
ENERGY POLICY FOR PENNSYLVANIA

Displacing Foreign Petroleum

REPORT OF THE TASK FORCE ON 21ST CENTURY ENERGY POLICY FOR PENNSYLVANIA



General Assembly of the Commonwealth of Pennsylvania
JOINT STATE GOVERNMENT COMMISSION

June 2002

The release of this report should not be interpreted as an endorsement by the members of the Executive Committee of the Joint State Government Commission of all the findings, recommendations and conclusions in this report.

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The Joint State Government Commission was created by the act of July 1, 1937 (P.L.2460, No.459) as amended, as a continuing agency for the development of facts and recommendations on all phases of government for the use of the General Assembly.



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June 3, 2002

FROM: David L. Hostetten
Executive Director

A handwritten signature in black ink that reads "David L. Hostetten". The signature is written in a cursive style and is positioned over the printed name and title of the sender.

RE: Clarification

The Indirect Coal Liquefaction and Coal Gasification to Ultraclean Fuels projects, described on pages 113-115 of Appendix C of this report, both refer to a production facility in Schuylkill County, Pennsylvania. This facility is currently planned for operation and is projected to cost between \$300 million and \$400 million to construct.



CONTENTS

Introduction	1
House Resolution 224.....	5
Summary of Recommendations	9
Energy Supply and Demand	13
Evaluation Criteria.....	23
Recommendations.....	31
Appendix A: Proposed Legislation.....	59
Appendix B: Summaries of Public Hearings and Site Visits.....	79
Appendix C: Project Summaries	109
Appendix D: Project Rankings.....	151

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INTRODUCTION

This is the report of the Joint State Government Commission Task Force on 21st Century Energy Policy for Pennsylvania. House Resolution 224 of 2001 (Pr.'s No. 2109) directed the Commission to establish a working group to develop an energy strategy for the Commonwealth that promotes the efficient use of energy by those who use foreign petroleum and to promote the development of new sources of petroleum and alternatives to petroleum products within the Commonwealth. The working group was also directed to evaluate the strategy's effects upon the environment and economy of the Commonwealth. The Commission was directed to report its findings and recommendations to the House of Representatives as soon as possible. Prior to its initial meeting, the working group was given the name Task Force on 21st Century Energy Policy for Pennsylvania.

The task force, chaired by Representative Ellen M. Bard of Montgomery County, consists of representatives of the petroleum, natural gas, coal, electric power, fuel cell and alternative fuel industries; an energy conservation consultant, representatives of environmental organizations, weatherization providers, the Farm Bureau, the Soybean Board, Philadelphia's energy office, a school district, industrial energy consumers, mass transit and the American Automobile Association; representatives of petroleum marketers, the Pennsylvania Chamber of Business and Industry, the United Mine Workers of America, professors in the fields of energy, economics, research and agriculture; representatives of the

trucking and railroad industries, representatives of the Pennsylvania Departments of Agriculture, Conservation and Natural Resources, Environmental Protection, General Services, and Transportation; representatives of the Pennsylvania Office of Consumer Advocate, the Pennsylvania Emergency Management Agency and the Pennsylvania Public Utility Commission; and three members of the House of Representatives.

To accomplish its work, the task force was organized into the following committees: Transportation Sector (Joseph J. Wydra, Chair), Commercial/Industrial Sector (Duane Feagley, Chair), Residential Sector (Dan Griffiths, Chair), Government Sector (Thomas J. Rados, Chair), Maximizing Energy Efficiency (Ann Jones Gerace, Chair), Maximizing Indigenous Renewables (John Hanger, Chair) and Maximizing Indigenous Fossil Fuels (Harold H. Schobert, Chair).

The task force reviewed statistics on the supply and consumption of energy in the Commonwealth, developed criteria for discussing and evaluating issues involved in creating an energy policy, focused on ways to displace foreign petroleum in the Commonwealth and reviewed legislation and statutes from other states. In addition, task force members were invited to sponsor or attend site visits (four such visits were held Statewide and are described in further detail later in this report), and three public hearings were held to gather further information for the task force to use in developing its recommendations. A summary of each public hearing is also provided later in this report.

This report reflects the work of the task force as conducted over ten meetings, including an organizational meeting which was held on September 21, 2001. It does not reflect unanimity on all points. Although most recommendations were supported by a consensus of opinion, some recommendations were adopted by majority vote. Participation on the task force should not be interpreted as an endorsement by the members of the task force of all the findings, recommendations and conclusions in this report.

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THE GENERAL ASSEMBLY OF PENNSYLVANIA

HOUSE RESOLUTION

No. 224 Session of 2001

INTRODUCED BY BARD, TULLI, HERSHEY, PERZEL, DALEY, GEIST,
RUBLEY, ARMSTRONG, BASTIAN, BELARDI, BELFANTI, CALTAGIRONE,
CAPPABIANCA, CLYMER, CORRIGAN, CREIGHTON, DeLUCA, GABIG,
GEORGE, HANNA, HERMAN, HESS, LaGROTTA, LAUGHLIN, McILHATTAN,
METCALFE, RAYMOND, READSHAW, SCHULER, SOLOBAY, SURRA, TIGUE,
WATSON, R. STEVENSON, TANGRETTI, HUTCHINSON, YUDICHAK, MANN,
JOSEPHS, PISTELLA, CAPPELLI, PALLONE, GRUCELA, ARGALL,
HARHAI, BENNINGHOFF, SCRIMENTI, FRANKEL, HENNESSEY, TRELLO,
ROHRER, FREEMAN, MELIO AND THOMAS, MAY 22, 2001

AS AMENDED, HOUSE OF REPRESENTATIVES, JUNE 5, 2001

A RESOLUTION

- 1 Directing the Joint State Government Commission to establish a
- 2 working group to develop an energy strategy for Pennsylvania
- 3 that promotes the efficient use of energy by residential,
- 4 commercial, industrial, government, transportation and power
- 5 generation users within this Commonwealth and promotes the
- 6 development and production of new sources of petroleum and
- 7 alternatives to petroleum products within this Commonwealth.
- 8 WHEREAS, Previous administrations of the Federal Government
- 9 resolved to free the United States from dependence upon foreign
- 10 petroleum by promoting energy conservation and efficiency and
- 11 developing new, domestic energy sources; and
- 12 WHEREAS, As headlines of oil crises fade into obscurity, so
- 13 too have Federal Government actions to decrease United States

14 reliance on imported petroleum products; and
15 WHEREAS, The national security implications of United States
16 dependence on foreign oil influences foreign policy decisions
17 affecting Israel, other Mideastern countries, Russia and many

1 other of the world's hot spots; and
2 WHEREAS, Our day-to-day, pervasive dependence on foreign
3 petroleum is ignored at great peril to our national economic
4 security; and
5 WHEREAS, Tightening in petroleum markets and spikes in
6 gasoline and heating oil prices offer new opportunities to focus
7 on United States dependence on petroleum imports and the need to
8 develop alternative domestic energy sources and technologies;
9 and

10 WHEREAS, The interests of state governments are the same as
11 the Federal Government in regard to lessening United States
12 dependence on foreign petroleum; and

13 WHEREAS, State governments should provide the leadership for
14 developing energy policies emphasizing the increased efficiency
15 of energy use, the increased development and production of new
16 domestic energy sources and the increased awareness of energy
17 use on the environment and the economy, and these state
18 government policies should provide direction for the private
19 sector; and

20 WHEREAS, The Commonwealth should be at the forefront of the
21 movement to formulate state energy policies with these important
22 objectives in mind; therefore be it

23 RESOLVED, That the House of Representatives direct the Joint
24 State Government Commission to establish a working group to
25 develop an energy strategy for Pennsylvania that promotes the
26 efficient use of energy by residential, commercial, industrial,
27 government, transportation and power generation users OF FOREIGN <--
28 PETROLEUM within this Commonwealth and promotes the development
29 and production of new sources of petroleum and alternatives to
30 petroleum products within this Commonwealth; and be it further

1 RESOLVED, That the working group evaluate the energy
2 strategy's effects upon the environment and economy of this
3 Commonwealth; and be it further
4 RESOLVED, That the working group be comprised of legislators,
5 academics, scientists, representatives of State and local
6 government, experts in the production and use of traditional and
7 alternative energy, experts in environmental and economic issues
8 related to energy and other such experts as may be necessary;
9 and be it further
10 RESOLVED, That the Joint State Government Commission report
11 its findings and recommendations to the House of Representatives
12 as soon as possible.

Page 8 Blank

SUMMARY OF RECOMMENDATIONS

TRANSPORTATION

The task force recommends:

- Amending the Alternative Fuels Incentive Grant (AFIG) statute to increase reimbursement rates for the purchase of alternative fuel and hybrid vehicles, the retrofit of gasoline powered vehicles to operate on alternative fuels and the installation of alternative fuel refueling facilities
- Eliminating the sales tax on the purchase of alternative fuel vehicles (AFVs)
- Suspending the alternative fuels tax for a minimum of ten years
- Enacting the Zero Emission Vehicle (ZEV) program
- Investigating incentives, such as grants and tax credits, to encourage the production of alternative fuels
- Enacting tax credits for the construction and operation of alternative fuel production facilities
- Participation by the Commonwealth in the United States Department of Energy's (DOE's) Clean Cities Program
- Providing incentive grants for establishing training centers for alternative fuel vehicle mechanics
- Making efforts to encourage a major manufacturer of hybrid and/or alternative fuel vehicles to locate a production facility for such vehicles in the Commonwealth

STATE INITIATIVES

The task force recommends:

- With regard to the State fleet, a series of proposals intended to promote better vehicle data collection, analysis, reporting and coordination and to promote the greater use of alternative fuels
- Enacting legislation to require that all State agencies operating State-owned vehicles increase their respective purchases of alternative fuel vehicles and operate their AFVs on alternative fuels
- State contracting for the construction of alternative fuel refueling facilities at privately owned fueling stations in order to develop an alternative fuels refueling infrastructure
- State funding for two State buildings to be converted to fuel cell power generation
- Designing State buildings to meet Leadership in Energy and Environmental Design (LEED) standards
- Enacting legislation requiring State agencies to analyze the cost effectiveness of implementing the Energy Service Company (ESCO) process for existing State buildings and to proceed to retrofit these buildings if practical
- Amending the Commonwealth's Procurement Code to require all State agencies to purchase Energy Star™ products when available
- Amending the Public School Code of 1949 to increase State funding to public schools which design new buildings or design alterations or additions to existing buildings to meet LEED standards
- Amending the Public School Code of 1949 to increase State funding to public school districts which purchase and operate alternative fuel vehicles

RESIDENTIAL

The task force recommends:

- Appropriating \$1 million in State General Funds to the Weatherization Assistance Program, on an annual basis, with the total amount of State funding to be increased each year by the rate of inflation
- Enacting tax incentives for the purchase of Energy Star™ products for the home

COMMERCIAL/INDUSTRIAL SECTOR AND UTILITIES

- The task force recommends tax credits for investment by power generating companies in pollution control equipment with the intent to extend the operation of non-petroleum fired power plants
- The task force supports the economically rational and environmentally sound development of the Trenton Black River Seam on private and public lands throughout the Commonwealth
- The task force takes no position on a Pennsylvania Department of Conservation and Natural Resources' natural gas lease auction originally scheduled for May 8 and 9, 2002
- The task force recommends exploring the possibility of re-directing new royalties obtained from natural gas drilling on State-owned lands, from the State's Oil and Gas Leasefund, to the AFIG program, to encourage the development and use of alternative fuels and AFVs in Pennsylvania
- The task force recommends that the State's Public Utility Code be amended to institute a distribution system improvement charge to encourage the expansion of natural gas mains to areas of the Commonwealth that do not currently have access to natural gas service

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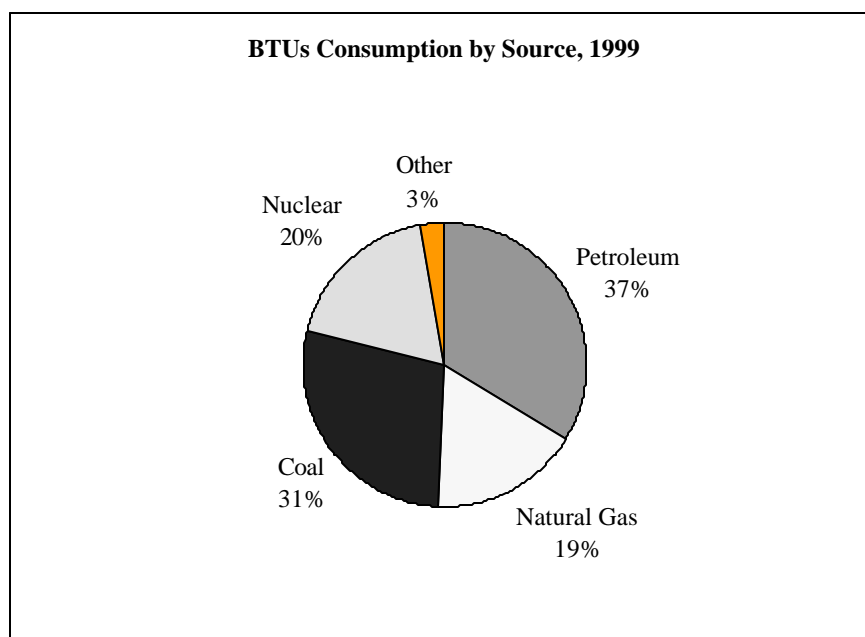
ENERGY SUPPLY AND DEMAND

An examination of the status of energy supply and demand in Pennsylvania was a necessary starting point for the task force. By examining the following statistical data, the task force members were able to identify the energy consuming sectors of the Commonwealth which accounted for the greatest petroleum use and to focus their efforts on the areas in which the greatest displacement of foreign petroleum could be achieved.

The latest annual figures available from the Energy Information Administration (EIA) of the United States Department of Energy show that in 1999 Pennsylvania consumed the following as sources of energy:

<u>Energy Source</u>	<u>Quantity</u>	<u>BTUs</u>
Petroleum	250.9 million barrels	1,385.3 trillion
Natural Gas	672.0 billion cubic feet	696.2 trillion
Coal	45.3 million short tons	1,142.7 trillion
Nuclear	71.1 billion kilowatt hours	755.5 trillion
Wood & Waste	_____	94.5 trillion
Hydroelectricity	_____	15.6 trillion
Other	_____	1.0 trillion
<hr/>		
Subtotal BTU Consumption	_____	4,090.8 trillion
Exports and Losses	_____	375.1 trillion
Grand Total BTU Consumption	_____	3,715.5 trillion
<hr/>		
Total Per Person	_____	309.8 million
<hr/>		

Because it is difficult to compare energy sources based on the physical units by which they are measured, such as barrels or tons, it is useful to compare the fuels in terms of their energy output measured in British Thermal Units (BTUs). Of the total BTUs consumed in Pennsylvania in 1999, petroleum accounted for 37 percent, or 1,385.3 trillion BTUs. Natural gas consumption was 19 percent, or 696.2 trillion, of the total BTUs. Coal accounted for 31 percent, or 1,142.7 trillion, of Pennsylvania's energy consumption in BTUs. Twenty percent of consumption was attributed to nuclear power, which equated to 755.5 trillion BTUs. The remaining energy source categories, Wood & Waste, Hydroelectricity, and Other (geothermal, wind, photovoltaic and solar power) represent 3 percent of energy consumed, or 111.1 trillion BTUs.



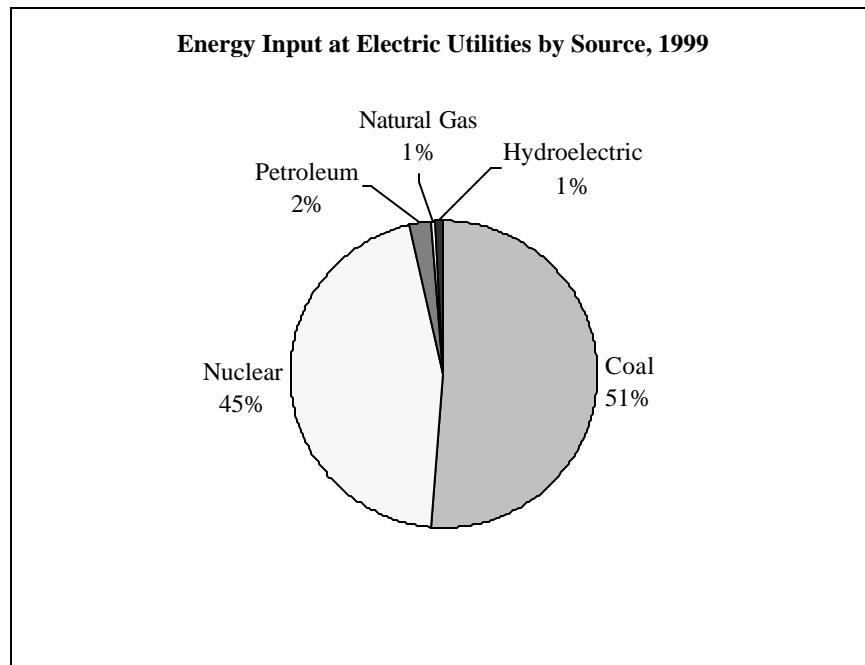
In state-by-state comparisons, Pennsylvania ranked 7th in overall consumption at approximately 3.7 quadrillion BTUs and 39th in per capita consumption at approximately 310 million BTUs.

Pennsylvania consumed 28.9 million gallons per day of petroleum fuel products in 1999. The EIA specifically notes consumption of the following quantities of petroleum products:

<u>Petroleum-Based Fuel</u>	<u>1999 Daily Consumption</u>
Gasoline	13.5 million gallons
Distillate Fuel	7.4 million gallons
Liquefied Petroleum Gas (LPG)	0.7 million gallons
Jet Fuel	1.8 million gallons.

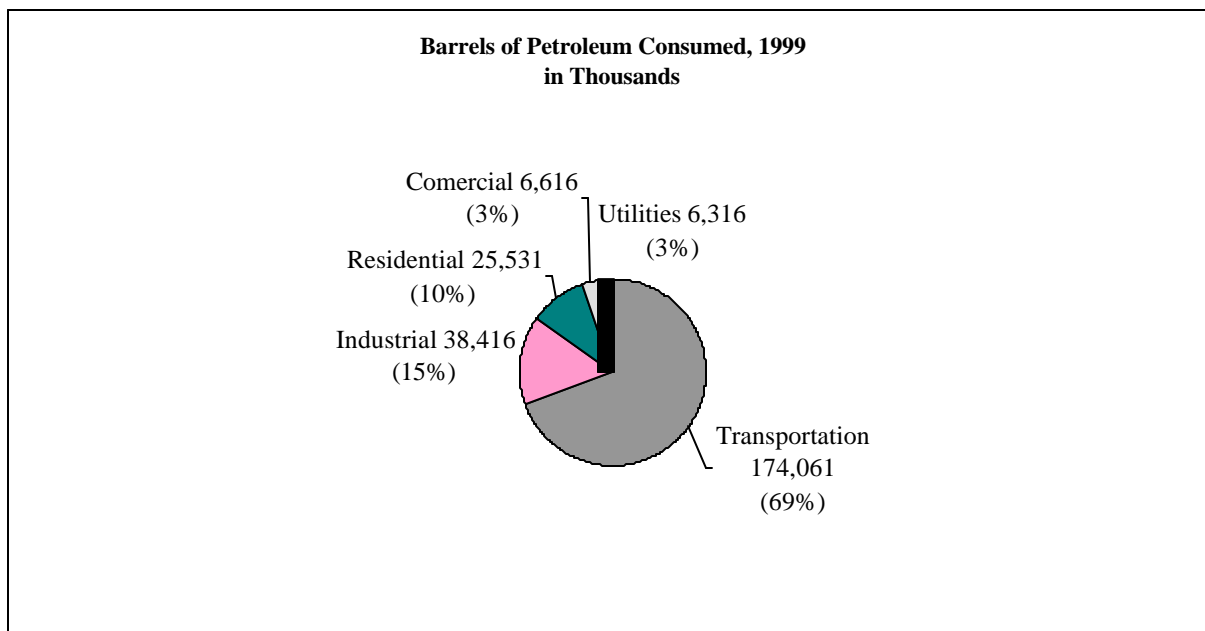
ELECTRICITY GENERATION

The fuel source used most often for electricity generation in Pennsylvania was coal, which accounted for 51 percent of the total generation for 1999. Nuclear power ranked second in electricity generation, accounting for 45 percent of the total. The remaining fuel sources were used far less. Natural gas represented 1 percent of the fuel used and petroleum accounted for 2 percent of total electricity generation. Hydroelectric accounted for 1 percent of electricity generation in Pennsylvania in 1999.



CONSUMPTION BY SECTOR

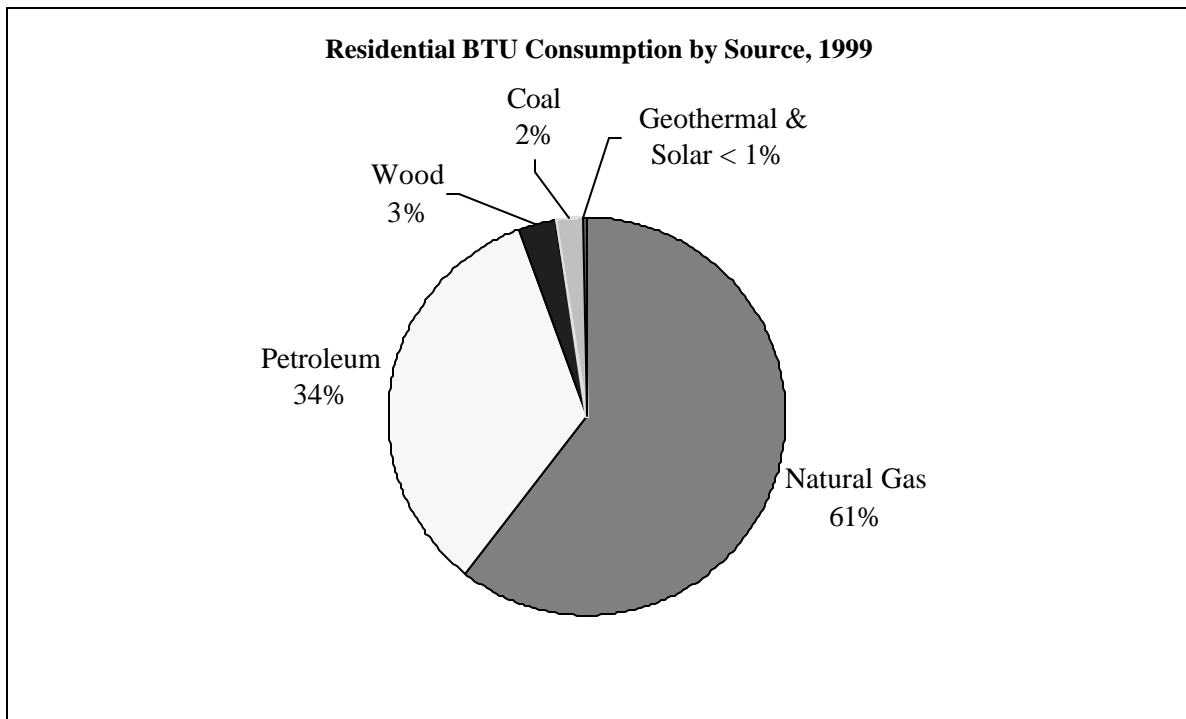
Fuel consumption statistics for Pennsylvania are divided into four sectors: residential, commercial, industrial and transportation. Of the four sectors, the transportation sector consumed the largest amount of petroleum. Slightly over 174 million barrels were processed and consumed for transportation uses in 1999. By contrast, the residential sector consumed approximately 25.5 million barrels, most of it in the form of heating oil. Industrial uses consumed roughly 38 million barrels. Commercial uses accounted for 6.6 million barrels consumed. Electric utilities consumed the fewest barrels at 6.3 million.



RESIDENTIAL

In 1999, the residential sector consumed most of its BTUs through the use of natural gas, which generated 250.2 trillion of the BTUs used. Distillate fuels, mostly home heating oil, accounted for 112.3 trillion BTUs, representing slightly less than half of the BTUs generated by natural gas. Distillate fuel was by far the largest volume petroleum product used in the residential sector. The other petroleum products, kerosene and LPG, accounted for 14.3 trillion and 13.5 trillion BTUs respectively. In total, 140.1 trillion BTUs were consumed from petroleum.

Coal produced 9.0 trillion BTUs consumed in the residential sector, which was slightly less than the 13.1 trillion BTUs consumed through the use of wood. Geothermal and solar sources provided .3 trillion and .5 trillion BTUs respectively.

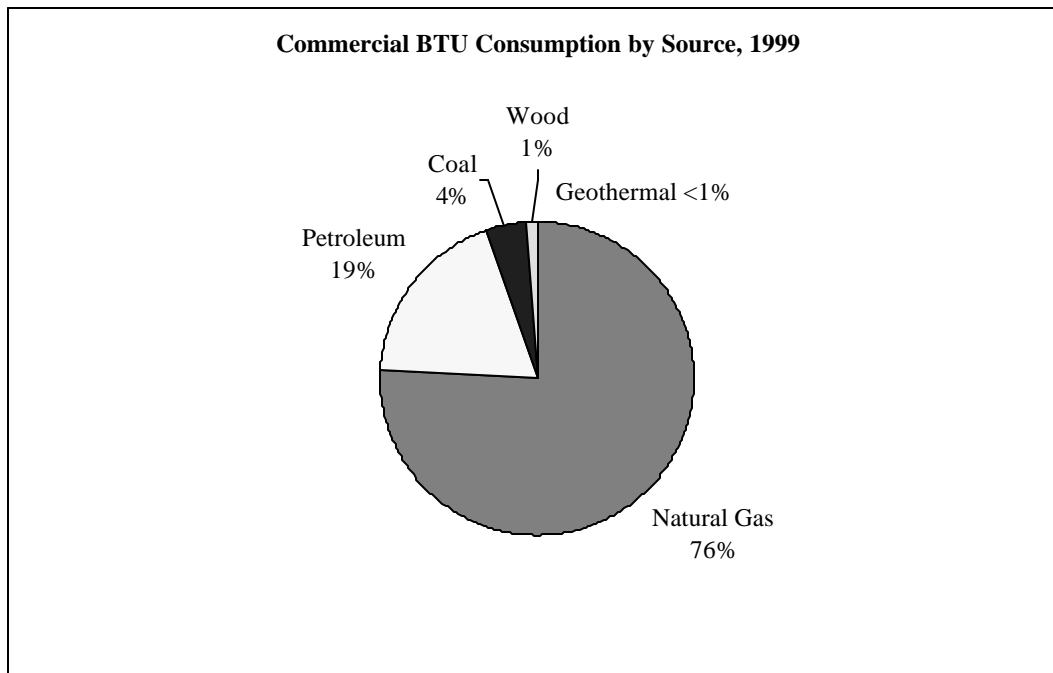


COMMERCIAL SECTOR

The commercial sector used the fewest barrels of petroleum in the Commonwealth, 6.6 million, when compared to the other three sectors. Petroleum use accounted for 37.2 trillion BTUs consumed, or 19 percent of the total BTUs in the sector. Distillate fuels accounted for 72 percent of the petroleum consumed or 75 percent of the petroleum-generated BTUs. Interestingly, motor gasoline accounted for only 3 percent of the petroleum consumed in this sector.

Natural gas was the largest source of BTUs for the commercial sector, producing 148.4 trillion BTUs, or 76 percent of the total. The sector consumed 8.1 trillion BTUs from coal, which accounted for 4 percent of the total BTUs.

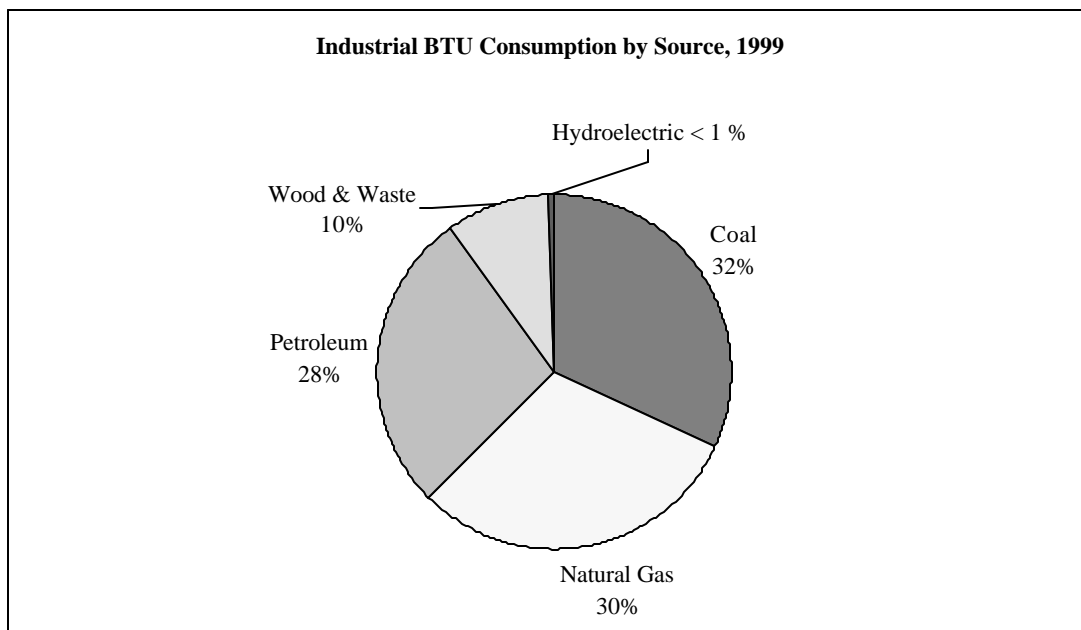
Wood and geothermal sources were insignificant, producing 2 trillion BTUs together, or less than 2 percent of the total.



INDUSTRIAL

The industrial sector consumed approximately 38.5 million barrels of petroleum, which provided 226.3 trillion, or 28 percent, of the BTUs consumed in the sector. Distillate fuels were 13 percent of the BTUs derived from petroleum, coming from slightly over 5 million barrels. Asphalt and road oil accounted for a significant use of petroleum in the sector, equaling nearly 5 million barrels, or 15 percent of the petroleum BTUs. Residual fuel was also a large part of the petroleum use by the industrial sector. More than 2.2 million barrels of residual fuel were consumed, which represented 14.4 trillion BTUs or 6 percent of the petroleum-derived BTUs.

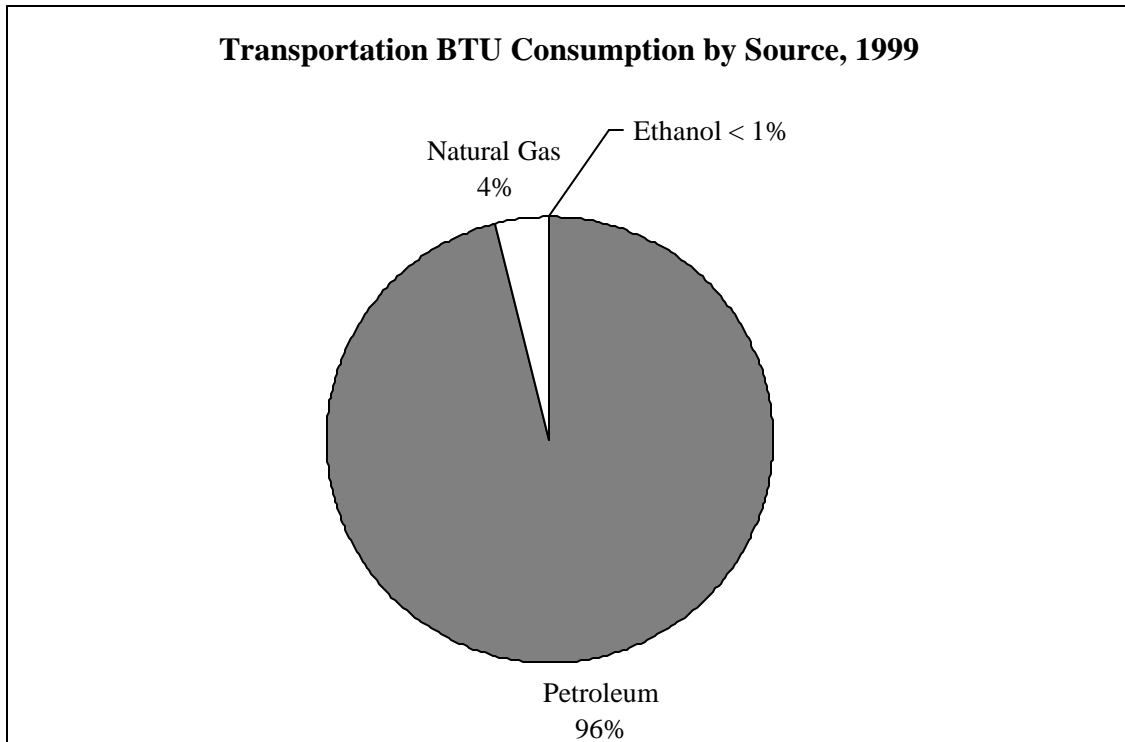
In comparison to petroleum, slightly more BTUs (i.e., 250 trillion or 30 percent of the sector total) were derived from natural gas. Coal-derived BTUs represented the highest volume of energy consumption in the sector at 263.7 trillion BTUs, or 32 percent of the total. Wood and waste accounted for 10 percent, and hydroelectric accounted for less than 1 percent of the BTUs consumed.



TRANSPORTATION

Of the four sectors, the transportation sector consumed the largest volume of petroleum. Sixty-nine percent, or 174 million barrels of the petroleum consumed in Pennsylvania, was used by the transportation sector. Motor gasoline represented over 116 million (67 percent) of the 174 million barrels. In terms of BTU consumption in the transportation sector, 96 percent (942.6 trillion) was

derived from petroleum. Approximately four percent of the BTUs came from natural gas, and one-tenth of one percent came from ethanol.



RESERVES

Pennsylvania's reserves of fuel in 1999 were:

Petroleum	16 million barrels
Dry Natural Gas	1,722 billion cubic feet
Coal	24.7 billion tons bituminous; 7 billion tons anthracite.

Using these figures, Pennsylvania's petroleum reserves would last for approximately three weeks based on total consumption in 1999.

The EIA reports Liquid Natural Gas (LNG) reserves of 8 million barrels among fourteen states, of which Pennsylvania is one. Pennsylvania's share of this reserve is not readily discernible from the EIA data.

Pennsylvania's electricity generating capabilities are greater than the State's use of electricity making it a net exporter of electric power. The capabilities of the three generating sectors (utility, industry, and nonutility) are reported as follows:

Utility	25,251 Megawatts
Industry	36,627 Megawatts
Non-utility	11,376 Megawatts.

(Source for all data in this section of the report is: Energy Information Administration, <http://www.eia.doe.gov/pub/state.data/pdf/pa.pdf>, May 2002).

EVALUATION CRITERIA

Very early in its deliberations, the task force explored technology and programs which could have an immediate impact on oil displacement in the Commonwealth. The task force also considered technology and programs that may have the ability to displace foreign petroleum in both the near and distant future. To better conceptualize some of the specific solutions to reducing Pennsylvania's reliance on foreign petroleum, task force members entered their respective ideas on a temporary website developed by the Energy Institute at Penn State University. This website was developed exclusively for the use of the task force. The ideas of the members were identified as "projects" by the task force, and a summary of each project is included in Appendix C of this report.

Members posting projects were asked to provide specific information about the project, including its cost, information about the availability of the project, where it has been implemented and the amount of petroleum that would be displaced by its implementation. Then, the task force developed criteria that it believed were important, not only in evaluating each project, but as guiding principles throughout its deliberations and in forming its final recommendations. These criteria reflected the diverse composition and interests of the task force members and were developed with the intent of keeping the task force true to its mission as stated in House Resolution (HR) 224. Each project was evaluated based on these criteria, and the results were tabulated for the use and consideration of the task force members as they proceeded to develop their policy

recommendations in accordance with their charge under HR 224. The final ranking of the projects is included as Appendix D of this report. The identification and ranking of the projects was a starting point for the discussions of the task force and was not intended to be relied upon for any sort of mathematical or scientific certainty. Rather it served as one factor for consideration of the task force in developing its broader policy recommendations.

The criteria developed by the task force was instrumental in the review of specific projects and helped to form parameters for task force discussions. Ultimately, the task force's proposals for a comprehensive energy policy for displacing foreign petroleum in Pennsylvania were measured by these criteria. While not every idea contemplated by the task force fared well in relation to each criterion, it was the performance of the idea in the aggregate that the task force considered as it settled upon its final recommendations. The following is a detailed explanation of each criterion used by the task force in developing its recommendations.

POTENTIAL TO DISPLACE FOREIGN PETROLEUM

HR 224 emphasized the displacement of foreign petroleum as central to developing an energy strategy. Thus, the task force placed primary importance on this principle as it evaluated projects, discussed various ideas and considered proposals for its final recommendations. Although the task force was seeking to identify proposals that would displace significant quantities of foreign petroleum, the members decided that this criterion would not function as a gatekeeper (i.e.,

projects and proposals would not be removed from consideration based solely on poor performance in regard to this criterion). The task force recognized that a project or a proposal could rate poorly on oil displacement but offer many other advantages to the Commonwealth based on the remaining criteria.

TECHNOLOGICAL DEVELOPMENT STATUS

The task force decided that proposals and projects which are currently available and which are able to be implemented quickly should be rated highly in the interest of securing Pennsylvania's energy position now and for the future. The task force also recognized that many projects and proposals may reflect technology in its developmental stages and that potentially valuable technology and innovative solutions to reducing Pennsylvania's reliance on foreign petroleum should not be rejected if such ideas hold significant and real promise.

COST COMPETITIVENESS

The task force recognized that energy saving ideas also come with associated expenses. In order for a project or proposal to be commercially viable in development, production and use, the task force felt the project or proposal needed to be economically competitive with the energy source it was attempting to displace. Projects were evaluated in regard to their price competitiveness with a barrel of petroleum, and similarly, recommendations for a Statewide energy policy were generally held in higher regard if they were able to be competitive with petroleum.

INFRASTRUCTURE COSTS

The purpose of this criterion was to capture the costs associated with developing or improving the means for production, distribution and delivery necessary to support a particular project or proposal. Such costs included the cost of building, improving or retrofitting plants, costs to establish transportation networks and costs to construct fueling facilities.

In order for an innovative idea to achieve market penetration and be competitive, certain capital investments must be made to ensure the ability to meet consumer demand and to reach a customer base. The task force recognized that such investments had to be considered to determine the true, total cost of any proposed project or proposal.

HIDDEN COSTS (EXTERNALITIES)

This criterion was meant to account for a project's or proposal's costs to society. Such costs are not readily apparent because they are not always factored into market price. These costs may include expenses associated with securing supplies and safeguarding by-products (domestically and abroad, including both militarily and through the use of private security efforts), health care costs and environmental costs. These expenses are generally borne by taxpayers.

ACTIONABILITY

This criterion was meant to evaluate whether State government could support a particular idea in realizing its full potential to displace foreign

petroleum, and if so, to what degree. This criterion was intended to segregate those ideas that did not readily lend themselves to government assistance from those that could be placed on a State government action agenda and assisted in their development through the use of tax credits, grants or other public funds and/or initiatives.

ABILITY OF STATE GOVERNMENT TO SET AN EXAMPLE

State government has the opportunity to affect energy policy within the Commonwealth. Through its own initiative, State government can develop and maintain energy efficiency programs as an example for others to follow. For instance, the Commonwealth could promote the use of efficient energy sources for heating or supplying electricity to State-owned buildings and by converting the State fleet to alternative fuel vehicles. A task force member's project or proposal generally received favorable consideration in regard to this criterion if it was able to be advanced by State initiative alone.

REGULATORY BARRIERS

Regulatory and statutory barriers can affect the development and implementation of any project or policy. The task force recognized that prior to establishing an energy policy or promoting a particular idea, statutory and regulatory barriers had to be considered to determine if the project or policy was realistic in the current regulatory environment. If it was not realistic, the value and difficulty in changing an existing regulation or law, in the context of the charge of

the task force, had to be considered on balance with the energy saving value of the idea itself.

ENVIRONMENTAL AND HEALTH IMPACTS

Most forms of energy use result in some negative impact on the environment. The goal with any project or proposal considered by the task force was to reduce this negative impact or eliminate it completely, if possible. Positive impacts on the environment by the use of either more efficient energy sources or cleaner, renewable sources of energy were generally considered in a favorable light.

FUEL FLEXIBILITY

Projects and proposals were evaluated on their ability to utilize more than one currently available fuel. An important consideration was the cost of fuel flexibility. Low cost fuel flexibility gave a project or proposal significant advantage. It was further noted by the task force members that fuel flexibility may take on additional significance in the future.

LONG-TERM FUEL SUPPLY AVAILABILITY

The task force evaluated members' ideas vis-a-vis the long-term availability and level of difficulty that could be encountered in procuring the necessary fuel source(s).

SECURITY

There was a consensus that the possibility of significant short-term interruptions in oil supply is a real and ongoing concern. Thus, the ability to

preserve the availability of a particular energy source, service or technology was an important consideration in evaluating any task force member's idea.

RENEWABLES

The task force recognized the value of using renewable sources of energy to displace foreign petroleum in order to ensure future supplies of that energy source and to avoid becoming reliant on other finite sources of energy. The members, therefore, considered whether particular technologies or proposed ideas employed renewable energy sources.

ECONOMIC DEVELOPMENT

The economic development of the State was an important consideration for the task force throughout this process. It was considered to be beneficial if a particular project or proposal offered potential to create jobs for Pennsylvanians and generate income for the State. As an example, it was noted that using biomass, such as corn, soybeans, switchgrass and agricultural waste to produce fuels, may open up new markets for farmers and expand farming operations in the State. The task force also determined that certain energy projects or proposals could help boost economic development by reducing energy costs for businesses or by attracting businesses to regions of the Commonwealth that invest in energy infrastructure.

Applying the above evaluation criteria to the more than 40 projects identified by the task force members as some of the best practices and most

promising technologies available now and for the near future, the following were the top rated projects overall:

1. Energy Efficient Upgrades and An Advisor for Existing Commonwealth Agency-Owned and Leased Facilities
2. Ethanol
3. Biodiesel Fuel Evaluation
4. Tax Credits for Investment in Pollution Control Equipment
5. Compressed Natural Gas (CNG) School Buses
6. Green Commonwealth Buildings
7. Displacing Foreign Petroleum in State Facilities with Pennsylvania Anthracite and Bituminous Coal
8. Clean Cars Campaign-Adopting Low Emission Vehicle (LEV) II Program
9. Solar-Powered Water Pumping for Rotational Grazing in Pennsylvania
10. Fayette Thermal LLC, SCI Fayette, Pennsylvania

RECOMMENDATIONS

In addition to reviewing individual member's projects, the task force reviewed and considered various incentives and disincentives as a means to implementing the various proposals it considered throughout its deliberations. The task force reviewed broad categories of implementing strategies such as tax incentives, tax moratoria, tax disincentives, fees and fee elimination or reduction plans, State initiatives, grants and subsidies, loans, public-private partnerships, dedicated funds, mandates, establishing oversight entities such as boards and commissions, and other monetary as well as non-monetary incentives. Within these broad categories, the task force considered individual member's proposals and projects, testimony received at public hearings held in Pittsburgh, Ardmore and York, Pennsylvania in late February and early March 2002, as well as energy legislation and programs existing in other states. Although some of these ideas received more consideration than others, it is from this broad base of implementation strategies that the final recommendations of the task force were ultimately derived.

With Pennsylvania's transportation sector responsible for nearly 70 percent of the petroleum consumed in the Commonwealth, the task force found it imperative to focus its efforts on reducing foreign petroleum reliance in this sector. Although many of the recommendations of the task force focus on initiatives that State government can undertake to alleviate Pennsylvania's

dependence on foreign petroleum and to lead by example, and on recommendations to reduce petroleum consumption in other sectors, the task force never lost sight of the impact that alternative fuels and alternative fuel vehicles (AFVs), including a well-developed alternative fuels infrastructure, can make on Pennsylvania's economy and its migration away from a reliance on foreign petroleum. In this regard, the task force strongly advocates the Commonwealth make a firm commitment to the continued research, development and use of alternative fuels in Pennsylvania.

The specific recommendations of the task force follow by sector.

TRANSPORTATION SECTOR

ALTERNATIVE FUELS INCENTIVE GRANT

The Alternative Fuels Incentive Grant (AFIG) program was established by Act 166 of 1992 to reimburse recipients for 60 percent of the difference in cost between an alternative fuel vehicle and comparable vehicles that run solely on gasoline. AFIG also originally provided a 60 percent reimbursement for the establishment of alternative fuel refueling infrastructure. As required by Act 166, the reimbursement rates under AFIG have been reduced by 10 percent every two years since the program's inception. Currently, the reimbursement rate is at its statutory minimum of 20 percent for both vehicles and refueling infrastructure. As a result of this decrease in the reimbursement rate, the number of applicants for AFIG grants has decreased while the available AFIG funds have increased.

AFIG is funded from a portion of the Commonwealth's utilities' gross receipts tax, and AFIG funds are carried forward from year to year. Currently, the AFIG program is administered by the Commonwealth's Energy Office, which is located within the Pennsylvania Department of Environmental Protection (DEP).

Proceeding under the premise of making the most impact in reducing the Commonwealth's reliance on foreign petroleum by targeting change within the transportation sector, the task force sought to expand participation in the AFIG program by encouraging the purchase of AFVs and other vehicles that achieve above average fuel efficiency.

To accomplish its goals, the task force recommends amending the AFIG statute to expand the definition of "alternative fuels" so that it more readily comports with current Commonwealth AFIG administrative agency regulations, as promulgated by DEP, and the Federal government's definition of "alternative fuel" in the Federal Energy Policy Act of 1992 (EPACT).

In addition, the task force recommends increasing the reimbursement rates provided under AFIG to a minimum of 70 percent for the incremental cost of purchasing or retrofitting of vehicles and a minimum of 50 percent for the installation of alternative fuel refueling infrastructure.

To encourage the purchase of vehicles that are powered solely by alternative fuels, the task force recommends creating a two-tiered reimbursement scheme, which will provide a 90 percent reimbursement for the incremental cost of purchasing or retrofitting a vehicle able to run solely on alternative fuels, while

providing a 70 percent incremental reimbursement for new or retrofitted vehicles, which are able to use alternative fuels but may also use a petroleum derived fuel such as gasoline or diesel. The two-tiered system of reimbursement is intended to promote the use of existing dual-fuel or hybrid vehicles while also providing added incentive for consumers to purchase dedicated AFVs. The task force believes that stimulating demand for AFVs will help lead to greater production of alternative fuels and to the installation of alternative fuel refueling centers, which will help mitigate current disincentives to AFV purchases.

To further assist in stimulating widespread development of alternative fuel refueling facilities across the Commonwealth, the task force recommends a two-tiered reimbursement scheme for the costs of establishing alternative fuel refueling infrastructure. In order to encourage the development of such facilities, the task force recommends that the minimum reimbursement rate be set at 50 percent. However, the task force also recommends that facilities, which will be made available to the general public rather than dedicated solely to the use of private or public sector vehicles and fleets, should be reimbursed at a rate of 70 percent. The intent of this recommendation is to encourage the development of facilities which will make it more convenient for the public to refuel AFVs which, in turn, will lead to a migration away from petroleum powered vehicles and toward a wider use of AFVs in Pennsylvania.

To encourage an increased and continuing use of the AFIG program, the task force recommends eliminating the provision of the current statute, which

provides for a 10 percent reduction in the reimbursement rate, on a biennial basis, until the rate is reduced to 20 percent. Although the task force recommends eliminating the reimbursement reduction provision, it recognizes that the AFIG program does not have an unlimited source of funding; thus, the task force also recommends that a provision be added to the statute to limit AFIG expenditures to the total amount of funds available in the program. The task force also supports the continued use of the utilities' gross receipts tax as a funding source for AFIG. The task force opposes an expansion of AFIG to provide reimbursement for non-transportation related uses, such as stationary power sources, or for purchase of AFVs for the Commonwealth's fleet.

In addition, the task force recognizes that the AFIG program cannot be fully effective unless the public is educated about the purpose and availability of the program. Although the task force did not see a need to set aside a specific amount or percentage of AFIG funds for this purpose, it strenuously supports widespread dissemination of information about AFIG to the public so that consumers in Pennsylvania are able to make fully informed decisions when purchasing vehicles.

The AFIG statute, reflecting the above recommendations of the task force, appears in Appendix A of this report.

The task force recommended the combination of AFIG program grants and tax relief for the purchase of alternative fuel vehicles and alternative fuels to create a powerful incentive for consumers to purchase alternative fuel vehicles.

SALES TAXES ON AFVS

The task force recommends that the State sales tax on the purchase of AFVs in the Commonwealth be eliminated in order to stimulate the sale of AFVs and, in turn, create a demand for the increased development of alternative fuel refueling infrastructure and the production of alternative fuels in Pennsylvania.

ALTERNATIVE FUELS TAX

In order to encourage the purchase of AFVs and the use of alternative fuels in Pennsylvania, the task force recommends that the Alternative Fuels Tax be eliminated for a period of ten years, at which time the General Assembly should revisit the issue of the proper rate for this tax in light of the number of AFVs in use in the Commonwealth.

Some task force members viewed these taxes in principle as “user fees” to be paid by all vehicles to cover the cost of road maintenance. The Department of Transportation (PENNDOT) opposed the recommendations since it would result in a negative revenue impact for Transportation. PENNDOT maintained that, ideally, there would be a revenue neutral way to encourage the use of alternative fuels so that the Commonwealth’s initiatives for transportation infrastructure improvements are not affected. Ultimately, the majority of the members supported the recommendation to eliminate the fuels tax for AFVs for ten years as a means for promoting the increased purchase of AFVs and promoting the wider use of alternative fuels in the Commonwealth.

ZERO EMISSION VEHICLE (ZEV) PROGRAM

The task force recommends that the General Assembly enact California's 2002 amended ZEV program into law.

This recommendation is based on a project which ranked second within the transportation sector and eighth overall. (See Appendices C and D of this report).

In order to avoid the need for special California "boutique" fuels, the Low Emission Vehicle (LEV) II aspect of California's program is not recommended for adoption. The stringent tailpipe and evaporative emission regulations for new passenger vehicles of the LEV II program exceed current requirements in Pennsylvania, but the Federally-mandated Tier II standards will begin to take effect, nationwide, in 2004 and will substantially close that gap.

The ZEV program, recommended to be adopted in Pennsylvania by 2006, will require that manufacturers include a specific percentage of low emission vehicles in a given year's total incoming fleet of vehicles to be sold in the Commonwealth. The equivalent of 10 percent of sales of passenger cars and light duty trucks must be ZEVs.

Manufacturers will have a certain amount of flexibility in meeting these mandates. Under the option most likely to be chosen by carmakers, a minimum of 2 percent of the total number of vehicles delivered for sale in Pennsylvania by a manufacturer would be required to be pure zero emission vehicles. At this point in time, such vehicles are expected to include fuel cell vehicles and battery

electric vehicles. These vehicles are most likely to be purchased by State agencies, municipalities or companies that utilize private fleets.

At a minimum, an additional 2 percent of the total number of vehicles produced for sale in Pennsylvania by any one manufacturer would be required to be “advanced technology vehicles” such as hybrid-electric or cars that run on alternative fuels, including natural gas, propane or ethanol.

Finally, a maximum of 60 percent of the 10 percent ZEV mandate may be those vehicles meeting California’s Super Ultra Low Emission Vehicle (SULEV) certification. Currently, there are versions of several popular automobiles already on the road that meet this designation, and more are expected to reach the market.

The ZEV mandate will result not only in significant energy savings but also in pollution reduction. The amount of oil saved will increase in subsequent years as vehicles from the first year of adoption continue to provide savings and new model year vehicles provide additional savings. This legislation will not involve retrofitting existing vehicles but will apply only to new model year vehicles as defined in the legislation. The cost of implementing stricter emission standards that would satisfy SULEV were estimated by the California Air Resources Board to be from \$100 to \$300 per vehicle, depending on the size of the vehicle.

It is anticipated that major new infrastructure, beyond government and corporate refueling stations, will not necessarily be required to meet the goals of the ZEV program.

Although some members of the task force raised concern that this program would be difficult to monitor and difficult to enforce, and others questioned the effectiveness of mandates, in general, the task force recommended a ZEV mandate for Pennsylvania.

Proposed legislation for the ZEV program is provided in Appendix A of this report.

INCENTIVES FOR ALTERNATIVE FUEL PRODUCTION IN PENNSYLVANIA

The task force expressed general support for alternative fuel production incentives. The task force recommends that State government investigate production grants and/or tax credits as a means for encouraging production of alternative fuels in Pennsylvania.

Some members of the task force raised concerns regarding Pennsylvania's ability to produce certain alternative fuels. In addition, some members expressed concern about the potential detrimental effects on the environment associated with the production of alternative fuels. However, a consensus emerged among the task force members to support the investigation of incentives, such as grants and tax credits, to encourage the production of alternative fuels in Pennsylvania.

TAX CREDITS FOR ALTERNATIVE FUEL PLANT CONSTRUCTION AND OPERATION

To further promote the use and production of all alternative fuels in Pennsylvania's transportation sector, the task force supports tax credits for the construction and operation of alternative fuel production facilities in

Pennsylvania. It should be noted that 20 other States, primarily in the Midwest, have built ethanol plants and more continue to be built. The task force recommends that these tax credits be available only to the extent that the recipient of the tax credit is engaged in constructing and/or operating an alternative fuel production facility which makes alternative fuels for use in the transportation sector.

PARTICIPATION IN THE UNITED STATES DEPARTMENT OF ENERGY'S CLEAN CITIES PROGRAM

The United States Department of Energy's Clean Cities Program supports public-private partnerships that deploy alternative fuel vehicles and build supporting alternative fuel infrastructure. (*Source: <http://www.ccities.doe.gov/>*). The task force recommends that the Commonwealth participate in the Clean Cities Program.

INCENTIVE GRANTS FOR ESTABLISHING TRAINING CENTERS FOR AFV MECHANICS

In order to encourage the purchase of AFVs, consumers must be assured that there are mechanics who possess the knowledge to repair these vehicles. To ensure that such a knowledge base exists in the Commonwealth, the task force recommends that the State provide incentive grants for the establishment of training centers, certified by the National Alternative Fuels Training Consortium, at post-secondary educational institutions in Pennsylvania.

EFFORTS TO ENCOURAGE LOCATION OF AN AFV MANUFACTURER IN PENNSYLVANIA

The task force recommends that the Department of Community and Economic Development (DCED) make every effort to encourage a major manufacturer of hybrid and/or alternative fuel vehicles to locate a production facility for such vehicles within the Commonwealth.

STATE INITIATIVES

The projects reviewed by the task force revealed several present State initiatives which the members commend, including: 1) Energy Efficiency Upgrades for Existing Commonwealth Buildings; 2) PENNDOT's Biodiesel Fuel Evaluation Pilot Project; and 3) Green Commonwealth Buildings. One example of a "green" building, which is energy efficient, is the State's DEP building in Cambria County. These projects are summarized in Appendix C of this report.

The task force focused its recommendations on State buildings, the State fleet, and public school buildings and transportation and on the need for better and more comprehensive coordination of the State's energy policies, programs and reporting efforts.

STATE FLEET

The Federal Energy Policy Act of 1992 (EPACT) requires states to include a percentage of alternative fuel vehicles within their fleets. An examination of national research on the issue of alternative fuels reveals that simple data collection on the number of vehicles in state fleets is awkward and

inconsistent. This inconsistency in data reporting has made an accurate assessment of states' compliance with EPACT difficult, if not impossible.

Pennsylvania contributes to this problem. Although the Office of Pollution Prevention and Compliance Assistance within the Department of Environmental Protection has made every effort to determine, accurately, the number of alternative fuel vehicles in the State fleet, the percentage of AFVs in the State fleet remains difficult to ascertain.

State fleet managers in various agencies report that they continue to *purchase* additional alternative fuel vehicles. However, *usage* of alternative fuels such as CNG and ethanol remains almost non-existent due to the lack of adequate infrastructure (e.g. fueling facilities). Primary fleet depots do not currently possess alternative fueling stations and there are either an inadequate number (in the case of CNG) or no (ethanol) fueling stations around the State.

To address these concerns, the task force offered a series of recommendations intended to promote better data collection and reporting and to promote greater use of alternative fuels.

The task force recommends the establishment of a uniform reporting requirement within State government to more accurately track the number of vehicles in each agency's fleet, including the number and type of AFVs in use, and the amount and kinds of alternative fuels used. The uniform reporting requirement will also help to monitor the Commonwealth's compliance with EPACT. In addition, the task force recommends that each State agency designate

one individual responsible for collecting and maintaining an accurate count of the total number of State-owned vehicles operated by the agency, along with an inventory of the total number of AFVs and the types and amounts of alternative fuels used by the agency in each of its AFVs.

Furthermore, the task force recommends that the Governor designate a lead agency or office with the responsibility of determining each agency's compliance with EPACT by accumulating data on the total number of State-owned vehicles, the number of State-owned vehicles by agency, the total number of alternative fuel vehicles, the number of alternative fuel vehicles by agency, the types of alternative fuel vehicles by agency, the types of alternative fuels used by agency, and the total amount of alternative fuels used by agency and by type of vehicle.

In regard to the reporting and monitoring functions to be located in a designated "lead agency," the task force contemplated the Energy Office within DEP as a likely possibility for this role; however, no specific recommendation was made by the task force.

The task force believes it is important for the Commonwealth to lead by example in the use of AFVs and alternative fuels. In this regard, the task force recommends that the General Assembly enact legislation requiring that all State agencies operating State-owned vehicles be required to purchase AFVs for compliance with the provisions of EPACT. To further reduce the Commonwealth's reliance on foreign petroleum, the task force believes it is

important to address the current shortcoming of EPACT which requires the purchase of AFVs but does not also require the use of alternative fuels. Therefore, the task force recommends that the General Assembly enact legislation requiring State agencies to operate AFVs on an alternative fuel to the degree that fueling and refueling facilities are available.

In order to operate State vehicles on alternative fuels, it will be necessary for an alternative fuels refueling infrastructure to be developed throughout Pennsylvania. The task force recommends that the State take the lead with an initiative to stimulate the development of such an infrastructure. Specifically, the task force recommends that the State contract for the construction of alternative fuel refueling facilities at privately owned fueling stations in order to make alternative fuels available to the public as well as to the State fleet.

Finally, in regard to the issue of the State fleet, the task force recommends that the State government conduct a detailed analysis of vehicle replacement methods, replacement intervals, service intervals, fleet utilization and fleet composition of each State agency and propose a plan for standardizing such practices to promote cost effectiveness and to reduce dependency on foreign petroleum.

STATE BUILDINGS

In examining how State government could make an impact on foreign petroleum consumption and also lead by example, the task force identified ways in which energy use in State buildings could be reduced.

The task force identified fuel cells as a stationary power source, which could be utilized by the State as a means for reducing energy consumption in State buildings. Fuel cells are projected to be available in the near future for use in the commercial and industrial sectors and over the next three to five years for use in the residential sector. Acknowledging the potential of fuel cells in displacing foreign petroleum, the task force recommends that the State provide funding for two of its buildings to be converted to fuel cell power generation.

The task force addressed the issue of better energy efficiency in new State buildings as another way for the State to lead by example in the effort to reduce the Commonwealth's reliance on foreign petroleum. To advance this goal, the task force recommends that all newly proposed State buildings be designed to meet Leadership in Energy and Environmental Design (LEED) standards unless the Secretary of the Commonwealth's Department of General Services determines that certain LEED criteria cannot be achieved. Such an exemption is to be reported to both the House and Senate Appropriations Committees. A proposed amendment to the Commonwealth's Administrative Code of 1929 is included in Appendix A of this report as a means for carrying out this recommendation.

The task force engaged in considerable debate over whether the State should be required to conform to LEED standards or whether a LEED rating must be obtained for each new State building. The task force arrived at its recommendation upon agreement that the State should be required to strive for LEED standards in all new building designs where possible, while recognizing

that LEED ratings could be difficult, if not impossible, to achieve in some cases. In addition, the task force believed it would be difficult to establish an effective enforcement mechanism to address instances in which a building failed to receive a LEED rating.

Furthermore, the task force believes that State agencies should improve the energy efficiency of existing State buildings. To achieve this goal, the task force recommends that the General Assembly enact legislation requiring State agencies to analyze the cost effectiveness of implementing the Energy Service Company (ESCO) process for existing State buildings and to proceed to retrofit these buildings if practical.

To further encourage the State to become more energy efficient and to contribute to a growing effort to reduce Pennsylvania's reliance on foreign petroleum, the task force recommends that the State Procurement Code [62 Pa.C.S. § 101 et seq.] be amended to require all State agencies to purchase Energy Star™ products when such products are available.

“[ENERGY STAR was introduced by the US Environmental Protection Agency (EPA) in 1992 as a voluntary labeling program designed to identify and promote energy-efficient products, in order to reduce carbon dioxide emissions. EPA partnered with the U.S. Department of Energy in 1996 to promote the ENERGY STAR label, with each agency taking responsibility for particular product categories. ENERGY STAR has expanded to cover new homes, most of the building sector, residential heating and cooling equipment, major appliances, office equipment, lighting, consumer electronics, and [other] product areas.]”

Source: <http://www.epa.gov/nrgystar/about.html>

As one additional means for encouraging greater energy efficiency in State buildings, the task force supported the concept of establishing an Energy Report Card for existing and future State buildings.

PUBLIC SCHOOLS

Buildings

The task force believes that Pennsylvania's 501 public school districts should be encouraged to be active participants in the effort to reduce the Commonwealth's reliance on foreign petroleum.

Each year, the Commonwealth provides partial reimbursement to school districts for costs associated with the construction of new school buildings and the renovation of existing buildings. The total amount of reimbursable costs are calculated by multiplying a variable known as the "rated pupil capacity" of the building by an amount specified by the General Assembly and contained in Section 2574 of the Public School Code of 1949 (P.L. 30, No. 14). The per pupil dollar amounts used as the multiplier to determine the total reimbursable costs have not been increased since 1987. School districts facing tight budgets in recent years have argued that the per pupil multiplier underestimates the rising costs associated with renovating buildings and constructing new buildings.

Given that districts consider the current reimbursement rates for school construction projects to be inadequate and that local school boards are finding it a significant challenge to balance their budgets, the task force believes it is worthwhile to create an incentive which ties higher reimbursement rates for

school construction projects to the design of energy efficient buildings capable of saving tax dollars over time. The task force believes that an incentive to encourage school districts to design more energy efficient school buildings and to retrofit existing buildings as necessary and feasible is an appropriate mechanism for encouraging school districts to participate in a Statewide effort to reduce Pennsylvania's dependency on foreign petroleum.

The task force recommends the enactment of legislation to increase the per pupil multiplier contained in Section 2574 of the Public School Code for any school district which designs its new school buildings or designs alterations or additions to existing school buildings to meet Leadership in Energy and Environmental Design (LEED) standards. The task force recommends that no payment be made by the Commonwealth until such time as the Secretary of the Commonwealth's Department of Education has certified that the design plans are capable of meeting these standards and that the appropriate documentation has been submitted to the Department.

Proposed legislation for implementing this recommendation follows in Appendix A of this report.

Transportation

Pupil transportation is another area in which school districts have the opportunity to help Pennsylvania reduce its dependence on foreign petroleum. Additionally, changes in this regard may provide an added benefit – a cleaner and healthier environment.

School districts provide transportation services for public and private school students by either operating their own fleet of district-owned buses and other vehicles or by contracting with a private provider. Section 2541 of the Public School Code and 22 Pa. Code, Chapter 23, contain specific language governing the way in which school districts are reimbursed by the Commonwealth for providing transportation services for students. In addition to the formula for calculating reimbursement, districts that own and operate their own vehicle fleets are eligible for the payment of depreciation charges. The School Code limits the annual depreciation charge to 10 percent of the approved cost of the vehicle at the time of purchase. Furthermore, the annual limit per vehicle being claimed for depreciation ranges from \$700 to a maximum of \$10,500. Whereas the cost of a new school bus generally exceeds \$100,000, the current depreciation figures are insignificant in helping districts recover the costs.

In the early 1990's, the Lower Merion School District in Montgomery County was faced with growing community concerns about the noise and pollution generated by the district's fleet of diesel-powered school buses located at a facility in a residential neighborhood. The school board agreed that action was needed to improve the air quality in the area as well as to improve relations between the school district and its neighbors. The school board directed its administration to explore options for addressing the problem, including the use of AFVs. Research showed that it would be feasible for the district to pursue such an option through the procurement of Federal and State grants. In 1996, with the

aid of significant grant funding, the school district opened its first compressed natural gas (CNG) fueling station and also purchased 26 dedicated CNG school buses. Today, nearly 70 percent of the Lower Merion School District's fleet of school buses is dedicated CNG vehicles, and the district continues to move in the direction of operating its entire fleet in this manner.

The task force believes that it is important for the Commonwealth to promote such efforts and to establish incentives for other school districts to follow suit.

The task force recommends the enactment of legislation amending Section 2541 of the Public School Code to provide several incentives for districts purchasing and operating dedicated alternative fuel buses. Specifically, the task force proposes the following incentives:

- Increase the depreciation charge percentage;
- Increase the annual depreciation charge per vehicle being claimed for depreciation;
- Increase the total amount of reimbursement; and
- Increase the total amount of depreciation charges allowed per vehicle.

These incentives would apply only to those school districts which proceed with the purchase and operation of dedicated AFVs.

For school districts which contract with private providers for the transportation of students and stipulate in the contract that the provider use dedicated alternative fuel buses, the task force recommends increasing the total

amount of reimbursement paid by the Commonwealth. The task force also recommends that private contractors be offered incentives for the purchase of dedicated alternative fuel buses.

Proposed legislation to implement this recommendation follows in Appendix A of this report.

STATE ENERGY OFFICE

The task force vigorously debated the concept of creating a State Department of Energy, but ultimately decided that it did not want to create an additional, and perhaps unnecessary, bureaucracy. However, the task force did recognize a need for better and more comprehensive coordination of the State's energy policies, programs, and reporting efforts. In recognition of this need for better coordination, the task force recommends that the State's energy office remain in the Department of Environmental Protection but that it be imbued with greater coordination authority. Specifically, the Energy Office should coordinate energy policy development for all agencies under the Governor's jurisdiction. This effort should ensure that consistent goals and approaches guide energy, and energy-related, policy. Independent agencies, including the Public Utility Commission and the Office of Consumer Advocate should be encouraged to participate in this effort.

RESIDENTIAL SECTOR

Ten percent of the Commonwealth's petroleum consumption occurs in its residential sector. In the effort to reduce foreign petroleum reliance in this sector, the task force considered a number of options and recommends the following.

WEATHERIZATION ASSISTANCE PROGRAM

The United States Department of Energy (DOE) provides grants to states to undertake energy conservation measures in the residences of low-income persons who may not otherwise be able to afford such measures themselves. Weatherization Assistance funds are used to provide energy audits, air leakage control, installation of insulation, and improvements to water heater systems. The Weatherization Assistance Program is administered by DCED.

Currently, the Weatherization Assistance Program in Pennsylvania is funded entirely with Federal funds; however, the task force believed it was important to demonstrate State support for the program and to increase the number of homes eligible for assistance through the program each year by supplementing the Federal funds with State monies. Thus, the task force recommends that \$1 million in State General Funds be appropriated to the Weatherization Assistance Program, on an annual basis, with the total amount of State funding to be increased each year by the rate of inflation. This additional funding will allow for approximately 400 additional homes to receive services from the Weatherization Assistance Program each year.

This recommendation is based on a project which ranked first within the residential sector and twelfth overall.

PURCHASE OF ENERGY STAR™ PRODUCTS

Acknowledging the value and importance of increasing energy efficiency within the home as a means for reducing the Commonwealth's reliance on foreign petroleum, the task force recommends that the State provide tax incentives for the purchase of products for the home which carry an Energy Star™ label.

COMMERCIAL/INDUSTRIAL SECTOR AND UTILITIES

TAX CREDITS FOR INVESTMENT IN POLLUTION CONTROL EQUIPMENT

As a means of reducing Pennsylvania's reliance on foreign petroleum as well as improving air quality in the Commonwealth, the task force recommends that the General Assembly enact legislation to provide tax credits for investment, by power generating companies, in pollution control equipment that will allow non-petroleum fired power plants to continue to operate in the Commonwealth due to a renewed ability to meet stricter air quality requirements.

This recommendation is based on a project which ranked first among the member's projects in the commercial sector and fourth overall.

Electricity generating companies are currently evaluating options for meeting new stringent limits on nitrogen oxide (NOx) emissions from coal-fired power plants, as well as an expected further tightening of emissions limitations on sulphur dioxide, mercury and particulate matter. Some plants may be retired

because plant owners cannot recover the investment and higher operating costs in a deregulated wholesale power market. Such retirements could result in an increase in oil use for electric generation. The proposed legislation would provide an annual tax credit for power plants that install air emission control technology and state-of-the-art, low-emission boiler technologies. A tax credit against the corporate net income tax for investment in emission control technology will encourage continued use of existing power plants, including coal-fired plants, reduce the use of oil as a boiler fuel, and avoid the greater use of oil due to non-petroleum fired plant retirements.

Emission control technologies eligible for the tax credit should include selective catalytic reduction; selective non-catalytic reduction; sulfur dioxide scrubbers; low-NOx burners; over-fire air systems; particulate control systems; and the entire array of clean coal technologies, including multi-pollutant control technologies, as well as low-emission boilers, such as circulating fluidized beds. It is estimated that capital costs for Pennsylvania electric generators for the installation of emission control equipment will exceed \$2 billion over the next three to five years, and total operating costs will increase.

Some members of the task force raised concern that this proposal would have little impact on foreign petroleum consumption and was, in effect, compensating electric generators for expenses incurred for compliance with the law. However, this recommendation was ultimately advanced by the task force as

a means for preserving existing power generating capacity for the Commonwealth.

POSITION STATEMENT ON THE EXPLORATION OF THE TRENTON BLACK RIVER SEAM

Throughout its deliberations, the task force was aware of the vast potential for the production of indigenous fossil fuels resources, especially natural gas, which run through both private and State-owned lands in northwestern Pennsylvania. In light of this potential, the task force supports the economically rational and environmentally sound development of the Trenton Black River Seam on private and public lands throughout the Commonwealth of Pennsylvania.

POSITION STATEMENT ON THE DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES' (DCNR) NATURAL GAS LEASE AUCTION ORIGINALLY SCHEDULED FOR MAY 8 AND MAY 9, 2002

In conjunction with its previous recommendation supporting development of the Trenton Black River Seam, the task force also decided that it did not want to take any position on a DCNR lease auction, scheduled for May 8 and 9, 2002, that involves State-owned lands within which the Trenton Black River Seam runs. This particular lease auction was delayed after becoming controversial due to the contention of some members of the public that DCNR had not conducted a required environmental impact analysis and had not given adequate public notice of the auction. DCNR has denied that it proceeded improperly. DCNR postponed the auction to allow additional time for public comment.

Thus, this task force takes no position in regard to the DCNR natural gas lease auction originally scheduled for May 8 and 9, 2002.

RE-DIRECTING NEW ROYALTIES FROM NATURAL GAS DRILLING ON STATE-OWNED LANDS FROM THE OIL AND GAS LEASE FUND TO AFIG

The task force recommends exploring the possibility of re-directing new royalties obtained from natural gas drilling on State-owned lands, from the State's Oil and Gas Leasefund, to the AFIG program, to encourage the development and use of alternative fuels and AFVs in Pennsylvania.

This recommendation was opposed by some members of the task force, including the representative from DCNR, because DCNR relies on monies received by the Oil and Gas Leasefund to maintain State forest and game lands for which it is responsible.

NATURAL GAS DISTRIBUTION SYSTEM IMPROVEMENT CHARGE

The task force recommends that the Public Utility Code be amended to institute a distribution system improvement charge (DSIC) to encourage the expansion of natural gas mains to areas of the Commonwealth that do not currently have access to natural gas service. This charge will allow the recovery of costs from all natural gas customers rather than concentrating these costs solely among the participants in any proposed new service areas. The purpose of spreading costs in this manner is to encourage the expansion of natural gas service into areas where such service is currently not an option. In this regard, consumers of petroleum in areas without natural gas service will have another fuel option and, thus, petroleum reliance in the State can be decreased.

Some task force members were concerned that spreading costs among all gas users would misplace the burden of costs onto present natural gas consumers and away from new gas users and utility shareholders. There was also concern that this proposal was not needed and that it would result in excess earnings by regulated gas companies.

In addition, proponents of the natural gas DSIC proposal compared it to the distribution improvement charge currently placed on water users to improve water mains. Critics of the natural gas proposal pointed out that the water system distribution charge applies only to existing mains, not new mains, and, thus, does not result in additional revenues for the utilities as the natural gas proposal would.

Ultimately, the task force members recommended support for the natural gas DSIC proposal in order to reduce Pennsylvania's reliance on foreign petroleum by extending an additional fuel option to regions of the Commonwealth that include individuals and businesses that do not have such an option currently and may otherwise, by default, continue to rely on petroleum-based energy sources.

Page 58 Blank

APPENDIX A: Proposed Legislation

1. Proposed Alternative Fuels Incentive Grant Amendments

CHAPTER 72

ALTERNATIVE FUELS

Sec.

7201. Definitions.

7202. Alternative Fuels Incentive Grant Fund.

7203. Reports.

7204. Appropriation.

7205. Rescinding application for reformulated fuels programs.

§ 7201. Definitions.

The following words and phrases when used in this chapter shall have the meanings given to them in this section unless the context clearly indicates otherwise:

"Alcohols." Fuels composed of 85 percent ethanol or methanol and 15 percent gasoline.

["Alternative fuels." Motor vehicle fuels and fuel systems which when compared to conventional gasoline or reformulated gasoline, will result in lower emissions of oxides of nitrogen, volatile organic compounds, carbon monoxide or particulates or any combination thereof. These shall include compressed natural gas (CNG), liquefied natural gas (LNG), liquid propane gas (LPG), alcohols

(ethanol - e85 and methanol - m85), hydrogen, hythane (a combination of CNG and hydrogen) and electricity.]

“Alternative Fuels.” A motor vehicle fuel which, when compared to conventional gasoline or reformulated gasoline, will result in lower emissions of oxides of nitrogen (NO_x), volatile organic compounds (VOC), carbon monoxide (CO), particulates or any combination thereof. These include compressed natural gas (CNG), liquified natural gas (LNG), liquid petroleum or propane gas (LPG), alcohols, hydrogen, hythane (H₂ and CNG), electricity, coal-derived liquid fuels, fuels derived from biological materials, and other fuels that the Secretary of the United States Department of Energy determines by rule as meeting the requirements of section 301 of the Energy Policy Act of 1992 (42 U.S.C.A. § 13211(2)).

Comment: The proposed definition of alternative fuels is the definition used in the current Alternative Fuels Incentive Grant Fund regulations (4 Pa. Code § 311.1) except that the phrase “other than alcohol” has been eliminated from the reference to “fuels other than alcohol derived from biological materials” in the sixth line of the definition. This language appeared to be unnecessary.

“Alternative fueled hybrid vehicle.” A vehicle that uses an alternative fuel to produce electricity, which in turn powers an electric drive motor for vehicle propulsion.

"Bi-fuel" or "dual-fuel." Vehicles that operate on an alternative fuel and gasoline or an alternative fuel and diesel fuel.

"Dedicated alternative fuel vehicle." A vehicle which runs exclusively on an alternative fuel. This term includes original equipment manufacturer vehicles.

"Diesel fuel." Diesel engine fuel and all other liquids suitable for the generation of power for the propulsion of motor vehicles except gasoline.

"Department." The Department of Environmental Protection.

"Fund." The Alternative Fuels Incentive Grant Fund.

"Gallon." The quantity of fluid or liquid at a temperature of 60 degrees Fahrenheit necessary to completely fill a United States standard gallon liquid measure.

"Gasoline." The same as a motor fuel and also means every liquid petroleum product, or combination thereof, other than solvents having an Atmospheric Pressure Index gravity of 46 degrees or above at a temperature of 60 degrees Fahrenheit and at atmospheric pressure and includes drip, casing head or natural gasoline. The term includes liquid of less than 46 degrees Atmospheric Pressure Index gravity at a temperature of 60 degrees Fahrenheit compounded, blended, manufactured or otherwise produced by mixing or blending gasoline or solvents with blending materials when the blended product can be used for generating power in internal combustion engines.

"Gasoline fueled hybrid vehicle." A vehicle that uses gasoline to produce electricity, which in turn powers an electric drive motor for vehicle propulsion.

"Incremental cost." The difference between the purchase price of [a dedicated] an alternative fuel vehicle and the purchase price of a gasoline-only fueled vehicle.

"OEM." The original equipment manufacturer.

"OEM vehicle." A vehicle originally manufactured to run exclusively on an alternative fuel.

["PEO." The Pennsylvania Energy Office.]

Comment: Section 504(c) of Act 18 of 1995, which created the Department of Conservation and Natural Resources and renamed the Department of Environmental Resources as the Department of Environmental Protection, provided that the Department of Environmental Protection has the powers and duties previously vested in the Pennsylvania Energy Office by Chapter 72.

"Retrofit." Installing an alternative fuel system into an existing gasoline fueled vehicle.

§ 7202. Alternative Fuels Incentive Grant Fund.

(a) Establishment.--There is hereby established a separate account in the State Treasury to be known as the Alternative Fuels Incentive Grant Fund. This fund shall be administered by the [PEO] Department. The fund shall consist of that portion of revenues collected under the utilities gross receipts tax as set forth in section 7204 (relating to appropriation).

(b) Expenditures.

(1) Moneys from the fund shall be expended by the [PEO] Department as grants to school districts, municipal authorities, political subdivisions,

nonprofit entities and corporations or partnerships incorporated or registered in this Commonwealth and to residents of this Commonwealth [to meet 60 percent of the expenses relative to retrofitting vehicles to operate on alternative fuels as either a bi-fuel, dual-fuel or dedicated vehicle, including the incremental cost of purchase of dedicated vehicles and to meet 60 percent of the cost to install the necessary fueling equipment. Two years after the effective date of this chapter and for every two-year period thereafter, the grant funding amount offered by the PEO shall be reduced 10 percent until it reaches 20 percent of the retrofit cost where it will remain until economic or other conditions warrant it be changed].

(2) Moneys shall be expended to meet:

(i) 90 percent of the incremental cost of purchase of a dedicated alternative fuel vehicle or an alternative fueled hybrid vehicle.

(ii) 90 percent of the expenses relating to retrofitting a vehicle to operate as a dedicated alternative fuel vehicle.

(iii) 70 percent of the incremental cost of purchase of a dual-fuel or gasoline fueled hybrid vehicle.

(iv) 70 percent of the expenses relating to retrofitting a vehicle to operate as a dual fuel vehicle.

(v) 70 percent of the cost to install the necessary refueling equipment at a facility owned and operated by a school district, municipal authority, or political subdivision.

(vi) 70 percent of the cost to install the necessary refueling equipment at a facility owned and operated by a corporation, partnership or nonprofit entity that permits public access to the facility.

(vii) 50 percent of the cost to install the necessary refueling equipment at a facility owned and operated by a corporation, partnership or nonprofit entity, which does not permit public access to the facility.

[(2)] (3) No more than 5 percent of the fund may be used to administer the provisions of this chapter.

[(3)] (4) No more than 10 percent of the fund may go to any one school district, municipal authority, political subdivision, nonprofit entity, corporation or partnership in any one year, provided that the total amount of grants made to grant recipients within a political subdivision in a year shall not exceed 15 percent of the fund.

(5) Moneys shall be expended only to the extent that moneys are available in the fund.

(c) Regulatory powers.--The [PEO] Department shall promulgate regulations necessary to carry out the provisions of this chapter which shall include a method by which grant applications will be prioritized according but not limited to the following goals and/or criteria:

(1) The improvement of this Commonwealth's air quality.

(2) The fulfillment of the State's requirements under the Clean Air Act (Public Law 95-95, 42 U.S.C. § 7401 et seq.).

(3) The protection of this Commonwealth's natural environment, including land, water and wildlife.

(4) The advancement of economic development in this Commonwealth and the promotion of this Commonwealth's indigenous resources.

(5) The reduction of this Commonwealth's dependence on imported crude oil and other petroleum products.

(6) The most cost-effective use of private and public funding.

(7) The transfer and commercialization of innovative energy technologies.

§ 7203. Reports.

(a) Annual report.--The [PEO] Department shall annually make a report to the General Assembly on the activities undertaken pursuant to this chapter, including the number of grants awarded and other expenditures from the fund.

(b) Special report.--The Department of Revenue, in consultation with the [PEO] Department and the Department of Transportation, shall submit a report to the General Assembly within two years after the effective date of this chapter which analyzes the impact of alternatively fueled vehicles on revenue from State taxes on motor fuels at the time and projected five years into the future and make recommendations on mechanisms to replace any revenue losses.

§ 7204. Appropriation.

There is hereby allocated from the General Fund, on an annual basis, an amount equal to 0.25 mills of the utilities' gross receipts tax collected during each fiscal year under Article XI of the act of March 4, 1971 (P.L.6, No.2), known as

the Tax Reform Code of 1971. All moneys in this fund are hereby appropriated to the [Pennsylvania Energy Office] Department on a continuing basis to carry out this chapter.

§ 7205. Rescinding application for reformulated fuels programs.

The application of the Commonwealth submitted by letter from the Governor, dated September 25, 1991, to extend the Federal reformulated fuels program to additional nonattainment areas in this Commonwealth under section 7545(k)(6) of the Clean Air Act (Public Law 95-95, 42 U.S.C. § 7545(k)(6)) is hereby rescinded.

2. Proposed Zero Emission Vehicle Act

Section 1. Short Title.

This act shall be known as the Zero Emission Vehicle Act.

Section 2. Declaration of Policy

(1) The Legislature finds that it is in the National Interest and in the interest of the Commonwealth to reduce dependency on foreign petroleum; that the transportation sector accounts for nearly 70 percent of petroleum consumption in Pennsylvania; that greater fuel efficiency of motor vehicles within Pennsylvania could result in a reduced need for petroleum imports; that advancing automotive technologies now offer a range of vehicles which deliver substantially superior fuel economy; and that the Commonwealth must act to obtain the petroleum consumption reductions such technologies may provide.

(2) The Legislature further finds that the National Low Emission Vehicle program is in effect in the Commonwealth; that the implementation of this program is a key component in the Commonwealth's plans to progress towards achieving on-time emissions reductions and to attain compliance with the National Ambient Air Quality Standards for Ozone by 2005 in the southeastern region of Pennsylvania, as required pursuant to the federal "Clean Air Act Amendments of 1990," 42 U.S.C. §7401 et seq.; and that the likelihood of reaching attainment of the National Ambient Air Quality Standards on time is still in doubt; that other regions of the Commonwealth are in non-attainment of the Ozone NAAQS, or in danger of falling into non-attainment; and that the Commonwealth may require further, more stringent reductions in emissions of pollutants to achieve the required goals.

(3) The Legislature further finds that the addition of the California Zero Emission Vehicle program, which provides that a percentage of vehicles produced and delivered for sale into Pennsylvania will emit zero pollutants or be the cleanest vehicles available, would result in substantial petroleum consumption reductions and greater reductions in pollutants than that achieved under the National Low Emission Vehicle (NLEV) program or the coming Federal Tier II emissions standards alone.

(4) The Legislature therefore determines that it is in the best interest of the Commonwealth, all the states in the ozone transport region, and the Nation as a

whole for Pennsylvania to implement the 2002 amended Zero Emission Vehicle component of Phase II of the California Low Emission Vehicle program in 2006.

Section 3. Authorization and Direction for Adoption of Zero Emission Vehicle Program.

(1) Notwithstanding the provisions of the Air Pollution Control Act of January 8, 1960 (P.L.2119, No.787), or any rule or regulation adopted pursuant thereto, or any provision of any State Implementation Plan submitted by the Department of Environmental Protection to the United States Environmental Protection Agency pursuant to the requirements of the federal "Clean Air Act Amendments of 1990," 42 U.S.C. § 7401 et seq., to the contrary, the Department of Environmental Protection is authorized and directed to forthwith adopt rules and regulations necessary to implement the 2002 amended Zero Emission Vehicle component of Phase II of the California Low Emission Vehicle program, in the Commonwealth, beginning in calendar year 2006.

(2) For the purposes of this act, "2002 amended Zero Emission Vehicle component of Phase II of the California Low Emission Vehicle program" is a program being implemented in California, pursuant to the requirements of the federal "Clean Air Act," 42 U.S.C. s.7401 et seq., and is set forth in the California Code of Regulations, Title 13, §1962.

Section 4. Effective Date.

(1) This act shall take effect immediately.

3. Proposed Legislation requiring LEED Standards for State buildings

Administrative Code

Section 508. Erection, Repairs, or Alterations of and Additions to Buildings.

* * *

C.1 All new buildings shall be designed to meet the minimum design standards published in the Leadership in Energy and Environmental Design (LEED) rating system unless the Secretary of the Department of General Services determines that certain LEED criteria cannot be achieved. The Secretary's determination shall be reported to the House and Senate Appropriations Committees.

4. Proposed Public School Code Amendments (Buildings)

Section 2574. Approved Reimbursable Rental for Leases.

Hereafter Approved and Approved Reimbursable Sinking Fund Charges on Indebtedness.

* * *

(b) For new school buildings the approved building construction cost shall be the lesser of

(1) The cost of constructing the school buildings including the cost of essential fixtures and equipment but excluding architect's fees in excess of six per cent (6%) of the contract price, or

(2) The product of the rated pupil capacity as determined by the Department of Public Instruction at the time the project is approved and (i) one thousand one hundred dollars (\$1100) in the case of elementary schools, (ii) one thousand seven hundred dollars (\$1700) in the case of secondary schools, (iii) an amount in the case of combined elementary-secondary schools obtained by multiplying the rated elementary pupil capacity by one thousand one hundred dollars (\$1100) and the rated secondary pupil capacity by one thousand seven hundred dollars (\$1700) and dividing the sum by the total rated pupil capacity.

(3) The provisions of clause (2) of subsection (b) hereof shall apply to all school building projects for which the general construction contract is awarded prior to July 1, 1966, and for approved school building projects for which a lease was approved by the Department of Public Instruction prior to July 1, 1966. For school buildings for which the general construction contract is awarded subsequent to July 1, 1966 and for approved school building projects for which the general construction contract was awarded but for which a lease was not approved by the Department of Public Instruction prior to July 1, 1966, the product of the rated pupil capacity as determined by the Department of Public Instruction at the time the project is approved and (i) two thousand three hundred dollars (\$2300) in the case of elementary schools, (ii) three thousand dollars (\$3000) in the case of secondary schools, (iii) an amount in the case of combined elementary-secondary schools obtained by multiplying the rated elementary pupil capacity by two thousand three hundred dollars (\$2300) and the rated secondary

pupil capacity by three thousand dollars (\$3000) and dividing the sum by the total rated pupil capacity.

(3.1) For school buildings for which the general construction contract is awarded subsequent to July 1, 1984, and for approved school building projects for which the general construction contract was awarded but for which a lease or general obligation bond resolution was not approved by the Department of Education prior to July 1, 1984, the product of the rated pupil capacity as determined by the Department of Education at the time the project is approved and (i) three thousand nine hundred dollars (\$3,900) in the case of elementary schools, (ii) five thousand one hundred dollars (\$5,100) in the case of secondary schools, (iii) an amount in the case of combined elementary-secondary schools obtained by multiplying the rated elementary pupil capacity by three thousand nine hundred dollars (\$3,900) and the rated secondary pupil capacity by five thousand one hundred dollars (\$5,100) and dividing the sum by the total rated pupil capacity.

(4) For school buildings adhering to minimum design standards published in the Leadership in Energy and Environmental Design (LEED) Rating System for which the general construction contract is awarded on or after July 1, 2002, , the product of the rated pupil capacity as determined by the Department of Education at the time the project is approved and (i) four thousand seven hundred dollars (\$4,700) in the case of elementary schools, (ii) six thousand two hundred dollars (\$6,200) in the case of secondary schools, (iii) an amount in the case of combined

elementary-secondary schools obtained by multiplying the rated elementary pupil capacity by four thousand seven hundred dollars (\$4,700) and the rated secondary pupil capacity by six thousand two hundred dollars (\$6,200) and dividing the sum by the total rated pupil capacity. No payment shall be approved until the Department has certified that the minimum design standards of the LEED Rating System have been included.

(c) For additions or alterations to existing buildings approved building construction cost shall be the lesser of

(1) The cost of constructing the additions or alterations including the cost of essential fixtures and equipment but excluding architect's fees in excess of six per cent (6%) of the contract price, or

(2) The difference obtained by subtracting the appraisal value of the existing building from the product of rated pupil capacity of the altered or expanded building as determined by the Department of Public Instruction at the time the project is approved and (i) one thousand one hundred dollars (\$1100) in the case of elementary schools, (ii) one thousand seven hundred dollars (\$1700) in the case of secondary schools, (iii) an amount in the case of combined elementary-secondary schools obtained by multiplying the rated elementary pupil capacity of the altered or expanded building by one thousand one hundred dollars (\$1100) and the rated secondary pupil capacity of the altered or expanded building by one thousand seven hundred dollars (\$1700) and dividing the sum by the total rated pupil capacity of the altered or expanded building. Appraisal value shall be the

valuation made immediately before the additions or alterations are begun by three competent appraisers, one appointed by the school authorities, one by the Superintendent of Public Instruction, and the third by the other two.

(3) The provisions of clause (2) of subsection (c) hereof shall apply to all school building projects for which the general construction contract is awarded prior to July 1, 1966 and for approved school building projects for which a lease was approved by the Department of Public Instruction prior to July 1, 1966. For school buildings for which the general construction contract is awarded subsequent to July 1, 1966 and for approved school building projects for which the general construction contract was awarded but for which a lease was not approved by the Department of Public Instruction prior to July 1, 1966, the difference obtained by subtracting the appraisal value of the existing building from the product of rated pupil capacity of the altered or expanded building as determined by the Department of Public Instruction at the time the project is approved and (i) two thousand three hundred dollars (\$2300) in the case of elementary schools, (ii) three thousand dollars (\$3000) in the case of secondary schools, (iii) an amount in the case of combined elementary-secondary schools obtained by multiplying the rated elementary pupil capacity of the altered or expanded building by two thousand three hundred dollars (\$2300) and the rated secondary pupil capacity of the altered or expanded building by three thousand dollars (\$3000) and dividing the sum by the total rated pupil capacity of the altered or expanded building. Appraisal value shall be the valuation made

immediately before the additions or alterations are begun by three competent appraisers, one appointed by the school authorities, one by the Superintendent of Public Instruction, and the third by the other two.

(3.1) For school buildings for which the general construction contract is awarded subsequent to July 1, 1984, and for approved school building projects for which the general construction contract was awarded but for which a lease or general obligation bond resolution was not approved by the Department of Education prior to July 1, 1984, the difference obtained by subtracting the appraisal value of the existing building from the product of the rated pupil capacity of the altered or expanded building as determined by the Department of Education at the time the project is approved and (i) three thousand nine hundred dollars (\$3,900) in the case of elementary schools, (ii) five thousand one hundred dollars (\$5,100) in the case of secondary schools, (iii) an amount in the case of combined elementary-secondary schools obtained by multiplying the rated elementary pupil capacity by three thousand nine hundred dollars (\$3,900) and the rated secondary pupil capacity by five thousand one hundred dollars (\$5,100) and dividing the sum by the total rated pupil capacity of the altered or expanded building.

(4) For school buildings adhering to minimum design standards of the Leadership in Energy and Environmental Design (LEED) Rating System for which the general construction contract is awarded on or after July 1, 2002, the difference obtained by subtracting the appraisal value of the existing building

from the product of the rated pupil capacity of the altered or expanded building as determined by the Department of Education at the time the project is approved and (i) four thousand seven hundred dollars (\$4,700) in the case of elementary schools, (ii) six thousand two hundred dollars (\$6,200) in the case of secondary schools, (iii) an amount in the case of combined elementary-secondary schools obtained by multiplying the rated elementary pupil capacity by four thousand seven hundred dollars (\$4,700) and the rated secondary pupil capacity by six thousand two hundred dollars (\$6,200) and dividing the sum by the total rated pupil capacity of the altered or expanded building. No payment shall be approved until the Department has certified that the minimum design standards of the LEED Rating System have been included.

5. Proposed Public School Code Amendments (Transportation)

Section 2541. Payments on Account of Pupil Transportation. --

(a) [School] Except as provided for in section (a.1), school districts shall be paid by the Commonwealth for every school year on account of pupil transportation which, and the means and contracts providing for which, have been approved by the Department of Education, in the cases hereinafter enumerated, an amount to be determined by multiplying the cost of approved reimbursable pupil transportation incurred by the district by the district's aid ratio. In determining the formula for the cost of approved reimbursable transportation, the Secretary of Education may prescribe the methods of determining approved mileages and the utilized passenger capacity of vehicles for reimbursement purposes. For the

school year 1998-1999 and each school year thereafter, any school entity which contracts with one or more school entities to provide pupil transportation services shall be reimbursed in accordance with the formula specified by the Department of Education for district-owned vehicles. In addition thereto, the Commonwealth shall pay to each district qualifying a payment for excessive cost of transportation, said amount to be determined by subtracting from the cost of the approved reimbursable transportation the sum of the Commonwealth transportation payment immediately above, plus the product of one-half mill (0.0005) times the latest market value of the district as determined by the State Tax Equalization Board, provided such amount is not negative. In addition thereto, the Commonwealth shall pay to school districts which own their own vehicles, an annual depreciation charge of ten per centum (10%), to be calculated on the basis of the approved cost at which the district acquired the vehicle for which depreciation is claimed. With respect to vehicles purchased prior to January 1, 1956, the number of depreciation payments shall be limited to ten such payments. With respect to vehicles purchased on or after January 1, 1956, the annual depreciation charge shall not exceed seven hundred dollars (\$700) for such vehicles. The number of annual depreciation charges shall be limited, so that the total amount of such payments shall not exceed the cost of the vehicle as approved by the Department of Education at the time of the purchase. [In] Except as provided for in subsection (a.1), in no case shall the Commonwealth pay, in

depreciation charges, more than ten thousand five hundred dollars (\$10,500) for any one vehicle.

(a.1) For school districts purchasing and operating dedicated alternative fuel vehicles or school districts contracting for the operation of dedicated alternative fuel vehicles, the amount to be paid by the Commonwealth for every school year on account of pupil transportation which, and the means and contracts providing for which, have been approved by the Department of Education, shall be the total determined by the formula contained in subsection (a) and an additional two per centum (2%). In addition thereto, the Commonwealth shall pay to school districts which own their own vehicles and which replace their own vehicles with dedicated alternative fuel vehicles, an annual depreciation charge of twelve per centum (12%), to be calculated as specified in subsection (a). With respect to vehicles purchased on or after January 1, 1981, the annual depreciation charge shall not exceed one thousand, five hundred dollars (\$1,500) for such vehicles. The number of annual depreciation charges shall be limited, so that the total amount of such payments shall not exceed the cost of the vehicle as approved by the Department of Education at the time of the purchase. In no case shall the Commonwealth pay, in depreciation charges, more than twenty five thousand dollars (\$25,000) for any one vehicle.

(1) For the purpose of this subsection, the term “dedicated alternative fuel vehicle shall mean a vehicle which runs exclusively on an alternative fuel.

(2) For the purpose of this subsection, the term “alternative fuel” shall mean a motor vehicle fuel which, when compared to conventional gasoline or reformulated gasoline, will result in lower emissions of oxides of nitrogen (NOx), volatile organic compounds (VOC), carbon monoxide (CO), particulates or any combination thereof. These include compressed natural gas (CNG), liquefied natural gas (LNG), liquid petroleum propane gas (LPG), alcohols hydrogen, hythane (H2 and CNG), electricity, coal-derived liquid fuels, fuels other than alcohol derived from biological materials, and other fuels that the Secretary of the United States Department of Energy determines by rule as meeting the requirements of section 301 of the Energy Policy Act of 1992 (42 U.S.C.A. 13211(2)).

* * *

APPENDIX B - Summaries of Site Visits and Public Hearings

PUBLIC HEARING ON HR 224 PITTSBURGH, PENNSYLVANIA FEBRUARY 26, 2002

James M. Seif, Vice President, PPL Services, PPL Corporation

Mr. Seif's testimony focused on the need to develop new energy sources and uses, and on the importance to maintain a balanced and diverse portfolio. He noted that there should be a balance between heavy fossil fuels and renewables. Mr. Seif cited hydroelectric, the use of waste methane, wind power, and fuel cells as growing in importance in PPL's approach to providing energy with a watchful eye toward protecting the environment.

Mr. Seif further stated that the free market is an important part of developing renewable energy sources. He noted the success of the Commonwealth's deregulation of the electricity generation industry.

He stated that a flexible regulatory framework for the power industry to explore new energy sources is preferable to an environment in which the government anoints certain technologies with grants and loans. In closing, Mr. Seif recommended that the Commonwealth serve as an advocate for innovation within the parameters of the free market.

Dan Lazzara, Chief Operating Officer, Westinghouse Plasma Corporation

Mr. Lazzara's testimony explained the process of plasma gasification and its use in energy generation. Plasma is the word used to describe a very high

temperature, ionized gas. For example, the surface of the sun exists as plasma. The Plasma Gasification Reactor converts “opportunity fuels” (such as coal, municipal solid waste, and industrial sludge) into plasma, which can then be used to power steam generators or fuel cells. Undesirable by-products, such as fly ash and dioxins, are eliminated in the process. The plasma can also be converted into liquids such as diesel fuel or ethanol.

The Westinghouse technology has been demonstrated in Japan in a waste-to-energy plant and is entering its commercial phase there. Mr. Lazzara stated that Westinghouse Plasma Corporation’s desire to build a demonstration plant in Pennsylvania is a first step in commercializing the technology with Pennsylvania’s energy generators.

Barry Kukovich, Public Relations Director, Katz Graduate School of Business, University of Pittsburgh

Mr. Kukovich divided his testimony into two topics, power and transportation. He described the importance of the two programs. First, he noted the success of the State’s Low-Income Usage Reduction Program. He spoke about Green Building Technology for energy conservation and the promise of DEP’s new building in Cambria County with regard to energy savings. Mr. Kukovich described ice storage as a means of easing the workload of air conditioning units, and its demonstrated success in other parts of the country. He told of how water can be stored uphill of turbine generators and released to power the generators when needed. Pumping water uphill for storage can be

accomplished via windmills, thus harnessing an environmentally friendly power source and making good use of it.

With regard to transportation, Mr. Kukovich noted magnetic levitation (MAGLEV) train technology. He also described how selected communities could outfit their municipal fleets with natural gas powered vehicles. He noted that a network of such communities could spawn an infrastructure of natural gas filling stations.

Suzanne Seppi, Director, Group Against Smog & Pollution

Ms. Seppi discussed fossil fuel usage, especially in transportation, and its associated pollution problems facing Pennsylvania and the United States. She discussed various ways to reduce reliance on petroleum, including raising CAFE standards, further development of AFVs through incentives, and joining the Low Emission Vehicle Program. Ms. Seppi encouraged the State to subsidize and assist schools in moving from traditional diesel buses to alternative ultraclean buses.

She went on to recommend that the State develop a growth strategy to control urban sprawl. This strategy would serve to reduce roadway construction and boost the use of public transportation. Ms. Seppi also recommended the development of personal power and on-site power generation via cleaner energy sources.

She concluded by encouraging the State to continue its support of energy programs.

Peter Wray, Chair, Allegheny Group, Sierra Club

Mr. Wray said that the Sierra Club recommends that the State Legislature's priorities include cleaner air, water, and restoration of environmentally damaged lands, as well as opportunities for economic growth in renewable energy technologies.

Mr. Wray listed a number of energy, technology, and resource developments which are creating opportunities for Pennsylvania to take advantage of renewable energy sources, conservation and efficiency measures. He made note of Pennsylvania's use of wind power, the Utility Restructuring and Customer Choice Act, and net metering as providing Pennsylvania with favorable opportunities. He encouraged the Legislature to move ahead with speed, political fortitude, and confidence to enhance the economy, provide durable jobs, and to protect the health of the people and environment.

Joan Miles, Western Pennsylvania Outreach Coordinator, Penn Future

Ms. Miles focused her remarks on energy efficiency. She recommended that the State government provide education and incentives that will lead to greater energy efficiency. These suggestions included distribution of time-of-use

meters and appliance control devices, improved efficiency of the energy markets and energy efficiency audits of government facilities.

She concluded by stating that it is Penn Future's belief that the State government has a responsibility to look for alternative energy sources.

**TOUR OF THE ENERGY INSTITUTE, COAL UTILIZATION
LABORATORY, COLLEGE OF EARTH AND MINERAL SCIENCES,
PENN STATE UNIVERSITY, UNIVERSITY PARK, PENNSYLVANIA
FEBRUARY 27, 2002**

On Wednesday, February 27, 2002, members of the task force toured the Energy Institute at Penn State University.

Prior to the tour, the tour participants gathered for a series of presentations on the various research programs being undertaken at the Energy Institute. Dr. Harold Schobert described the purpose, goals and activities of the Institute. He stated that the purpose of the Energy Institute is to facilitate faculty research projects in energy science and engineering and that the goal is to conduct fundamental and applied research in energy extraction, refining and conversion of fuels, combustion and environmental issues. He stated that approximately 140 people work full or part-time at the Institute, and they include faculty, research staff, support staff, visiting scholars and graduate and undergraduate students. He stated that the Institute also develops partnerships with industry, government and institutions of higher learning. Following Dr. Schobert's overview of the Institute, several faculty members gave presentations focused on their respective areas of expertise.

Mr. Bruce Miller lectured on the use of fuel flexible boilers as an approach to stabilizing fuel prices and fuel supply, addressing environmental issues and enhancing energy security by using Pennsylvania's indigenous resources. He said that the use of traditional fuels, such as natural gas, fuel oils and coal can be augmented by the addition of coal-water mixtures, synfuels, petroleum coke, biomass, sewage sludge and animal fats and vegetable oils.

Dr. Andre L. Boehman described the development of a dimethyl ether (DME)-fueled shuttle bus demonstration project.

Dr. Dennis Buffington talked about the relationship between energy and agriculture. He noted that such a relationship could involve a comprehensive study of the Statewide impacts of producing ethanol in a corn-deficit state such as Pennsylvania. He stated that the production of ethanol in Pennsylvania would stimulate rural economies, increase job opportunities and provide byproducts for animal feed but that producing ethanol in Pennsylvania would also increase the import of out-of-state corn, have a financial impact on farmers who buy corn and result in the farming of marginal lands.

Following Dr. Buffington, Dr. Chunshan Song gave a presentation on natural gas conversion and developing more efficient ways for comprehensive utilization of hydrocarbon resources in making and using ultraclean fuels.

Dr. Schobert gave a presentation on the importance of finding ways to displace imported petroleum with Pennsylvania coal. He said that Prototype JP-900, a jet fuel, can be produced by blending refined chemical oil (a coal tar

product from the metallurgical coke industry) with light cycle oil from catalytic cracking, using existing refining infrastructure. He noted that in the future, jet fuel will be used as a coolant as well as for propulsion energy. Furthermore, he said studies show that some Pennsylvania anthracite coals can be used to make specialty graphite used by the steel and aluminum industries.

Mr. Joel Morrison concluded the presentations by stressing the need to stimulate energy technology development via public and private partnerships in Pennsylvania and the United States.

The participants were then taken on a tour of the various laboratories of the Institute.

SITE VISIT AT LOWER MERION SCHOOL DISTRICT MARCH 1, 2002

Rep. Ellen Bard, Rep. Wallis Brooks, members of the task force, and legislative staff visited the Lower Merion School District to obtain information on the use of compressed natural gas (CNG) school buses. Details of the district's bus fleet and its experience with CNG buses were provided. This information was also provided at a public hearing which focused on natural gas issues and which was held subsequent to the site visit.

A video prepared by the CNG Cylinder Corporation detailed the safety of using CNG. Among the safety features noted were that CNG burns at a temperature which is 600 degrees higher than the temperature at which gasoline burns and that CNG does not ignite at the pressures at which it is vented in an

emergency situation. To demonstrate the safety of the CNG cylinder, cars were dropped from various heights to simulate crashes at high speeds, and the CNG cylinders remained intact. An exploding half stick of dynamite caused a mere 1/16-inch dent in a CNG cylinder, and a full stick of dynamite caused the cylinder to vent through its valve. Even with fire surrounding the CNG cylinder, the gas did not ignite. Armor piercing projectiles were fired into the cylinder, but again, the gas safely vented and did not ignite.

The tour participants then toured the school district's two fueling stations, which include 60,000 cubic feet of storage and two compressors. Because the compressors can be loud, noise attenuation was included in the design of the fueling stations.

The tour ended with a ride on a CNG fueled school bus.

**PUBLIC HEARING AT SENIOR CITIZEN CENTER OF ARDMORE
ARDMORE, PENNSYLVANIA
MARCH 1, 2002**

Michael Andre, Supervisor of Transportation, Lower Merion School District

Mr. Andre stated that seven years ago, the Lower Merion School District began to acquire CNG buses in order to rid the area of the noise and fumes associated with a fleet of diesel buses and that since that time the district's bus fleet has grown to 102 school buses, 68 of which are dedicated CNG vehicles.

He said that the district transports students approximately one million miles a year by CNG bus and that since the first CNG bus was acquired, the

district has logged 3.6 million miles on the CNG buses and has never experienced a delay or failure in getting the children to school or home because of the use of CNG.

Mr. Andre testified that a CNG school bus costs approximately \$20,000 to \$25,000 more than a diesel school bus, and installing a fueling station like Lower Merion's costs between \$300,000 and \$500,000. Thus, he noted that the initial cost can be an impediment for districts that, historically, have been low on funds. Mr. Andre said that amendments to the State's reimbursement formulas for school buses might help these districts replace their diesel buses with CNG buses. In addition, he noted that the Commonwealth's Alternative Fuel Incentive Grant (AFIG) program provides funds for the purchase of alternative fuel vehicles and the installation of fueling infrastructure. Mr. Andre added that Lower Merion applied for and received \$1.2 million in grants for its CNG bus program, most of which came from the AFIG program.

Reed Horting, Vice President, Gas Supply and Transportation, PECO Energy Company, and Paul Miles, PECO Energy Company's Technical Services Group

Mr. Horting and Mr. Miles testified that increasing reliance on foreign oil threatens the security and economic well being of the Commonwealth and the nation and that almost 70 percent of the petroleum used in Pennsylvania is used for transportation. They stated that more funding is needed for research and development into alternative fuels, and funding is also needed to expand natural gas infrastructure so that it is available to consumers. They said that without the

ability to refuel, consumers will not buy AFVs. They testified that there are 20 CNG fueling stations in the Philadelphia area but that not all of these stations are accessible by the public. They added that eight are owned by PECO, eight are privately owned (including those owned by the Lower Merion School District), and four are owned by Philadelphia Gas Works. They noted that of the eight stations owned by PECO, only 300 gallons of gasoline equivalent were sold in the last month. They also stated that Pennsylvania's tax structure formerly supported AFVs, however, the tax incentives have been eliminated.

They said that incentives are needed to attract businesses to the Commonwealth to develop and build alternative fuel infrastructure and that while the current low demand for alternative fuels would not attract these businesses, an opportunity, such as an exclusive arrangement in a particular region, might do so. They noted that an anchor concept might also help attract these businesses and that the Philadelphia airport, for example, could require that a certain percentage of the taxis, shuttles and buses providing transportation to and from the airport be AFVs. They said that infrastructure would then be needed in various locations to refuel these vehicles.

They testified that utility companies have extended their gas mains where economical, but State and local requirements regarding paving and relocation have greatly increased the cost of extending gas mains. They concluded by saying that in addition to the needed extension of natural gas infrastructure, State-

sponsored incentives are needed to help consumers with the costs of converting their homes and businesses from oil to gas.

Mason Hemphill, Marketing Representative for M.A. Brightbill Body Works, Inc. (Eastern Pennsylvania distributor for Blue Bird school buses)

Mr. Hemphill testified that natural gas vehicles became widely available in the early 1990's. He noted that natural gas school buses are ideal for transport that involves early morning ignition, travel with frequent stops and starts, and the desire for less noise and fumes. Mr. Hemphill stated that the school bus industry is still primarily diesel, however, because there is nothing to drive the conversion to natural gas. He said that John Deere and Caterpillar make CNG engines. He testified that CNG engines cost \$40,000 to \$50,000 more per engine than a diesel engine and that a CNG bus costs \$40,000 to \$60,000 more per bus than diesel, depending on the configuration of the bus. Mr. Hemphill stated that the \$20,000 to \$25,000 more per bus that Lower Merion School District paid for its buses is a better price than normal due to the volume of business. He added that the cost keeps school districts from considering conversion to CNG and that Blue Bird has received no inquiries regarding CNG school buses from school districts other than Lower Merion. He noted that increased demand would result in more CNG vehicles being manufactured and in lower prices.

Vince Tomasso, President, Air & Gas Technologies, Inc. and Mark Smith, Sales Manager for northeastern United States, FuelMaker Corporation (manufacturers of on-site natural gas and hydrogen refueling systems)

Mr. Tomasso testified that Air & Gas Technologies, Inc. has been involved in installing CNG refueling stations since 1992 and that 85 percent of the CNG stations in New Jersey were designed and installed by the company. He said that many companies have entered and left the business as they found that they could not do business by continuously offering low bids and by cutting corners on service and equipment. He noted that due to the expense of refueling equipment, it is imperative that equipment be purchased from a company with a proven record of performance and support for its product. He related an example of what can happen when doing business with an unproven company, testifying that the United States Postal Service bought a conversion system, and the company that sold it to them could not support its own warranty claims and subsequently went out of business. He added that ultimately, the Post Office had thousands of vehicles that could not run because of the lack of system support.

Mr. Tomasso stated that because expense is a consideration in switching from one type of fuel to CNG, it is important to purchase a properly-sized system. He added that the smallest compressor that can handle the expected load is optimal so that the cost of electricity, maintenance and replacement parts can be kept as low as possible.

Mr. Smith testified that FuelMaker manufactures modular refueling systems that enable the system to grow as the owner's needs grow, (e.g. when more cars are added to a company's fleet). He said that a small unit for use by an individual sells for approximately \$6000, which is too costly for some

individuals. He noted that when this cost is added to the cost of a CNG Honda Civic GX, which costs \$4,000 more than a similar gasoline powered car, a consumer would be required to invest a total of \$10,000 more than if he or she purchased a gasoline powered vehicle. He said that incentives would help individuals purchase and use CNG vehicles. He also testified that FuelMaker is developing a unit that should retail for under \$1000 and run on 110 volts of electricity. He said that the unit is projected to be available sometime in 2003.

Mr Smith said that natural gas has been 25 percent to 30 percent cheaper than gasoline over the last ten years and that with current gasoline prices at about \$1.25 per gallon and CNG at \$.85 or \$.90 for a gasoline equivalent amount, natural gas is significantly cheaper. He added that a gas station could offer fast-fill CNG to the public for an investment of about \$50,000 to \$70,000.

He testified that New Jersey makes Federal Congestion Mitigation and Air Quality (CMAQ) funds available to municipal governments to purchase AFVs and that grants are given in the amount of \$4000 for light-duty dedicated AFVs and \$2000 for bi-fuel vehicles.

Mr. Smith added that under Governor Pataki's direction, New York State has embraced alternative fuel technologies. He said that New York considered and tested various models, including electric and propane vehicles, and decided on dedicated CNG vehicles. He noted that to establish the needed CNG infrastructure, New York set up 30 fueling centers statewide, each using two of the larger FuelMaker compressors, a card management system and a card reader.

He added that the state now uses about 2,000 dedicated CNG vehicles and is considering heavy-duty CNG vehicles. He said that in order to provide the infrastructure for these larger vehicles, which require more fuel, the state has begun to build 16 large commercial refueling stations.

He also noted that Mack Trucks, Inc., is working on producing CNG heavy-duty vehicles at its manufacturing plant in Macungie, Pennsylvania.

Amy Weigand, owner of a bi-fuel gasoline/CNG Ford Contour

Ms. Weigand testified that in 1998, when her family needed a new car and decided to purchase an AFV, Honda's gasoline/electric hybrid Insight was available only in California, and Toyota's hybrid Prius was not available until the following year. She added that this is why her family investigated the natural gas option. Ms. Weigand noted that due to uncertainties about the ability to access a CNG fueling station, her family purchased a bi-fuel gasoline/CNG Ford Contour, at a cost of \$4,000 more than the gasoline model. She stated that her family received a \$2,000 Federal grant through the Clean Cities Program, netting \$1,850 after the mandatory \$150 Clean Cities membership dues were paid, and that the grant would have been for the full \$4000 if her family had purchased a dedicated CNG vehicle.

She testified that the car has a 4.8 gallon equivalent CNG tank in the trunk. Ms. Weigand said that at 20 to 22 MPG in the city and 25 MPG on the highway, the car can travel 80 to 125 miles on a tank of CNG. She noted that

PECO had originally allowed her family to refuel at its Ardmore facility which was only a few blocks from their home. Ms. Weigand stated that in 2000, PECO closed that facility and that the family must now travel to a refueling station in Plymouth Meeting which is 20 minutes from their home. Ms. Weigand stated that the CNG itself, including the compressor fee, tax and surcharge, equals a cost per gallon equivalent of about \$0.70. However, added to this is a quarterly customer charge of about \$14, meaning that the overall cost per gallon equivalent has fluctuated between \$1.08 and \$2.03, depending on the family's usage of the vehicle, which has declined since the closing of the Ardmore refueling station.

She added that despite the pre-purchase assurances of the dealership regarding service, the mechanics have not proven to be informed about the needs of a CNG system, and parts have not been routinely available.

She stated that a positive result of owning the car is its emissions and that the vehicle's 2000 emissions test shows zero emissions of carbon monoxide and hydrocarbons and a nitrous oxide level of 20 parts per million (ppm) – with the acceptable level being 1,088 ppm.

Ms. Weigand said that her family has decided that its next AFV will be a hybrid electric vehicle. She noted that the Toyota Prius has zero emissions during slow and moderate speed driving and does not rely on non-renewable resources for fuel. She added that the Prius recycles the energy generated while braking and while running on gasoline at higher speeds, to recharge its battery, thus, avoiding the need to be plugged into an electrical outlet to be recharged.

Ms. Weigand said that even with the ability to own a private refueling appliance at home, the family would not purchase a CNG vehicle again because of the risks and unknown ability to refuel during trips away from home. She stated that the Clean Cities Program offers a book, which lists CNG refueling stations, but when her family used this book to plan a trip through the northeastern part of the United States, they found that many stations were either closed or no longer available to the public. Ms. Weigand also said she sees CNG as an interim fuel for AFVs and considers hybrid electric and fuel cells to be the future for AFVs.

Mark Brody, owner of a 2000 hybrid gasoline/electric Toyota Prius

Mr. Brody testified that Toyota sells the Prius at a loss to help get it on the market. He stated that while it costs Toyota about \$30,000 to manufacture a Prius, the Prius sells for about \$20,000. He added that Toyota also offers a certain number of free scheduled maintenance sessions. Mr. Brody said that the Prius must be ordered, and delivery usually occurs about four or five months after the order date. He said that the car is getting 43 to 44 MPG in mostly stop and go city driving.

Mr. Brody explained that when stopped in traffic, the gasoline engine completely shuts off, so that there is no noise, vibration, or exhaust fumes, and the electric motor battery recharges. He added that the car's computer screen indicates when the battery is recharging and which energy source is running the

car and that the car alternates between the electric engine and gasoline, depending on speed and driving conditions.

**PUBLIC HEARING ON HOUSE RESOLUTION 224
YORK, PENNSYLVANIA
MARCH 6, 2002**

The main focus of this public hearing was biofuels. Rep. Ellen Bard presided over the hearing. Rep. Arthur Hershey and Rep. David Argall also participated. Live and/or written testimony was received from various interested individuals and entities.

Dan Sharrer, Vice-President of AgCom, Inc.

Mr. Sharrer testified to the benefits of soydiesel, which he produces and uses in 26 tractor-trailers. Mr. Sharrer stated that it costs approximately \$2,500 to retrofit a truck to run on a 20 percent soy/80 percent diesel blend. Mr. Sharrer said that a fuel heater is needed to prevent soy oil from gelling in cold weather and that currently the greatest impediment to the wider use of soydiesel is the cost due to taxes. He advocates eliminating various State and Federal taxes so that soydiesel is able to become more competitive with diesel fuel.

Rick Handley, Director of the Northeast Regional Biomass Program

Mr. Handley testified that achieving significant reductions in imported petroleum will take time. He said that he encourages Pennsylvania to designate and support its State Department of Agriculture as its lead agency on biofuels. He

noted that Pennsylvania would need to determine whether it has enough fields available to produce ethanol, using corn as a source. He suggested the possibility of using alternative feedstocks, grains imported into the State and techniques such as double cropping or planting new crops to produce ethanol. However, Mr. Handley also added that alternative feedstocks are currently more expensive than corn to convert into ethanol. He encouraged the Department of Agriculture to work with Pennsylvania farm organizations to look at crop demonstration projects with the United States Department of Energy (DOE). Mr. Handley noted that there is extensive activity on the subject of biofuels at the Federal level, and he suggested that the State Legislature direct Pennsylvania's Congressional delegation in regard to the kinds of efforts and initiatives it would like it to pursue.

Mr. Handley said that producers are likely to lead the endeavor to build ethanol facilities, via regional efforts, in the northeastern United States. He suggested that the State consider investment and other tax credits for Pennsylvanians who participate in developing and operating these regional facilities, regardless of the location of the facility.

Robert Barkanic, Pennsylvania Department of Environmental Protection (DEP)

Mr. Barkanic advocated wider use of ethanol and biodiesel. He noted that these are the most viable motor vehicle fuels for strengthening Pennsylvania's energy security.

Mr. Barkanic added that ethanol provides many environmental benefits. He testified that studies on air emissions from vehicles using ethanol show reduced amounts of CO₂ and a 55 percent reduction in emissions of air toxics when compared to gasoline. He added that ethanol breaks down easier than gasoline in groundwater, if spilled or leaked; however, in his written testimony, Mr. Barkanic cautioned that due to the chemical nature of ethanol, when small amounts of it (10 percent or less) are added to gasoline, the resultant fuel is more volatile than either gasoline, or E85. He testified that ethanol at these levels can lead to adverse effects on air quality and added that most ethanol in use today in the United States is an additive to gasoline in amounts of 10 percent or less.

Mr. Barkanic also stated that current ethanol production using corn and/or grain feedstocks can be energy intensive and require the use of considerable agricultural acreage. He recommended that the economics of corn-based ethanol in Pennsylvania be looked at very closely to determine whether Pennsylvania-based plants could compete with the large plants in the Midwest.

Mr. Barkanic testified that the environmental benefits of using biodiesel (specifically, B20) are that the soybean oil portion of the blended fuel is non-toxic, reducing particulates, toxics, and carbon dioxide emissions. However, he cautioned that tests have shown there is a slight increase in NO_x emissions with the use of B20.

He noted that DEP recommends: (1) exploring avenues that will assist in the development of Pennsylvania-based ethanol production, especially those using

developing technologies which make use of cellulosic feedstock; (2) developing State government coordinating mechanisms, such as a biomass/bioenergy task force coordinated between the Departments of Agriculture and Environmental Protection; (3) balancing a more prominent use of ethanol and biodiesel with care to protect air quality statewide; and (4) proceeding with caution on Federal mandates that may not only impede the State's progress in providing clean air for its citizens but also subsidize large Midwestern agricultural concerns at the expense of Pennsylvania.

Jim Peeples, United States Representative for AAE Technologies

Mr. Peeples is the United States Representative for AAE Technologies, a small fuel development company working on developing and commercializing a product known as E-diesel, an ethanol-diesel blended fuel. He is also Vice-President of PMC Marketing Group. Mr. Peeples testified that ethanol, specifically E85, is readily available and that he has supplied it to the United States Postal Service in South Florida as well as to six military bases. He stated that he has also been in negotiations to provide E85 to the United States Postal Service in Philadelphia.

Mr. Peeples testified that there is an array of feedstocks which can be used to produce ethanol and that ethanol currently can be produced more economically, using various feedstocks, than was previously possible. He added that ethanol is an excellent substitute for toxic and carcinogenic octane boosters, which are

currently used by gasoline refiners. He also noted that E85 is a lower cost alternative than compressed natural gas (CNG) because the infrastructure issues for E85 are not as substantial. He also stated that he believes ethanol can play a role in powering fuel cells, although he noted that the use of fuel cells to power automobiles is unlikely to occur for another 15 years.

Mr. Peeples testified that there is great pressure on the diesel industry and users of diesel fuel to clean up emissions, but some of the solutions, such as CNG for use in fleets and urban buses, are expensive due to the high cost of infrastructure and the maintenance costs associated with CNG vehicles. He noted that biodiesel is a very efficient fuel in that it can be used in existing infrastructure and in existing diesel equipment without modification. He added that there are good emissions reductions associated with biodiesel, although he acknowledged there are NOx problems with some biodiesel fuels. He stated that B100 (100 percent neat biodiesel) has great potential for use in underground mines to reduce health and safety risks to miners. He added that B100 also has great potential as a marine fuel because it breaks down quickly or evaporates, and it does not pollute when discharged.

Mr. Peeples spoke of the economic benefits of promoting ethanol, noting that a number of states in the Midwest have concluded that for every dollar invested in ethanol plants through producer incentives, they have received \$2.50 in terms of direct and indirect economic activity, taxes returned to the state, and other returns.

William Ehrman, Executive Director, York County, Pennsylvania, Solid Waste Authority

Mr. Ehrman spoke in regard to using solid waste to generate energy (i.e., waste-to-energy (WTE) resource recovery systems). He testified that 1.5 to 2.0 tons of solid waste is produced by the average home in the United States in one year. He said that WTE technology serves to reduce the volume of trash by about 90 percent, resulting in a 90 percent decrease in the amount of land required for trash disposal.

He added that WTE facilities provide a stable, reliable source of energy and that the annual average number of barrels (bbl) of oil that are conserved as a result of WTE facilities is as follows: York County – 550,000 bbl.; Pennsylvania, 3,720,00 bbl; and the United States as a whole, 49,255,000 bbl. Mr. Ehrman noted that in York County, enough electricity to power 20,000 homes is generated via WTE systems and that in Pennsylvania, 134,000 homes are powered by WTE systems.

Mr. Ehrman testified that a booklet published jointly by the U.S. Conference of Mayors, the American Society of Mechanical Engineers, and others indicates that the energy produced from a WTE facility is approximately as clean as the energy from a natural gas-fired power plant.

John Dernbach, Professor of Law, Widener University School of Law, Harrisburg, Pennsylvania

Professor Dernbach spoke in regard to carbon taxes and global warming. He noted that there is widespread support for carbon taxes among economists. He testified that there are two approaches that can be taken to implementing carbon taxes: (1) impose a tax on carbon, carbon dioxide, or fossil fuels simply to raise revenue or (2) have a tax to raise a certain amount of revenue and then reduce taxes on income on profits by a corresponding amount. Professor Dernbach added that the latter approach is called a tax shift because it shifts the base of taxes toward energy and materials and away from labor and profits. He stated that many European governments, particularly northern European governments have adopted some kind of carbon tax. He noted that we have learned the following from the European experience with carbon taxes:

- (1) Carbon taxes have been adopted to reduce greenhouse gases and other emissions in the environment;
- (2) Carbon taxes work by discouraging the use the fuels that are subject to the tax, encouraging conservation and the use of energy alternatives;
- (3) We, as a society, need to pay attention to the distribution of these taxes to avoid imposing greater burdens on the poor;
- (4) It is important to proceed with implementation of carbon taxes, gradually, and increase them over time, and it is helpful if the ultimate tax rate for a

particular thing is indicated in order to reduce transition costs and allow planning for alternatives; and

- (5) Carbon taxes have many benefits, including producing a more efficient economy, reducing pollutants and encouraging development of new technologies and renewable energy sources.

Professor Dernbach noted that legislation proposing a carbon tax has been introduced in Minnesota and in Vermont.

Professor Dernbach testified that more carbon dioxide in the atmosphere leads to surface warming and rising sea levels and that warmer ocean water takes up more space. He testified that a four to ten degree increase in surface temperatures is predicted by the year 2100 and that this will have a negative effect on health, business and the environment in Pennsylvania. He recommended a renewable energy portfolio standard to deal with the problem of warming. He explained that the point of a renewable standard is to increase the use of renewable fuels by a certain total amount, by a specific date, and that if an entity exceeds its requirements, it can sell its credits to those not meeting their requirements. He testified that it is important to use legal tools such as this to harness the creativity and energy of the private sector. Professor Dernbach also stated that Pennsylvania emits one percent of the world's greenhouse gases, which is more than some countries, and added that anything that can be done to reduce this level is worth doing.

Dan Wolff, Pennsylvania Corn Growers' Association

Mr. Wolff testified that he believes there is no problem relative to reducing Pennsylvania's feed supply by using corn for ethanol production.

Mr. Wolf said the current trend in Pennsylvania is that fewer acres are being farmed and that there is limited livestock expansion. He noted that ethanol and biodiesel are emerging as the additives of choice in response to environmental concerns.

He suggested that Pennsylvania be aware of opportunities to promote alternative sources of energy. He recommended that Pennsylvania consider relaxing its road tax for oxygenate additives. He testified that Pennsylvania should recognize the benefits of producing what it uses and that, in this regard, jobs would be created, and other benefits would be derived from producing fuel near its final point of consumption. He added that the State should consider making low-interest loans available for plant construction and should consider providing grants to help promote initial activity in bio-energy production.

David J. Webster, Vice President of Project Development, Masada OxyNol, LLC

Mr. Webster provided written testimony that renewable fuels are a vital component of our long-term energy policy. He testified that ethanol is a cleaner burning fuel than oil and that it helps decrease air pollution by reducing the production of greenhouse gases and other harmful toxic pollutants. He also testified that Masada OxyNol has patented a process that converts household

garbage and sewage sludge into fuel ethanol in a process which reuses or recycles over 90 percent of the incoming waste stream.

Mr. Webster testified that Masada OxyNol is currently under contract with the City of Middletown, New York to build a waste-to-ethanol facility. He added that this facility is designed to produce 9.5 million gallons of ethanol annually and will provide over 350 construction jobs in addition to creating 200 new permanent jobs. Mr. Webster stated that groundbreaking for this facility is scheduled for later in 2002.

Mr. Webster noted that Masada OxyNol favors the establishment of a renewable fuel standard as a way to increase national energy security, stimulate economic growth, and help protect the environment.

American Petroleum Institute (API), Associated Petroleum Industries of Pennsylvania

Via written testimony, API testified that focusing on one energy source, while neglecting others, could lead to unintended consequences for the environmental and economic well being of the Commonwealth. API testified that a strategy for the Commonwealth must recognize the regional, national, and international nature of some energy markets and that states should allow issues associated with fuel formulation to be addressed at the Federal level through broad policy directives. API noted that, most important, the State must rely primarily on the private sector, working through free markets, rather than strict government mandates with their unintended consequences. API stated that

government can help introduce new and innovative products by supporting research and development but that government should not distort the marketplace by mandating the public use of a particular product at the state level.

API testified that the United States' oil and natural gas industry is not anti-biofuel, and that API's concerns over biofuel mandates have focused on the proper role of government in regulating fuels, not on the use of biofuels, per se.

API also testified that it is difficult and costly to refine reformulated gasoline (RFG) blendstock for use with ethanol that meets Federal Clean Air Act requirements and that in addition, ethanol cannot be transported through the existing petroleum product pipeline network, which transports the majority of petroleum products in the United States. API added that gasoline and ethanol must be blended at bulk terminals near the point at which the final product is sold and that addressing this challenge requires significant capital investments for the creation of new refining and distribution infrastructure.

API testified that biodiesel may hold some promise as a viable fuel option in certain areas of the country. However, it noted that the use of biodiesel has somewhat mixed environmental impacts. API stated that the use of biodiesel reduces some vehicle emissions, but that it raises others, adding that the true environmental impact of the fuel must be studied in greater detail.

Joe Biluck, Jr., Director of Operations and Technology Medford Township, New Jersey, Board of Education

Mr. Biluck testified in writing that his school district received funding for a four-year study, beginning in 1997, to use biodiesel in its school buses. He stated that at the beginning of the project the cost of No. 2 diesel fuel was about \$0.65 per gallon and the cost for biodiesel was \$1.83 per gallon. He testified that in 1997, Medford Township was the only school bus fleet in the United States to use biodiesel and that since that time, there has been an increase in the number of fleets across the nation which are using the fuel.

Mr. Biluck testified that the attractiveness of biodiesel is that it provides a seamless integration into an existing diesel fleet in that there are no vehicle or infrastructure modifications required in its implementation. He stated that part of the requirements of the project required extensive emission testing to be performed on a sample of the fleet both prior to and following the introduction of biodiesel. He noted that these tests showed a significant reduction in the targeted emission in the buses using biodiesel. Mr. Biluck added that due to the higher cetane rating and oxygen content of biodiesel, diesel engines run smoother. Furthermore, Mr. Biluck stated that biodiesel offers increased lubricity over conventional petroleum and that this adds to the performance of diesel engine components. Mr. Biluck also noted that the cost of biodiesel has decreased approximately \$0.55 since the beginning of Medford Township's project in 1997.

SITE VISIT: TOUR OF PINE GROVE ANTHRACITE COAL REGION
April 12, 2002

On Friday, April 12, 2002, Rep. Ellen Bard, Rep. David Argall, task force members and legislative staff were taken on a tour of the Pine Grove anthracite coal region. The tour was arranged by task force member Duane Feagley of the Pennsylvania Anthracite Coal Council. The tour covered a number of sites in the Pine Grove region, including the Pine Grove School District Campus, the Blaschak Coal Corporation Raven Run Site and the Gilberton Power Plant.

The first two stops of the tour provided a lesson in comparison for the participants. These two stops were to a school building heated by a coal stoker and to another school building that is heated by a heat pump. Mr. Feagley had pointed out, in a prior meeting of the task force, that operation of the coal stoker heated school costs \$20,000 annually, while the heat pump heated school costs \$125,000 to \$150,000 annually to operate. The tour participants were informed that the coal stoker operation uses fine “pea” anthracite, which is automatically introduced into the furnace

The tour proceeded to the Blaschak Coal Corporation Raven Run site, a reclamation site. On its way to this site, the tour participants traveled through areas of serious devastation caused by coal mining activities in the nineteenth and twentieth centuries. The tour participants noted large swathes of land which had been cut from surrounding hills and mountains and the resulting “culm” banks of waste material from the mining activities. The participants were informed that efforts are being made to reclaim these devastated areas. The Blaschak Coal Corporation Raven Run site is an example of one such reclamation effort. The

tour participants learned that the area is being seeded and that the hope is for vegetation to succeed in the inhospitable soil.

Following the visit to the reclamation site at Raven Run, the members traveled to the Gilberton Power Company plant, a co-generation plant that converts waste coal into electricity. Company President John W. Rich, Jr. gave a presentation on the activities of the company. He also described a new process which could have dual benefits in ridding the landscape of huge unsightly culm banks and in providing coal-based oil, which could result in a degree of independence from imported oil. The process, which is new to the United States but which was introduced in Germany during World War II (and later in South Africa) is known as indirect coal liquefaction. The company is working on a demonstration project and is seeking both Federal and State funding.

APPENDIX C: Project Summaries

Throughout its work, the task force focused on ways to displace the consumption of foreign petroleum in the Commonwealth. The members documented various projects to serve as examples of the types of programs and technology that would directly or indirectly lead to the displacement of foreign petroleum. These projects generally fell into the categories of conservation (using less energy), efficiency (using equipment that consumes less energy), and substitution (using another source of energy in place of foreign petroleum). The projects that were offered for consideration are summarized below.

Early in the deliberations of the task force, members submitted projects to be assessed through various criteria as discussed in the body of this report. The “project summaries” below are one aspect of those submittals and appear in their original form. Some of these projects were ultimately selected by the task force as recommendations and may have undergone modifications to meet various concerns. Therefore, in the case where any project summary has become a recommendation, it is that recommendation, rather than the project summary, which reflects the will of the task force.

The project summaries, below, appear in the order of their ranking, by sector, as determined by the members of the task force.

TRANSPORTATION

ETHANOL

Ethanol is an alcohol that is fermented from starches, most commonly from corn, which can be used as a fuel for vehicles. Cellulosic biomass such as trees and grasses are also usable feed stocks for making ethanol when used in conjunction with an acid hydrolysis process.

Ethanol has been considered for use in vehicles for many years. In fact, Henry Ford intended it to be the primary fuel for the Model T.

The Clean Air Act Amendments of 1990 required that oxygenated fuels be sold in areas where unhealthy levels of carbon monoxide exist. Ethanol is blended into gasoline thereby replacing gasoline by volume. E10 contains 10 percent ethanol, 90 percent gasoline. E-85 contains 85 percent ethanol, 15 percent gasoline. It is estimated that one barrel of ethanol replaces two barrels of petroleum at the refinery.

All automobile manufacturers that do business in the United States approve the use of ethanol blends. These manufacturers are selling cars and trucks that are capable of running on ethanol blends and gasoline. Ethanol production plants have been built in 20 states, primarily in the Midwest, and more continue to be built. While ethanol has the potential to be used Statewide in passenger and commercial gasoline vehicles, there are currently no ethanol fueling stations in Pennsylvania. However, consideration is being given to building ethanol plants in several regions in Pennsylvania. Existing retail

gasoline stations can supply ethanol blends based on company decisions and availability.

CLEAN CARS CAMPAIGN – ADOPTING LOW EMISSION VEHICLE (LEV) II PROGRAM AND THE ZERO EMISSION VEHICLE (ZEV) PROGRAM

The Clean Cars Campaign seeks the adoption of California's LEV II and ZEV program into law in Pennsylvania. The LEV II portion offers more stringent tailpipe and evaporative emission regulations for all new passenger vehicles. The ZEV portion requires that manufacturers ensure that a certain percentage of their incoming year's fleet of vehicles, made ready for sale in Pennsylvania include specific low-emission cars. Manufacturers have a certain amount of flexibility when meeting the mandate. Under the option most likely to be chosen by carmakers, 2 percent of the total number of vehicles produced by a manufacturer for sale in Pennsylvania must be battery electric vehicles. These vehicles are most likely to be purchased by State agencies, municipalities or companies that utilize private fleets of vehicles. Another 5 percent of the total number of vehicles produced by a manufacturer for sale in Pennsylvania by a manufacturer would have to be "advanced technology vehicles," such as hybrid-electric vehicles or cars that run on alternative fuels, such as natural gas, propane or ethanol. Finally, another 30 percent of the total number of vehicles produced by a manufacturer for sale in Pennsylvania would have to meet California's Super Ultra Low Emission Vehicle (SULEV) certification.

The LEV II and ZEV mandate will result not only in significant energy savings but also in pollution reduction. Approximately 1,084,050 barrels of oil will be saved in the first year of adoption. The total amount of oil saved is compounded in subsequent years as vehicles from the first year of adoption continue to provide savings, and new production years add more savings. This project would not involve retrofitting existing vehicles but would apply only to new model year vehicles as determined by legislation. The cost of implementing stricter emission standards under LEV II were estimated by the California Air Resources Board to be from \$100 to \$300, depending on the size of the vehicle. The cost of implementing the ZEV and Advanced Technology Vehicle (ATV) portion of the program is not quantifiable due to changing prices associated with these vehicles. Major new infrastructure is not necessarily required to meet program goals.

LANDFILL GAS TO VEHICLE FUEL

This project uses the byproducts of landfill operations to produce compressed natural gas (CNG) or liquefied natural gas (LNG) for use in dual fuel or natural gas vehicles. The landfill gas clean-up technology produces a very clean dry stream of gas which is between 970 and 980 BTUs per cubic foot. Such a product is known as pipeline quality. By further compressing the gas, it could be available as compressed gas for vehicles or as liquefied natural gas. The cost for LNG is approximately \$1.10 per gallon, while the cost of CNG is somewhat lower.

It costs approximately \$7.5 million to construct a landfill gas to vehicle fuel plant, including the cost of the fueling station. Such a plant has been in operation at the Valley Landfill in Penn Township, Westmoreland County since June 2001. Operations are scheduled to start in the near future at the Monroeville Landfill and at locations in Morgantown and Lancaster, Chester and Allegheny Counties. This project has Statewide potential. The projected average daily production from a large landfill is approximately 50,000 to 100,000 equivalent gallons of petroleum.

Natural gas is used by a number of fleets including the Port Authority of Allegheny County; BARTA in Berks County; CATA in State College; the Lower Merion School District and the United Parcel Service.

INDIRECT COAL LIQUEFACTION

The generic process of indirect coal liquefaction involves two distinct steps. First, coal is gasified (i.e., reacted with steam and oxygen) to produce a mixture of carbon monoxide and hydrogen that is known as synthesis gas. Second, the synthesis gas is reacted in the presence of a catalyst to produce hydrocarbons. Depending on specific conditions chosen for the second step, it is possible to make any desired hydrocarbon, including methane, gasoline, jet fuel, diesel fuels and waxes. The process is versatile and can be tailored to produce high yields of a particular product. The process was used on a large scale in Germany, during World War II, and has been used in South Africa since 1950.

An indirect coal liquefaction plant would be a new facility and not a retrofit to an existing plant. Currently, there is a facility under construction in Schuylkill County, which will cost approximately \$310 million to build. Studies performed within the past ten years suggest that indirect liquefaction would be economically feasible at petroleum prices of approximately \$35 per barrel. However, if the plant were run to co-produce electricity, then estimated equivalent petroleum prices are in the range of \$30 to under \$25 per barrel. The plant under construction in Schuylkill County is planned to produce 5,000 barrels per day, or 1.6 million barrels annually, assuming 90 percent on-stream time.

The types and quantities of byproducts depend on two things: the composition of the specific coal used and the exact kind of coal gasification process selected. All such plants will produce, as byproducts, coal ash, ammonia and sulfur. The ammonia and sulfur can be sold for by-product credits. The coal ash, removed as liquid slag, also has potential by-product credit. For example, coal ash has been considered for use as road fill and synthetic fiberglass products. Modern gasified designs produce no other significant by-products. However, older types produce a coal tar by-product which is a source of chemical products.

COAL GASIFICATION TO ULTRACLEAN FUELS

The production of fuel for transportation using coal gasification, is modeled after facilities operated in South Africa by the Sasol Company. Such a facility produces 1.55 million barrels of fuel annually resulting in a yield of 62,152,000 gallons per year. The process of indirect liquefaction involves several

steps. Micronized anthracite waste is mixed with water and then pumped into an entrained flow gasifier. The resulting syngas is delivered to a Fischer-Tropsch process. The liquid produced is 0 percent sulphur transportation fuel. The cost is approximately \$1.10 per gallon. This finished ultraclean fuel liquid can be mixed with existing liquid fuels, such as diesel and gasoline, and distributed through the existing infrastructure. The process produces byproducts such as steam which can be used for co-generation and other heating uses and a clean crushed glassy, non-leaching material which can be used for building products, road construction and clean landfill.

This project is planned for operation in Frackville, Pennsylvania and will use an existing waste coal processing plant. In addition, the project will have a Chevron Texaco entrained flow gasifier and use a Sasol synfuels Fischer-Tropsch process. The cost to construct such an operation is approximately \$400 million. The project is positioned to take advantage of an abundant supply of coal and waste coal in Pennsylvania. It will produce an ultraclean transportation fuel while concomitantly removing the environmental hazard inherent in waste coal piles. Furthermore, it will establish Pennsylvania as a model for a developing industry. In addition, it will provide jobs for Pennsylvania's coal and related industries.

DIRECT COAL LIQUEFACTION

The direct conversion of coal to synthetic liquid fuels is known technology with potential to displace a large percentage of the petroleum used in the Commonwealth. This process was a large-scale operation in Germany from about

1933 to 1945. Direct coal liquefaction is a process in which, essentially, a synthetic crude oil is produced from coal by adding hydrogen – either from gaseous hydrogen or from a so-called “hydrogen donor solvent” – to the coal molecules. Many Pennsylvania coals, particularly those of high-volatile bituminous rank, are excellent feedstocks for this process. However, it is thought that anthracite is not suitable for this process. A 1990 study published by the National Research Council suggests a capital cost of \$2.9 billion for a plant producing about 27 million barrels per year of synthetic petroleum (about one-tenth of Pennsylvania’s consumption annually). If one plant is constructed using a 1990 design, about 25 million barrels of oil would be displaced each year in the Commonwealth.

PHILADELPHIA G-R ETHANOL

This project will convert municipal solid waste (MSW) to fuel grade ethanol. The plant, currently under site negotiations, is hoped to be under construction by late 2002, and will recycle/reclaim 6,000 tpd of MSW and produce ethanol from organics, via hydrolysis of cellulose and ultimate fermentation of sugars. Total investment value of the project is \$485,000,000 which is primarily equipment and includes foundations, storage bins, a conveyor system, fermentors, a boiler, heat exchangers, control valves, air compressors and other items. Using a HHV of ethanol of 83,961 BTUs/gallon (USDA) and based on estimated production of 235,000 gallons, this project would offset 3,400 gallons of petroleum daily.

RAILWAY ELECTRIFICATION

This project would replace diesel locomotives on railways with electric locomotives, thus saving all diesel fuel consumed by railway locomotives. Furthermore, if long-haul trucks went by trailer on flat car or container freight traffic, a fraction of diesel consumed by long-haul trucks would be displaced as well.

The process involves electrifying the railway system so that the locomotives operate electrically, via overhead centenary wire systems, thus displacing diesel locomotives. The technology is widely available since most of the European and Japanese rail systems are electrified. Some European freight haulage involves driving the entire tractor-trailer unit onto special flat cars and accommodating the truck drivers in passenger coaches, so that trucks and their drivers form a single unit train. Locomotives could be imported from Europe or European designs could be copied and built in the United States.

While there is no cost data for equipment or infrastructure, the project would clearly require a massive investment in overhead wires (or electrified “third” rails, depending on the technology adopted), rail yard infrastructure and locomotives.

ENHANCED INTERMODAL FREIGHT TRANSPORTATION

Railroad diesel electric locomotives are three times more efficient than diesel highway trucks and operate under stringent Federal emissions

requirements. With renewed emphasis on freight movement by train, increased intermodal movements could occur throughout the Commonwealth.

Intermodal freight transport consists of placing cargo boxes on railroad flat cars. The containers are moved by train to major metropolitan areas or intermodal distribution hubs, removed from the railroad cars, attached to the motor cab portion of a tractor trailer and driven to a final destination.

The key Pennsylvania intermodal hubs are Rutherford Yards, Harrisburg; Beth Intermodal, Bethlehem; Harrisburg Intermodal, Harrisburg; Pitcairn Yards, Pittsburgh; Taylor Yards, Scranton and Morrisville and Ameriport in the Philadelphia region.

Intermodal freight transportation will result in less congestion and wear on the highway and interstate system, less pollution, improved safety for motorists and a significant reduction in diesel fuel consumption.

COAL TAR BLENDING

The coal tar blending process involves the blending of two materials: a byproduct of the metallurgical coke industry, known as refined chemical oil (RCO) and a petroleum refinery process stream known as light cycle oil (LCO). The RCO and LCO are blended in a refinery and then reacted with hydrogen to reduce impurities. About 80 percent of the resulting product is jet fuel; the remainder is light material that can be further refined as gasoline and heavy material that might serve as diesel or heating oil. A mixer is the only retrofit item

needed. Otherwise the process takes advantage of existing equipment at metallurgical coke plants and oil refineries.

This process has been successfully tested by PARC Technical Services, Harmarville, Pennsylvania. Pending final trials, the process will be ready for implementation at United Refining Company, Warren, Pennsylvania. Commercialization could occur as early as 2003. Based on an annual Pennsylvania consumption of 16 million barrels per year of jet fuel, this process could displace eight to twelve million barrels of jet fuel annually.

DEVELOPMENT OF COMPRESSION IGNITION NATURAL GAS (CING) ENGINES FOR THE CONVERSION OF DIESEL ENGINES

This project proposes the development of an advanced natural gas engine involving operation on the compression-ignition cycle for application in off-road diesel vehicles and diesel-fueled equipment. The intent is to increase natural gas engine efficiency without sacrificing the particulate emissions benefits provided by natural gas fuel. This will enable a total class of engines (from 15hp to 4,000hp) to operate on an efficient cycle while reducing NOx and particulate matter emissions. The project will cost approximately \$750,000 to support a three-year program of research and development and technology transfer. It would involve development of the CING engine concept and a knowledge base for conversion of the off-road diesel vehicles and engines to the CING combustion process. The prototype injected gas-fueled engine would employ fuels produced from Pennsylvania's indigenous resources and agricultural products and by-products. The pilot project would include studies of fuel

formulation via a bio-refining process. The final stage will be the transfer of this knowledge and process to relevant commercial and agricultural entities in the Commonwealth.

The retrofit of off-road diesel engines and vehicles would include the equipment to convert these systems to natural gas fueling. This could raise the cost by \$1,000 to \$10,000 for light-duty to heavy-duty engines and vehicles. This project's impact on infrastructure would include the expansion of natural gas production and distribution facilities throughout the Commonwealth. The project would also require an expansion of compressed natural gas (CNG) delivery capability.

The project has the potential of displacing 10 percent of Pennsylvania's current use of 1,990,000 gallons of No. 2 diesel fuel daily or the equivalent of 3,250,000 barrels of petroleum annually.

CONTINUOUS SUPERCRITICAL EXTRACTION SYSTEM FOR RECYCLING USED OIL

This project introduces a revolutionary chemical technology that provides an environmentally friendly and efficient alternative to existing technologies employed to recycle used oil. The present process is complex, costly and time consuming and produces industrial burning fuel and waste components that require further processing. The new technology involves a continuous separation and reaction of chemical fluids and non-toxic supercritical fluids to separate industrial fluids, such as used oil, into sub-components. The waste products, such as chlorinated hydrocarbons and other contaminants, are removed and the purified

oil is available for recycling as an acceptable lubricant rather than being destroyed as a fuel source.

The project would require the construction of a pilot plant to validate the design and operational process with parameters at the rate of one gallon per minute flow rate. The project could then be assembled into a full-scale industrial-sized multiple gallon per minute system. The approximate initial cost of the project is \$300,000. The cost of equipment, such as pump modules, vessel modules, a chiller module, safety and plumbing and engineering assembly amounts to \$228,000.

More than 1 million barrels of oil, annually, can be saved by implementing this technology.

CO-COKING

The co-coking process is a modification of delayed coking which is a standard operation in many oil refineries. Heavy process streams, such as distillation residua or the heavy products from catalytic cracking are sent to a coker. The principal product is a solid petroleum coke. Depending upon the characteristics of the feedstock and coking conditions, coke of various qualities can be produced. The coke may only be useful as fuel with a nominal value of \$20 per ton. However, premium coke is extremely valuable for the manufacture of various carbon materials and commands prices in excess of \$400 per ton. The liquid product from delayed coking is sent to other refinery operations and ultimately contributes to various products, such as gasoline and diesel fuel.

A proposed location for a co-coking operation is in Warren County, Pennsylvania. This process would use an existing oil refinery infrastructure. The only new infrastructure required would be the necessary coal handling equipment needed to bring the coal into the refinery and the mixing equipment to blend the crushed coal into the petroleum stream being fed to the coker. There are no real byproducts because everything produced in the co-coking process finds a use. The liquid from the coker would be processed back through the refinery. The coke would be used as fuel or converted to premium carbon products. It is possible that by 2005, 10 percent of petroleum-derived jet fuel could be displaced, yielding a savings of about 1.6 million barrels of petroleum annually.

GOVERNMENT

ENERGY EFFICIENCY UPGRADES AND AN ADVISOR FOR EXISTING COMMONWEALTH AGENCY OWNED AND LEASED FACILITIES

This project recommends that all State agencies should be required to assess the buildings they occupy to determine if a performance contract would significantly reduce energy use. If appropriate, the agency should retain a performance contractor.

Energy usage by Commonwealth agencies costs approximately \$100 million annually. The Commonwealth may be able to save \$25 million annually if buildings occupied by State agencies are energy efficient.

BIODIESEL FUEL EVALUATION

In June 2001, the Commonwealth's Department of Transportation (Penn DOT) began a pilot project to evaluate the feasibility of using biodiesel fuel in its dump trucks. Evaluation of the project is expected to continue through June 2002. A variety of issues will be considered before determining how to proceed, including how the project performs in various weather conditions and range of temperatures, and in operational tasks. Furthermore, Penn DOT will evaluate the availability of biodiesel fuel, projected costs, the impact of EPA diesel emissions regulations and other factors. A final report will be prepared and presented to PennDOT's Strategic Management Committee regarding the success of the project and the future utilization of biodiesel in all diesel-powered equipment owned by PennDOT.

The project consists of six trucks in Philadelphia County and one truck at PENNDOT's Eastern Pennsylvania Training Facility. Additional vehicles will be added to the project at PENNDOT's Quehanna Training Center in Clearfield County. These vehicles, which include three dump trucks, one loader and three excavators, will be added to test the impact of cold temperature (-15°F) on biodiesel fuel and the operation and maintenance of equipment. The standard mix of biodiesel is 80 percent petroleum-based diesel fuel and 20 percent ester-based oxygenated fuel made from soybean oil, vegetable oil or animal fat. PENNDOT uses approximately nine million gallons of fuel annually to operate 2,250 single, tandem and tri-axle dump trucks and over 6,000 other pieces of diesel-powered

equipment. If implemented Statewide, nearly two million gallons of diesel fuel could be replaced with biodiesel. There are no costs associated with equipment modification. At the end of the testing period, PENNDOT will determine whether the program should be expanded throughout the Commonwealth or whether it should be discontinued.

COMPRESSED NATURAL GAS (CNG) SCHOOL BUSES

The Commonwealth's approximately 19,000 school buses are ideal candidates for the use of alternative fuels, such as compressed natural gas (CNG). The viability of CNG in school buses has been proven by the Lower Merion School District in suburban Philadelphia and Harbor Creek School District in Erie.

Presently, two of the three United States' school bus manufacturers offer alternative fuel school buses in a variety of engine and chassis configurations. School districts making a commitment to convert their fleets could continue purchasing the same school buses from the same manufacturers and distributors with the only change being the choice of engine and fuel.

The current competitive bid process for the purchase of school buses would remain unchanged. School districts would need to install alternative fuel infrastructures while maintaining conventional fuel infrastructures. Training for repair technicians could be accomplished through a variety of sources, such as engine/chassis manufacturers, vocational/technical schools, community colleges or peer training.

The incremental cost of a CNG school bus, versus a comparably equipped diesel school bus is currently about \$30,000. However, the cost differential may narrow as CNG buses gain greater market share.

Each fleet converting to CNG would need to install a CNG fueling station. Capital costs could be minimized if neighboring districts could share fueling infrastructures. Construction of a fast fill CNG fuel station with the capacity to fuel a fleet the size of Lower Merion School District's (which uses 900 gasoline equivalent gallons daily) would cost approximately \$500,000.

Approximately 19,000 school buses transport students daily throughout the Commonwealth. Assuming each bus operates 15,000 miles annually, at a fuel efficiency of 10 miles per gallon, each bus consumes 1,500 gallons of fuel annually. Statewide, that figure approximates 28,500,000 gallons, or 678,571 barrels, of petroleum annually. By replacing 10 percent of the Commonwealth's school buses by 2005, Pennsylvania could displace approximately 67,857 barrels of oil annually.

GREEN COMMONWEALTH BUILDINGS

Green Commonwealth Buildings are designed with energy efficiency and environmentally sound considerations in mind. In the past year, under the auspices of the Governor's Green Government Council, the Commonwealth has incorporated green building concepts in the design and construction of all new office buildings owned by the Commonwealth. Several State agencies have undertaken green building projects, including the Departments of Conservation

and Natural Resources, Environmental Protection, Transportation, General Services, and the State System of Higher Education. A green building is designed to utilize a focused systems integration process. Such a process minimizes redundancy, maximizes efficiency and downsizes or eliminates system components. The nationally accepted design and evaluation tool “Leadership in Energy and Environmental Design” (LEED) is available for design professionals.

An example of a green building which is energy efficient and environmentally sound is the State’s Department of Environmental Protection (DEP) building in Cambria County. According to the United States Department of Energy (DOE), the average office building uses an energy equivalent of 513 barrels of oil at 5,880,000 BTUs per barrel (42 gal x 140,000 BTUs/gal). In its first year of operation, the Cambria green building used 421,560 KWh, the energy equivalent of 243 barrels of oil, a reduction of 52 percent. The average energy use in a green building is 40 percent of that used when compared to a traditional building. The building is equipped with permanently installed energy consumption monitoring equipment. Building construction costs are currently estimated at \$90.00 per square foot, well within the range for a traditional office building in Cambria County. Thus, opportunities exist for future reduction in oil consumption by requiring that new Commonwealth buildings meet green building energy efficiency standards.

DISPLACING FOREIGN OIL AT STATE FACILITIES WITH PENNSYLVANIA ANTHRACITE AND BITUMINOUS COAL

Coal and stoker technology has been in use in Pennsylvania for over 75 years. Anthracite and bituminous coal are used at over two dozen facilities around the State. It is estimated that over 135,000 barrels of oil could be displaced annually using this technology.

The coal is fed into two gravity feed stoker units and burned on a grate. The ashes fall through the gates and are mechanically distributed into storage units. The ash storage units are rotated and emptied. There are currently several units on the market. One unit type is the CNB Tri-Fuel Boiler. The by-product of burning coal is ash. In the case of anthracite coal, about 10 percent per ton of the coal burned will remain as ash. This is about 200 lbs. of ash for every 2,000 lbs. of coal. This boiler provides flexibility. The boiler can burn oil, gas or coal. It can also burn coal and oil or coal and gas at the same time. The company that supplies the technology, Combustion Services & Equipment Company, is a Pennsylvania based manufacturing operation employing local workers. Furthermore, the use of Pennsylvania anthracite contributes to the reclamation of the Commonwealth's land and water resources.

FAYETTE THERMAL LLC, SCI FAYETTE, PENNSYLVANIA

This project provides for a steam plant for heating, hot water and air conditioning on a long-term contract with a State correctional institution. The contract will be for a 20-year period with two five-year extensions. Steam will be

produced for an integrated HVAC facility by utilizing a circulating fluidized bed coal boiler. The system uses both waste coal and natural gas. The waste coal is a low quality, high ash end product. It will not require any special infrastructure. The use of waste coal is important in the reclamation of abandoned surface coal operations. It is expected that this project will displace over 31,000 barrels of oil annually, rising to 35,000 barrels annually after approximately five years of operation.

DEVELOPMENT OF BIODIESEL FUEL PRODUCTION STRATEGIES AND FORMULATION FOR PENNSYLVANIA

This proposal is for a research and development project and study in regard to production of biodiesel fuel from Pennsylvania resources. Pennsylvania is not a major producer of soybeans, the preferred feedstock for the production of biodiesel. The program would utilize undesirable and waste by-products of agricultural, forest and food processing industries. The production and disposal of wastes in the Commonwealth would be decreased as a consequence. However, the implementation of biodiesel in existing diesel vehicles and off-road diesel engines may not be 100 percent beneficial on exhaust emissions. Some studies are needed to evaluate the impact of biodiesel fuel on the regulated emissions from classes of engines affected.

Approximately \$1 million would be needed to support a three-year program of research and development. It would involve development of bio-refining strategies tailored to Pennsylvania's indigenous resources, agricultural products, and by-products. Furthermore, studies of fuel formulation and

utilization are essential to the development of the bio-refining process. The final stage is transfer of this knowledge and process to relevant commercial and agricultural entities within the Commonwealth.

The project would not require retrofit of in-service diesel engines beyond the addition of fuel heaters, which cost approximately \$300. Production facility fabrication would require a substantial investment to produce roughly 800 gallons of biofuel daily for blending at fuel distribution terminals serving the Commonwealth. There is the potential for 20 percent displacement of the Commonwealth's current daily use of 3,983,000 gallons of No. 2 diesel fuel. This amounts to a total displacement of 797,000 gallons of petroleum daily or 6,500,000 barrels of petroleum annually.

UNITED STATES DEPARTMENT OF ENERGY – VISION 21

Vision 21 is DOE's new initiative for developing technology needed for ultra-clean, 21st century energy plants. The overall goal is to eliminate effectively, at competitive costs, environmental concerns associated with the use of fossil fuels for producing electricity and for transportation purposes. Vision 21 is based on three premises: (1) the reliance on fossil fuels for a major share of energy needs in the 21st century, (2) the utilization of a diverse mix of energy resources, including coal, gas, oil, nuclear, biomass and other renewables, and (3) the knowledge that research and development directed at resolving energy and environmental issues can produce affordable ways to make energy conversion systems meet strict environmental standards.

Vision 21 is a government/industry/academia cost-shared partnership to develop the technology basis for integrated energy plants that will, early in the 21st century, result in the deployment of ultra-clean plants which produce electricity and, where it makes economic sense, “opportunity” products, including clean transportation fuels, high value-chemicals, synthesis gas and hydrogen. Vision 21 plants will effectively remove environmental constraints as an issue in the use of fossil fuels. Emissions of traditional pollutants, including smog and acid rain will be near zero, and the greenhouse gas, carbon dioxide, will be reduced 40 to 50 percent by efficiency improvements, and reduced to zero, if coupled with sequestration (absorbing and storing carbon dioxide in biomass, such as forests). Vision 21 is fundamentally different from the traditional fossil energy research and development program to develop improved power system technology. While traditional approaches addressed different areas of power technology separately, Vision 21 aims to integrate multiple advanced technologies in order to create systems that achieve breakthrough improvements in performance and cost.

RESIDENTIAL

WEATHERIZATION ASSISTANCE PROGRAM

The Weatherization Assistance Program is available in every county in Pennsylvania. The program has been in operation for 25 years and is supplied through a network of local providers. A client who is certified to participate in the program receives an energy audit that determines what energy conservation

measures will be installed in his residence. The audit is followed by an interview with the client that includes an energy education component. The work is then assigned either to a crew from the agency or to a subcontractor who is certified to deliver services. Upon completion of the work, a quality control inspection by the agency and a third party inspection are performed. The client then signs off on the measures installed in the home, and the unit is processed for payment. The work is subject to further inspection by the State in a random selection process.

In addition to the initial energy audit, the process includes a blower door diagnostic test, duct testing, air infiltration sealing, and may include insulation, appliance replacement, a furnace test and furnace and other required repairs. Infrared imaging may be used to locate heat or cold sources. There is no cost to the client, and material, labor and subcontractor costs are paid by the local agency.

In fiscal year 1999-2000, over 7,000 homes in Pennsylvania received Weatherization services. Significant savings are realized for low-income clients who routinely pay approximately 14 percent of net income for utilities. The average weatherized home saves 3,000,000 BTUs, reduces pollution, and identifies and addresses health and safety issues. Pennsylvania's weatherized homes displaced an equivalent of 37,600 barrels of oil during fiscal year 1999-2000.

REFLECTIVE ACRYLIC COATED “COOL ROOFING”

The United States has an inventory of approximately 50 billion square feet of low slope (flat) roofs. Approximately 75 percent of these roofs are black or very dark in color. These dark surfaces increase air conditioning loads on the buildings and increase utility costs. Because electricity cannot be stored, peak demands often outstrip supply resulting in brownouts and rolling blackouts. Air conditioning costs for houses with low slope roofs can be reduced by applying a reflective acrylic roof coating to the roof surface. These cost savings have been quantified and there are mathematical models for estimating the cost savings available on the Internet at www.roofcalc.com and the Oak Ridge National Laboratory websites. Energy cost savings vary based on location, building use, utility costs and roof design specifics.

The benefits of applying a reflective acrylic roof coating extend well beyond reducing the air conditioning costs of buildings since these coatings also lower the internal temperatures of factories and warehouses. The reduced electricity demand also reduces the pollution associated with electricity generation. Greenhouse gases and ozone are reduced, not only by lowering electricity demand but also because ambient air temperature is lower. The air temperature is lower because white-coated building roofs do not absorb solar heat.

CONSERVATION SERVICES FOR OIL-HEATED HOMES

Conservation services have the potential of saving 900,000 barrels of oil annually. Three steps are involved in a conservation service. A home energy

review or audit is performed to examine the integrity of the building involved. Residents have the option of making, or arranging for, a contractor to make improvements to the building, such as adding insulation, adding weather stripping and checking and cleaning heating and water heating systems. The conservation service also includes an educational component to alert the residents to the improvements made and to prepare them to use the structure efficiently.

OIL FURNACE CLEAN AND TUNE SERVICE

An oil furnace clean and tune service for residential dwellings and small commercial businesses may save the equivalent of 111,000 barrels of oil annually. The consumer may be educated about the value of the service by the vendor supplying the appliance or by advertisements in the media. A service technician examines the equipment in a residence or business and performs routine and other necessary maintenance during a single visit. The cost of the service ranges from \$50 to \$250 depending on the vendor and the condition of the equipment. The cost of parts is usually separate from the cost of the service.

RESIDENTIAL SPACE HEATING WITH COAL STOVES

According to the 1990 Federal Census, 132,277 homeowners in the Commonwealth use coal to heat their homes. This figure accounts for 2.9 percent of all occupied housing units in Pennsylvania. Anthracite coal could displace 14,912,900 barrels of oil annually in the Commonwealth's residential sector if all residents were to convert to anthracite coal for heating purposes. Since approximately 2.9 percent of the Commonwealth's homeowners are using

anthracite coal for heating, resulting in a displacement of 1.5 million barrels of oil, converting just an additional 2.1 percent of homeowners (for a total of 5 percent of the Commonwealth's homeowners) to anthracite coal for heating would result in a displacement of an additional 1.1 million barrels of oil, for a total savings of 2.6 million barrels annually.

There are currently three companies in the Commonwealth that manufacture coal burning stoves. These companies employ approximately 130 people in stove manufacturing operations in Schuylkill Haven, Halifax and Bloomsburg. These companies produce Direct Vent Coal Stoves (DVC 500). The DVC 500 utilizes a standard 12,500 BTUs anthracite product on an automated gravity feed stoker mechanism. The heat is transferred from the fire box to the home through a computer controlled forced air vent. The DVC 500 comes standard with a miniature computer which makes constant adjustments to the fuel consumed and to the heat distributed into the house by the blower. The DVC 500 does not require the construction of a conventional chimney. The cost to purchase and install this product is approximately \$3,000. The DVC 500 uses indigenous anthracite, which costs \$100-\$120 per bulk ton delivered.

In addition to displacing foreign petroleum, the manufacture of the DVC 500 will, directly and indirectly, provide jobs for Pennsylvania. An added benefit to the wider use of anthracite coal is that active re-mining will result in the reclamation of land in the coal regions and the cleaning of Pennsylvania's streams.

FURNACE FILTER REPLACEMENT

The routine annual replacement of furnace filters in oil-heated residential dwellings and small commercial buildings has the capacity of saving the equivalent of 139,000 barrels of oil annually. The consumer purchases and installs the furnace filter, which is available at home improvement, hardware and heating systems retailers. The cost of filters ranges from \$5 to \$25 annually. Used filters are disposed of with regular household waste.

OIL-FIRED BURNER REPLACEMENT (RETROFIT WITH HIGH EFFICIENCY FLAME RETENTION BURNER)

Replacing inefficient oil-fired burners with high efficiency flame retention burners and related internal piping and electrical work in residential oil-heated dwellings and small commercial businesses has the capacity of saving 234,000 barrels of oil annually. The cost ranges from \$500 to \$900 depending on the size of the system. Heating contractors and home heating oil dealers perform this type of system installation.

OIL-FIRED HEATING PLANT REPLACEMENT (RETROFIT WITH HIGH EFFICIENCY FLAME RETENTION BURNER)

Replacing inefficient oil-fired heating systems in residential dwellings and small commercial businesses has saved approximately 400,000 barrels of oil annually over the past ten years. The equipment replacement typically includes a new boiler, burner and related piping and electrical work. Efficiencies may be enhanced through appropriate sizing of the replacement system. The cost of a

replacement system ranges from \$2,000 to \$4,000 depending on the size of the system and the specific equipment required.

ENERGY MORTGAGE (EM), ENERGY EFFICIENT MORTGAGE (EEM), ENERGY IMPROVEMENT MORTGAGE (EIM)

Freddie Mac and Fannie Mae provide mortgage guidelines that allow lenders to expand normal home qualifying ratio criteria for homes identified as energy efficient. Using Energy Mortgages (EM's), energy efficiency can be incorporated into the home loan process for both new and existing homes. An Energy Efficient Mortgage (EEM) allows the buyer of a highly efficient house to qualify for a loan with a lower income, while an Energy Improvement Mortgage (EIM) allows the buyer to incorporate costs for energy-saving retrofits into a home loan.

A qualified buyer meets with a participating lender and/or realtor who contacts a Home Energy Rating System (HERS) energy rate-auditor to inspect the home and assign an energy rating to it. The auditor determines what improvements can be made to the home and the cost of improvements including the energy savings. The lender then determines the adjusted mortgage amount and the increased qualifying ratios. The mortgage level is increased because buyers of homes with reduced monthly energy costs can afford more expensive houses because they will have more disposable income than if they buy less efficient homes. This also increases the number of potential homebuyers because people are able to qualify for loans with lower incomes. The cost of the audit is generally between \$350 and \$500 and may or may not be rolled into the mortgage

amount. There is a network of certified rate-auditors and lenders Statewide. Pennsylvania may be able to promote this concept through the Pennsylvania Housing Finance Agency (PHFA) and/or the Weatherization Assistance Program network.

RETROFIT OIL-FIRED WATER HEATER WITH EFFICIENT REPLACEMENT

The replacement of inefficient, often unreliable, water-heating equipment by more efficient appliances in residential dwellings and small commercial businesses may save the equivalent of 35,000 barrels of oil annually. Efficiencies may also be enhanced through appropriate sizing of the replacement system. The cost of replacing a water heating tank and burner ranges from \$1,295 to \$1,695, depending on the size of the tank.

5 kWe SOFC POWER SYSTEMS FOR RESIDENTIAL AND REMOTE APPLICATIONS.

Siemens Westinghouse Power Corporation in Pittsburgh is developing a 5 kWe SOFC power system for residential and remote applications. This project will place in the field a number of developmental 5 kWe SOFC power systems. These systems are ideally suited for residential use because they are sized consistent with domestic electrical and hot water requirements, are highly efficient, quiet, environmentally sound, and can operate using a variety of fuels, such as natural gas, fuel oil, diesel, propane and others.

Examples of remote applications for this product include gas pipeline compressor/pumping stations, oil well heads, mines, remote telecommunication

stations, State and national parks and university laboratories. The 5 kWe SOFC power systems are fully contained, and the remote applications will be equipped for remote monitoring and control.

The cost of the system is currently unknown. However, the development and cost goals of DOE's SECA program (which is focused solely on the development of 5 kWe class SOFC power systems) are \$400/kWe.

A 5 kWe SOFC power system that displaces a comparably sized diesel/oil fuel power system will reduce oil consumption by approximately 50 percent.

COMMERCIAL/INDUSTRIAL/UTILITY

TAX CREDITS FOR INVESTMENT IN POLLUTION CONTROL EQUIPMENT

Electricity generating companies are currently evaluating options for meeting new stringent limits on nitrogen oxide (NO_x) emissions from coal-fired power plants, as well as an expected further tightening of emission limitations on sulphur dioxide, mercury and particulate matter. Some plants may be retired because the owner cannot recover the investment and higher operating costs in a deregulated wholesale power market. Such retirements could result in an increase in oil use for electric generation. This project proposes legislation that would provide an annual tax credit for coal-fired power plants that install air emission control technology and state-of-the-art low-emission boiler technologies. A tax credit against the corporate net income tax for investment in emission control technology will encourage greater continued use of existing coal-fired power

plants, reduce use of oil as a boiler fuel and avoid the greater use of oil due to coal plant retirements.

Emission control technologies eligible for the tax credit include selective catalytic reduction, selective non-catalytic reduction, sulphur dioxide scrubbers, low-NO_x burners, over-fire air systems, particulate control systems, the entire array of clean coal technologies, including multi-pollutant control technologies, as well as low-emission boilers such as circulating fluidized beds. Removing pollutants from the air results in the production of significant volumes of coal combustion by-products, chiefly fly ash, bottom ash and flue gas desulphurization material. All these materials can be recycled or beneficially used as road base, flowable fill, wallboard, synthetic aggregate, anti-skid material, substitutes for cement in concrete, and to neutralize acid mine drainage, among other uses. It is estimated that capital costs for Pennsylvania electric generators for the installation of emission control equipment will exceed \$2 billion over the next three to five years, and total operating costs will increase. This project has the potential to save the Commonwealth a minimum of one to three million barrels of petroleum annually depending on the cost of petroleum in the market.

SOLAR-POWERED WATER PUMPING FOR ROTATIONAL GRAZING

Water supply is one of the most critical components in establishing a rotational grazing system. Since water is typically found at lower elevations it must be pumped. Underutilized grazing lands are often remote and are distant from grid power sources so that alternative energy sources must be used to power

the pumps. A cost effective, reliable and non-polluting means of moving water to and from remote locations is by the use of photovoltaic (PV) solar technology.

Since Spring 1999, 27 systems have been installed in 19 Pennsylvania counties. The total grant for this project was \$128,500. Each system cost an average of \$5,000, with approximately \$1,250 in grant support per system. The result is an estimated savings of 300 gallons of diesel fuel per site, with a total estimated savings of 8,100 gallons of diesel fuel annually for all sites combined.

FOX CHASE GOLF CLUB GEOTHERMAL HEAT PUMP SYSTEM

Since 1991, the 15,000-square-foot clubhouse of the Fox Chase Golf Club in Lancaster County, Pennsylvania has been heated and cooled with six GeoExchange (geothermal) heating and cooling units. This system, which uses vertical closed-loop wells for the heat exchanger, provides hot water for restrooms and the clubhouse kitchen. The geothermal heat pump (GHP) works by taking advantage of the near constant temperature of the earth that exists a few feet below the surface. For example, cooling, air-to-air heat pumps and other air conditioning units found in most homes and businesses actually remove heat from the air in the building through a refrigeration mechanism and move the heat to the outdoors. As summer progresses and the average daytime temperatures rise, conventional air conditioning units find it difficult to expel heat into hot air. Therefore, the system loses efficiency and labors to keep up with cooling demands. In contrast, the GHP uses the same type of refrigeration system to remove heat from the building, but it transfers heat into the cooler earth

The entire installed cost of the GHP was \$40,000, which is approximately \$1,400 more than a conventional packaged rooftop system with electric air conditioning and propane heat. Heating and cooling the clubhouse costs approximately \$.30 per square foot. Total annual energy costs for the Fox Chase Golf Club, including heating, cooling and hot water, average about \$.90 per square foot. The GHP had a payback period of less than 1.2 years. An added bonus of the GHP was the elimination of the need for an unsightly outdoor condensing unit. Annual operating costs are about \$1,200 less than with a conventional system. However, the capital cost of the initial installation of a GHP for industrial or residential applications could be about 50 percent more than for a conventional heat pump system.

PENNSYLVANIA SWITCH GRASS FOR ENERGY AND CONSERVATION

The use of Pennsylvania Switchgrass for Energy and Conservation measures is still in the planning phase of development. The project will be managed by the Penns Corner Resource Conservation and Development Council in Westmoreland County. Conservation reserve rental rates will continue to be paid to landowners under the United States Department of Agriculture program guidelines for agricultural lands. Farmers are eligible for payment on switchgrass harvested over the third year. Rental rates are set at the county level with a reduced payment in harvest years. Conventional harvesting equipment is used to harvest and transport hay. Besides being a Statewide project, the project will

conserve soil and water, improve wildlife habitat and provide value from a limited harvest.

LEHIGH UNIVERSITY INDUSTRIAL ASSESSMENT CENTER (IAC)

Industrial Assessment Centers (IACS) provide technical assistance in plants of small and medium-sized manufacturers nationwide. Teams of engineering faculty and students from the centers, located at 26 universities around the country, conduct energy audits or industrial assessments and provide recommendations to manufacturers to help them identify opportunities to improve productivity, save energy, and to reduce costs and waste. The service is provided at no cost to manufacturers by Lehigh University through funding from DOE. Recommendations from industrial assessments have averaged about \$55,000 in potential annual savings for each manufacturer.

The assessment begins with the IAC team conducting a survey of the plant, followed by a one- or two-day site visit to take engineering measurements as a basis for assessment recommendations. The team then performs a detailed analysis for specific recommendations with related estimates of costs, performance and payback times. Within 60 days, a confidential report detailing the analysis, findings and recommendations of the team is sent to the plant. In two to six months, follow-up telephone calls are placed to the plant manager to verify recommendations that will be implemented. Results of data compiled from the assessments since 1980 are currently available through Rutgers University, Office of Industrial Productivity and Energy Assessment.

BIOMASS CROPS FOR PENNSYLVANIA FARMERS

This project involves evaluating biomass production from willow and hybrid poplar and developing basic data on the potential from the growth of these crops. First, the yield in dry tons per acre is determined. Next, BTUs and energy values are determined. Finally, field plots yield data on the performance of multiple varieties and cultivars. The project will use commercial harvesting equipment from the State University of New York (SUNY). A strip planter will be utilized for commercial plantings, and volunteers will plant regular plots.

The project is being conducted at several locations in Pennsylvania: Lafayette College, Easton; Roaring Branch, Tioga County; and Montour Preserve, Washingtonville. It is conducted in cooperation with the Salix Consortium, coordinated by SUNY, and the Pennsylvania Friends of Agriculture Foundation, which coordinates and maintains Pennsylvania field plots. The project will improve air quality, provide riparian buffers, supply green energy potential, conserve soil and water, improve wildlife habitat and add value from a limited harvest.

CONSOLIDATED EDISON COMPANY OF NEW YORK: EAST RIVER RE-POWER PROJECT

The Consolidated Edison Company of New York, Inc., has applied to construct and operate a re-powered combined cycle power plant at the East River Complex in Manhattan. The project converts an existing conventional oil-fired power plant to a new higher efficiency natural gas-fired power plant. The cycle thermal efficiency increases from about 35 percent to nearly 60 percent. The

combined cycle power plant will burn natural gas over 95 percent of the time with limited use of fuel oil. Stack emissions, such as NO_x and SO_x and opacity will be reduced. The project uses existing land space and puts the energy supply (electricity and steam) near the user, thus minimizing transmission and distribution costs.

**DEMONSTRATION OF SOLID OXIDE FUEL CELL 250 kWe
COMBINED HEAT AND POWER SYSTEMS (SOFC CHP250)**

The primary system location for this project is Carnegie Mellon University (CMU) in Pittsburgh, Pennsylvania. This project will demonstrate two 250 kWe Solid Oxide Fuel Cell Combined Heat and Power Systems (SOFC CHP250). Each system is a high efficiency, natural gas fueled electric power generation system capable of delivering 250 kWe and up to 150 kWe at unsurpassed efficiency levels for power systems of this size. The demonstration at CMU will be incorporated into CMU's Intelligent Workplace/Building as a power plant demonstration. The cost of installing the SOFC CHP250 power system and integrating it into the facility is estimated to be \$2.5 million. The system will be installed in 2004 for an indefinite operation period with similar power generation systems. A natural gas fired CHP250 power system, if displacing an oil or diesel fueled system of similar size and function, will displace more than 6,000 barrels of oil per year of operation. Siemens Westinghouse will have an initial capacity of 15 MW per year (60 250 kWe power systems) with planned plant expansion to more than 100 Mwe per year. However, not all of the CHP250 power systems

will replace oil or diesel fired systems and the displacement noted above is representative.

The secondary system location, still to be determined, may include Harrisburg, Philadelphia or another location. The decision will be based on such criteria as an appropriate site, interested sponsors and local utility acceptance. The secondary location will feature a demonstration of the SOFC technology in either an all electric application or a cogeneration application in which the thermal energy is used to generate either heat, steam or hot water, depending on site requirements. This SOFC technology is being developed exclusively by Siemens Westinghouse in Pittsburgh and is scheduled to be offered on a commercial basis in 2003.

Total costs of this project, including installation, are estimated to be \$2 – \$2.5 million. The environmental advantage of SOFC technology makes it ideal for deployment as a distribution generation power source. SO_x and NO_x are virtually immeasurable and there are no VOCs or particulates in the exhaust. Carbon dioxide, a greenhouse gas, is reduced in comparison to other power systems.

MEADVILLE COMMUNITY ENERGY AND ECONOMIC ASSESSMENT

An integrated energy supply concept based on local resources is projected for the city of Meadville and the surrounding area. The Fraunhofer Center for Energy and Environment in Pittsburgh offers solutions and technologies for sustainable and efficient energy generation and utilization using alternative types

of fuels. Utilizing local resources, such as manure or waste wood, can be an economic and environmentally sound way to generate energy. Digested manure produces compost and fertilizer, and pulpwood supports local owners of wooded land. For industry, efficient integrated energy supply concepts can substantially reduce operational costs while also reducing environmental impact. In order to develop and implement an optimized energy supply concept, different technologies have to be adapted to local requirements and boundary conditions. First, all necessary data on the composition and availability of fuel types, data on daylight and seasonal energy demands and the price of the finished product must be collected. Further, detailed economic calculations and necessary adaptations of plant design must be determined. Finally, one or more plants applying one of several energy generation, conversion and utilization technologies can be designed, constructed and operated.

Due to its high efficiency, one of the most promising technologies for decentralized energy generation from solid biomass, such as wood, is gasification combined with an IC engine. After reforming, cooling and dust removal, the produced gas is fed into a block-type CHP-plant for the generation of electricity and heat. This technology enables electricity generation from biomass with a capacity of 7,000 – 50,000 t/a. An environmentally friendly utilization of liquid manure is possible through an integrated process. First, biogas is obtained by digesting organic material and is transformed into electricity and heat in an on-site cogeneration unit. In the second reprocessing stage, a separator is used to remove

the remaining solid matter. This matter is used to produce compost or plant soil. The remaining liquid can be spread without hazard to the environment. The steam can be used for irrigation. Existing facilities for energy generation and distribution can be assessed, and proposed new plants can be integrated in the existing infrastructure. A wood gasification plant could generate 1.5 to 10 MW of electricity and displace 7,350 to 49,000 barrels of oil. Use of biomass, manure, grasses, and sludge will potentially displace even greater amounts of oil.

DISPLACEMENT OF PETROLEUM COKE BY PENNSYLVANIA ANTHRACITE

The manufacture of artificial graphite products, which have a wide range of uses in many different industries, uses petroleum coke as one of the principal ingredients. The quality of petroleum coke is declining. Furthermore, in the event of a petroleum shortage, refiners will crack or hydrotreat materials usually used to make coke to produce liquid fuels instead. In addition, petroleum coke shortages would cripple Pennsylvania's carbon/graphite industry. Also, such shortages would adversely impact companies, such as Alcoa, a Pennsylvania-based corporation, which uses petroleum coke to make anodes for aluminum smelting. Current research at The Energy Institute at Penn State University, indicates that there is potential for replacing petroleum coke with Pennsylvania anthracite in the manufacture of specialty graphites.

No significant new investment or significant retrofit of existing plant would be required. However, it is unknown at the present time whether the calciner used for petroleum coke could be used for anthracite. A calciner heats

petroleum coke to remove volatile organic compounds. It is also unknown whether modifications would be required to pulverizing and grinding equipment because anthracite is much harder than petroleum coke.

It is difficult to estimate the barrels of oil such a process would displace because of the difficulties inherent in the processing of petroleum coke and the probability that in the event of serious shortages of petroleum, petroleum coke would be cracked to produce extra liquid fuel.

PLASMA GASIFIER REACTOR DEMONSTRATION

The Westinghouse Plasma Corporation has proposed the development and demonstration of a plasma reactor energy plant design to efficiently gasify a wide range of fossil fuels and other opportunity fuels including municipal solid wastes (MSW); biomass, automobile shredder residue (ASR), industrial wastes, sludges and all types of coal, including coal fines, coal pond sludge, mined coal, lignite and others. The resulting “syngas” can then be used in conventional processes to more efficiently generate electricity, offset the use of other fuels, such as imported foreign oil, or produce liquid fuels. During the last several decades, the Westinghouse Plasma Center (WPC), in Madison, Pennsylvania has conducted successful experimental investigations involving the gasification of simulated MSW, ASR and other materials in a plasma reactor. Experiments were conducted whereby the feed materials were gasified to produce syngas, primarily carbon monoxide (CO) and hydrogen (H₂). The inorganic components of the feed were converted to molten glassy slag, which was removed as vitrified byproduct. The

slag passed the EPA-mandated Toxicity Characteristic Leachage Procedure (TCLP) requirements. WPC has developed procedures and analytical tools to minimize the use of plasma electricity for gasification of the fuel and verification of the residues. WPC has also been investigating the generation of electricity using fossil fuels, such as coal, coal waste, and lignite, in an atmospheric Plasma Gasification Reactor.

The WPC proposal for the development of a fuel-flexible, thermally efficient, environmentally beneficial, gasification energy plant design, using plasma reactor technology, will benefit the economic and security interests of Pennsylvania and the United States by producing power economically, by using fuels that are uneconomic or problematic, by reducing the environmental impact of gasification technologies and by producing a useful construction industry byproduct.

Page 150 Blank

APPENDIX D: Project Rankings

Each model energy project was evaluated based on the 14 factors explained in the “Evaluation Criteria” section of this report. The members completing the evaluations assigned 0/4 to 4/4 points to score each project’s performance in each criterion. In the interest of giving more weight to the first criterion, which measured a project’s ability to displace foreign petroleum, the members scored performance on a scale of 0/4 to 8/4. In instances where an evaluator felt a particular criterion was not applicable, or if more information was necessary, he or she assigned a score of 0/0.

Each project’s scores were summed and divided by the total possible points to arrive at an overall percent score. The percent scores for each project were averaged across members to arrive at a final score. The projects were ranked in descending order according to their final scores. Nineteen task force members completed evaluations, although not all nineteen ranked every project.

Project	Average	Median	Maximum	Minimum	Standard Deviation	Responses
Energy Efficient Upgrades & Advisor for Existing Commonwealth Agency Owned & Leased Facilities	71.74	74.04	96.88	28.85	21.21	12
Displace Foreign Petroleum	83.33	50.00	200.00	0.00	93.09	6
Technological Development Status	93.75	100.00	100.00	50.00	15.54	12
Cost Competitiveness	83.33	87.50	100.00	50.00	20.41	6
Infrastructure Costs	67.50	75.00	100.00	50.00	16.87	10
Hidden Costs (Externalities)	91.67	100.00	100.00	75.00	12.50	9
Actionability	89.58	100.00	100.00	50.00	16.71	12
Ability of State government to Set an Example	87.50	100.00	100.00	50.00	19.94	12
Regulatory Barriers	84.09	100.00	100.00	0.00	32.16	11
Environmental and Health Impacts	75.00	75.00	100.00	50.00	15.81	11
Fuel Flexibility	75.00	75.00	100.00	50.00	25.00	5
Long-Term Fuel Supply Availability	87.50	87.50	100.00	75.00	14.43	4

<u>Project</u>	<u>Average</u>	<u>Median</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Standard Deviation</u>	<u>Responses</u>
Energy Efficient Upgrades & Advisor for Existing Commonwealth Agency Owned & Leased Facilities						
Security	80.00	75.00	100.00	50.00	20.92	5
Renewables	43.75	37.50	100.00	0.00	43.81	8
Economic Development	47.50	50.00	75.00	0.00	24.86	10
Ethanol	71.33	72.18	94.23	53.85	9.53	18
Displace Foreign Petroleum	160.00	200.00	200.00	75.00	49.82	15
Technological Development Status	79.17	100.00	100.00	25.00	28.76	18
Cost Competitiveness	60.71	50.00	100.00	25.00	18.90	14
Infrastructure Costs	38.89	25.00	100.00	25.00	23.04	18
Hidden Costs (Externalities)	64.71	50.00	100.00	25.00	25.09	17
Actionability	66.67	75.00	100.00	25.00	22.69	18
Ability of State government to Set an Example	69.44	75.00	100.00	25.00	26.51	18
Regulatory Barriers	69.44	62.50	100.00	25.00	25.08	18
Environmental and Health Impacts	57.35	50.00	75.00	25.00	19.29	17
Fuel Flexibility	65.00	75.00	100.00	0.00	36.35	15
Long-Term Fuel Supply Availability	76.39	75.00	100.00	50.00	15.98	18
Security	79.41	75.00	100.00	50.00	20.22	17
Renewables	80.88	75.00	100.00	25.00	22.59	17
Economic Development	59.72	50.00	100.00	0.00	27.30	18
Biodiesel Fuel Evaluation	71.07	71.67	93.75	40.38	16.05	19
Displace Foreign Petroleum	108.93	100.00	200.00	0.00	70.44	14
Technological Development Status	75.00	100.00	100.00	0.00	35.36	19
Cost Competitiveness	59.38	50.00	100.00	0.00	31.46	16
Infrastructure Costs	57.89	50.00	100.00	25.00	22.13	19
Hidden Costs (Externalities)	71.67	75.00	100.00	0.00	31.15	15
Actionability	76.32	75.00	100.00	25.00	22.78	19
Ability of State government to Set an Example	85.53	100.00	100.00	25.00	19.21	19
Regulatory Barriers	84.21	100.00	100.00	50.00	19.02	19
Environmental and Health Impacts	68.06	75.00	100.00	25.00	22.37	18
Fuel Flexibility	61.11	75.00	100.00	25.00	29.98	18
Long-Term Fuel Supply Availability	72.06	75.00	100.00	25.00	26.34	17
Security	72.37	75.00	100.00	25.00	24.85	19
Renewables	55.26	50.00	100.00	0.00	35.92	19
Economic Development	64.47	50.00	100.00	0.00	25.43	19
Tax Credits for Investment in Pollution Control Equipment	70.80	60.71	200.00	22.92	41.75	15
Displace Foreign Petroleum	136.67	200.00	200.00	0.00	85.50	15
Technological Development Status	78.85	100.00	100.00	0.00	35.13	13
Cost Competitiveness	54.55	75.00	100.00	0.00	41.56	11
Infrastructure Costs	41.67	25.00	100.00	0.00	32.27	15
Hidden Costs (Externalities)	50.00	50.00	100.00	0.00	32.52	14

<u>Project</u>	<u>Average</u>	<u>Median</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Standard Deviation</u>	<u>Responses</u>
Tax Credits for Investment in Pollution Control Equipment (Cont.)						
Actionability	66.67	75.00	100.00	0.00	36.19	15
Ability of State government to Set an Example	28.33	25.00	100.00	0.00	31.15	15
Regulatory Barriers	66.67	75.00	100.00	0.00	27.82	15
Environmental and Health Impacts	61.67	75.00	100.00	0.00	33.89	15
Fuel Flexibility	50.00	50.00	100.00	0.00	33.97	14
Long-Term Fuel Supply Availability	75.00	75.00	100.00	0.00	29.42	14
Security	78.57	100.00	100.00	0.00	30.79	14
Renewables	0.00	0.00	0.00	0.00	0.00	13
Economic Development	46.67	50.00	100.00	0.00	31.15	15
Compressed Natural Gas (CNG) School Buses	70.79	73.21	100.00	44.23	14.21	18
Displace Foreign Petroleum	123.44	150.00	175.00	50.00	37.05	16
Technological Development Status	91.67	100.00	100.00	25.00	21.00	18
Cost Competitiveness	80.36	75.00	100.00	50.00	17.48	14
Infrastructure Costs	51.47	50.00	100.00	0.00	24.16	17
Hidden Costs (Externalities)	76.47	100.00	100.00	0.00	31.21	17
Actionability	83.33	75.00	100.00	50.00	17.15	18
Ability of State government to Set an Example	73.61	75.00	100.00	0.00	31.47	18
Regulatory Barriers	86.11	100.00	100.00	50.00	17.62	18
Environmental and Health Impacts	76.47	75.00	100.00	50.00	16.47	17
Fuel Flexibility	61.11	75.00	100.00	0.00	31.18	18
Long-Term Fuel Supply Availability	73.61	75.00	100.00	50.00	18.13	18
Security	75.00	75.00	100.00	25.00	19.76	17
Renewables	5.00	0.00	50.00	0.00	14.02	15
Economic Development	52.94	50.00	100.00	25.00	23.19	17
Green Commonwealth Buildings	69.49	72.92	91.07	44.64	13.00	19
Displace Foreign Petroleum	57.81	50.00	200.00	0.00	47.19	16
Technological Development Status	100.00	100.00	100.00	100.00	0.00	19
Cost Competitiveness	72.92	75.00	100.00	0.00	31.00	12
Infrastructure Costs	66.18	75.00	100.00	25.00	24.91	17
Hidden Costs (Externalities)	76.56	75.00	100.00	0.00	28.09	16
Actionability	73.68	75.00	100.00	25.00	25.65	19
Ability of State government to Set an Example	88.16	100.00	100.00	25.00	19.31	19
Regulatory Barriers	67.11	75.00	100.00	0.00	25.07	19
Environmental and Health Impacts	82.89	75.00	100.00	50.00	14.56	19
Fuel Flexibility	67.65	75.00	100.00	0.00	35.09	17
Long-Term Fuel Supply Availability	76.92	75.00	100.00	0.00	27.88	13
Security	75.00	75.00	100.00	50.00	18.26	16
Renewables	45.83	37.50	100.00	0.00	34.57	18
Economic Development	50.00	50.00	100.00	0.00	26.35	19

<u>Project</u>	<u>Average</u>	<u>Median</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Standard Deviation</u>	<u>Responses</u>
Displacing Foreign Petroleum in State Facilities w/Pennsylvania Anthracite & Bituminous Coal	69.34	69.64	100.00	46.15	14.45	18
Displace Foreign Petroleum	132.81	150.00	200.00	50.00	41.55	16
Technological Development Status	95.83	100.00	100.00	50.00	12.86	18
Cost Competitiveness	82.69	100.00	100.00	25.00	23.68	13
Infrastructure Costs	55.88	50.00	100.00	25.00	18.81	17
Hidden Costs (Externalities)	63.89	50.00	100.00	25.00	24.59	18
Actionability	73.53	75.00	100.00	25.00	24.16	17
Ability of State government to Set an Example	79.41	100.00	100.00	25.00	26.86	17
Regulatory Barriers	64.71	50.00	100.00	25.00	23.48	17
Environmental and Health Impacts	45.31	50.00	100.00	0.00	22.76	16
Fuel Flexibility	54.17	50.00	100.00	0.00	41.35	18
Long-Term Fuel Supply Availability	83.33	87.50	100.00	50.00	19.17	18
Security	83.33	75.00	100.00	50.00	17.15	18
Renewables	0.00	0.00	0.00	0.00	0.00	15
Economic Development	55.56	50.00	100.00	0.00	25.08	18
Clean Cars Campaign--Adopting Low Emission Vehicle (LEV) II Program	69.07	73.21	87.50	45.83	12.30	17
Displace Foreign Petroleum	160.94	200.00	200.00	75.00	52.42	16
Technological Development Status	51.47	50.00	100.00	0.00	35.87	17
Cost Competitiveness	47.92	37.50	100.00	25.00	27.09	12
Infrastructure Costs	53.13	50.00	100.00	25.00	28.69	16
Hidden Costs (Externalities)	65.00	75.00	100.00	25.00	20.70	15
Actionability	72.06	75.00	100.00	25.00	24.82	17
Ability of State government to Set an Example	64.71	50.00	100.00	25.00	25.09	17
Regulatory Barriers	71.88	75.00	100.00	25.00	28.69	16
Environmental and Health Impacts	85.29	100.00	100.00	50.00	17.81	17
Fuel Flexibility	66.18	75.00	100.00	0.00	34.17	17
Long-Term Fuel Supply Availability	80.88	75.00	100.00	50.00	18.81	17
Security	77.94	75.00	100.00	50.00	23.19	17
Renewables	25.00	25.00	75.00	0.00	24.02	14
Economic Development	57.35	50.00	100.00	25.00	19.29	17
Solar-Powered Water Pumping for Rotational Grazing in Pennsylvania	68.28	70.47	90.63	30.77	15.10	14
Displace Foreign Petroleum	37.50	25.00	100.00	0.00	30.62	13
Technological Development Status	85.71	100.00	100.00	0.00	28.95	14
Cost Competitiveness	67.59	50.00	133.33	25.00	41.13	9
Infrastructure Costs	66.67	62.50	100.00	25.00	24.62	12
Hidden Costs (Externalities)	82.69	75.00	100.00	25.00	21.37	13
Actionability	62.50	50.00	100.00	25.00	25.48	14
Ability of State government to Set an Example	34.09	25.00	100.00	0.00	25.67	11
Regulatory Barriers	90.38	100.00	100.00	75.00	12.66	13

<u>Project</u>	<u>Average</u>	<u>Median</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Standard Deviation</u>	<u>Responses</u>
Solar-Powered Water Pumping for Rotational Grazing in Pennsylvania (cont.)						
Environmental and Health Impacts	83.93	75.00	100.00	75.00	12.43	14
Fuel Flexibility	58.33	50.00	100.00	0.00	37.44	12
Long-Term Fuel Supply Availability	86.54	100.00	100.00	50.00	21.93	13
Security	85.42	100.00	100.00	50.00	22.51	12
Renewables	100.00	100.00	100.00	100.00	0.00	14
Economic Development	35.42	37.50	75.00	0.00	27.09	12
Fayette Thermal LLC, SCI Fayette	68.02	62.50	92.31	50.00	12.01	15
Displace Foreign Petroleum	91.07	100.00	150.00	50.00	30.39	14
Technological Development Status	92.86	100.00	100.00	75.00	11.72	14
Cost Competitiveness	78.13	75.00	100.00	50.00	16.02	8
Infrastructure Costs	55.00	50.00	100.00	25.00	21.55	15
Hidden Costs (Externalities)	64.29	50.00	100.00	0.00	28.95	14
Actionability	71.43	75.00	100.00	25.00	23.73	14
Ability of State government to Set an Example	69.64	75.00	100.00	0.00	31.28	14
Regulatory Barriers	76.67	75.00	100.00	50.00	22.09	15
Environmental and Health Impacts	55.36	50.00	100.00	0.00	26.27	14
Fuel Flexibility	73.21	75.00	100.00	0.00	24.93	14
Long-Term Fuel Supply Availability	86.67	75.00	100.00	75.00	12.91	15
Security	90.00	100.00	100.00	50.00	15.81	15
Renewables	9.09	0.00	100.00	0.00	30.15	11
Economic Development	55.00	50.00	100.00	25.00	23.53	15
Landfill Gas to Vehicle Fuel	67.56	69.23	93.75	33.93	14.89	17
Displace Foreign Petroleum	123.33	150.00	200.00	0.00	53.84	15
Technological Development Status	72.06	75.00	100.00	0.00	32.93	17
Cost Competitiveness	65.38	75.00	100.00	0.00	24.02	13
Infrastructure Costs	36.67	25.00	75.00	0.00	20.85	15
Hidden Costs (Externalities)	69.64	75.00	100.00	50.00	17.48	14
Actionability	63.24	75.00	100.00	0.00	26.69	17
Ability of State government to Set an Example	54.41	50.00	100.00	0.00	28.28	17
Regulatory Barriers	75.00	75.00	100.00	25.00	25.82	16
Environmental and Health Impacts	76.47	75.00	100.00	25.00	18.69	17
Fuel Flexibility	66.18	75.00	100.00	0.00	27.87	17
Long-Term Fuel Supply Availability	80.88	75.00	100.00	50.00	18.81	17
Security	77.94	75.00	100.00	50.00	17.42	17
Renewables	55.36	75.00	100.00	0.00	41.81	14
Economic Development	50.00	50.00	75.00	25.00	17.68	17
Weatherization Assistance Program	65.61	69.64	95.45	21.43	18.82	17
Displace Foreign Petroleum	51.56	50.00	100.00	0.00	29.54	16
Technological Development Status	98.44	100.00	100.00	75.00	6.25	16

<u>Project</u>	<u>Average</u>	<u>Median</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Standard Deviation</u>	<u>Responses</u>
Weatherization Assistance Program (cont.)						
Cost Competitiveness	83.33	100.00	100.00	25.00	33.07	9
Infrastructure Costs	79.41	75.00	100.00	50.00	18.19	17
Hidden Costs (Externalities)	85.29	100.00	100.00	25.00	25.09	17
Actionability	73.44	75.00	100.00	0.00	30.91	16
Ability of State government to Set an Example	45.31	50.00	100.00	0.00	33.19	16
Regulatory Barriers	86.76	100.00	100.00	0.00	25.18	17
Environmental and Health Impacts	67.19	75.00	100.00	0.00	25.36	16
Fuel Flexibility	61.11	75.00	100.00	0.00	33.33	9
Long-Term Fuel Supply Availability	65.00	75.00	100.00	0.00	33.75	10
Security	77.50	87.50	100.00	25.00	27.51	10
Renewables	4.55	0.00	25.00	0.00	10.11	11
Economic Development	41.18	50.00	100.00	0.00	29.24	17
Fox Chase Golf Club Geothermal Heat Pump	64.28	60.42	84.62	30.36	14.85	17
Displace Foreign Petroleum	52.27	50.00	150.00	0.00	48.03	11
Technological Development Status	97.06	100.00	100.00	50.00	12.13	17
Cost Competitiveness	65.00	62.50	100.00	0.00	31.62	10
Infrastructure Costs	65.63	50.00	100.00	25.00	27.20	16
Hidden Costs (Externalities)	78.13	75.00	100.00	0.00	25.62	16
Actionability	47.06	50.00	100.00	0.00	32.93	17
Ability of State government to Set an Example	52.94	50.00	100.00	0.00	29.16	17
Regulatory Barriers	82.35	75.00	100.00	50.00	14.70	17
Environmental and Health Impacts	75.00	75.00	100.00	0.00	25.00	17
Fuel Flexibility	44.12	25.00	100.00	0.00	35.94	17
Long-Term Fuel Supply Availability	80.88	100.00	100.00	0.00	27.29	17
Security	78.13	75.00	100.00	50.00	20.16	16
Renewables	46.88	37.50	100.00	0.00	38.60	16
Economic Development	33.82	50.00	50.00	0.00	19.65	17
Reflective Acrylic Coated "Cool Roofing"	63.85	68.75	90.00	32.14	14.52	16
Displace Foreign Petroleum	35.00	50.00	100.00	0.00	33.75	10
Technological Development Status	96.88	100.00	100.00	75.00	8.54	16
Cost Competitiveness	87.50	100.00	100.00	50.00	20.92	6
Infrastructure Costs	73.08	75.00	100.00	50.00	18.99	13
Hidden Costs (Externalities)	79.69	87.50	100.00	0.00	27.72	16
Actionability	50.00	50.00	100.00	0.00	27.39	16
Ability of State government to Set an Example	55.73	50.00	100.00	25.00	30.69	16
Regulatory Barriers	85.94	100.00	100.00	0.00	25.77	16
Environmental and Health Impacts	78.57	75.00	100.00	50.00	16.57	14
Fuel Flexibility	65.00	100.00	100.00	0.00	48.73	5
Long-Term Fuel Supply Availability	70.00	100.00	100.00	0.00	44.72	5
Security	75.00	100.00	100.00	0.00	37.80	8

<u>Project</u>	<u>Average</u>	<u>Median</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Standard Deviation</u>	<u>Responses</u>
Reflective Acrylic Coated "Cool Roofing" (cont.)						
Renewables	0.00	0.00	0.00	0.00	0.00	9
Economic Development	45.31	50.00	100.00	0.00	29.18	16
Indirect Coal Liquefaction	63.58	63.94	104.55	21.43	20.36	16
Displace Foreign Petroleum	156.25	200.00	200.00	0.00	70.42	16
Technological Development Status	46.88	25.00	100.00	0.00	41.71	16
Cost Competitiveness	41.07	25.00	75.00	25.00	21.05	14
Infrastructure Costs	37.50	25.00	100.00	25.00	22.36	16
Hidden Costs (Externalities)	51.92	50.00	100.00	0.00	31.39	13
Actionability	60.94	50.00	100.00	25.00	25.77	16
Ability of State government to Set an Example	46.88	50.00	100.00	0.00	28.69	16
Regulatory Barriers	61.67	50.00	100.00	0.00	29.68	15
Environmental and Health Impacts	44.23	50.00	75.00	0.00	23.17	13
Fuel Flexibility	76.56	87.50	100.00	0.00	33.50	16
Long-Term Fuel Supply Availability	84.38	100.00	100.00	25.00	22.13	16
Security	78.13	87.50	100.00	25.00	27.20	16
Renewables	15.38	0.00	75.00	0.00	29.82	13
Economic Development	73.21	75.00	100.00	50.00	20.72	14
Conservation Services for Oil-heated Homes	63.58	65.10	97.73	25.00	15.40	18
Displace Foreign Petroleum	103.33	100.00	200.00	0.00	61.14	15
Technological Development Status	98.61	100.00	100.00	75.00	5.89	18
Cost Competitiveness	70.83	75.00	100.00	25.00	23.44	12
Infrastructure Costs	71.32	75.00	100.00	0.00	24.91	17
Hidden Costs (Externalities)	85.29	100.00	100.00	25.00	21.76	17
Actionability	61.11	50.00	100.00	0.00	26.04	18
Ability of State government to Set an Example	41.67	50.00	100.00	0.00	33.21	18
Regulatory Barriers	86.76	100.00	100.00	0.00	25.18	17
Environmental and Health Impacts	75.00	75.00	100.00	0.00	27.39	16
Fuel Flexibility	19.23	0.00	75.00	0.00	29.14	13
Long-Term Fuel Supply Availability	55.36	50.00	100.00	0.00	24.37	14
Security	66.67	75.00	100.00	0.00	28.87	12
Renewables	3.33	0.00	25.00	0.00	8.80	15
Economic Development	48.53	50.00	100.00	0.00	27.20	17
Oil Furnace Clean & Tune Service	62.33	63.87	100.00	28.57	16.03	18
Displace Foreign Petroleum	100.00	100.00	150.00	0.00	54.28	15
Technological Development Status	97.22	100.00	100.00	50.00	11.79	18
Cost Competitiveness	75.00	75.00	100.00	50.00	18.46	12
Infrastructure Costs	77.94	75.00	100.00	0.00	24.82	17
Hidden Costs (Externalities)	89.71	100.00	100.00	50.00	15.46	17
Actionability	60.29	50.00	100.00	25.00	26.60	17

<u>Project</u>	<u>Average</u>	<u>Median</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Standard Deviation</u>	<u>Responses</u>
Oil Furnace Clean & Tune Service (cont.)						
Ability of State government to Set an Example	38.24	25.00	100.00	0.00	35.49	17
Regulatory Barriers	89.71	100.00	100.00	0.00	25.09	17
Environmental and Health Impacts	71.67	75.00	100.00	0.00	28.14	15
Fuel Flexibility	0.00	0.00	0.00	0.00	0.00	9
Long-Term Fuel Supply Availability	55.77	50.00	100.00	25.00	23.17	13
Security	58.93	50.00	100.00	25.00	25.21	14
Renewables	1.67	0.00	25.00	0.00	6.45	15
Economic Development	40.28	37.50	100.00	0.00	28.62	18
Residential Space Heating With Coal Stoves	62.16	58.93	104.17	30.36	16.49	18
Displace Foreign Petroleum	121.67	100.00	200.00	25.00	55.80	15
Technological Development Status	97.22	100.00	100.00	75.00	8.08	18
Cost Competitiveness	72.73	75.00	100.00	0.00	34.38	11
Infrastructure Costs	61.76	50.00	100.00	0.00	23.58	17
Hidden Costs (Externalities)	65.28	50.00	100.00	25.00	25.92	18
Actionability	51.39	50.00	100.00	0.00	26.39	18
Ability of State government to Set an Example	43.06	25.00	100.00	0.00	30.69	18
Regulatory Barriers	70.59	75.00	100.00	25.00	28.28	17
Environmental and Health Impacts	40.00	50.00	100.00	0.00	22.76	15
Fuel Flexibility	41.67	25.00	100.00	0.00	39.30	18
Long-Term Fuel Supply Availability	81.94	87.50	100.00	25.00	22.37	18
Security	84.72	100.00	100.00	0.00	25.92	18
Renewables	0.00	0.00	0.00	0.00	0.00	16
Economic Development	55.56	50.00	100.00	0.00	25.08	18
Pennsylvania Switchgrass for Energy & Conservation	61.70	52.08	100.00	37.50	20.55	12
Displace Foreign Petroleum	45.83	37.50	100.00	0.00	36.80	6
Technological Development Status	40.91	50.00	100.00	0.00	34.05	11
Cost Competitiveness	40.00	50.00	75.00	0.00	37.91	5
Infrastructure Costs	35.71	50.00	50.00	0.00	24.40	7
Hidden Costs (Externalities)	68.18	75.00	100.00	50.00	19.66	11
Actionability	65.00	75.00	100.00	25.00	26.87	10
Ability of State government to Set an Example	40.91	25.00	75.00	25.00	20.23	11
Regulatory Barriers	62.50	50.00	100.00	25.00	24.30	10
Environmental and Health Impacts	55.00	50.00	100.00	0.00	28.38	10
Fuel Flexibility	50.00	50.00	100.00	0.00	28.87	10
Long-Term Fuel Supply Availability	77.08	75.00	100.00	25.00	24.91	12
Security	83.33	87.50	100.00	50.00	19.46	12
Renewables	87.50	100.00	100.00	50.00	16.85	12
Economic Development	52.50	50.00	100.00	0.00	29.93	10

<u>Project</u>	<u>Average</u>	<u>Median</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Standard Deviation</u>	<u>Responses</u>
Furnace Filter Replacement for Oil-heated Residential & Small Commercial Buildings	61.49	65.25	95.00	30.36	15.29	16
Displace Foreign Petroleum	91.07	100.00	150.00	0.00	63.25	14
Technological Development Status	98.44	100.00	100.00	75.00	6.25	16
Cost Competitiveness	88.64	100.00	100.00	50.00	17.19	11
Infrastructure Costs	82.14	87.50	100.00	0.00	26.73	14
Hidden Costs (Externalities)	85.71	100.00	100.00	25.00	23.44	14
Actionability	48.44	37.50	100.00	0.00	33.50	16
Ability of State government to Set an Example	32.81	25.00	100.00	0.00	31.25	16
Regulatory Barriers	90.00	100.00	100.00	25.00	20.70	15
Environmental and Health Impacts	70.00	75.00	100.00	50.00	16.90	15
Fuel Flexibility	22.73	0.00	100.00	0.00	39.46	11
Long-Term Fuel Supply Availability	61.54	50.00	100.00	25.00	28.17	13
Security	63.64	75.00	100.00	0.00	34.21	11
Renewables	1.92	0.00	25.00	0.00	6.93	13
Economic Development	26.92	25.00	50.00	0.00	16.01	13
Oil-fired Burner Replacement (Retrofit with High Efficiency Flame Retention Burner)	61.43	63.39	81.25	37.50	11.01	16
Displace Foreign Petroleum	92.86	100.00	150.00	0.00	59.18	14
Technological Development Status	100.00	100.00	100.00	100.00	0.00	16
Cost Competitiveness	75.00	75.00	100.00	50.00	22.36	11
Infrastructure Costs	76.79	75.00	100.00	50.00	15.39	14
Hidden Costs (Externalities)	91.07	100.00	100.00	75.00	12.43	14
Actionability	51.56	50.00	100.00	0.00	26.57	16
Ability of State government to Set an Example	32.81	25.00	75.00	0.00	26.95	16
Regulatory Barriers	93.33	100.00	100.00	75.00	11.44	15
Environmental and Health Impacts	75.00	75.00	100.00	50.00	16.37	15
Fuel Flexibility	11.11	0.00	50.00	0.00	18.16	9
Long-Term Fuel Supply Availability	63.64	50.00	100.00	25.00	23.35	11
Security	67.50	62.50	100.00	50.00	20.58	10
Renewables	0.00	0.00	0.00	0.00	0.00	13
Economic Development	40.63	50.00	75.00	0.00	27.20	16
Lehigh U. Industrial Assessment Center	59.84	58.48	85.71	7.69	21.20	14
Displace Foreign Petroleum	42.50	12.50	150.00	0.00	55.34	10
Technological Development Status	90.38	100.00	100.00	25.00	24.02	13
Cost Competitiveness	75.00	75.00	100.00	25.00	25.00	7
Infrastructure Costs	75.00	75.00	100.00	25.00	25.00	11
Hidden Costs (Externalities)	77.08	75.00	100.00	25.00	24.91	12
Actionability	58.93	75.00	100.00	0.00	33.41	14
Ability of State government to Set an Example	57.14	62.50	100.00	0.00	26.73	14
Regulatory Barriers	86.54	100.00	100.00	50.00	19.41	13

<u>Project</u>	<u>Average</u>	<u>Median</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Standard Deviation</u>	<u>Responses</u>
Lehigh U. Industrial Assessment Center (cont.)						
Environmental and Health Impacts	62.50	75.00	100.00	0.00	27.00	10
Fuel Flexibility	58.33	75.00	100.00	0.00	46.55	6
Long-Term Fuel Supply Availability	35.00	25.00	75.00	0.00	37.91	5
Security	75.00	75.00	100.00	50.00	20.41	7
Renewables	21.43	25.00	50.00	0.00	22.49	7
Economic Development	53.85	50.00	100.00	0.00	24.68	13
Coal Gasification to Ultraclean Fuels	59.63	62.50	88.64	26.74	15.63	17
Displace Foreign Petroleum	168.75	200.00	200.00	50.00	54.39	16
Technological Development Status	47.06	25.00	100.00	0.00	40.39	17
Cost Competitiveness	50.00	50.00	75.00	0.00	25.00	13
Infrastructure Costs	25.00	25.00	50.00	0.00	15.31	17
Hidden Costs (Externalities)	44.15	50.00	100.00	0.00	27.81	12
Actionability	68.75	75.00	100.00	0.00	28.14	16
Ability of State government to Set an Example	43.33	25.00	75.00	0.00	32.00	15
Regulatory Barriers	60.00	50.00	100.00	0.00	29.58	15
Environmental and Health Impacts	53.57	50.00	75.00	0.00	21.61	14
Fuel Flexibility	53.13	62.50	100.00	0.00	32.76	16
Long-Term Fuel Supply Availability	86.76	100.00	100.00	50.00	17.94	17
Security	79.41	75.00	100.00	50.00	22.07	17
Renewables	10.00	0.00	50.00	0.00	20.70	15
Economic Development	69.12	75.00	100.00	50.00	20.78	17
Oil-fired Heating Plant Replacement (Retrofit with High Efficiency Flame Retention Burner)	59.05	55.36	81.82	38.46	11.26	13
Displace Foreign Petroleum	86.36	100.00	175.00	25.00	46.59	11
Technological Development Status	100.00	100.00	100.00	100.00	0.00	13
Cost Competitiveness	83.33	100.00	100.00	0.00	33.07	9
Infrastructure Costs	72.92	75.00	100.00	50.00	19.82	12
Hidden Costs (Externalities)	87.50	87.50	100.00	75.00	13.06	12
Actionability	42.31	25.00	100.00	0.00	32.89	13
Ability of State government to Set an Example	26.92	25.00	75.00	0.00	25.94	13
Regulatory Barriers	93.75	100.00	100.00	75.00	11.31	12
Environmental and Health Impacts	69.23	75.00	100.00	50.00	14.98	13
Fuel Flexibility	19.44	0.00	75.00	0.00	30.05	9
Long-Term Fuel Supply Availability	62.50	62.50	100.00	25.00	21.25	10
Security	60.00	50.00	100.00	25.00	21.08	10
Renewables	0.00	0.00	0.00	0.00	0.00	11
Economic Development	45.83	50.00	75.00	25.00	20.87	12
Direct Coal Liquefaction	58.61	60.71	102.08	28.57	20.56	18
Displace Foreign Petroleum	166.18	200.00	200.00	0.00	57.92	17
Technological Development Status	43.06	37.50	100.00	0.00	39.11	18

<u>Project</u>	<u>Average</u>	<u>Median</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Standard Deviation</u>	<u>Responses</u>
Direct Coal Liquefaction (cont.)						
Cost Competitiveness	38.46	25.00	100.00	0.00	28.17	13
Infrastructure Costs	25.00	25.00	75.00	0.00	21.00	18
Hidden Costs (Externalities)	45.31	50.00	100.00	0.00	29.18	16
Actionability	54.17	50.00	100.00	25.00	24.63	18
Ability of State government to Set an Example	42.65	25.00	100.00	0.00	30.32	17
Regulatory Barriers	56.25	50.00	100.00	25.00	26.61	16
Environmental and Health Impacts	44.23	50.00	75.00	0.00	20.80	13
Fuel Flexibility	68.06	75.00	100.00	0.00	35.15	18
Long-Term Fuel Supply Availability	82.35	100.00	100.00	25.00	22.99	17
Security	76.47	75.00	100.00	0.00	29.94	17
Renewables	3.33	0.00	50.00	0.00	12.91	15
Economic Development	68.06	62.50	100.00	50.00	20.66	18
Philadelphia G-R Ethanol	58.58	56.35	90.91	25.00	14.88	14
Displace Foreign Petroleum	134.62	150.00	200.00	0.00	68.11	13
Technological Development Status	33.93	25.00	100.00	0.00	28.77	14
Cost Competitiveness	33.33	25.00	75.00	0.00	25.00	9
Infrastructure Costs	30.77	25.00	50.00	0.00	14.98	13
Hidden Costs (Externalities)	40.00	37.50	100.00	0.00	26.87	10
Actionability	60.71	50.00	100.00	25.00	21.29	14
Ability of State government to Set an Example	48.21	50.00	100.00	0.00	30.17	14
Regulatory Barriers	55.00	50.00	100.00	25.00	19.72	10
Environmental and Health Impacts	57.50	62.50	75.00	25.00	20.58	10
Fuel Flexibility	67.31	75.00	100.00	0.00	32.89	13
Long-Term Fuel Supply Availability	89.29	100.00	100.00	50.00	16.16	14
Security	80.77	75.00	100.00	50.00	20.80	13
Renewables	45.83	37.50	100.00	0.00	42.42	12
Economic Development	52.08	50.00	100.00	25.00	19.82	12
Development of Biodiesel Production Strategies & Formulation for Pennsylvania	58.49	57.14	89.58	25.00	18.60	16
Displace Foreign Petroleum	138.33	180.00	200.00	0.00	80.32	12
Technological Development Status	19.64	25.00	75.00	0.00	20.04	14
Cost Competitiveness	47.22	50.00	75.00	0.00	31.73	9
Infrastructure Costs	41.67	50.00	75.00	25.00	16.28	12
Hidden Costs (Externalities)	51.92	50.00	100.00	0.00	31.39	13
Actionability	57.14	62.50	100.00	0.00	26.73	14
Ability of State government to Set an Example	51.92	75.00	100.00	0.00	31.39	13
Regulatory Barriers	66.07	75.00	100.00	0.00	27.05	14
Environmental and Health Impacts	46.15	50.00	75.00	0.00	22.47	13
Fuel Flexibility	67.86	75.00	100.00	0.00	30.11	14
Long-Term Fuel Supply Availability	80.36	75.00	100.00	25.00	20.04	14
Security	75.00	75.00	100.00	0.00	28.87	13

<u>Project</u>	<u>Average</u>	<u>Median</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Standard Deviation</u>	<u>Responses</u>
Development of Biodiesel Production Strategies & Formulation for Pennsylvania (cont.)						
Renewables	67.86	100.00	100.00	0.00	45.39	14
Economic Development	53.85	50.00	100.00	0.00	26.70	13
Energy Efficient Mortgages	58.26	62.50	95.45	15.38	23.55	15
Displace Foreign Petroleum	30.56	25.00	75.00	0.00	27.32	9
Technological Development Status	77.27	100.00	100.00	25.00	34.38	11
Cost Competitiveness	75.00	100.00	100.00	25.00	38.73	6
Infrastructure Costs	85.00	87.50	100.00	50.00	17.48	10
Hidden Costs (Externalities)	76.92	100.00	100.00	0.00	36.03	13
Actionability	65.00	50.00	100.00	0.00	31.05	15
Ability of State government to Set an Example	35.71	25.00	100.00	0.00	38.87	14
Regulatory Barriers	85.71	100.00	100.00	0.00	28.95	14
Environmental and Health Impacts	70.83	75.00	100.00	0.00	31.68	12
Fuel Flexibility	72.22	75.00	100.00	0.00	31.73	9
Long-Term Fuel Supply Availability	75.00	87.50	100.00	0.00	35.36	8
Security	80.00	100.00	100.00	0.00	32.91	10
Renewables	21.88	25.00	75.00	0.00	24.78	8
Economic Development	45.45	50.00	100.00	0.00	29.19	11
Retrofit Oil-Fired Water Heater	58.22	60.57	79.55	28.57	11.62	18
Displace Foreign Petroleum	70.31	62.50	150.00	0.00	38.96	16
Technological Development Status	97.22	100.00	100.00	50.00	11.79	18
Cost Competitiveness	64.58	62.50	100.00	25.00	22.51	12
Infrastructure Costs	72.06	75.00	100.00	0.00	26.34	17
Hidden Costs (Externalities)	89.71	100.00	100.00	50.00	15.46	17
Actionability	50.00	50.00	100.00	25.00	25.00	17
Ability of State government to Set an Example	32.35	25.00	100.00	0.00	35.09	17
Regulatory Barriers	88.24	100.00	100.00	0.00	25.18	17
Environmental and Health Impacts	64.06	75.00	100.00	0.00	24.10	16
Fuel Flexibility	20.45	0.00	75.00	0.00	31.26	11
Long-Term Fuel Supply Availability	62.50	50.00	100.00	25.00	20.41	16
Security	60.00	50.00	100.00	25.00	22.76	15
Renewables	3.33	0.00	25.00	0.00	8.80	15
Economic Development	33.82	25.00	75.00	0.00	24.91	17
5kW SOFC Power Systems for Residential & Remote Applications	57.65	53.85	81.25	42.86	12.41	13
Displace Foreign Petroleum	59.38	62.50	150.00	0.00	56.60	8
Technological Development Status	30.77	25.00	100.00	0.00	37.02	13
Cost Competitiveness	31.82	25.00	75.00	0.00	31.80	11
Infrastructure Costs	59.62	50.00	100.00	25.00	19.20	13
Hidden Costs (Externalities)	60.42	62.50	100.00	0.00	29.11	12
Actionability	55.77	50.00	100.00	25.00	23.17	13

<u>Project</u>	<u>Average</u>	<u>Median</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Standard Deviation</u>	<u>Responses</u>
5kW_e SOFC Power Systems for Residential & Remote Applications (cont.)						
Ability of State government to Set an Example	46.15	50.00	75.00	25.00	22.47	13
Regulatory Barriers	75.00	75.00	100.00	50.00	14.43	13
Environmental and Health Impacts	81.25	87.50	100.00	0.00	28.45	12
Fuel Flexibility	75.00	75.00	100.00	0.00	32.27	13
Long-Term Fuel Supply Availability	83.33	75.00	100.00	75.00	12.31	12
Security	77.08	75.00	100.00	50.00	19.82	12
Renewables	25.00	25.00	75.00	0.00	26.11	12
Economic Development	55.77	50.00	100.00	25.00	25.32	13
Biomass Crops for Pennsylvania Farmers	57.37	58.04	93.18	0.00	21.12	14
Displace Foreign Petroleum	29.17	25.00	50.00	0.00	18.82	6
Technological Development Status	32.69	25.00	100.00	0.00	25.79	13
Cost Competitiveness	43.75	50.00	75.00	0.00	31.46	4
Infrastructure Costs	42.86	50.00	75.00	0.00	31.34	7
Hidden Costs (Externalities)	73.08	75.00	100.00	25.00	25.94	13
Actionability	53.85	50.00	100.00	25.00	20.02	13
Ability of State government to Set an Example	44.23	25.00	75.00	25.00	23.17	13
Regulatory Barriers	75.00	75.00	100.00	50.00	21.32	12
Environmental and Health Impacts	75.00	75.00	100.00	50.00	18.46	12
Fuel Flexibility	56.82	75.00	100.00	0.00	40.45	11
Long-Term Fuel Supply Availability	80.77	75.00	100.00	50.00	18.13	13
Security	82.69	75.00	100.00	50.00	18.78	13
Renewables	92.31	100.00	100.00	50.00	15.76	13
Economic Development	52.08	50.00	75.00	0.00	24.91	12
Railway Electrification	56.00	52.78	82.69	17.86	18.69	17
Displace Foreign Petroleum	118.18	100.00	200.00	0.00	71.67	11
Technological Development Status	75.00	100.00	100.00	0.00	40.09	15
Cost Competitiveness	38.89	25.00	100.00	0.00	37.73	9
Infrastructure Costs	20.00	25.00	50.00	0.00	14.02	15
Hidden Costs (Externalities)	53.57	50.00	100.00	0.00	32.31	14
Actionability	48.53	50.00	100.00	0.00	25.72	17
Ability of State government to Set an Example	21.67	25.00	100.00	0.00	29.68	15
Regulatory Barriers	73.44	75.00	100.00	25.00	26.57	16
Environmental and Health Impacts	66.67	75.00	100.00	25.00	26.16	15
Fuel Flexibility	67.65	75.00	100.00	0.00	32.79	17
Long-Term Fuel Supply Availability	86.76	100.00	100.00	25.00	20.00	17
Security	69.12	75.00	100.00	0.00	27.29	17
Renewables	11.54	0.00	50.00	0.00	16.51	13
Economic Development	68.75	75.00	100.00	25.00	25.00	16

<u>Project</u>	<u>Average</u>	<u>Median</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Standard Deviation</u>	<u>Responses</u>
Enhanced Intermodal Freight Transportation	55.81	57.29	75.00	28.57	15.15	16
Displace Foreign Petroleum	102.78	75.00	200.00	0.00	77.50	9
Technological Development Status	92.19	100.00	100.00	25.00	21.83	16
Cost Competitiveness	75.00	75.00	100.00	50.00	23.15	8
Infrastructure Costs	43.33	25.00	100.00	0.00	32.00	15
Hidden Costs (Externalities)	76.56	75.00	100.00	50.00	17.00	16
Actionability	54.69	50.00	100.00	0.00	30.58	16
Ability of State government to Set an Example	25.00	25.00	75.00	0.00	23.15	15
Regulatory Barriers	63.33	75.00	100.00	0.00	29.68	15
Environmental and Health Impacts	75.00	75.00	100.00	50.00	20.41	16
Fuel Flexibility	41.07	25.00	100.00	0.00	34.82	14
Long-Term Fuel Supply Availability	61.67	50.00	100.00	25.00	18.58	15
Security	58.93	50.00	100.00	25.00	18.62	14
Renewables	3.57	0.00	50.00	0.00	13.36	14
Economic Development	55.00	50.00	100.00	0.00	25.35	15
Consolidated Edison East River Re-Power Project	55.23	59.62	80.77	16.07	16.99	17
Displace Foreign Petroleum	107.81	150.00	200.00	25.00	59.66	16
Technological Development Status	85.94	100.00	100.00	25.00	24.10	16
Cost Competitiveness	69.44	100.00	100.00	0.00	39.09	9
Infrastructure Costs	48.33	50.00	75.00	25.00	14.84	15
Hidden Costs (Externalities)	66.67	75.00	100.00	25.00	26.16	15
Actionability	39.06	25.00	100.00	0.00	31.58	16
Ability of State government to Set an Example	26.47	25.00	75.00	0.00	25.72	17
Regulatory Barriers	60.94	50.00	100.00	25.00	24.10	16
Environmental and Health Impacts	68.75	75.00	100.00	25.00	19.36	16
Fuel Flexibility	57.35	50.00	100.00	25.00	29.00	17
Long-Term Fuel Supply Availability	66.18	75.00	100.00	0.00	24.91	17
Security	56.25	50.00	75.00	0.00	21.41	16
Renewables	5.36	0.00	25.00	0.00	10.65	14
Economic Development	50.00	50.00	100.00	0.00	26.52	17
Coal Tar Blending	54.70	53.57	90.91	28.57	16.60	17
Displace Foreign Petroleum	160.71	200.00	200.00	50.00	52.55	14
Technological Development Status	38.24	50.00	100.00	0.00	30.77	17
Cost Competitiveness	33.33	25.00	75.00	0.00	27.95	9
Infrastructure Costs	45.59	50.00	75.00	0.00	23.78	17
Hidden Costs (Externalities)	51.67	50.00	100.00	0.00	25.82	15
Actionability	52.94	50.00	75.00	25.00	19.53	17
Ability of State government to Set an Example	33.33	25.00	50.00	0.00	18.09	15
Regulatory Barriers	58.33	50.00	100.00	0.00	27.82	15
Environmental and Health Impacts	36.54	50.00	50.00	0.00	19.41	13
Fuel Flexibility	57.35	75.00	100.00	0.00	38.29	17

<u>Project</u>	<u>Average</u>	<u>Median</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Standard Deviation</u>	<u>Responses</u>
Coal Tar Blending (cont.)						
Long-Term Fuel Supply Availability	76.47	75.00	100.00	50.00	20.67	17
Security	73.44	75.00	100.00	50.00	19.30	16
Renewables	5.00	0.00	50.00	0.00	14.02	15
Economic Development	58.82	50.00	100.00	25.00	23.29	17
Development of Compression Ignition Natural Gas Engines for Conversion of Diesel Engines	54.15	57.14	86.36	23.08	18.80	14
Displace Foreign Petroleum	137.50	200.00	200.00	0.00	88.23	12
Technological Development Status	22.92	0.00	100.00	0.00	37.63	12
Cost Competitiveness	50.00	50.00	100.00	0.00	38.19	7
Infrastructure Costs	40.38	50.00	75.00	0.00	19.20	13
Hidden Costs (Externalities)	57.50	50.00	100.00	0.00	37.36	10
Actionability	62.50	50.00	100.00	25.00	22.61	12
Ability of State government to Set an Example	46.15	25.00	100.00	0.00	32.03	13
Regulatory Barriers	75.00	75.00	100.00	50.00	23.84	12
Environmental and Health Impacts	61.54	50.00	75.00	50.00	12.97	13
Fuel Flexibility	55.00	50.00	100.00	0.00	30.73	10
Long-Term Fuel Supply Availability	75.00	75.00	100.00	50.00	15.08	12
Security	70.00	75.00	100.00	50.00	19.72	10
Renewables	20.83	0.00	100.00	0.00	31.68	12
Economic Development	57.50	50.00	100.00	25.00	26.48	10
Demonstration of 250 kWe Solid Oxide Fuel Cell	50.88	49.11	82.69	3.57	19.37	16
Displace Foreign Petroleum	75.00	75.00	100.00	25.00	27.00	13
Technological Development Status	45.31	37.50	100.00	0.00	34.42	16
Cost Competitiveness	35.00	25.00	75.00	0.00	26.87	10
Infrastructure Costs	42.19	25.00	100.00	25.00	23.66	16
Hidden Costs (Externalities)	66.07	75.00	100.00	0.00	33.41	14
Actionability	48.33	50.00	100.00	25.00	22.09	15
Ability of State government to Set an Example	45.00	50.00	100.00	0.00	31.62	15
Regulatory Barriers	62.50	75.00	100.00	0.00	29.01	14
Environmental and Health Impacts	71.67	75.00	100.00	0.00	24.76	15
Fuel Flexibility	58.33	75.00	100.00	0.00	32.27	15
Long-Term Fuel Supply Availability	69.64	75.00	100.00	25.00	20.04	14
Security	71.43	75.00	100.00	25.00	23.73	14
Renewables	5.77	0.00	50.00	0.00	14.98	13
Economic Development	60.00	50.00	100.00	25.00	24.64	15
Continuous Supercritical Extraction System for Recycling Used Oil	49.85	49.11	95.00	18.75	21.09	14
Displace Foreign Petroleum	140.38	150.00	200.00	0.00	59.11	13
Technological Development Status	25.00	25.00	50.00	0.00	17.68	13
Cost Competitiveness	43.75	50.00	100.00	0.00	34.72	8
Infrastructure Costs	38.46	50.00	50.00	0.00	16.51	13

<u>Project</u>	<u>Average</u>	<u>Median</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Standard Deviation</u>	<u>Responses</u>
Continuous Supercritical Extraction System for Recycling Used Oil (cont.)						
Hidden Costs (Externalities)	42.50	50.00	75.00	0.00	26.48	10
Actionability	46.43	37.50	100.00	25.00	25.68	14
Ability of State government to Set an Example	42.31	25.00	100.00	0.00	27.74	13
Regulatory Barriers	62.50	62.50	100.00	0.00	31.08	12
Environmental and Health Impacts	45.45	50.00	75.00	0.00	21.85	11
Fuel Flexibility	44.23	25.00	100.00	0.00	37.02	13
Long-Term Fuel Supply Availability	71.15	75.00	100.00	0.00	35.13	13
Security	67.31	50.00	100.00	0.00	31.27	13
Renewables	12.50	0.00	50.00	0.00	21.25	10
Economic Development	42.31	25.00	100.00	0.00	27.74	13
Meadville Community Energy & Economic Assessment	49.79	48.53	75.00	19.64	15.68	14
Displace Foreign Petroleum	52.78	50.00	100.00	0.00	40.40	9
Technological Development Status	27.27	25.00	100.00	0.00	30.53	11
Cost Competitiveness	34.38	37.50	75.00	0.00	32.56	8
Infrastructure Costs	43.75	50.00	50.00	25.00	11.31	12
Hidden Costs (Externalities)	55.00	50.00	100.00	0.00	28.38	10
Actionability	42.86	50.00	75.00	0.00	24.86	14
Ability of State government to Set an Example	28.57	25.00	75.00	0.00	25.68	14
Regulatory Barriers	61.36	50.00	100.00	0.00	30.34	11
Environmental and Health Impacts	62.50	75.00	100.00	0.00	25.00	12
Fuel Flexibility	79.17	75.00	100.00	50.00	14.43	12
Long-Term Fuel Supply Availability	83.33	75.00	100.00	75.00	12.31	12
Security	79.55	75.00	100.00	50.00	15.08	11
Renewables	72.92	75.00	100.00	25.00	27.09	12
Economic Development	45.83	50.00	100.00	0.00	27.87	12
Co-Coking	48.26	49.04	79.55	23.21	16.32	16
Displace Foreign Petroleum	134.38	150.00	200.00	25.00	74.33	8
Technological Development Status	19.23	25.00	50.00	0.00	20.80	13
Cost Competitiveness	33.33	25.00	75.00	0.00	37.64	6
Infrastructure Costs	50.00	50.00	75.00	0.00	21.93	14
Hidden Costs (Externalities)	56.67	50.00	100.00	0.00	29.07	15
Actionability	39.06	25.00	75.00	0.00	22.30	16
Ability of State government to Set an Example	26.56	25.00	75.00	0.00	17.00	16
Regulatory Barriers	54.17	50.00	100.00	25.00	17.94	12
Environmental and Health Impacts	42.31	50.00	50.00	0.00	15.76	13
Fuel Flexibility	53.13	50.00	100.00	0.00	38.60	16
Long-Term Fuel Supply Availability	73.44	75.00	100.00	0.00	30.91	16
Security	76.67	75.00	100.00	25.00	22.09	15

<u>Project</u>	<u>Average</u>	<u>Median</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Standard Deviation</u>	<u>Responses</u>
Co-Coking (cont.)						
Renewables	1.79	0.00	25.00	0.00	6.68	14
Economic Development	57.14	50.00	100.00	50.00	15.28	14
Displacement of Petroleum Coke by Pennsylvania Anthracite	46.01	44.23	85.00	1.79	20.21	17
Displace Foreign Petroleum	46.43	25.00	150.00	0.00	58.50	7
Technological Development Status	28.57	25.00	100.00	0.00	30.79	14
Cost Competitiveness	43.75	50.00	100.00	0.00	34.72	8
Infrastructure Costs	50.00	50.00	100.00	0.00	33.85	13
Hidden Costs (Externalities)	58.93	62.50	100.00	0.00	25.21	14
Actionability	51.56	50.00	100.00	25.00	19.30	16
Ability of State government to Set an Example	28.33	25.00	100.00	0.00	22.89	15
Regulatory Barriers	61.54	50.00	100.00	0.00	31.65	13
Environmental and Health Impacts	47.92	50.00	75.00	0.00	22.51	12
Fuel Flexibility	54.69	50.00	100.00	0.00	30.58	16
Long-Term Fuel Supply Availability	82.81	87.50	100.00	25.00	21.83	16
Security	80.77	75.00	100.00	50.00	18.13	13
Renewables	7.14	0.00	50.00	0.00	15.28	14
Economic Development	50.00	50.00	100.00	0.00	29.88	15
Plasma Gasifier Reactor Demonstration	45.57	44.64	90.63	3.85	21.94	15
Displace Foreign Petroleum	50.00	50.00	100.00	0.00	43.30	11
Technological Development Status	16.07	25.00	50.00	0.00	15.83	14
Cost Competitiveness	38.89	25.00	100.00	0.00	37.73	9
Infrastructure Costs	25.00	25.00	75.00	0.00	17.68	13
Hidden Costs (Externalities)	50.00	50.00	100.00	0.00	41.83	11
Actionability	40.00	25.00	100.00	0.00	24.64	15
Ability of State government to Set an Example	28.33	25.00	100.00	0.00	26.50	15
Regulatory Barriers	60.42	62.50	100.00	0.00	34.47	12
Environmental and Health Impacts	60.42	50.00	100.00	0.00	27.09	12
Fuel Flexibility	75.00	75.00	100.00	0.00	29.42	14
Long-Term Fuel Supply Availability	80.36	87.50	100.00	0.00	28.04	14
Security	76.79	75.00	100.00	50.00	20.72	14
Renewables	15.38	0.00	75.00	0.00	26.10	13
Economic Development	59.62	50.00	100.00	25.00	24.02	13
U.S. Dept. of Energy-Vision 21	43.71	47.92	73.21	5.36	22.86	15
Displace Foreign Petroleum	80.56	50.00	200.00	0.00	91.67	9
Technological Development Status	11.67	0.00	75.00	0.00	26.50	15
Cost Competitiveness	18.75	0.00	100.00	0.00	37.20	8
Infrastructure Costs	23.08	25.00	50.00	0.00	18.99	13
Hidden Costs (Externalities)	41.67	37.50	100.00	0.00	35.89	12
Actionability	45.00	50.00	75.00	0.00	23.53	15

<u>Project</u>	<u>Average</u>	<u>Median</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Standard Deviation</u>	<u>Responses</u>
U.S. Dept. of Energy-Vision 21 (cont.)						
Ability of State government to Set an Example	33.33	50.00	75.00	0.00	24.40	15
Regulatory Barriers	54.17	50.00	100.00	0.00	41.06	12
Environmental and Health Impacts	61.54	50.00	100.00	0.00	37.66	13
Fuel Flexibility	62.50	75.00	100.00	0.00	32.15	14
Long-Term Fuel Supply Availability	69.64	75.00	100.00	0.00	32.79	14
Security	60.00	75.00	100.00	0.00	32.46	15
Renewables	13.64	0.00	75.00	0.00	23.35	11
Economic Development	58.93	75.00	100.00	0.00	31.94	14