6	8	9	4	2	9	4	10
5	2	7	1	3	3	2	10	1	1
2	8	6	8	9	4	2	9	4	10
5	2	7	1	3	3	1	10	1	1
55	56	57	58	59	60	61	62	63	64
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6%	6%	6%	6%	6%	6%	6%		6%	
-0.069626	0.337359	-0.199965	0.017663	-0.241315	-0.437127	-0.082805	-0.516934	-0.437813	-0.551768

6	7	5	3	5	5	3	6	7	6
8	5	7	8	5	9	4	9	9	2
6	7	5	3	5	5	3	6	7	6
8	5	7	8	5	9	4	9	9	2
65	66	67	68	69	70	71	72	73	74
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8%	8%	8%	8%	8%		8%			8%
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0.081459	-0.24426	-0.24426	0.023956	-0.243053	-0.222435	-0.437127	-0.172375	-0.213404	0.014347

1	5	3	7	9	8	3	4	9	4
3	6	9	10	7	5	10	6	7	3
1	5	3	7	9	8	3	4	9	4
3	6	9	10	7	5	10	6	7	3
75	76	77	78	79	80	81	82	83	84
	1%	1%	1%	1%	1%	1%	1%	1%	1%
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8%	8%		8%		8%	8%	8%		8%
6%	6%	6%		6%	6%		6%	6%	6%
-0.301845	-0.21028	-0.241315	-0.547524	-0.213404	0.036323	-0.543386	-0.347338	-0.213404	-0.437127

1	5	6	8	10	6	2	3	3	9
2	4	2	9	4	1	6	5	6	7
1	5	6	8	10	6	2	3	3	9
2	4	2	9	4	1	6	5	6	7
85	86	87	88	89	90	91	92	93	94
	1%	1%	1%	1%		1%	1%	1%	1%
	1%		1%	1%	1%		1%	1%	1%
1%	1%	1%	1%	1%	1%	1%			1%
1%		1%	1%		1%	1%	1%	1%	1%
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1%	1%		1%	1%			1%		1%
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4%	4%	4%		4%	4%	4%	4%	4%	4%
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5%	5%	5%	5%	5%	5%	5%	5%	5%	
-10%	-10%	-10%		-10%	-10%	-10%	-10%	-10%	-10%
8%	8%	8%		8%	8%	8%	8%	8%	
6%	6%	6%	6%		6%	6%	6%	6%	6%
-0.082805	-0.408325	0.014347	0.066193	-0.67771	-0.226276	0.014347	-0.281693	-0.22999	-0.213404

10	1	2	6	3	9
6	1	7	5	9	10
10	1	2	6	3	9
6	4	7	5	9	10
95	96	97	98	99	100
1%		1%	1%	1%	1%
1%	1%		1%	1%	1%
1%	1%	1%	1%		1%
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1%	1%	1%		1%	1%
	1%	1%		1%	1%
2%	2%		2%	2%	2%
4%	4%	4%	4%	4%	4%
1%	1%	1%	1%		
	5%	5%	5%	5%	

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1%	1%	1%		1%	1%
	8%	8%		8%	8%
5%	5%		5%	5%	5%
-10%	-10%	-10%	-10%	-10%	-10%
8%	8%	8%	8%		
	6%	6%	6%	6%	
-0.50057	-0.437813	-0.071355	-0.21028	-0.241315	-0.516934

REQUEST NO. 11. Please refer to page 18, line 10 and Exhibit JIF-4 of the direct testimony of Dr. Fisher. Please provide all assumptions and workbooks, in electronic format with all calculations operational and formulas intact and unprotected, used to prepare Exhibit JIF-4.

RESPONSE NO. 11:

See attached workbook, produced in both electronic and hard copy format:

"Exhibit JIF-4 - CapCostCalcs – CONFIDENTIAL.xlsx"

Formulas are fully functional; source workbooks are referenced directly in the Exhibit.

Witness: Jeremy Fisher

Exhibit JIF-4

Sierra DR 1-69 "Big Sandy CC Brownfield & U1 Repower S&L-based SUMMARY.xls"				
BS (Brownfield) NGCC Cost Estimates - Preliminary *				
Option 2 - G Class				*Note:*
NGCC EPC Subtotal (from S&L)	$	790.2	M 2011$	
AEP Owners Costs (per EP&FS)	$	53.8	M 2011$	~ 7% increase
Total NGCC (2011$)	**$**	**844.0**	M 2011$	
Interconnections				
Natural Gas Supply (per FEL)	$	47.4	M 2011$	
Transmission /SWYD (per EP&FS)	$	4.4	M 2011$	
Total Interconn (2011$)	**$**	**51.8**	M 2011$	
Project total (2011$)	**$**	**895.8**	M 2011$	
S&L Escalation	$	73.2		*Real to nominal*
Project Total (As Spent)	**$**	**969.0**	**M Nom$**	
Sierra DR 1-69 "PRELIMINARY_Relative BS2 Unit Disposition Alt Economics_081711.xls"				
Redacted				
Direct Testimony of Mr. Scott Weaver, Table 2 (p24)				
Option #2: Big Sandy Unit 2				
Replacement Option - **New-Build CC**	**$**	**1,141**	**M ("As Spent" $)**	

REQUEST NO. 12. Please refer to page 23, lines 1-8, Figure 3, and Exhibit JIF-6A of the direct testimony of Dr. Fisher. Please provide all assumptions and workbooks, in electronic format with all calculations operational and formulas intact and unprotected, used to prepare Figure 3 and Exhibit JIF-6A.

RESPONSE NO. 12:

See workbook referenced in response to Company DR 1-7, above:

"Exhibit JIF-2, 3 & 6 Strategist_Compilation_Workbook_Synapse.xlsx"

Chart can be found in tab entitled "Exhibit JIF-6A." Chart and accompanying data can also be found in tab "Carrying Charges KPCO New Adds" in cells N268:Y291. Formulas are fully operational. The source and derivation of this worksheet is described in response to Company DR 1-7, above.

Witness: Jeremy Fisher

REQUEST NO. 13. Please refer to page 24, line 7 and Exhibit JIF-6B of the direct testimony of Dr. Fisher. Please provide all assumptions and workbooks, in electronic format with all calculations operational and formulas intact and unprotected, used to prepare Exhibit JIF-6B.

RESPONSE NO. 13:

See attached workbook, produced in both electronic and hard copy format:

"Exhibit JIF-6B - AFUDC Calc for modeling - all projects.xlsx"

Formulas are fully functional; source workbooks are referenced directly in the Exhibit.

Witness: Jeremy Fisher

Big Sandy Unit 2 DFGD Project Spend — **Calculation of AFUDC**

Estimated AFUDC Calculation Utilized in Alternative Economic Evaluations (i.e., Initially Assuming No CWIP Treatment)

All Dollars in Millions

	Total Project Cost 'As Spent' $ (Excl. AFUDC)		*Year 1* **2011**	*Year 2* **2012**	*Year 3* **2013**	*Year 4* **2014**	*Year 5* **2015**	*Year 6*** **2016**	**TOTAL**
DFGD *	1,046	Cash Cost + Overhd Allc *[inc. cont]*	3.0	35.8	107.2	179.4	261.2	252.8	*839*
		Annual CF %	*0.4%*	*4.3%*	*12.8%*	*21.4%*	*31.1%*	*30.1%*	*100%*
		(Avg) AFUDC Rate	*8.6%*	*8.6%*	*8.6%*	*8.6%*	*8.6%*	*8.6%*	
		AFUDC	0.1	1.8	8.1	21.1	41.8	28.1	101
		Total w/ AFUDC	3.1	37.6	115.3	200.5	303.0	280.9	940

* includes DFGD, Associated (Boiler) Projects, FGD Landfill

** assumes 6/2016 In-service

REQUEST NO. 14. Please refer to page 24, lines 13-16 of the direct testimony of Dr. Fisher. Please provide all assumptions and workbooks, in electronic format with all calculations operational and formulas intact and unprotected, used to develop the "Synapse Strategist Compilation Workbook".

RESPONSE NO. 14:

See workbook referenced in response to Company DR 1-7, above:

"Exhibit JIF-2, 3 & 6 Strategist_Compilation_Workbook_Synapse.xlsx"

Witness: Jeremy Fisher

REQUEST NO. 15. Please refer to page 25 lines 1-5, Table 2, and Exhibit JIF-3B of the direct testimony of Dr. Fisher. Please provide all assumptions and workbooks, in electronic format with all calculations operational and formulas intact and protected, used to prepare Table 2 and Exhibit JIF-3B.

RESPONSE NO. 15:

See workbook referenced in response to Company DR 1-7, above:

"Exhibit JIF-2, 3 & 6 Strategist_Compilation_Workbook_Synapse.xlsx"

See tab "Exhibits JIF-3A-3F"

Witness: Jeremy Fisher

REQUEST NO. 16. Please refer to page 26, lines 1-2, Table 3, and Exhibit JIF-3C of the direct testimony of Dr. Fisher. Please provide all assumptions and workbooks, in electronic format with all calculations operational and formulas intact and unprotected, used to prepare Table 3 and Exhibit JIF-3C.

RESPONSE NO. 16:

See workbook referenced in response to Company DR 1-7, above:

"Exhibit JIF-2, 3 & 6 Strategist_Compilation_Workbook_Synapse.xlsx"

See tab "Exhibits JIF-3A-3F"

Witness: Jeremy Fisher

REQUEST NO. 17. Please refer to page 30, lines 4-6 of the Direct testimony of Dr. Fisher.

a. Please provide all assumptions and workbooks, in electronic format with all calculations operational and formulas intact and unprotected, used to develop these scenarios where fuel prices are not correlated.

b. Please provide the Strategist files in FSV format after run execution for each of these fuel price sensitivity scenarios where fuel prices are not correlated.

c. Please provide in electronic format, with all calculations operational and formulas intact and unprotected, the results of the scenarios referred to in subparts (a) and (b) of this data request.

RESPONSE NO. 17:

The recommendation posed by Dr. Fisher on page 30, lines 4-6 states "In evaluating this CPCN, running scenarios in which the price of fuels are not correlated would be an important and illuminating mechanism of evaluating the risk of either a retrofit or retire decision" (emphasis added). The operative term here is "would be;" Synapse has not run such scenarios. It is incumbent on the Company, not interveners, to show that they have appropriately evaluated risk for ratepayers.

a. See above.

b. See (a).

Witness: Jeremy Fisher

REQUEST NO. 18. Please refer to page 35, lines 6-9 of the direct Testimony of Dr. Fisher. Please reconcile Dr. Fisher's statement that "For the purposes of this case Ms. Wilson tested three of the Options… using the Synapse Low CO2 Price Forecast" with Ms. Wilson's testimony at page 10, lines 9-11 indicating she tested all five options.

RESPONSE NO. 18:

Page 35, line 6 of Dr. Fisher's testimony is misstated. Ms. Wilson did run all five options through Strategist. Dr. Fisher only obtained and examined three Synapse Low CO_2 Price Forecast options (Options 1, 2, and 4A) in the Synapse Strategist Compilation Workbook.

Witness: Jeremy Fisher

REQUEST NO. 19. Please refer to page 10, lines 9-11 of Ms. Wilson's testimony.

a. Please provide the Strategist files in FSV format after run execution for each of the five options tested by Ms. Wilson as described in her testimony

b. Please provide a detailed description of each change made to the Company's Strategist databases in performing the Synapse Low CO2 Price Forecast Strategist runs described by Ms. Wilson in her testimony on page 10. The requested description of each change should include the location in the Strategist database where each change was made (e.g. "Input.System.Effluent.Individual Variables.Cost Rate") and a detailed listing in electronic format of the input changes (i.e. values) used in these runs.

c. Please provide the forecast of other commodity prices (e.g. gas prices, PJM market energy prices, AEP existing fleet delivered coal prices, etc.) associated with or used to generate the Synapse Low CO2 Price Forecast referred to by Ms. Wilson in her testimony on page 10. Provide all analyses and research reviewed and/or prepared by Synapse supporting the development of other commodity price forecasts associated with the Synapse Low CO2 Price Forecast.

RESPONSE NO. 19:

a. See attached CD.

b. Changes were made to the Company's Strategist databases in the following locations:

i. Base – Option 1 – Synapse Low CO2

1. Input.System.Effluent.Individual Variables.Cost Rate – CO2 (S)
2. Input.System.Effluent.Individual Variables.Cost Rate – CO2 (G)

3. Input.System.Effluent.Individual Variables.Dispatch Rate – CO2 (S)
4. Input.System.Effluent.Individual Variables.Dispatch Rate – CO2 (G)

ii. Base – Option 2 – Synapse Low CO2

1. Input.System.Effluent.Individual Variables.Cost Rate – CO2 (S)
2. Input.System.Effluent.Individual Variables.Cost Rate – CO2 (G)
3. Input.System.Effluent.Individual Variables.Dispatch Rate – CO2 (S)
4. Input.System.Effluent.Individual Variables.Dispatch Rate – CO2 (G)

iii. Base – Option 3 – Synapse Low CO2

1. Input.System.Effluent.Individual Variables.Cost Rate – CO2 (S)
2. Input.System.Effluent.Individual Variables.Cost Rate – CO2 (G)
3. Input.System.Effluent.Individual Variables.Dispatch Rate – CO2 (S)
4. Input.System.Effluent.Individual Variables.Dispatch Rate – CO2 (G)

iv. Base – Option 4a – Synapse Low CO2

1. Input.System.Effluent.Individual Variables.Cost Rate – CO2 (S)
2. Input.System.Effluent.Individual Variables.Cost Rate – CO2 (G)
3. Input.System.Effluent.Individual Variables.Dispatch Rate – CO2 (S)
4. Input.System.Effluent.Individual Variables.Dispatch Rate – CO2 (G)

v. Base – Option 4b – Synapse Low CO2

1. Input.System.Effluent.Individual Variables.Cost Rate – CO2 (S)
2. Input.System.Effluent.Individual Variables.Cost Rate – CO2 (G)
3. Input.System.Effluent.Individual Variables.Dispatch Rate – CO2 (S)
4. Input.System.Effluent.Individual Variables.Dispatch Rate – CO2 (G)

For each of these items, the "KPCo Base CO2 Value in Strategist" was changed to the "Synapse Low CO2 Value in Strategist," as shown in the table below.

Year	KPCo Base CO_2 Value in Strategist	Synapse Low CO_2 Value in Strategist
2011	$0.00	$0.00
2012	$0.00	$0.00
2013	$0.00	$0.00
2014	$0.00	$0.00
2015	$0.00	$0.00
2016	$0.00	$0.00
2017	$0.00	$0.00
2018	$0.00	$0.00
2019	$0.00	$0.00
2020	$0.00	$18,414.78
2021	$0.00	$20,560.11
2022	$15,079.00	$22,765.64
2023	$15,278.00	$25,032.72
2024	$15,476.00	$27,362.69
2025	$15,675.00	$29,756.93
2026	$15,884.00	$32,216.83
2027	$16,083.00	$34,743.84
2028	$16,292.00	$37,339.41
2029	$16,501.00	$40,005.03
2030	$16,722.00	$42,700.10
2031	$16,940.00	$45,633.48
2032	$17,159.00	$48,657.79
2033	$17,383.00	$51,775.34
2034	$17,609.00	$54,988.48
2035	$17,840.00	$58,299.64
2036	$18,072.00	$61,711.29
2037	$18,308.00	$65,225.95
2038	$18,547.00	$68,846.21
2039	$18,788.00	$72,574.72
2040	$19,034.00	$76,414.19

c. Other commodity price forecasts were not developed in conjunction with the Synapse Low CO_2 price forecast. The derivation and research supporting the price forecast can be found in the Synapse Energy Economics paper entitled *2011 Carbon Dioxide Price Forecast*, dated February 2011. The forecast was not developed specifically for this docket. *See* Dr. Fisher's testimony starting on page 30, and accompanying Exhibit JIF-8.

Witnesses: Rachel Wilson (a & b); Jeremy Fisher (c)

REQUEST NO. 20. Please refer to page 36, lines 1-2, Table 4 and Exhibit JIF-3D of the direct testimony of Dr. Fisher. Please provide all assumptions and workbooks, in electronic format with all calculations operational and formulas intact and unprotected, used to prepare Table 4 and Exhibit JIF-3D.

RESPONSE NO. 20:

See workbook referenced in response to Company DR 1-7, above:

"Exhibit JIF-2, 3 & 6 Strategist_Compilation_Workbook_Synapse.xlsx"

See tab "Exhibits JIF-3A-3F"

Witness: Jeremy Fisher

REQUEST NO. 21. Please refer to page 36, lines 8-10, Table 5 and Exhibit JIF-3E of the direct testimony of Dr. Fisher. Please provide all assumptions and workbooks, in electronic format with all calculations operational and formulas intact and unprotected, used to prepare Table 5 and Exhibit JIF-3E.

RESPONSE NO. 21:

See workbook referenced in response to Company DR 1-7, above:

"Exhibit JIF-2, 3 & 6 Strategist_Compilation_Workbook_Synapse.xlsx"

See tab "Exhibits JIF-3A-3F"

Witness: Jeremy Fisher

REQUEST NO. 22. Please refer to page 38, lines 1-2, Table 6, and also Exhibit JIF-3F of the direct testimony of Dr. Fisher. Please provide all assumptions and workbooks, in electronic format with all calculations operational and formulas intact and unprotected, used to prepare Table 6 and Exhibit JIF-3F.

RESPONSE NO. 22:

See workbook referenced in response to Company DR 1-7, above:

"Exhibit JIF-2, 3 & 6 Strategist_Compilation_Workbook_Synapse.xlsx"

See tab "Exhibits JIF-3A-3F"

Witness: Jeremy Fisher

REQUEST NO. 23. Please refer to page 5, lines 6-10 of the direct testimony of Ms. Wilson. Please provide all documents, including any notes, recordings, and correspondence, evidencing, memorializing, or related to the February 24, 2012 phone conversation referred to by Ms. Wilson in her testimony.

RESPONSE NO. 23:

See attached notes.

Witness: Rachel Wilson

- .FSV files in final form valuating Big Sandy in 5 commodity pricing scenarios

- contain inputs and outputs from 2040

Some changes we need to make
8.04 to -100 in 2014 to 2024

2nd Carbon Vo Option 4b — Option 1, 2 or 3 stays at 8.04 from 2025 to 2037

constrained to not add capacity

Low Band, Option 1
BS 23, operating life 30 years
Alt, year, CCR2, min # to add in 2032 to c

Can add capacity from 2025 to 2037

fixed O+M spike - captured on-going capital for any unit that is retired, carried on through time until unit was retired and PV'ed them to the year of retirement

in essence accounting for end effects for that particular cost

No method of capturing go 2. that year capital cost w/o CER other than fixed costs

drop in fixed cost - ongoing capital expenditures made earlier in the period are expiring b/c of the 15 year life

REQUEST NO. 24. Please refer to page 20, lines 8-10 of the direct Testimony of Dr. Fisher. Please provide the assumptions, calculations, and workbooks, in electronic format with all calculations operational and formulas intact and unprotected, that support or were used to develop Dr. Fisher's testimony that the gap between the two lines (referenced in Figure 2 (Exhibit JIF-5)) "suggests a capital cost difference of nearly $1 billion (2011$)" between the Big Sandy retrofit alternative (Option #1) and the CC replacement alternative (Option #2).

RESPONSE NO. 24:

See attached workbook produced in both electronic and hard copy format:

"Exhibit JIF-5 (Carrying Charges) Staff_1-48_(Ex SCW-4A-BASE Price Eval Detail).xlsx"

Calculation is found in tab Exhibit SCW-4A. Actual value is $1.095 billion.

VERIFICATION

The undersigned, JEREMY FISHER, being duly sworn deposes and says that he has personal knowledge of the matters set forth in the foregoing responses for which he is the identified witness and that the information contained therein is true and correct to the best of his information, knowledge, and belief.

Jeremy Fisher

STATE OF MASSACHUSETTS)
) Case No. 2011-00401
COUNTY OF MIDDLESEX)

Subscribed and sworn to before me, a Notary Public in and before said County and State by Jeremy Fisher, this the 2 day of April 2012.

Notary Public

My Commission Expires: 7/27/18

JANICE CONYERS
Notary Public
Commonwealth of Massachusetts
My Commission Expires
July 27, 2018

VERIFICATION

The undersigned, J. RICHARD HORNBY, being duly sworn deposes and says that he has personal knowledge of the matters set forth in the foregoing responses for which he is the identified witness and that the information contained therein is true and correct to the best of his information, knowledge, and belief.

J. Richard Hornby

STATE OF MASSACHUSETTS)
) Case No. 2011-00401
COUNTY OF MIDDLESEX)

Subscribed and sworn to before me, a Notary Public in and before said County and State by J. Richard Hornby, this the 2 day of April 2012.

Notary Public

My Commission Expires: 7/27/18

JANICE CONYERS
Notary Public
Commonwealth of Massachusetts
My Commission Expires
July 27, 2018

VERIFICATION

The undersigned, RACHEL WILSON, being duly sworn deposes and says that she has personal knowledge of the matters set forth in the foregoing responses for which she is the identified witness and that the information contained therein is true and correct to the best of her information, knowledge, and belief.

Rachel Wilson

STATE OF MASSACHUSETTS)
) Case No. 2011-00401
COUNTY OF MIDDLESEX)

Subscribed and sworn to before me, a Notary Public in and before said County and State by Rachel Wilson, this the 2 day of April 2012.

Notary Public

My Commission Expires: 7/27/18

JANICE CONYERS
Notary Public
Commonwealth of Massachusetts
My Commission Expires
July 27, 2018

VERIFICATION

The undersigned, KRISTIN HENRY, being duly sworn deposes and says that she has personal knowledge of the matters set forth in the foregoing responses for which she is the identified witness and that the information contained therein is true and correct to the best of her information, knowledge, and belief.

Kristin Henry

STATE OF CALIFORNIA)
) Case No. 2011-00401
COUNTY OF SAN FRANCISCO)

Subscribed and sworn to before me, a Notary Public in and before said County and State by J. Kristin Henry, this the 2nd day of April 2012.

Notary Public

My Commission Expires: 09/09/2015

NICHOLAS JAMES LIFE
Commission # 1951418
Notary Public - California
San Francisco County
My Comm. Expires Sep 9, 2015

VERIFICATION

The undersigned, BRUCE NILLES, being duly sworn deposes and says that he has personal knowledge of the matters set forth in the foregoing responses for which he is the identified witness and that the information contained therein is true and correct to the best of his information, knowledge, and belief.

Bruce Nilles

DISTRICT OF COLUMBIA)
) Case No. 2011-00401
)

Subscribed and sworn to before me, a Notary Public in and before said County and State by Bruce Nilles, this the 2nd day of April 2012.

Notary Public

SHANIKA R. MCBRIDE NOTARY PUBLIC DISTRICT OF COLUMBIA Expiration Jun 14, 2016

My Commission Expires: June 14 2016

CERTIFICATE OF SERVICE

I certify that I mailed a copy of Environmental Intervenors Tom Vierheller, Beverly May, and Sierra Club's Responses to Kentucky Power Company's First Request for Information by first class mail on April 2, 2012 to the following:

R. Benjamin Crittenden
Laura S. Crittenden
Mark R. Overstreet
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Frankfort, KY 40602-0634

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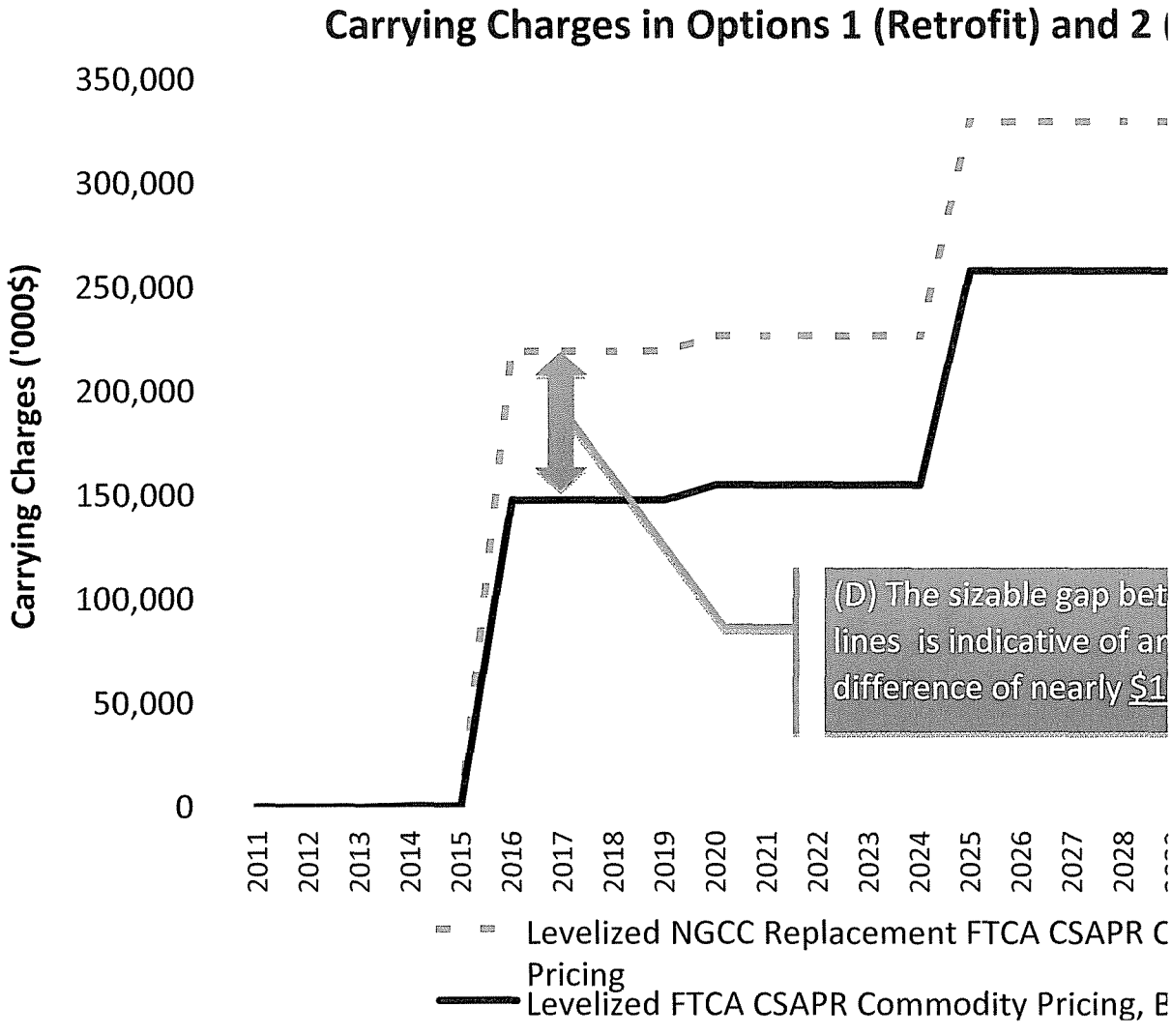
Vantage Energy Consulting
P.O. Box 75018
Fort Thomas, Kentucky 41075

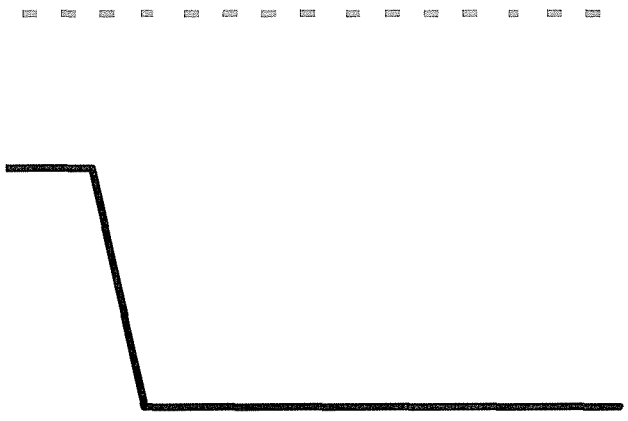
Mike Boismenu
2645 West Marion Avenue, Apt. 111
Punta Gorda, Florida 33950

Kristin Henry

Exhibit JIF-5



? (NGCC Replace)



etween these two
an overnight cost
1 billion .

2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040

Commodity

Big Sandy 2

FTCA CSAPR Retrofit

	Capital Expenditures (N)
2011	0
2012	0
2013	0
2014	607
2015	607
2016	147,762
2017	147,762
2018	147,762
2019	147,762
2020	155,093
2021	155,093
2022	155,093
2023	155,093
2024	155,093
2025	257,945
2026	257,945
2027	257,945
2028	257,945
2029	257,945
2030	257,945
2031	146,766
2032	146,766
2033	146,766
2034	146,766
2035	146,766
2036	146,766
2037	146,766
2038	146,766
2039	146,766
2040	146,766

Utility Discount Rat
8.64%

DFGD

Carrying C	$	147,762
Assumed escalation [1]		2.80%
Carrying Charge in 2011	$	128,706
Book life (yrs)		15
Capital represented	$	1,059,876

Gap

[1] from supplemental response to Sierra 1-
Pgrs\Levelized Retrofit Under FT_CSAPR.x
Additions, annual escalation deltas in rows 7

and K for DFGD and NGCC, respectively.

FTCA CSAPR
NG
Replacement

Capital Expenditures (N)
0
0
0
607
607
219,322
219,322
219,322
219,322
226,653
226,653
226,653
226,653
226,653
329,505
329,505
329,505
329,505
329,505
329,505
329,505
329,505
329,505
329,505
329,505
329,505
329,505
329,505
329,505
329,505

:e

NG Replace
$ 219,322
1.55%
$ 203,087
30
$ 2,154,898
$ 1,095,022

69 "FT-CSAPR 2-
:ls" Tab KPCO New
75-104, columns B

Big Sandy Unit 2 under BASE: "Fleet Transition-CSAPR" Commodity Pricing

Kentucky CPCN Filing Economic Analysis
Capacity Resource Optimization
Resource Plan Summary

Resource Plan Year	**'BASE' Option #1** BS2 DFGD Retrofit 6/2016	**Option #2** (1) RK Retires 1/2016 with (Brownfield) CC Replacement	**Option #3** (1) RK Retires 1/2016 with BS2 CC Repwrng Replacement	**Option #4A** (1) RK Retires 1/2016 w/ PJM-Mkt Replacmnt to 2020	**Option #4B** (1) RK Retires 1/2016 w/ PJM-Mkt Replacmnt to 2025	BS2 "Timing" Sensitivity **Option #1A** BS2 DFGD Retrofit **Delayed until 1/2017** (~1-Yr EGU MACT Delay)
2011-2013				45 MW- ICAP	45 MW- ICAP	
2014				225 MW- ICAP	225 MW- ICAP	
2015	Big Sandy 1 Retire	Big Sandy 1&2 Retire	Big Sandy 2 Retire	938 MW- ICAP	938 MW- ICAP	Big Sandy 1 Retire
2016	**Big Sandy 2 Retrofit**	**1 -904 MW NGCC**	**Big Sandy 1 1 -780 MW Repower,**			Big Sandy 2 Mothball (1-yr)
2017				922 MW- ICAP	922 MW- ICAP	**Big Sandy 2 Retrofit**
2018				930 MW- ICAP	930 MW- ICAP	
2019				934 MW- ICAP	934 MW- ICAP	
2020				**1 -904 MW NGCC**	938 MW- ICAP	
2021					939 MW- ICAP	
2022					951 MW- ICAP	
2023					957 MW- ICAP	
2024					967 MW- ICAP	
2025	**1- 407 MW CC,**	**1- 407 MW CC,**	**1- 407 MW CC,**	**1- 407 MW CC,**	**1 -904 MW NGCC, 407 MW CC**	1-
2026						
~						
2040						
Life-Cycle Analysis Period (2011-2040)						
($000)						
CPW of Revenue Requirements	6,724,489	7,152,559	7,079,239	6,811,507	6,487,042	6,721,898
Less: ICAP Revenue	(114,391)	77,262	(11,944)	(106,260)	(304,545)	(114,503)
CPW of Revenue Requirements, Net	6,838,879	7,075,297	7,091,182	6,917,767	6,791,587	6,836,401
A. Cost/(Savings) Over 'BASE' Case						
CPW of Revenue Requirements		428,070	354,750	87,018	(237,447)	(2,591)
Less: ICAP / Pool Revenue		191,652	102,447	8,130	(190,154)	(112)
CPW of Revenue Requirements, Net		**236,418**	**252,303**	**78,888**	(47,293)	(2,478)
B. Cost/(Savings) Over 'BASE' Case						
Impact of 20-Year (vs. 15-Year) RETROFIT Cost Recovery		37,200	37,200	37,200	37,200	37,200
CPW of Revenue Requirements, Net		**273,618**	**289,503**	**116,088**	(10,093)	**34,722**

Note:
- o The 'BASE' / Option 1 (Big Sandy 2 RETROFIT) analysis results assumes a **15-year recovery period** for the incremental DFGD retrofit investment
- o Option #2 (Big Sandy 2 RETIRED & REPLACED w/ a [BS-site 'Brownfield'] CC) assumes a 30-year recovery period for the new-build CCs in all analyses
- o Option #3 (Big Sandy 2 RETIRED & REPLACED w/ a CC-Repowered Big Sandy U1) assumes a 20-year recovery period in all analyses
- o All cases (except Option #3) assume that Big Sandy 1 retired 1/2015
- o In all cases, effectively assumes replacement capacity & energy for BS1 would be 'delayed' until ~2025 in recognition of a) the (incremental) financing/cost burden to KPCo and its customers; and b) assumed limited (PJM) market availability of reasonably-priced replacement capacity & energy during the interim (~150-300 MW)
- o Evalution economics (all cases) reflect KPCo's 30% share (~195-MW) Purchase Entitlement from affiliate AEG Generating Cos.' 50% Ownership Share of both Rockport Units 1&2
- o "Retirement" options EXCLUDE costs associated w/ socio-economic impacts to the plant staff, supply vendors, or to the overall easten-Kentucky region
- o "G" Revenue Requirements established on a KPCo "stand-alone" (basis and is reflective of a 'cost-optimized' resource plan necessary to achieve PJM minimum reserve margin criterion (summer peak)...

Inclusive of:
1) All KPCo (company-dispatched) Fuel, VOM and Emission Costs (incl. CO2); 2) on-going plant FOM; and
3) FOM and Capital (carrying charges) on *incremental* investments (e.g. environmental retrofits and/or new-build or repowered NG-CCs)

PRE IARY

Big Sandy 2 UD Analysis Under FTCA_CSAPR Commodity Pricing
Capacity Resource Optimization
Expansion Plan Summary

	Retrofit 15 yr book life	***BS1 Repower 20 yr book life***	***NGCC Replacement***	***Market to 2020***	***Market to 2025***
2011				0 MW- ICAP	0 MW- ICAP
2012				0 MW- ICAP	0 MW- ICAP
2013				0 MW- ICAP	0 MW- ICAP
2014				45 MW- ICAP	45 MW- ICAP
2015	Big Sandy 1 Retire		Big Sandy 1 Retire	225 MW- ICAP	225 MW- ICAP
2016	**Big Sandy 2 Retrofit**	**Big Sandy 1 Retire**	**1 -904 MW NGCC**	938 MW- ICAP	938 MW- ICAP
		1 -780 MW Repower,			
2017				922 MW- ICAP	922 MW- ICAP
2018				930 MW- ICAP	930 MW- ICAP
2019				934 MW- ICAP	934 MW- ICAP
2020				**1 -904 MW NGCC**	938 MW- ICAP
2021					939 MW- ICAP
2022					951 MW- ICAP
2023					957 MW- ICAP
2024					967 MW- ICAP
					1 -904 MW NGCC,
2025	**1- 407 MW CC,**	**1- 407 MW CC,**	**1- 407 MW CC,**	**1- 407 MW CC,**	**1-407 MW CC**
2026					
2027					
2028					
2029					
2030					
2031					
2032					
2033					
2034					
2035					
2036					
2037					
2038					
2039					
2040					

	Retrofit 15 yr book life	*BS1 Repower 20 yr book life*	*NGCC Replacement*	*Market to 2020*	*Market to 2025*
FTCA_CSAPR					
CPW	6,724,489	7,079,239	7,152,559	6,811,507	6,487,042
ICAP Revenue	(114,391)	(11,944)	77,262	(106,260)	(304,545)
Total	$6,838,879	$7,091,182	$7,075,297	$6,917,767	$6,791,587
Cost Over Retrofit		$252,303	$236,418	$78,888	($47,293)

KENTUCKY POWER COMPANY
KPCo Capacity Resource Optimization
Costs and Emissions Summary
Levelized FTCA CSAPR Commodity Pricing, Big Sandy 2 Retrofit

Optimal Plan Cost Summary ($000)

Annual Costs	Fuel Cost (A)	Contract Revenue (B)	Market Revenue/(Cost) (C)	Fuel & Transactions (D)=(A)-(B)-(C)	Base Rate Impacts: Carrying Charges (E)	Base Rate Impacts: Incremental O&M (F)	Base Rate Impacts: Total (G)=(E)+(F)	Total Cost (H)=(D)+(G)	Market Value of Allowances Consumed (I)	Grand Total (J)=(H)+(I)	Value of ICAP (K)	Grand Total (L)=(J)-(K)	CPW (M)	Capital Expenditures (N)
2011	198,123	(12,788)	40,914	169,997	0	0	0	169,997	7,418	177,415	0	177,415	177,415	0
2012	250,465	(21,183)	95,923	175,725	0	0	0	175,725	86,954	262,680	0	262,680	419,204	0
2013	227,817	(30,153)	37,371	220,599	0	0	0	220,599	51,659	272,258	0	272,258	649,879	0
2014	276,567	(38,222)	58,226	256,564	607	0	607	257,171	102,595	359,766	1,379	358,386	929,379	607
2015	275,707	(51,088)	45,044	281,751	607	0	607	282,358	29,795	312,153	(17,667)	329,820	1,166,144	607
2016	165,006	(48,054)	(85,222)	298,281	147,762	76,499	224,261	522,542	2,302	524,845	(96,221)	621,065	1,576,526	147,762
2017	236,355	(53,834)	28,377	261,812	147,762	137,403	285,165	546,977	1,511	548,488	(15,275)	563,763	1,919,419	147,762
2018	254,318	(54,857)	51,107	258,068	147,762	149,018	296,780	554,848	626	555,473	(13,781)	569,255	2,238,116	147,762
2019	242,101	(56,908)	22,817	276,191	147,762	139,475	287,237	563,428	572	564,000	(16,129)	580,129	2,537,072	147,762
2020	257,391	(58,754)	50,028	266,118	155,093	140,061	295,154	561,271	0	561,271	(18,970)	580,242	2,812,305	155,093
2021	263,061	(72,859)	57,490	278,430	155,093	143,776	298,869	577,298	0	577,298	(21,002)	598,301	3,073,534	155,093
2022	252,602	(73,893)	44,072	282,423	155,093	143,739	298,832	581,255	108,290	689,545	(24,128)	713,673	3,360,356	155,093
2023	225,510	(72,531)	(27,181)	325,222	155,093	140,117	295,210	620,431	96,073	716,505	(26,606)	743,111	3,635,257	155,093
2024	255,531	(77,447)	21,273	311,705	155,093	150,129	305,222	616,927	106,998	723,925	(29,365)	753,290	3,891,762	155,093
2025	336,073	(60,870)	136,139	260,804	257,945	166,903	424,848	685,653	116,552	802,205	20,285	781,919	4,136,841	257,945
2026	354,700	(61,862)	156,979	259,583	257,945	176,504	434,449	694,032	122,595	816,627	19,255	797,372	4,366,887	257,945
2027	351,082	(62,861)	134,514	279,429	257,945	174,827	432,772	712,201	119,821	832,023	17,955	814,067	4,583,071	257,945
2028	370,369	(63,743)	156,602	277,510	257,945	184,827	442,772	720,282	125,870	846,152	16,731	829,421	4,785,815	257,945
2029	370,732	(65,061)	141,804	293,989	257,945	188,259	446,204	740,193	124,788	864,981	15,461	849,520	4,976,958	257,945
2030	367,888	(64,315)	118,179	314,024	257,945	184,860	442,805	756,829	121,007	877,836	13,734	864,102	5,155,920	257,945
2031	388,156	(66,853)	144,828	310,181	146,766	148,849	295,615	605,796	128,489	734,285	11,814	722,471	5,293,649	146,766
2032	406,168	(67,107)	169,892	303,383	146,766	150,067	296,833	600,216	135,793	736,009	10,491	725,518	5,420,959	146,766
2033	411,019	(68,442)	163,642	315,819	146,766	149,262	296,028	611,847	136,812	748,659	7,036	741,623	5,540,746	146,766
2034	394,818	(69,438)	110,425	353,831	146,766	143,959	290,725	644,557	127,901	772,458	6,134	766,323	5,654,678	146,766
2035	408,588	(72,741)	122,805	358,523	146,766	155,220	301,986	660,509	133,275	793,784	5,012	788,772	5,762,622	146,766
2036	413,597	(74,000)	120,432	367,165	146,766	157,203	303,969	671,134	135,608	806,742	3,438	803,304	5,863,812	146,766
2037	426,893	(74,708)	132,956	368,645	146,766	158,887	305,653	674,298	141,194	815,492	868	814,624	5,958,266	146,766
2038	423,004	(77,575)	107,009	393,570	146,766	160,400	307,166	700,736	139,015	839,751	(1,085)	840,837	6,048,007	146,766
2039	432,896	(78,143)	113,529	397,511	146,766	163,017	309,783	707,294	143,353	850,646	(2,903)	853,549	6,131,859	146,766
2040	431,457	(80,190)	89,506	422,142	146,766	342,266	489,032	911,174	141,291	1,052,464	(2,592)	1,055,057	6,227,265	146,766
2011 Net Present Value														
Period of 2011-2040	3,169,734	(585,636)	700,340	3,055,030	1,257,570	1,078,614	2,336,184	5,391,214	721,660	6,112,874	(114,391)	6,227,265		
Base Case O&M 2011-2040							611,615			611,615	0	611,615		
Utility Cost Present Value 2011-2040					69,029		2,947,799			6,724,489	(114,391)	6,838,879		

	Surplus MW	ICAP Value $/MW-Wk
2011	0	958
2012	0	388
2013	0	161
2014	45	595
2015	(225)	1,507
2016	(938)	1,973
2017	(178)	1,652
2018	(189)	1,403
2019	(197)	1,572
2020	(206)	1,774
2021	(206)	1,960
2022	(218)	2,129
2023	(224)	2,280
2024	(234)	2,412
2025	155	2,524
2026	142	2,615
2027	129	2,685
2028	118	2,731
2029	108	2,751
2030	96	2,745
2031	82	2,765
2032	72	2,785
2033	48	2,805
2034	42	2,825
2035	34	2,845
2036	23	2,866
2037	6	2,887
2038	(7)	2,907
2039	(19)	2,928
2040	(17)	2,949

PRELIMINARY

KPCo Capacity Resource Optimization
Costs and Emissions Summary
Levelized FTCA CSAPR Commodity Pricing, Big Sandy 2 Retrofit

	SO2 Emissions ktons	CO2 Emissions ktons	NOX Emissions ktons	HG Emissions (Tons)
2011	10,452	7,387	6,171	0.29
2012	10,586	8,375	6,944	0.34
2013	7,296	6,781	5,751	0.29
2014	5,050	7,009	5,319	0.33
2015	9,351	7,369	3,884	0.28
2016	4,097	5,144	2,089	0.15
2017	4,430	6,999	2,755	0.27
2018	4,358	7,419	2,785	0.28
2019	3,557	6,938	2,433	0.26
2020	4,573	7,448	1,741	0.27
2021	4,372	7,451	1,742	0.27
2022	4,559	7,182	1,676	0.25
2023	4,269	6,288	1,467	0.22
2024	3,655	6,914	1,619	0.25
2025	4,559	7,436	1,662	0.24
2026	3,917	7,718	1,739	0.26
2027	4,558	7,450	1,664	0.24
2028	3,884	7,726	1,742	0.27
2029	4,401	7,562	1,707	0.26
2030	4,332	7,236	1,610	0.23
2031	3,536	7,585	1,711	0.26
2032	4,572	7,914	1,783	0.27
2033	4,374	7,870	1,774	0.26
2034	4,558	7,263	1,618	0.23
2035	4,270	7,471	1,691	0.26
2036	3,658	7,504	1,701	0.26
2037	4,559	7,712	1,746	0.26
2038	3,917	7,495	1,701	0.26
2039	4,558	7,630	1,732	0.26
2040	3,886	7,423	1,688	0.26

							15	30
				1056		1056	($128.23)	($99.52)
				784		784	($95.20)	($73.89)

Summary of Energy Purchases and Sales (Gwh)

	Internal Requirements	Contract Purchases	Contract Sales	Net Contract Transactions	Market Purchases	Market Sales	Net Market Transactions	Internal Requirement 0.923 GWh
2011	7,432	58	115	57	369	1,247	878	6,860
2012	7,476	138	117	(22)	80	2,136	2,057	6,900
2013	7,457	138	36	(102)	807	1,172	365	6,883
2014	7,469	139	17	(122)	690	1,367	677	6,894
2015	7,479	139	23	(116)	260	1,242	982	6,903
2016	7,488	139	19	(120)	2,373	743	(1,630)	6,911
2017	7,505	139	28	(111)	307	855	548	6,927
2018	7,536	139	37	(102)	154	1,139	985	6,955
2019	7,571	139	36	(103)	341	772	431	6,988
2020	7,604	139	34	(106)	174	1,132	958	7,019
2021	7,648	288	34	(254)	151	1,223	1,072	7,059
2022	7,695	288	34	(254)	354	1,044	690	7,102
2023	7,744	288	34	(254)	828	450	(378)	7,148
2024	7,798	289	34	(255)	384	702	318	7,198
2025	7,846	288	34	(254)	185	1,775	1,591	7,242
2026	7,896	288	34	(254)	140	1,990	1,851	7,288
2027	7,947	288	34	(254)	299	1,832	1,533	7,335
2028	7,999	289	34	(255)	167	1,930	1,764	7,383
2029	8,044	288	34	(254)	202	1,720	1,519	7,425
2030	8,093	288	34	(254)	515	1,712	1,197	7,470
2031	8,143	288	34	(254)	212	1,683	1,472	7,516
2032	8,195	289	34	(255)	134	1,888	1,754	7,564
2033	8,241	288	34	(254)	187	1,829	1,642	7,606
2034	8,289	288	34	(254)	474	1,447	973	7,651
2035	8,339	288	34	(254)	287	1,349	1,061	7,697
2036	8,389	289	34	(255)	319	1,317	999	7,743
2037	8,439	288	34	(254)	273	1,410	1,138	7,789
2038	8,488	288	34	(254)	307	1,123	816	7,835
2039	8,538	288	34	(254)	299	1,169	871	7,881
2040	8,589	289	34	(255)	443	1,020	577	7,927

Reserve Margin - MW

	Demand	Existing Capacity	Expansion Plan	Case Capacity Changes	Total Capacity	Reserve Margin - %
2011	1,033	1,115		0	1,115	8.0%
2012	1,251	1,316		0	1,316	5.2%
2013	1,257	1,317		0	1,317	4.8%
2014	1,243	1,387		0	1,387	11.6%
2015	1,234	1,108		0	1,108	-10.2%
2016	1,213	373	Retrofit	0	373	-69.3%
2017	1,198	1,116		0	1,116	-6.8%
2018	1,207	1,115		0	1,115	-7.6%
2019	1,218	1,119		0	1,119	-8.2%
2020	1,224	1,117		0	1,117	-8.8%
2021	1,238	1,131		0	1,131	-8.6%
2022	1,249	1,131		0	1,131	-9.4%
2023	1,255	1,131		0	1,131	-9.8%
2024	1,264	1,131		0	1,131	-10.5%
2025	1,281	1,131	1- 407 MW CC,	407	1,538	20.1%
2026	1,293	1,131		407	1,538	19.0%
2027	1,305	1,131		407	1,538	17.9%
2028	1,315	1,131		407	1,538	17.0%
2029	1,324	1,131		407	1,538	16.2%
2030	1,335	1,131		407	1,538	15.2%
2031	1,348	1,131		407	1,538	14.1%
2032	1,357	1,131		407	1,538	13.4%
2033	1,372	1,123		407	1,530	11.6%
2034	1,378	1,123		407	1,530	11.1%
2035	1,389	1,127		407	1,534	10.5%
2036	1,399	1,127		407	1,534	9.7%
2037	1,415	1,127		407	1,534	8.4%
2038	1,427	1,127		407	1,534	7.5%
2039	1,438	1,127		407	1,534	6.7%
2040	1,436	1,127		407	1,534	6.9%

	Internal Sales PV 8.58%	2011 PV 2016-2040
2011	6,860	
2012	6,355	
2013	5,838	
2014	5,385	
2015	4,966	
2016	4,579	4,579
2017	4,227	4,227
2018	3,909	3,909
2019	3,617	3,617
2020	3,346	3,346
2021	3,099	3,099
2022	2,872	2,872
2023	2,662	2,662
2024	2,469	2,469
2025	2,288	2,288
2026	2,120	2,120
2027	1,965	1,965
2028	1,822	1,822
2029	1,687	1,687
2030	1,563	1,563
2031	1,449	1,449
2032	1,343	1,343
2033	1,244	1,244
2034	1,152	1,152
2035	1,067	1,067
2036	989	989
2037	916	916
2038	849	849
2039	786	786
2040	728	728
Sum	52,748	

KENTUCKY POWER COMPANY
KPCo Capacity Resource Optimization
Costs and Emissions Summary
Levelized FTCA CSAPR Commodity Pricing, Big Sandy 1 Repower 20_30

Optimal Plan Cost Summary ($000)

Annual Costs	Fuel Cost (A)	Contract Revenue (B)	Market Revenue/(Cost) (C)	Fuel & Transactions (D)=(A)-(B)-(C)	Base Rate Impacts: Carrying Charges (E)	Base Rate Impacts: Incremental O&M (F)	Base Rate Impacts: Total (G)=(E)+(F)	Total Cost (H)=(D)+(G)	Market Value of Allowances Consumed (I)	Grand Total (J)=(H)+(I)	Value of ICAP (K)	Grand Total (L)=(J)-(K)	CPW (M)	Capital Expenditures (N)		Surplus MW	ICAP Value $/MW-Wk
2011	198,123	(12,788)	40,914	169,997	0	(0)	(0)	169,997	7,418	177,415	0	177,415	177,415	0	2011	0	958
2012	250,465	(21,183)	95,923	175,725	0	0	0	175,725	86,954	262,680	0	262,680	419,204	0	2012	0	388
2013	227,817	(30,153)	37,371	220,599	0	(0)	(0)	220,599	51,659	272,258	0	272,258	649,879	0	2013	0	161
2014	276,567	(38,222)	58,226	256,564	607	(0)	607	257,171	102,595	359,766	1,379	358,386	929,379	607	2014	45	595
2015	306,568	(45,520)	93,574	258,514	607	45,523	46,130	304,643	35,151	339,794	2,451	337,344	1,171,545	607	2015	31	1,507
2016	261,948	(47,806)	(10,420)	320,174	216,791	33,267	250,058	570,233	1,727	571,960	(16,179)	588,139	1,560,171	216,791	2016	(158)	1,973
2017	261,110	(46,021)	(24,759)	331,889	216,791	42,248	259,039	590,929	981	591,910	(12,240)	604,150	1,927,627	216,791	2017	(142)	1,652
2018	272,816	(46,171)	(15,680)	334,666	216,791	43,056	259,847	594,513	397	594,910	(10,916)	605,827	2,266,799	216,791	2018	(150)	1,403
2019	271,831	(45,831)	(30,291)	347,953	216,791	44,128	260,919	608,872	356	609,227	(12,596)	621,823	2,587,241	216,791	2019	(154)	1,572
2020	277,705	(46,875)	(15,282)	339,862	224,122	45,120	269,242	609,104	0	609,104	(14,619)	623,723	2,883,100	224,122	2020	(158)	1,774
2021	285,928	(61,526)	(10,484)	357,937	224,122	46,127	270,249	628,186	0	628,186	(16,195)	644,381	3,164,449	224,122	2021	(159)	1,960
2022	297,847	(62,966)	(11,911)	372,725	224,122	47,357	271,479	644,204	65,479	709,683	(18,906)	728,589	3,457,265	224,122	2022	(171)	2,129
2023	295,719	(62,635)	(39,828)	398,181	224,122	48,408	272,530	670,711	61,326	732,038	(21,014)	753,052	3,735,844	224,122	2023	(177)	2,280
2024	308,264	(63,573)	(36,796)	408,633	224,122	49,648	273,770	682,402	63,294	745,696	(23,450)	769,146	3,997,748	224,122	2024	(187)	2,412
2025	393,703	(58,312)	99,655	352,361	326,974	67,359	394,333	746,694	75,377	822,071	26,475	795,596	4,247,113	326,974	2025	202	2,524
2026	410,118	(59,436)	100,540	369,015	326,974	70,140	397,114	766,128	75,338	841,466	25,668	815,798	4,482,475	326,974	2026	189	2,615
2027	417,943	(60,004)	104,034	373,913	326,974	71,257	398,231	772,144	78,308	850,452	24,539	825,913	4,701,805	326,974	2027	176	2,685
2028	429,257	(61,112)	97,556	392,812	326,974	73,527	400,501	793,313	77,225	870,538	23,428	847,110	4,908,873	326,974	2028	165	2,731
2029	436,546	(62,691)	86,970	412,267	326,974	75,375	402,349	814,616	76,259	890,875	22,206	868,668	5,104,325	326,974	2029	155	2,751
2030	446,505	(62,816)	99,848	409,473	326,974	76,846	403,820	813,293	80,663	893,956	20,466	873,489	5,285,230	326,974	2030	143	2,745
2031	455,572	(64,317)	89,830	430,060	326,974	79,413	406,387	836,446	78,857	915,303	18,594	896,709	5,456,175	326,974	2031	129	2,765
2032	466,718	(64,710)	107,526	423,902	326,974	80,720	407,694	831,596	84,626	916,221	17,320	898,901	5,613,910	326,974	2032	120	2,785
2033	473,614	(66,050)	103,064	436,600	326,974	82,426	409,400	846,000	85,546	931,546	13,915	917,631	5,762,125	326,974	2033	95	2,805
2034	483,685	(67,499)	102,033	449,151	326,974	84,412	411,386	860,537	86,876	947,413	13,062	934,351	5,901,039	326,974	2034	89	2,825
2035	483,601	(69,616)	74,349	478,868	326,974	86,694	413,668	892,537	82,550	975,087	11,990	963,097	6,032,839	326,974	2035	81	2,845
2036	491,883	(71,173)	75,349	487,707	146,766	88,252	235,018	722,724	84,625	807,349	10,466	796,883	6,133,220	146,766	2036	70	2,866
2037	500,999	(71,342)	83,539	488,802	146,766	89,390	236,156	724,957	89,675	814,632	7,947	806,685	6,226,754	146,766	2037	53	2,887
2038	499,784	(73,241)	61,040	511,985	146,766	91,072	237,838	749,823	87,425	837,248	6,044	831,204	6,315,467	146,766	2038	40	2,907
2039	509,032	(74,284)	65,129	518,187	146,766	92,618	239,384	757,571	91,212	848,783	4,278	844,505	6,398,430	146,766	2039	28	2,928
2040	511,478	(76,024)	46,326	541,176	146,766	124,803	271,569	812,746	89,166	901,912	4,640	897,272	6,479,568	146,766	2040	30	2,949
2011 Net Present Value																	
Period of 2011-2040	3,574,130	(535,075)	449,472	3,659,732	1,812,173	452,326	2,264,499	5,924,232	543,392	6,467,624	(11,944)	6,479,568					
Base Case O&M 2011-2040							611,615			611,615	0	611,615					
Utility Cost Present Value 2011-2040							2,876,114			7,079,239	(11,944)	7,091,182					

KPCo Capacity Resource Optimization
Costs and Emissions Summary
Levelized FTCA CSAPR Commodity Pricing, Big Sandy 1 Repower 20_30

	SO2 Emissions ktons	CO2 Emissions ktons	NOX Emissions ktons	HG Emissions (Tons)
2011	10,452	7,387	6,171	0.29
2012	10,586	8,375	6,944	0.34
2013	7,296	6,781	5,751	0.29
2014	5,050	7,009	5,319	0.33
2015	9,351	8,110	6,039	0.32
2016	4,097	4,176	1,635	0.01
2017	4,430	4,028	1,812	0.01
2018	4,358	4,244	1,793	0.01
2019	3,557	4,026	1,505	0.01
2020	4,573	4,338	764	0.00
2021	4,372	4,327	762	0.00
2022	4,559	4,342	764	0.00
2023	4,269	4,014	694	0.00
2024	3,655	4,090	709	0.00
2025	4,559	4,809	808	0.00
2026	3,917	4,743	783	0.00
2027	4,558	4,869	814	0.00
2028	3,884	4,740	781	0.00
2029	4,401	4,621	754	0.00
2030	4,332	4,824	800	0.00
2031	3,536	4,655	758	0.00
2032	4,572	4,932	822	0.00
2033	4,374	4,921	820	0.00
2034	4,558	4,934	822	0.00
2035	4,270	4,627	754	0.00
2036	3,658	4,683	767	0.00
2037	4,559	4,898	819	0.00
2038	3,917	4,714	781	0.00
2039	4,558	4,855	814	0.00
2040	3,886	4,685	777	0.00

Summary of Energy Purchases and Sales (Gwh)

	Internal Requirements	Contract Purchases	Contract Sales	Net Contract Transactions	Market Purchases	Market Sales	Net Market Transactions	Internal Requirement 0.923 GWh
2011	7,432	58	115	57	369	1,247	878	6,860
2012	7,476	138	117	(22)	80	2,136	2,057	6,900
2013	7,457	138	36	(102)	807	1,172	365	6,883
2014	7,469	139	17	(122)	690	1,367	677	6,894
2015	7,479	139	23	(116)	139	1,927	1,788	6,903
2016	7,488	139	19	(120)	621	368	(253)	6,911
2017	7,505	139	28	(111)	766	284	(482)	6,927
2018	7,536	139	37	(102)	622	319	(303)	6,955
2019	7,571	139	36	(103)	843	279	(565)	6,988
2020	7,604	139	34	(106)	612	346	(267)	7,019
2021	7,648	288	34	(254)	569	393	(176)	7,059
2022	7,695	288	34	(254)	559	390	(169)	7,102
2023	7,744	288	34	(254)	855	268	(586)	7,148
2024	7,798	289	34	(255)	807	278	(529)	7,198
2025	7,846	288	34	(254)	421	1,408	986	7,242
2026	7,896	288	34	(254)	346	1,384	1,038	7,288
2027	7,947	288	34	(254)	390	1,439	1,049	7,335
2028	7,999	289	34	(255)	390	1,336	946	7,383
2029	8,044	288	34	(254)	424	1,223	800	7,425
2030	8,093	288	34	(254)	409	1,338	928	7,470
2031	8,143	288	34	(254)	461	1,259	798	7,516
2032	8,195	289	34	(255)	425	1,397	972	7,564
2033	8,241	288	34	(254)	402	1,307	904	7,606
2034	8,289	288	34	(254)	364	1,250	887	7,651
2035	8,339	288	34	(254)	497	1,038	541	7,697
2036	8,389	289	34	(255)	478	1,009	531	7,743
2037	8,439	288	34	(254)	402	1,024	622	7,789
2038	8,488	288	34	(254)	512	859	347	7,835
2039	8,538	288	34	(254)	470	864	394	7,881
2040	8,589	289	34	(255)	572	743	171	7,927

East Reserve Margin - MW

	Demand	Existing Capacity	Expansion Plan	Case Capacity Changes	Total Capacity	Reserve Margin - %
2011	1,033	1,115		0	1,115	8.0%
2012	1,251	1,316		0	1,316	5.2%
2013	1,257	1,317		0	1,317	4.8%
2014	1,243	1,387		0	1,387	11.6%
2015	1,234	1,364		0	1,364	10.6%
2016	1,213	1,153	1 -780 MW Repower,	0	1,153	-5.0%
2017	1,198	1,152		0	1,152	-3.9%
2018	1,207	1,154		0	1,154	-4.4%
2019	1,218	1,162		0	1,162	-4.6%
2020	1,224	1,164		0	1,164	-4.9%
2021	1,238	1,179		0	1,179	-4.8%
2022	1,249	1,179		0	1,179	-5.6%
2023	1,255	1,179		0	1,179	-6.1%
2024	1,264	1,179		0	1,179	-6.8%
2025	1,281	1,179	1- 407 MW CC,	407	1,586	23.8%
2026	1,293	1,179		407	1,586	22.6%
2027	1,305	1,179		407	1,586	21.5%
2028	1,315	1,179		407	1,586	20.6%
2029	1,324	1,179		407	1,586	19.8%
2030	1,335	1,179		407	1,586	18.8%
2031	1,348	1,179		407	1,586	17.6%
2032	1,357	1,179		407	1,586	16.9%
2033	1,372	1,171		407	1,578	15.0%
2034	1,378	1,171		407	1,578	14.5%
2035	1,389	1,175		407	1,582	13.9%
2036	1,399	1,175		407	1,582	13.1%
2037	1,415	1,175		407	1,582	11.8%
2038	1,427	1,175		407	1,582	10.8%
2039	1,438	1,175		407	1,582	10.0%
2040	1,436	1,175		407	1,582	10.1%

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KENTUCKY POWER COMPANY
KPCo Capacity Resource Optimization
Costs and Emissions Summary
Levelized NGCC Replacement FTCA CSAPR Commodity Pricing

Optimal Plan Cost Summary ($000)

Annual Costs	Fuel Cost (A)	Contract Revenue (B)	Market Revenue/(Cost) (C)	Fuel & Transactions (D)=(A)-(B)-(C)	Base Rate Impacts: Carrying Charges (E)	Base Rate Impacts: Incremental O&M (F)	Base Rate Impacts: Total (G)=(E)+(F)	Total Cost (H)=(D)+(G)	Market Value of Allowances Consumed (I)	Grand Total (J)=(H)+(I)	Value of ICAP (K)	Grand Total (L)=(J)-(K)	CPW (M)	Capital Expenditures (N)
2011	198,123	(12,788)	40,914	169,997	0	(0)	(0)	169,997	7,418	177,415	0	177,415	177,415	0
2012	250,465	(21,183)	95,923	175,725	0	0	0	175,725	86,954	262,680	0	262,680	419,204	0
2013	227,817	(30,153)	37,371	220,599	0	(0)	(0)	220,599	51,659	272,258	0	272,258	649,879	0
2014	276,567	(38,222)	58,226	256,564	607	(0)	607	257,171	102,595	359,766	1,379	358,386	929,379	607
2015	275,723	(51,088)	45,062	281,748	607	1	608	282,356	29,797	312,153	(17,667)	329,819	1,166,144	607
2016	265,889	(48,190)	(5,161)	319,241	219,322	33,361	252,683	571,924	1,730	573,654	(3,454)	577,108	1,547,481	219,322
2017	264,881	(46,427)	(19,759)	331,067	219,322	42,256	261,578	592,645	983	593,628	(1,589)	595,217	1,909,504	219,322
2018	276,542	(46,694)	(10,689)	333,925	219,322	42,920	262,242	596,167	398	596,565	(1,871)	598,436	2,244,539	219,322
2019	275,802	(46,745)	(24,712)	347,259	219,322	43,738	263,060	610,319	356	610,676	(2,460)	613,136	2,560,503	219,322
2020	281,618	(47,538)	(9,953)	339,109	226,653	44,543	271,196	610,304	0	610,304	(3,179)	613,483	2,851,504	226,653
2021	290,148	(62,012)	(5,000)	357,159	226,653	45,380	272,033	629,193	0	629,193	(3,555)	632,747	3,127,774	226,653
2022	302,092	(63,388)	(5,857)	371,336	226,653	46,444	273,097	644,433	65,933	710,366	(5,177)	715,543	3,415,347	226,653
2023	300,374	(63,334)	(33,065)	396,774	226,653	47,320	273,973	670,747	61,817	732,564	(6,312)	738,877	3,688,682	226,653
2024	313,032	(64,305)	(29,869)	407,206	226,653	48,351	275,004	682,210	63,787	745,997	(7,897)	753,894	3,945,392	226,653
2025	397,097	(58,035)	104,722	350,410	329,505	65,757	395,262	745,672	75,723	821,395	42,751	778,645	4,189,444	329,505
2026	414,742	(59,125)	106,929	366,938	329,505	68,403	397,908	764,846	75,810	840,656	42,532	798,124	4,419,707	329,505
2027	421,946	(59,730)	109,782	371,894	329,505	69,273	398,778	770,672	78,712	849,384	41,849	807,536	4,634,157	329,505
2028	433,804	(60,821)	103,872	390,753	329,505	71,359	400,864	791,617	77,680	869,297	41,037	828,260	4,836,618	329,505
2029	441,578	(62,380)	93,777	410,181	329,505	73,056	402,561	812,742	76,755	889,498	39,942	849,556	5,027,769	329,505
2030	451,055	(62,446)	106,218	407,283	329,505	74,234	403,739	811,022	81,114	892,136	38,167	853,969	5,204,632	329,505
2031	460,422	(63,997)	96,615	427,804	329,505	76,575	406,080	833,884	79,339	913,223	36,423	876,800	5,371,781	329,505
2032	471,622	(64,319)	114,474	421,467	329,505	77,631	407,136	828,604	85,113	913,717	35,277	878,440	5,525,926	329,505
2033	475,881	(65,655)	107,888	433,647	329,505	78,914	408,419	842,066	85,772	927,838	32,000	895,837	5,670,621	329,505
2034	490,443	(67,175)	111,328	446,290	329,505	80,990	410,495	856,785	87,547	944,332	31,279	913,053	5,806,368	329,505
2035	488,660	(69,177)	81,730	476,107	329,505	82,817	412,322	888,429	83,055	971,484	30,337	941,147	5,935,165	329,505
2036	497,150	(70,743)	83,039	484,854	329,505	84,290	413,795	898,649	85,148	983,797	28,946	954,851	6,055,444	329,505
2037	505,038	(70,949)	89,906	486,082	329,505	85,193	414,698	900,779	90,083	990,862	26,560	964,302	6,167,254	329,505
2038	504,709	(72,900)	68,668	508,941	329,505	86,844	416,349	925,291	87,914	1,013,205	24,791	988,414	6,272,745	329,505
2039	514,193	(73,770)	73,028	514,935	329,505	88,291	417,796	932,731	91,723	1,024,455	23,160	1,001,295	6,371,112	329,505
2040	515,003	(75,518)	52,379	538,143	329,505	90,192	419,697	957,840	89,527	1,047,366	23,658	1,023,708	6,463,682	329,505
2011 Net Present Value														
Period of 2011-2040	3,582,748	(540,539)	457,930	3,665,357	1,927,380	406,823	2,334,203	5,999,560	541,384	6,540,944	77,262	6,463,682		
Base Case O&M 2011-2040							611,615			611,615	0	611,615		
Utility Cost Present Value 2011-2040							2,945,818			7,152,559	77,262	7,075,297		

	Surplus MW	ICAP Value $/MW-Wk
2011	0	958
2012	0	388
2013	0	161
2014	45	595
2015	(225)	1,507
2016	(34)	1,973
2017	(18)	1,652
2018	(26)	1,403
2019	(30)	1,572
2020	(34)	1,774
2021	(35)	1,960
2022	(47)	2,129
2023	(53)	2,280
2024	(63)	2,412
2025	326	2,524
2026	313	2,615
2027	300	2,685
2028	289	2,731
2029	279	2,751
2030	267	2,745
2031	253	2,765
2032	244	2,785
2033	219	2,805
2034	213	2,825
2035	205	2,845
2036	194	2,866
2037	177	2,887
2038	164	2,907
2039	152	2,928
2040	154	2,949

KPCo Capacity Resource Optimization
Costs and Emissions Summary
Levelized NGCC Replacement FTCA CSAPR Commodity Pricing

	SO2 Emissions ktons	CO2 Emissions ktons	NOX Emissions ktons	HG Emissions (Tons)
2011	10,452	7,387	6,171	0.29
2012	10,586	8,375	6,944	0.34
2013	7,296	6,781	5,751	0.29
2014	5,050	7,009	5,319	0.33
2015	9,351	7,370	3,884	0.28
2016	4,097	4,209	1,638	0.01
2017	4,430	4,059	1,815	0.01
2018	4,358	4,273	1,796	0.01
2019	3,557	4,056	1,508	0.01
2020	4,573	4,368	767	0.00
2021	4,372	4,358	765	0.00
2022	4,559	4,373	767	0.00
2023	4,269	4,046	697	0.00
2024	3,655	4,122	712	0.00
2025	4,559	4,831	810	0.00
2026	3,917	4,773	786	0.00
2027	4,558	4,894	817	0.00
2028	3,884	4,768	784	0.00
2029	4,401	4,652	757	0.00
2030	4,332	4,851	803	0.00
2031	3,536	4,684	761	0.00
2032	4,572	4,960	825	0.00
2033	4,374	4,934	821	0.00
2034	4,558	4,972	826	0.00
2035	4,270	4,656	757	0.00
2036	3,658	4,712	771	0.00
2037	4,559	4,920	821	0.00
2038	3,917	4,740	784	0.00
2039	4,558	4,882	817	0.00
2040	3,886	4,704	779	0.00

Summary of Energy Purchases and Sales (Gwh)

	Internal Requirements	Contract Purchases	Contract Sales	Net Contract Transactions	Market Purchases	Market Sales	Net Market Transactions	Internal Requirement 0.923 GWh
2011	7,432	58	115	57	369	1,247	878	6,860
2012	7,476	138	117	(22)	80	2,136	2,057	6,900
2013	7,457	138	36	(102)	807	1,172	365	6,883
2014	7,469	139	17	(122)	690	1,367	677	6,894
2015	7,479	139	23	(116)	260	1,242	982	6,903
2016	7,488	139	19	(120)	575	410	(165)	6,911
2017	7,505	139	28	(111)	716	316	(400)	6,927
2018	7,536	139	37	(102)	580	355	(225)	6,955
2019	7,571	139	36	(103)	789	311	(478)	6,988
2020	7,604	139	34	(106)	571	384	(187)	7,019
2021	7,648	288	34	(254)	529	436	(93)	7,059
2022	7,695	288	34	(254)	519	427	(91)	7,102
2023	7,744	288	34	(254)	797	298	(499)	7,148
2024	7,798	289	34	(255)	752	309	(443)	7,198
2025	7,846	288	34	(254)	421	1,465	1,044	7,242
2026	7,896	288	34	(254)	333	1,449	1,117	7,288
2027	7,947	288	34	(254)	387	1,502	1,116	7,335
2028	7,999	289	34	(255)	378	1,398	1,020	7,383
2029	8,044	288	34	(254)	407	1,286	879	7,425
2030	8,093	288	34	(254)	402	1,401	999	7,470
2031	8,143	288	34	(254)	447	1,319	872	7,516
2032	8,195	289	34	(255)	414	1,460	1,047	7,564
2033	8,241	288	34	(254)	419	1,359	940	7,606
2034	8,289	288	34	(254)	345	1,334	989	7,651
2035	8,339	288	34	(254)	484	1,099	615	7,697
2036	8,389	289	34	(255)	466	1,072	606	7,743
2037	8,439	288	34	(254)	400	1,078	678	7,789
2038	8,488	288	34	(254)	499	915	416	7,835
2039	8,538	288	34	(254)	457	920	464	7,881
2040	8,589	289	34	(255)	567	785	218	7,927

East Reserve Margin - MW

	Demand	Existing Capacity	Expansion Plan	Case Capacity Changes	Total Capacity	Reserve Margin - %
2011	1,033	1,115		0	1,115	8.0%
2012	1,251	1,316		0	1,316	5.2%
2013	1,257	1,317		0	1,317	4.8%
2014	1,243	1,387		0	1,387	11.6%
2015	1,234	1,108		0	1,108	-10.2%
2016	1,213	1,277	1 -904 MW NGCC,	0	1,277	5.3%
2017	1,198	1,276		0	1,276	6.5%
2018	1,207	1,278		0	1,278	5.9%
2019	1,218	1,286		0	1,286	5.6%
2020	1,224	1,288		0	1,288	5.2%
2021	1,238	1,303		0	1,303	5.2%
2022	1,249	1,303		0	1,303	4.3%
2023	1,255	1,303		0	1,303	3.8%
2024	1,264	1,303		0	1,303	3.1%
2025	1,281	1,303	1- 407 MW CC,	407	1,710	33.5%
2026	1,293	1,303		407	1,710	32.2%
2027	1,305	1,303		407	1,710	31.0%
2028	1,315	1,303		407	1,710	30.0%
2029	1,324	1,303		407	1,710	29.1%
2030	1,335	1,303		407	1,710	28.1%
2031	1,348	1,303		407	1,710	26.8%
2032	1,357	1,303		407	1,710	26.0%
2033	1,372	1,295		407	1,702	24.0%
2034	1,378	1,295		407	1,702	23.5%
2035	1,389	1,299		407	1,706	22.8%
2036	1,399	1,299		407	1,706	21.9%
2037	1,415	1,299		407	1,706	20.5%
2038	1,427	1,299		407	1,706	19.5%
2039	1,438	1,299		407	1,706	18.6%
2040	1,436	1,299		407	1,706	18.8%

[A] Total East SO2 Excludes Cardinal 2&3 Emissions

[B] NSR Adjusted Total Includes Emissions for Cardinal 2&3, 780 MW Conesville 4, and excludes Beckjord, Stuart 1-4, Zimmer, all Gas Units, and IGCC's & PC's

KE. .KY POWER COMPANY
KPCo Capacity Resource Optimization
Costs and Emissions Summary
Levelized Market Replacement to 2020 then BS2 Replacement CC Added FTCA CSAPR Commodity Pricing

Optimal Plan Cost Summary ($000)

Annual Costs	Fuel Cost (A)	Contract Revenue (B)	Market Revenue/(Cost) (C)	Fuel & Transactions (D)=(A)-(B)-(C)	Base Rate Impacts: Carrying Charges (E)	Base Rate Impacts: Incremental O&M (F)	Base Rate Impacts: Total (G)=(E)+(F)	Total Cost (H)=(D)+(G)	Market Value of Allowances Consumed (I)	Grand Total (J)=(H)+(I)	Value of ICAP (K)	Grand Total (L)=(J)-(K)	CPW (M)	Capital Expenditures (N)		Surplus MW	ICAP Value $/MW-Wk
2011	198,123	(12,788)	40,914	169,997	0	0	0	169,997	7,418	177,415	0	177,415	177,415	0	2011	0	958
2012	250,465	(21,183)	95,923	175,725	0	0	0	175,725	86,954	262,680	0	262,680	419,204	0	2012	0	388
2013	227,817	(30,153)	37,371	220,599	0	0	0	220,599	51,659	272,258	0	272,258	649,879	0	2013	0	161
2014	276,567	(38,222)	58,226	256,564	607	0	607	257,171	102,595	359,766	1,379	358,386	929,379	607	2014	45	595
2015	275,707	(51,088)	45,044	281,751	607	0	607	282,358	29,795	312,153	(17,667)	329,820	1,166,144	607	2015	(225)	1,507
2016	72,505	(39,933)	(262,595)	375,034	36,583	0	36,583	411,617	1,596	413,213	(96,221)	509,433	1,502,763	36,583	2016	(938)	1,973
2017	69,730	(38,322)	(276,013)	384,065	36,583	0	36,583	420,648	895	421,543	(79,236)	500,781	1,807,349	36,583	2017	(922)	1,652
2018	76,949	(37,921)	(270,260)	385,130	36,583	0	36,583	421,713	359	422,072	(67,811)	489,883	2,081,610	36,583	2018	(930)	1,403
2019	71,023	(38,178)	(290,467)	399,689	36,583	0	36,583	436,272	317	436,589	(76,355)	512,944	2,345,943	36,583	2019	(934)	1,572
2020	281,553	(47,516)	(10,052)	339,121	238,249	44,537	282,786	621,907	0	621,907	(3,179)	625,085	2,642,447	238,249	2020	(34)	1,774
2021	290,179	(62,012)	(4,964)	357,155	238,249	45,383	283,632	640,786	0	640,786	(3,555)	644,341	2,923,779	238,249	2021	(35)	1,960
2022	301,970	(63,388)	(6,019)	371,377	238,249	46,434	284,683	656,060	65,920	721,980	(5,177)	727,157	3,216,019	238,249	2022	(47)	2,129
2023	300,421	(63,334)	(33,005)	396,760	238,249	47,324	285,573	682,333	61,822	744,156	(6,312)	750,468	3,493,642	238,249	2023	(53)	2,280
2024	313,025	(64,305)	(29,873)	407,203	238,249	48,350	286,599	693,802	63,786	757,588	(7,897)	765,485	3,754,300	238,249	2024	(63)	2,412
2025	397,097	(58,035)	104,722	350,410	341,101	65,757	406,858	757,268	75,723	832,991	42,751	790,241	4,001,986	341,101	2025	326	2,524
2026	414,742	(59,125)	106,929	366,938	341,101	68,403	409,504	776,442	75,810	852,252	42,532	809,720	4,235,595	341,101	2026	313	2,615
2027	421,946	(59,730)	109,782	371,894	341,101	69,273	410,374	782,268	78,712	860,980	41,849	819,132	4,453,124	341,101	2027	300	2,685
2028	433,804	(60,821)	103,872	390,753	341,101	71,359	412,460	803,213	77,680	880,893	41,037	839,856	4,658,419	341,101	2028	289	2,731
2029	441,579	(62,380)	93,777	410,181	341,101	73,056	414,157	824,338	76,755	901,094	39,942	861,152	4,852,179	341,101	2029	279	2,751
2030	451,055	(62,446)	106,218	407,283	341,101	74,234	415,335	822,618	81,114	903,732	38,167	865,565	5,031,444	341,101	2030	267	2,745
2031	460,422	(63,997)	96,615	427,804	341,101	76,575	417,676	845,480	79,339	924,819	36,423	888,396	5,200,804	341,101	2031	253	2,765
2032	471,622	(64,319)	114,474	421,467	341,101	77,631	418,732	840,200	85,113	925,313	35,277	890,036	5,356,983	341,101	2032	244	2,785
2033	475,827	(65,655)	107,830	433,652	341,101	78,909	420,010	853,662	85,766	939,428	32,000	907,428	5,503,551	341,101	2033	219	2,805
2034	490,443	(67,175)	111,328	446,290	341,101	80,990	422,091	868,381	87,547	955,928	31,279	924,649	5,641,022	341,101	2034	213	2,825
2035	488,660	(69,177)	81,730	476,107	341,101	82,817	423,918	900,025	83,055	983,080	30,337	952,743	5,771,405	341,101	2035	205	2,845
2036	497,150	(70,743)	83,039	484,854	341,101	84,290	425,391	910,245	85,148	995,393	28,946	966,447	5,893,146	341,101	2036	194	2,866
2037	504,986	(70,949)	89,848	486,087	341,101	85,188	426,289	912,376	90,078	1,002,454	26,560	975,894	6,006,299	341,101	2037	177	2,887
2038	504,647	(72,900)	68,598	508,950	341,101	86,839	427,940	936,889	87,908	1,024,798	24,791	1,000,007	6,113,028	341,101	2038	164	2,907
2039	514,193	(73,770)	73,028	514,935	341,101	88,291	429,392	944,327	91,723	1,036,051	23,160	1,012,891	6,212,534	341,101	2039	152	2,928
2040	514,966	(75,518)	52,337	538,148	341,101	90,188	431,289	969,437	89,523	1,058,961	23,658	1,035,302	6,306,153	341,101	2040	154	2,949
2011 Net Present Value																	
Period of 2011-2040	3,118,913	(520,817)	(150,432)	3,790,161	1,556,036	312,502	1,868,539	5,658,700	541,192	6,199,892	(106,260)	6,306,153					
Base Case O&M 2011-2040							611,615			611,615	0	611,615					
Utility Cost Present Value 2011-2040							2,480,153			6,811,507	(106,260)	6,917,767					

KP\ .icity Resource Optimization
Costs and Emissions Summary
Levelized Market Replacement to 2020 then BS2 Replacement CC Added FTCA CSAPR Commodity Pricing

	SO2 Emissions ktons	CO2 Emissions ktons	NOX Emissions ktons	HG Emissions (Tons)
2011	10,452	7,387	6,171	0.29
2012	10,586	8,375	6,944	0.34
2013	7,296	6,781	5,751	0.29
2014	5,050	7,009	5,319	0.33
2015	9,351	7,369	3,884	0.28
2016	4,097	2,600	1,465	0.01
2017	4,430	2,470	1,644	0.01
2018	4,358	2,695	1,627	0.01
2019	3,557	2,470	1,337	0.01
2020	4,573	4,367	767	0.00
2021	4,372	4,358	765	0.00
2022	4,559	4,372	767	0.00
2023	4,269	4,046	697	0.00
2024	3,655	4,122	712	0.00
2025	4,559	4,831	810	0.00
2026	3,917	4,773	786	0.00
2027	4,558	4,894	817	0.00
2028	3,884	4,768	784	0.00
2029	4,401	4,652	757	0.00
2030	4,332	4,851	803	0.00
2031	3,536	4,684	761	0.00
2032	4,572	4,960	825	0.00
2033	4,374	4,934	821	0.00
2034	4,558	4,972	826	0.00
2035	4,270	4,656	757	0.00
2036	3,658	4,712	771	0.00
2037	4,559	4,920	821	0.00
2038	3,917	4,740	784	0.00
2039	4,558	4,882	817	0.00
2040	3,886	4,703	779	0.00

	Summary of Energy Purchases and Sales (Gwh)							Internal Requirement 0.923
	Internal Requirements	Contract Purchases	Contract Sales	Net Contract Transactions	Market Purchases	Market Sales	Net Market Transactions	GWh
2011	7,432	58	115	57	369	1,247	878	6,860
2012	7,476	138	117	(22)	80	2,136	2,057	6,900
2013	7,457	138	36	(102)	807	1,172	365	6,883
2014	7,469	139	17	(122)	690	1,367	677	6,894
2015	7,479	139	23	(116)	260	1,242	982	6,903
2016	7,488	139	19	(120)	4,621		(4,621)	6,911
2017	7,505	139	28	(111)	4,778		(4,778)	6,927
2018	7,536	139	37	(102)	4,579		(4,579)	6,955
2019	7,571	139	36	(103)	4,855		(4,855)	6,988
2020	7,604	139	34	(106)	573	384	(189)	7,019
2021	7,648	288	34	(254)	528	436	(93)	7,059
2022	7,695	288	34	(254)	520	426	(94)	7,102
2023	7,744	288	34	(254)	796	298	(498)	7,148
2024	7,798	289	34	(255)	752	309	(443)	7,198
2025	7,846	288	34	(254)	421	1,465	1,044	7,242
2026	7,896	288	34	(254)	333	1,449	1,117	7,288
2027	7,947	288	34	(254)	387	1,502	1,116	7,335
2028	7,999	289	34	(255)	378	1,398	1,020	7,383
2029	8,044	288	34	(254)	407	1,286	879	7,425
2030	8,093	288	34	(254)	402	1,401	999	7,470
2031	8,143	288	34	(254)	447	1,319	872	7,516
2032	8,195	289	34	(255)	414	1,460	1,047	7,564
2033	8,241	288	34	(254)	420	1,359	939	7,606
2034	8,289	288	34	(254)	345	1,334	989	7,651
2035	8,339	288	34	(254)	484	1,099	615	7,697
2036	8,389	289	34	(255)	466	1,072	606	7,743
2037	8,439	288	34	(254)	401	1,078	677	7,789
2038	8,488	288	34	(254)	500	915	415	7,835
2039	8,538	288	34	(254)	457	920	464	7,881
2040	8,589	289	34	(255)	568	785	217	7,927

	East Reserve Margin - MW					
	Demand	Existing Capacity	Expansion Plan	Case Capacity Changes	Total Capacity	Reserve Margin - %
2011	1,033	1,115		0	1,115	8.0%
2012	1,251	1,316		0	1,316	5.2%
2013	1,257	1,317		0	1,317	4.8%
2014	1,243	1,387		0	1,387	11.6%
2015	1,234	1,108		0	1,108	-10.2%
2016	1,213	373		0	373	-69.3%
2017	1,198	372		0	372	-69.0%
2018	1,207	374		0	374	-69.0%
2019	1,218	382		0	382	-68.7%
2020	1,224	1,288	1 -904 MW NGCC,	0	1,288	5.2%
2021	1,238	1,303		0	1,303	5.2%
2022	1,249	1,303		0	1,303	4.3%
2023	1,255	1,303		0	1,303	3.8%
2024	1,264	1,303		0	1,303	3.1%
2025	1,281	1,303	I- 407 MW CC,	407	1,710	33.5%
2026	1,293	1,303		407	1,710	32.2%
2027	1,305	1,303		407	1,710	31.0%
2028	1,315	1,303		407	1,710	30.0%
2029	1,324	1,303		407	1,710	29.1%
2030	1,335	1,303		407	1,710	28.1%
2031	1,348	1,303		407	1,710	26.8%
2032	1,357	1,303		407	1,710	26.0%
2033	1,372	1,295		407	1,702	24.0%
2034	1,378	1,295		407	1,702	23.5%
2035	1,389	1,299		407	1,706	22.8%
2036	1,399	1,299		407	1,706	21.9%
2037	1,415	1,299		407	1,706	20.5%
2038	1,427	1,299		407	1,706	19.5%
2039	1,438	1,299		407	1,706	18.6%
2040	1,436	1,299		407	1,706	18.8%

KE. .KY POWER COMPANY
KPCo Capacity Resource Optimization
Costs and Emissions Summary
Levelized Market Replacement to 2025 then BS2 Replacement CC Added FTCA CSAPR Commodity Pricing

Optimal Plan Cost Summary ($000)

Annual Costs	Fuel Cost (A)	Contract Revenue (B)	Market Revenue/(Cost) (C)	Fuel & Transactions (D)=(A)-(B)-(C)	Base Rate Impacts: Carrying Charges (E)	Base Rate Impacts: Incremental O&M (F)	Base Rate Impacts: Total (G)=(E)+(F)	Total Cost (H)=(D)+(G)	Market Value of Allowances Consumed (I)	Grand Total (J)=(H)+(I)	Value of ICAP (K)	Grand Total (L)=(J)-(K)	CPW (M)	Capital Expenditures (N)		Surplus MW	ICAP Value $/MW-Wk
2011	198,123	(12,788)	40,914	169,997	0	0	0	169,997	7,418	177,415	0	177,415	177,415	0	2011	0	958
2012	250,465	(21,183)	95,923	175,725	0	0	0	175,725	86,954	262,680	0	262,680	419,204	0	2012	0	388
2013	227,817	(30,153)	37,371	220,599	0	0	0	220,599	51,659	272,258	0	272,258	649,879	0	2013	0	161
2014	276,567	(38,222)	58,226	256,564	607	0	607	257,171	102,595	359,766	1,379	358,386	929,379	607	2014	45	595
2015	275,707	(51,088)	45,044	281,751	607	0	607	282,358	29,795	312,153	(17,667)	329,820	1,166,144	607	2015	(225)	1,507
2016	72,505	(39,933)	(262,595)	375,034	36,583	0	36,583	411,617	1,596	413,213	(96,221)	509,433	1,502,763	36,583	2016	(938)	1,973
2017	69,730	(38,322)	(276,013)	384,065	36,583	0	36,583	420,648	895	421,543	(79,238)	500,781	1,807,349	36,583	2017	(922)	1,652
2018	76,949	(37,921)	(270,260)	385,130	36,583	0	36,583	421,713	359	422,072	(67,811)	489,883	2,081,610	36,583	2018	(930)	1,403
2019	71,023	(38,178)	(290,487)	399,689	36,583	0	36,583	436,272	317	436,589	(76,355)	512,944	2,345,943	36,583	2019	(934)	1,572
2020	75,257	(38,014)	(279,366)	392,657	43,914	0	43,914	436,571	0	436,571	(86,584)	523,156	2,594,098	43,914	2020	(938)	1,774
2021	76,468	(52,948)	(279,891)	409,307	43,914	0	43,914	453,221	0	453,221	(95,706)	548,927	2,833,769	43,914	2021	(939)	1,960
2022	76,760	(53,230)	(327,351)	457,341	43,914	0	43,914	501,255	41,846	543,102	(105,268)	648,370	3,094,346	43,914	2022	(951)	2,129
2023	69,002	(53,442)	(360,111)	482,555	43,914	0	43,914	526,469	37,415	563,884	(113,496)	677,380	3,344,931	43,914	2023	(957)	2,280
2024	72,372	(55,536)	(367,599)	495,506	43,914	0	43,914	539,420	38,892	578,313	(121,283)	699,595	3,583,152	43,914	2024	(967)	2,412
2025	397,097	(58,035)	104,722	350,410	356,636	65,757	422,393	772,803	75,723	848,526	42,751	805,776	3,835,708	356,636	2025	326	2,524
2026	414,742	(59,125)	106,929	366,938	356,636	68,403	425,039	791,977	75,810	867,787	42,532	825,255	4,073,799	356,636	2026	313	2,615
2027	421,946	(59,730)	109,782	371,894	356,636	69,273	425,909	797,803	78,712	876,515	41,849	834,667	4,295,454	356,636	2027	300	2,685
2028	433,804	(60,821)	103,872	390,753	356,636	71,359	427,995	818,748	77,680	896,428	41,037	855,391	4,504,546	356,636	2028	289	2,731
2029	441,579	(62,360)	93,777	410,181	356,636	73,056	429,692	839,873	76,755	916,629	39,942	876,687	4,701,802	356,636	2029	279	2,751
2030	451,055	(62,446)	106,218	407,283	356,636	74,234	430,870	838,153	81,114	919,267	38,167	881,100	4,884,284	356,636	2030	267	2,745
2031	460,422	(63,997)	96,615	427,804	356,636	76,575	433,211	861,015	79,339	940,354	36,423	903,931	5,056,605	356,636	2031	253	2,765
2032	471,622	(64,319)	114,474	421,467	356,636	77,631	434,267	855,735	85,113	940,848	35,277	905,571	5,215,510	356,636	2032	244	2,785
2033	475,827	(65,655)	107,830	433,652	356,636	78,909	435,545	869,197	85,766	954,963	32,000	922,963	5,364,587	356,636	2033	219	2,805
2034	490,443	(67,175)	111,328	446,290	356,636	80,990	437,626	883,916	87,547	971,463	31,279	940,184	5,504,368	356,636	2034	213	2,825
2035	488,660	(69,177)	81,730	476,107	356,636	82,817	439,453	915,560	83,055	998,615	30,337	968,278	5,636,877	356,636	2035	205	2,845
2036	497,150	(70,743)	83,039	484,854	356,636	84,290	440,926	925,780	85,148	1,010,928	28,946	981,982	5,760,574	356,636	2036	194	2,866
2037	504,986	(70,949)	89,848	486,087	356,636	85,188	441,824	927,911	90,078	1,017,989	26,560	991,429	5,875,530	356,636	2037	177	2,887
2038	504,647	(72,900)	68,598	508,950	356,636	86,839	443,475	952,424	87,908	1,040,333	24,791	1,015,542	5,983,916	356,636	2038	164	2,907
2039	514,193	(73,770)	73,028	514,935	356,636	88,291	444,927	959,862	91,723	1,051,586	23,160	1,028,426	6,084,948	356,636	2039	152	2,928
2040	514,966	(75,518)	52,337	538,148	356,636	90,188	446,824	984,972	89,523	1,074,496	23,658	1,050,837	6,179,972	356,636	2040	154	2,949
2011 Net Present Value																	
Period of 2011-2040	2,669,682	(501,624)	(763,376)	3,934,682	1,207,804	218,929	1,426,733	5,361,415	514,012	5,875,427	(304,545)	6,179,972					
Base Case O&M 2011-2040							611,615			611,615	0	611,615					
Utility Cost Present Value 2011-2040							2,038,348			6,487,042	(304,545)	6,791,587					

KP\ .city Resource Optimization
Costs and Emissions Summary
Levelized Market Replacement to 2025 then BS2 Replacement CC Added FTCA CSAPR Commodity Pricing

	SO2 Emissions ktons	CO2 Emissions ktons	NOX Emissions ktons	HG Emissions (Tons)
2011	10,452	7,387	6,171	0.29
2012	10,586	8,375	6,944	0.34
2013	7,296	6,781	5,751	0.29
2014	5,050	7,009	5,319	0.33
2015	9,351	7,369	3,884	0.28
2016	4,097	2,600	1,465	0.01
2017	4,430	2,470	1,644	0.01
2018	4,358	2,695	1,627	0.01
2019	3,557	2,470	1,337	0.01
2020	4,573	2,783	597	0.00
2021	4,372	2,775	595	0.00
2022	4,559	2,775	595	0.00
2023	4,269	2,449	525	0.00
2024	3,655	2,513	539	0.00
2025	4,559	4,831	810	0.00
2026	3,917	4,773	786	0.00
2027	4,558	4,894	817	0.00
2028	3,884	4,768	784	0.00
2029	4,401	4,652	757	0.00
2030	4,332	4,851	803	0.00
2031	3,536	4,684	761	0.00
2032	4,572	4,960	825	0.00
2033	4,374	4,934	821	0.00
2034	4,558	4,972	826	0.00
2035	4,270	4,656	757	0.00
2036	3,658	4,712	771	0.00
2037	4,559	4,920	821	0.00
2038	3,917	4,740	784	0.00
2039	4,558	4,882	817	0.00
2040	3,886	4,703	779	0.00

	Summary of Energy Purchases and Sales (Gwh)							Internal Requirement 0.923
	Internal Requirements	Contract Purchases	Contract Sales	Net Contract Transactions	Market Purchases	Market Sales	Net Market Transactions	GWh
2011	7,432	58	115	57	369	1,247	878	6,860
2012	7,476	138	117	(22)	80	2,136	2,057	6,900
2013	7,457	138	36	(102)	807	1,172	365	6,883
2014	7,469	139	17	(122)	690	1,367	677	6,894
2015	7,479	139	23	(116)	260	1,242	982	6,903
2016	7,488	139	19	(120)	4,621		(4,621)	6,911
2017	7,505	139	28	(111)	4,778		(4,778)	6,927
2018	7,536	139	37	(102)	4,579		(4,579)	6,955
2019	7,571	139	36	(103)	4,855		(4,855)	6,988
2020	7,604	139	34	(106)	4,566		(4,566)	7,019
2021	7,648	288	34	(254)	4,458		(4,458)	7,059
2022	7,695	288	34	(254)	4,495		(4,495)	7,102
2023	7,744	288	34	(254)	4,902		(4,902)	7,148
2024	7,798	289	34	(255)	4,870		(4,870)	7,198
2025	7,846	288	34	(254)	421	1,465	1,044	7,242
2026	7,896	288	34	(254)	333	1,449	1,117	7,288
2027	7,947	288	34	(254)	387	1,502	1,116	7,335
2028	7,999	289	34	(255)	378	1,398	1,020	7,383
2029	8,044	288	34	(254)	407	1,286	879	7,425
2030	8,093	288	34	(254)	402	1,401	999	7,470
2031	8,143	288	34	(254)	447	1,319	872	7,516
2032	8,195	289	34	(255)	414	1,460	1,047	7,564
2033	8,241	288	34	(254)	420	1,359	939	7,606
2034	8,289	288	34	(254)	345	1,334	989	7,651
2035	8,339	288	34	(254)	484	1,099	615	7,697
2036	8,389	289	34	(255)	466	1,072	606	7,743
2037	8,439	288	34	(254)	401	1,078	677	7,789
2038	8,488	288	34	(254)	500	915	415	7,835
2039	8,538	288	34	(254)	457	920	464	7,881
2040	8,589	289	34	(255)	568	785	217	7,927

	East Reserve Margin - MW					
	Demand	Existing Capacity	Expansion Plan	Case Capacity Changes	Total Capacity	Reserve Margin - %
2011	1,033	1,115		0	1,115	8.0%
2012	1,251	1,316		0	1,316	5.2%
2013	1,257	1,317		0	1,317	4.8%
2014	1,243	1,387		0	1,387	11.6%
2015	1,234	1,108		0	1,108	-10.2%
2016	1,213	373		0	373	-69.3%
2017	1,198	372		0	372	-69.0%
2018	1,207	374		0	374	-69.0%
2019	1,218	382		0	382	-68.7%
2020	1,224	384		0	384	-68.6%
2021	1,238	399		0	399	-67.8%
2022	1,249	399		0	399	-68.1%
2023	1,255	399		0	399	-68.2%
2024	1,264	399		0	399	-68.5%
2025	1,281	1,303	I- 407 MW CC,1 -904 MW NGCC,	407	1,710	33.5%
2026	1,293	1,303		407	1,710	32.2%
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2030	1,335	1,303		407	1,710	28.1%
2031	1,348	1,303		407	1,710	26.8%
2032	1,357	1,303		407	1,710	26.0%
2033	1,372	1,295		407	1,702	24.0%
2034	1,378	1,295		407	1,702	23.5%
2035	1,389	1,299		407	1,706	22.8%
2036	1,399	1,299		407	1,706	21.9%
2037	1,415	1,299		407	1,706	20.5%
2038	1,427	1,299		407	1,706	19.5%
2039	1,438	1,299		407	1,706	18.6%
2040	1,436	1,299		407	1,706	18.8%

[A] Total East SO2 Excludes Cardinal 2&3 Emissions

[B] NSR Adjusted Total Includes Emissions for Cardinal 2&3, 780 MW Conesville 4, and excludes Beckjord, Stuart 1-4, Zimmer, all Gas Units, and IGCC's & PC's