

ENVIRONMENTAL SYNOPSIS

The Chairman's Corner

Rep. Scott E. Hutchinson, Chairman



Pennsylvania in general and Pittsburgh in particular were the recipients of good news recently. As was the state's scientific community.

The National Academy of Sciences and the National Academy of Engineering announced that it had chosen Pittsburgh as the pilot site for its new "Science & Engineering Ambassador Program." I imagine your first question is to ask what that program is.

The program is intended to address the need for greater public understanding of scientific issues. A 2005 survey cited by the academies found that 82 percent of Americans polled said they did not know a scientist. This despite the fact that scientists certainly seem to be well respected in the community at large. A 2006 National Science Board study concluded that, "...most Americans do not understand the scientific process and therefore may lack a valuable tool for assessing the validity of various claims they encounter in daily life."

The National Academy of Sciences and the National Academy of Engineering are private, non-profit organizations. They seek to provide expert advice on pressing challenges facing our nation and our world.

The new ambassador program will endeavor to increase the average Americans' familiarity with science and scientists. This is a concept that certainly could not hurt in our increasingly technological, technical and specialized society, and hopefully may help to boost students' interest in and understanding of scientific principles, achievements and future directions. Employers in Pennsylvania and elsewhere are certainly on the lookout for individuals with scientific knowledge and the ability to handle science-related positions.

While Pittsburgh is the first pilot site, the program – if successful – is expected to go nationwide. The academies also announced that the Pittsburgh program is putting its initial focus on energy. This is certainly a topical and timely focus here in Pennsylvania, given the current emphasis on Marcellus shale exploration and the growth of the natural gas industry in the commonwealth. It is also consistent with Pennsylvania's history as the site of the nation's first oil well and its prominent national role in the development and use of fossil fuels in general.

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NOTES FROM THE DIRECTOR

CRAIG D. BROOKS, EXECUTIVE DIRECTOR



According to two recent studies of the Regional Greenhouse Gas Initiative (RGGI), the program has generated significant economic benefits in participating states, and those states could benefit even further under an improved program.

Proceeds from the RGGI program allowance auctions are reinvested in energy-efficiency programs, which in turn, generate direct employment. According to the analysis, the RGGI program is a catalyst for economic growth. The RGGI-funded investments keep money in the state and reduce fossil fuel imports. Less money leaving the region means more growth at the local level.

The studies indicate that through April 2012, the allowance auctions have generated just over \$1 billion in revenue. This puts the program on track to add over \$1.7 billion in net value to state economies. The studies project that this increase in growth will generate over 17,000 job-years of employment (each job-year represents one full-time job for one year) across the states' economies.

Other key findings include consumer savings of nearly \$1.1 billion on electricity bills and an additional \$174 million on natural gas and heating oil bills. This means a total of \$1.3 billion in savings over the next decade through installation of energy efficiency measures using funding from RGGI auction proceeds.

The RGGI is the first market-based regulatory program in the United States that targets the reduction of greenhouse gas emissions. It is a regional cap and trade system for carbon dioxide emissions from power plants in the member states and affects fossil fuel power plants with 25 megawatts or greater generating capacity. The RGGI commits states to invest 25 percent of revenue from carbon credits in energy efficiency and strategic energy schemes.

Emission permit auctioning began in 2008 and the proceeds are used to promote energy conservation and renewable energy. States sell nearly all emission allowances through auctions and invest proceeds in consumer benefits such as clean energy technologies. Nine states currently participate in the initiative:

Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island and Vermont. Several states and Canadian provinces act as observers: Pennsylvania, Quebec, New Brunswick and Ontario.

According to the studies, if member states take action to amend the program to account for decreased emissions, and more specifically by resetting the cap at current emission levels, and use revenue to support consumer programs and energy efficiency, RGGI could generate an additional \$4.7 billion from 2012 to 2020 to invest in programs that could add \$11.6 billion in value to state economies and create more than 82,000 jobs.

The studies suggest that states have an extraordinary opportunity to capitalize on RGGI's proven success and continue demonstrating that market-based programs can boost growth while reducing emissions. Earlier this year, it was reported that carbon dioxide emissions in participating states in 2011 were far below the regional cap set by the program and are expected to stay below the cap for the foreseeable future.

However, given the state of the national economy, industry officials warn that this might not be a good time to adjust the program by resetting the cap and therefore adding to the cost of electricity so that more dollars are generated by RGGI. They say hundreds of millions of dollars are being spent on energy efficiencies and encouraging residential and commercial users to invest in energy efficiencies, and that it is not the right time to be adjusting RGGI in ways that will increase prices before demand is proven.

The first report, "*Economic Impacts of the Regional Greenhouse Gas Initiative on Ten Northeast and Mid-Atlantic States*", is available at: <http://www.analysisgroup.com/rggi.aspx>.

The second study is available at: http://www.env-ne.org/public/resources/ENE_RGGI_Economic_Benefits_20120426.pdf.

The question is whether or not to amend the RGGI program to reset caps to account for reduced emissions

RESEARCH BRIEFS

Each month, the committee's staff researches and prepares a number of "briefs" on several topics relevant to the Joint Conservation Committee's mission.

Very often, these briefs include references to reports and further research on the topics so that readers may pursue issues on their own.

Please Note: The information and opinions expressed in the Research Brief articles do not necessarily represent the opinions or positions of the Joint Legislative Air and Water Pollution Control and Conservation Committee, nor those of the Pennsylvania General Assembly.

Older Coal Power Plants Produce Disproportionate Amount of Emissions

-- Tony M. Guerrieri, Research Analyst

Electricity is critical to the nation's economy and standard of living. The nation depends on a variety of fuels to generate this electricity, including coal, natural gas, nuclear power, oil and renewable sources. While fossil fuels – coal, natural gas and oil – account for 70 percent of U.S. electricity, generating units that burn these fuels are major sources of airborne emissions that pose human health and environmental risks.

A report by the U.S. Government Accountability Office (GAO), "*Air Emissions and Electricity Generation at U.S. Power Plants*", analyzed how older plants compare with newer plants in their emissions, energy production, location, and fuel type. It reviewed energy and emissions data from 2010 from units that:

- listed a fossil fuel (coal, natural gas, or oil) as a primary fuel;
- generated electricity in 2010; and
- had a net summer capacity greater than 25 megawatts, making them subject to U.S. Environmental Protection Agency emissions monitoring and reporting requirements.

In all, the GAO examined the characteristics of 3,443 electricity generating units – 1,485 older units and 1,958 newer units. Combined, the plants produce 2.8 billion megawatts of electricity – 143 million of them in Pennsylvania. The GAO focused the analysis on power plant emissions of three regulated pollutants. Two of the substances emitted, sulfur dioxide and nitrogen oxides, have been linked to respiratory illness and acid rain. A third, carbon dioxide, has been linked to global climate change.

The report indicates that older electricity generat-

ing units – those that began operating in or before 1978 – provided 45 percent of the electricity from fossil fuel units in 2010, but produced a disproportionate share of emissions, both in aggregate and per unit of electricity generated. Overall, in 2010 older units contributed 75 percent of sulfur dioxide emissions, 64 percent of nitrogen oxides emissions, and 54 percent of carbon dioxide emissions from fossil fuel units. For each unit of electricity generated, older units collectively emitted about 3.6 times as much sulfur dioxide, 2.1 times as much nitrogen oxides, and 1.3 times as much carbon dioxide as newer units.

The GAO report looked at old units versus new units in terms of emissions

The report finds that the difference in emissions between older units and their newer counterparts may be attributed to a number of factors. First, a total of 93 percent of the electricity produced by older fossil fuel units in 2010 was generated by coal-fired units. Compared with natural gas units, coal-fired units produced over 90 times as much sulfur dioxide, twice as much carbon dioxide and over five times as much nitrogen oxides per unit of electricity, largely because coal contains more sulfur and carbon than natural gas.

Second, fewer older units have installed emissions controls, which reduce emissions by limiting their formation or capturing them after they are formed. Among coal-fired units – which produce nearly all sulfur dioxide emissions from electric power generation – approximately 26 percent of older units used controls for sulfur dioxide, compared with 63 percent of newer units. Controls for nitrogen oxides emissions were more common among all types of fossil fuel units, but these controls vary widely in their effectiveness. Among older units, 14 percent had installed selective catalytic reduction equipment, the type of control capable of reducing the greatest amount of nitrogen

oxides emissions, compared with 33 percent of newer units. In addition, the report found that approximately 38 percent of older units did not have any controls for nitrogen oxides, compared with six percent of newer units. Third, lower emissions among newer units may be attributable in part to improvements in the efficiency with which newer units convert fuel into electricity.

Old coal units in the Great Lakes region were among those that produced the most emissions, along with the South Central and Southeast regions of the U.S. These three regions bore the brunt of the generation burden, at 62 percent, and accounted for 69 percent of sulfur dioxide, 59 percent of nitrogen oxides, and 63 percent of carbon dioxide emitted from older coal units nationwide.

While Pennsylvania ranked third for its electricity output from among more than 3,400 plants nationally, according to the GAO report, plants in the state ranked 18th worst from nitrogen oxides. Pennsylvania's plants emit 1.87 pounds of nitrogen oxides for each megawatt of energy produced. North Dakota, at the top of the list, produces 7.64 pounds per megawatt.

In addition, Pennsylvania plants produce 5.74 pounds of sulfur dioxide per megawatt hour of electricity, according to the GAO. That is well below the sulfur pollution from plants in New Hampshire (9.13 pounds per megawatt hour) and Ohio (9.04 pounds per megawatt hour), which are at the top of the nationwide list.

The report concluded that older units remain an important part of the electricity generating sector, particularly in certain regions of the United States.

The GAO report (GAO-12-545R) is available at: <http://www.gao.gov/assets/600/590188.pdf>.

Electronics Makers Reconsider Participation in Energy Star

-- Craig D. Brooks, Executive Director

A report by the Government Accountability Office (GAO) suggests that electronics manufacturers are threatening to pull out of the Energy Star program, saying new testing requirements and other changes made by the Environmental Protection Agency (EPA) make participation in the voluntary program too costly.

Among the chief complaints of the Consumer Electronics Association and other trade groups is a

requirement that companies seeking an Energy Star label have their products' energy usage tested in third-party labs. Previously, companies were allowed to conduct the tests themselves after signing an agreement committing that their products met Energy Star specifications. The testing requirements have become costly to the point where companies question whether it is worth having the Energy Star label.

The program, which began in 1992 and is jointly administered by the EPA and the Energy Department, includes a labeling component to help consumers identify energy-efficient products. According to EPA, the program has prevented more than 1.7 billion metric tons of carbon emissions and saved consumers about \$230 billion over the past 20 years.

Will third-party testing result in electronics manufacturers leaving the Energy Star program?

The third-party certification requirements were implemented after a series of negative reports about the program, including an investigation by GAO that found fictitious products were able to receive Energy Star certification. According to EPA, in order to continue to be valuable in the marketplace for consumers, manufacturers, retailers and utilities, increased oversight of the product certification process has become necessary. Third-party certification is one among a number of comprehensive program enhancements that will ensure that Energy Star remains a trusted symbol of environmental protection through superior efficiency.

However, those changes raised concerns from Energy Star participants that the program was shifting from a voluntary program to more of a regulatory program, and participants were considering decreasing their participation.

Electronics industry groups have called third-party verification requirements an overreaction to a few bad apples in the industry, who force everybody in the Energy Star program to pay the price. The third-party testing is not only costly but can also slow down the product development cycle which can be detrimental to an electronics industry in which shelf life of a product can sometimes be measured in months.

Consumers look to Energy Star as a clear, easy-to-understand guide to the most energy efficient products available. They do not expect nor necessarily

demand that Energy Star qualified products be anything more than energy efficient.

According to EPA, however, while energy efficiency will remain the primary focus of the Energy Star program, the program may be expanding to include non-energy specifications related to recyclability and toxicity. For example, Energy Star specifications for televisions released in February 2012 would limit the amount of mercury, cadmium, lead and other chemicals in Energy Star-certified products. Energy Star is considering non-energy specifications and requirements where appropriate to ensure that overall product performance and value is maintained. These new requirements are still under consideration.

Energy Star participants are also concerned about an EPA proposal to charge user fees for the program, which is currently free. As outlined in the agency's FY 2013 budget proposal, EPA would begin collecting user fees in 2014 after rulemaking to establish a fee system.

The GAO report (GAO-11-888) is available at: <http://www.gao.gov/assets/590/585547.pdf>.

The Relationship Between Abundant Natural Gas and Renewables

-- Tony M. Guerrieri, Research Analyst

According to a report by the Massachusetts Institute of Technology (MIT), the glut of natural gas coming from newly-developed shale plays in the United States has the potential to slow development of renewable energy and could impact ways of cutting greenhouse gas (GHG) emissions. The MIT report, "*The Influence of Shale Gas on U.S. Energy and Environmental Policy*", uses economic modeling to show that relatively cheap natural gas is likely to have a far more complex impact on the energy scene than is generally assumed.

For example, the report predicts if climate policy continues to play out in the United States with a relatively weak set of measures to control emissions, the new gas sources will lead to lower gas and electricity prices, and total energy use will be higher in 2050.

Absent the shale supply, the United States could have expected to see GHG emissions two percent below 2005 levels by 2050 under a relatively weak policy, according to the report. But lower gas prices under the current shale gas outlook will stimulate economic

growth, leading GHG emissions to increase by 13 percent over 2005 levels. The report goes on to state that shale gas use will suppress the growth of renewable energy's share of electricity, and push off the development of carbon capture and storage technology, needed to meet more ambitious policy targets, by as long as two decades.

The report indicates that in just five years, the supply from shale gas has soared to become one-quarter of the domestic gas supply. And, the report predicts that if this production continues to expand, natural gas prices will remain relatively low for decades, and natural gas will take over more of the electricity market.

The MIT report seems to show that relatively cheap natural gas is likely to have a far more complex impact on the energy scene than expected

Turning to climate change impacts, the report compares two different kinds of climate policies, and two different situations – with or without shale gas.

In a weak climate policy scenario, the government would mandate that by 2030, renewable energy such as wind and solar would grow to become 25 percent of the electricity market, and half of all coal power plants would be shut down.

In a strong climate policy case, GHG emissions would be required to shrink continually, dwindling to about half of today's level by 2050, driven by a price on these emissions, either through a tax or market-based policy to cap emissions.

Either way, the presence of abundant shale gas would make it cheaper to meet the targets, the report concluded.

However, the expansion of shale gas would also put limits on the expansion of other sources of electricity, because natural gas power plants would tend to be cheaper than wind or solar.

In the strong policy scenario, the report forecasts that natural gas would take over about a third of the electricity market by 2050, completely driving out coal. In this case, renewable energy would increase as well, tripling between now and 2050 – but this growth of renewable energy would be much slower than what the U.S. has seen in the past several years.

Low-cost gas would also hamper the development of carbon capture and storage (CCS) technology, which seeks to store carbon dioxide - the primary GHG - underground.

According to the report, if there were no shale gas, meeting the stronger policy target would first bring CCS into play around 2030, and then it would expand to become a crucial part of the electricity system. But with shale gas available, CCS is projected to be pushed back by up to two decades.

The MIT report is available at: http://global-change.mit.edu/files/document/MITJPSPGC_Report_12-1.pdf.

Report Predicts Environmental Benefits, Cost Savings of Plastic-to Energy Facilities

-- Craig D. Brooks, Executive Director

New technologies that convert non-recycled plastic waste into energy could provide environmental benefits and cost savings compared to landfill disposal, according to a report from the American Chemistry Council (ACC).

The report, *"Environmental and Economic Analysis of Emerging Plastics Conversion Technologies"*, identifies 41 facilities in development or undergoing demonstration projects of the new technologies throughout the country, and predicted they would become commercially viable within five to 10 years.

Although there are a number of waste conversion technologies under development, the report focuses on pyrolysis and gasification, which both involve heating waste to high temperatures to reduce it to hydrocarbons. Pyrolysis uses heat to thermally decompose carbon-based materials without the use of oxygen and then uses the byproducts for steam and electricity generation.

Gasification converts carbon-based materials into carbon monoxide and hydrogen without the use of combustion. Those products can then be used as heat or power. Both technologies can process a variety of waste materials, but the report most closely examines facilities that handle non-recycled plastics. According to the report, many things that we consider as waste actually have tremendous potential as energy resources. As a complement to a successful recycling program, conversion technologies offer environmental benefits and cost savings over traditional

waste disposal processes.

According to the report, both methods of waste conversion create less heat and fewer air emissions compared to landfill disposal. Gasification saves 6.5 million to 13 million BTUs per ton and 0.3 to 0.6 ton of carbon-equivalent emissions per ton of municipal solid waste, while pyrolysis saves 1.8 million to 3.6 million BTUs per ton and 0.15 to 0.25 per ton of carbon-equivalent emissions.

The report also said that the new technologies potentially could produce fuel at lower costs than traditional landfill and recycling methods. Pyrolysis and gasification have costs of \$50 per ton to process waste, compared to up to \$75 per ton for traditional disposal methods.

The report found that the future development of plastics-to-energy facilities would have little impact on national energy policy. According to the report, 100 operational plastics-to-energy facilities could offset 6,000 to 18,000 barrels of oil each day. Total oil consumption per day will reach 21.57 million barrels by 2015. According to the report, 100 plastic-to-energy facilities would offset less than one percent of the annual oil consumption.

New technologies to convert non-recycled plastic waste into energy are predicted to be commercially viable in five to 10 years

The ACC says that a number of demonstration facilities will transition to commercial operation within the next five to 10 years. Once the first generation of plants becomes operational, the technologies could help address landfill diversion needs.

The report says that there was a high level of uncertainty surrounding the environmental and cost data associated with the facilities because they are not currently operating commercially. However, the future of these technologies will depend heavily on the success of the first generation facilities, with some successes already coming to fruition. Conversion technologies should be considered an emerging, viable option for managing non-recycled plastics and municipal solid waste in the future, according to the report.

The ACC report is available at: <http://bit.ly/Jn-hkD5>.

ON THE HORIZON...

A LOOK AT UPCOMING EVENTS

No events are scheduled at this time.

Check the Committee website at <http://jcc.legis.state.pa.us> for events that may be added to the schedule.

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To learn more about the Joint Legislative Air and Water Pollution Control and Conservation Committee, simply pay a visit to our website.

Website visitors will find information such as the Environmental Issues Forums schedule; the *Environmental Synopsis* monthly newsletter; Committee members; current events; Committee reports; staff contact information; Committee history and mission; and links to other helpful sites.

The website address is <http://jcc.legis.state.pa.us>. Stop by the website often to keep up with Committee information and events.

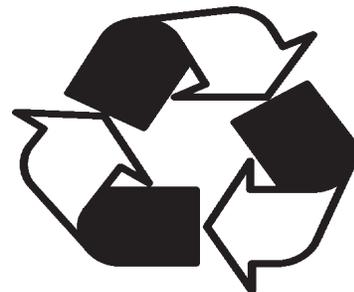


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The academies also paid tribute to Pittsburgh-based educational capabilities, noting that it was home to "...an impressive number of eminent scientists and engineers in some of the nation's top universities, along with a strong network of museums and other cultural outlets." Similarly, the academies praised the local citizenry, citing "an impressive participatory spirit among the population." Additionally, the academies noted that historically, Pittsburgh had played a role in debates over coal, natural gas, nuclear, solar and wind power.

The program's initial stated goal will be to raise scientific awareness about energy issues. Over time, the program is expected to expand its focus to address other complex scientific topics, including technology and medicine.

To get the program started, the academies selected its first group of "ambassadors," and will further prepare and support the team of ambassadors in its expected interaction with the community. The initial team members include two professors from Carnegie-Mellon University, two professors from the University of Pittsburgh, an executive from Westinghouse Electric and the president of the region's University Energy Partnership. The fields of expertise of the professors selected include materials science, engineering, technology, Pitt's Power & Energy Initiative, and Carnegie-Mellon's Electricity Industry Center.

To widen the circle of involvement, each ambassador will recruit two younger scientists or graduate students. They will be trained this summer on how to partner with the academies, build relationships with local leaders and improve communication skills. The latter is particularly aimed at what is seen as a gap between scientists' unwillingness or inability to explain research to the public and the afore-mentioned public lack of scientific knowledge. Eventually, a coordinator is to be hired and it is hoped by the academies that an office will be operational by fall. Community engagement will be an important part of the ambassadors' mission.

To learn more about the Science and Engineering Ambassador Program, visit the program's website at www.scienceambassadors.org

Another goal of the program is to make teachers, business leaders and the media more knowledgeable about and more comfortable in discussing and explaining energy topics and assessing the validity of claims and conclusions. That may help the public to receive a greater amount of and more accurate information about energy issues, and improve understanding and dialogue about such topics. The academies have already met with officials from local museums and science centers, the universities, industry and business officials and others to get a feel for energy issues of interest in the region, for programs that may already be in place to encourage citizen-scientist interaction, and examine possible ways to improve communication in the community.

Charles M. Vest, president of the National Academy of Engineering, summed up the outlook of the program in announcing its creation. He said, "The one point we don't want to lose is that it is not our goal to convince people that they need to be scientists or engineers but to be good enough with basic science and engineering concepts to be citizens of the 21st century."

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