ROLE OF CLEAN AIR ACT REQUIREMENTS IN ANACONDA COPPER COMPANY'S CLOSURE OF ITS MONTANA SMELTER AND REFINERY

preliminary report

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
DENVER, COLORADO

March 19, 1981

FOREWORD

This report presents preliminary findings and conclusions from EPA's investigation of Anaconda Copper Company's closure of its smelter in Anaconda, Montana, and refinery in Great Falls, Montana. Under Section 321 of the Clean Air Act, the Agency is authorized to conduct, at the request of affected employees, a full investigation of cases where industrial facilities are closed allegedly due to requirements of the Act. The purpose of the investigation is to determine the specific role the Clean Air Act played in the closure. The investigation is not intended to require or authorize EPA to modify or withdraw any requirement imposed under the Act in order to keep a facility open.

EPA expects that additional information concerning the validity of the preliminary findings and conclusions will surface during review of the report. The report is based on publicly available financial information and technical data provided by Anaconda related to the proposed environmental improvements at the smelter. Additional data may be required from Anaconda in order to properly respond to comments EPA receives on this report.

There will be a two week public comment period to receive reaction and additional information regarding the report. EPA will use the comment period to determine the need to hold a public hearing to receive further information related to the Anaconda closings.

Individuals wishing to furnish comments on the report should do so in writing by April 3, 1981. Requests for a public hearing should indicate specific needs which could be satisfied by conducting a hearing. Please address your comments and/or request for a public hearing to:

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TABLE OF CONTENTS

I. INTRODUCTION

This document consists of EPA's findings to date and preliminary conclusions resulting from its investigation and evaluation of the decision by Atlantic Richfield Company (ARCO) to terminate operations at its smelter in Anaconda, Montana and refinery in Great Falls, Montana. The purpose of this report is: 1) to present the results of EPA's investigation of the role the Clean Air Act played in closing the smelter and refinery, 2) to solicit additional information about the validity of EPA's preliminary findings and conclusions, and 3) to determine the public interest in holding a hearing to receive and disclose further information related to the Anaconda closings.

The findings and conclusions included in this report are preliminary. By raising basic questions and concerns surrounding the closure of the smelter, EPA expects that additional data will surface that may affect the ultimate findings and conclusions reached in the investigation. Before EPA can make recommendations and reach final conclusions regarding the role of Clean Air Act requirements in the closure, additional analysis of all available information will be required.

II. BACKGROUND

On September 29, 1980, Anaconda Copper Company, a subsidiary of Atlantic Richfield Company (ARCO), publicly announced the closure of its Anaconda smelter and Great Falls refinery, affecting approximately 1500 employees at the two facilities in Montana. The company cited the costs to comply with State and Federal environmental and occupational health standards at the smelter as the reason for closing these facilities. Despite efforts by the Governor, State legislators, Congressmen, and EPA to have the company reconsider its decision, ARCO refused to initiate discussions to reopen the smelter and in December 1980 indicated its decision was "final and irrevocable." In the meantime, the company made arrangements with a consortium of Japanese smelters to process the concentrates from its U.S. mines, including the mine in Butte, Montana. Details of this arrangement have not yet been made available by ARCO.

Subsequent to the announcement of the closure, three unions representing employees at the two facilities requested EPA to conduct an investigation under authority of Section 321 of the Clean Air Act into the reasons for terminating the smelter and refinery operations. The unions requesting the investigation were: 1) Local Lodge #2 of the International Association of Machinists and Aerospace Workers, 2) Locals 6002 and 16-A of the United Steelworkers of America (AFL-CIO-CLC), and 3) Local #88 of the United Brotherhood of Carpenters and Joiners of America. At the time of ARCO's announcement, the facilities had been closed for three months due to a labor strike. Labor-management negotiations continued after the announcement and a labor settlement was reached in November 1980.

Section 321 of the Clean Air Act empowers EPA to conduct, at the request of affected employees, a full investigation of cases where industrial facilities are closed allegedly due to requirements of the Act. The report of the investigation is to make findings of fact on the role expenditures for air pollution control played in the closure of the facilities and to make recommendations. Any affected party can request EPA to hold public hearings requiring the company and other parties to present information relating to the effects of these requirements on employment and the detailed reasons or justification for the company's action. However, if EPA determines there is no reasonable ground for conducting a public hearing, no hearing need be held. In connection with the investigation, Section 321 gives EPA the authority to issue subpoenas for the production of relevant papers, books and documents and testimony of witnesses needed to reach conclusions on the reasons for the closure. As a final point, nothing in the section is construed to require or authorize EPA to modify or withdraw any requirement imposed under the Act in order to keep the facility open. Thus, the investigation itself is likely to have little impact in reopening a closed facility.

III. Preliminary Findings and Conclusions

In the course of the investigation, EPA has assembled and analyzed publicly available information relating to the Anaconda smelter. Though the company has not yet supplied all requested data relating to the matter, EPA's review of the information and the circumstances surrounding the closure has led to a number of preliminary findings and conclusions. These findings put the environmental and health requirements for continued operation of the smelter in perspective and strongly suggest that other reasons may have prompted ARCO to close the smelter and refinery at this time.

1. While requirements of the Clean Air Act played a role in ARCO's assessment of the future viability of the smelter, evidence indicates the requirements were not the overwhelming factor influencing the decision. Rather, other economic, operational and occupational health factors contributed significantly to the company's decision. In order to understand the context of the ultimate decision, all factors have to be viewed collectively as contributing to the weak competitive position of the smelter in the world market.

2. Even in the absence of Federal and state environmental and health regulations, the smelter was a marginal operation that may not have been economically viable in the long run due to numerous economic and operational factors affecting the continued operation of the facility. These factors include: historically low profitability of the company's copper operations; high operating costs associated primarily with operating energy-intensive technology and processing low grade concentrates; cost of needed process improvements; high

mining costs; underutilization of smelter capacity resulting from reduced supply of concentrates; and marketing problems with sulfuric acid. These factors eroded and would have continued to weaken the economic position of the smelter to the point that only minimal investments in pollution control, far short of meeting the Clean Air Act requirements, were practical from an economic standpoint. If prospects for future economic and operational parameters had been more favorable, the company could possibly have afforded the necessary pollution control investment while maintaining the competitive position of the smelter.

3. Anaconda's estimated cost of $400 million for complying with Federal and State environmental and health regulations is misleading and overstated. The company's cost estimate includes more than just improvements needed to comply with Clean Air Act requirements. The estimate also includes the costs of the company's desired process improvements, costs of the company's internal environmental requirements, and costs to meet OSHA's occupational health requirements. EPA believes nearly half of the anticipated plant modification cost can be attributed to plant process improvements, while only $120-160 million may be attributed directly to the Clean Air Act.

4. Anaconda's internal environmental and health policies may have imposed sufficient financial burdens on the smelter to significantly contribute to the closure decision. The company has conceded the smelter did not meet its own internal standards and continued operation of the facility was not in keeping with the company policies. In particular, concern exists on the part of all associated with the smelter regarding the potential health hazards of processing concentrates with a high content of arsenic, a listed carcinogen.

5. Institutional problems confronting the copper industry place domestic producers at competitive disadvantage with foreign producers and contribute to the weak economic position of some companies. In addition to having to compete in a dynamic world copper market, U.S. producers do not benefit from governmental incentives as do their foreign counterparts. Some foreign governments support their copper industry through a variety of institutional incentives. In Japan, for instance, where environmental requirements are more stringent than in the U.S., the government aids its industry with greater tax benefits, protective tariffs, and low interest loans that allow the Japanese copper industry to effectively compete in the world market. Nonetheless, despite the institutional disadvantages confronting domestic producers, prospects for the U.S. copper industry look much improved in the near future because of continued strengthening of copper prices and reduced excess capacity in the industry.

6. The Clean Air Act Amendments of 1977 recognize the special problems facing nonferrous smelters like Anaconda's and contain unique provisions that give companies an extended period of time to comply with requirements of the Act. Under a nonferrous smelter order (NSO), a smelter experiencing difficulties can extend compliance until January 1, 1988 by committing to make necessary improvements to meet applicable emission limitations.

7. Within the flexibility granted in administering the NSO provision of the Act, EPA demonstrated its willingness to explore possible solutions with Anaconda. However, the company chose not to pursue this option. Through negotiations EPA believes a workable solution could have been found whereby the company could have continued operating the smelter consistent with requirements of the Clean Air Act. At the same time, the company could have pursued the other alternatives it was considering.

8. With the economic and operational problems facing the smelter in Anaconda, ARCO's long-term solution appears to be construction of a new smelter somewhere in the world. If ARCO decides to build a new facility, the smelter would probably be a large-scale operation with state-of-the-art technology, in a location closer to the major markets for copper and by-products, and accessible to low-cost water transportation. Up to seven years would be required to plan and construct such a plant.

9. ARCO expedited the closure of the smelter in order to seize the current opportunity of securing reasonable terms with Japanese smelters. Even though the smelter could have continued operating for another two years without making capital investments to install pollution control equipment, the company chose to take advantage of excess smelting capacity currently in Japan in order to guarantee a place for its concentrates. Anaconda and ARCO apparently view this as an interim measure that will keep the mines operating while long-term options are explored. This option is economically feasible despite Japan imposing more restrictive environmental controls for copper smelters than found in the U.S.

IV. Anaconda's Environmental Problems in Perspective

Like all other copper smelters in the country, Anaconda's smelter was subject to several requirements established by the Clean Air Act. The Act represents one of many pieces of environmental legislation Congress has enacted in response to the public's concern over the environmental and health effects of pollution.

The Clean Air Act requires industrial sources to control sulfur dioxide (SO_2) emissions to meet health-based ambient air quality standards. Control of SO_2 emissions is a major problem at the Anaconda smelter. In 1970 the

State of Montana adopted regulations that required the Anaconda smelter to achieve 90 percent control of SO_2 by June 30, 1973. Over the last seven years, the smelter has operated under variances granted by the State while the company investigated compliance alternatives.

Soon after the merger of ARCO and Anaconda in 1977, negotiations were initiated by representatives of ARCO and Anaconda with EPA and the State of Montana in order to develop emission limitations for the smelter that would provide for attainment of the SO_2 ambient standards in the Anaconda area. As a result of these negotiations, Montana submitted a revised state implementation plan (SIP) in April 1979 that would meet the objectives of the Clean Air Act in what was agreed to be a reasonable manner.

In January 1980, EPA approved Montana's SIP revision that included a schedule for the smelter to comply with SO_2 emission requirements by December 31, 1982. The compliance plan would have required Anaconda to install a continuous control system which would achieve 85 to 90 percent control of SO_2 emissions.

When it was operating, the smelter achieved less than 30 percent control of SO_2 and was one of the largest sources of SO_2 emissions in the country. The smelter caused violations of the 24-hour ambient health standard 45 days in 1979 and 67 days during the first six months of 1980. Violations increased in 1980 due partly to relocation of ambient monitors around the smelter. Hourly SO_2 concentrations exceeded the more stringent emergency episode warning level 251 times in 1979 and 170 times during the first six months of 1980. During these episodes, operations had to be curtailed at the smelter because of the immediate danger to public health.

Like other forms of air pollution, sulfur oxides have been shown through scientific and epidemiological studies to pose significant harm to human health and public welfare. High levels of sulfur oxides in the air cause an obstruction of breathing, a choking effect that doctors call "pulmonary flow resistance". The amount of breathing obstruction has a direct relation to the amount of sulfur compounds in the air. Many types of respiratory disease are aggravated by exposure to oxides: coughs and colds, asthma, bronchitis, and emphysema. The harmful effects of sulfur pollution are enhanced by the presence of other pollutants, especially particulates and oxidants. Some researchers believe that the harm is mainly due not to the sulfur oxide gases but to other sulfur compounds that accompany the oxides: sulfur acids and sulfate salts. While there have been significant strides in controlling industrial air pollution in recent years, there have been catastrophic air pollution incidents over the last 30 to 40 years that demonstrate the potential magnitude and severity of air pollution episodes. Marked increases in respiratory distress cases and fatalities attributable to air pollution have been evident during episodes in heavily industrialized areas such as London, New York City, Detroit and the Monongahela River Valley in Pennsylvania.

Though the company has made attempts since 1972 to address the smelter's significant environmental problems, the control efforts have not been adequate as the smelter remained one of the industry's worst controlled facilities (See Table 1). A modernization program undertaken at the smelter in the mid 1970's that was supposed to enhance pollution control efforts did little to reduce emissions to necessary levels. Other companies in the country have made considerable efforts to control emissions at their smelters and are continuing to take appropriate measures to further reduce emissions. In the last ten years, three Western smelters in addition to Anaconda installed more modern smelting technology to replace conventional reverberatory furnaces. While Anaconda achieved less than 30 percent control, these other smelters have achieved SO_2 control levels of 80 to 90 percent. The Inspiration smelter in Miami, Arizona, which is the only other smelter in the U.S. to employ electric furnace technology similar to that which existed at Anaconda, currently achieves close to 80 percent control efficiency. Of the 10 remaining Western smelters that still utilize reverberatory furnaces, one is achieving close to 90 percent control, seven range in control from 35 to 70 percent, and two currently have no control of SO_2. While most smelters were making capital investments to control their pollution problems, Anaconda kept delaying the necessary commitment to undertake the modifications needed for pollution control.

If the Anaconda smelter had remained in operation, it might also have been subject to requirements under Section 112 of the Clean Air Act to control arsenic emissions. The Butte concentrates that are processed at the smelter contain extraordinarily high levels of arsenic, which is emitted with process off- gases during the smelting of the concentrates. Arsenic was listed as a hazardous pollutant under Section 112 after EPA determined from scientific evidence that the compound is a carcinogenic air pollutant that poses significant risks to public health. Though regulations do not currently exist, the Agency is in the process of establishing limits on arsenic emissions from primary copper smelters. Anaconda's smelter might have been one of only two smelters, the other being the ASARCO-Tacoma smelter, that would have been subject to the limitations.

In addition to requirements under the Clean Air Act, the Anaconda smelter was also subject to standards promulgated in 1978 by the Occupational Safety and Health Administration (OSHA) for worker exposure to inorganic arsenic. The regulations require the use of engineering and work practice controls to limit occupational exposure to 10 ug/m^3, averaged over any 8-hour period. The 10 ug/m^3 limit was exceeded in some work areas at the smelter. These regulations were challenged in court by affected industries and the requirement for engineering controls has been temporarily stayed pending resolution of the challenge. Nonetheless, in its compliance plan for the smelter Anaconda included installation of engineering controls to meet the OSHA standards in its work areas.

Table 1

Comparison of Sulfur Control Efficiency at Western Copper Smelters

Company/Location	Annual Capacity of Blister Copper (tons)	Percent Sulfur Removal
Anaconda Copper/Anaconda, MT	195,000	20%-30%
ASARCO/El Paso, TX	115,000	70%
Hayden, AZ	180,000	35%
Tacoma, WA	100,000	35%
Inspiration/Miami, AZ	150,000	80%
Kennecott/Garfield, UT	280,000	85%
Hayden, AZ	80,000	90%
Hurley, NM	80,000	60%
McGill, NV	50,000	0%
Magma Copper/San Manuel, AZ	200,000	45%
Phelps Dodge/Ajo, AZ	70,000	55%
Douglas, AZ	127,000	0%
Hidalgo, NM	140,000	90%
Morenci, AZ	177,000	65%

V. Discussion of Preliminary Findings and Conclusions

A. Efforts to Explore Alternatives with EPA

ARCO's announcement that it was indefinitely suspending operations at the Anaconda smelter and Great Falls refinery came as a surprise to EPA. Although public statements by Anaconda officials over the past several years included speculation that the costs of pollution control could force a shutdown, EPA's understanding developed through communications with the company and state officials was that two alternatives were being considered. The first involved adding air pollution controls to the existing facility; the second was building a new smelter in Montana. Throughout development of its compliance plan, Anaconda indicated that the economic feasibility of compliance would have to be considered prior to making a decision. However, the determination that compliance was not feasible was first announced at the same time ARCO announced its decision to suspend operations. Serious discussions with EPA concerning the prospect of alternatives to shutdown were never initiated. During discussions with Anaconda following the shutdown, EPA indicated its willingness to negotiate a reasonable solution which would permit continued operation of the facility, but Anaconda was unwilling to explore the options presented.

The most obvious, short-term approach was the negotiation of a consent agreement which would have permitted the smelter to operate until the end of December, 1982. Under this solution, the company would not have been required to make any capital commitments to add pollution control equipment. Anaconda rejected the option without exploring its feasibility with EPA.

The second alternative was for the company to apply for a nonferrous smelter order (NSO) under the unique provisions in Section 119 of the Clean Air Act which allows copper smelters flexibility in meeting air pollution control requirements. Section 119 authorizes issuance of two NSOs -- the initial order could delay compliance until January 1, 1983; the second until January 1, 1988. In June 1980, EPA issued regulations outlining eligibility requirements and application procedures for obtaining an initial NSO. Although copper industry representatives voiced some concerns regarding the highly detailed application procedures included in these rules, EPA has received several NSO applications and expects to issue the first final order in the near future.

Anaconda, in particular, may have had some concerns regarding the practicability of obtaining the initial order because of the legal and regulatory requirements (e.g., demonstration that controls beyond what is reasonably available are needed to achieve compliance; constant and supplementary control system requirements). However, Anaconda never approached EPA to discuss flexibility that might exist in administering an NSO.

In any event, Anaconda could have entered into a consent decree for the same time period covered by the initial NSO and avoided the capital investments which might have been necessary under the initial NSO. Entry of a consent decree would not have affected Anaconda's ability to apply for the second NSO. Although regulations for the second NSO have not yet been developed, EPA indicated its willingness to negotiate a solution, consistent with the flexibility afforded by the Clean Air Act, which could have permitted continued operation of the existing smelter beyond 1982 under certain circumstances (e.g., if a new smelter was being built or if additional time was needed to install air pollution controls on the existing smelter). However, Anaconda made no effort to explore this alternative with EPA. Instead, the company affirmed that the smelter and refinery would not be reopened.

B. Evaluation of ARCO Estimates of Costs for Environmental and Health Requirements

1. The $400 Million Cost Claim

ARCO and Anaconda stated publicly when announcing the plant closure that the cost to retrofit the smelter was approximately $400 million. This cost figure has its basis in a comprehensive six month engineering study done by American Lurgi Corporation. The Lurgi cost estimate for equipment and installation for the 30 million pound per month copper smelter was $379 million. Anaconda adjusted the Lurgi estimate to $358 million by removing the Lurgi contingency estimate of $21 million. Anaconda then added their own estimates of additional cost items such as escalation and 15% contingency and arrived at a total cost estimate of approximately $480 million. Anaconda also estimated that approximately $80 million might be saved by the inclusion of possible modifications to the Lurgi system, resulting in the $400 million publicly reported by ARCO and Anaconda. Anaconda estimated that an additional $80 million would be required for items not included in the Lurgi study such as dust treatment, relocation of the flux system, demolition, zero discharge, and materials handling. The zero water discharge cost estimate of $20 million is the only additional environmental cost item.

2. Other Cost Estimates

Cost estimates for Anaconda smelter plant modifications have been made over the years and are summarized in Table 2.

In 1977, SRI International completed an analysis for EPA of the economic impact of environmental regulations on the Anaconda smelter. The capital cost of compliance with the Clean Air Act and the Water Pollution Control Act used in the report was $35.8 and $7.8 million, respectively. In its report SRI International concluded: "...it is highly improbable that Anaconda would decide to close the smelter and other closely associated facilities, rather than comply with the EPA regulations".

TABLE 2

COMPARATIVE HISTORY OF ESTIMATES OF COMPLIANCE COSTS

Date	Who	Source	Cost
1977	EPA	SRI Report	$43 Million
1977	ARCO	10-K Report	$65 Million
1978	Anaconda	Kaiser Eng. Report	$40 Million
1978	ARCO	10-K Report	$145 Million
1979	Anaconda	Fluor-Furukawa Report	$97 Million
1979	Anaconda	Lurgi Report	$136 Million
1979	Anaconda	SIP Compliance Plan	$185 Million
1979	ARCO	10-K Report	$200 Million
1980	Anaconda	Lurgi II Report	$378 Million
1980	ARCO	Public Announcement of Plant Closures	$400 Million

The 1977-78 Kaiser Engineering study for the Anaconda Company proposed many alternative control strategies to achieve desired sulfur dioxide emission characteristics for the main stack at the smelter. The needed emission characteristics were determined by Environmental Research and Technology, Inc., and were claimed to be necessary to meet the sulfur dioxide national ambient standards. Alternative control strategies were developed for various smelter production levels and ranged in cost from $21 million to $40 million.

In 1978 Anaconda contracted with Fluor Mining and Metals, Inc., and Furukawa Company, Ltd. and also the American Lurgi Corporation to do separate engineering studies to develop a modification plan of the smelter and its operation to comply with EPA's current environmental regulations for ambient air quality and OSHA's regulations for worker exposure to arsenic.

The Fluor-Furukawa study evaluated the most advanced smelter technology as developed and applied at the Ashio, Toyo, Tamano and Onahama smelters in Japan. Their January 1979 report estimated the capital cost of the smelter modification to be $96.6 million (± 25%). In March 1979, the American Lurgi Corporation reported on its engineering study and estimated the capital cost to be $135.8 million (± 25%).

Anaconda combined elements of the Fluor-Furukawa and Lurgi studies to come up with a final smelter modification plan. With the modifications to the studies, contingency and escalation, Anaconda estimated the capital costs for the system to be approximately $185 million, which was included with the company's SIP compliance plan submitted to the State of Montana in July 1979. On the basis of Anaconda's compliance plan, Lurgi conducted a detailed engineering study of the specific modifications needed at the plant and estimated the resulting cost. The April 1980 Lurgi report estimated the capital cost to be $378,987,000 (± 20%).

3. The Existing Smelter

In order to appreciate the magnitude of the proposed modification it is necessary to understand the condition of the existing facility. In the early 1970s, Arthur G. McKee and Company was requested by the Anaconda Company to conduct an engineering study to develop a plan to modernize the smelter and to bring the facility into compliance with a sulfur dioxide emission regulation adopted by the State of Montana in June of 1970. The McKee smelter modification plan included a change in smelting technology and installation of sulfuric acid plant capacity sufficient to capture 90% of the sulfur dioxide.

The Anaconda Company implemented only portions of the McKee recommendations. The reverberatory furnaces were replaced by a fluid bed roaster and an electric smelting furnace. The existing process gas handling system, converters, and remaining smelter process equipment continued to be used.

Pollution controls added to the smelter since 1971 consisted of a baghouse and an acid plant. Since the antiquated converter hoods and the existing gas handling system permitted excessive leakage, the baghouse was capable of treating only a portion of the process gases. For the same reason, the acid plant never performed at design capacity. At design capacity, the acid plant could handle less than 50% of the process gases. However, due to problems with the process and operation of the smelter, only 20 to 30 percent of the SO_2 gases were controlled.

The 1979 ARCO 10K Report on page 22 stated: "Anaconda has invested $68 million in environmental protection at the smelter since 1971." The Rocky Mountain News on January 25, 1981 contained an article which stated: "Since 1972, Anaconda has spent $65 million on steps to upgrade environmental and health performance at the plants. In 1979-80, the firm spent another $15 million on research for technology that would reduce plant emissions to legally acceptable levels." The $65 to $68 million cost was the result of a two-phased modification undertaken at the smelter. The Phase I modification was completed in 1974 at an approximate cost of $29 million. Major improvements at the smelter consisted of an acid plant (cost of $18 million) and a baghouse (cost of $11 million). Addition of this pollution control equipment resulted in some particulate and sulfur dioxide pollution control. The Phase II modification was completed in 1976 at an approximate cost of $36 million. Major improvements at the smelter consisted of a fluid bed roaster and an electric furnace. The Phase II modification was primarily a smelting technology change that resulted in little or no additional pollution control. The $15 million spent on research and engineering in a worldwide search for technology consisted of the Fluor-Furukawa and Lurgi studies and also resulted in no additional pollution controls at the smelter.

4. Cost Allocation and Perspective

The smelter modifications in the Lurgi study included costs that are not attributable to controls to meet the Clean Air Act requirements. To better appreciate the total smelter modification cost estimate, it is necessary to allocate the modification cost according to purpose. Included in the Anaconda/Lurgi smelter modification plan are significant process improvements needed to make the smelting system operate efficiently and more profitably and to provide for effective pollution control. Separation or allocation of cost between process improvement and pollution control is difficult and therefore only a coarse estimate was made from the Lurgi report cost summary.

The Lurgi modification cost estimates for the roaster, electric furnace, converter, slag cleaning, anode furnace, and 50% of utilities areas are considered to be for plant process improvements since these costs are not for pollution control equipment. Total equipment and installation cost for these areas is $168 million. Using Anaconda's estimates for contingency and escalation, the total cost for plant process improvement is approximately $225 million.

To meet the Clean Air Act requirements, additional acid plant capacity and control of fugitive emissions from the converters and the electric furnace matte and slag tap launders are required. Costs associated with pollution control equipment are estimated to be the total of the Lurgi modification cost for the fugitive, wet gas cleaning, sulfuric acid, waste water, and 50% of the utilities areas. Total equipment and installation cost for these areas is $190 million. The Lurgi modification included fugitive control in areas other than the converters and the electric furnace matte and slag tap launders. EPA believes that $20 million of the total cost estimate for this area is not attributable to the Clean Air Act. Instead, these costs pertain to equipment needed for either OSHA requirements or simply the company's desire to improve worker conditions.

Further, approximately $50 million should be deducted from the Lurgi modification cost estimate for the combined wet gas cleaning and acid plant areas because of possible design changes in the acid plants. The resulting cost estimate for those items needed to comply with the Clean Air Act is then $190-$70 million or $120 million for equipment and installation. When adjusted for Anaconda's contingency and escalation the estimated total cost is $160 million.

In conclusion, the cost estimates can be summarized as follows:

- Plant process equipment improvement	$168 million
- Clean Air Act	120 million
- OSHA/Other Fugitive controls	20 million
- Acid Plant Overdesign	50 million
- Total for Lurgi modification	358 million
- Anaconda Contingency and Escalation	$122 million
- Total	$480 million
- Anaconda's "possible" modifications to reduce costs	84.5 million
- Anaconda's publicly announced estimate	400 million (approximately)
- Anaconda estimate for additional items not in Lurgi study	$83 million

C. Anaconda's Internal Environmental Policies

Public concern over the health and welfare effects of pollution are well founded in American society today. Significant environmental laws, such as the Clean Air Act, enacted by Congress in the last decade reflect this public support for pollution control efforts. Citizens want the environmental impact of government and corporate actions and decisions factored into the normal process of conducting corporate and governmental business. Environmental laws are not mere whims of a few; rather the public has indicated through its support for environmental control measures that the costs for minimizing serious environmental impact should be considered as a necessary cost of doing business. These measures that protect public health cannot be disregarded during the course of corporate and governmental business.

Many corporations have willingly undertaken considerable and costly efforts to control pollution and minimize the environmental impact of their operations. In testimony before the Montana Select Committee on Economic Problems in December 1980, Anaconda officials indicated the company has its own health, safety and environmental policies that govern operation of its facilities. The officials conceded the smelter at Anaconda did not meet the company's minimum standards and continued operation of the substandard facility was not in keeping with the company's policies. Given the magnitude of the environmental problems at the smelter, it is not certain whether the company would have even undertaken the investment needed to upgrade the smelter to its own internal standards. Coupling this with needed process improvements, the investment required for the smelter to continue operations, irrespective of regulatory environmental requirements, may have been too much for ARCO to accept. The already marginal position of the smelter made additional investment unwarranted from the company's economic standpoint.

D. Economic Factors Affecting the Anaconda Smelter

Despite modernization efforts at the Anaconda smelter in the early 1970's, the facility remained a marginal operation economically. Numerous economic and operational factors which contributed to this weak economic position made the smelter's future somewhat dubious, even in the absence of environmental requirements. Collectively, these factors are probably more significant than regulatory environmental requirements and are of sufficient magnitude that it is doubtful the smelter could become a cost competitive operation, given other alternatives available to the company. These alternatives included building a new large-scale, efficient smelter at a location closer to major markets for sulfuric acid by-product and within proximity to low-cost water transportation; and toll smelting its concentrates at other domestic or foreign smelters. While Anaconda has chosen the latter option as an interim measure, the company is still considering the possibility of building a new smelter somewhere in the world. Factors other than environmental regulations are discussed in further detail below.

1. Smelter in the Production Chain

Even though Anaconda Copper Company is an integrated producer that handles all aspects of copper production (mining, milling, smelting, refining, and fabricating), the company's main business is mining. For integrated companies, it is general industry practice to operate smelters and refineries as service centers to the owned mines by processing the concentrates essentially at cost. This acts to shift profits of an integrated operator to the mines where depletion allowances for the ore can be claimed to maximize profits for the overall operation. If a company can find a lower cost alternative to operating its own smelter and refinery it would have reason to do so on strictly economic grounds without adversely affecting its mining or fabricating operations.

2. Financial Condition of Anaconda Copper Company

The economic viability of the smelter at Anaconda was affected by the condition of Anaconda Copper Company in particular and the copper industry in general. Throughout the 1970's Anaconda was in a comparatively worse profitability position than other companies in the industry. During the decade between 1966 and 1976, the company consistently exhibited lower net profit margins and return on net worth than the industry average. Since the company was bought by ARCO in 1977, independent profitability data has not been available for the copper operations. However, there is no reason to believe the company's position in the industry has improved appreciably.

Lower profitability indicates the company has some inefficient operations resulting in relatively higher costs. In addition, the company suffered appreciable losses in the early 1970's when Chile nationalized Anaconda's copper mines, resulting in a weak financial condition for the company. During merger proceedings in 1976, ARCO management conceded that Anaconda Copper had some serious problems that required a significant infusion of capital to make the overall operation viable. Information presented during the Federal Trade Commission suit to prevent the merger indicated that Anaconda was a marginal company that, at the time, was unable to compete efficiently and effectively in the industry. Since the merger, ARCO has been trying to strengthen Anaconda's position as a mining company.

3. General Industry Problems

Anaconda's internal financial problems were further exacerbated by the general economic and institutional problems confronting many companies in the copper industry during the 1970's. These problems included slack demand for copper, weak and widely fluctuating prices, escalating capital and operating costs, environmental controls, and foreign competition. Foremost among the problems is foreign competition, which the International Trade Commission in a 1978 report concluded seriously threatens the domestic copper industry. While most foreign producers have higher grade ore bodies and more modern facilities that result in lower costs of operation, the competitive

advantages that foreign copper producers enjoy also point out the institutional differences under which U.S. copper companies are operating. In a 1979 report to Congress, the General Accounting Office concluded that the: "cumulative effect of U.S. government actions, which although in response to legitimate public concerns, have tended to discourage investment in domestic mineral projects. By contrast, many foreign governments encourage development of their minerals production."

The institutional incentives offered by foreign governments take various forms. In some countries, less restrictive laws, such as in the anti-trust, worker safety and health, and environmental laws, place fewer requirements on companies that make the cost of doing business less. In addition, many foreign governments support their domestic industry through financial incentives such as tax benefits, subsidies, and tariffs. In Japan, for instance, where environmental requirements are more stringent than in the U.S., the government aids its industry with tax benefits, protective tariffs, and low interest loans that allow the Japanese copper industry to effectively compete in the world market.

Despite the institutional disadvantages confronting the domestic copper industry, future prospects for U.S. producers appear improved. Based on steadily increasing demand for copper, the price of refined copper, as estimated by EPA for its NSO regulations, should rise seven percent per annum in real terms between 1981 and 1986. The effect of this should be to increase mining capacity of domestic and foreign mines and provide necessary capital for smelters to make environmental and process improvements in order to service increased mines output. Some additional domestic smelting capacity may also be constructed.

4. Costs of Operation

In testimony before the Montana Select Committee on Economic Development on December 20, 1980, representatives of Anaconda Copper Company indicated that 80 to 85 percent of their competitors worldwide produced copper cheaper than Anaconda's Montana operations. Higher costs of mining at Butte coupled with relatively higher operating costs at the smelter results in a competitive disadvantage for the company.

The relatively high cost of the Butte mining operations has an indirect effect on the continued operation of the Anaconda smelter. Because of the declining yield of copper from the Butte ores, the costs of mining in Butte are higher than the costs for most major mines in the country. In order for the Butte mine to remain competitive, Anaconda must be able to operate its smelter and refinery at relatively lower costs to offset the higher costs of mining, which did not appear possible at the Anaconda smelter. Anaconda has to look elsewhere for more favorable smelting and refining terms to keep the Butte mining operations in a competitive posture.

Contributing significantly to the higher cost at the Anaconda smelter is the electric furnace technology utilized at the smelter. In an assessment of alternative smelting technologies, EPA's Industrial Environmental Research

Laboratory in Cincinnati has shown electric furnace technology to have many disadvantages and higher costs. The higher costs are due principally to higher energy consumption and rising electricity costs.

Another factor influencing the higher operating costs concerns the operational problems at the smelter resulting in inefficiencies in the process. Many of the problems are due to the high level of contaminants in the Butte concentrates. Metallurgical processing of the concentrates is more difficult and expensive because of the existence of appreciable quantities of arsenic, bismuth and other impurities. The presence of these contaminants also results in a lower grade copper that cannot command as high a price in the market place. In addition, metal recovery in the process was made exceedingly difficult by these contaminants, to the extent that copper and other valuable metals and minerals normally recovered at other smelters were lost in the process, resulting in higher overall costs of production. As discussed in a previous section of this report, the smelter needed significant capital improvements in the process to overcome operational problems and become an efficient operation.

5. Supply of Concentrates

Also contributing to the unfavorable economic position of the smelter is Anaconda's supply of concentrates. First of all, over 50 percent of Anaconda's concentrate supply comes from company-owned mines in Utah and Arizona. Transportation costs of the concentrates, which are comprised of 65-75 percent waste material, are increasing and result in higher costs of operation in Montana. In fact, most smelters in the U.S. are close to mines in order to minimize the transportation costs of the material.

While Anaconda's current supplies of concentrates are adequate to effectively utilize the capacity of the smelter, the condition will be less favorable within three years. As a result of merger terms set forth by the Federal Trade Commision in the merger of Anaconda Copper Company and ARCO, ARCO must divest of its share of the Anamax Twin Buttes mine in Arizona by 1984. Loss of the Twin Buttes mine would reduce the supply of concentrates to the Anaconda smelter by 20 percent and would result in only a 70 percent utilization of the smelter's capacity while utilization of the Great Falls refinery would be less than 60 percent. A smelter or refinery cannot generally operate on an economic basis for long periods of time at such low utilization rates.

Development of new mines is not a near-term option since mines take several years to develop and require a large capital investment. Anaconda is not in a good position to secure concentrates from other mines for toll smelting to make up for the loss of concentrates. The smelter is not favorably located with respect to receiving copper concentrates from other parts of the country or overseas and there are other toll smelters in that area which can process the concentrates cheaper. At one time 40 percent of the Anaconda's production was toll business, but in recent years the smelter has had no toll business.

6. Marketing Problems

The smelter's location in Montana also creates marketing problems for copper and by-products such as sulfuric acid. Since the major markets for sulfuric acid are in the industralized regions of the country, Anaconda is unable to compete with other producers since it costs more to ship acid from Montana to these markets. Acid produced in the major producing area of the Southeast U.S. commands a price six to eight times higher than the price Anaconda is able to receive, mainly because of transportation costs. Higher prices for its acid would mean that the company could recover portions of its operating costs that would make the operation more economic.

7. Feasibility of a New Smelter

An option still open to the company is construction of a new smelter somewhere in the U.S. ARCO has indicated it does not necessarily want to get out of the smelting and refining business permanently. For many of the reasons stated above, Montana is an unlikely location for a new smelter. Other areas of the country such as the Gulf Coast offer better access to copper and by-product markets as well as proximity to low-cost water transportation for receiving concentrates from abroad. A large smelter will realize economies of scale while more efficient state-of-the-art technology such as flash furnaces will result in lower operating costs. Of course, construction of a new smelter will require a large capital investment that will have to be weighed against other alternatives. For this reason and since a new smelter appears to be a feasible long term economic solution, ARCO chose not to invest considerable money in the Anaconda smelter when the capital can be put to other uses, including building a new smelter or supporting other corporate investments.

8. Opportunities with Japanese Smelters

Since Anaconda expects it may take up to seven years to build a new smelter, the company had to find an interim means to have its concentrates smelted and refined. Since the option of continuing to operate the existing smelter was discarded, the company investigated many possibilities for having its concentrates processed on a toll basis elsewhere in the U.S. or abroad. After months of negotiations, Anaconda finally reached an agreement in December 1980 with several Japanese smelters to have its concentrates processed overseas for the next seven years. Historically, Anaconda has shipped a portion of its concentrates from the Anamax Twin Buttes mine to Japan for smelting and refining.

Although Anaconda has not disclosed all the details of this agreement, apparently the Japanese copper producers will toll-smelt and refine Anaconda's concentrates. The finished copper may be returned to the United States for fabrication, but the Japanese firms also have an option to purchase some of the finished copper.

Several factors enable Japanese copper smelters to be an economically attractive alternative to a domestic copper producer with high cost operations. Even though the cost of transporting concentrates to Japan is high, the increased cost is offset significantly by lower smelting and refining charges of the Japanese firms. A major reason is lower costs of operation, due to the fact the Japanese copper industry has newer and more efficient facilities than those generally found in the United States. These smelters incorporate the latest state-of-the-art technology that makes for efficient operations, while still meeting environmental requirements more stringent than those in the U.S. In addition, since the Japanese view the smelting operation as a potential profit center, they strive to operate their smelters at full capacity in order to reduce unit costs.

Governmental support of the copper industry also contributes significantly to the favorable cost situation in Japan. In addition to tax benefits, Japanese smelters are aided by a high import duty on refined copper and no duty on copper concentrates coming into the country. The high duty on refined copper protects the Japanese producers from foreign competition and allows them to charge artificially high prices for fabricated copper products within Japan. Thus, Japanese smelters can charge toll customers at a rate below the actual cost of processing because the loss is covered by the extra margin of profit realized by charging prices for domestic refined copper at competitive import levels. The combination of low smelter and refinery costs with a protective tariff enables the Japanese to offer competitive terms to foreign suppliers of concentrates.

Anaconda's decision to ship concentrates to Japan indicates the company believed this alternative was more economical in the interim than retrofitting and continuing to operate its own smelter. Although the total transportation and processing costs associated with the Japanese alternative may be somewhat higher than Anaconda's cost of operations before closure, apparently the difference does not significantly affect the viability and profitability of the company's mining operations.

The opportunity to secure reasonable terms with Japanese smelters at this time accelerated Anaconda's decision to suspend operations at the smelter. Although the smelter could have remained open for at least another two years with minimal or no investment in pollution control equipment, the company apparently acted at this time in order to obtain capacity somewhere in the world to have its concentrates processed. While there is currently excess smelting capacity in Japan, Anaconda believes this excess will soon be consumed by supplies from other U.S. or foreign mining companies.

9. Financial Analysis of Anaconda's Smelter

All the economic and operational factors discussed above contributed to making the Anaconda smelter a marginal operation, a condition that would have no doubt continued in the future. The effect of these factors collectively influenced the smelter's future economic viability and Anaconda's consideration of options for having its concentrates processed.

In order to gain a better understanding of the baseline financial condition of the smelter and the relative magnitude of environmental expenditures for the plant, EPA contracted for a financial analysis of the smelter's operations based on publicly available information in the absence of actual data from Anaconda. While the analysis is based upon limited data, the results nonetheless provide insight into the smelter's financial condition. The analysis employed a discounted cash flow technique that represents a quantitative method for objective decision-making.

The analysis results in a range of capital investment the company could make for process improvements or pollution control equipment at the smelter and still remain competitive with the other alternatives available to Anaconda. Because of uncertainties surrounding the economic and operational factors affecting the continued operation of the smelter, the range of affordable investment does not indicate definitively conclusive results.

As discussed previously, the factors affecting the continued operation of the smelter do not appear to be favorable. With the smelter underutilized, with operating costs continuing to escalate, and with more attractive alternatives for a new smelter and toll smelting in Japan, the analysis indicates the smelter was an unprofitable or only marginally profitable operation even in the absence of additional expenditures for process improvements or pollution control. Under a reasonable and plausible set of assumptions, the analysis suggests the smelter was marginal to the point that it could afford little or no investment in process improvements or pollution control without placing the smelter in an uncompetitive position with Anaconda's more favorable alternatives. The smelter could possibly afford a minimal investment of up to $25 million, a level that would be far short of what would be required for basic process improvements, for Clean Air Act requirements, or for possibly even the company's own internal environmental and health requirements.

On the other hand, if all the factors discussed previously were more favorable for future operation of the smelter, the company could have possibly afforded up to $200 million in process improvements and environmental controls at the smelter. This amount would have been sufficient to cover investment for the Clean Air Act requirements alone, but when coupled with the necessary process improvements the total investment required at the facility was not warranted on strictly economic grounds. However, for as much as $200 million to be justified, an unlikely and unrealistic combination of factors would have to result to make the prospects for continued operation more favorable.

In conducting the analysis, all of the non-environmental factors influencing the smelter were included in the baseline condition of the plant, with expenditures for process improvments and environmental requirements added as the last increment. All of these other factors led to the baseline marginal condition of the smelter in the first place. If not viewed in proper context, this approach may lead to the erroneous conclusion that the last factor added was the only basis for the decision to close the smelter. When

so many crucial factors affect the economic viability of the smelter, all factors have to be viewed as incremental problems contributing collectively to the weak economic state, without singling out any one factor as being the primary reason for closing the plant. If other factors were more favorable, the last incremental factor, which in this case was process improvements and pollution control, may not have been the deciding factor. For this reason, it is imprudent to single out environmental requirements as the sole, or even overriding, reason leading to the closure of the smelter when numerous factors were involved.