Study of the Economic Consequences
of Using U.S. Coal
at Defense Installations in Europe

As Required by Section 8090
Public Law 100 - 463
FY 1989 Defense Appropriations Act

Prepared by:
United States Department of Defense
United States Department of State
United States Department of Commerce

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EXECUTIVE SUMMARY

STUDY OBJECTIVES

This report is in response to section 8090 of Public Law 100-463, the FY 1989 Department of Defense Appropriations Act. Section 8090 directed that no funds be expended to convert Defense facilities in Europe from coal to any other fuel until ninety days after a study on the economic benefits of using United States coal at Defense installations in Europe is completed and forwarded to Members of Congress. Specific direction was given that the study:

[1] "...should determine the extent of, and justification for, the economic benefits accruing to the Soviet Union from all prior and anticipated conversions of United States military installations in Europe to district heat and direct natural gas systems which utilize Soviet-supplied natural gas...",

[2] "...should also address the issues raised by the economic analysis prepared by the Ambassador at Large on burdensharing negotiations to be appointed by the President as delineated by subsection (c) of section 8125 of this Act...", and that

[3] "...the study also include a review of the modernization plan for the needed updating of the heating systems in the Kaiserslautern military community and the usage of United States produced coal...

Conference Report H.R. 100-1002 accompanying the Act requested that the study required by section 8090 also address:

[4] "...the economic implications of German coal being used in district heating systems, displacing American anthracite..." and


These five specific items have been numbered above for clarity in referring to the detailed sections of this report. This report summarizes the detailed independent review of the issues raised by section 8090 and presents the conclusions on them shared by the Departments of Defense, State and Commerce.

BACKGROUND

Congress has placed restrictions on Defense Department heating fuel selection in Europe for many years. Restrictions mandating the use of U.S. coal at Defense installations in Europe have precluded or delayed conversions to more reliable, economical and environmentally acceptable heating energy sources. Additional heating costs for Defense installations attributable to these restrictions amounted to approximately $1.1 billion between 1962 and 1988.1

The 1987 Defense Authorization Act and the 1988 Defense Appropriations Act allowed conversion to the most life-cycle cost-effective heat sources at the
U.S. Forces' European installations. This enabled the Defense Department to accelerate its heating modernization efforts by converting to district heat, natural gas or oil, drastically reducing both total heating costs and expenditures of U.S. funds on host nation economies. The 1989 Defense Appropriations Act has once again placed limitations on the ability of the Defense Department to proceed with cost-effective heating system modernization for the U.S. Forces in Europe.

CONCLUSIONS

This review of all issues raised by section 8090 has resulted in the conclusion, shared by the Departments of Defense, State and Commerce, that there is no economic or burdensharing reason to favor the use of U.S. coal at Defense installations in Europe. There is no reason to modify the general Defense energy selection policy of choosing the most life-cycle cost-effective, environmentally acceptable energy source which satisfies the mission requirements for facilities, unless Congress simply decides to subsidize the U.S. coal industry. The Administration is opposed to all such subsidies. The following is a summary of the findings and conclusions on each of the specific issues raised in section 8090 and Conference Report 100-102:

[1] There is no significant quantifiable benefit to the Soviet economy from changing fuel sources for Defense Department facilities in the FRG (Federal Republic of Germany). The economic impact of such conversions is negligible compared to the impact of commercial and industrial fuel switching. Furthermore, the Defense Department makes no purchases of gas having a specific, identifiable origin. All gas is purchased from West German public utility companies as "system gas." However, in order to identify a value that may be useful to Congress in evaluating the magnitude of the issue, the maximum dollar value of all gas used directly or indirectly to generate heat was computed, using a worst-case assumption about the origin of that gas and assuming that the Defense Department converted its facilities to burn gas wherever feasible. The maximum imputed value to the Soviet Union of this indirect transaction is $7.1 million per year--less than 0.4 percent of 1987 U.S./Soviet trade.

The economic benefits that the U.S. obtains from these transactions far outweigh any imputed benefits to natural gas suppliers. It is not U.S. foreign policy to limit Soviet export earnings or to attempt to damage the Soviet economy. There are no restrictions on U.S. imports of fuel from the Soviet Union. U.S. military installations in Europe are not dependent on Soviet-supplied natural gas. Backup fuels are available to compensate for any cutoff or reduction of Soviet gas supplies.

[2] The question of heating facilities for U.S. installations is not a proper burdensharing issue. Fuel conversion provides the Defense Department with an opportunity to reduce unilaterally the costs of maintaining its presence overseas without reducing its commitments. The Defense Department's heating modernization efforts have drastically decreased both the costs of heating U.S. installations, and expenditures on host nation economies. Fuel conversions have improved the political climate between the U.S. Forces and West German host communities, where environmental concerns are acute.
[3] Defense Department-owned natural gas-fired heating plants are the lowest-cost option analyzed, on a life-cycle basis, for heating the Kaiserslautern military community. Central heating plants fired by U.S. anthracite coal are the highest-cost option, nearly three times as costly as natural gas. Some of the most obvious components of U.S. coal costs leading to this conclusion are the transportation costs, including land and sea freight, multiple handling and losses. All Defense goods, including fuel, transported overseas by water must be shipped in U.S.-flag vessels at significant additional cost.

[4] District heat does not directly displace anthracite coal at U.S. military installations in Europe. When district heat was unavailable and conversions from U.S. coal to oil or gas were blocked by Congress, the U.S. Forces were replacing inefficient, hand-fired anthracite coal boilers with automated central heating plants fired by U.S. bituminous coal. While these were not the least-cost alternative, they represented a feasible improvement under the Congressional restrictions.

German coal is estimated to be the source of approximately 15% of the U.S. Forces' district heat. Most of it is burned in large electric generating stations with appropriate environmental controls. The resultant district heat is waste heat from the power generation process. Since multiple fuels are used to generate the heat on most district heating systems, it is not possible to quantify the "economic implications" of the use of German coal to displace U.S. anthracite coal. Six previous studies of this subject, including that done by the Energy Information Administration for Congress in 1986, have concluded that U.S. coal is, in almost every case, the most expensive heat source available for U.S. Forces installations in Europe.

[5] The American Embassy, Bonn, analysis of the German coal market did not include the cost of U.S. coal sold and delivered to Defense Department facilities in Germany. This report includes more specific cost data than the Embassy cable, which summarized average commercial market prices over a longer period of time. Current cost figures confirm that U.S. coal, particularly anthracite, purchased by the Defense Department and shipped to Europe in U.S. vessels is not competitive with other foreign coal or U.S. coal shipped via foreign-flag vessels as serve the commercial markets. At current market prices, total elimination of German domestic coal subsidies would likely result in increased coal imports. It is unclear how much of this increase in imports could be captured by U.S. coal, due to competition from other low-cost suppliers.
SECTION 1

ECONOMIC QUESTIONS REGARDING GAS PURCHASES

1.1 DEFENSE DEPARTMENT USE OF GERMAN GAS

The U.S. Forces in Europe buy gas from regulated West German gas companies. District heat is likewise purchased from public utility companies. The maximum potential Defense Department consumption of German natural gas, through direct use and through district heat, amounts to less than 0.5% of total West German natural gas consumption (see graph below).

West German gas companies receive their gas supplies from multiple sources through the European gas pipeline network. The West German Government carefully regulates its energy industry to prevent dependence on individual sources of supply. According to the FRG Ministry of Finance\(^2\), an agreement was made between the German Government and the gas importers that limits Soviet-source gas to a maximum of 30% of German national consumption. Actual purchases have been below this ceiling figure. The West German cabinet has endorsed the International Energy Agency supply diversification decision of May 8, 1983, and the amount of gas imported into the FRG is controlled by Federal import licensing.\(^3\) In case of a cutoff of Soviet supplies, replacement gas would be obtained through additional purchases from other European gas pipelines, or by tapping large underground gas storage facilities in Germany.

![US DOD Max Consumption of German Gas versus Total German Gas Consumption](image-url)
1.2 COST AND VALUE OF NATURAL GAS PURCHASES

It is not possible to identify Soviet gas end use within Germany, since such gas becomes part of the overall system supply. The Defense Department makes no purchases of gas having a specific identifiable origin; all gas is purchased from West German public utility companies as "system gas." Moreover, gas use is discretionary where multi-fueled systems exist. Unlike the majority of the Defense Department's own facilities, all district heating systems can burn at least two fuels.

Therefore, it is not possible to quantify specifically the benefits derived by the Soviet Union from the U.S. Forces' use of German gas and district heat. However, in order to identify a value that may be useful to Congress in evaluating the magnitude of the issue, the maximum dollar value of all gas used directly or indirectly (through district heat) to generate heat was computed. The estimate was generous for district heat, i.e. all gas-capable plants were assumed to be burning gas. The maximum 30% Soviet share of the West German gas supply was also assumed. The resulting calculation placed the value of this constructive Soviet gas volume at $3.9 million per year. If all possible conversions to gas and district heat were completed, this amount could increase to about $7.1 million per year, at current average costs and exchange rates.4

There is no significant quantifiable benefit to the Soviet economy from these indirect purchases. The economic impact of changes in Defense Department fuel sources in the FRG is negligible compared to the impact of commercial and industrial fuel switching. The possible "worst-case" indirect transfer of $7.1 million to the Soviet Union compares to a U.S./U.S.S.R. trade volume of $1.90 billion in 1987, including about $1.5 billion in U.S. goods exported to the U.S.S.R. and about $0.42 billion in U.S. imports from the U.S.S.R. (see graph on next page). Of this trade, $18 million was in U.S. exports of American energy products; $91 million was in U.S. imports of Soviet energy products.5 Thus the magnitude of the maximum possible Defense Department indirect purchase of Soviet gas would amount to 1.7% of U.S. imports from the Soviet Union, or 0.4% of total U.S./U.S.S.R. trade. Although 1988 data are not complete, it is estimated that the maximum potential value of Soviet gas would be only 0.2% of total 1988 bilateral trade.

1.3 JUSTIFICATION OF CONVERSIONS

The request of section 8090 for justification of the indirect economic benefits that accrue to the Soviet Union from fuel conversions can best be met by comparing the maximum cost of gas that might be purchased from the Soviet Union with the net reduction in Federal Government outlays resulting from these conversions. On a net present value basis, purchases over the next 25 years would "cost" a maximum of $100 million in indirect use of Soviet gas, while the savings achieved through modernization would be $1,418 million. This represents a benefit/cost ratio of 14 to 1.6 Thus, the cost savings alone justify modernization, although there are many other benefits as well, discussed elsewhere in this report.
It is not U.S. foreign policy to limit Soviet export earnings or to attempt to damage the Soviet economy. There are no restrictions on U.S. imports of fuel from the Soviet Union. U.S. military installations in Europe are not dependent on Soviet-supplied natural gas. Backup fuels are available to compensate for any cutoff or reduction of Soviet gas supplies.

SECTION 2

ISSUES RAISED BY THE ECONOMIC ANALYSIS OF THE AMBASSADOR AT LARGE FOR BURDENSHARING INITIATIVES

2.1 INTRODUCTION

The Ambassador at Large for burdensharing initiatives, directed to be appointed by section 8125 of PL 100-463, is assigned responsibility by the statute for negotiating with other countries which rely on a U.S. military presence as part of their defense. It is U.S. policy to attempt to recover more of the costs incurred by the U.S. in maintaining its overseas military presence. The Ambassador is yet to be appointed by the new Administration.

The Ambassador’s economic analysis of burdensharing initiatives in Europe will take considerable time to complete. In response to the expressed
Congressional concern for these issues and in order to provide a timely response to the issues raised by section 8090 of PL 100-463, the Departments of Defense, State and Commerce have addressed the energy-related issues that would be included in the Ambassador’s analysis.

2.2 FUEL CONVERSIONS AND BURDENSHARING

The Defense Department’s heating modernization efforts to date have drastically decreased the costs incurred to heat its installations, and have also decreased transfers of U.S. funds to host countries for heating purposes. This is one area in which the Defense Department can very effectively reduce the costs of maintaining its overseas presence without reducing U.S. commitments, simply by selecting the most cost-effective sources of heat.

Implementation of all the district heat and fuel conversion contracts signed and proposed by the U.S. Forces in Europe since 1982 would eliminate the expenditure of $1,109 million (present value) on the German economy and $309 million on the American economy for heating-related costs over the next 25 years, compared to the U.S. Forces’ former heating plant configuration (see graph below). It would also eliminate the additional expenditure of over $192 million on the German economy in construction costs at Defense Department installations, as compared to providing separate boiler plants.7

Funds Transferred to German Economy
Present Value, 25-Year LCCA

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount (MILLION $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1982 Base Config</td>
<td>3134</td>
</tr>
<tr>
<td>With Conversions</td>
<td>2025</td>
</tr>
</tbody>
</table>

4
2.3 GERMAN LIMITATIONS ON IMPORTED COAL

One of the issues which section 8125 directed be addressed in the Ambassador's economic analysis is the factors in the German economy that effectively limit the purchase of foreign coal by German utility companies. While there is no law in Germany that prohibits the importation or purchase of foreign coal, various subsidies and incentives that encourage the burning of German coal reduce the demand for imports, which supply about 10% of the total German demand. Since coal is Germany's major indigenous energy source, it has long been German Government policy to keep domestic coal mines operating.

The most important limiting factor is the long-term supply agreement, called the century contract (Jahrhundertvertrag), that requires the German electric utilities to purchase at least 45 million metric tons of domestic coal annually from 1985 through 1990 and 47.5 million metric tons annually from 1991 through 1995, when the agreement expires. The electric utilities are compensated for paying the high cost of domestic coal through a special fund (the Verstromungsfonds) that reimburses the utilities for the cost difference between high-priced domestic coal and imports. This compensation fund is financed by a tax on electricity consumption, called the coal penny (kohlepfennig), which is set every year by the German Government and is paid by electricity consumers. A separate law (the Tariff Quota Law) sets up a quota system for imports. The quota for non-EC (European Community) coal imports was set at 31 million metric tons annually from 1986 through 1990. Of this, 23.1 million metric tons was set aside for the electricity sector in 1987, although only 31 percent of this quota was used. The century contract, along with a long-term supply agreement between the coal and steel industries, has limited the demand for imported coal. In addition, there is a nominal tariff of 7 Deutsche Marks (DM) per metric ton on imports of most non-EC coal.8

Germany is under considerable pressure to rationalize its coal industry before the single European market is established in 1992. In fact, the coal industry and state and federal governments have agreed to cut annual hard coal production by 13 to 15 million metric tons (from 82.4 million metric tons in 1987) by 1995. In April 1989, the EC Commission published a decision on German coal subsidies which states that German efforts to reduce state aids to uncompetitive mines have been insufficient. The Commission requested that Germany submit, before September 30, 1989, a plan covering the period until December 31, 1993, for the reduction of compensatory payments given to the German coal industry. Section 5 includes further discussion of the competitiveness of American coal as compared to other foreign coal in the German market.

2.4 GERMAN COAL SUBSIDY TAX ON ELECTRIC BILLS

Another issue directed to the Ambassador's attention is the extent to which the U.S. Forces, military dependents, and Defense Department civilian employees pay the West German coal subsidy tax on electric bills.

Under the NATO Status of Forces Agreement, the U.S. Forces do not pay this tax. This exclusion applies directly to any electric bill on which any
Defense Department unit or activity is the billed customer. In addition, all Defense Department employees and dependents who live on the German economy, and are billed in their own names for electric service, are eligible for relief from this tax.9

2.5 POLITICAL IMPLICATIONS OF BURNING U.S. COAL IN EUROPE

The Ambassador's task will be to pursue maximum relative reductions in U.S. contributions to foreign defense costs. This can only be done if it is clear that the U.S. will not prevent rational cost reductions where they are readily available. One of these in Europe is clearly heating facility modernization.

The issue of coal-fired heating facilities for U.S. installations has been an irritant in U.S./West German relations for many years, due to the increasing concern of the German public over the environmental effects of pollution. Europe is currently facing a serious environmental problem. The deterioration of forests, believed to be caused by air pollutants, has increased from seven percent of total forest area in 1982 to over .50 percent today.

West Germany has responded by imposing strict environmental regulations on fossil fuel-fired plants. These regulations cover emissions of particulates, sulfur dioxide ($SO_2$), oxides of nitrogen ($NO_x$), and carbon monoxide (CO) from fuel-burning equipment. They also cover emissions of coal dust into the air and contaminated leachate into ground water from coal storage areas. By Executive Order, and according to the NATO Status of Forces Agreement (SOFA), the U.S. Forces must comply with these regulations.

Given the seriousness of the FRG's environmental situation and the high level of concern for the problem on the part of most Germans, any perceived impact on the German environment by the U.S. military is subject to political reaction. The coal-burning issue has received wide exposure in the German news media. As noted in the Energy Information Administration report to Congress in August 1986, German officials at all levels have repeatedly requested that the U.S. Forces convert to cleaner energy sources. The following recent letters have reemphasized the impact of this issue on U.S./West German relations.

On November 5, 1988, His Excellency Juergen Ruhfus, Ambassador of the Federal Republic of Germany, wrote to U.S. Secretary of Defense Frank Carlucci:

"My Government is of the view that it is in the best interest of our common defense and security to respond to the environmental concerns of the local population where U.S. defense facilities are located and to maintain a cordial relationship between them and the U.S. forces in Germany by converting their facilities to environmentally and economically sound district heating facilities."10

In April 1988, the Ambassador wrote to House Armed Services Committee Chairman Les Aspin to express his concern over proposed provisions in FY 1989 legislation that would have prohibited additional heating conversions.11
Also in April 1988, the former Commander in Chief of the U.S. Army in Europe, General Glenn K. Otis, wrote to the Committees on Appropriations and Authorization, summarizing the negative implications of fuel use restrictions. In December 1987, U.S. Secretary of State George P. Shultz wrote to Senate Foreign Relations Committee Chairman Claiborne Pell to urge that fuel conversion restrictions be dropped in the interest of better U.S./West German relations.12

SECTION 3

REVIEW OF THE HEATING MODERNIZATION PLAN FOR KAISERSLAUTERN

3.1 BACKGROUND

The heating facilities at Kaiserslautern presently consist of central and individual coal, oil and gas-fired heating plants of various types and ages. Many of these plants are antiquated and inefficient, and do not comply with West German environmental regulations. Some of the coal-fired boilers are hand-fired, and very costly to operate. Updating is necessary for reasons of cost, energy efficiency and environmental compliance.

Heating modernization is in the planning stages for all facilities. For the Army installations at Kaiserslautern East, several specific alternatives are under review.

An offer for heating service at Kaiserslautern East has been received from Energieversorgung Kaiserslautern AG (EVK). This offer was made in the absence of a formal request for proposal. EVK is a consortium composed of the municipal district heating company and the local gas company (Stadtwerke Kaiserslautern and Gasanstalt Kaiserslautern AG), with ties to the U.S. anthracite coal industry.13 The consortium has proposed building two gas-fired central heating plants with oil backup within the boundaries of the U.S. installations. EVK would own and maintain the plants, and the Defense Department would pay for the heat. No mention has been made in the official record of negotiations of the use of U.S. coal in these heating plants.

In addition, a separate letter of interest has been received from the local gas company at Kaiserslautern expressing its interest in conversion of the existing heating systems at Kaiserslautern East to direct gas firing.

3.2 ECONOMIC ANALYSES

Economic analyses were performed by The Kling-Lindquist Partnership, Inc. to compare the relative 25-year life-cycle costs of continuing to utilize the existing heating plants at Kaiserslautern with various appropriate alternatives, including individual gas-fired boilers and modern central heating plants fired by gas, oil, U.S. anthracite coal and U.S. bituminous coal. The total cost of heating all facilities at Kaiserslautern by each method analyzed is shown in the graph on the next page. The EVK proposal for
Kaiserslautern East was considered separately; see section 3.3. Other heating alternatives involving systems not owned and operated by the Defense Department were not analyzed, since no other offers for heat supply have been received.

For comparison, the present value life-cycle cost of continuing to utilize the existing heating plant configuration for all facilities at Kaiserslautern for the next 25 years, with environmental upgrade, is approximately $183 million. This option is designated "EXIST" in the graph.

The economic analyses found that the least costly heating option at Kaiserslautern is Defense Department-owned, natural gas-fired heating plants. For Kaiserslautern West, Ramstein Air Base, and Landstuhl Hospital, central gas-fired heating plants are least costly. For Kaiserslautern East and Rhine Ordnance Barracks, individual gas-fired boilers are least costly. The present value life-cycle cost of heating all installations at Kaiserslautern for the next 25 years using the least expensive options is approximately $102 million. This option is designated "MIX GAS" in the graph. The cost of heating all installations with gas-fired central heating plants or individual gas-fired boilers is also shown ("CENTRAL GAS" and "INDIV GAS" respectively).
U.S. coal proved to be the most expensive heating option analyzed in every case. U.S. bituminous coal ("BITUM" in the graph) was only slightly less expensive than anthracite coal ("ANTHRA"). The present value life-cycle cost of heating all installations at Kaiserslautern with anthracite coal in modern, automated central heating plants is approximately $272 million, or nearly three times the cost of the least expensive option and 49% more than the cost of utilizing the existing coal, oil and gas-fired heating plant configuration with upgraded environmental equipment.

3.3 KAIERSLAUTERN EAST

The EVK offer for Kaiserslautern East, excluding Pulaski Barracks, is based on assumed minimum heating demand and consumption figures that exceed the true calculated heating requirements. The offer requires that the U.S. Forces pay for the specified minimum demand and consumption, regardless of whether less heat is needed.

The minimum cost of the EVK proposal, including the cost of heating Pulaski Barracks with a separate Defense Department-owned oil-fired heating plant, is $42.6 million present value over 25 years. This is 58% more expensive than individual gas-fired boilers, which are the least expensive option at $27 million. It is also more expensive than gas or oil-fired central heating plants. The EVK gas-fired proposal is, however, less expensive than heating plants fired by U.S. anthracite or bituminous coal.

The cost of heating the installations that constitute Kaiserslautern East by each method analyzed is shown in the graph below.
3.4 USE OF U.S. COAL AT KAISERSLAUTERN

U.S. coal is presently used in some of the existing heating plants at Kaiserslautern. These plants are in general antiquated, inefficient, very costly to operate, and not in compliance with German environmental regulations. The U.S. Forces need to replace them in the near future.

The economic analyses show that modern, automated central heating plants fired by U.S. coal are the most costly option studied for heat at Kaiserslautern. Central coal-fired heating plants are 33-43% more expensive, depending on whether bituminous or anthracite coal is burned, than continuing to utilize the existing coal, oil and gas-fired heating plant configuration with environmental upgrade.

The EVK offer for Kaiserslautern East is for gas-fired central heating plants. No mention has been made of the use of U.S. coal, despite the fact that EVK is known to have ties to the U.S. anthracite coal industry.

Considering the results of the economic analyses, it is highly improbable that any proposal involving the use of U.S. coal at Kaiserslautern would be economically competitive with oil or gas-fired heating options. However, when the Air Force completes development of detailed technical requirements for rehabilitation of the heating systems in the Kaiserslautern area, the solicitation for proposals will be completely open to any technology and fuel type. The lowest life-cycle cost alternative which meets the technical requirements will be selected, in accordance with Title 10, U.S. Code, section 2690.

SECTION 4

ECONOMIC IMPLICATIONS OF GERMAN COAL IN DISTRICT HEATING SYSTEMS DISPLACING AMERICAN ANTHRACITE COAL

4.1 DISPLACEMENT OF AMERICAN ANTHRACITE COAL

The use of district heat is not the only factor causing the displacement of anthracite coal at U.S. military installations in Europe. Before Congressional restrictions on district heat, natural gas and oil conversions were removed, the U.S. military was replacing anthracite coal boilers with consolidated heating plants fired by U.S. bituminous coal. Bituminous coal of acceptable quality is 36% less expensive than anthracite coal. Even if the Defense Department had been required to convert all its European installations to burn U.S. coal, bituminous coal would have been the fuel selected.

In addition, German coal is not the primary district heating fuel. German district heat networks are supplied with heat from a variety of sources. These include waste heat from electric generating stations (cogeneration), heat from municipal trash incinerators, and heat from central heating plants...
fired by natural gas or oil. It is estimated that 15% of all the district heat under contract is supplied by German coal, most of it in the form of waste heat from electric power generation.\textsuperscript{14}

The displacement of anthracite coal at specific locations is not directly related to the use of German coal to supply part of the U.S. Forces' district heat. It is not generally possible to determine what fuel was used to produce the heat consumed by specific customers on a district heating network. Therefore, it is not possible to quantify specifically the "economic implications" of the use of German coal to displace anthracite coal through district heating contracts. The potential cost savings from district heat and fuel conversion contracts are discussed in section 2.2. The decrease in the Defense Department's use of anthracite coal has paralleled that of the private sector, where demand for anthracite has declined by over 95% since the end of the First World War.

4.2 COST OF GERMAN DISTRICT HEAT

Concerns have been raised in Congress that the U.S. Forces are subsidizing the development of West German municipal district heating facilities that serve other customers. Investigation has shown the reverse to be the case.

Municipal district heat systems have been installed at many locations where the U.S. has no installations, and were begun long before the first U.S. district heat contracts were signed. In addition, while the U.S. Forces' district heat load represents 4.3% of total FRG district heating capacity, the district heat investment cost that the U.S. Forces must repay is less than 0.5% of the total cost of the FRG's district heating facilities.\textsuperscript{15} The graphs below and on the next page show the relative figures.

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{district_heat_investment_costs.png}
\caption{District Heat Investment Costs, Federal Republic of Germany}
\end{figure}
The Germans have converted to district heat wherever economically feasible; according to the FRG Ministry of Finance:

"Over the last 10 years, the [West German] Federal Government has supported the extension of district heat supply with the goal of substantially increasing the proportional share of district heat in the energy supply for reasons of energy conservation, oil substitution, supply security, and environmental improvement. Efforts in this field were concentrated on the extension of power-heat coupling on the basis of domestic sources of energy as well as waste heat utilization." 16

There are no grounds to support the hypothesis that the Defense Department is in any way subsidizing the German district heat infrastructure. On the contrary, the West German Government has provided over DM 4.8 billion in funding support for municipal district heating systems in the past ten years. The U.S. Forces and other district heat customers have benefitted from this support through lower rates.

**DISTRICT HEAT CAPACITY**
**FEDERAL REPUBLIC OF GERMANY**

<table>
<thead>
<tr>
<th>TOT FRG DH CAP</th>
<th>US FORCES DH LOAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td>4.3%</td>
</tr>
</tbody>
</table>

It should be noted that the U.S. Forces would incur higher initial capital and ongoing operating and maintenance costs to build their own coal-fired heating plants than to connect to district heating systems subsidized by the German Government. 17 In accordance with the NATO Status of Forces Agreement, such plants would also revert to German ownership should the U.S. withdraw from the heated facilities. In contrast, all unamortized
capital costs and termination charges associated with district heat contracts would be borne by the German Government in the event of a U.S. withdrawal.

4.3 STUDIES AND AUDITS ALREADY COMPLETED

Six major studies concerning U.S. military heating sources in Europe have been performed since 1984. Each of these studies has concluded that U.S. coal is the most expensive heat source for the Defense Department in Europe.

The FY 1984 Appropriations Bill Report ordered a study to "establish coal as the major energy source" for the U.S. Army in Europe. The resulting study stated that conversion to coal firing was "neither feasible nor cost-effective." 18

In each of the fiscal years from 1986 through 1988, the U.S. Army has prepared an economic analysis report of its heating options in Europe, incorporating the latest technological changes and economic estimates. 19 The conclusions of each report were the same: U.S. coal was always the most expensive alternative studied.

In 1986, Congress requested that the Energy Information Administration study the implications of U.S. laws mandating the use of U.S. coal in Europe and restricting the use of alternative fuels by the Defense Department. The resulting report stated:

"...natural gas, district heat, and fuel oil, in that order, are the most economical heating fuel sources for the U.S. Forces in Germany. District heating systems not only provide economical and reliable heat, avoiding costly investments in new boilers or modifications to existing power plants to comply with FRG emissions standards, but also are preferred by the German Government and the German public." 20

Finally, Congress requested that the U.S. General Accounting Office evaluate the life-cycle cost analyses that led to the Defense Department's decisions to convert heating facilities at individual installations to district heat. In its report, the GAO stated:

"The...[U.S. Forces']...analyses were prepared by comparing the costs of district heat with current operations, or construction and operation of a new or expanded coal-fired central heat plant, or both. All the analyses showed district heat to be less costly." 21
5.1 INTRODUCTION

The American Embassy in Bonn distributed an analysis of the German domestic coal market in April, 1988. The Embassy's analysis pointed out the potential for drastic changes in the German domestic coal and electricity markets in 1992, when all trade barriers within the EEC (European Economic Community) are scheduled to be eliminated. Other countries have offered to supply electricity to Germany at low rates when the market is opened. The Embassy's analysis did not address the cost of the coal which the Defense Department procures for use in Europe.

The analysis discusses the subsidy programs and other economic incentives developed in Germany to maintain a market for German coal, despite high production costs. Less expensive foreign coal accounts for about 10% of the German market. According to the Embassy's analysis, German electricity customers pay for the higher cost of German steam coal through a tax on electric bills. The tax rate is set each year by the German Government. Under the NATO Status of Forces Agreement, the U.S. Forces do not pay this tax. See section 2.4 for a discussion of this issue.

5.2 GERMAN MARKET FOR U.S. STEAM COAL

The table below summarizes the cost of steam coal in the FRG in 1987, and updates the cost figures cited in the subject American Embassy analysis:

<table>
<thead>
<tr>
<th>Coal Type</th>
<th>Cost</th>
<th>Source</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. BITUMINOUS</td>
<td>103.47</td>
<td>U.S. Embassy</td>
<td>DELIVERED TO FRG BORDER (1)</td>
</tr>
<tr>
<td>U.S. ANTHRACITE</td>
<td>140.20</td>
<td>U.S. Embassy</td>
<td>DELIVERED TO FRG BORDER (1)</td>
</tr>
<tr>
<td>NON-U.S. FOREIGN COAL</td>
<td>78.88</td>
<td>U.S. Embassy</td>
<td>DELIVERED TO FRG BORDER (1)</td>
</tr>
<tr>
<td>FOREIGN COKE (2)</td>
<td>90.00</td>
<td>U.S. Embassy</td>
<td>DELIVERED TO FRG BORDER (1)</td>
</tr>
<tr>
<td>FRG BITUMINOUS</td>
<td>250.00</td>
<td>U.S. Embassy</td>
<td>DELIVERED TO UTILITY CO.</td>
</tr>
<tr>
<td>FRG BITUMINOUS</td>
<td>263.00</td>
<td>U.S. Embassy</td>
<td>DELIVERED TO UTILITY CO.</td>
</tr>
<tr>
<td>LOW SULPHUR (1%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FRG COKE (2)</td>
<td>258.00</td>
<td>U.S. Embassy</td>
<td>DELIVERED TO UTILITY CO.</td>
</tr>
</tbody>
</table>

(1) Inland transport, storage and delivery would add approx. DM 41/Mton.
(2) Equivalent to anthracite.

<table>
<thead>
<tr>
<th>Coal Type</th>
<th>Cost</th>
<th>Source</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. PEA ANTHRACITE</td>
<td>302.82</td>
<td>DOD Cost</td>
<td>DELIVERED TO HEAT PLANT</td>
</tr>
<tr>
<td>U.S. BITUMINOUS</td>
<td>227.00</td>
<td>DOD Cost</td>
<td>DELIVERED TO HEAT PLANT</td>
</tr>
</tbody>
</table>
It has been suggested that U.S. anthracite coal could be sold in Germany at competitive prices for use in generating heat and power, due to the high price of German domestic coal. In fact, as discussed in section 2.3, the amount of foreign coal sold in Germany is determined not by the price difference between German and foreign coal, but by incentives in the German economy that encourage the burning of large amounts of German coal. Because foreign coal is effectively limited to a small share of the German market by factors other than price, significant price competition can be expected between the various foreign suppliers for that small share.

The table above shows that the average price of all foreign coal imported into Germany is quite low, about one-third the price of German coal. However, U.S. coal delivered to U.S. Defense Department facilities is much more expensive than either U.S. or other foreign coal delivered to the German steam coal market.

Three primary factors account for the high cost of the Defense Department's coal. First, the Department is required to ship its coal to Europe in U.S.-flag ("Jones Act") vessels, which results in transportation costs that are two to three times the cost of transporting coal in foreign-flag vessels. Second, total transportation costs are also high because freight rates are higher for the Defense Department's smaller shipments of coal, as compared to the full vessel cargoes of most commercial coal users. Transportation, storage and handling costs account for 45% of the average delivered cost of Defense Department anthracite coal at the heating plant in Germany; the percentage is even higher for bituminous coal. Third, the old hand-fired boilers at U.S. installations in Germany require large-size anthracite coal, which is more expensive than small-size coal. Most of the boilers that require this coal have been, or are being, removed from service.

U.S. anthracite coal sold on the open market in Germany (not at the higher price which the U.S. Government pays) is 36% more expensive than U.S. bituminous coal (at the open-market price) and 78% more expensive than the average of other foreign coal being imported into Germany under the same trade conditions. It is also 56% more expensive than foreign coke.

The U.S. anthracite coal that the Defense Department is required to buy and ship to Germany is burned in boilers that were originally designed to burn coke. It is more than 200% higher in cost than other imported coal and coke of equal quality available in Germany. U.S. bituminous coal that is purchased and shipped to Germany by the Defense Department is more than 100% higher in cost than other such coal.
1 Figure obtained from calculations prepared for this study. Source data from HQ US Army Europe, AEAEN-FE-U, and HQ US Air Force Europe, DEMO.


3 According to Herr G. Dahlhoff, Councillor, Embassy of the Federal Republic of Germany, Washington, D.C.

4 Results obtained from calculations prepared for this study.


6 Results obtained from calculations prepared for this study.

7 Results obtained from calculations prepared for this study.

8 The factual information in this section was taken from an American Embassy, Bonn cable, "German Coal: Huge Subsidies and High Prices", April 1988.

9 Memo, Cannon.


14 Memo, Cannon.

15 Information on total capacity and cost of FRG district heating network provided by Fernwaerme International (the German District Heat Council) on October 17, 1988.


19 TKLP, "Economic Analysis of Heating Options in Europe", Philadelphia, Continued on following page
Continued from previous page


22 As reported by Mr. Freund of the U.S. Embassy, Bonn, on November 2, 1988.

23 As reported by Defense Fuel Supply Center for FY 1987 shipments.