

# PENNSYLVANIA ENERGY DEVELOPMENT AUTHORITY

ANNUAL REPORT July 1, 1992 - June 30, 1993



**Robert P. Casey, Governor**  
**Mark S. Singel, Lt. Governor**  
**Anthony T. Sossong, Chairman of the Board**

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## **1992-93 ANNUAL REPORT**

July 1, 1992 - June 30, 1993



## MESSAGE FROM THE CHAIRMAN AND DIRECTOR

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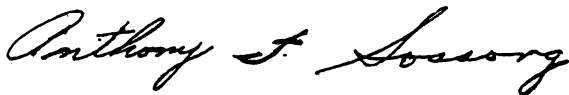
This Annual Report is submitted to the Governor and General Assembly pursuant to the Pennsylvania Energy Development Authority and Emergency Powers Act of 1982, P.L. 1213, 280. It is also prepared for the review and use of the citizens of the Commonwealth interested in the wide range of energy research conducted to promote energy development and conservation for the benefit of Pennsylvania's environment and economy.

During the past year, this nation has been engaged in active deliberations over numerous vital energy related issues. Energy has become a focal point for not only national issues but also global ones. It is now clear that energy issues are directly linked to environmental, economic, and political issues, and that actions taken on these energy issues will affect us for decades to come. With the passage of the National Energy Policy Act of 1992 (EPACT), this nation initiated steps to attempt to make progress in addressing many energy topics. The EPACT focuses on increasing research in energy efficiency and renewable technologies, promotes coal research, alternative fuels, and coalbed methane, as well as addressing nearly every facet of the energy community. In addition, the impact of the Clean Air Act Amendments of 1990 continue to garner considerable attention throughout the nation and in Pennsylvania. Regulatory bodies are vigorously developing implementation measures. Utility companies are conducting strategic planning programs. Hundreds of millions of dollars are being invested in research and deployment of new technologies to reduce emissions and improve the efficiency of emerging technologies.

In Pennsylvania, these initiatives will have an impact on the future living environment of every Pennsylvanian. Whether in the coal fields of western Pennsylvania, the agricultural areas in the eastern part of the state, or the suburban and urban areas throughout the state, energy laws, regulations, and programs will affect our lifestyles. A crucial question for the Commonwealth is what role state supported energy research and development will play in answering the many technical issues and in developing new technologies that can mitigate hardships and enhance our future.

It is in this context that the Pennsylvania Energy Development Authority (PEDA) has attempted transition into a research organization which supports projects that address the technical side of these issues. During the past nine years, PEDA has contributed nearly \$12.5 million to over 120 energy projects worth more than \$54 million. During that period, it has evolved into a nationally respected research organization. PEDA has placed particular research attention on the development of technologies that make coal a cleaner fuel. However, it has also supported a broad range of projects such as wind power, improved energy conservation practices in buildings, oil and gas well drilling, and energy efficient agricultural practices.

As the Authority nears the end of its first decade of operation, many of its research projects have proven successful, however, its future remains uncertain. The pending need for a sustained energy research and development program is counter balanced by the budgetary pressures of state government. However, in the next several years, PEDA will attempt to focus on the research essential to improving Pennsylvania's ability to meet energy needs in an environmentally enhanced manner.



Anthony T. Sossong  
Chairman



Dane C. Bickley  
Director

**TABLE OF CONTENTS**

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**BOARD OF DIRECTORS** ..... 1

**TECHNICAL ADVISORY COMMITTEE** ..... 3

**PEDA STAFF** ..... 5

**THE RESEARCH AGENDA** ..... 7

**FINANCIAL SUMMARY** ..... 13

**APPENDICES**

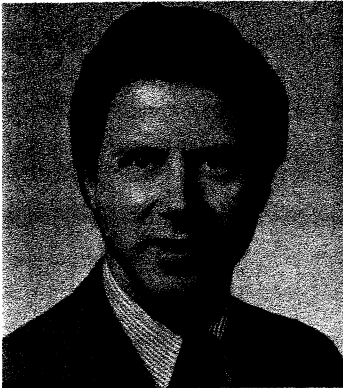
**APPENDIX A -- PEDA RD&D PROJECTS COMPLETED DURING FY 1992-93**

**APPENDIX B -- PEDA RD&D PROJECTS IN PROGRESS DURING FY 1992-93**

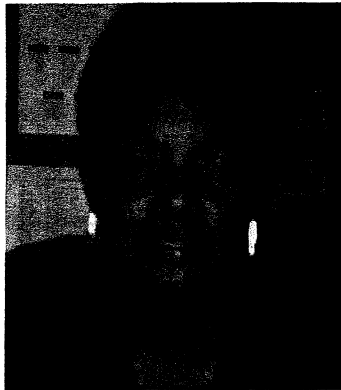
**APPENDIX C -- PEDA RD&D PROJECTS AWARDED DURING FY 1992-93**

**BOARD OF DIRECTORS**

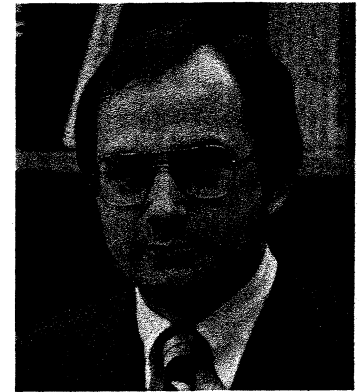
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**Lawrence B. Abrams III, Esquire**  
Rhoads & Sinon  
Harrisburg



**Virginia Brown**  
Philadelphia



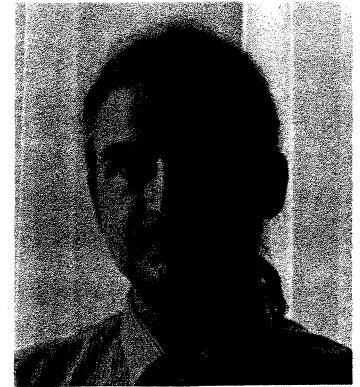
**James H. Cawley, Esquire**  
Camp Hill



**Jeffrey S. Craig**  
Pittsburgh



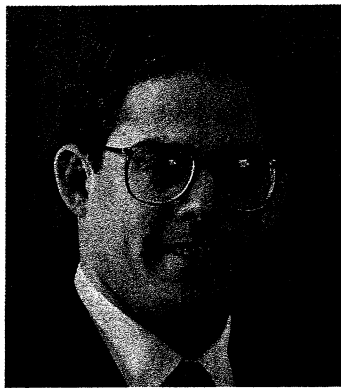
**Honorable Arthur A. Davis**  
Secretary of Environmental Resources  
Harrisburg



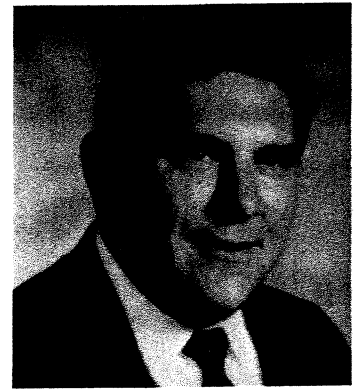
**Medard Gabel**  
The World Game  
Philadelphia



**Thomas P. Gordon, Ph.D.**  
Gordon Terminal Service Company  
Pittsburgh



**Honorable Andrew T. Greenberg**  
Secretary of Commerce  
Harrisburg



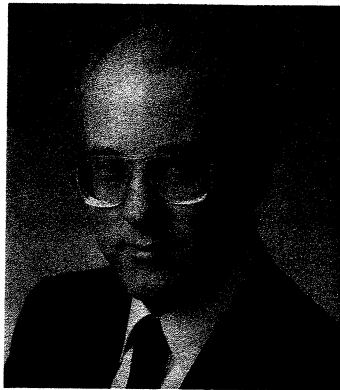
**Honorable James J. Rhoades**  
Senate  
Mahanoy City

**BOARD OF DIRECTORS**

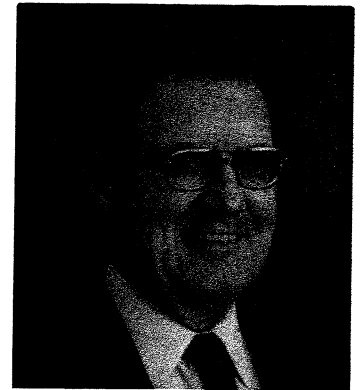
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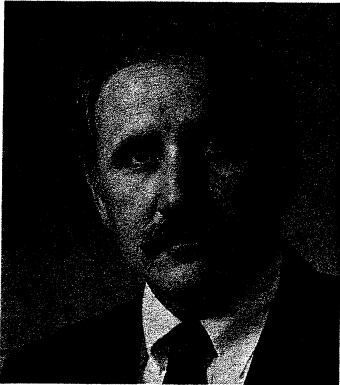
**Honorable Sarah W. Hargrove**  
Secretary of Banking  
Harrisburg



**Honorable William R. Lloyd, Jr.**  
House of Representatives  
Somerset



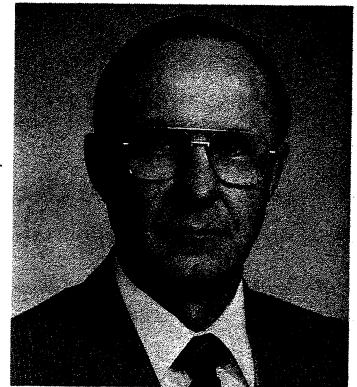
**Franklin H. Mohney, Secretary**  
Camp Hill



**Irwin A. Popowsky, Esquire**  
Consumer Advocate  
Harrisburg



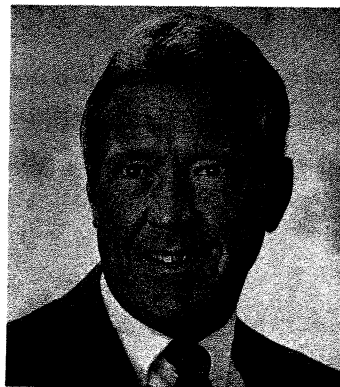
**Honorable David Rolka**  
Public Utility Commission  
Harrisburg



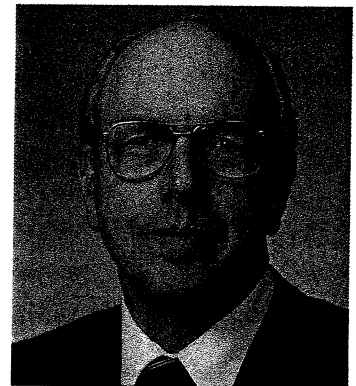
**Anthony T. Sossong, Chairman**  
Reitz Coal Company  
Windber



**Honorable Samuel E. Rohrer**  
House of Representatives  
Reading



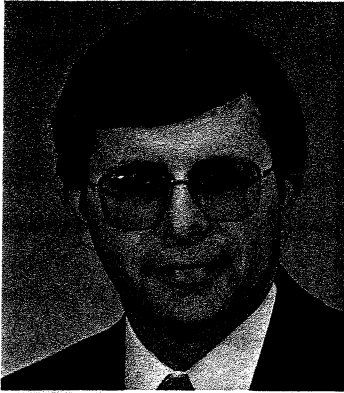
**Honorable William Stewart**  
Senate  
Johnstown



**Honorable Boyd E. Wolff**  
Secretary of Agriculture  
Harrisburg

**TECHNICAL ADVISORY COMMITTEE**

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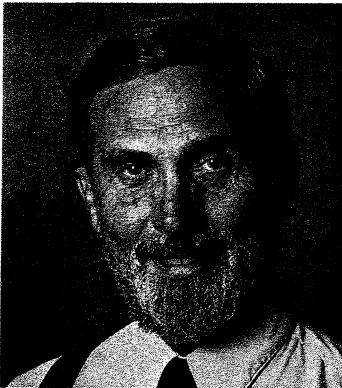
**Thomas Bradish, Director**  
Research and Development  
Pennsylvania Electric Company  
Johnstown



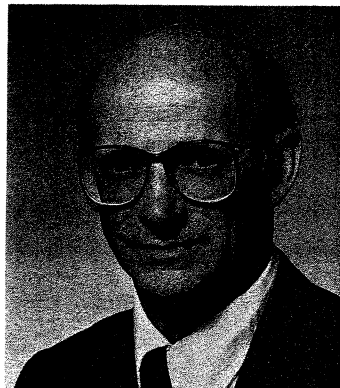
**Martin Campfield, CPAg**  
GRO-MOR Plant Food Company  
Leola



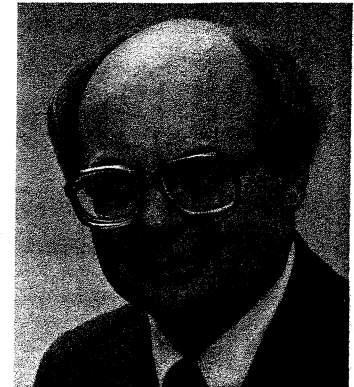
**James T. Cobb, Jr., Ph.D., Director**  
Energy Resources Program  
University of Pittsburgh  
Pittsburgh



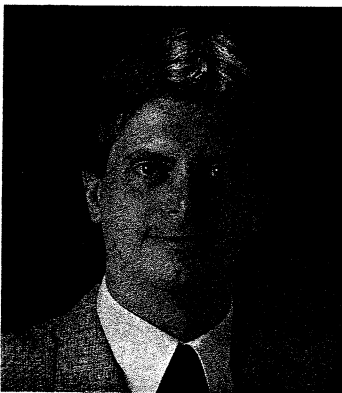
**Gilbert M. Freedman**  
Allegheny Electric Cooperative, Inc.  
Harrisburg



**Robert P. Johnson, Manager**  
Energy Utilization Research  
Pennsylvania Power & Light Company  
Allentown



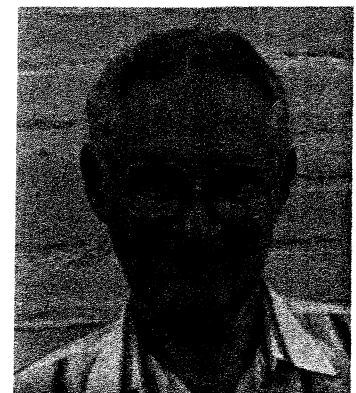
**Flynt Kennedy, Ph.D., Vice President**  
Research and Development  
Consolidation Coal Company  
Library



**Andy Lau**  
Penn State Harrisburg  
Middletown



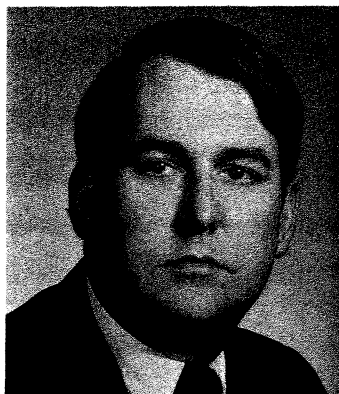
**Edward K. Levy, Ph.D., Director**  
Energy Research Center  
Lehigh University  
Bethlehem



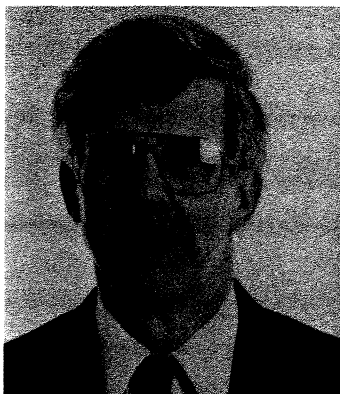
**Harold G. Lorsch, Ph.D., Director**  
Center for Insulation Technology  
Drexel University  
Philadelphia

## **TECHNICAL ADVISORY COMMITTEE**

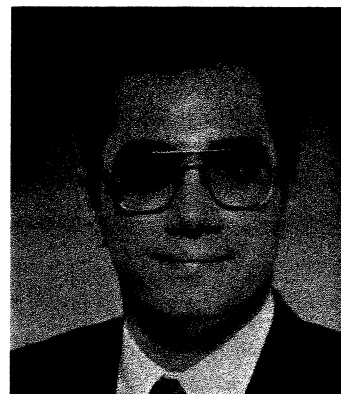
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**Peter T. Luckie, Ph.D.**  
Associate Dean for Research  
Pennsylvania State University  
University Park



**John E. Notestein, Senior Scientist**  
Office of the Director  
US Department of Energy  
Morgantown Energy Technology Center  
Morgantown, West Virginia



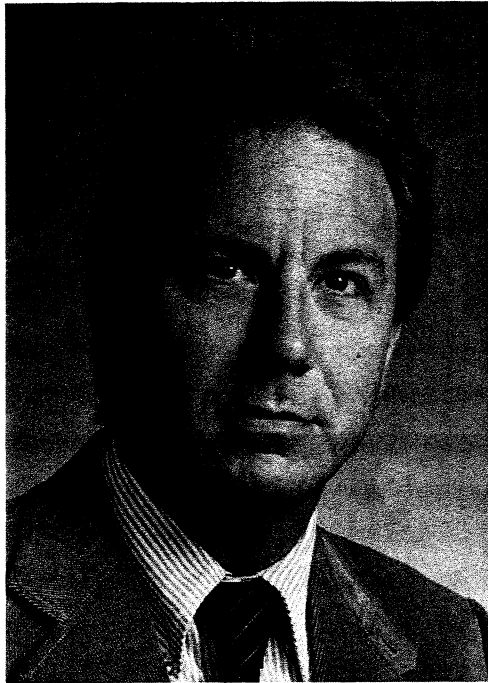
**Thomas A. Sarkus, Esquire**  
US Department of Energy  
Pittsburgh Energy Technology Center  
Pittsburgh

**Frederick P. DeWeese, President**  
Carbon Sales, Inc.  
Wilkes-Barre

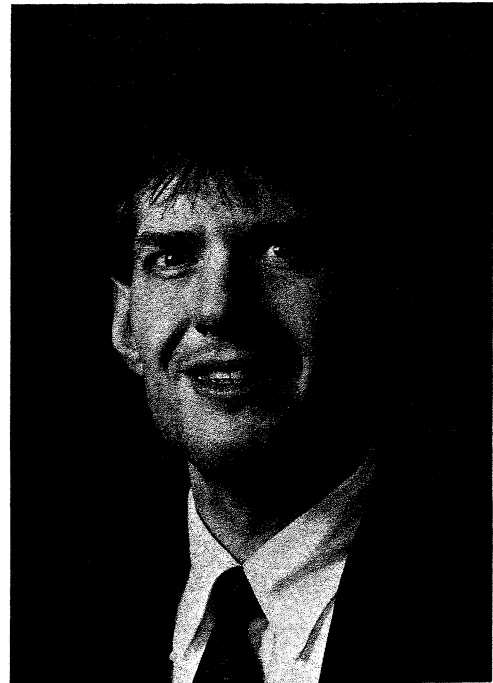
**Robert Kobet, AIA**  
Energy Design Associates  
Harmony

**David Martin**  
Gilberton Power Company  
Frackville

**Tad R. Potter**  
Pittsburgh Coalbed Methane Forum  
Pittsburgh



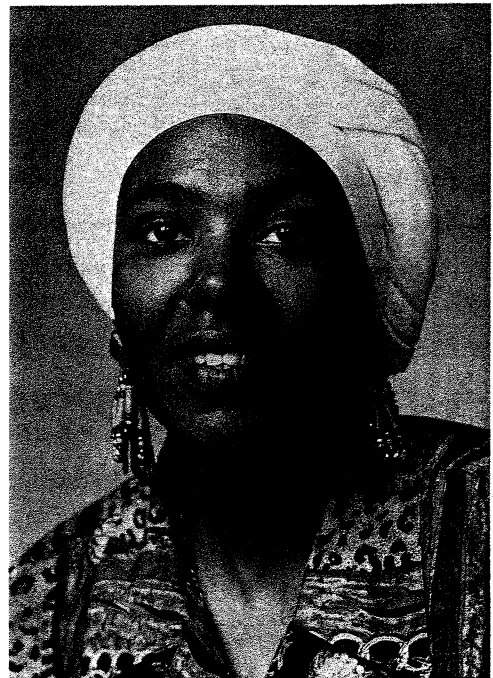
**Dane C. Bickley**  
Director



**Joseph J. Garbacik**  
Program Manager



**Billie E. Ramsey, Esquire**  
Counsel



**Toni J. Mears**  
Assistant Secretary  
to the Board

Despite significant reductions in state appropriated research dollars, PEDA has attempted to sustain an active research program for Pennsylvania's universities, private companies, and non-profit corporations. In FY 92-93, PEDA received an appropriation of \$300,000. Considering that its FY 91-92 state appropriation of \$750,000 was placed in budgetary reserve making it unavailable to support energy research in Pennsylvania, PEDA directed its limited resources to research projects that could either address near term technology issues or develop new energy technologies. During the FY 92-93 fiscal year the Authority allocated \$423,383 to nine research projects totalling \$734,080. The nine projects are:

- **NOXSO Corporation**, a \$50,000 venture capital grant to conduct laboratory scale tests of the NOXSO dry sorbent powder in a bubbling bed reactor;
- **Dravo Lime Company**, venture capital grants of \$40,000 for each of two research projects: (1) to develop and test a process that simultaneously removes sulfur dioxide, nitrogen oxides and air toxics from the flue gas of coal-fired boilers and (2) to conduct pilot scale testing of process to produce high-quality, high-strength gypsum from the flue gas desulfurization scrubber sludge from a coal-fired power plant.
- **Pennsylvania State University**, (1) a \$50,000 grant to characterize coal pond fines and to conduct combustion testing on a coal-water slurry mixture from these fines to determine their utilization potential in utility boilers; and (2) a \$79,992 grant to study the hydraulics associated with air drilling for oil and gas production;
- **Coreco Fiberglass, Inc.**, a \$19,967 venture capital grant to develop an impervious secondary containment system for well-site containment of crude oil using fiberglass-reinforced plastic laminates and composites;
- **Lehigh University**, a \$47,992 grant to develop a testing and demonstration unit for the continuous concentration and removal of sulfur dioxide from the flue gas stream in coal-fired boilers;
- **The Grass Roots Alliance for a Solar Pennsylvania (GRASP)**, a \$49,935 grant to monitor duct leakage rates, energy consumption and energy savings as a result of using leakage diagnostic treatment techniques in homes; and
- **EXPORTech Company Inc.**, a \$45,547 venture capital grant to explore using dry magnetic separation technology in cleaning

**TABLE 1: PEDA REVENUE BOND PROJECTS**

<b>Project Number</b>	<b>Name</b>	<b>Developer</b>	<b>Revenue Bond Issue Amount</b>
84061	Humboldt Energy Center	Continental Energy Associates	\$ 39,000,000
85033	Piney Creek Project	MidAtlantic Energy Group	45,650,000
85034	Ebensburg Power Company	Babcock & Wilcox Company	77,600,000
87048	Ebensburg Power Company	Babcock & Wilcox Company	4,400,000
90036*	Northern Appalachian Project	Northern Appalachian Development Corp.	8,500,000

\* On September 30, 1992, PEDA Revenue Bonds for this project were redeemed. This is no longer an active project.

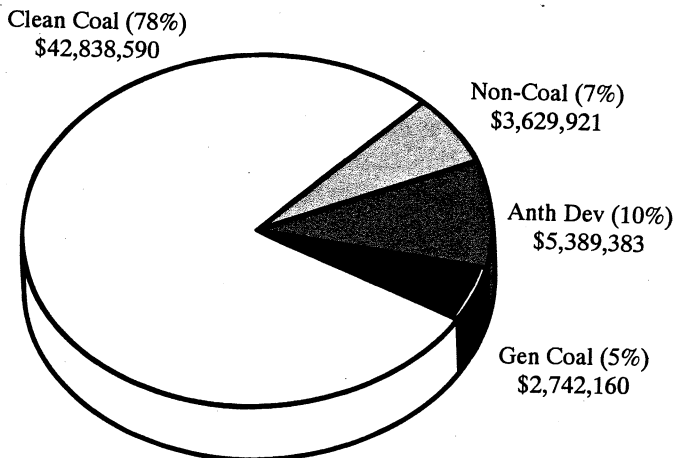
# THE RESEARCH AGENDA

coal from the recirculating load of a coal pulverizer.

These projects were selected from a total of 21 applications requesting \$1,008,052 in financial assistance with total project costs of \$1,729,798. Reviewing the last two fiscal years, PEDAs received 67 applications requesting over \$6.4 million. However, PEDAs was only able to provide financial support to 25 of these projects totalling about \$2.0 million.

In FY 91-92, PEDAs initiated a Colleges and Universities Program which provided \$504,408 for nine research projects throughout Pennsylvania. Due to financial limitations this program was discontinued in FY 92-93. The focus of this program was to provide research opportunities to investigate fundamental scientific issues and explore new and advanced energy technologies.

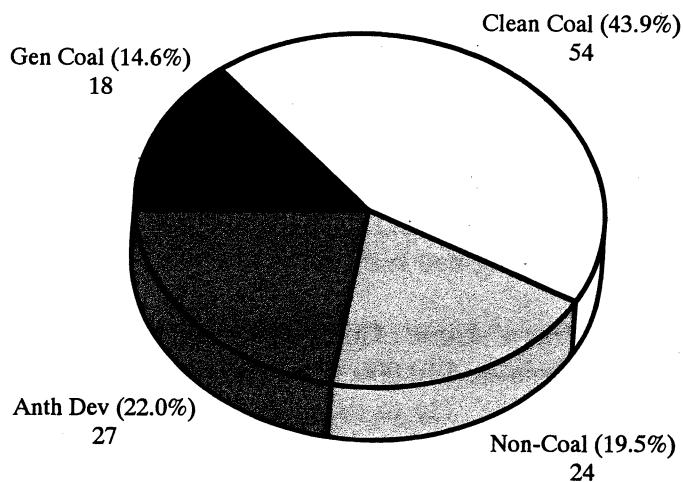
**TOTAL COST**  
(through nine years of program)



PEDAs has now completed its ninth year of operation. In those nine years it has allocated a \$12,488,352 contribution to total project costs of \$54,600,054. For every dollar invested in energy research by PEDAs nearly four dollars was generated

for total project support. Categorically, the greatest project type receiving support was those that focus on the development of clean coal technologies. Of the total project cost investment, \$42,838,590, or 78%, went to research projects that were directed to finding ways to make coal a cleaner fuel. Other coal, energy conservation and renewable project investments comprise the remaining 22%.

**CATEGORICAL DISTRIBUTION OF PROJECTS**  
(through nine years of program)



Of the 123 research projects receiving financial support from the Authority, 54 received a total of \$6,531,571 to promote these clean coal technologies. Research to support anthracite development totaled 27 projects, followed by 24 renewable and energy conservation projects and 18 projects supporting general coal development research.

While its financial support has dramatically declined, PEDAs actively managed existing research projects to benefit the Commonwealth. During FY 92-93, PEDAs staff managed 54 research projects. (See Tables 2, 3, and 4 for a listing of these projects and Appendices A, B, and C for more information on each project.) Several notable project achievements during the fiscal year include:

- The completion of a research project by Viking Systems International (formerly BCR National Laboratory), titled "A Study of Potential Impacts of Coal Blends on Power Plant Operations". With the passage of the 1990 Clean Air Act Amendments Pennsylvania utilities will be developing compliance plans that may include the blending of various coals to reduce sulfur emissions. This project involved the technical investigation of coals that may represent a low cost solution to emission reduction particularly for older or smaller power plants in Pennsylvania. Upon completion of this project, final reports were sent to Pennsylvania's utility companies.
- With the issuance of a surface mining permit, the Kauffman demonstration project commenced mining operations. This project, a joint project of The Pennsylvania State University and the Al Hamilton Contracting Company, focuses on the mining of Pennsylvania coals which have alkaline deficient overburden and the potential for post-mining drainage. The project involves ↓ the validation of innovative uses of alkaline

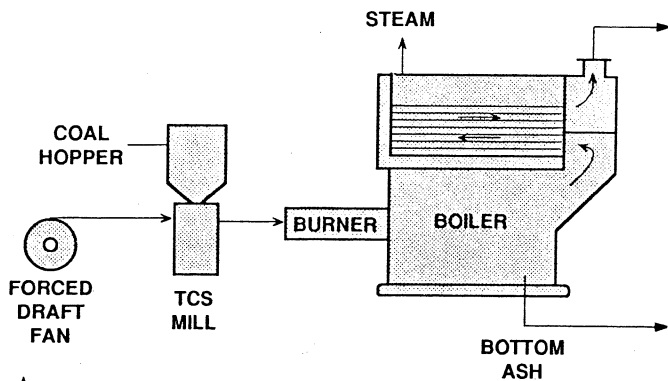


material during mining and reclamation to prevent post-mining formation of acid drainage. If successful the mining, or re-mining, of areas with acid overburden may be possible in Pennsylvania's coal fields.



- ↑ • The Rodale Institute Research Center completed its four-year study to look at the energy efficiency of six different cropping scenarios representing a range of existing and experimental cropping systems. The study concluded that large amounts of energy are used by the agricultural sector directly through tillage and indirectly through the production of farm equipment, seeds, chemical fertilizers and pesticides. Using a low-input system reduces energy consumption. The Institute developed a fact sheet on its energy analysis for distribution to farmers and other interested parties.

## THE RESEARCH AGENDA



- ↑ Several years ago, PEDA undertook a research needs assessment for the anthracite region. One recommendation was to support the development of a new, efficient boiler system for the commercial and small industrial market. As a result, PEDA implemented a design competition that resulted in an award to the Energy and Fuels Research Center at The Pennsylvania State University to design and demonstrate a new boiler system. During FY 92-93, construction of the anthracite boiler project was initiated.

- On December 17, 1992, the Piney Creek Power Plant began commercial operation. Located several miles from the town of Clarion, this 30-megawatt plant required 300 construction workers to build the plant and now employs about 30 workers for its operation. The total cost of the plant was about \$100 million of which PEDA provided \$45,650,000 in revenue bonds. The plant incorporates the modern circulating fluidized bed technology and utilizes waste-coal fuel from surrounding active and abandoned mining sites. Important benefits from the project include the clean-up of waste material and improved efficiency of the technology to remove air pollutants during operation. With this project underway, PEDA now has three commercial energy projects that are generating power, providing jobs, and improving Pennsylvania's environment. See Table 1 for a listing of PEDA's revenue bond projects.



**TABLE 2: PEDA RD&D PROJECTS COMPLETED DURING FY 1992-93**  
(These projects are detailed in Appendix A)

<b>Project Number</b>	<b>Recipient</b>	<b>Purpose</b>	<b>Total Cost</b>	<b>PEDA Share</b>
486-043	Pennsylvania State University	Acid Mine Drainage Computer Model	\$ 223,521	\$ 142,175
488-007	Renewable Energy Institute	Wind Data Acquisition	20,000	18,000
488-009	Pennsylvania State University	Short-Longwall Mining Study	61,902	36,902
883-4024	Pennsylvania Electric Company	Weathered Coal Effects on Performance	100,000	70,000
893-4004	University of Pittsburgh	LICADO Coal Cleaning Process	91,000	58,680
893-4013	Pennsylvania State University	Anthracite Institute	121,000	108,900
893-4021	Lehigh University	Erosion Study of Anthracite Waste	193,796	153,796
893-4030	Zurn Industries, Inc.	Rotary Cascading Bed Boiler Study	304,017	130,000
893-4038	Viking Systems International	Coal Blends Impact Study	238,338	213,338
9003-4002	NOXSO Corporation	NOXSO Flue Gas Cleanup Process	282,125	188,177
9003-4011	Tampella Power Corporation	Improve SO <sub>2</sub> Capture in CFB Boilers	306,108	175,000
9003-4013	Rodale Institute Research Center	Energy Efficiency in Agriculture	101,992	10,000
9003-4025	Washington Energy Processing	Ultra Fine Waste Coal Recovery	194,060	155,248
9003-4034	BCR National Laboratory	Fine Coal Drying thru Vibrofluidization	714,961	99,961

**TABLE 3: PEDA RD&D PROJECTS IN PROGRESS DURING FY 1992-93**  
(These projects are detailed in Appendix B)

<b>Project Number</b>	<b>Recipient</b>	<b>Purpose</b>	<b>Total Cost</b>	<b>PEDA Share</b>
863-4008	Pennsylvania Electric Company	Low NO <sub>x</sub> Burner Demonstration	\$4,600,000	\$ 400,000
487-010	Pennsylvania Electric Company	Coal-Water Slurry Combustion Testing	262,777	172,500
883-4034	Drexel University	Refuse Derived Fuel Combustion Tests	171,780	107,054
893-4002	Pennsylvania Electric Company	Confined Zone Dispersion Demo.	8,510,200	750,000
893-4014	Pennsylvania State University	Alkaline Addition Study	280,000	250,000
893-4016	Pennsylvania State University	Sorbent Performance Study	246,926	219,810
893-4018	Pennsylvania State University	Oil Well Brine Treatment Study	160,000	144,000
893-4029	University of Pittsburgh	Cyclonic Agglomeration Coal Cleaning	234,405	157,633
9003-3004	GE Transportation Systems	Coal-Water Slurry Fueled Locomotive	2,084,043	100,000
9003-4008	Pennsylvania Electric Company	Coal-Water Slurry Pilot Plant	376,880	249,380
9003-4022	Lehigh University	Flue Gas Cleanup w/Zeolite	81,795	71,795
9003-4027	Lehigh University	Dry Coal Purifier (D-CoP) Pilot Plant	1,725,906	250,000
9003-4029	Pennsylvania State University	Recovery of Low Ash Anthra. Tailings	94,727	85,227
9103-1001	Pennsylvania State University	High Performance Anthracite Boiler	353,257	210,863
9103-4001	Lehigh University	Aromatic Structures of Coal	60,000	48,000
9103-4006	University of Pittsburgh	Taylor-Vortex Column in Coal Cleaning	50,000	40,000
9103-4010	Drexel University	Heating Efficiency of Heat Pumps	85,300	58,568

Continued on page 12

**TABLE 2: PEDA RD&D PROJECTS COMPLETED DURING FY 1992-93**  
(These projects are detailed in Appendix A)

Project Number	Recipient	Purpose	Total Cost	PEDA Share
486-043	Pennsylvania State University	Acid Mine Drainage Computer Model	\$ 223,521	\$ 142,175
488-007	Renewable Energy Institute	Wind Data Acquisition	20,000	18,000
488-009	Pennsylvania State University	Short-Longwall Mining Study	61,902	36,902
883-4024	Pennsylvania Electric Company	Weathered Coal Effects on Performance	100,000	70,000
893-4004	University of Pittsburgh	LICADO Coal Cleaning Process	91,000	58,680
893-4013	Pennsylvania State University	Anthracite Institute	121,000	108,900
893-4021	Lehigh University	Erosion Study of Anthracite Waste	193,796	153,796
893-4030	Zurn Industries, Inc.	Rotary Cascading Bed Boiler Study	304,017	130,000
893-4038	Viking Systems International	Coal Blends Impact Study	238,338	213,338
9003-4002	NOXSO Corporation	NOXSO Flue Gas Cleanup Process	282,125	188,177
9003-4011	Tampella Power Corporation	Improve SO <sub>2</sub> Capture in CFB Boilers	306,108	175,000
9003-4013	Rodale Institute Research Center	Energy Efficiency in Agriculture	101,992	10,000
9003-4025	Washington Energy Processing	Ultra Fine Waste Coal Recovery	194,060	155,248
9003-4034	BCR National Laboratory	Fine Coal Drying thru Vibrofluidization	714,961	99,961

**TABLE 3: PEDA RD&D PROJECTS IN PROGRESS DURING FY 1992-93**  
(These projects are detailed in Appendix B)

Project Number	Recipient	Purpose	Total Cost	PEDA Share
863-4008	Pennsylvania Electric Company	Low NO <sub>x</sub> Burner Demonstration	\$4,600,000	\$ 400,000
487-010	Pennsylvania Electric Company	Coal-Water Slurry Combustion Testing	262,777	172,500
883-4034	Drexel University	Refuse Derived Fuel Combustion Tests	171,780	107,054
893-4002	Pennsylvania Electric Company	Confined Zone Dispersion Demo.	8,510,200	750,000
893-4014	Pennsylvania State University	Alkaline Addition Study	280,000	250,000
893-4016	Pennsylvania State University	Sorbent Performance Study	246,926	219,810
893-4018	Pennsylvania State University	Oil Well Brine Treatment Study	160,000	144,000
893-4029	University of Pittsburgh	Cyclonic Agglomeration Coal Cleaning	234,405	157,633
9003-3004	GE Transportation Systems	Coal-Water Slurry Fueled Locomotive	2,084,043	100,000
9003-4008	Pennsylvania Electric Company	Coal-Water Slurry Pilot Plant	376,880	249,380
9003-4022	Lehigh University	Flue Gas Cleanup w/Zeolite	81,795	71,795
9003-4027	Lehigh University	Dry Coal Purifier (D-CoP) Pilot Plant	1,725,906	250,000
9003-4029	Pennsylvania State University	Recovery of Low Ash Anthra. Tailings	94,727	85,227
9103-1001	Pennsylvania State University	High Performance Anthracite Boiler	353,257	210,863
9103-4001	Lehigh University	Aromatic Structures of Coal	60,000	48,000
9103-4006	University of Pittsburgh	Taylor-Vortex Column in Coal Cleaning	50,000	40,000
9103-4010	Drexel University	Heating Efficiency of Heat Pumps	85,300	58,568

Continued on page 12

# THE RESEARCH AGENDA

**TABLE 3: PEDA RD&D PROJECTS IN PROGRESS DURING FY 1992-93 (Continued)**

(These projects are detailed in Appendix B)

Project Number	Recipient	Purpose	Total Cost	PEDA Share
9103-4014	Pennsylvania State University	Electric Car Solar Charging Station	47,199	37,759
9103-4019	Pennsylvania State University	Production of Graphite from Anthracite	74,844	59,875
9103-4021	Pennsylvania State University	Analysis of DC Mine Trolley Systems	43,771	35,017
9103-4023	Pennsylvania State University	Effects of Moisture in Coal Combustion	86,654	69,323
9103-4024	Pennsylvania State University	Multi-Faceted Fine Coal Cleaning	100,000	80,000
9103-4031	Pennsylvania Electric Company	Coal-Water Slurry Utility Test Burn	560,000	178,400
9103-4035	Pennsylvania State University	Pa. Limestone Eval. for Wet FGD	265,445	152,356
9103-3036	Lehigh University	Improve Erosion Resistance in CFBs	195,398	124,318
9103-3039	Viking Systems International	Coal/Gas Reburn for NO <sub>x</sub> Reduction	194,718	107,774
9103-4042	Cambria Cogen Company	Bituminous Silt in CFB Boilers	199,737	127,789
9103-4043	GRASP	Duct Leakage Evaluation	87,000	59,160

**TABLE 4: PEDA RD&D PROJECTS AWARDED DURING FY 1992-93**

(These projects are detailed in Appendix C)

Project Number	Recipient	Purpose	Total Cost	PEDA Share
9103-4017	Pennsylvania State University	Oil and Gas Production Enhancement	\$ 79,942	\$ 79,942
9203-4009	Pennsylvania State University	Characterization of Pond Fines as CWS	80,000	50,000
9203-3010	NOXSO Corporation	Removal of SO <sub>2</sub> & NO <sub>x</sub> from Flue Gas	62,500	50,000
9203-3012	EXPORTech Company, Inc.	Magnetic Separation for Coal Cleaning	56,934	45,547
9203-4013	Lehigh University	SO <sub>2</sub> Concentration - Flue Gas Clean-Up	59,990	47,992
9203-3014	Coreco Fiberglass, Inc.	Fiberglass Containment System for Oil	24,959	19,967
9203-4015	GRASP	Energy Savings from Duct Repair	73,935	49,935
9203-3018	Dravo Lime Company	Removal of SO <sub>2</sub> /NO <sub>x</sub> /Air Toxics	117,858	40,000
9203-3019	Dravo Lime Company	Utilization of FGD Waste for Gypsum	157,977	40,000

## FINANCIAL SUMMARY

**TABLE 5: BALANCE SHEET  
JUNE 30, 1993**

<b>ASSETS</b>	
Cash	\$ 136.57
Short Term Investments	2,940,000.00
Accrued Interest Receivable	<u>8,016.75</u>
<b>TOTAL ASSETS</b>	<b>2,948,153.32</b>
<b>LIABILITIES &amp; FUND BALANCE</b>	
<b>LIABILITIES</b>	
Vouchers Payable	110,482.80
<b>FUND BALANCES</b>	
Reserved	
Grants/Venture Capital Commitments:	
Encumbered	2,743,599.05
Unencumbered	34.00
Operating Encumbrances	5,655.64
Undesignated	<u>88,381.83</u>
<b>TOTAL FUND BALANCES</b>	<b><u>2,837,670.52</u></b>
<b>TOTAL LIABILITIES AND FUND BALANCES</b>	<b>\$ 2,948,153.32</b>

At the conclusion of FY 92-93 the Authority had \$88,381.83 in net funds available. This reflects an increase of \$78,482 when compared to FY 91-92. However, it is important to note that the entire FY 91-92 state appropriation of \$750,000 was placed in budgetary reserve and never transferred into the Energy Development Fund. The state appropriation for FY 92-93 was \$300,000; down considerably from the \$1.5 million appropriated in FY 90-91.

As of June 30, 1993, the fund balance for the Authority was \$2,837,670.52. Of these dollars, the Authority committed a total of \$2,749,289 to research projects and operating costs. It is important to note that once the Board of Directors commits an allocation to a research project it is viewed as a reservation of those funds. The total operating expenses for the Authority during FY 92-93 was \$250,887.29. This is a reduction of \$39,786 from the previous fiscal year.

During FY 92-93, the Authority's interest payments on investments totaled \$135,702.28. This figure is down \$177,176 from FY 91-92 and is due to the reduction in interest rates as well as a reduction of the total dollars in the Energy Development Fund on which interest accrues. However, in comparing the total revenues generated by the Authority, exclusive of state appropriated dollars, to total operating expenses the Authority continued to cover its operational expenses without cost to the taxpayers in Pennsylvania.

Summaries of the Authority's fiscal status are provide in Tables 5, 6, and 7. The financial information was prepared by the Comptroller's Office of the Commonwealth of Pennsylvania. It is subject to minor changes as revised information becomes available subsequent to the conclusion of the fiscal year.

## **FINANCIAL SUMMARY**

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With the significant reduction in state appropriations and the reduced Energy Development Fund balance, the Authority will begin FY 93-94 with very limited financial resources for new energy research and development opportunities. The FY

92-93 funds committed to projects was reduced by about 75% compared to FY 91-92. The Authority has reached a juncture where it will be difficult to continue providing financial support to vital energy research in Pennsylvania.

**TABLE 6: STATEMENT OF REVENUES AND EXPENDITURES  
JUNE 30, 1993**

<b>REVENUES</b>	
Interest on Investments	\$ 135,219.03
Application Fees	2,100.00
Commitment Fees	0.00
Venture Capital Repayments	165.33
Miscellaneous Revenue	<u>0.00</u>
<b>TOTAL REVENUES</b>	<b>137,484.36</b>
<b>EXPENDITURES</b>	
Grants/Venture Capital	1,346,366.61
Operating Expenses	<u>250,887.29</u>
<b>TOTAL EXPENDITURES</b>	<b>1,597,253.90</b>
Revenues Over/(Under) Expenditures	(1,459,769.54)
Other Financing Sources:	
Transfer from General Fund	300,000.00
<b>REVENUE AND OTHER FINANCING SOURCES OVER/(UNDER) EXPENDITURES</b>	<b>(1,159,769.54)</b>
FUND BALANCE, JULY 1, 1992	<u>3,997,440.06</u>
<b>FUND BALANCE, JUNE 30, 1993</b>	<b>\$2,837,670.52</b>

# FINANCIAL SUMMARY

**TABLE 7: COMPARATIVE STATEMENT OF FUNDS AVAILABLE  
FOR THE TWELVE MONTH PERIOD ENDING JUNE 30**

	<u>1992</u>	<u>1993</u>
<b>TOTAL AVAILABLE FUNDS - July 1</b>	<b>\$ 6,717,081</b>	<b>\$ 3,997,440</b>
<b>RECEIPTS</b>		
Transfer from General Fund	\$ 0	\$ 300,000
Interest on Investments	312,878	135,219
Application Fees	4,600	2,100
Commitment Fees	0	0
Venture Capital Repayments	0	165
Miscellaneous	<u>0</u>	<u>0</u>
<b>TOTAL RECEIPTS</b>	<b>\$ 317,478</b>	<b>\$ 437,484</b>
<b>AVAILABLE FOR DISBURSEMENT</b>	<b>\$ 7,034,559</b>	<b>\$ 4,434,924</b>
<b>DISBURSEMENTS</b>		
Grants/Venture Capital	\$ 2,746,446	\$ 1,346,367
Operating Expenses	<u>290,673</u>	<u>250,887</u>
<b>TOTAL DISBURSEMENTS</b>	<b>\$ 3,037,119</b>	<b>\$ 1,597,254</b>
<b>GROSS FUNDS AVAILABLE</b>	<b>\$ 3,997,440</b>	<b>\$ 2,837,670</b>
<b>COMMITMENTS</b>		
Grants/Venture Capital	\$ 3,983,981	\$ 2,743,633
Operating	<u>3,559</u>	<u>5,656</u>
<b>TOTAL COMMITMENTS</b>	<b>\$ 3,987,540</b>	<b>\$ 2,749,289</b>
<b>NET FUNDS AVAILABLE</b>	<b>\$ 9,900</b>	<b>\$ 88,381</b>

*The following is a list of projects that were completed during FY 1992-93. Contact PEDA at 717-783-9981 for further information on these projects. For the projects identified with an asterisk (\*), copies of the final reports are on file at PEDA and are available through the State Library System.*

### BCR NATIONAL LABORATORY

#### "An Improved Thermal Dryer for Fine Coal - Phase I" (Project # 9003-4034)

The objective of this project has been to evaluate the feasibility of an improved dryer for coal based on the concept of vibrated beds. This conceptual system draws on the advantages inherent to vibrated beds such as their ability to handle a variety of material types (wet, sticky, etc.), high thermal efficiency and low particle emissions.

### LEHIGH UNIVERSITY

#### "Erosion Characteristics of Anthracite Waste for Fluidized Bed Combustion Systems" (Project # 893-4021)\*

This research studied the erosivity and particle characteristics of anthracite coal and other feed materials for circulating fluidized bed boilers. It was observed that erosivity, composition and shape of the material changed with particle size. Particle composition also determined the erosivity of a material. The results of this study could be used to develop a quality control system for the proper selection of feedstock materials that will minimize bed material erosivity.

### NOXSO CORPORATION

#### "An Experimental Study and Economic Evaluation of a Dilute Phase Transport Reactor in the NOXSO Flue Gas Cleanup Process" (Project #9003-4002)\*

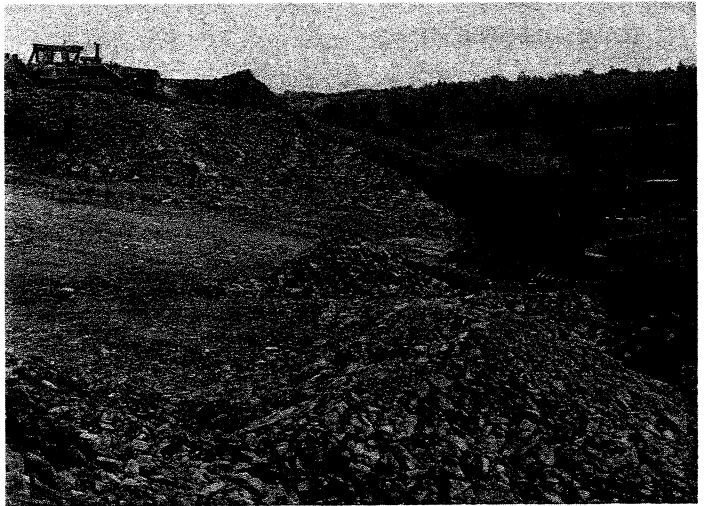
This project involved laboratory-scale testing of the adsorption step of the NOXSO process using the dilute phase reactor and the regeneration step using a bubbling bed reactor to evaluate the use of sorbent powder in the NOXSO flue gas cleanup process. It is viewed that, if successful, the use of sorbent powder would greatly

enhance the process. Based on the success of this project, further investigations into the use of the sorbent powder are underway at NOXSO.

### PENNSYLVANIA ELECTRIC COMPANY

#### "Weathered Coal Effects on Plant Performance" (Project # 883-4024)\*

This project was conducted to increase the understanding of changes in the physical and chemical properties of bituminous coal as a result of natural weathering. A three-year test program was carried out to quantify the impact of weathering on the coal piles at Units 1 and 2 of Pennsylvania Electric Company's Homer City Generating Station. Combustion tests were conducted on the weathered coal to verify laboratory results. While the test results showed a decrease in the total sulfur content of the coal due to oxidation, it also showed an increase in moisture and to the Hardgrove Grindability Index of the coal which could result in a decrease in combustion performance.



### PENNSYLVANIA STATE UNIVERSITY ↑

#### "Development of a Predictive Model for Acid Mine Drainage: Based Upon State-of-the-Art Overburden Characterization" (Project # 486-043)

This project developed a statistical model to predict acid mine drainage from proposed coal mining sites. This project also developed improved overburden characterization techniques which better predict the occurrence of acidic mine drainage.

**PENNSYLVANIA STATE UNIVERSITY**

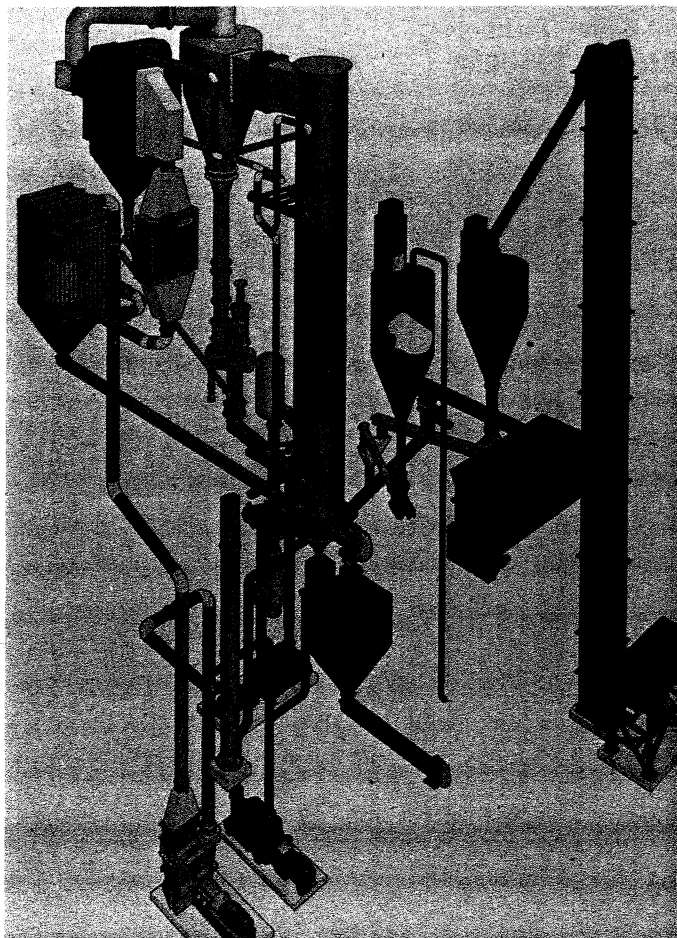
**"Short-Longwall Mining Study"  
(Project # 488-009)**

Under this project, all aspects of the concept of short-longwall mining were studied. A short-longwall generally has a longwall face not in excess of 200 feet. Areas studied include ventilation, subsidence, coal handling, movement, productivity, and mine plan development requirements. In addition, the short- and long-term effects of both standard and short-longwall mining on groundwater were assessed.

**PENNSYLVANIA STATE UNIVERSITY**

**"Anthracite Institute" (Project # 893-4013)**

A joint public/private partnership between the Anthracite Industry and the Pennsylvania State University was established as the Anthracite Institute. The function



of the Anthracite Institute was to provide technical extension services and to coordinate and to expand anthracite research programs. PEDA provided first year funding for the initiation of the organization.

**RENEWABLE ENERGY INSTITUTE**

**"Wind Data Acquisition" (Project # 488-007)**

A wind tower was installed on the Pennsylvania shore of Lake Erie to collect site-specific wind data to determine the feasibility of using a commercial wind machine to generate electricity in the Northwestern part of Pennsylvania. Data was collected on wind speed, wind direction, and other pertinent factors used to determine feasibility.

**RODALE INSTITUTE RESEARCH CENTER**

**"Energy Savings through the Use of Low Input Reduced Tillage Cropping Systems with Perennial and Annual Crops" (Project # 9003-4013)\***

The purpose of this study was to determine the relative energy efficiency of crop production systems currently being used by Pennsylvania farmers as well as those that are still under development. In the future, this long term research will provide farmers with new crop production options that will significantly reduce energy consumption while providing more environmentally benign alternatives to current crop production techniques.

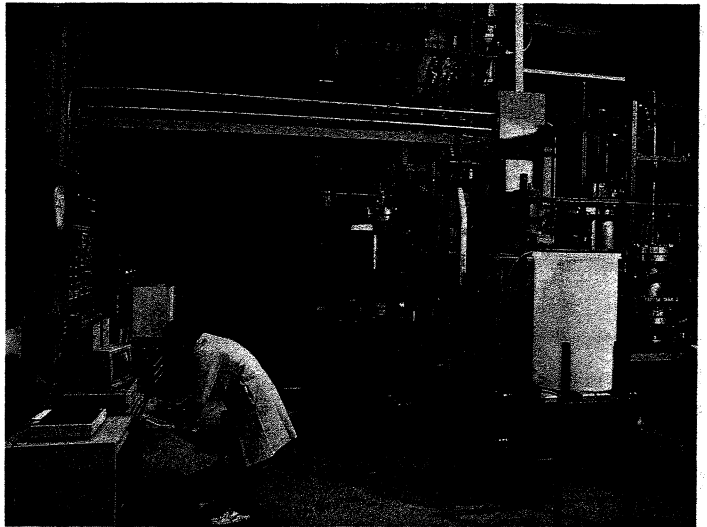
**← TAMPELLA POWER CORPORATION**

**"Improving Sulfur Capture and Limestone Utilization in Circulating Fluidized Bed Boilers by Effective Solids Management" (Project # 9003-4011)**

This was an in-depth study into improving sulfur capture and limestone utilization in circulating fluidized bed boilers by identifying ways to control size distribution and residence time of the limestone particles in the boiler. Two Pennsylvania coals, a high sulfur bituminous and an anthracite waste product, together with two Pennsylvania limestones were utilized in the testing. The results are being used by Tampella Power Corporation, a manufacturer of circulating fluidized bed boilers, to improve boiler design.

**UNIVERSITY OF PITTSBURGH****"Further Development of the LICADO Process for Fine Coal Cleaning" (Project # 893-4004)\***

The LICADO (liquid carbon dioxide) process, invented by the University of Pittsburgh, uses liquid CO<sub>2</sub> to clean ultra fine (-200 mesh) coal. PEDA has supported several of the development steps for this process. This particular phase involved equipment development, testing of the continuous operation, and engineering and economic analysis. For a 200-ton-per-hour plant, processing costs were estimated between \$10 and \$17 per ton.

**VIKING SYSTEMS INTERNATIONAL**  
(formerly BCR National Laboratory)**"A Study of Potential Impacts of Coal Blends on Power Plant Operations" (Project # 893-4038)\***

As part of this project, a series of laboratory and bench scale tests were conducted to look at the underlying properties of coal blends, how they relate to the properties of their constituent coals, and the potential impacts of these blends on the performance of a boiler system. While the results of the project are very blend and boiler specific, they open the door for coal blending to be considered as an option for utilities to use in their Clean Air compliance strategies.

**WASHINGTON ENERGY PROCESSING****"Handling and Combustion Testing in an Atmospheric Circulating Fluidized Bed Test Unit of a Fine Coal Product Recovered from a Refuse Filter Cake" (Project # 9003-4025)\***

This project tested and demonstrated the use of a patented process which removes clay from ultra fine coal particles in the recovery of ultra fine coal fuel from coal processing plant refuse filter cake. The project also involved the testing of the recovered fuel in an atmospheric circulating fluidized bed combustor to evaluate its handling and combustion characteristics. The results of the testing showed that, by using the process on the refuse filter cake material, the end product is a fuel that can be utilized in a cost effective and environmentally acceptable manner.

**ZURN INDUSTRIES, INC.**  
Energy Division**"Report of Testing and Study of the Rotary Cascading Bed Boiler Technology" (Project # 893-4030)**

This project investigated the feasibility of using the Rotary Cascading Bed Boiler (RCBB) technology to burn high sulfur, high ash and caking Pennsylvania coals and coal wastes cleanly and to co-fire coal in combination with industrial and municipal wastes. As part of the project, tests were conducted on an existing RCBB unit with the data used for the design of a transportable combustion system engineered to burn Pennsylvania coal products.

*The following is a list of projects that were active and ongoing throughout FY 1992-93. Contact PEDA at 717-783-9981 for further information on these projects.*

**CAMBRIA COGEN COMPANY**

**"Demonstration Project to Utilize Pennsylvania Bituminous Silt as Circulating Fluidized Bed Boiler Fuel" (Project # 9103-4042)**

The objectives of this project are to conduct an engineering and economic evaluation of seven technologies to determine which technology has the greatest potential to enable the use of ultra fine bituminous coal refuse material or silt as fuel for circulating fluidized bed (CFB) boilers, to demonstrate the selected technology using a 100 ton prepared sample and conducting a test burn in a commercial CFB boiler, and demonstrating the use of the processed fuel in place of CFB premium fuel to verify combustion efficiency and emissions control performance.

**DREXEL UNIVERSITY**

**"Refuse Derived Fuel Combustion Tests and Pilot Plant Program" (Project # 883-4034)**

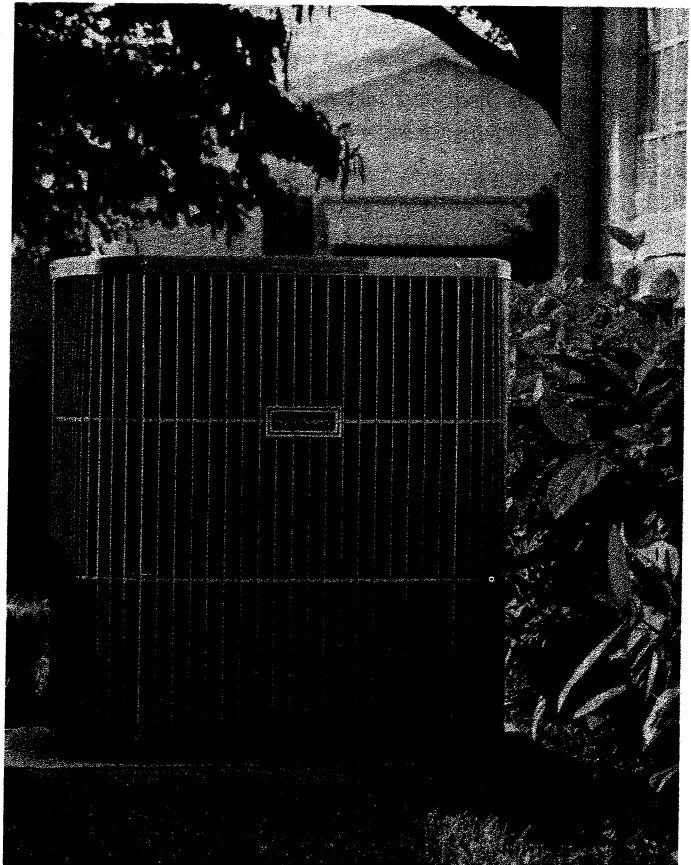
This project is comprised of two major tasks: 1) perform laboratory studies to characterize the devolatilization dynamics of a broad range of refuse derived fuel (RDF) pellets and fluff samples; and, 2) perform an industrial pilot plant scale combustion study to determine the performance of the RDF pellets in a circulating fluidized bed combustor. The goal of this project is to develop technology for the implementation of processed municipal solid waste as an energy producing fuel.

**DREXEL UNIVERSITY**

**"Improving the Heating Efficiency of Air-Source Heat Pumps" (Project # 9103-4010)**

This project will investigate the use of desiccants to remove moisture from the air stream that passes over the outdoor heat exchanger coils of heat pumps. The prevention of frost buildup will reduce the thermal insulation and blockage effects of the frost and therefore

enhance the energy efficiency of the heat pumps. Since the use of electric air source heat pumps are becoming increasingly common in Pennsylvania, this research could result in substantial energy savings and have a significant impact on electrical energy use in the state. ↓



**GRASS ROOTS ALLIANCE FOR A SOLAR PENNSYLVANIA (GRASP)**

**"Duct Leakage Research Project" (Project # 9103-4043)**

Under this project, GRASP is analyzing the extent of the problem of duct leakage in homes in Southeastern Pennsylvania. The air leakage rates in a sample of houses are being measured in order to develop diagnostic and treatment approaches for fixing this duct leakage. GRASP will also implement a pilot program using these techniques in another sample of houses, analyze the results, develop training materials for replicating the work and disseminate the results through presentations at conferences, workshops and seminars.

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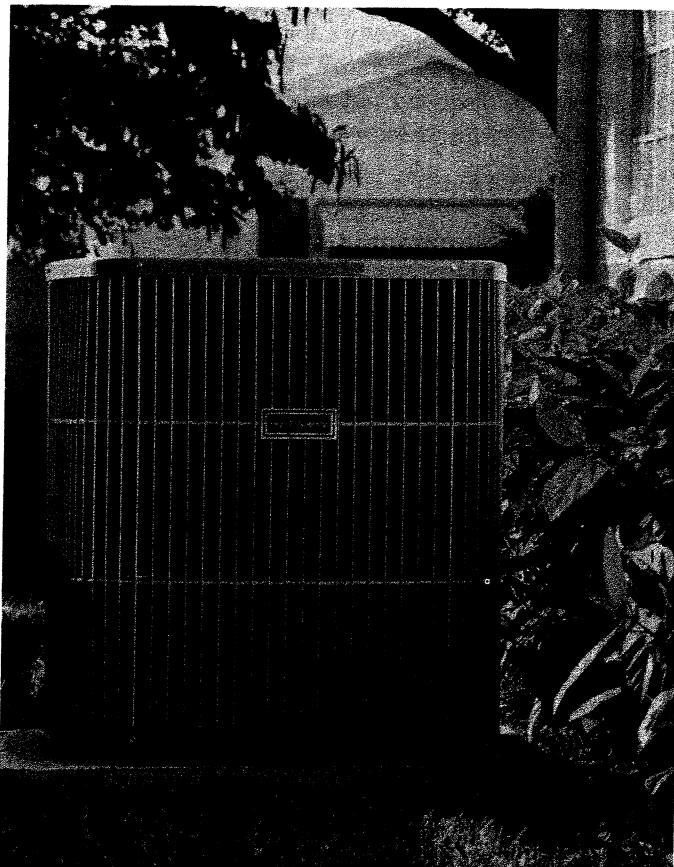
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fuel and coal in pulverized coal (PC) utility boilers. The project involves firing CWS at pilot and demonstration scales. In addition to the PEDA, project participants include Pennsylvania Electric Company, New York State Electric and Gas Company, Jim Walter Resources, Pennsylvania State University, Management and Technical Services, and CLI Corporation. The project comprises four phases, (1) CWS Formulation and Characterization, (2) Combustion Behavior of CWS fuels, (3) Combustion Behavior when Co-firing CWS and PC and, (4) CWS Demonstration Tests.

**PENNSYLVANIA ELECTRIC COMPANY**

**"Low No<sub>x</sub> Burner Demonstration - Homer City Unit #2" (Project # 863-4008)**

This project is a demonstration of the Low NO<sub>x</sub> burner technology at the Homer City generating station in Indiana County, Pennsylvania. This demonstration is part of a program sponsored by the Electric Power Research Institute to evaluate the performance of low NO<sub>x</sub> burner systems. These burners will be retrofitted to a pre-1971 New Source Performance Standards boiler. Comparisons

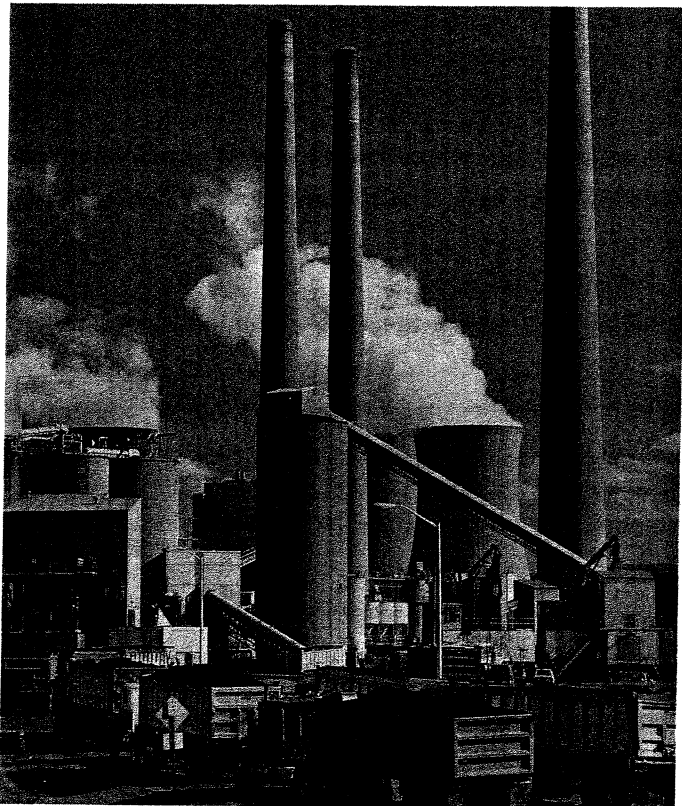
between data obtained before, immediately after, and well after burner conversion will accurately and conclusively assess performance of the selected low NO<sub>x</sub> burner system. Low NO<sub>x</sub> burners appear to be the simplest and cheapest means of achieving significant NO<sub>x</sub> emission reductions in utility boilers.



**PENNSYLVANIA ELECTRIC COMPANY ↑**

**"Confined Zone Dispersion (CZD) Flue Gas Desulfurization Demonstration Program" (Project # 893-4002)**

The project is a demonstration of a new process to remove sulfur and nitrogen pollutants from the flue gas leaving coal-fired boilers. The Pennsylvania Electric Company is hosting the site for a demonstration of Bechtel Corporation's confined zone dispersion process at its Seward Station electrical generating facility located near Johnstown, Pennsylvania.



**PENNSYLVANIA ELECTRIC COMPANY**

**"Coal-Water Slurry Pilot Plant" (Project # 9003-4008)**

This project involves the construction of a three-ton-per-hour fine coal cleaning and coal water slurry (CWS) pilot plant at Pennsylvania Electric Company's Homer City Coal Preparation Plant. The pilot plant will produce CWS from the reject circuit of the cleaning plant so that tests can be conducted to determine the optimum CWS which can be produced from fine coals at the Homer City Plant.

**PENNSYLVANIA ELECTRIC COMPANY****"Coal-Water Slurry Test Burn at Seward Station"  
(Project # 9103-4031)**

Under this project, combustion tests of coal-water slurry (CWS) fuels are being conducted in Unit 12 of Pennsylvania Electric Company's Seward Station generating plant. The project will utilize CWS prepared at the Homer City Coal Preparation Plant. The test program includes an engineering and design phase during which time burner selection and location of the burners in the boiler will be finalized.

**PENNSYLVANIA STATE UNIVERSITY****"A Controlled Study of the Effect of Alkaline Addition to Surface Mine Overburden: Kauffman Mine Demonstration" (Project # 893-4014)**

This project will analyze the chemical effects of alkaline addition to mining overburden in the neutralization of acid mine drainage from a surface coal mine. This project will directly observe and measure the use of alkaline addition over an extended period of time in an operating surface mine demonstration site, the Kauffman mining operation in Clearfield County, and investigate the cause of differences between observed water quality and calculated quality, in order to develop improved procedures for preventing acid drainage.

**PENNSYLVANIA STATE UNIVERSITY****"Sorbent Performance Project"  
(Project # 893-4016)**

The purpose of this project is to maximize the cost effectiveness of air quality compliance in circulating fluidized bed (CFB) combustion power plants using Pennsylvania sorbent products. This is to be accomplished by using sorbent evaluation techniques developed to provide calcium utilization efficiency data that sorbent suppliers and customers can use to evaluate within the context of cost. Both sorbent supplier and CFB power plant operators will derive the technical benefits of this program.

**PENNSYLVANIA STATE UNIVERSITY****"Oil Production Enhancement through a Standardized Brine Treatment"  
(Project # 893-4018)**

Under this project, extensive field testing is being performed on the treatment of various brines produced from oil reservoirs throughout the state. Previous research at Penn State resulted in a benchscale model of a brine treatment method and some initial testing. The effectiveness of the treatment method and the effects of temperature changes will be tested on at least five different brines. The testing procedure will follow recommendations of the Department of Environmental Resources. A database will be developed with a resultant software package to design appropriately scaled treatment systems in the field.

**PENNSYLVANIA STATE UNIVERSITY****"Recovery of Low Ash Carbon Products from Anthracite Preparation Tailings"  
(Project # 9003-4029)**

This project is focused on recovering and marketing tailings from existing anthracite coal preparation plants for use in the carbon market. These tailings have the potential, if recovered, to yield a very low ash (less than 3%) anthracite product. The laboratory work involves examining tailings streams from six active anthracite preparation plants for the presence of low ash fines and determining whether these fines can be recovered effectively using froth flotation or multiple staged water-only cyclones.

**PENNSYLVANIA STATE UNIVERSITY****"High Performance Anthracite Commercial Boiler Design" (Project # 9103-1001)**

This project is to design and to construct a highly efficient, convenient anthracite-fired boiler system for the commercial and light industrial markets. The boiler is in the size range of 2 to 20 MMBtu/hr. The conceptual design incorporates the integration of a water-cooled

furnace with a steel firetube boiler. The thrust of this program is to develop and demonstrate a shop-assembled anthracite boiler, based on a mass produced gas/oil boiler design, requiring a minimum of installation effort and expense.

**PENNSYLVANIA STATE UNIVERSITY →**

**"Research and Development of a Photovoltaic-Powered Charging Station for an Electric Car"  
(Project # 9103-4014)**

This project is directed at developing, designing, constructing, and testing a photovoltaic (PV) powered charging station for an electric vehicle. Its objectives include improving the knowledge base in PV technology by utilizing the latest PV and related electronic equipment; providing hands on experience for both faculty and students from various disciplines; and spurring commercial development of both the electric vehicle and the charging station.

**PENNSYLVANIA STATE UNIVERSITY**

**"Novel Approach to Production of Graphite from Anthracite" (Project # 9103-4019)**

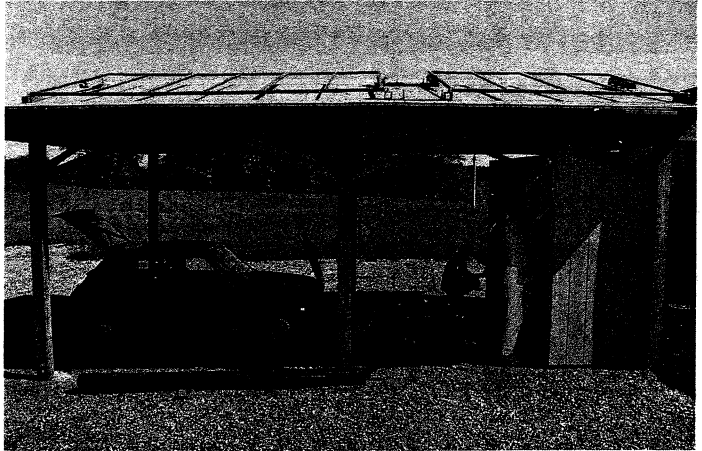
This project is an investigation into an approach to convert anthracite to graphite. It is a theoretical approach based on treating the anthracite with a mixture of dihydrophenanthrene and phenanthrene. The dihydrophenanthrene is used to provide a source of donatable hydrogen to intercept crosslink formation between aromatic structures while the phenanthrene should provide the aromatic fluid medium to disrupt the electronic interactions between aromatic structures. Currently, petroleum coke is used as the filler constituent in the manufacture of graphite.

**PENNSYLVANIA STATE UNIVERSITY**

**"Elimination of Trolley-Related Fires in Underground Coal Mines" (Project # 9103-4021)**

This project is to conduct research and to demonstrate the technical feasibility and practicality of a method of detecting electrical faults in an underground

mine's direct current trolley system. The research will be conducted through extensive laboratory and in-mine experiments at two Pennsylvania coal mines. The data will be analyzed and used to demonstrate the technical feasibility, economic viability, and simplicity of the proposed detection method.



**PENNSYLVANIA STATE UNIVERSITY**

**"The Role of Moisture in the Combustion of Coal on Stokers" (Project # 9103-4023)**

This project is an investigation of the tempering process, adding water to coal to aid in combustion. This project is a result of an earlier PEDA project which investigated anthracite/bituminous coal blends. This project will seek to determine the mechanism of the tempering process, elucidate the role of moisture in the ignition process, determine the relative importance of the change in the physical condition of the fuel bed (bed density) upon tempering, and identify the chemical reaction that occurs within the bed during the combustion of tempered coal and blends.

**PENNSYLVANIA STATE UNIVERSITY**

**"An Integration of Centrifugal, Flotation, and Solid/Liquid Separations as a Novel Approach to Fine Coal Cleaning" (Project # 9103-4024)**

This project is investigating several unit operations that are key to the successful operation of an integrated fine-coal cleaning circuit. This multi-faceted approach allows several critical areas to be examined, offering the potential of a greater overall process improvement that

would be applicable to a wider range of coals than a single process development. The areas of study include centrifugal dense-medium circuits, and solid-liquid separation of coal and refuse products.

**PENNSYLVANIA STATE UNIVERSITY****"Evaluation of Pennsylvania Limestone and Dolomite Products for Feedstock for Wet Flue Gas Desulfurization Systems" (Project # 9103-4035)**

The purpose of this project is to evaluate Pennsylvania limestones and dolomites for use in wet flue gas desulfurization (FGD) applications. FGD is one of several utility alternatives for meeting Clean Air Act compliance levels. The stones will be evaluated to determine their sulfur dioxide capture ability, limestone utilization, and limestone dissolution.

**UNIVERSITY OF PITTSBURGH****"Development of a Cyclonic Agglomerator for Fine Coal Cleaning" (Project # 893-4029)**

This project is being conducted to develop an improved fine coal cleaning method based on the application of cyclonic separation to selective agglomeration processes. The goal of this project is to successfully develop a cyclonic agglomeration system which would provide an effective technology for fine coal cleaning making major Pennsylvania coal reserves more environmentally acceptable and commercially marketable to utility and other users.

**UNIVERSITY OF PITTSBURGH****"Development of a Taylor-Vortex Column for Fine Coal Cleaning" (Project # 9103-4006)**

The objective of this project is to develop a novel, simple and effective device for fine coal cleaning, based on the concept of Taylor vortices formation in rotating concentric cylinders. This project would provide for: (1) the design and construction of a novel Taylor-Vortex column; (2) conducting hydrodynamic tests; (3) conducting conventional flotation tests as a comparison with those obtained by the Taylor-Vortex column; and (4) performing statistical analysis of experimental data. The thrust of the project is to determine the feasibility of the process.

**VIKING SYSTEMS INTERNATIONAL****"Coal NO<sub>x</sub> Reduction by INO<sub>x</sub>ulation" (Project #9103-3039)**

The purpose of this project is to test a method of reducing NO<sub>x</sub> emissions in coal-fired burners. The method has been patented and proven effective in reducing NO<sub>x</sub> in burners firing gas and liquid fuel oils. Emissions are reduced by recirculating stack gases into selected zones of the burner. The proof-of-concept tests will be conducted in a 500,000 Btu/hr. combustion test facility. If successful, this project could lead to a commercial demonstration.

*The following is a list of projects that were awarded during FY 1992-93. These projects were approved by the Board of Directors at their meeting on April 6, 1993. Contact PEDA at 717-783-9981 for further information on these projects.*

**CORECO FIBERGLASS, INC.**

**"Development of an Impervious Secondary Containment System for Well-Site Containment of Crude Oil Using Fiberglass-Reinforced-Plastic" (Project # 9203-3014)**

This project will create and develop a functional and economic "impervious secondary containment system" for the well-site containment of crude oil by using fiberglass-reinforced-plastic laminates and composites. This system offers the potential to reduce hazardous contamination of the soil, be practical and economically reasonable for the well operator, and easily adapt to various sizes and dimensions.

**DRAVO LIME COMPANY**

**"Development of the ThioNO<sub>x</sub> Process for the Simultaneous Removal of SO<sub>2</sub>, NO<sub>x</sub>, and Air Toxins from Flue Gas" (Project #9203-3018)**

The overall project objective of this project is the development of the ThioNO<sub>x</sub> Process, an integrated technology that simultaneously removes SO<sub>2</sub>, NO<sub>x</sub>, and air toxins in the forms of heavy metals from the flue gas of coal-fired boilers. A bench scale unit will be tested with the results used to define process parameters for larger scale testing. An economic analysis will also be conducted on the technology. The technology holds promise for boilers currently burning high sulfur Pennsylvania coals.

**DRAVO LIME COMPANY**

**"The Conversion of Flue Gas Desulfurization Scrubber Waste to Alpha Hemi-Hydrate Gypsum" (Project #9203-3019)**

The objective of this project is to conduct tests and to demonstrate the feasibility of converting scrubber sludge, a waste product from flue gas desulfurization scrubber systems, to a high quality, high strength gypsum

product, alpha hemi-hydrate gypsum. The project will entail the design, construction, testing and operation of a skid mounted pilot facility that will process one gallon of scrubber waste per minute. Potential benefits are a reduction in waste disposal costs and decreased landfill needs for those power plants burning high sulfur Pennsylvania coals with scrubbers.

**EXPORTECH COMPANY, INC.**

**"Magnetic Separation of Pyritic Sulfur at the Pulverizer at Coal-Fired Plants" (Project # 9203-3012)**

The purpose of this project is to examine whether it is technically feasible to significantly lower the as-fired sulfur content of Pennsylvania bituminous coal by dry magnetic separation of the mineral reject from a roller mill pulverizer. The dry magnetic separation technology is based on the principle that coal has magnetic properties different from the mineral impurities surrounding it. The project will investigate the possibility of incorporating the dry magnetic separation technology into the pulverizers at a coal-fired power plant.

**GRASS ROOTS ALLIANCE FOR A SOLAR PENNSYLVANIA (GRASP)**

**"Measuring Energy Savings as a Result of Identifying and Treating Duct Leakage in Residential Homes" (Project # 9203-4015)**

The purpose of this study is to demonstrate the energy savings impact of repairing duct leakage in



Pennsylvania's housing stock in order to provide homeowners and utility companies with reliable data for selecting cost-effective energy retrofit technologies. A sample of homes will be monitored for this study.

**LEHIGH UNIVERSITY****"A Test and Demonstration Unit for Concentrating SO<sub>2</sub> from Flue Gas" (Project # 9203-4013)**

The objective of this project is to design, to construct, and to test a bench scale continuous unit for concentrating SO<sub>2</sub> in flue gas. The highly concentrated and purified SO<sub>2</sub> can be removed and recovered as a sulfur bearing product. Once the SO<sub>2</sub> is removed, the system will be regenerated. The unit will also be used to design scaled up versions of the unit as well as serving as a demonstration unit.

**NOXSO CORPORATION****"Sorbent Powder Regeneration in the NOXSO Flue Gas Treatment Process: An Experimental Study and Economic Evaluation" (Project # 9203-3010)**

This project is a continuation of earlier research funded by PEDA into the use of a sorbent powder in the NOXSO Process. This research will investigate the regeneration phase of the process to determine the optimum sorbent powder regeneration conditions including an economic evaluation comparing the use of the powder with the current technology, the use of sorbent beads.

**PENNSYLVANIA STATE UNIVERSITY****"Wellbore Hydraulics Optimization Studies in Air Drilling for the Enhancement of Oil and Gas Production" (Project # 9103-4017)**

This project involves conducting fundamental and applied research to foster a better understanding of the hydraulics associated with air drilling and well control operations for the enhanced production of oil and gas wells. The project will provide the drilling community with scientifically-based predictive capabilities of well-bore hydraulics.

**PENNSYLVANIA STATE UNIVERSITY****"Formulation of Coal Pond Fines as Coal-Water Slurry Fuels and Their Combustion Characteristics" (Project # 9203-4009)**

This research is aimed at investigating the use of coal fines from waste coal ponds in the development of coal-water slurry fuel. Several coal ponds will be sampled, analyzed for cleanability and washability, and evaluated on their combustion performance. The use of coal pond fines for coal-water slurry fuels is a possible alternative to disposal of the fines, offering both an economic and environmental benefit.