NATIONAL MINING AND MINERALS POLICY

HEARING

BEFORE THE

SUBCOMMITTEE ON MINERALS, MATERIALS, AND FUELS

OF THE

COMMITTEE ON INTERIOR AND INSULAR AFFAIRS

UNITED STATES SENATE

NINETY-FIRST CONGRESS

FIRST SESSION

ON

S. 719

A BILL TO ESTABLISH A NATIONAL MINING AND MINERALS POLICY

JULY 9, 1969

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NATIONAL MINING AND MINERALS POLICY

WEDNESDAY, JULY 9, 1969

U.S. SENATE,
SUBCOMMITTEE ON MINERALS, MATERIALS, AND FUELS
OF THE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D.C.

The subcommittee met, pursuant to call, at 10 a.m. in room 3110, New Senate Office Building, Senator Frank E. Moss (chairman of the subcommittee) presiding.

Present: Senators Moss, Jordan of Idaho, Allott, and Stevens.

Also present: Senators Burdick, Fannin, and Hansen.

Staff members present: Jerry T. Verkler, staff director; Stewart French, chief counsel; and Charles Cook, minority counsel.

Senator Moss. The subcommittee will come to order. We are trying to start very punctually this morning, because we have a serious time problem which I will say more about in a minute.

This is an open hearing of the Minerals, Materials, and Fuels Subcommittee of the Senate Interior Committee on S. 719, a bill to establish a national mining and minerals policy. The principal sponsor of this bill is our distinguished colleague on the committee, Senator Allott, of Colorado. I am proud to have joined as a cosponsor of the bill, along with Senators Bellmon, Bennett, Bible, Cannon, Church, Dominick, Fannin, Hansen, Hruska, Jordan of Idaho, McGee, Metcalf, Stevens, and Young of North Dakota.

Without objection, I will direct that the text of S. 719 appear at this point in the hearing record, to be followed by the reports of the executive agencies.

(The documents referred to follow:)

[S. 719, 91st Cong., first sess.]

A BILL To establish a national mining and minerals policy

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Mining and Minerals Policy Act of 1969".

SEC. 2. The Congress declares that it is the continuing policy of the Federal Government in the national interest to foster and encourage (1) the development of an economically sound and stable domestic mining and minerals industry, (2) the orderly development of domestic mineral resources and reserves necessary to assure satisfaction of industrial and security needs, and (3) mining, mineral, and metallurgical research to promote the wise and efficient use of our mineral resources. It shall be the responsibility of the Secretary of the Interior to carry out this policy in such programs as may be authorized by law other than this Act. For this purpose the Secretary of the Interior shall include in his annual report to the Congress a report on the state of the domestic mining and minerals industry, including a statement of the trend in utilization and depletion of these resources, together with such recommendations for legislative programs as may be necessary to implement the policy of this Act.

U.S. DEPARTMENT OF THE INTERIOR,
Washington, D.C., July 9, 1969.

Hon. HENRY M. JACKSON,
Chairman, Committee on Interior and Insular Affairs,
U.S. Senate, Washington, D.C.

DEAR MR. CHAIRMAN: Your Committee has requested this Department's views on S. 719, a bill to establish a national mining and minerals policy.

The bill would declare that it is in the best national interest to foster and encourage the development of the domestic mining and minerals industry, the development of domestic mineral resources to meet industrial and security needs, and mining, mineral and metallurgical research. It directs the Secretary of the Interior to carry out this policy in accordance with other statutes authorizing such programs, and to make an annual report to Congress.

This legislation does not provide any new authority. We believe, however, it is desirable to establish such a national policy and to carry it out. In establishing and carrying out such a policy, the Administration, of course, would take into account other national policies, such as those relating to the conservation of these resources and the protection of the environment and other resources values and, most importantly, the national need to improve the health and safety of those who work in these industries.

Among all people, we in the United States enjoy the highest standard of living—a standard featuring the consumption of an extraordinary volume of minerals and their products. We, as a Nation, seek to maintain and improve this standard and to insure at the same time that our essential mineral needs are met at costs that are in line with other material and service costs.

Accordingly, there can be little argument with the basic assumption that mineral substances and the products derived from them for the material foundation of our society. These minerals and metals are woven into every pattern of our economy and technology. Many of them are critical to national security.

With respect to the Nation's long-range mineral position, we believe the United States has cause for deep concern. It is our considered opinion that unless an urgent effort to up-grade minerals and mining technology is launched soon, we face the possibility that the growth in our standard of living will be limited due to mineral resource constraints within 20 to 30 years.

While in one sense it is true that we are not "running out" of mineral resources, the United States definitely is past its "flush" period of rich, easily accessible, easily mineable mineral resources. New mineral technologies are needed to aid mineral discovery and profitable production and processing.

A recent study on mineral science and technology conducted by the National Academy of Sciences, the National Academy of Engineering, and the National Research Council warns that "despite the key role of minerals in our society and the vastly increasing worldwide demand for mineral products, mineral technology in the United States is in a declining state, and serious trouble lies ahead for the country unless corrective actions are taken promptly."

We find ourselves in this troublesome position for a number of reasons, such as the wasting nature of mineral deposits, declining grades of ore at home, increasing competition for high-grade deposits abroad, and a growing shortage of trained mineral specialists and engineers, to mention just a few.

Even the most conservative projections of mineral consumption and requirements indicate that assuring future supply will require new discoveries, technologies, and capabilities. How we plan or provide for future supplies will become the controlling factor in how effective we are in meeting future requirements.

The latest Bureau of Census median projection for population of the United States in the year 2000 is 320 million, and the United Nations estimates that the world's population will climb to 6½ billion by the year 2000.

With only about 6 percent of the world population at present, the United States consumes almost one-third of the world's minerals. Twenty years ago the United States had 9.5 percent of the world's population and consumed about half of the world's minerals. At that time, there was a 9 percent domestic production deficit with a possible 20 percent deficit forecast for 1975.

We have already exceeded the figure projected for 1975 and the gap between domestic production and consumption is widening at a frightening rate.

Presently, we tend to appraise our resources and supply capabilities on the basis of foreseeable apparent demands for the various commodities, tempering our findings by such intelligence as may be available as to how these demands

might change from current and historical patterns. In developing our longer term strategy, the possibility of developing domestic alternatives to imports should be given increased attention by both industry and government as a means of enhancing the general welfare and national security.

All elements of the mineral-related industries, the ultimate consumers of metals and mineral products, Federal and local Governments, educational establishments, and even the public at large share responsibilities for mineral supply. Meeting the national need for minerals is a function of private enterprise, but the Government has a variety of obligations and a significant supporting role as our security and overall economic well-being depend upon the continued availability and an adequate and dependable flow of mineral raw materials.

Faced with rising demand and widening competition, the alternatives open to the United States to augment its mineral resource base include (1) a shift of investment to foreign sources of supply, or (2) development and utilization of new technology to exploit domestic deposits of lower grade or those presenting more difficult mining and metallurgical processing problems. Although U.S. mineral producers have made use of both alternatives, the trend has been investment shifts to foreign sources. But the number of producers with the financial resources to move in this direction are limited, and, thus, most domestic producers find themselves captive to a declining resource base and a relatively static technology.

An additional complication exists in the fact that there are certain mineral substances for which we must, to the best of our current knowledge, be virtually dependent upon foreign supply. Usable resources are not now, nor likely to be in the future, present in nature in a system that conforms to any ethnical, political, or continental patterns. Thus, access to world supply will continue, as it has in the past, to be sought through alliances or mutually advantageous trade agreements—mostly of a transitory nature.

But regardless of this overseas dependence for certain minerals, we must search for more domestic mineral deposits that can be worked economically with present technology, or produce the technology that will enable us to process deposits that are presently marginal. Even if, we make this investment, imports will increase.

The Nation is also faced with the problem of insuring the optimum use of its land surface. With the projected increase in population there will be increased demands on land use for the growth of food, for living space, and for recreation. These pressures already are such in some areas of the United States that land prices would obviate the exploitation of the mineral resources in the land if any were found. These pressures can only increase. The problem is compounded by land pollution arising from some past mining practices and disposal of mineral waste materials.

The disposal, control, and reclamation of mineral waste products not only pose technologic and sociologic problems but also are or may be economic factors in the effective conservation and use of mineral resources. Specifically, methods must be sought to improve recovery systems in order to reduce mineral losses and to reduce the volume of products finally discarded. The impact of mineral extraction, processing, and use upon the physical environment has become a matter of national concern. The problems that arise from mineral production cannot be treated apart from environmental degradation that stems from the mining, treatment, or use of any mineral substance. Accordingly, concern for pollution of air, land, and water, together with the ultimate disposal of all mineral-based waste products and reclamation of the land for other uses, must influence every program undertaken to alleviate the mineral supply threat.

Whereas improvements in mineral technology and efficiency have, in the past, made it possible, in a limited extent, to commercially recover and employ minerals from lower grade and more inaccessible sources, the challenge of the future is to make a massive improvement upon this capability while at the same time implementing more effective means of limiting environmental degradation.

No overall single solution applies to the national problem of mineral supply, but generally accepted positions exist on essentially every facet of this complex subject, and these do not change very often. Of these, the principal and most important element is recognition of minerals as being critical and essential to the Nation's economy and security, and the need to assure an adequate and dependable and continuing supply of these vital materials. It seems safe to assume that this position will continue to prevail and to gain in significance.

The importance of lead-time to the solution of impending mineral supply problems is critical to our national interest. But to achieve this lead-time we must substantially improve our capacity to isolate, appraise, analyze and forecast events that promise to upset supply-demand patterns in some significant way.

With properly directed purpose—

We can expect a gradual transition to lower-grade and less-accessible deposits for our essential needs;

We can expect that practical methods will be developed for supplementing our land resources with minerals from the ocean, the ocean floor, and submarine surfaces;

We can expect improvement in out capability to use out supplies more efficiently, to speed-up reuse cycles, and recapture much greater percentages of our mineral substances that are presently lost in the extractive processes or unreclaimed from worn-out or discarded items;

We can expect to learn more about how to substitute relatively abundant materials for substances in short supply without sacrificing quality or adding to the cost of the end product.

Our achievements towards these ends will be constantly held back if trained manpower is not available. Even if the present unfavorable outlook for an adequate supply of talent to meet the challenge of the immediate future could be sharply reversed soon, it seems likely that we shall continue to suffer in this regard for several decades. Unless we meet this challenge intelligently at home, our latent mineral potential will never be realized and our eventual dependence on others for most of our essential material needs is a virtual certainty.

We recommend the enactment of S. 719 with the following clarifying amendments:

1. On page 1, line 9, insert "economical" after the word "orderly".
2. On page 1, line 10, change "necessary to" to "to help".

These amendments are designed to reflect the fact that some necessary minerals are either not available at all domestically or their domestic production would be uneconomical.

3. On page 2, line 4, strike "in" and insert "when exercising his authority under".

This change is designed to bring the language of the bill in accord with the mineral policy and program responsibilities of the Secretary of the Interior.

The Bureau of the Budget has advised that there is no objection to the presentation of this report from the standpoint of the Administration's program.

Sincerely yours,

WALTER J. HICKEL,
Secretary of the Interior.

EXECUTIVE OFFICE OF THE PRESIDENT,
OFFICE OF SCIENCE AND TECHNOLOGY,
Washington, D.C., July 7, 1969.

Hon. HENRY M. JACKSON,
Chairman, Committee on Interior and Insular Affairs,
U.S. Senate, Washington, D.C.

DEAR CHAIRMAN JACKSON: Thank you for the opportunity to comment on the bill to establish a national mining and minerals policy—S. 719. Specifically, the proposed bill declares a national policy in mining and minerals and assigns responsibility to the Secretary of the Interior to carry out the policy and to report to the Congress annually on the state of the domestic mining and minerals industry. It also requires him to recommend legislation to implement the policy. While the bill is brief, the issues it raises are far-reaching and complex.

I believe the Committee should be commended for focusing public attention on an area of public policy of which the general public is not sufficiently aware. There has been no broad review of our nation's policies with respect to supply and demand of minerals since the Paley Commission report, completed in 1952. And, more importantly, there has been insufficient attention to the policies which Government must pursue in order to meet our mineral needs in an orderly and economical manner. A fresh assessment is needed not only to determine supply with respect to potential needs, but because of the new dimensions of public policy that are of increasing public concern.

I believe that we should view our minerals policy from a broad long-term national perspective. There are numerous current problems affecting particular minerals, their associated industries and workers, and it is essential that the national policy be directed toward ensuring the availability of adequate economical supplies of minerals to meet the nation's needs now and in the future. As our standard of living rises and we depend more on technological innovations and improvements, we will need more fuels, metals and other minerals. Adequate mineral supplies are therefore essential to the long-run economic development of the nation.

Our use of minerals in the past, however, has led to depletion of many of the rich, easy-to-mine deposits in this country. Although rich foreign resources have in some cases proved substitutes for the lower grade domestic ores, in the long run they also will be depleted. This is especially evident when one realizes that foreign demands may accelerate even faster than our own as other nations become industralized.

To meet the world's long-run needs, it will therefore be essential to develop economical means for using the lower grade ores remaining. The best hope of achieving this is the development or improvement of technologies for finding, mining and processing the resources available. While there is a great deal which can be done to improve present mining and processing systems, such as increasing the scale of open-pit mine operations, a whole array of radically different approaches has been suggested. Many of these approaches are based on the use of large, low-cost energy sources. These range from in-situ recovery through nuclear explosives or leaching, to electric reduction techniques using nuclear electricity from the breeder reactor, to separation of elements in ores and solid wastes using a fusion plasma. Admittedly, some of these are "blue sky ideas," but if we hope to meet the vastly increased demands projected for the next 25 or 50 years such extraordinary measures will be required.

When meeting our future needs "economically" we must consider as real costs the health and safety of those who work in the mines and processing plants and the quality of the environment in and around these facilities. Recent concern for coal and uranium miners, as well as for the land around strip mines, clearly shows public sentiment for considering such costs. As lower grade ores are mined, even more solid wastes will be produced, exacerbating that problem. Technological developments may prove the only feasible solution for economically meeting these new requirements.

The stress on technology which I have outlined above provides the primary long-term solution to improving the U.S. minerals industry. Traditionally, this country has made progress by improving the productivity of our industries and workers through technology and education. Problems may be temporarily alleviated by protection of domestic industries, but this tends to distort major segments of the economy and to increase the real cost of living. Increased productivity through adaptation of new technology has been the established road to progress in this country in industry generally and has resulted in a standard of living for the U.S. worker second to none. I believe that the minerals industries can also expect to participate in an improved standard of living, but we must devote a great effort to the need for better technology in order to meet our future needs. Certainly a Congressional declaration of policy to that effect—as is contemplated by S. 719—would be a useful step in that direction.

We envision that the Department of the Interior would take the lead in identifying the areas where research and development of new technology would be most useful. While this first step would be conducted or funded by the government, its purpose would be to guide industrial and university efforts as well as subsequent government work. In cooperation with the Bureau of Mines, we have recently contracted with TRW, Inc., a large industrial firm with experience in new technologies and far-reaching systems studies, to develop an R&D plan for underground coal mining. This is really an experiment to ascertain how advanced technologies and methods can be applied to a particular segment of the mining industry and, hopefully, may provide a model for Interior's subsequent efforts on other minerals problems.

Stimulation of research and development in the minerals area should in the long run help to alleviate the shortage of highly trained technical manpower required for the future. Support of significant new university research projects by industry and government should enable the universities to attract new student and faculty members.

The large variety of commodities identified as minerals makes it difficult to assure that any single policy or group of policies would be equally applicable to all. As indicated above, there are some minerals, such as chrome and mica, for which domestic sources are essentially not available; others, such as cement and salt, are in plentiful supply domestically; while for still others domestic supplies exist but have difficulty competing with foreign sources at present. In addition, some of the minerals, especially fuels, raise economic and policy issues so broad that many interests beyond the Department of the Interior are concerned.

Petroleum offers a case where both the import issue and the large number of points of view would make a single agency review of the over-all-policy at best uncertain. As you know, the oil import policies of the previous Administration have been subject to criticism by both industry and consumer groups. This Administration has concluded that a comprehensive review of our oil import policy should be the first order of business. To accommodate the many interests and points of view involved, the President established a Cabinet-level task force, consisting of seven department heads, plus observers from six other agencies, to make the review.

Although there is no inherent difference between fuels and non-fuel minerals, the relative numbers, magnitude and impact on the over-all economy of our sources of fuel supply may make it desirable to treat them separately. The value of our annual domestic petroleum production, for example, exceeds the combined value of all the non-fuel metals and minerals. While the value of coal and natural gas is not so large as that of oil, it is still much larger than any individual non-fuel mineral. The multi-agency involvement in energy is pointed up by the fact that OST plays a role in coordinating energy policy on a government-wide basis.

We, therefore, support the effort initiated by the sponsors of S. 719 and your Committee to establish a minerals policy for the United States emphasizing the need for development of new and improved technologies for exploration, mining, processing and utilization of mineral resources to meet the nation's long-term needs. We believe that certain language changes in the text of S. 719, as proposed by the Department of the Interior, are desirable. With such changes, we urge enactment of the bill.

I hope that we can be of assistance in supporting the commendable purpose of S. 719—to develop a minerals policy for the nation which will enable the minerals industry to continue to play its rightful role in improving the standard of living of all Americans.

Sincerely yours,

LEE A. DUBRIDGE, *Director.*

EXECUTIVE OFFICE OF THE PRESIDENT,
BUREAU OF THE BUDGET,
Washington, D.C., July 9, 1969.

Hon. HENRY M. JACKSON,
Chairman, Committee on Interior and Insular Affairs,
New Senate Office Building, Washington, D.C.

DEAR MR. CHAIRMAN: This is in reply to your letter of March 12, 1969, inviting the Bureau of the Budget to comment on S. 179, a bill "To establish a national mining and minerals policy."

The bill describes a minerals policy in broad terms and would make the Secretary of the Interior responsible for carrying it out, including the presentation of implementing legislative recommendations in annual reports to the Congress.

In its report to your Committee, the Department of the Interior notes that the bill would not provide any new authority. The Department also recommends several amendments designed to avoid language in S. 719 that could be construed to encourage the development of uneconomic programs and to affect the responsibilities of agencies other than the Department of the Interior.

If amended as recommended by the Department of the Interior, the Bureau of the Budget would have no objection to the enactment of S. 719.

Sincerely yours,

WILFRED H. ROMMEL,
Assistant Director for Legislative Reference.

Senator MOSS. We have a long list of many distinguished witnesses scheduled. The minerals industry, the academic community, and the

executive branch all have contributed outstanding leaders as spokesmen. We think we truly have the first team on the field today.

Unfortunately, because of the floor action involving a major issue of national security, the ABM, it is doubtful whether we can sit with any effectiveness this afternoon. As a matter of fact, there will be a live quorum at 12:15 and we will go into executive session on the ABM, with debate at 12:30 so that we will be precluded from going beyond that point. Consequently, I will make my remarks brief and point out only that Senator Allott has performed a great public service in sponsoring this legislation.

He certainly has been very persistent. Senator Allott has been introducing a similar bill since the 86th Congress and we have not yet come to grips with the problem. I am glad that we have come to this point today, so that perhaps we can report a bill. In 1968 we had a rather long colloquy in this committee on the subject with Dr. Hibbard, who was leaving his post as Director of the Bureau of Mines and who made a forceful presentation to us on mineral shortages.

I refer to that because I would like to include it by reference in our hearings today. Before I recognize Senator Allott, whom I am sure will have some comments to make at the opening, I want to suggest that we change the order of appearances of the witnesses as was put on the mimeographed sheet. This is, of course, never a firm order, but normally what we would do is call on the executive departments here. We would expect to hear from them first. However, we have so many outstanding witnesses who have come long distances to be here this morning that I am going to ask that the executive department witnesses give way this morning. They are in the city and we can arrange for them to come and give their testimony at another time if we are not able to get around to it today, whereas witnesses who have crossed the continent, and come very long distances to testify, certainly should be heard and should not be put to the inconvenience of trying to meet another date.

Assistant Secretary Dole is with us, Charles Kendall, the General Counsel, and William Lawrence, Chief of Materials Policy Division of the Office of Emergency Preparedness, and S. David Freeman, Director of the Energy Policy Staff of the Office of Science and Technology, along with J. Frederick Weinhold. I will ask those gentlemen if they would go to the foot of the list as it were, and we will try to hear them today if it is possible, but I do want to move along and we will begin after Senator Allott's statement by hearing from the representatives of the American Mining Congress, of whom there are many distinguished representatives here.

Senator Allott?

STATEMENT OF HON. GORDON ALLOTT, U.S. SENATOR FROM THE STATE OF COLORADO

Senator ALLOTT. Thank you very much, Mr. Chairman. I am appreciative of the fact that you and so many others have joined in the bill to create a national minerals policy. I must say one word with respect to the amenities. I know that the members of the administration understand the situation which creates this particular reversal here, but I would be very remiss if I did not express my apprecia-

tion to all of those who have come here because we have never within my recollection for many years assembled such a fine, outstanding list of leadership in the minerals field as we have here today.

At the outset I would like to make it clear for the record that I intentionally excluded coal, oil, gas, oil shale, and uranium from the definition of "minerals" as that term is used in S. 719. You and I have discussed this, and I believe we are in agreement that coal, oil, gas, oil shale, and uranium more properly fit into the energy picture along with hydroelectric power and solar energy. In my view, there are many common factors to the energy picture that are peculiar to energy and which simply do not apply to minerals in general; and therefore, the problems of energy and of the energy mix should be treated separately.

As an example of this, both the electric industry, which is the largest user of coal and in which uranium is becoming a larger factor, and the natural gas industry, are regulated by the Federal Power Commission, or by State regulatory agencies. Such questions as "service area integrity," public versus private power, rate structuring, et cetera, common to the energy field are simply not present in the general mineral field.

In addition, the Office of Science and Technology, under the leadership of Mr. David Freeman, has been conducting a review of our total energy picture for some 2 years now.

Therefore, it is my intention, and I believe the cosponsors of the bill are in accord, that the ambit of the national mining and minerals policy we are discussing here today be exclusive of the energy field and its primary fuel sources.

Mr. Chairman, it has been more than a full 10 years since I first introduced the provisions contained in S. 719, to establish a national mining and minerals policy in order to promote the wise and efficient use of our mineral resources. I first introduced this proposal on March 25, 1959, and it was passed by the Senate as Senate bill S. 1537 on September 10, 1959.

However, this proposed legislation has yet to receive the full congressional support needed for enactment into law. I have persistently introduced and pursued enactment of this legislative measure in each succeeding Congress because I believe in the necessity of congressional actions and leadership in establishing and sustaining actions directed toward carrying out a national mining and mineral policy.

Unfortunately, in 1959 the Congress, in lieu of enacting my proposal, accepted what I, and others, considered a weak approach to the establishment of national minerals policy. That action was House Concurrent Resolution 177 as adopted in the 86th Congress. The resolution stated in part that:

> It is in the national interest to foster and encourage (a) the maintenance and development * * * (b) orderly discovery * * * and (c) research to promote the wise and efficient use of domestic metal and mineral reserves.

However, as you know, such a resolution has no legislative force. To all intents and purposes no policy and implementing program including these three important factors has been formulated by either the executive branch of the Government or the Congress.

We in the Congress are continuing our neglect, if I may say so, of the minerals base of the Nation's economy. We still continue to deal

with minerals problems on a crisis, case by case, hit or miss, basis. In consequence our efforts in the minerals field are greatly diluted at best and our congressional responsibilities for assuring this basic resource development are not being met.

Since minerals occupy a dominate position among the essential materials required for national security and for the continuing existence and progress of the industrialized economy of the United States, it is essential that we examine and, more significantly, provide for continuity of such examination as may be required to assure that the Federal responsibility in the minerals field be adequately met.

By 1980 we will require twice the amount of minerals that we consume today to provide for the growth of our economy, standard of living, and the national security. Such fantastic need comes in a time when our domestic ores are leaner in values, when production costs must include provision for abatement of air, water and land pollution, when our graduates in the field of minerals engineering are in short supply, and as more and more of our minerals commodities are being imported.

However, this crisis situation in prospect is not something entirely new or unforeseen. There has been a pronounced downtrend in our metal and mineral self-sufficiency since 1935, accounted for by rising demand from an expanding, and now exploding, population with attendant accelerating industrial growth outrunning our rate of increase of output from our domestic mines. Reportedly, more than 75 percent of our needs for 20 key mineral commodities are supplied today from other countries. But the economics of the situation are such that it has become more profitable, and economically more feasible, to import.

As we permit our Nation to become more and more dependent upon foreign sources for minerals important to our industry, we tend to lose the ability to find and satisfactorily produce these minerals domestically. Our dependence tends to encumber our foreign policy and limit our freedom of movement within the family of nations. It is, therefore, in the national interest, both in terms of foreign policy and national defense, that our ability to domestically produce important mineral commodities be developed and maintained.

I believe it to be of paramount importance that the Congress act at this juncture to establish a national minerals policy to promote the wise and efficient use of our mineral resources, because never before has the future of our country been so dependent upon the advancement of technology in the minerals field, and never before have we had the degree of crisis in prospect that may well face us by the year 1980, barely more than a decade away.

How much longer are we to delay the creation of policy, national purpose, and action for pursuing:

(1) Programs for exploring at greater depths and developing technology so that we may know where the minerals are in the second layer of the earth's crust which we must indeed tap to meet our future needs?

(2) Programs for improving our minerals base by improving mining, beneficiation, and processing technology to provide the technology which will make extraction of metal and minerals from second layer leaner ores economically feasible.

(3) Programs for taking advantage of the tremendous opportunity in the field of recycling? There are large amounts of minerals in use or in disuse which can be tapped to meet future needs.

(4) Programs in the field of physical metallurgy for developing the degree and extent of substitutability, of those materials which are in abundant supply, for those which are in short supply or are anticipated to become scarce?

(5) Programs designed to achieve and maintain a reasonable balance between imports and domestic production?

(6) Programs to relieve the shortage of engineering know-how?

(*a*) Ways and means must be found to increase markedly the number of mineral-industry engineers graduated each year. Twenty years ago the number of engineering graduates, for mining alone, was between 400 to 500 annually. Reportedly, this year it will be slightly more than 100.

(*b*) Ways and means must be found to overcome the decline and stimulate an increase in the number of our mining schools. Their number in the past 10 years has dropped from 37 to 17.

(*c*) Ways and means must be found to overcome deficiencies in the orientation of our mining schools. Few of those that remain are even partially oriented to today's needs of our extractive industries—let alone the future speciality requirements of these industries. Creating the technical know-how that we must have will require immensely talented human beings. It will take young people, in far greater number and with far better training than our mineral industries now are drawing. Not only can progress in the development of mining systems provide continuing economic access to domestic sources of urgently needed minerals, but the spinoff from such progress would be almost unlimited. Development of rapid-excavation systems would, for example, open the earth's subsurface for a multiplicity of uses that now add clutter and confusion to urban, and even suburban life. High-speed transport, sewage and waste disposal, the generation and transmission of electric power, all of these, and more, could be moved underground, freeing large areas of the earth's surface for additional living space, in the real sense of the word.

Mr. Chairman, the foregoing is a rough thumbnail sketch of what I have in mind accomplishing through enactment of law for a national mining and minerals policy to promote the wise and efficient use of our mineral resources. With 10 years of ineffectiveness behind us in pursuing this aim under the guise of House Concurrent Resolution 177, I believe it is indeed urgent that we undertake to give this matter the force of law the resolution lacks.

I believe it is important, as a matter of law, to give notice to the world, as a matter of national mineral policy, that this country intends to foster a progressive and stable domestic mining industry.

I belive it is important to enact, as a matter of law, a national policy as a guideline to all agencies and representatives of the Federal Government that the Federal Government will assist in the development of the necessary mineral reserves and will promote the wise and efficient use of our domestic mineral resources.

I believe it is most important, as a matter of law, to clear up once and for all the authority and responsibility of the Department of the Interior in its continuing but much too feeble attempt to foster the domestic minerals industry. We have to implement their hand. The authority of a department can, of course, be established only by law. S. 719 would do this. Ten years ago we expressed this policy as the "sense of the Congress" in House Concurrent Resolution 177. Let us express it now as the "sense of the Nation" by enacting it into effective law.

Thank you, Mr. Chairman.

Senator Moss. Thank you, Senator Allott.

Senator Jordan?

STATEMENT OF HON. LEN B. JORDAN, U.S. SENATOR FROM THE STATE OF IDAHO

Senator JORDAN. Thank you, Mr. Chairman. I wish to associate myself with the remarks that you made, Mr. Chairman, in your opening statement and with the fine statement made by Senator Allott, the champion of this bill back through the years.

I would like to make a brief statement now, Mr. Chairman, because shortly I must leave to attend a Finance Committee meeting where we have before us the consideration of the extension of the surtax and other matters of some immediacy. I am pleased to join Senator Allott and you, Mr. Chairman, and our other colleagues who are cosponsors of this legislation to establish a national minerals policy. It is a long-needed, succinct statement of policy on one of the most basic areas of our natural resources and one that daily becomes more important to our continued growth and economic development in this era of the space age.

Some witnesses who may appear at this hearing may object to this legislative approach on the grounds that there is a considerable body of policy on mineral resources already on the statute books and in the administrative regulations of the public agencies.

I can personally testify to the great volume of statutory and administrative policy in the minerals field. The vast area of public law relating to mineral resources—much of it fragmented and single purpose in scope—is currently under review by the Public Land Law Review Commission, of which Senator Allott and I are both members.

However, as Senator Allott has suggested in his introductory remarks, these measures do not contain a definitive general national minerals policy. The closest thing to such a policy is a "sense of the Congress" statement passed by concurrent resolution in 1959.

The legislation we consider today sets forth a simple, direct policy and implements it with a requirement for an annual minerals report by the President to keep the country informed on the status of utilization and depletion of our vital mineral resources and to include his recommendations for legislative programs to implement this policy.

Enactment of this legislation should in no way inhibit the Public Land Law Review Commission from going forward with its indepth study of public laws dealing with mineral prospecting and development on public lands. The prolonged study by this Commission, in fact, represents an absence of implementation of the proposed policy.

Moreover, its legislative recommendations, when announced in 1970, will be analogous to the Presidential reports on suggested legislation called for in this bill. Furthermore, the recommendations from both the Commission and the President will be subject to ultimate legislative consideration by the Congress.

I am pleased to report that the Idaho Mining Association has considered this legislation and has gone on record as favoring it with a strong endorsement.

For many years past—

Secretary Al Teske wrote to the sponsors of S. 719—

the Idaho Mining Association has consistently urged the adoption of a strong and forthright national minerals policy. We have long been convinced that such a policy, vigorously pursued and implemented, is absolutely essential to the maintenance of a strong and productive mining industry in this Nation.

Mr. Chairman, I request consent to make Mr. Teske's letter a part of the official record of this hearing at this time.

Senator Moss. Without objection, it will be printed at this point in the record. Thank you, Senator Jordan.

(The document referred to follows:)

IDAHO MINING ASSOCIATION,
Boise, Idaho, June 5, 1969.

Senator LEN B. JORDAN,
New Senate Office Building,
Washington, D.C.

DEAR SENATOR JORDAN: It has come to our attention that your bill (S. 719) to establish a national mining and minerals policy has been scheduled for hearings on June 11 in Washington, D.C.

Since it will not be possible for our association to have a representative in attendance at the hearings, we wish to express for the record our strong endorsement and support of this legislation.

For many years past the Idaho Mining Association has consistently urged the adoption of a strong and forthright national minerals policy. We have long been convinced that such a policy, vigorously pursued and implemented, is absolutely essential to the maintenance of a strong and productive mining industry in this nation.

We commend your sponsorship of this legislation and sincerely trust it will receive prompt and favorable consideration by the Congress.

Sincerely,

A. J. TESKE, *Secretary.*

Senator Moss. Senator Hansen?

STATEMENT OF HON. CLIFFORD P. HANSEN, U.S. SENATOR FROM THE STATE OF WYOMING

Senator HANSEN. Thank you, Mr. Chairman. I would like to associate myself with the remarks made by the sponsor of this bill, the distinguished senior Senator from Colorado, and to add that I think this proposed legislation is in full harmony with a growing conviction among the Members of Congress that this country must look to a greater self-sufficiency in order to assure our national security and in my judgment this bill marks a definite milepost in the long march toward this goal. I am proud to be associated with my distinguished colleagues in cosponsoring this bill. Thank you, sir.

Senator Moss. Thank you, Senator Hansen.

Senator Bible, a member of this subcommittee, was unable to attend this morning because of pressures of his other commitments, the kind

referred to by Senator Allott. He has sent a statement here that will be made part of the record at this point. In addition, we have a statement from Senator Bennett of Utah that will be included in the record. As Senator Allott points out, he is at the Finance Committee meeting that was referred to. We also have statements from Senator Stevens, of Alaska, Senator Dominick, of Colorado, and Senator Cannon, of Nevada for inclusion in the hearing record.

(The statements referred to follow:)

STATEMENT OF HON. ALAN BIBLE, A U.S. SENATOR FROM THE STATE OF NEVADA

Mr. Chairman, I am pleased to be a cosponsor of the bill now before the subcommittee. I cosponsored identical legislation in both the 89th and 90th Congresses, and I feel it is high time the Congress acted to lay the statutory foundation for the formulation of an effective National Minerals Policy.

It hardly needs saying that minerals, their derivatives, and the products we fashion from them make up the material foundation of modern society. They are the fabric of today's economy. Many are so critical to our national defense that our very survival depends on them.

And this is especially true of the United States. Our technological and industrially-oriented society; our unprecedented standard of living; our insatiable demand for the good material things in life, and our vital defense requirements have levied extraordinary demands on our mineral resources.

But our mineral wealth is a wasting asset, and where do we find ourselves today? A recent study on mineral science and technology conducted by the National Academy of Sciences, the National Academy of Engineers, and the National Research Council states that "despite the key role of minerals in our society, and the vastly increasing worldwide demand for mineral products, mineral technology in the United States is in a declining state, and serious trouble lies ahead for the country unless corrective actions are taken."

In recent testimony before the House Interior Committee Mr. Dole, Assistant Secretary of the Interior for Mineral Resources, stated that the Nation's long-range mineral position is in serious jeopardy, and that within the next 20 to 30 years we face the grim prospect that the growth in our standard of living will be limited due to mineral resource constraints.

There has been a decline in the grades of ore our present technology can economically produce at home. We face increasing competition from high-grade foreign deposits. And very seriously, there is a growing shortage of trained mineral specialists and engineers here in the United States.

According to the statement submitted to this subcommittee by the then Director of the Bureau of Mines in March, 1968, United States mining interests are turning to foreign resources. That testimony showed that the United States is now the largest importer of minerals and fuels, with over 75 percent of our requirements for a number of important commodities being imported today. In 1966, major tonnages of key basic materials were coming from foreign sources: 85 percent of our bauxite for aluminum, almost 20 percent of our copper, 40 percent of our iron ore, nearly 40 percent of our zinc and more than 25 percent of our lead, all of our manganese and chromium needed for steel—and our gold and silver production were about one-fourth of our industrial consumption.

At the same time, projections based on population growth indicate that by 1985 the Nation's mineral and fuel requirements will increase by about 50 percent on the average, and in some cases by as much as 100 percent.

But enough of statistics, Mr. Chairman. The experts will be testifying on the present bill, and I am sure they will bring us all of the up-to-date information.

The point I want to make is that evidence already before the Congress indicates that under current trends our capacity to produce domestic minerals is tending to remain static, and, in some cases, may disappear entirely because of our inability to compete costwise with foreign production.

There seems to be general agreement that the United States is not running out of mineral resources. But, as Secretary Dole has stated it, we have short-changed the science and technology needed for their discovery and profitable production and processing at a time of widening world competition and increasing demands.

The warning flags have been raised.

As I've said, the expert testimony the subcommittee is about to receive should bring us up to date on the critical dimensions of this problem.

I think their statements will demonstrate that if the United States is to retain is leadership in world mineral production, we must act to improve our leadership in the technology of minerals exploration, discovery, extraction, processing and use.

We must search out more of our domestic resources, and produce the technology that will make today's marginal or subeconomic deposits economically competitive.

We must correct what has become a deplorable situation today. We are not graduating enough trained mineral scientists and engineers to meet our needs. Incentives must be provided. Careers in the earth science have got to be made more attractive.

Basic research in these sciences must be emphasized and encouraged.

Mr. Chairman, meeting the mineral requirements for today and the future is and should continue to be the responsibility of free private enterprise. Private business has always brought great fortitude, vitality, and resourcefulness to the task, and I know it will continue to do so.

But this natural resource is of such importance to the national welfare that all of our people have an interest at stake, and government must play a meaningful supporting role.

Today there is no identifiable national minerals policy. The nation has declared policies on agriculture, transportation, housing, and a number of industries and resources that are basic to our economic well-being.

I think it remarkable that we have overlooked and ignored our most basic industry—the very foundation of our society. Without a strong, economically healthy mining and minerals industry technologically capable of exploiting our domestic reserves and developing new mineral sources that will compete effectively in world markets, domestic mining will continue to decline to the ultimate detriment of all our people.

We need a policy that recognizes the overriding importance of this basic industry—one that will encourage orderly long-range planning and the orderly development of our domestic resources. The well-being of our people—indeed our national defense—requires this.

S. 719 would provide the statutory framework. The bill very simply declares that it shall be national policy to foster and encourage (1) the development of an economically sound and stable domestic mining and minerals industry, (2) the orderly development of domestic mineral resources and reserves necessary to assure satisfaction of our industrial and security needs, and (3) to foster research to promote the wise and efficient use of our mineral resources.

The bill would make the Secretary of the Interior responsible for carrying out this policy in accordance with such other programs as may be authorized, and requires an annual report to the Congress on the state of and trends in the domestic mining and minerals industry. It would obligate the Secretary to develop the legislative recommendations needed to overcome problems and implement the national policy.

As Senator Allott stated when he introduced the bill, this declaration of national policy would not be a panacea. It would be a small but much needed step in the right direction of providing a statutory framework upon which we would be able to build step-by-step orderly, imaginative programs to preserve and enhance the Nation's vital mineral resources.

I am convinced that this step is long overdue. The national interest will be well-served by the enactment of S. 719, and I commend the bill to the subcommittee for favorable action.

STATEMENT OF HON. WALLACE F. BENNETT, A U.S. SENATOR FROM THE STATE OF UTAH

NATIONAL MINING AND MINERALS POLICY NEEDED NOW

Mr. Chairman, it is a pleasure to testify today in full support of S. 719, a bill to establish a national mining and minerals policy, which I have the honor to co-sponsor.

As you know, Utah is one of the leading states in the Union in mineral production. In 1965, it ranked second among the states in production of gold, copper,

and molybdenum and third in the production of silver and lead. It is the fourth largest producer of uranium and iron ore and ranks ninth in the production of zinc. The only domestic source of beryllium is just coming into production in Utah. And the Bingham Canyon Copper Mine, the largest single mining project ever undertaken by man, has produced more copper than any individual mine in history.

Despite Utah's intense interest in mining and mineral production, I wish to emphasize that in co-sponsoring this legislation I did not do so because of a regional or sectional interest. The development of an economically sound and stable domestic mining industry is essential to our Nation's future economy and security. History has shown us the dangers that can befall us when our country is faced with mineral shortages in time of war and national emergency. The national stockpile of strategic and critical minerals and metals stands as testimony to this nation's need for mineral materials in times of national crisis.

I was especially pleased to learn that Assistant Secretary Hollis M. Dole of the Department of the Interior strongly supported this legislation in a recent speech to the Wyoming Mining Association, since the previous Administration had reported unfavorably on S. 522, a predecessor to our present bill.

Mr. Dole pointed out the importance of these hearings which provide a forum calling the attention of all the people of the country to the tremendous quantity of mineral raw material that will be needed in the coming years.

Projections made by the Bureau of Mines and other authorities in the field have shown that our mineral requirements by the year 2000 will reach staggering proportions. Even today the minerals industry is forced to mine lower grade ore deposits to realize current mineral production. I am convinced that unless an accelerated exploration program is launched to find new deposits, our nation will face a minerals crisis in the not too distant future.

The establishment of a national minerals policy would encourage three important programs for the mining industry.

First, the government would assist in the development of an economically sound and stable domestic mining and minerals industry.

Second, it would provide the orderly development of domestic mineral resources and reserves necessary to assure satisfaction of industrial and security needs.

And, third, it provides for mining, mineral and metallurgical research to promote the wise and efficient use of our mineral resources.

Mr. Chairman, I sincerely hope that your Committee will give favorable consideration to this vital proposal.

STATEMENT OF HON. TED STEVENS, A U.S. SENATOR FROM THE STATE OF ALASKA

Mr. Chairman, I shall be brief in my statement of support of S. 719, a bill that would establish a continuing policy by our government to foster and encourage the development of a mining and mineral industry.

This legislation is sorely needed. It is one of the greatest modern paradoxes that this nation, the richest in the world of many mineral deposits, watches and frets about its dwindling supplies while doing nothing to encourage its production.

A glance at the situation of gold mining in my state reveals that since World War II there has been a constant decline in Alaska's gold production and unless there is a drastic change in the financial environment surrounding it, this slide can be expected to continue. Gold production in Alaska is at a modern all-time low. Yet there seems to be common agreement that at most only five to ten percent of the land has been adequately surveyed and that there is at least as much gold left in the ground as the amount that has been mined.

Yet, no steps have been taken to increase the gold production in my state. All this, while this nation concerns itself about the gold drain.

This legislation is an excellent first step toward restoring the United States in its rightful place in mineral production, and I urge the committee to act affirmatively on it.

STATEMENT SUBMITTED BY HON. PETER H. DOMINICK, A U.S. SENATOR FROM THE STATE OF COLORADO

Mr. Chairman, I wish to make only a few very brief comments in support of S. 719 to establish a national mining and minerals policy. The scope of this legis-

lation is limited to mining of minerals other than energy fuel sources. We can no longer conserve the natural resources of this country by withdrawals or merely holding back from development. We must adopt comprehensive policies to use and conserve our mineral resources, energy and non-energy sources, our water, our air, our forests, our lands, and open spaces. This bill is the first step to develop overall planning of a positive nature of an important segment of our natural resources.

In many ways our policies concerning natural resources are still part of the 19th Century. We then assumed we possessed nearly inexhaustible supplies, particularly most minerals. We clearly know today that is not the case. In the past few decades we have assumed that when the need arose technology would be developed to meet the needs. Neither government nor private industry nor the pressures of the market place nor the preservationists can meet all the needs of the people of this country alone. Our industrial usage of minerals of all kinds has soared with population growth and economic growth.

There are vast stores of minerals in the deeper layers of the earth's crust, the continental shelf and the oceans. Means of recovery in most instances is either unknown or not economically feasible. We must not wait for a crisis to develop the technology to locate, recover, and process minerals as well as restore and preserve the environment in which they are found.

This task will take trained people. We do not now have nearly enough people to explore and find new resources; to develop new techniques of mining, processing, and restoration; to develop new machinery; and to develop substitutes where supplies run out and new materials to do both new and old jobs.

Benefits can also be derived which are useful outside the minerals field, particularly in the areas of urban development and relocation, communications and transportation.

We have arrived at an era where we can control, protect and improve our environment. We can project needs in the immediate and distant future and develop means to meet those needs. We are running out of time with regard to mineral resources. We must devlop basic policy and encourage new exploration, development and technology.

I wish to commend my colleague, the senior Senator from Colorado, for his foresight and persistence for over 10 years. We have clearly seen the need of this program for over 10 years. Prior Congressional action has been ineffective. The Executive Branch has lacked the clear authority and direction to proceed positively and constructively to develop policies and technology in the use and preservation of our natural resources. We have allowed the government to be little more than a caretaker of these resources trying to balance conflicting interests on a piecemeal basis.

I certainly urge the Committee's consideration of this measure. I feel all of us recognize this problem and the contribution this legislation can make toward its solution. The Committee and the Senate have acted favorably in the past. We must persevere and do so again. The Committee has before it excellent testimony from very able and expert witnesses. I know this measure will receive your full consideration.

STATEMENT OF HON. HOWARD W. CANNON, A U.S. SENATOR FROM THE STATE OF NEVADA

Mr. Chairman and members of the committee, I am most appreciative of the opportunity to support S. 719, a bill I am co-sponsoring with Senator Allott to establish a national minerals policy.

I regard this measure as one of the most significant in the field of natural resources to come before the United States Congress. It is important to our domestic mining industry in general and to the people of Nevada in particular.

This hearing is essential because there is a desperate national need to focus attention on the enormous requirements there will be in the future for mineral products and for mineral raw materials. We have the choice in this country of permitting this resource to lie untapped and be at the mercy of import programs from foreign sources, or to reactivate our once thriving domestic industry.

I certainly favor the latter course, because it is essential that we develop an independent and viable domestic industry if we are to avoid dependence on others whose industrial interests may run counter to our own.

In order to bring such a domestic industry into being, I envision substantial investments and great risk, as well as the hard work of all those who labor within our domestic mining industry. To build such an undertaking is unthinkable from an investor's point of view unless we are going to have a national policy and a national commitment to work towards self-sufficiency—as nearly as we can possibly do so—in the minerals area.

I hope that these hearings will receive the widest possible attention, because the average American is woefully unaware of the source of the metals which come to him in fabricated appliances and from the counters of millions of stores across this nation. The Congress and the public should be made aware that our mineral needs for the future will break all previous records. Metals will be required for the thousands of items we no longer consider luxuries, and for the gadgets and industrial tools of the future.

As Members of this Committee know, the fullest development of a domestic mining industry is something that requires years of planning, exploration, and actual mining. The commitment, however, must be made now. It needs to be a commitment that will persuade students to study the earth's sciences in our institutions of higher learning, anticipating the needs and challenges of the years ahead.

Our experience in Nevada has been encouraging in recent years in the field of exploration. There are vast untapped sources of mineral wealth throughout the West, and in other parts of the country, too, waiting for man's ingenious hand. I am encouraged about the great assist which nuclear energy offers to the mining industry, both in nuclear stimulation for gas and in fracturing for metals and oil. The possibility of off-shore mining is only just being thought about, and yet may constitute one of our largest future sources of mineral wealth. The progress made in Nevada through recovery of what was thought to be mining waste is most promising.

I therefore fully and wholeheartedly support this call for a national minerals policy to guide us through the 1970's so that we as a nation will be able to meet the challenge—industrially, socially, and economically—which we will face in that decade and beyond.

Senator ALLOTT. Mr. Chairman, an article in Science Magazine by Walter J. Hibbard, Jr., who was then director of the Bureau of Mines, discusses the minerals situation with a knowledgeable insight into the technological and research challenges of the mining industry. I ask that it be included in the hearing record.

Senator MOSS. Without objection it will be included.

(The article referred to follows:)

[From Science, Apr. 12, 1968]

MINERAL RESOURCES: CHALLENGE OR THREAT?

CAN TECHNOLOGY MEET OUR FUTURE NEED FOR MINERALS AND STILL PRESERVE A LIVABLE ENVIRONMENT?

(By Walter R. Hibbard, Jr., director, U.S. Bureau of Mines, and president, American Institute of Mining, Metallurgical, and Petroleum Engineers)

> For I dipt into the future, far as human eye could see,
> Saw the Vision of the world, and all the wonders that would be;
> —TENNYSON, *Locksley Hall* (1842)

Soothsayers are popular when they foresee good things and predict fulfillment of widespread longings and expectations. Consequently, Edward Bellamy's utopian novel, *Looking Backward*, was a best seller when it appeared in 1881[1]. It foretold that in the year 2000 there would be a very good thing in Boston—an ideal society.

Those who foresee dangers and darkness are less likely to be listened to. Cassandra predicted that Troy would fall, and no one believed her. Malthus reasoned that population would outstrip food supply, and all kinds of refutations were marshaled against him. Lindbergh in 1938 warned that the air force which the Nazis possessed was the best in the world, and he was doubted.

[1] E. Bellamy, *Looking Backward: 2000–1887* (Boston, 1888; New American Library, New York, 1960).

It is the same today. We tend to ignore predictions only when the house is already on fire.

Bellamy, whose book is enjoying a modest revival now, believed that it would be "the limit of human felicity" if people could have "music in their homes, perfect in quality, unlimited in quantity, suited to every mood, and beginning and ceasing at will".[2] This describes the phonographs and stereo tape recorders now in many American and European homes.

Many of today's and tomorrow's problems also have long been predicted, but we are accustomed to undertake seriously and purposefully solutions to only those problems that present a clear and immediate danger. Too often solutions come too late, and it becomes necessary to apply remedies which are expensive and difficult; the answers would have been cheaper and easier had we started earlier.

Thus, in a society whose standard of living is the highest ever attained for so many people, the opinion that our economic growth may decelerate and our living standard decline would be highly unpopular.

Let Science Fix It

We are called an affluent society, and we want to believe it; but is it really true? Secretary of the Interior Udall has called our vaunted superabundance a myth inherited from the 19th century. And this myth is rapidly being supplanted, he says, by a "myth of scientific supremacy . . . we tolerate great imbalance" in the use of our natural resources and "shrug off the newer forms of erosion with a let-science-fix-it-tomorrow attitude".[3]

Our ability to handle some of our greatest present threats—war, poverty, crime, urban crowding and ugliness, growing damage to our environment—is seldom thought of as resource-limited. Whatever material resources we need to solve these problems, most of us apparently assume are already here at hand—or if not, don't worry; the economics of the market place will soon provide them!

A requisite for affluence, now or in the future, is an adequate supply of minerals—fuels to energize our power and transportation; nonmetals, such as sulfur and phosphates to fertilize farms; and metals, steel, copper, lead, aluminum, and so forth, to build our machinery, cars, buildings, and bridges. These are the materials basic to our economy, the multipliers in our gross national product. But the needed materials which can be recovered by known methods at reasonable cost from the earth's crust are limited, whereas their rates of exploitation and use obviously are not. This situation cannot continue.

A warning to that effect was sounded early in the last decade by the President's Materials Policy Commission after a careful review and appraisal of our materials balance sheet.[4] The report, *Resources for Freedom*, popularly known as the Paley Commision Reoprt, was published before the full impact of the curent population increase was widely recognized, and before the full extent of the postwar expansion of the U.S. economy was identified. Therefore many of its forecasts of mineral supply and demand turned out to be too conservative, too comforting. The commission has been widely criticized for not sounding the alarm. Its cautious conclusions have been questioned—and largely ignored or forgotten.

Although there were obvious inconsistencies between their forecasts and subsequent events, the philosophy that underlay the Paley Commission study was sound, and its general conclusions apply today as much as they did 15 years ago. In area after area the same pattern was discrenible: soaring demands, shrinking resources, the consequent pressure of rising real costs, the risk of wartime shortages, the ultimate threat of an arrest or decline in the standard of living we cherish and hope to help others attain.

Last year, President Johnson, in a message to Congress on air pollution,[5] summed it up in another way.

"Sharply rising world demands threaten to exhaust the best and most accessible deposits of minerals .Rapidly changing demands for materials are bringing changes in our mineral needs. We must understand the technological and economic changes taking place."

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[2] E. Bellamy, *Looking Backward: 2000–1887*, chap. 11.

[3] S. L. Udall, "Conservation challenge of the sixties," Albright Lecture, University of California, Berkeley, 19 April 1963.

[4] W. S. Paley *et al.*, in *Resources for Freedom*, President's Materials Policy Commission (Government Printing Office, Washington, D.C., 1952). Five volumes, also summary of vol. 1.

[5] President Johnson, "Message to Congress" 30 January 1967, in *Presidential Documents*, 6 February 1967 (Government Printing Office, Washington, D.C.), vol. 3, No. 5, p. 139.

Severe Strain on Mineral Supply

With only about 9 percent of the Free World population in 1965, the United States consumed between 30 and 40 percent of the Free World's mineral supply.[6] Simple projections based on growth of the population and the gross national product suggest that by 1980 consumption of minerals by the United States will in general increase by 50 percent and in many cases double. Although by 1980 it is estimated that the United States will include 7.7 percent of the Free World's population, the number of people in the nation will increase by some 29 percent, and the Free World's population is projected to increase by 50 percent. This sheer weight of numbers is going to place a severe strain on the mineral supply of the Free World to maintain and improve the standard of living in most of the Free World.

With the rapid expansion of the economy during and since World War II, the United States has consumed a correspondingly large increase in mineral output. The result has been greater dependence of U.S. industry on foreign sources of raw materials. Today, imports supply over 75 percent of our needs for 20 different mineral commodities.[6] Also world mineral development and depletion of the higher grade domestic reserves and development of mineral industries in other nations have led the U.S. mineral producer into widening world competition for key resources.

Recognizing our increasing reliance on foreign resources, the Paley Commission recommended: (i) government measures to encourage investment of risk capital in the mineral industries; (ii) a continuous appraisal of the nation's mineral and energy supply position; and (iii) accelerated research and development to expand the base of our mineral and fuel resources.

These recommendations are still valid. Indeed, events since the Paley Report make it more urgent than ever to expand the technical and economic base of our resources by every feasible means.

New Paley Commission Study Urgent

Industrial growth in many parts of the world, the population explosion, advances in transportation and in communications, changing marketing patterns, shifting needs and requirements stemming from wars (Vietnam and the Middle East), and the emergence of new nations—all these, and other trends barely discernible now, make it imperative that another study similar to the Paley Commission review be made as soon as possible so that we may anticipate and undertake as soon as possible the steps necessary to avert serious calamity. Although such a study may also fail in precision of forecasting, new and continuously revised estimates of each mineral requirement and each type of fuel or energy source would provide a sound basis for action by both government and private industry.

Raw materials are powerful economic multipliers. Cost changes in ores are reflected throughout the economic structure, from metal producer, to fabricator, and ultimately to the consumer. But we cannot depend upon the law of supply and demand in a free economy to spur the necessary investment. Mineral production cannot be turned on like a faucet. Substantial capital (hundreds of millions of dollars per venture) and substantial time (often 5 to 10 years) are required to complete a new mineral-producing facility.

The Time Problem

Prain points out that the mining investor has to wait many years, perhaps a quarter of a century, before a mine can be built and can operate long enough to repay his investment and make a reasonable profit.[7]

Winning from the earth the minerals needed for prosperity and well-being depends not only on the capital available for investment, but also on the technology that can be applied. As Boyd has pointed out, our resources are limited less by the amounts of raw materials than by the technology of treatment and extraction and by the capacity to produce at a reasonable cost.[8] Spencer believes that one mineral industry, petroleum, will be "bumping against the ceiling, not of resources, but of technology, and therefore of capital. Unlike land, which

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[6] U.S. Department of the Interior, Bureau of Mines, *Minerals Yearbook 1966*, vols. 1 and 2 (Government Printing Office, Washington, D.C., 1967), chap. 1.

[7] Sir Ronald Prain, "Investment climate for the developing countries," address to Institute of Mining Engineers of Peru, Lima, 8 November 1967.

[8] J. Boyd, *Mining Eng.* 19 (No. 3), 54 (1967).

becomes more valuable as population increases and good prospects are snapped up, technology can be improved, and the supply of capital can be stretched."[9]

Although technology may stretch capital by less-expensive production facilities, permitting utilization of lower grade ores, only rong-range planning can remedy the time problem. It is already too late to initiate new production capability for 1970; facilities for that year must be well along in development now.

Technology, willingness to risk capital, and planning have made the United States a major producer of minerals. The U.S. Bureau of Mines shows complete world production data on 54 mineral commodities for 1966;[10] U.S. led in the production of 27. In the case of 11 additional commodities for which complete figures were not available, it is believed the United States led in the production of six.

However, as long as mineral deposits in other parts of the world can be profitably developed, the incentives for radial innovation in technology are slight and investment capital is attracted abroad. It is axiomatic that investors seek out ventures that are the most profitable. Hence, capital will flow to those countries with lower labor costs, greater government incentives (such as tax benefits and subsidies), and minimum costs for pollution control (relative to the United States) as well as high-grade reserves which can be readily exploited by well-established procedures and available equipment. Already, American investment in mining is going abroad at an increasing rate—to Australia, Canada, Spain, South Africa, and South America. If this trend continues, by 1985 we may be importing a major portion of our large-tonnage metals such as iron, copper, lead, and zinc, thus adding commodities for which the United States is already primarily dependent on overseas sources. Advanced technology at home, economically applied to domestic reserves, can reverse this trend.

Technology Can Expand Resource Base

Most of our mineral industries are mature; they have been operating for a long time, and the cream has been skimmed from the richest and most easily recovered ores. Yet technological innovation is continually injecting new life into these mature industries. I believe that technology can help increase our mineral resource base in the following four ways:

(1) Exploration and discovery. The minerals so far used by man have come from very near the surface. Most were discovered from outcrops. We must learn how to explore at depths, and we must develop methods to find and extract minerals in the deeper layers of the earth's crust and from under the sea.

(2) Improved mining, benefication, and processing. More efficient methods for mining ores and for upgrading them before smelting and refining can make the use of leaner ores technically and economically feasible.

(3) Recycling of scrap and waste. There is tremendous opportunity in "mining" our scrap heaps and junk yards. Already about 40 percent of this year's production of lead and 25 percent of this year's copper comes, not from primary ores, but from reclaimed scrap. Such salvage programs could be greatly extended through research and improved collection and processing techniques.

(4) Substitution. Using abundant materials in place of those in short supply is the challenge of the physical metallurgist—and of the polymer chemist. Not only is there strong economic pressure to find substitutes (because they are usually cheaper), but there is technical pressure also. The materials engineer, redesigning from basic principles, often finds that the traditonal materials are not the best technically.

Potentially one of the most rewarding opportunities for dramatic expansion of our mineral resource base—and one of the greatest challenges to our ingenuity—is the exploration and exploitation of the almost untapped three-quarters of the earth's crust beneath the oceans. The deepwater sections are beyond our reach at preesnt, but very encouraging progress has been made on the continental shelves, defined as offshore sea bottom to a depth of 200 meters. These shelves are geologically similar to the adjacent dry land; and we can assume with some confidence that they contain ore bodies of similar types and distributions.

Let us imagine a map of the United States with a 200-meter depth line offshore, showing the approximate extent of our 2.3 million square kilometers of continental shelf. If we were to flip the shelf over onto dry land, using the coast line as a hinge, we would have a mirror image of the shelf. The value of the

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[9] W. I. Spencer, "Exploration, key to the future," address to American Association of Petroleum Landmen, New Orleans, La., 23 June 1967.

[10] Mineral Industry Survey, U.S. Bureau of Mines, *World Mineral Production in 1966*, (Government Printing Office, Washington, D.C., 1967).

minerals produced from this onshore mirror image is estimated at $160 billion (in 1966 dollars), exclusive of the value of the oil and gas produced.

It is entirely reasonable to expect several billion dollars worth of minerals in our continental shelf, but we must develop the technology to explore, identify, and sample them; and then the technology of delineating, and mining these undersea deposits. About 60 percent of the shelf area has a thick cover of sediment; 20 percent is believed to have a thin cover; and another 20 percent to be essentially bare bedrock or outcrop.

Invisible Goal

The technology of improved exploration and processing is typified by recent developments in gold production. Gold has traditionally been discovered in visible deposits, where material can be crushed and physically separated by panning. Extracting the ores from a wide variety of geologic settings, at varying ocean depths in all kinds of weather, is a formidable challenge requiring new technology. Elemental gold can generally be picked out because it is heavier than other minerals in the mix. So-called invisible gold, identified only by sophisticated chemical analysis, has been discovered. One such discovery, at Carlin, Nevada, was largely responsible for the 1965 increase in U.S. gold production.

Chemical extraction of gold from ore is also being improved, supplanting methods that are 50 years old. With massive new techniques for bulk ore-handling, low-grade ore deposits known as dry placers may be surface mined.

Thus, discoveries (including anticipated development of offshore gold placers in the estuaries of once-productive gold-bearing streams and beaches), better mining, and progressive technology should ultimately make it possible to increase U.S. gold production three- or fourfold.

Recycling to further extend our resource base is certainly not a new concept; it is an established business of great social usefulness and should not be depreciated as junk. Most of its value is in metal scrap. Even in our disposable, no-depost-no-return, throw-away mode of living, sales of nonferrous scrap alone amount to $1.5 billion annually. This figure represents only that portion of recycled nonferrous metals that go through obsolescence, discard, and scrap dealers; it is only a fraction of the total, for home scrap produced in metal and fabricating plants is recycled without going through the scrap dealer and its value cannot be accurately computed.

Two reforms are urgently needed to extend the use and to expand the reuse of valuable materials, even though they may seem to run counter to the affluent status our society seems to be trying to maintain. (i) We should design our durable, mineral-containing products to last longer before they go out of style or wear out, and (ii) we should design such products to make it easier to collect and separate their mineral content for recycling after they are discarded.

An American automobile, for instance, lasts about 7 years, or 160,000 kilometers. From a technical standpoint, doubling those figures should not be difficult, and there would be a tremendous saving in metals and other materials.

Moreover, most automobiles seem to be designed on the assumption that no one, not even a mechanic, will ever want to take one apart. Workers at the Bureau of Mines have dismantled several dozen cars of different ages and makes in the course of current work on solid-waste disposal problems. The manufacturers were unable to tell them the composition and distribution of materials in their cars, since many components were supplied by vendors. The placement of these components and the overall design of the car are subject to many restrictions: conservation of space, esthetic appeal, ease of manufacture, safety, and others. The result is that not only the exterior design but also the materials which are used in automobiles change from year to year. Wiring becomes more complex in order to take care of additional electrical equipment. Increasing use is made of stainless, aluminized, and galvanized steel and of aluminum and zinc castings and other materials which make salvage difficult.

I propose that in designing automobiles—and refrigerators, ranges, and other metallic consumer products—manufacturers should provide greater durability, retard obsolescence, and anticipate the need for recycling. If engineering design were to include this concept, valuable materials could then be readily saved when the product is obsolete or worn out. This is a stiff requirement but a necessary one. The annual addition to the scrap market of millions of tons of metal is such a valuable potential resource that we cannot afford to overlook any means of making it easier to salvage.

The continuing failure, on the one hand, to retard the flow of usable materials into the scrap piles, and, on the other hand, to utilize this above-ground bonanza more fully to satisfy our proliferating requirements is shortsighted, in fact, criminal.

There is no reason why, with skill in design and materials application, we cannot make products more durable while we salvage every bit we can from our unusable and discarded products, and thereby extend the mineral resource base of the nation.

The rising need for minerals creates the corollary problem of controlling the detrimental effects of mining on man's living space and on his environment. The same increases in population and living standards that require more minerals also require intensified and multiple use of land for homes and other buildings, for roads and airports, for parks and recreational areas.

Mechanical Monsters at Work

Our current mining operations, for reasons of economy, are, where feasible, conducted from the surface rather than underground. These open-pit, strip or surface mines already produce most of the tonnage of some materials such as copper, and in the foreseeable future will extract an even larger proportion of coal and ore in the United States. Big machines—large electric shovels and draglines, some of which can handle up to 152 cubic meters at a single pass and cost as much as a jet plane—are making it profitable to mine deposits under a considerable overburden of earth and waste rock.

But mounting public protests against alteration of the land surface and the past failure of numerous operators to restore mined lands to satisfactory condition may reverse the trend. Several states already have passed or strengthened their strip-mining laws and enforcement procedures. Other states—and possibly the federal government—may also take action along these lines. These measures will obviously add to the cost of surface-mining operations and can shrink the available resources. Marginal producers may be discouraged, but the necessities of the situation will stimulate more economical and efficient mining and transportation techniques.

In addition, there are finite limits to deposits minable by surface access. Consequently there is an urgent need to develop more efficient underground mining equipment, analogous to the gigantic, economic, high-speed surface machines concurrently with new systems of procedures and techniques for high-capacity underground operations. Some equipment has already been developed (such as the giant boring machines) to bore vertical holes as large as 2 meters in diameter in soft rock; and horizontal holes up to about 13 meters in diameter such machines can chew their way along at satisfactory speeds, but the broken rock and ore pile up too fast to be removed by present conveyor systems. Other problems are proper ventilation at a rapidly moving cutting face, fast and efficient propping to keep the tunnel intact, means of handling water intrusion, and methods of geological reconnoitering to locate obstacles or hazards before the cutter reaches them. All of these challenges await technical solutions which I believe the future burgeoning demands for minerals will bring about.

Rapid Excavation for Urban Development

Incidentally, development of rapid tunneling methods would benefit many aspects of modern life other than mining. Subway systems and vehicular tunnels would be easier and cheaper to build. Greater portions of our water, sewer, electric power, and communication systems could be installed underground. Buildings in metropolitan centers might grow downward as well as upward, thereby creating new living and working space.

Our increasing need for minerals has created the additional environmental problem of air pollution, largely the result of the burning of fossil fuels and the processing of minerals, which adds to our costs. If their emissions are not carefully controlled, coal-fueled electric power stations, steel mills, and other industrial plants pour sulfur oxides and fly ash into the air. Automobiles, trucks, and diesel-powered vehicles produce hydrocarbons and nitrogen oxides. All fuels produce carbon dioxide—in itself harmless and necessary for plant life, but potentially harmful if it should accumulate enough to change the world's atmospheric composition. Imperfectly burned fuel produces carbon monoxide, a deadly poison. Awareness of the hazards of these pollutants to people, animals, and crops is bringing about laws and regulations that upset normal patterns of fuel use. Consequently, the cost of air-pollution control increases the costs not only of power

production, space heating, and manufacture, but also that of fuels treated or modified to meet new standards.

Technology of Air Pollution Control

In general, the technology of controlling air pollution is known. Many government agencies and industry are working on these problems, but, in every case I know of, the cost is still too high for voluntary adoption by the industries involved. People must be educated and their habits changed. The social force of public opinion, backed by legislation when necessary, is needed before much progress can be made, and research and development work must be continued and expanded.

Work on one aspect of air pollution at the U.S. Bureau of Mines points to the encouraging prospect of getting valuable products from the poisons taken from air. A process used by the Bureau to remove sulfur dioxide from the stack gases of coal-burning plants recovers part of the process cost from the sale of elemental sulfur. The prospect of using a crop-killing pollutant to make fertilizer is intriguing. Technology to control air pollution is also being applied to the fuels themselves, as in the removal of sulfur before burning. These developments as well as legislation, regulations, and social pressure will have a bearing on the kinds of fuels we use and on their costs. Will we have enough of the prescribed kind to meet our needs in the future?

Disposal of trash and other solid waste is nearly as acute an environmental problem as the pollution of air and water. We pay dearly for space in which to dump discarded material that may contain valuable metals. We bury in sanitary landfills tons of iron and other metals mixed together in residues from municipal incinerators. Even as we bury metal in one place we are looking elsewhere for ores that may well be leaner than our sanitary landfills.

Bonanza in the Trash Heaps

The 34 million metric tons of municipal refuse incinerated annually in this country contain more than 2.8 million metric tons of iron and some 180,000 metric tons of aluminum, zinc, copper, lead, and tin.[11] Archeologist-miners of the future may well go prospecting in our city dumps, which for the present are lost resources.

The disposal, control, and reclamation of mineral waste products also pose technologic and social problems, and in addition are economic factors in the effective conservation and use of mineral resources. The problem must be attacked from the standpoint of conservation by minimizing the amount of waste produced. Specifically, methods must be sought to improve recovery systems in order to reduce mineral losses and to reduce the volume of products finally discarded. In addition, more efficient techniques must be devised for reclamation and reuse of mineral-based materials that currently are wastefully discarded—a practice we may no longer be able to afford.

We should develop the technology to mine waste of all types. Recovering metals and other minerals from mine tailings, industrial refuse, and incinerator ash are likely places to start.

Of course, these objectives in themselves do not provide adequate direct economic gains to industry. On the contrary, they would frequently add costs that would probably have to be passed on to consumers. Nevertheless, the problems arising from mineral supply cannot be treated apart from environmental degradation stemming from the mining, treatment, or use of any mineral substance.

In our political and economic system, it is the responsibility of private industry to develop and exploit resources to meet demands at the market place. It is the federal government's role, however, to assume a position of leadership in determining the projected needs, in supplying the long-range scientific and technologic support for the minerals industry, and in using techniques such as education, communication of information, and cooperation to encourage industry to attack the vital problems of minerals supply. Such assistance is especially necessary where the risks are too costly to be undertaken by a corporate entity, and where the rewards benefit the public rather than a particular industry. Research and engineering are under way to devise methods for processing marginal reserves, improving efficiency of extraction and recovery, recycling mineral materials, and making alternatives or substitutes for minerals materials in short supply.

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[11] C. B. Kenahan and P. M. Sullivan, *Amer. Public Works Assoc. Reporter*, March 1967, pp. 5–8.

All these efforts of the government are aimed at promoting the wise development and use of the nation's mineral resources to sustain the economy and to assure adequate, dependable supplies at the lowest economic and social cost. But these efforts, with those of cooperating state and local governments and the mineral industries, are not enough. A broad public understanding is needed to insure support for the concerted action by all sectors of our society to alleviate the coming threats to our mineral resources.

Understanding by Scientific Community

Understanding by our scientific community is especially needed, for, although I have stressed the technical and utilitarian aspects of the problems we will face, there is a tremendous need for scientific backup. The challenges herein are not just to engineers, industrialists, and statesmen; they are as well to scientists of many disciplines; for, unless we acquire the fundamental knowledge to apply, our progress may be too slow to avert the threats to our standards of living and future security.

These threats—or challenges—can be summed up. (i) Minerals are essentially and in the long run nonrenewable, and some of our mineral reserves, exploitable by today's technology, are becoming exhausted. (ii) The population explosion and rising living standards impose unprecedented demands that will hasten the depletion of our mineral resources. (iii) Pollutants from the extraction and use of minerals and the sheer bulk of inert wastes are degrading our environment and must be controlled, even at increased real costs for the minerals we need. Whether these predictions are optimistic or pessimistic depends upon one's temperament and point of view. I believe they are optimistic, that the tasks we face are demanding, but not impossible.

Senator ALLOTT. Also, Mr. Chairman, I have a paper delivered by Charles R. Mottley, of the Pennsylvania State University, before the joint national meeting of the American Astronautical Society and the Operations Research Society of America in Denver, Colo., on June 18, 1969. I asked that it be included in the hearing record.

Senator MOSS. Without objection, it is so ordered.

(The article referred to follows:)

PLANNING TO MEET THE NEEDS FOR MINERAL RESOURCES

(By Charles M. Mottley, Professor of Operations Research and Special Assistant to the Vice President for Planning, The Pennsylvania State University, University Park, Pa.)

Over the next thirty years the worldwide consumption of minerals to satisfy the materials needs of exploding populations and their rising living standards will be huge. Our mineral industries are going overseas more and more to obtain supplies of key materials notwithstanding the attendant hazards of losing control of their sources. In spite of the foreseeable demands, mineral science and technology are lagging; mineral education is declining; and our mineral policies are either non-existent or have a short-range, expedient thrust. The paper discusses the necessity for a new approach to meet the challenge. The insights of cybernetics are mentioned as a possibility. It is suggested that competent strategic planning must be instituted as the basis for effective mineral resource management.

INTRODUCTION

The conventional wisdom says: there is no need to worry about the future supply of minerals because:

Private enterprise and the forces of the market place will take care of the situation.

Marginal resources will be exploited when the price is right—scarcity will induce higher prices.

Technology will rise to the occasion and the necessary processes will be developed to recover enough material from lower grade ores to meet our needs.

Technology will be developed to create substitutes if the supply of a mineral should run out.

Foreign sources of ore, much richer in grade, can always be found and exploited with known technology.

Imported raw materials can be upgraded by our more efficient manufacturing processes, and then the higher valued fabricated products can be sold in world markets to offset any disturbances in the balance of trade that might result.

There is no reason to worry about the signs and symptoms of day-to-day problems, wait until a full-blown crisis develops; we know how to justify, fund and manage a crash program to take care of a crisis, but we can't be bothered with solving little problems.

If these were ordinary times, we might go along with the conventional wisdom, lulled by struthious optimism, thus emulating a habit usually attributed to the ostrich. But these are not ordinary times——

Over the next 30 years the worldwide consumption of minerals to meet the materials needs of exploding populations and their rising standards of living will be huge.

The annual primary production of minerals in the United States alone is currently worth about $25 billion—within 30 years, it could reach three or four times that amount (in today's dollars), the cumulative result could be disastrous.

The rate of consumption in the rest of the world of many of the key mineral materials is rising at an even faster pace than it is in the United States.

The necessity for minimizing disturbances of the quality of the environment is driving upward the cost of domestic mining operations and in some instances, public reaction is blocking the exploitation of high-grade mineral deposits.

In spite of evident needs, mineral science and technology are lagging, the support for minerals research by the Government has been reduced, and the mineral industries are not investing in research to meet foreseeable needs.

The number of students enrolled in the mineral disciplines in the colleges and universities is declining.

We have difficulty competing in world markets because of the high cost of producing many of our fabricated products.

U.S. mining companies are turning more and more to foreign sources for supplies of raw materials, but we are already faced with loss of control of our mineral supplies in several countries.

Our own mineral policies are either nonexistent or have a short-range, politically expedient thrust.

The responsibility for the management of our mineral resources, in the total system sense, is dispersed among many different agencies, public and private, and if a crisis should occur, there is actually no one responsible for taking charge and managing it.

SELF-ORGANIZING SYSTEMS

A look at the future, therefore, makes one wonder whether the nation can continue to depend on the conventional wisdom. It is evident that a new approach is needed—a new wisdom must be generated. Stafford Beer has suggested that the insights of cybernetics might provide a useful approach to such a situation. He says in his book, *Decision and Control*, "that there is no doubt whatever that the enterprise has to be very largely a self-organizing system; nor is there any doubt that the *laissez-faire* approach to it reveals gross inadequacies, which nevertheless are not remedied by the installation of mandatory controls."

Let us assume that the whole national enterprise of supplying our needs for mineral materials constitutes a self-organizing or self-regulating system and that control is exercised in a manner similar to an ecosystem, i.e., it organizes and regulates itself. Because the mineral materials system is composed of a great variety of public and private components interacting in a highly complex, probabilistic way, the key to its management is the manner in which policy is formed. This in turn depends on information about both the external and internal worlds and the way it is acquired and used. If the viability of a self-organizing mineral materials system is to be maintained, one component of the system must be responsible for conducting the necessary inquiries to provide, in the *national* interest, the scientific, technical, statistical and economic information required by the Government, and also essential for industry, in order to assure an adequate, dependable and timely flow of mineral materials within the economy to support national goals and to meet industrial and social needs at a reasonable cost. Such an agency does exist. The foregoing statement is in fact a paraphrase of part of the original mission assigned to the Bureau of Mines in the Department of the Interior.

The Bureau of Mines, like many of the other information-gathering agencies of the Government, formerly regarded the informational aspects of its mission

as one of providing the statistics for writing history. The use of such information as a base for *managing* the future is a new concept. Nevertheless, the need for information about the future is critical if both government and industry are to formulate effective policies on which to base management decisions. Very long lead times are required for decisions related to mining ventures, exploration, research, engineering, and the development of mineral producing sites. Investment decisions regarding plant and equipment also take time. If our economy is to be viable in the year 2000, long-range studies of the mineral materials needs to guide policy making must be conducted now. These policies must in turn be translated into effective action—which also takes time.

THE STRATEGIC PLANNING PROCESS

It is my purpose here to tell you about the strategic planning process, as it applies to the management of our mineral resources. The concepts involved are shown in the flow model, Figure 1.

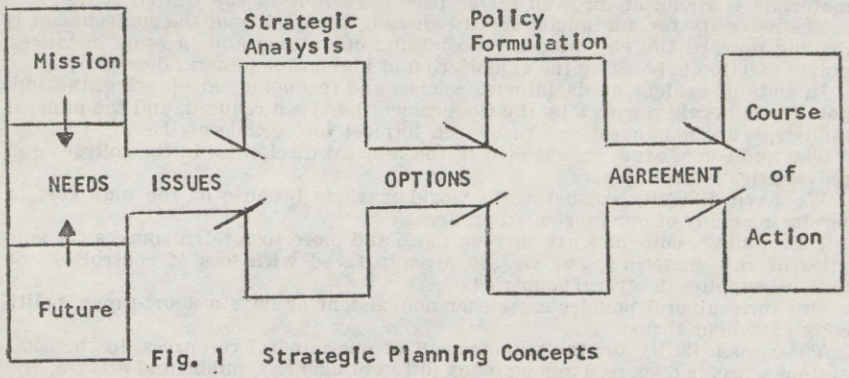

Fig. 1 Strategic Planning Concepts

The specialized branch of the planning activity that is concerned with anticipating events, making timely diagnoses of needs, identifying issues, reaching policy agreements, and shaping appropriate courses of action so that an organization will be in the best position, ready and capable, to respond effectively to contingencies is called *strategic planning.*

Dr. Walter R. Hubbard, Jr., Director of the Bureau of Mines, established a strategic planning function in the Bureau in 1967. On March 21, 1968, he made a progress report on the development of the procedure in a hearing before the Subcommittee on Minerals, Materials and Fuels of the Senate Committee on Interior and Insular Affairs. The strategic planning procedure is still evolving in the Bureau and, although much of the information is available now for those who need it, the first formal document is expected to be released for publication next year. One of its principal uses within the Government will be to provide guidance for the planning, programming, budgeting system (PPBS). Industrial concerns will also find it very useful for their own long-range policy planning.

The Data Base

The first requirement for a self-regulating system of the type proposed is an adequate data base. The managerial components of the several subsystems that comprise the whole must have access to the necessary information on which to base their policy decisions. It assumed that, if reasonable people use the same source of reliable information, they will reach general agreement about the preferred course of action. The *laissez-faire* economists postulate that the elements of the economy must have perfect information for their concept to work, rarely, however, does such a situation exist outside the classroom. Fortunately, the Bureau of Mines had had long experience in acquiring statistical data on minerals and had developed considerable expertise in data processing. The next step in establishing a strategic planning function was to add a capability to project the

data base into the future, to evaluate the trends and to identify the emerging issues. This ability has been achieved and a common body of reliable information about the projected needs for mineral materials now exists.

Background Profiles

The Bureau has met, therefore, the initial requirement for a set of background data related to the mineral materials situation. This information was assembled in the form of a series of statements that convey the essential facts needed for an understanding of the source, processing, and end-use patterns of the various mineral substances that have, or may have, potential commercial significance. These materials become commodities by having value added to them in the course of the sequence of mineral industrial activities: discovery, development, extraction, processing, and fabrication. The latest statistics and background data on each mineral or commodity have been assembled and are maintained under the following broad topical headings:

Present mineral supply-demand data.—A series of 84 flow charts, similar to Figure 2 for aluminum, present the broad overview of the quantitative relationships of the components of U.S. mineral supply and consuming sectors. The list of minerals runs the gamut from aluminum to zirconium including substances in solid, liquid, and gaseous forms. World production is displayed in each instance and, where exports to the U.S. are recorded, the form and amounts are shown. All the important components of U.S. supply are indicated, U.S. exports and stocks are explained, and the major consuming sectors to which supplies are committed (SIC codes) are also shown. Wherever feasible the mineral materials are described in terms of elemental content in preference to the commodity terms in which they are commonly priced, traded, and in certain instances, consumed in current marketing patterns. Although the resulting units may not be familiar for some discussions of supply-demand relationships, they do facilitate the description and analysis of future source and end-use patterns.

In addition to the charts and certain essential explanatory material the background prepared on each mineral material also summarizes significant information on:

Apparent reserves.—In which apparent domestic reserves are compared to reserves known to be developed elsewhere in the world.

Industry patterns.—In which the structure of the industries at home and abroad are defined.

Consumption patterns.—In which the way the materials are marketed and the forms in which they are consumed in the U.S. and the rest of the world are summarized.

Byproducts and coproducts.—In which the complex of interrelationships in mineral supply are discussed.

Economic factors.—In which the essential aspects of cost-price relationships are explained.

Technology.—In which the prevailing state of the art and engineering practices are described.

Because the background compilation is maintained to provide a base for facilitating the preparation of projections, it is neither a comprehensive historical treatment of individual materials nor a recasting of data available from readily accessible reference sources. The format is designed to furnish, using a common structure for all materials, the information necessary for the subsequent analyses. Eventually a computerized data system will be developed to facilitate the maintenance of the data base. Basic supply and demand data will be issued annually and, although the data are continuously refined, major reevaluation is feasible only at yearly intervals. Accordingly, the procedure provides for reassessing the background information at least once each year in relation to the PPB cycle.

Outlook

The second part of the data base involves projecting the supply-demand relationships to specified periods in the future. These projections are based on the background data and employ econometric techniques using selected indices. The projections are modified to reflect the effects of foreseeable technologic advances that might tend to affect the situation by lessening costs, reducing demands, increasing supplies, or establishing new markets. They are further modified through the consideration of possible effects of nontechnologic changes like price incentives, Import or export controls, international events and the like. The

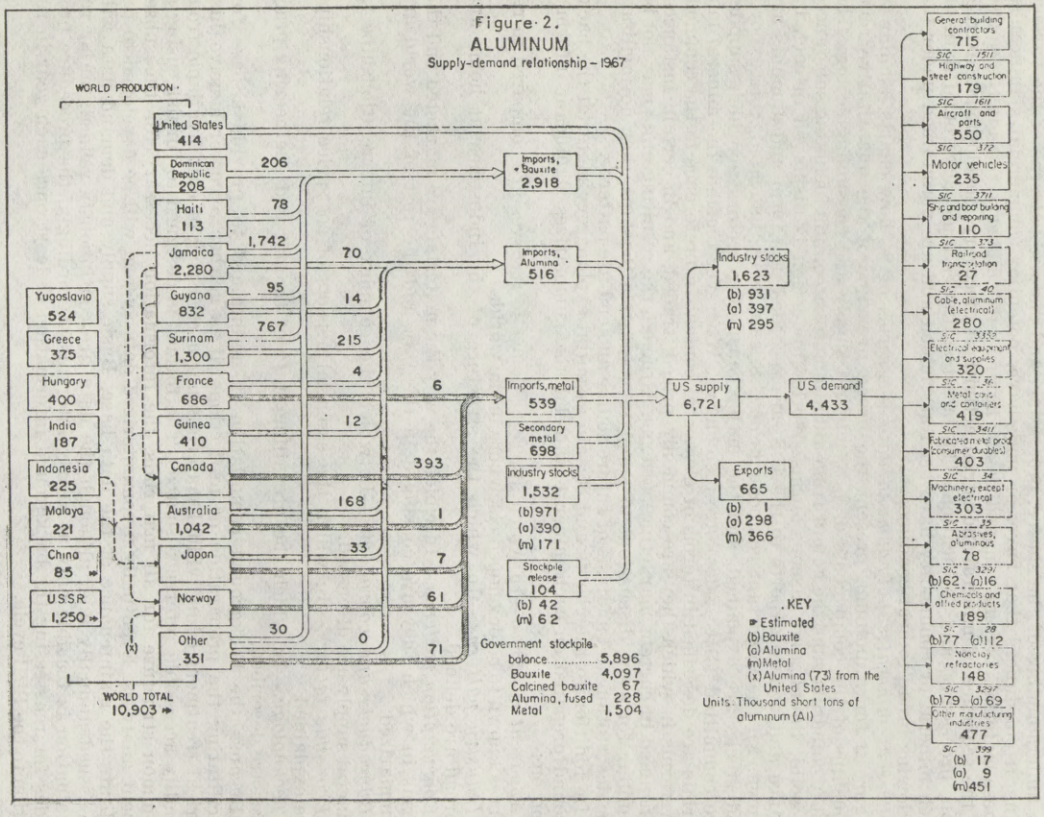
Figure 2.
ALUMINUM
Supply-demand relationship – 1967
WORLD PRODUCTION
United States 414
Dominican Republic 208
Haiti 113
Jamaica 2,280
Guyana 832
Surinam 1,300
France 686
Guinea 410
Canada
Australia 1,042
Japan
Norway
Other 351
Yugoslavia 524
Greece 375
Hungary 400
India 187
Indonesia 225
Malaya 221
China 85 ⇒
USSR 1,250 ⇒
WORLD TOTAL 10,903 ⇒
206
78
1,742
95
767
70
14
215
4
6
12
393
168
1
33
7
61
30
0
71
Imports, Bauxite 2,918
Imports, Alumina 516
Imports, metal 539
Secondary metal 698
Industry stocks 1,532
(b) 971
(a) 390
(m) 171
Stockpile release 104
(b) 42
(m) 62
Government stockpile balance 5,896
Bauxite 4,097
Calcined bauxite 67
Alumina, fused 228
Metal 1,504
Industry stocks 1,623
(b) 931
(a) 397
(m) 295
U.S. supply 6,721
Exports 665
(b) 1
(a) 298
(m) 366
U.S. demand 4,433
KEY
⇒ Estimated
(b) Bauxite
(a) Alumina
(m) Metal
(x) Alumina (73) from the United States
Units - Thousand short tons of aluminum (Al)
General building contractors 715
SIC 1511
Highway and street construction 179
SIC 1611
Aircraft and parts 550
SIC 372
Motor vehicles 235
SIC 3711
Ship and boat building and repairing 110
SIC 373
Railroad transportation 27
SIC 40
Cable, aluminum (electrical) 280
SIC 3355
Electrical equipment and supplies 320
SIC 36
Metal cans and containers 419
SIC 3411
Fabricated metal prod. consumer durables 403
SIC 34
Machinery, except electrical 303
SIC 35
Abrasives, aluminous 78
SIC 3291
(b) 62, (a) 16
Chemicals and allied products 189
SIC 28
(b) 77 (a) 112
Sanicoid refractories 148
SIC 3297
(b) 79 (a) 69
Other manufacturing industries 477
SIC 399
(b) 17
(a) 9
(m) 451

significance of long lead time is emphasized because consideration of contingent possibilities 15 to 30 years hence is more important for developing action programs for minerals than shorter-term projections that might embody more certainties. For this reason, at the initiation of the procedure, the years 1985 and 2000 were selected as appropriate target dates for the projections. These targets will be advanced five years at appropriate intervals, the first advance to become effective during 1970. Because the outlook for each material depends substantially upon annual changes in the background information, it too subject to major revision at yearly intervals. Moreover, continuous refinements in the techniques of data collection and econometric projection are expected to permit more frequent revision and improvement of the outlook section.

Specifically, the outlook section on each mineral material is addressed to the following topics:

Future demand.—In which high, medium, and low projections of demand in 1985 and 2000, in the U.S. and in the rest of the world, are estimated.

Trend projections.—In which different projections of domestic primary production and U.S. demand for primary are displayed graphically and compared.

Future supply.—In which the resources likely to be important sources of raw materials in the future, including those that might be noncommercial at present, are assessed and related to projected demands.

Domestic supply.—In which potential resources are related to price.

Time-price relationships.—In which probable price levels are estimated through the remainder of the century.

Possible advances in technology.—In which the possibility of significant technologic advances is assessed and related to the projections.

Profile summaries

The third part of the planning procedure is to extract from the background and outlook sections and from all relevant supplementary and reference sources those facts needed for a clear understanding of the emerging issues. In making the diagnosis for each mineral material, special attention is drawn to those elements or factors in the situation which appear to be characterized by signs of uncertainty. Subsequent parts of the strategic planning procedure depend heavily upon the data and observed "signs of uncertainty" recorded in the summaries. Accordingly, they must also be revised frequently as changes in background information, projection refinements, or contingent events dictate.

Delineating the Issues

The next step in the procedure is to identify more precisely where attention should be directed in the *pattern of mineral flow* as the basis for delineating the issues. The flow of materials from discovery to ultimate disposal consists of the following stages in a functional sequence:

1. Exploration
2. Reserve definition
3. Reserve Delineation
4. Development for exploitation
5. Extraction
6. Processing
7. Using
8. Extending uses
9. Reusing and disposal

By arranging the 84 mineral materials as the rows and the nine stages of the functional sequence as the columns, a matrix of 756 points of interaction or cells is created. Each interaction is then probed for signs of uncertainly or possible constraint. The procedure is a type of crosswalk in which each mineral material is examined in relation to each stage in the functional sequence.

Such an examination made by a team of diagnosticians from the Bureau resulted in the identification of those points of interaction where there appeared to be definite evidence of one or more signs of uncertainty. The observed signs were carefully defined and consolidated into eight types or classes related to the following situation factors:

1. Governmental
2. International
3. Geographical
4. Physical
5. Technological
6. Source and Use Patterns
7. Environmental
8. Capital (investment)

The final step in the diagnostic procedure is to consolidate the signs of uncertainty into fewer but more inclusive groups that embrace the important issues. In medical practice this is the step in which the objective evidence,

the signs and symptoms, are related to recognized disease syndromes. This step requires considerable experience and sound judgment. In the case of the flow of mineral materials, experience suggested that there were nine principal issue categories to which the signs of uncertainty could be assigned.

There was evidence of uncertainty with regard to—

1. Maintaining the competitive position of domestic sources;
2. insuring the reliability of essential overseas supplies;
3. accommodating to changing end-use patterns;
4. diversifying established primary source patterns;
5. creating technologic advances that could ultimately minimize reliance on conventional resources that could become inadequate or undependable;
6. extending, by more effective use or reuse, the degree to which the demand for primary materials might be minimized;
7. employing the latent potential of plentiful resources;
8. resolving conflicts arising from the use of the resources; and
9. conserving the manpower capabilities in the mineral industries.

Basically, the foregoing list consists of issues requiring decisions concerning strategy. The question for decision in each case is *whether* to "maintain," "insure," etc., and if so, *how* should it be accomplished and *who* should do it. The most frequent recurring question seems to be whether the domestic extractive industries will be able to compete effectively in domestic and world markets. This is a serious issue in the light of projected demand patterns, changing end-use patterns, and uncertainties concerning the ability to perfect the technology required to utilize materials from other than traditional or established primary sources of supply. With its current resources, the U.S. will find it increasingly difficult to compete commercially with newly developed, higher-grade, lower-cost, and relatively abundant foreign sources. The technologic advances that have so effectively permitted high U.S. productivity coincident with a decreasing tenor of source material in the recent past demand further augmentation if they are to help us meet the much greater challenges of the future. The strategic question is: will U.S. industry develop the technology?

CONCLUSION

World resources of most mineral raw materials are considered to be adequate to meet projected world demands for a long time. Achieving an assured access to such supplies at reasonable cost is an entirely different matter. However, realism dictates that, as the United States demonstrates a continuing capability to supply a significant part of its growing material needs from its own sources at acceptable costs, it is best enabled to maintain control over its destiny. This, of course, means a greater investment in mineral science and technology than is evident today.

Domestic mineral industries now fulfill a substantial portion of our needs and also supply a great variety of minerals to world markets. How long this important domestic capability can be maintained in light of the variety of possible future world and domestic demands is open to considerable conjecture. The question lies close to the center of a complex pattern of foreseeable critical issues that deserve particular attention. The effectiveness with which attenion is directed to these issues, and the extent to which options are examined and policy agreements are reached, will largely determine the degree to which an adequate and dependable flow of mineral materials can be maintained in the future.

However, questions of national strategy and policy go beyond the mission of the Bureau of Mines. Other agencies in the Executive Branch, the Congress, industry, the universities, and the public will have to cooperate to develop them in the national interest. Nevertheless, the next decade or two will provide a crucial test of the effectiveness of a self-organizing mineral materials system operating with the benefit of the supporting information supplied by the Bureau.

ACKNOWLEDGMENT

The collaboration of Mr. Paul Zinner, Assistant Director for Planning, Bureau of Mines, in the development of the concepts and procedures described herein, and the advice of Dr. William A. Vogely, Assistant Director for Mineral Resource Evaluation, Bureau of Mines, are gratefully acknowledged.

Senator Moss. I might say that this record, when it is printed, might not come in absolute sequence of the way we are moving it along, but all of the proceedings will be a part of the record.

We are now going to ask the representatives from the American Mining Congress to come forward. The president, Mr. Cris Dobbins, is with us, and in addition Mr. Andrew Fletcher, honorary chairman, St. Joseph Lead Co.; Mr. James Boyd, president of the Copper Range Co.; Mr. David Swan, vice president—technology, Kennecott Copper Corp.; Mr. Charles F. Barber, president, American Smelting & Refining Co.; Mr. Lindsay F. Johnson, president, the New Jersey Zinc Co.; Mr. Fred W. Peel, Miller & Chevalier; and Mr. Donald J. Donahue, president, American Metal Climax, Inc.

We would like to have all of you gentlemen sit at the table if you would, and we will have Mr. Dobbins take charge, as it were, and designate which one he wants to speak and let us know what particular area that each one directs his speaking to.

STATEMENTS OF CRIS DOBBINS, PRESIDENT, AMERICAN MINING CONGRESS; ANDREW FLETCHER, HONORARY CHAIRMAN, ST. JOSEPH LEAD CO.; JAMES BOYD, PRESIDENT, COPPER RANGE CO.; DAVID SWAN, VICE PRESIDENT, TECHNOLOGY, KENNECOTT COPPER CORP.; CHARLES F. BARBER, PRESIDENT, AMERICAN SMELTING & REFINING CO.; LINDSAY F. JOHNSON, PRESIDENT, THE NEW JERSEY ZINC CO.; FRED W. PEEL, MILLER & CHEVALIER; AND DONALD J. DONAHUE, PRESIDENT, AMERICAN METAL CLIMAX, INC.; ON BEHALF OF THE AMERICAN MINING CONGRESS

Mr. Dobbins. Thank you very much, Mr. Chairman and members of the committee.

Senator Moss. Thank you, Mr. Dobbins. You may proceed.

STATEMENT OF CRIS DOBBINS, PRESIDENT, AMERICAN MINING CONGRESS

Mr. Dobbins. Mr. Chairman and members of the committee, I am Cris Dobbins, chairman and president of Ideal Basic Industries, Inc. I am president also of the American Mining Congress, a trade association of U.S. companies that produce most of the Nation's metals, coal, and industrial and agricultural minerals. Its membership also includes more than 200 corporations that manufacture mining and mineral processing equipment and supplies, as well as financial institutions with a business interest in the mining industry.

My colleagues and I appreciate this opportunity to appear before you to support the development of a national mining and minerals policy. Through our several witnesses we hope to demonstrate the need for such a policy.

First, however, let me indicate how we interpret the concept, "policy," and how we believe it might function to produce the desired result.

In a sense, almost every enactment by the Congress of a law relating to minerals is an expression of national minerals "policy." In this sense, the considerable number of existing laws pertaining directly to mining and minerals—the organic acts of the Geological Survey, the public land laws, the stockpiling legislation—all define the national "policy."

But each of these legislative enactments is passed to meet a particular problem or purpose; seldom are they viewed altogether as an integrated expression of overall policy. As a result, they are not coordinated, there are contradictions one against another, and their relative priority is not determinable. The executive branch of the Government, charged with the responsibility of implementing all the laws, consequently lacks the clear direction which it needs effectively to achieve the intention of the Congress.

The articulation of a broad "policy," such as the proposed mining and minerals policy, will, we believe, be of great value to the executive branch and to the Nation, both in the implementation of existing legislation and in the development of future legislation. It will serve as a statement of fundamental principles or objective, and indication of congressional priority, a "benchmark," if you will, against which the executive branch can measure proposed action and the Congress can measure proposed new legislation. Moreover, by charging the Secretary of the Interior with overall responsibility for effectuation of the policy, the Congress assures itself of a fully responsible source of advice and counsel as to whether the Congress objectives are being achieved and of recommendations as to further congressional action which might from time to time be necessary. The testimony you will hear from my colleagues is based upon this understanding of the concept of the term "policy" as it is used in S. 719.

Our first witness is Mr. Andrew Fletcher, honorary chairman of the St. Joseph Lead Co., who will provide you an overview of the problems and opportunities facing the United States in regard to mining and minerals. He will be followed by Mr. James Boyd, president of Copper Range Co., who will discuss implications of the proposed policy on development and manpower in mining and minerals; Mr. David Swan, vice president-technology of Kennecott Copper Corp., who will discuss environmental quality; Mr. Charles F. Barber, president of American Smelting & Refining Co., who will discuss the use of public lands; Mr. Lindsay F. Johnson, president of the New Jersey Zinc Co., who will discuss stockpiling; Mr. Fred W. Peel, of Miller & Chevalier, who will discuss tax policy and mine finance; and Mr. Donald J. Donahue, president of American Metal Climax, Inc., who will discuss foreign trade.

Following Mr. Donahue's statement we will all be pleased to respond to any questions you may have for us.

Now, if it please the Chairman and the committee, our presentation will begin with Mr. Andrew Fletcher.

Senator Moss. That is very fine. Thank you, Mr. Dobbins.

Mr. Fletcher will proceed and the others in the order in which they were named.

STATEMENT OF ANDREW FLETCHER, HONORARY CHAIRMAN, ST. JOSEPH LEAD CO.

Mr. FLETCHER. Mr. Chairman and members of the committee, my name is Andrew Fletcher. I am honorary chairman of the board of trustees of the St. Joseph Lead Co. and an honorary member of the board of directors of the American Mining Congress. I am an engineer by profession and my experience in the mining field goes back 40 years to 1929, when I was first employed by St. Joseph Lead.

Today we would like to express to you in broad terms why we support the development of a national mining and minerals policy. We believe the aim of a national mining and minerals policy should be to help guarantee the security of our country, to enhance its economy, and to contribute to its general well-being. These have been the historic purposes to which men have always devoted their metals and mineral resources. The intention of the proposed legislation should be to make certain that these resources—both domestic and foreign—will be available to serve the same purposes in the future.

It is hard to believe that, as reported by the Bureau of Mines, our mineral production is slightly less than 3 percent of the U.S. gross national product. But small as that figure may seem, its significance is enormous. It has a direct impact on 40 percent of the GNP and an indirect impact on 75 percent of the GNP.

This is a fact too little appreciated by the average citizen, who tends to forget that minerals have a role in nearly everything he eats or drinks, in his appliances and conveyances, in the arsenal of defense that lets him sleep at night, and the current of electricity that sounds his alarm in the morning.

For example, most people have scant knowledge of the increasing industrial uses of precious metals. Although silver has disappeared from our coinage, production has failed to keep pace with demand. Our annual consumption of gold is more than four times the yearly production, while reserves have dwindled to the danger point.

A recent survey showed that one-quarter of the people who were asked could not name a single use for lead. Yet, over half the lead consumed in the United States goes into automotive storage batteries and fuels. People might know that the automotive industry has annual sales of $25 billion, but they don't all know that lead makes it possible.

Twenty-two percent of our copper goes into building construction—an industry which may exceed a record volume of $90 billion this year. Another 26 percent of our copper is used in electrical and electronic products—a market worth about $38 billion.

Zinc is a metal that seldom comes to the public mind, except perhaps as an alternative to "zebra" in giving alphabetical examples. But without it, we could not have galvanized steel or brass—uses which account for half our consumption of zinc. Nor would we have the many useful and economic applications of zinc die casting.

Coal is probably remembered by most Americans as an old-fashioned material that they are glad to have gotten out of their cellars. Yet, domestic demand for generating electric power and other uses is expected to send production soaring from 500 million tons today to 729 million tons in 1980. Coal also figures importantly in some areas of

the more glamorous chemical industry, which expects sales to exceed $47 billion this year.

I believe, Mr. Chairman, that the essentiality of mining and minerals to the economic sustenance of the United States is clearly demonstrated. Their part in national defense is every bit as vital and direct. Without our access to metals, no plane would fly, no ship would sail, no tank would roll, no missile would follow its trajectory—whether shot from the muzzle of a rifle or propelling a nuclear warhead. To preserve the peace of the strong, we believe the United States should stockpile sufficient quantities of strategic metals and minerals. We believe this is the only--and I repeat only—valid reason for such stockpiling.

We are also persuaded that it should be a matter of national policy to foster a vigorous and competitive domestic mining industry. The objective of that policy is not to follow a phantom wish for self-sufficiency. That is already economically impractical. Even self-sufficiency in the most common and heavily used metal, iron, would mean little, when we consider the demand for about a hundred different alloys of steel—presently requiring substantial imports of chrome, cobalt, manganese, nickel, titanium, tungsten, zirconium, and so on. The fact is that minerals are distributed unevenly throughout the world, and nations that hope to progress are already bonded in interdependence.

The United States is an enormous consumer of minerals and fuels. The startling truth is that we have consumed more of these resources in the last 10 years than the entire peoples of the world in all previous history. In the single decade from 1965 to 1975, it is estimated that our mineral consumption will have climbed 40 percent. Today, the worldwide per capita consumption of iron and copper is about one-sixth that of the United States, and for lead it is only about one-eighth. Looking further into the future, we can see that not only will our own growing appetite continue, but other nations and particularly underdeveloped nations will increase their demand at an even more rapid rate than ours.

It is becoming somewhat trite, I know, to cite expectations about the year 2000. But it is also sobering to realize that the millenium is about as far ahead of us as the beginning of World War II is behind us. With this in mind, let us look at the statistics. Comparing the figures for 1965 and estimates for the year 2000, based on Bureau of Mines projections, we find: That U.S. zinc, lead, iron, coal, and copper consumption will double and triple and the worldwide consumption will increase at an even greater rate.

It will be no easy task to meet these soaring demands, and it is notoriously difficult to estimate the resources we will have at our command. This is not only because we cannot foresee what geological discoveries may lie ahead. It is also because the exploitation of ore bodies depends on so many factors: location, quality, technology, marketability, and so forth.

Nevertheless, a study by Resources for the Future, Inc., has concluded that over the next three decades, the United States will be largely dependent on imports for such vital metals as manganese, chromium, nickel, and tungsten. It believes that the total world demand will begin to outstrip the known mining potential of copper, lead, and zinc in all parts of the globe.

Given this situation, there are those who argue that the United States should sharply curtail its domestic mining production, relying on imports for as long as possible and keeping its own resources. In our judgment, this would be extraordinarily shortsighted.

First, it is hard to believe that good foreign relations could survive this sort of behavior, with us carting home foreign treasure while carefully keeping our own. This would become increasingly impossible as the rest of the world experienced a constant narrowing between supply and its own growing demand.

Second, it would make us dangerously reliant on our present stockpiles or would call for a vast increase in those stockpiles. Moreover, once we allow mines and machinery and men to fall into disuse, it can take a long time—in the case of a national security emergency, a perilously long time—to restore them to productivity.

Third, this is simply not a sound way to increase our command of mineral resources. Essentially there are only two ways to do that: either by exploration which leads to the discovery of new resources, or by developing the technologies that will permit more effective and economic exploitation of the ones we already know about.

Exploration is no longer a matter of a lonely prospector with a pick and a mule. Today it is often a search for deeply buried deposits, requiring aerial photography; geochemical, aeromagnetic, electromagnetic, and ground magnetometer surveys; induced polarization; gravity surveys; and eventually diamond drilling or trenching.

It is an expensive, arduous, and frightfully risky enterprise. Even when an economically viable discovery is made, there can ensue a long period of huge capital expenditures before the minerals can flow to the marketplace. For example, it will be in the mid-1970's, after a decade of development and costs of about $200 million, before American Metal Climax, Inc., will bring its new molybdenum mine in Colorado into production.

Besides new discovery, we can expect to increase our available resources through improved exploitation. For example, at the turn of the century the grade of copper mined in the United States was around 5 percent. Today it is much less than 1 percent. The profitable mining of lower grade ore has become possible only because of immense investments of capital and ingenuity. There may be unbounded riches in what we now consider dross, if we can but find a way to win its value.

A world reaching for unrivaled affluence, and increasingly dependent on its mineral resources, cannot afford to be content with skimming the cream off the earth's crust. Instead, we must employ more vigorously than ever all the manmade resources of capital, technology, and skill to developing the resources of nature. I do not believe we Americans can exert our maximum effort in this regard unless we can direct a significant part of it to objectives here in America.

If for no other reason, in the absence of promising resources development here, we could not attract the geologists and mining engineers and metallurgists and other highly trained and educated specialists who must be enlisted in the task. We cannot reasonably expect to attract bright young people to these professions by telling them they can only serve their professions in exile from their homeland.

If, then, it is agreed that a sufficiency of minerals is essential to the security, the economy, and the material well-being of our Nation—and

if it is agreed that this sufficiency requires the element of vigorous and competitive development of our domestic resources—a clear-cut national policy committing us to these objectives is not only sensible but it is imperative. We commend the intentions of S. 719.

We are encouraged that this bill calls for the Secretary of the Interior to report annually to Congress on the state and orderly development of our mineral resources and their associated industries. We respectfully suggest that the Secretary further be called upon to concern himself with and to report on the availability of foreign mineral resources and the access of the United States thereto.

I suspect there is hardly a day that goes by, when you gentlemen are not considering legislation that could have an important impact on our mineral industries. To cite a few: national defense, treaties, and foreign aid; taxation; public land use; trade, tariffs, and maritime policies; urban revitalization; transportation; employment and manpower training; environmental pollution, public health, and safety; international monetary affairs; foreign policy.

The list could go on and on.

In the preoccupations with his lifetime work, I think each of us runs the risk of equating his own interests with those of the public. Hopefully, we are right most of the time. There are times, I am sure, when advancing one national goal means—at least for the moment—retarding another. In a world still short of the ideal, we must often seek accommodations, weigh means and objectives in careful balance, and set about the hard business of fixing priorities.

In adopting a national mining and minerals policy—if my interpretation is correct—the Congress would declare what ought to be the broad objectives of future minerals development; it would require the Secretary of the Interior to report on the degree to which those objectives are being achieved; and it would be guided by its own judgment in reaching decisions that could affect this policy and all other policies of the United States.

In summary, then, we of the American Mining Congress believe that for now and in the future our national security will be served and our civilization will largely be shaped by our command of mineral resources. With the steep acceleration of global consumption, we believe that exploration for new discoveries and improved utilization of existing mines must be encouraged. We think this requires a national mining and minerals policy as contemplated by S. 719.

Thank you.

Senator Moss. Thank you, Mr. Fletcher, for a very fine statement.

We will go on with Mr. Boyd, president of the Copper Range Co.

I see that all these witnesses have prepared very fine and excellent statements, and in every instance the full statement will go into the record. If you want to highlight parts of it and direct attention to that particularly, you may do so, but you may proceed in whatever way to wish to get the story told to this committee.

STATEMENT OF JAMES BOYD, PRESIDENT, COPPER RANGE CO.

Mr. Boyd. Thank you, Mr. Chairman and members of the committee. My name is James Boyd, and I am president of the Copper Range

Co. and a member of the board of directors of the American Mining Congress.

As raw materials are at the base of all economic systems, availability in sufficient quantities at the lowest possible cost is essential to the economic health of any society. Unless there are raw materials upon which men can expend their own energy, supplemented by power-activated tools, there can be no commodities for people to make, sell, buy, or use.

It is the function of the extractive industries to find, extract, refine, and put into usable form minerals for the production of tradeable commodities. It's their function to find within the earth's crust the deposits which can yield these materials at the lowest cost; to develop the most efficient methods of producing these materials from their natural source; and to make them available in usable form so that merchantable commodities can be provided using the minimum amount of such materials.

All these functions require the highest development of engineering in all its disciplines and science in all of its complexities.

Just recently the National Academy of Engineering completed a deep study of the status of mineral science and technology. So recently has the report been completed, that it has not been printed. However, the chairman of the committee, Dr. Elburt F. Osborn, has accepted an invitation from this committee to testify at these hearings.

The search for new mineral deposits requires the mastery of more sciences than many of our most glamorous engineering undertakings. It might be useful at this time to present an outline of the various disciplines that must be combined in the process of exploration and extraction of minerals from the earth.

First, let us look at exploration. This means projecting trained thought into the third dimension, based upon only partial observations in two dimensions. We cannot see all of the rocks at the surface, but using what we can see in scattered outcrops we must, with the aid of scientific instruments, project our minds deep into the unknown. The correctness of scientific conclusions can be checked only by expensive diamond drilling or excavation.

Few other scientists or engineers are called upon to come to conclusions and back up their decisions with more costly verification than the modern prospector; few require a wider training in as many sciences as does this man we call a geologist. His work, so fundamental to economic systems, is so little known to the general public that it attracts little attention and is therefore not well supported. Accordingly, the science of geology and the related science of geophysics have attracted disproportionately small sums for fundamental scientific research.

Minerals, once discovered, must be extracted from their natural resting place. This is what we call mining engineering. As we face the necessity of mining lower grade ores, the responsibilities of engineers in these disciplines become steadily more important. The mining engineer must be the most broadly trained of all engineers.

He must deal with geology; rock mechanics; civil, mechanical electrical, and virtually the whole spectrum of engineering; excavation; materials handling; and finally and most important, human relationships under trying conditions. Despite the fact that he has made it

possible in some instances to mine profitably deposits which contain as little as one-tenth of the valuable minerals that they did 60 years ago, he has been supported by the very minimum of scientific research.

This brings us to the next key need after manpower: that of more and better research and development activity focused upon the most pressing needs of our mining industry.

It is true that scientists would prefer to search for the truth, unfettered by the need to face pragmatic situations; nevertheless, we have to ask them to concentrate on the search for solutions to more mundane problems. We need to put our limited scientific manpower resources to work in areas which most require them.

If we are to produce basic resources economically, research effort must be expended first upon improving mining engineering, and second, upon training broadly educated men to practice this demanding occupation in proportion to the relative need for all types of research.

The next most expensive operation in the extractive industries is that of separating the valuable minerals from the rock; this is called beneficiation. The skills and efficiency in this operation determine how much of the valuable resources will be made available to the public. Virtually no mineral deposits will economically yield all their values; many will give up only 50 percent with present technology.

The areas for research in these fields are legion, for improvement in recovery automatically extends our reserves and reduces costs. Workers with the funds to support this research are pitifully few.

The next step is to refine the minerals after they have been concentrated from the ore. In only a few of the metals, such as iron, has fundamental research been carried to any sophisticated length. We still do not know today some of the fundamental characteristics of our metals to refine them as efficiently as we should.

Finally, the refined materials have to be put in usable form with the proper characteristics to meet consumer needs. In metals this is what we call physical metallurgy. This discipline is more visible and attracts more public attention. The profession is therefore more attractive to young men and receives more funds for research, albeit on only a slightly higher scale, usually because it is needed urgently in space and atomic energy technologies.

All these steps, from discovery to ultimate production of mineral raw materials, therefore, require both scientific research and the application of the highest order of human brainpower. Others have testified that this country is deficient in certain mineral supplies for economic reasons. We could conceivably have raw materials from our own sources if we are willing to pay for them.

Our dependency upon foreign sources for raw materials is, therefore, usually economic in nature. A prime example is the fact that every man has potential aluminum ore in his own backyard, but it is less expensive to mine high-grade deposits of bauxite in Australia, for instance, and ship the ore clear across the Pacific Ocean to our west coast aluminum plants, than it would be to attempt to recover the low-grade supplies in this country.

There are many other examples of this economic fact of life. In general public policy, however, it is important to remind ourselves

that we usually import materials because they can be produced elsewhere more cheaply than we can produce them from our own sources.

One of the most pressing problems facing not only the United States but the entire civilized world, however, is helping people rise above the levels of mere subsistence. This will require harnessing energy, through the use of tools, in the presently undeveloped nations, or part of this Nation, so that people can satisfy their wants beyond their basic necessities.

This requires the generation of electricity and the production of tools, all of which require metalliferous materials. According to the latest figures available, the consumption of copper in the United States today is 19.65 pounds per capita, while that of the total world is under 4 pounds, with many of the underdeveloped nations consuming less than a pound.

Since the world is already short of copper to meet present requirements, it can easily be seen that this one metal alone will require vast expenditures of energy, both scientific and human, to make available to the entire underdeveloped world sufficient copper to meet their minimum needs.

This can be accomplished only with the help of scientific research and the resultant development of new techniques to discover and mine deposits more economically, to recover as much of the minerals they contain as possible, and to find methods of using minerals in a way which will permit us to stretch the limited supply to cover the needs of more people.

The mineral science and technology report will point out to you how rapidly disappearing are our institutions of higher learning devoted to these fields, how little fundamental research work is being done, and how badly it is needed. It is, however, one thing to point out the difficulties to this committee; it is quite another to suggest ways in which the problems may be solved. Senator Allott already referred to that.

Until recent years the surficial deposits of minerals in this country were so large, so relatively easily found, and so profitable, that there was no need for industry to institute extensive research programs. Today, however, industry is conducting research of its own, is building laboratories and supporting the activities of the academic institutions and research agencies.

This is by no means enough, for primarily the activities of the Federal Government, and in some cases the State governments, have so glamorized competing diciplines that the cream of young brainpower has been enticed into them. The excitement which used to be generated in a young man's mind, of searching for materials and mines in distant places, has been transferred to space industries, computers, et cetera.

Attempts of the mineral industries to overcome this have been futile. The result is that fewer students have applied for admission to the mineral schools, and we have seen the decline of mining schools in the United States from 26 to 17 in 5 years. The inevitable outcome will be that we will have developed material sciences for producing products in other areas, which will be required in ever-growing volume, but the cost of living and producing raw materials to meet that demand will be steadily rising.

We must undertake research work to overcome this calamity. It is therefore essential that the minerals policy of the United States be

firmly stated and implemented to encourage growth in scientific research and development in those disciplines which will contribute to the discovery and subsequent production of raw materials for the future. In other words, a much higher priority should be put upon this area in relation to other research than is now accorded it. S. 719 states the policy and places in the hands of the Secretary of the Interior responsibility for guiding it.

This does not remove from the U.S. Congress the difficult decision of making priority judgments concerning utilization of our resources. For example, the scientific bureaus servicing the raw material disciplines, such as the U.S. Geological Survey and the U.S. Bureau of Mines, attract support infinitely below the levels granted to research into other technologies.

The clearest example of this is that the Geological Survey has never been able to obtain sufficient funds to map completely the surface of the United States; in fact, it is a long way from having done this at the scales required. Yet, many other less developed nations have completed the first generation of geological mapping. It is with the Geological Survey's maps that much of the modern-day scientific prospecting begins.

The Government bureaus cannot do more than the very fundamental jobs. It is up to the private sector to carry out the activities of industrial development. During this process industry must have the understanding of Government whenever new legislation is found necessary.

The universal belief that passing a law putting responsibility in the hands of the Federal bureaucracy provides solutions to all difficult problems is among the most fallacious. It should be the policy of the U.S. Government, wherever possible, to create the climate within which private organizations can develop the necessary services for the people. If the public interest requires regulative action, it should be within the bounds of technical and economic feasibility. If technology has not reached the desired levels for this purpose, research should be supported to achieve that competence.

The depletion allowances, which have long been debated and adopted by Congress to recognize the need for replacing raw materials which become exhausted, are again under attack by those who do not understand the situation. To repeal these time-honored incentives to research, development, and exploration at this crucial time in the development of our resources, would be a very serious blow to the self-sufficiency of the United States and its ability to assist the rest of the world in solving their mineral problems.

So far I have sought to show how research and development on the one hand and brainpower on the other are intertwined. Certainly engineering manpower is a grave problem for the extractive industries. I have referred to the fact that mining schools are steadily disappearing; but worse than this is the steady decline in enrollment of students in the mineral engineering fields, the graduates of which have declined from 1,813 per year to 1,351 in a decade. The engineering profession itself has undertaken the task of finding the means of drawing to the attention of young men and women the fact that engineering in virtually all of its aspects is a rewarding career.

Unfortunately the Government has lavished funds on programs which have diverted qualified scientific manpower from those fields which are basic to all other activities.

The constant reiteration by public officials and others in statements about dangerous working conditions in mines is one reason that young people downgrade the profession. The fact of the matter is that in most of our mines a man is safer than he is at home, and certainly than he is on his way to and from work. His environment is carefully controlled so that his surroundings, although not as immaculate as a candy factory, are certainly a satisfactory place to work, while his profession is an essential contribution to the economy.

The public attitude toward mining, arising from ignorance of this change in the working conditions of mines, has made it even more difficult to recruit labor to man the mines, and particularly the underground mines in remote areas. This is why the industry needs special attention.

The administration and Congress must therefore look more deeply behind research and development programs and lend their support by the diversion of funds into those areas which are basic and necessary. The scientific bureaus involved should be strengthened and relieved of the responsibility of less urgent administrative functions and industry should be encouraged in every possible way to develop its research facilities and activities.

I appreciate the privilege of appearing before you today. Thank you.

Senator Moss. Thank you very much, Mr. Boyd. You were formerly Director of the Bureau of Mines, so that you are an old hand at this business.

Mr. Boyd. Thank you.

Senator Moss. We are delighted to have you with us. We appreciate your statement very much. I do have some good news. The time for this hearing has been extended slightly by the happenings on the floor of the Senate and we may be able to sit this afternoon, so we are not under quite as much pressure as we were before, although we still have about 27 witnesses to hear.

We will hear now from Mr. Swan, the vice president—technology, Kennecott Copper Corp.

STATEMENT OF DAVID SWAN, VICE PRESIDENT—TECHNOLOGY, KENNECOTT COPPER CORP.

Mr. Swan. Thank you, Mr. Chairman. I am here also as the chairman of the American Mining Congress Environmental Matters Committee. My testimony is related to the mining industry's relation to environmental control in the framework of a national minerals policy. Our industry will fully and enthusiastically collaborate in achieving the goal of improved environmental quality in the United States, with the attainment of this goal requiring, of course, consideration of the optimum balancing of costs and benefits derived, both short and long term.

In this light, I would like to discuss first some of the factors peculiar to mining which influence—and are influenced by—environmental considerations; then stress the importance of setting realistic goals for environmental quality which reflect the actual needs and aspirations of the people of our country; and, finally, the need to implement environmental control policies so as to minimize the time and effort required to attain the desired improvements in our environmental quality.

The nature of mining requires that provisions be made for both temporary and permanent disposal of the wastes which often comprise a large portion of the mine output.

Thus, in any mining venture, utilization of air, water, and land resources for processing, storage, and disposal is an integral part of the operation. The degree of usage of each of these resources is determined by its local availability, by the extent to which others are using the same resource, and by the topographic and ecologic conditions surrounding the area of the mine.

These environmental conditions very often determine the mining methods and influence the processing operations as well. For example, mines in arid areas seek to utilize dry-processing techniques. The design of the mining, milling, and smelting operation tends to be unique to each mine and forms an important part of any overall development plan. Thus an optimum economic solution of the problems involved in conducting the mining, milling, and smelting operation can be achieved only by considering the local environment as part of the total mining system.

For many years, the mining industry has been concerned with the technical problems associated with use of the environment and has developed practical solutions for most of the problems so far encountered. As further environmental quality improvement is sought, the technical difficulties and the cost of gaining each new increment of quality tend to increase by some multiplying factor as the increasing level of quality approaches perfection. Clearly, then, precise determination of environmental usage is influenced by at least five factors:

1. the characteristics of local air, land, and water resources;
2. the needs and aspirations of the mine's neighbors;
3. their shared use of the same resources;
4. the economics of the situation; and
5. the level of available technical talent and knowledge.

If optional usage of one or more of the environmental resources is frozen by, for example, the imposition of a national standard or nondegradation requirement, the other resources, whether they be land or air or water, must necessarily absorb temporary and permanent wastes produced not only by the mining operation but by all other users.

Such standards, if imposed, make the necessary tradeoffs in environmental resource use much more difficult, if not impossible, and, thus, may themselves become contributors to lessened environmental quality.

The foregoing general statements regarding the use of the environment as part of the total mining system lead to several suggestions relating to a national minerals policy.

First, the setting of environmental quality goals for the United States which are significantly higher than those of other mineral-producing countries requires recognition that the additional capital and operating cost penalties incurred in meeting these goals will tend to weaken the competitive position of the U.S. producer in both world and domestic markets. The answer lies in providing suitable credits or offsets for the cost of environmental control programs, such as tax relief or other appropriate measures as determined by Congress.

Second, better coordination is sorely needed among the many local, State, and Federal agencies concerned with defining and regulating

certain aspects of environmental quality requirements. The miner necessarily treats his environmental problem as part of a systems approach, recognizing the need to minimize all adverse environmental effects on a balanced basis at the lowest possible cost. It does no good to solve a water pollution problem by replacing it with an air pollution problem. As to land reclamation of private lands, State and local governments are rapidly and effectively assuming broad responsibility for this essentially local problem.

Unfortunately, at the Federal level, responsibility for administering the various aspects of national programs is vested in different agencies, each often preoccupied with its own mission. Further, despite repeated attempts to set up adequate coordination among the different agencies, management authority, and responsibility on an overall level often reside only with the President.

For example, the Department of Health, Education, and Welfare has major responsibility for air pollution, while water pollution and land reclamation on public lands are primary concerns of agencies in the Interior Department or the Department of Agriculture. Hopefully, a national minerals policy will provide for positive means to insure that inconsistent regulations are not adopted by Federal agencies where several are separately concerned with only one aspect of the total environmental problem.

Third, a delineation of the respective roles of local government, State government, Federal Government, and industry—as they relate to the setting of environmental standards and enforcement procedures—is essential. We believe the local area concerned is in the best position to determine the degree of environmental quality suited to its own needs and aspirations.

The role of the Federal Government should be neither regulatory nor prescriptive, but rather should be concerned primarily with (1) implementing long-range research programs which must precede the efforts to improve environmental quality by private industry and others (2) establishing and maintaining policies which encourage the supply of trained specialists needed to staff enhanced effort on environmental quality, and (3) publishing and disseminating relevant knowledge and data so that those concerned with direct efforts on improvement are adequately and realistically informed. A notable feature of the Air Quality Act of 1967 was its recognition of this role with respect to use of the air resource.

In summary, Mr. Chairman, the environmental problems generally facing the mining industry are quite different than those which characterize urbanized areas where high population density and mobile sources create an array of environmental problems.

We believe that a national minerals policy should recognize these significant differences and provide for clarification of the often conflicting Federal programs which presently exist.

Thank you very much.

Senator Moss. Thank you, Mr. Swan, for a very fine statement.

This question of environmental preservation is, of course, one of the factors that has caused a lot of discussion and some friction and I am pleased to have you address yourself to it and recognize the problem that is there and suggest that we can find a pragmatic way to approach it and deal with it.

We have been joined by Senator Stevens, a member of the committee. We are very glad to have him. He had a brief statement which I placed in the record at the point where the Senators give their opening statements. We are glad to have you, Senator Stevens.

The next witness is Charles F. Barber, a witness for the American Mining Congress. He is president of American Smelting & Refining Co.

STATEMENT OF CHARLES F. BARBER, PRESIDENT, AMERICAN SMELTING & REFINING CO.

Mr. BARBER. Thank you, Mr. Chairman. My name is Charles F. Barber. I am president of American Smelting & Refining Co. and a member of the Public Lands Committee of the American Mining Congress. I will speak briefly on public lands.

We believe that a national mining and minerals policy, as contemplated by S. 719, would provide a useful standard in formulating and administering Federal policy regarding public lands. It is important to the future economic well-being of the Nation that there be established and maintained a regime of law and policy which will permit and encourage intensive search for deposits of metals and minerals lying within the public domain and the development of mineral deposits found to exist therein.

Mineral resources not yet discovered are unlike other resources of the public domain. The forest, grassland, water, fish and wildlife resources, and so forth, can be evaluated by a visual inspection and study which is made on the surface of the land. But mineral resources lie buried and their potential is unknown and of no practical value until they have been discovered by prospecting and drilled and tested to determine their value. Searching out and evaluating these resources is the challenge of the mining industry. It is a challenge of increasing difficulty as the search extends to deeply buried deposits and utilizes new instruments and new techniques developed to probe more effectively the unseen geological environment.

What framework of law and policy is best calculated to encourage this search for minerals on the public domain? We believe that the basic principle of the present mining law has served the Nation well and should be preserved, that is, the location system which assures to the individual the right to go onto the public lands to search for, and if successful, to acquire title to valuable mineral deposits found therein.

It is this system which, over the years, has attracted to exploration and to mining the energy of courageous men and large amounts of high-risk capital—and, in the process, has provided and extended reserves of minerals for the Nation's growing needs.

The mining industry has recently made a careful study of the mining and mineral leasing laws. We are all aware that there are certain important deficiencies in the present mining laws—and we have presented to the Public Land Law Review Commission detailed recommendations to deal with these problems. They are contained in a brochure which is available to members of the committee.

These include recommendations to deal with the clearing of the public domain of abandoned mining claims, avoidance of destructive

location requirements, prevention of the misuse of mining laws by persons seeking public lands for nonmining purposes, payment for surface resources where fee title is acquired by the patentee, and various other amendments designed to assist the mining industry to cope with the requirements of new exploration and mining methods and the large scale of modern, low-grade, open-pit operations.

Of course, no regime of law can be effective unless the mining industry has access to the public domain. Valuable mineral deposits are rare indeed and no one can know with certainty where they may lie hidden. A national minerals policy, therefore, should assure that the public lands, with very limited exceptions, remain open to exploration for minerals and to mining. It is important to the Nation that no area be closed to exploration and to mining in the absence of a compelling national interest.

What is a compelling national interest that would justify withdrawing an area from mineral location? Withdrawals for defense installations provide examples. This issue of withdrawal was central in the 4 years of debate that culminated in the Wilderness Act of 1964, which provides for 20 years of exploration before the designated wilderness areas would be closed for mineral location. Looking ahead, the question of compelling national interest cannot be treated in a doctrinaire manner—each situation must be considered on its merits against a policy which should encourage mining in the absence of compelling circumstances to the contrary.

In recent years, the national importance of the mineral reserves of our public lands has, to a significant degree, been lost sight of, and subordinated, in some instances without a clear understanding of the factors involved, to other less imperative values. An established minerals policy should restore a proper balance among the differing and competing resource values of our public lands.

The mining industry endorses the principle of multiple use of the public lands. Present-day exploration and mining procedures, like present-day farming, lumbering, and industrial activities, are, with relatively few exceptions, but remotely related to procedures of 25 or more years ago. The mining industry recognizes that it is the industry's continuing responsibility to minimize adverse effects of mining on other resource values and the industry is hard at work at the task of demonstrating its responsibility in this regard. A national minerals policy should recognize that, with rare exception, the full development of our mineral resources can be accomplished in a manner fully consistent with sound conservation principles.

Thank you, Mr. Chairman.

Senator Moss. Thank you, Mr. Barber. That was a very fine statement and on a very important phase of the whole subject matter that we are considering.

We will now hear from Lindsay F. Johnson, president, the New Jersey Zinc Co.

STATEMENT OF LINDSAY F. JOHNSON, PRESIDENT, THE NEW JERSEY ZINC CO.

Mr. JOHNSON. Thank you, Mr. Chairman.

I appear also today as director of the American Mining Congress and chairman of its strategic stockpile committee. I have a prepared

statement and, in the interests of saving time, rather than reading it in its entirety I will comment briefly on its substance and conclusions.

Senator Moss. Thank you, sir. The entire statement will go in the record at the end of your remarks.

Mr. JOHNSON. Thank you, Mr. Chairman.

The statement does suggest that any consideration of the minerals policy for the United States must of necessity include the matter of Government stockpiles. It discusses at some length, as has been brought out in the testimony elsewhere, the dependence of the United States on imports of metals and minerals that are critical to us, particularly in times of emergency.

It also indicates that the development of mining reserves in this country, as in any country, is a long-range proposition, that it is usually many years from the decision to develop reserves to getting production. It suggests that the mining industry, therefore, is not able to respond rapidly on all occasions to the demand for greater volume of metals which could be the case in time of emergency.

It points out that in times of stress even though transportation and other problems can be solved, that sometimes usual sources of materials disappear and it concludes that the strategic advantage of a carefully conceived and prudently accumulated and well-conserved and administered stockpile of metals and minerals is abundantly clear and something this Nation should have for a matter of security.

As regards the effect of stockpiles on the basic industry in this country, the statement suggests that the stability of such industry would not necessarily be affected by the presence or absence of Government stockpiles. It could, however, be grossly affected by the way in which stockpiles are accumulated, the way in which they are administered and the way in which metals and minerals are released from those stockpiles.

The statement also points out that our recent experience with stockpiles has shown that the program as originally initiated has veered very far from the principle on which it was founded. The stockpile has, for example, been used as a haven for bartered materials to take in excess foreign production of those materials, it has been used in lieu of more realistic measures of protecting domestic industries by taking up production from them rather than having their position protected by quotas or other means of control of imports.

It points out that the uncertainties that have arisen from the whole stockpile situation as it has been permitted to vary from principle has been a cause of great concern to the domestic industry and to other governments and industries in other countries as well. This has introduced a sense of instability and uncertainty which, without question, has clouded positive thinking and action for strengthening domestic mining.

The statement does suggest that if we are to have a constructive minerals policy such as we now seek to promote the stability and growth of the domestic industry, and if we are to have stockpiles, then among the many things that must be taken into account in the setting of a policy is to have a clearly defined policy on stockpiles that will insure the accomplishment of security but which will remove and avoid the uncertainties now prevailing and confine the use of stockpiles to the purposes for which they are intended.

It is but one of the many important factors that a national mineral policy will have to take into account, and the purpose of this segment of the testimony and the statement is to bring that to the attention of the committee. We appreciate the opportunity to do so. Thank you.

Senator Moss. Thank you. Mr. Johnson, for your statement and your summary of it for us. It was done very lucidly and well. Thank you.

(The statement referred to follows:)

STATEMENT OF LINDSAY F. JOHNSON, PRESIDENT, THE NEW JERSEY ZINC CO., ON BEHALF OF THE AMERICAN MINING CONGRESS

Mr. Chairman and members of the committee: I am Lindsay F. Johnson, President of The New Jersey Zinc Company.

Any consideration and determination of a minerals policy for the United States must include the matter of Government stockpiling of strategic and critical metals and minerals.

This is not only for the reason that the nation should have such stockpiles as a matter of security, but also because we already have stockpiles with the many problems involving their use that have arisen from lack of definition or misinterpretation or misunderstanding of such policy as may exist at present.

As to the needs in the interest of national security, it is difficult to dispute the wisdom of having for use in emergency an adequate supply of materials that could rapidly become critically scarce when an emergency arises, an event we have seen in the past in the case of metals and minerals.

It is well known that except for coal and molybdenum the United States is partially or wholly dependent on imports for even its normal needs of most of the metals and minerals that are the foundation of our economy and are those that come to critical use in emergencies.

In some cases this dependence on foreign sources is due to there being no known deposits of particular minerals within our borders. In other cases domestic sources are very limited in relation to our needs, and in still others we have not been able to locate or economically develop reserves in competition with foreign sources.

It must be borne in mind that development of mineral reserves is a long-range proposition and even though reserves are available it is a matter of years from the beginning of development to production.

The mining industry cannot, therefore, always respond rapidly to emergency demands for more minerals to replace those that might not be available from usual foreign sources. Nor can anyone create things that are not here.

In times of stress, even though transportation problems can be overcome with difficulty and usually at great loss, some sources are not longer available and the production from others has a way of fleeing to other markets, sometimes for reasons other than price.

In the last great emergency we found ourselves scouring the world with great difficulty and at great expense to partially satiate our need for metals and minerals.

The strategic advantage of carefully conceived, prudently accumulated and well conserved and administered stockpiles of metals and minerals is abundantly clear.

The basic stability of the United States mining industry would not necessarily be affected by the absence or presence of Government stockpiles. Its stability which is the foundation for strength and necessary growth, can be however, greatly affected by the manner in which stockpiles are accumulated and managed and the circumstances in which stockpiled metals and minerals are released from the stockpiles.

In the legislation under which the existing stockpiles have been accumulated the Congress wisely reserved to itself approval for withdrawal of stockpiled materials except in cases of declared national emergency, and this very likely is the only thing that has avoided grave impact on the markets for many metals and minerals during the past several years.

However, in the method of accumulation the determination of objectives and the management of it, the stockpile program has veered very far from the basic principles on which it was initiated.

Rather than having been accumulated in a prudent manner the stockpiles have been havens for bartered materials to absorb excess foreign production

of them. They have been used in lieu of more realistic measures of control in an effort to support production in domestic industries that have been beset by excessive and unwarranted imports. They have been looked upon alternately as great assets or as great liabilities, depending on political and economic climates, and there have been incomprehensible variations in the setting of stockpile objectives.

The uncertainties arising from the whole stockpile situation as it has been permitted to vary from basic principle has been a cause of great concern to the domestic mining industry and to other governments and industries. It has introduced a sense of instability and uncertainty which without question has clouded positive thinking and action for strengthening domestic mining.

If we are to have a broad and constructive minerals policy, such as is now sought, to promote stability and growth of domestic mining, and if we are to have stockpiles, then among the many things that must be taken into account is the setting of a clearly defined policy on stockpiles that will insure the accomplishment of security, but which will remove and avoid the uncertainties now prevailing and confine the use of stockpiles to the purposes for which they are intended.

We believe the legislation now proposed by Senator Allott and his distinguished colleagues will set a pattern, an atmosphere and a sense of direction required for the evolution and adoption of a national minerals policy that will be all-encompassing and take into account all of the factors that will lead to a strong, stable and expanding minerals industry.

The purpose of this segment of our testimony has been to bring out that well-conceived, well-directed and well-managed stockpiles of metals and minerals constitute one of the important factors, and we appreciate this opportunity to do so.

Senator Moss. Mr. Peel, who is on the tax committee, and is a partner of Miller & Chevalier, is next.

STATEMENT OF FRED W. PEEL, MILLER & CHEVALIER

Mr. PEEL. Thank you, Mr. Chairman.

With your permission I will submit my statement for the record and summarize it briefly.

Senator Moss. Thank you, sir. You may do that.

Mr. PEEL. With respect to mine finance, our mining industry is facing a prospect of financing an expansion of production necessary to meet a fourfold increase in minerals demand over the next generation. Our only hope is through low-cost operation of the mining of the poorer and thinner grades of ore. This can only be done by large-scale mining. This requires a huge capital investment per employee.

In fact a recent survey of the 500 largest corporations by Fortune magazine showed that the mining companies had capital assets per employee in excess of $100,000, by far the largest investment per employee for any category of industry.

To attract adequate financing, it is important that our Government's minerals policy be stable, well defined, and consistently applied. Above all, it should make sure that the actions of the Government do not impede the task of financing this needed expansion.

With respect to taxation, mining must yield an after-tax rate of return that will be sufficient to attract the necessary investment. Thus the tax burden must not be so heavy as to make the after-tax yield unattractive to new capital. Our Federal tax policies with respect to the mining industry need improvement in many respects, but they have by and large permitted the growth of a healthy American mining industry.

One point that should be emphasized above all with respect to taxing of the minerals industry is that the industry must be able in planning and financing to rely on the existing tax policies continuing. This is particularly important because of the long leadtime. It may take as much as 8 to 10 years to develop a mine between the time that the decision is made to open a new mine and the time that the development is completed and commercial production gets underway.

Thus, a mining operation is planned and financed on the basis of assumptions as to its tax treatment many years in the future. We must avoid disrupting financial planning for the expansion of the mining industry through hasty or temporary tax changes.

Thank you, Mr. Chairman.

Senator Moss. Thank you very much, Mr. Peel, for the fine statement dealing with the finance and tax policy matter.

(The statement referred to follows:)

STATEMENT OF FRED W. PEEL, CHAIRMAN, AMC TAX COMMITTEE, AND PARTNER, MILLER & CHEVALIER, ON BEHALF OF THE AMERICAN MINING CONGRESS

Mr. Chairman and members of the committee, I am Fred W. Peel, Chairman of the Tax Committee of the American Mining Congress and a partner in the Washington law firm of Miller & Chevalier. I am testifying today on the relationship of mine finance and tax policy to S. 719.

MINE FINANCE

Our mining industry is facing the awesome prospect of financing an expansion of production necessary to meet a fourfold increase in minerals demand over the next generation. There is a tremendous need both for equity capital and for debt capital.

Large-scale mining operations, with their attendant financing problems, cannot be avoided if we are to meet the mineral demand. The richer, more easily mined veins of ore have been mined out. Now we must look to the poorer, thinner grades, and the only hope for low-cost operation under these conditions is by large-scale mining, with a huge capital investment per employee. That is why a recent survey by *Fortune* magazine of the 500 largest corporations showed that the mining companies in that group had capital assets in excess of $100,000 per employee—by far the largest investment per employee for any category of industry.

The sheer magnitude of the investment needed to develop and put in operation a large-scale mechanized mine is so great that it presents unique financing problems. For example, the Kennecott Copper Corporation recently spent $100,000,000 in a program at its Bingham Canyon open pit copper mine in Utah merely to maintain copper production at the mine at its present level.

To attract adequate financing, it is important that our Government's minerals policy be stable, well-defined, and consistently applied. Above all, it should make sure that the actions of the Government do not impede the task of financing the needed expansion.

TAXATION

Put briefly, mining must yield an after-tax rate of return that will be sufficient to attract the necessary investment. Thus, the tax burden must not be so heavy as to make the after-tax yield unattractive to new capital.

While our Federal tax policies affecting the mining industry need improvement in many respects, they have, by and large, permitted the growth of a healthy American mining industry. Heretofore Congress has recognized the importance of preventing the income tax from suppressing the development of the mining industry.

The last comprehensive review of the objectives of our Government vis-a-vis the minerals industry was made by the President's Materials Policy Commission, the so-called Paley Commission, which reported in June, 1952. With respect to taxation, this report said:

"In short, the device of percentage depletion as an incentive to minerals exploration is not without its limitations. But no alternative method of taxation

has come to the Commission's attention or could be devised by the Commission which, in its judgment, promises to overcome these limitations and still achieve the desired results, particularly not without seriously dislocating well established capital values and other arrangements in the industries concerned, with highly adverse effects on supply. Taking the practical situation as it finds it, the Commission believes that any radical alteration of the existing tax arrangements would be undesirable."

This statement is still true today.

One point that should be emphasized above all with respect to taxing the minerals industry is that the industry must be able, in planning and financing, to rely on existing tax policies continuing. This is particularly important for mining because of the long lead time, which means that funds expended may not begin to yield a return for years. As much as 8 or 10 years may elapse between the time a decision is made to open a new mine and the time the development work is completed and commercial production gets under way. Thus, a mining operation is planned and financed on the basis of assumptions as to its tax treatment many years in the future. We must avoid disrupting financial planning for the expansion of the mining industry through hasty or temporary tax changes.

Thank you.

Senator Moss. Mr. Donohue, president, American Metal Climax, Inc., is next.

STATEMENT OF DONALD J. DONAHUE, PRESIDENT, AMERICAN METAL CLIMAX, INC.

Mr. DONAHUE. Sir, I will also summarize my statement and submit it for the record.

Senator Moss. Very good. The entire statement will go in the record at the end of your summary.

Mr. DONAHUE. As my colleague, Mr. Fletcher, has already said, it is not possible for the United States to be self-sufficient in minerals and metals vital to its future progress. A great many of the important metallic minerals are virtually unavailable within the United States and most of the major metals are in insufficient supply at competitive costs within our borders. Nothing that we can see in the future will change this situation. In view of this, the foreign policy of the United States and its foreign trade in minerals and metals are bound to be affected.

In the thoughtful development of a national mining and minerals policy, therefore, these must be considered:

First, American private investment in exploration and in the development of foreign resources must be encouraged, because it is of vital interest to U.S. manufacturers and therefore U.S. consumers to have access to raw materials at costs competitive with those of foreign manufacturers.

Second, American investment abroad must have a reasonable degree of protection against the risk of uncompensated expropriation.

Third, notwithstanding our great and growing reliance on imports of most minerals and metals, it may be necessary to take special cognizance of some cases where imports are inconsistent with an economically sound domestic industry.

Those of us engaged in exploration and mineral development around the globe see ever-increasing evidence that other nations recognize the imperative of finding new mineral resources wherever they may be. The Japanese, the French, and the Germans were not well endowed

with mineral raw materials. Nevertheless they are important factors in the industrial strength of the free world.

Everywhere we look in the world today we find these people seeking new resources. They are stimulated by their governments which, as a matter of national policy, are prepared to make large amounts of capital available at low cost in order to assure raw material supply. By contrast American mining companies are hampered by the foreign direct investment limitations which could very well preclude the development of important foreign mineral discoveries under American ownership.

With all the attention currently being addressed to the problem of inflation, we need not take time to underscore its importance. It is sufficient to say that inflation can undermine all of our efforts, yours in the Congress and ours in private industry, to meet the objectives of S. 719.

It would be remiss, however, if we did not point out the outstanding record of the U.S. mining industry with respect to the balance of payments. During the 8-year period preceding the foreign direct investment control program, the net favorable contribution of the mining industry from foreign investments to the U.S. balance of payments was in excess of $2 billion. Moreover by maintaining a reliable supply of low-cost raw materials the mining industry helps to enable the U.S. manufacturing industries to compete effectively in international markets, further contributing to a favorable balance of payments.

As we have said, there are special considerations and risks in investment in some areas of the world particularly when the investment is concerned with the extraction of native resources. Growing nationalism and the burgeoning aspirations of people throughout the world can be accommodated by diplomacy and statesmanship on the part of the American industrialist.

However, there have been and surely will be instances where another nation may expropriate American-owned mining industries without prompt and adequate compensation. In such cases the risk is not only loss of private American investment, but loss of U.S. access to raw materials as well. To guard against such developments we regard it as esential that the U.S. Government in its foreign policy be prepared to deal promptly with such situations.

Finally, in some cases imports may be inconsistent with a sound domestic industry. No industry so reliant on the development of foreign resources and so experienced in international trade as the American mining industry can logically advocate a policy of general protectionism, and we do not. At the same time we cannot avoid recognition of the fact that in some cases at some times competitive pressures from foreign materials may seriously undermine the economic viability of some segments of the domestic industry. For this reason the American Mining Congress in its 1968 declaration of policy suggested that in such cases selective duties for other imports or other import restrictions may be necessary.

It is a delicate task, indeed, to be internationalists on the one side and protectionists on others. The implementation of such a seemingly contradictory foreign trade policy undoubtedly burdens the architects of our overall foreign policy. Nevertheless, we urge simply that the national mining and minerals policy take cognizance of the fact that

such philosophical conflict may occur and may require a special response.

Senator Moss. Thank you, Mr. Donahue, for your very fine statement and your section of the presentation having to do with foreign trade and foreign exploration.

(The statement referred to follows:)

STATEMENT OF DONALD J. DONAHUE, PRESIDENT, AMERICAN METAL CLIMAX, INC., ON BEHALF OF THE AMERICAN MINING CONGRESS

Mr. Chairman and members of the committee, I am Donald J. Donahue, President of American Metal Climax, Inc.

As my colleague, Mr. Fletcher, has already indicated, it is not possible for the United States to be self-sufficient in the minerals and metals vital to its future progress.

We now rely almost exclusively on non-U.S. sources for bauxite, beryl, asbestos, chromite, cobalt, manganese, columbium, and nickel. Rutile (a raw form of titanium), tantalum (a key commodity in the electronics industry), copper, lead, zinc, and iron ore must all be imported in significant quantities. These minerals are either not available in the United States in sufficient quantities or cannot be produced at costs competitive with foreign sources.

The nation's enormous future requirements for these raw materials promise no respite from this reliance on non-U.S. resources.

The ramifications of this fact to the foreign policy of the United States and to its foreign trade in minerals and metals are many and varied. In the thoughtful development of a National Mining and Minerals Policy, these must be considered:

First, American private investment in exploration and in the development of foreign resources must be encouraged, because it is of vital interest to United States manufacturers and therefore U.S. consumers to have access to raw materials at costs competitive with those of foreign manufacturers.

Second, American investment abroad must have a reasonable degree of protection against the risk of uncompensated expropriation.

Third, notwithstanding our great and growing reliance on imports of most minerals and metals, it may be necessary to take special cognizance of some cases where imports are inconsistent with an economically sound domestic industry.

Let me comment briefly on each of these points:

1. American private investment must be encouraged

Those of us engaged in exploration around the globe see ever increasing evidence that other nations recognize the imperative of finding new mineral resources wherever they may be.

The Japanese, unlike the United States never well endowed with mineral raw materials, have built the second largest position of industrial strength in the Free World. Everywhere we look in the world today, we find the Japanese actively seeking new resources. They are stimulated, I believe, by their government, which as a matter of national policy, is prepared to make large amounts of capital available at low interest rates in order to assure raw material supply. Similar policies are pursued by the Germans and the French.

By contrast, American mining companies are hampered by Foreign Direct Investment limitations which could very well preclude the development of important foreign mineral discoveries.

Restrictions on American investment abroad are hardly likely to encourage American enterprise in the pursuit of new foreign mineral resources. However, the interests of our manufacturers and, therefore, those of the consumers of their production in many instances will be best served by having foreign sources of minerals owned by United States firms.

With all the attention currently being addressed to the problem of inflation, I need not take your time to underscore its importance. It is sufficient to say that inflation can undermine all of our efforts—yours in the Congress and ours in private industry—to meet the objectives of S. 719.

Neither is it necessary for me to belabor the importance of a favorable United States balance of payments.

I would be remiss, however, if I did not point out the outstanding record of the U.S. mining industry with respect to the balance of payments. During the eight-

year period immediately preceding the Foreign Direct Investment mandatory control program started in 1968, the net favorable contribution of the mining industry from its foreign investments to the U.S. balance of payments was in excess of 2 billion dollars.

Moreover, by maintaining a reliable supply of low cost raw materials, the mining industry helps to enable the U.S. manufacturing industry to compete effectively in international markets, further contributing to a favorable balance of payments.

This record, combined with the critical need for additional American development of foreign mineral resources, raises real question as to the propriety of continued limitations on the Foreign Direct Investment of the United States mining industry.

2. American investment abroad must have reasonable protection against uncompensated expropriation

There are special considerations—risks, if you will—in investment in some areas of the world, particularly when the investment is concerned with the extraction of native resources.

Usually, growing nationalism and the burgeoning aspiration of peoples throughout the world for self-determination can be accommodated by diplomacy and statesmanship on the part of the American industrialist in his relations with the host country.

There have been, however, and surely will be instances where another nation may expropriate American owned mining properties without prompt and adequate compensation.

In such cases the risk is not only loss of American private investment but loss of United States access to the vital raw materials.

To guard against such developments, we regard it as essential that the United States government in its foreign policy be prepared to deal with such situations.

This is clearly a very important aspect of a National Mining and Minerals Policy.

3. In some cases, imports may be inconsistent with a sound domestic industry

No industry so reliant on the development of foreign resources and so experienced in international trade as the American mining industry can logically advocate a policy of general protectionism; and we do not.

At the same time we cannot avoid recognition of the fact that in some few cases at some times competitive pressures from foreign materials may seriously undermine the economic viability of some segments of the domestic industry. The American Mining Congress in its 1968 Declaration of Policy suggested that in such cases "selective duties or other import restrictions" may be necessary.

It is a delicate task, indeed, to be "internationalist" as to most minerals and metals and "protectionist" on others. The implementation of such a seemingly contradictory foreign trade policy undoubtedly burdens the architects of our overall foreign policy.

We urge simply that the National Mining and Minerals Policy take cognizance of the fact that such philosophical conflict may occur, and may require a special response.

In summary, Mr. Chairman, I believe it is clear that the United States mining industry must be able to operate effectively in international competition if it is to respond adequately to this nation's enormous future requirements for metals and minerals. I believe that the American mining industry has responded to this challenge by turning its attention increasingly abroad during recent years, and, I would hope that future mineral policies of the government will recognize the need to support these international endeavors as well as to maintain a strong domestic mineral base.

Mr. Chairman, like my colleagues, I am sincerely appreciative of the opportunity to present these views, and to support the effort to forge a National Policy on Mining and Minerals.

Thank you.

Senator Moss. We will now return to Mr. Dobbins, the president of the congress, to wind up, if he will, his testimony.

STATEMENT OF CRIS DOBBINS, PRESIDENT, AMERICAN MINING CONGRESS—Resumed

Mr. DOBBINS. Thank you, Mr. Chairman.

These several presentations have certainly demonstrated the broad scope and nature of the problems and opportunities facing our Nation in regard to mining and minerals, and the importance of a congressional declaration of national policy on this vital subject.

It is clear, we believe, that such a policy has implications to research, development and manpower, to environmental quality, to the use of public lands, to the subject of stockpiling, to tax policy and mine finance, and to foreign trade. Overall it has the most profound implications to the economic future of the United States which is based so heavily on a continuing supply of raw materials—both domestic and foreign.

The mining industry of the United States, which we represent here today, is dedicated to meeting the raw material requirements of our Nation. The support and encouragement of a national mining and minerals policy will help greatly in continuing to achieve that objective.

In closing we want to thank you for the opportunity you have given us to present our views, and we will be pleased to respond to any questions that you may have.

Senator Moss. Thank you, Mr. Dobbins, and all of you gentlemen who have given us such a well-documented and thoughtful discussion of this question of a national mining and minerals policy. I want to compliment the American Mining Congress and all of you who have appeared for the very detailed and thoughtful attention that you have given to the matter. I don't know when we have had such a broad and authoritative presentation made in this committee in this general field of mining.

I am sure that this is what Senator Allott and the rest of us who have joined him in this legislation had in mind in setting this hearing—getting before us and on the record the points that you have presented here and, together with many other outstanding witnesses we have yet to hear, I am sure we are going to make a great record.

I don't have any detailed questions to ask at this time, but I will, of course, give my colleagues an opportunity to do so. I just want to let you know what an excellent presentation I believe you have made, all of you.

Senator Allott.

Senator ALLOTT. Thank you, Mr. Chairman.

I must say that in these last 10 years I have been somewhat dismayed at the lack of progress in this field and my own inability to apparently awaken the country to what I think is one of the most serious problems facing us. But as I listened to these statements this morning, it occured to me that perhaps I was premature because I don't believe that 10 years ago or 8 years ago, or 4 years ago even, it would have been possible to get this particular group that has just testified, for example, together to testify with a recognition of all of the problems that are involved.

I don't think I shall ask questions, but I think some things need to be pointed up—for example, the relationship of mining to silver. We

have spent endless hours, the chairman of the Subcommittee on Minerals, Materials, and Fuels of the Senate Interior Committee has, in trying to reconcile the problem of our precious metals. There is no question that one of the things that put great pressure on the action of Congress in removing silver from our coinage, one which at least those of us in the West very greatly regret, has been the fact that in the executive branch of the Government, as well as in some of the committees in Congress concerned with this, there has been no disposition to provide the means by which we could increase the production of these valuable minerals, and I am speaking particularly of silver and gold.

We have had a lucid and, I think, a very clear discussion of the stockpile situation. The emphasis has been placed on the loss of skills, which is one of the great problems that must be faced—not only the loss of skills of mining engineers but the loss of the skilled man who goes into the mine to extract the ore.

We have had, not as thorough as it will take eventually, a discussion of the international aspects, including the last statement by Mr. Donahue on expropriation. I am sure that we all realize what a tremendous problem this is going to be. We have covered the field of environment very lucidly. I think particularly back 10 years ago no statement upon the relation of the mining industry to environment of the nature we have had this morning would have been forthcoming, and yet today we recognize that it is necessary.

We have not yet begun to explore the taxation means by which we might implement some of our mining policy. I don't think that subsidies are the answer, but neither do I think it can necessarily all be found in depletion.

It is a peculiar thing that we have not been able to get any of the committees in Congress or the administrations—and this is not Republican nor Democrat, but both of them—to realize that the production of these materials is necessary.

But all in all it seems to me that none of the things that you seek and that we hope to seek, those of us who joined in this bill, are really possible until we have set out and defined the limits of what a national minerals policy could be.

One final word: I just want to say to you gentlemen that this is without doubt the finest coordinated set of papers that I have ever seen in any committee before Congress. They are not repetitive. They cover in detail your own positions. None of us is so foolhardy as to believe that all of these questions are going to be resolved by this bill, but this bill is a beginning before we do solve many of the other problems which have been discussed here this morning.

I only say that I appreciate very much the effort and the time and coordination and particularly the fine quality of the statements that have been made here this morning.

Senator Moss. Thank you, Senator Allott.

Senator Stevens?

Senator Stevens. Yes, Mr. Chairman. I am sorry I was late. I was at another meeting.

I want to join Senator Allott in his comments concerning the quality of these statements. I do have a question for Mr. Peel, if I may.

I was interested in the comment about assuring continuity of our tax policy. Have you any specific recommendations as to how we might assure the continuity of the tax policies in order to give incentive for development of new mining properties? I think it would be very significant if we could have some of those recommendations, particularly from my area of Alaska. I know that we have many properties up there that could be developed if we had some real incentives for development.

Mr. PEEL. The purpose of our tax committee at this present time has been largely on trying to keep the present tax system that we have and keep it on a stable basis.

We are filing today a statement with the Senate Finance Committee in opposition to the repeal of the investment credit which, of course, is tremendously important to such a capital intensive industry as the mining industry. We anticipate that the hearings that Senator Long has announced to begin July 21 in that committee will probably also touch upon provisions affecting the mining industry.

I think, frankly, that our posture with respect to that surcharge extension bill is largely a defensive one because we are at this present time, with all the excitement about tax reform, most anxious not to lose the provisions in the tax law that have been helpful in the past in solving some of our mining problems.

Senator STEVENS. We explored in Alaska the concept of inserting a commitment for tax policy in our leases. As you know, in Alaska we lease mineral lands rather than have the allocation of the Federal mining law apply. I don't know whether that is going to develop or not. I suggest to you that it might be something that could be explored by the committee to see whether at the same time you guarantee, for instance, the royalty provisions for a period of specific years, we could do similar things in the Federal area.

I do appreciate your comments and I thank all of you gentlemen.

I hope, Mr. Chairman, that we can pursue this concept and see what we can do to rejuvenate the mining industry in my State which is sort of dying on the vine compared to our Canadian neighbors. The comparison of what is happening in Canada to what is happening in our State with the same minerals is very striking, and I don't see why we should sit back and see this happen if we can find some way to give incentive to American industry to develop the mineral resources in Alaska.

Thank you.

Senator ALLOTT. May I ask a question of Mr. Peel?

Senator Moss. Yes.

Senator ALLOTT. I have tried to be brief, and not gone into questions because of the time pressure.

Have you ever given consideration, Mr. Peel, in your group as to what effect an accelerated depletion schedule might have for the production of gold? Without providing subsidy and getting into all the problems that are involved there, it might actually increase the income by way of income tax to the United States. If the depletion were raised to a certain level, and I don't know what that should be, it might also permit the production of much gold which is not being produced at the present time. Has this question ever been studied by you?

Mr. PEEL. Yes, we have discussed that. We felt that if that were done, it would probably be necessary not only to raise the percentage depletion rate but also to raise the present limitation on depletion deduction which is 50 percent of the taxable income from the property, and I believe it would be safe to say that most, if not all, gold mining in the United States today is subject to that 50-percent limitation. So that a simple increase in the depletion rate wouldn't do, since it wouldn't make it more profitable in and of itself, without also a coordinated increase in the 50-percent net income limitation.

Senator ALLOTT. I understand that, but if these two things could be done, it would not constitute a financial burden on the Government. We would not get into the problems that we are concerned with about subsidies as we have had in some areas in the past and also we would get away from the bugaboo that our Government, in all branches, seems to have been afflicted with for a long time that gold is sacrosanct and must not be touched under any circumstances because of the chance of upsetting the whole world.

I think this is worth exploring and I hope to be able to talk with you sometime about it.

Mr. PEEL. I believe if you raised that limitation sufficiently, you could make mining gold attractive.

Senator ALLOTT. Thank you very much.

Senator MOSS. Thank you again, all of you gentlemen who have appeared here. We appreciate it very much.

We will try to hear perhaps two more witnesses this morning. As I had indicated, we are going to be able to sit this afternoon. We have some changed signals. I hope that all of the witnesses can be heard today and we will not need to call any of them at a later date.

I would like to hear from Dr. George Hill, now the dean of the College of Mines and Mineral Industries at the University of Utah, an old friend of mine and one who does a great job in this field of mines and mineral industries. We are glad to have you, Dr. Hill. You may proceed, sir.

STATEMENT OF GEORGE RICHARD HILL, DEAN, COLLEGE OF MINES AND MINERAL INDUSTRIES, UNIVERSITY OF UTAH

Dr. HILL. Thank you very much, Senator Moss.

In the United States a system of financial supports, restraints, and subsidies creates a matrix within such corporate entities operate to produce the goods and services we need at a reasonable profit to their owners. For example:

Petroleum industry.—The 27½-percent depletion allowance and the quotas on imports of petroleum protect and give incentive for the development of internal reserves of oil. Antitrust laws provide a restrictive lid on operations. Within this matrix, oil companies operate to discover and develop petroleum reserves and produce their products. Even with the present support measures, petroleum exploration efforts within the United States have dropped sharply the past 5 years.

Nuclear power.—The Government recognized that it was desirable to develop nuclear power. Therefore, a several billion dollar research

and development effort was mounted at Government expense through the Atomic Energy Commission. There was established a guaranteed price incentive for uranium ores. The Government built the plants for producing fuel elements. All this was done in order to establish an alternative source to fossil fuels for the production of electric power. All cost determining parameters for nuclear power have not yet been pinned down. For example, Federal funds in the amount of $80 million for research and development for just one type of new reactor have been allocated for 1969–70. Finally a matrix allowing competitive production of power from nuclear fuels will be established.

Agricultural products.—An example of Government assistance in agriculture has been the sugar beet industry with import quotas and tariffs coupled with controlled production. This has established a balance based on the need for U.S. self-sufficiency and on the availability of sugar at a reasonable cost to the consumer.

The role of Congress in establishing the matrices is vital since it is the agency (a) concerned with national security in time of war; (b) concerned with balance of payments and stability of our—and the world's—economy; and (c) concerned with the prosperity, well-being, and happiness of the electorate.

THE NEED FOR A MINERAL POLICY

1. *Raw materials.*—The demand for minerals upon which our material economy is built is increasing steadily. This requires the use of ever lower grade ores with more sophisticated mining—and restoration—techniques as well as technically trained engineers with a knowledge of mining, metallurgy, safety, air and water pollution control, et cetera, than ever before.

As things now stand it is, except in a few instances, more profitable to invest U.S. capital overseas and to import minerals and/or finished products than to develop our internal resources. Some changes must be made before we irreversibly lose the ability to meet our country's needs.

2. *Personnel in the mineral industries.*—The incentives and attractiveness of other areas of engineering and science have caused the production of mining and metallurgical engineers to drop to an alarmingly low level. In the past 10 or 15 years the number of colleges and universities with undergraduate curriculums in mining and metallurgical engineering has dropped by nearly one-half, from 30 to 17. In contrast, each year many new programs in space engineering, ocean engineering, and nuclear science and engineering are announced. These all receive substantial direct and indirect Government support.

The shortage of engineers with a geological background and with training in techniques prerequisite to safe and healthful operation of mines—basic ingredients in mining and metallurgical engineering curriculums—is not limited to the United States but is worldwide.

Engineers from other fields are being recruited to do the technical work in mineral production in the United States when mining and metallurgical engineers are unavailable. Unfortunately these men rarely have the background in the geological sciences and in mine safety design principles which are required to avoid serious problems in the mining operations. Many coal mines are operated without a

single mining engineer. The mine accident rate is higher than it should be as a consequence.

3. *Urgency.*—A European colleague at the recent Gordon Conference on Coal Science—June 30–July 4, 1969—expressed grave concern lest the United States allow itself to become dependent upon overseas sources of fuels and strategic minerals as Western European nations are now doing. He expressed the view that if the United States follows the same pattern his own country would, in all probability, reassess its position and turn toward the East.

Senator ALLOTT. Would you read that last sentence again? I think it is important and I didn't get it.

Dr. HILL. All right. This colleague at the Coal Science Conference expressed the view that if the United States followed the same pattern—that is, becoming more dependent on overseas supplies of minerals and fuels—his own country would in all probability reassess its position and turn toward the East.

The balance-of-payments problem will become even more acute if we don't reverse the trend and begin to develop more of our own mineral resources.

For these reasons it is most urgent that Congress adopt a national mineral policy for the United States of America.

Thank you for the privilege of appearing.

Senator Moss. Thank you, Dr. Hill. I know that you have long considered this matter that we are discussing here today and have been a very distinguished member in the field of mines and mineral industries. We appreciate your coming to give us your views and to endorse the principle of what we are trying to accomplish in this bill.

Senator Allott, do you have any questions?

Senator ALLOTT. I have no questions, but I want to compliment Dr. Hill on a very fine statement which has been a help to this hearing. Thank you very much.

Senator Moss. Thank you, sir.

Dr. HILL. Thank you.

Senator Moss. Mr. John B. Rigg, manager of the Colorado Mining Association, who, I am sure, has had quite a bit to do with the general concept that Senator Allott has proposed in his bill, is the next witness. I know that his association with Senator Allott has been long and beneficial to the whole mining industry.

Senator ALLOTT. Yes, and may I say, Mr. Chairman, that I think we are very much indebted to Mr. Rigg for his own work in helping us to assemble here a list of very fine witnesses this morning at these hearings.

Senator Moss. He brought us some ore samples, too.

STATEMENT OF JOHN B. RIGG, MANAGER, COLORADO MINING ASSOCIATION

Mr. RIGG. Mr. Chairman, thank you. My name is Jack Rigg and I am manager of the Colorado Mining Association. I have a written statement which you have. I will not read the entire statement.

Senator Moss. The entire statement will go into the record and then you highlight it and point out the parts which you particularly want to emphasize.

(The statement referred to follows:)

STATEMENT OF JOHN B. RIGG, MANAGER OF THE COLORADO MINING ASSOCIATION

Mr. Chairman, members of the Committee and guests. For many years the Colorado Mining Association, its members and officers, has believed that a National Minerals Policy for all mined resources is essential to the orderly development of those resources and proper use of the entire environment of America.

The maximum achievement of productive environmental, social and mineral values can only be accomplished through a minerals policy that recognizes:

(1) *If the mining industry can rely on a policy, it will produce metals and minerals without wild fluctuation or severe shortages, and at attractive prices.*—The domestic copper industry has done this. This has been done because the industry itself has been able to create some stability. (See Illustration No. 1)

(2) *Minerals must be developed and exploited where they are; discoveries on usable mining claims create major producing districts.*—Only 91 mining districts are responsible for approximately 98 percent of the total value, defined as past production plus unmined reserves, of all metal deposits in the West, excluding iron, uranium and vanadium ores. (Noble, James A., speech at Rocky Mountain Section, Geological Society of America, Salt Lake City, Utah, May 8, 1969.) (See Tables 1 and 2)

These districts represent far less than 2 percent of the total land area of the Western United States. Even double the number of districts would not occupy substantial amounts of land. The industry must have reliable titles in mining property, stability, access and a policy within which orderly development may occur.

(3) *Major new mineral deposits are commonly found in new areas which may have been insufficient in the past and can now be developed with new sophisticated exploration methods and advanced refining and reduction technology.*—Examples of this are the Yerington Copper Mine in Nevada, known as a mineralized area in 1918, developed in 1940 and placed in production in 1953; the Lakeshore Copper deposit in Arizona, discovered over 85 years ago and brought into production in 1968, and the current boom in the reopening and bringing into production of new silver properties.

Restrictions on prospecting and perfecting of discovery of metals which do not consider the long term nature of our industry will be harmful by forcing higher prices for basic components in consumer goods. We again remind you that if we doubled the number of mining districts the land resource area devoted to mining would rise from 2 to 4 percent in the Western United States.

(4) *Discovered properties lawfully located, once commercial, may again be commercial under new technology.*—Examples of this are: (a) the work done by the U.S. Bureau of Mines on the recovery of micronsized gold from carbonaceous ores in Nevada and (b) work done by private enterprise to develop economic methods of recovering beryllium from extensive deposits in the Spor's Mountain District of Utah. Further technological improvements may result in recovery of valuable minerals which cannot now be economically recovered.

Production depends upon cooperation, transportation including access roads, technology and sufficient stabilization to warrant the expenditure of large sums of money.

(5) *Valuable minerals can be marketed and our standard of living can be raised if technological progress is available to the mining industry.*—The United States would be producing no molybdenum whatsoever if it had to be developed under the present governmental attitude towards the industry. The United States is the Number 1 world producer of molybdenum, but molybdenum would be a mountain of minerals still in the ground if the mining industry had not done research and development for end use when marketability was five, ten and even fifty years in the future.

Here are some rocks. These rocks are ore, produced recently, at small mine operations in the Colorado Mineral Belt. Both rocks contain gold, silver, lead and zinc, typical Colorado complex ore, and the larger rock also contains copper. With a National Minerals Policy, we can develop mining and recovery techniques which will conserve the Colorado Rockies, where some of the most beautiful scenery of the world is located, together with some of the most valuable of the world's mineral deposits.

(6) *Mines must be developed and in production for availability in emergencies.*—Even after a prospect is recognized as interesting, it commonly requires 10 years or more or exploration, evaluation and development work before it

Copper Chronology 1880-1968

Federal Reserve Bank
of San Francisco - Data 1968

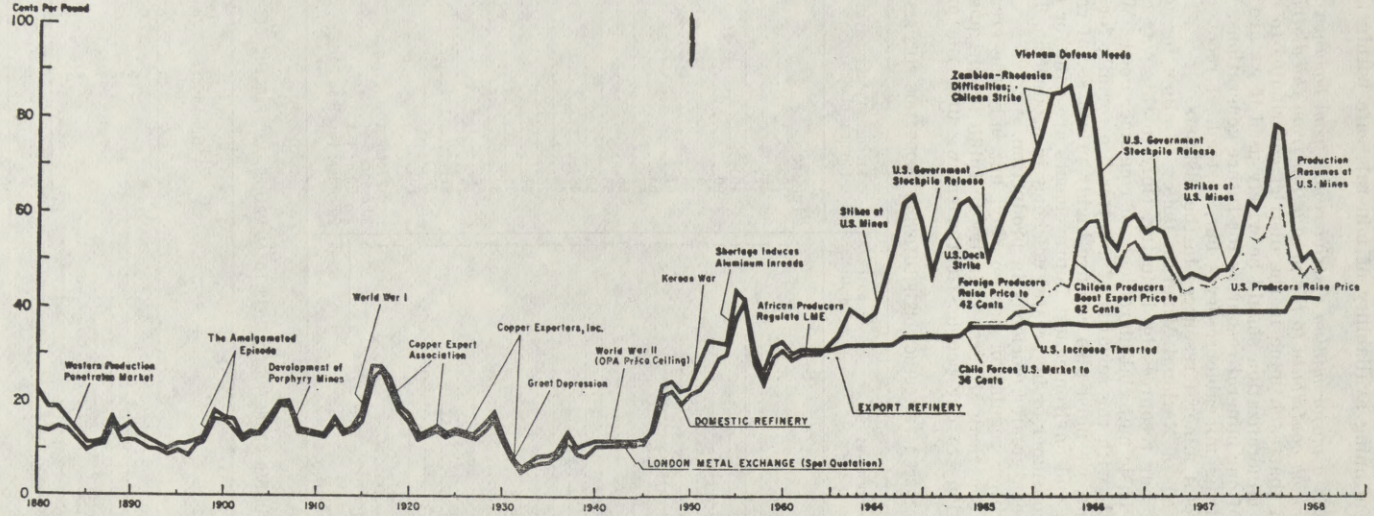

Illustration No. 1

becomes a viable producing mine. National security means a continuing vigilance plus continuing availability of minerals safe within the confines of our own borders.

(7). *Mines in a major mining district range from bonanza to marginal operations, all of which contribute to the production from the district.*—A policy must be recognized that each mine in the district contributes to overall production. Lower grade mineralization should be wisely used if we are to exercise proper stewardship of our mineral resources for future generations. We must not think of just capturing mineable reserves but, instead, of recovering in an orderly fashion the total mineral resources in the districts.

America needs a National Minerals Policy to allow for planned and stable production of our resources by industry. Only in this way can industry make available the basic material ingredients of consumer goods. We must equate the costs of metals with the rewards of a better life for all; for in addition to the economic value, we must also capture highly prized social values. Mine safety, higher wages and environmental improvements are paid for either by a higher price to the consumer or by greater efficiency in production. The American Way has always been greater efficiency in production.

We ask neither regulation nor subsidy, but only the creation of a climate allowing the American Mineral Industry to fulfill its citizenship, economic and social obligations to our people. Gentlemen, we urge the prompt adoption of S. 719.

TABLE 1.– FREQUENCY DISTRIBUTION OF PRODUCTION PLUS RESERVES

Production plus reserves (millions of dollars)	Number of districts	Production plus reserves (millions of dollars)	Number of districts
1st order:		2d order:	
5,600	1	195	1
5,500	1	150	2
4,450	1	112	1
4,000	1	100	5
3,230	1	90	1
3,000	3	75	1
2,250	1	70	1
2,043	1	67	1
2,000	3	63	1
1,520	1	57	1
1,500	3	56	1
1,000	4	53	1
950	1	50	6
700	1	46	1
600	1	45	2
535	1	38	1
520	1	37	1
500	3	35	2
405	1	32	3
400	3	30	4
325	1	29	2
300	1	27	2
270	1	26	4
250	3	25	2
245	1		
230	1	Total	47
200	3	3d order: 5–24	93
		4th order: 1–4	206
Total	45	5th order: Less than 1	(1)

[1] Several thousand.

TABLE 2.—NUMBER OF DISTRICTS, THEIR TOTAL VALUES, AND PERCENTAGES OF TOTAL VALUES

Order	Number of districts	Total value (millions of dollars)	Percentage of total value
1st	44	61,223	93.7
2d	47	2,701	4.1
3d	93	1,000	1.6
4th	206	400	.6
5th	(2)	(3)	
Total			100.0

[1] It does not seem to be worth while to count and total the large number of 5th order mines, particularly as the production data are very questionable. However, it can be demonstrated that it requires several thousand of these to equal the value of 1 average 1st order district. There are a few thousand such mines on the map but certainly not tens of thousands.
[2] Thousands.
Unknown.

Mr. RIGG. First of all, in support of this, if the mining industry can rely on a policy it will produce metals and minerals without wild fluctuation or severe shortages and at attractive prices. This copper chronology illustrated indicates how the domestic copper industry has done. This has been accomplished because the industry itself has been able to create some stability.

Notice the line which is the domestic copper price. In the period 1960 through 1968 it is a farily stable price, while the upper line is the world price of copper with wild fluctuations and tremendous increases over the domestic price. The copper industry has saved the American consumer millions of dollars in this period because of its own stability.

Second, minerals must be developed and exploited where they are. Discoveries on usable mining claims create major producing districts. I have attached to the statement two tables which show that there are only 91 mining districts responsible for approximately 98 percent of the total value of all production, plus unmined reserves in the metal deposits in the West.

This is to me a very significant thing in that the districts represent far less than 2 percent of the total land area and if we would double this we still have no large use of land for mining. If we have reliable titles, stability, access, and a policy, we can develop these in an orderly manner.

Third, major new mineral deposits are commonly found in new areas which may have been insufficient in the past and can now be developed with new technology. Examples of this are the Yerington Copper Mine in Nevada, known as a mineralized area in 1918, devloped in 1940 and placed in production in 1953; the Lakeshore copper deposit in Arizona, discovered over 85 years ago and brought into production in 1968. We again remind you that we only have about 2 percent of the land.

Fourth, discovered properties lawfully located, once commercial, may again be commercial under new technology. Examples of this are: (*a*) the work done by the U.S. Bureau of Mines on the recovery of micronsized gold from carbonaceous ores in Nevada, and (*b*) work done by private enterprise to develop economic methods of recovering beryllium from extensive deposits in the Spor's Mountain District of Utah.

Five, valuable minerals can be marketed and our standard of living can be raised if tchnological progress is available to the mining industry. The United States would be producing no molybdenum whatsoever if it had to be developed under the present governmental attitude toward the industry.

The United States is the No. 1 world producer of molybdenum, but molybdenum would be a mountain of mineral still in the ground if the mining industry had not done research and development for end use when marketability was 5, 10, and even 50 years in the future.

You have some rocks on your desk up there and these rocks are ore, produced recently, at small mine operations in the Colorado Mineral Belt. Both rocks contain gold, silver, lead, and zinc, typical Colorado complex ore, and the larger rock also contains copper. With a national minerals policy, we can develop mining and recovery techniques which will conserve the Colorado Rockies, where some of the most

beautiful scenery in the world is located, together with some of the most valuable of the world's mineral deposits.

Mines in a major mining district range from bonanza to marginal operations, all of which contribute to the production from the district. A policy must be recognized that each mine in the district contributes to overall production. Lower grade mineralization should be wisely used if we are to exercise proper stewardship of our mineral resources for future generations. We must not think of just capturing mineable reserves but, instead, of recovering in an orderly fashion, the total mineral resources in the districts.

We must equate the costs of metals with the rewards of a better life for all; for in addition to the economic value, we must also capture highly prized social values. Mine safety, higher wages, and environmental improvements are paid for either by a higher price to the consumer or by greater efficiency in production. The American way has always been greater efficiency in production.

We ask neither regulation nor subsidy, but only the creation of a climate allowing the American mineral industry to fulfill its citizenship, economic, and social obligations to our people.

Mr. Chairman and gentlemen, we urge the prompt adoption of S. 719. Thank you.

Senator Moss. Thank you, Mr. Rigg, very much for a very well-written statement. I had time to read through it and you made reference to the note headings in it and highlighted it for us.

What you have to say, of course, is so fundamental. If we don't develop a policy for mining and minerals, and this has to be broad enough to include land use, pollution, and all of these other impinging factors, then we just go along from crisis to crisis and inefficiency to inefficiency, rather than resolve our problem.

We have to do both. We have to preserve our environment and at the same time we must develop and exploit the mineral resources so essential to our economy. This is one thing I have been trying to develop for some time in trying to get a department of natural resources established, because I thought perhaps that is where these problems could all come under one heading.

I am pleased to have you come and give us your views on the bill before us, and your experience and position with the Colorado Mining Association makes you a very able spokesman, one that we want to listen to in this committee.

Senator Allott?

Senator Allott. Thank you very much. I have appreciated very much not only the support of Mr. Rigg, but also the Colorado Mining Association through the years with respect to this. Mr. Rigg, I know you well enough that you didn't bring these rocks up here just to lay them on our desk that we could use them for watch fobs.

You mentioned two or three minerals in these rocks. What was the real reason you brought them up here, to demonstrate what? I know that you had a reason.

Mr. Rigg. To show you that we mine these rocks and bring them to the surface and liberate the minerals and then throw away about 75 percent of the total gross volume.

Senator ALLOTT. What is in the 75 percent? Are there recoverable minerals in that which are not now being recovered?

Mr. RIGG. There are other minerals. Each of these rocks contains about 29 specific elements and, as an example, in the past bismuth was not recovered from our Colorado ores. Starting about 5 years ago we were recovering bismuth and today we are encouraged to recover this along with our basic gold, silver, lead and zinc.

Senator ALLOTT. Do you believe that the bill under consideration here, considering all of the research and emphasis on more people, more qualified mining engineers and the allied disciplines, would help to increase the production of these other valuable minerals in these complex ores which we have in Colorado and the West?

Mr. RIGG. Yes, I think it would. We have the problem of technology of recovery and also, to use our old word "environment" again, but by environment I mean our social environment, the attitude of the citizens toward each other and the Government, and vice versa.

We are not attuned to a national minerals policy because we, society, have not been able to see that such a policy would encourage the technical advantages needed to recover our mine products. The technology is there. It is exciting and it should be encouraged.

Senator ALLOTT. I would like to ask this question: Oftentimes it is impossible to get everyone present at these meetings. Your particular association has in its membership everyone from very large operators down to many one-man operations or maybe two-men operations, and I think in one instance a one-woman operation, if I remember correctly. Do you find that this concept, the approach of this bill is supported not only by the larger mining interests but also by the smaller individual membership?

Mr. RIGG. Yes, I do, Senator. Everyone with whom I have talked, the small mine operators as well as the large operators, is enthusiastic in their support for this bill.

Senator ALLOTT. Thank you very much.

Mr. Chairman, I have had letters from the Western States, particularly the mining interests, supporting this bill and I would like to have them included and made a part of the record at this point in Mr. Rigg's testimony. I have no further questions. I want to thank you again, Jack, and I mean it sincerely, for all your efforts.

Senator Moss. Thank you, Mr. Rigg. The letters will be placed in the record at this point.

(The documents referred to follow:)

NEVADA MINING ASSOCIATION, INC.,
RENO, NEV., *June 3, 1969.*

Hon. GORDON ALLOTT,
New Senate Office Building, Washington, D.C.

DEAR SENATOR ALLOTT: Nevada Mining Association, Inc., wishes to go on record as endorsing S. 719, a bill to establish a national mining and minerals policy.

All of the Western States, and Nevada in particular, have long been in favor of establishing a sound national minerals policy which will be instrumental in maintaining a reliable supply of metals and minerals which is of vital importance to the domestic economy.

Respectfully yours,

PAUL GEMMILL, *Executive Secretary.*

WYOMING MINING ASSOCIATION,
Riverton, Wyo., June 3, 1969.

Hon. GORDON ALLOTT,
New Senate Office Building,
Washington, D.C.

DEAR SENATOR: The Wyoming Mining Association endorses S. 719, the "Mining and Minerals Policy Act of 1969". We note that you are the sponsor of this Bill and therefore assume that you favor this proposed legislation. We commend you on this position.

Respectfully yours,

R. W. BEAMER, *Executive Secretary.*

IDAHO MINING ASSOCIATION,
Boise, Idaho, June 5, 1969.

Senator GORDON ALLOTT,
New Senate Office Building,
Washington, D.C.

DEAR SENATOR ALLOTT: It has come to our attention that your bill (S. 719) to establish a national mining and minerals policy has been scheduled for hearings on June 11 in Washington, D.C.

Since it will not be possible for our association to have a representative in attendance at the hearing, we wish to express for the record our strong endorsement and support of this legislation.

For many years past the Idaho Mining Association has consistently urged the adoption of a strong and forthright national minerals policy. We have long been convinced that such a policy, vigorously pursued and implemented, is absolutely essential to the maintenance of a strong and productive mining industry in this Nation.

We commend your sponsorship of this legislation and sincerely trust it will receive prompt and favorable consideration by the Congress.

Sincerely,

A. J. FISKE, *Secretary.*

NEW MEXICO MINING ASSOCIATION,
Santa Fe., N. Mex., June 5, 1969.

Hon. GORDON ALLOTT,
New Senate Office Building,
Washington, D.C.

DEAR SENATOR ALLOTT: The members of the New Mexico Mining Association strongly support S. 719 and urge its passage. We believe that a national policy to foster and encourage a basic segment of our economic structure—mining—is long overdue.

We, in New Mexico, appreciate your interest in the welfare of the mining industry.

WILLIAM F. DARMITZEL, *Executive Director.*

THE DENVER MINING CLUB, LTD.,
Denver, Colo., June 5, 1969.

Hon. GORDON ALLOTT,
U.S. Senate, Washington, D.C.

DEAR SENATOR: The Denver Mining Club, over 2,000 members, endorses S. 719, A National Minerals Policy. More power to you!

Cordially,

GUY L. V. EMERSON, *President.*

MINING ASSOCIATION OF SOUTHERN CALIFORNIA,
Los Angeles, Calif., May 29, 1969.

Hon. GORDON ALLOTT,
New Senate Office Building,
Washington, D.C.

DEAR SENATOR: Mr. John R. Rigg, Manager of The Colorado Mining Association, has been been good enough to send me a copy of Senate Bill No. 719, intro-

duced by you and other Senators, "To establish a national mining and mineral policy".

We most heartily endorse the principle of that Bill. We have been waiting for such a policy for many years.

The writer of this letter began his practice of law at Prescott, Arizona, in September, 1915. He went to work for Leroy Anderson, who was General Counsel of the United Verde Copper Company, which had its very large mine at Jerome, Arizona. Therefore, the writer has been associated with mining and oil production for almost 54 years.

The two earth industries—agriculture and mining—are the very foundation of civilization. As a matter of fact, there would not be much food for many of us if it were not for minerals, beginning with the steel plow and on through the other agricultural machinery.

The national mineral and mining policy is important for "We The People" in our daily lives and is certainly necessary for our national defense.

Assuring you of our hearty support of every endeavor to secure a substantial mining and mineral policy and offering to assist in any way we can, we are

Yours very truly,

GEORGE W. NILSSON, *President.*

NORTHWEST MINING ASSOCIATION,
Spokane, Wash., June 2, 1969.

Hon. GORDON L. ALLOTT,
New Senate Office Building,
Washington, D.C.

DEAR SENATOR ALLOTT: Your bill S. 719 establishing a national minerals policy would be the first important step towards a reasonable and sensible approach by Congress and the public for providing for the orderly development of our mineral resources and reserves. This Association is wholeheartedly in favor of S. 719 and is thankful to you and your fellow Senators for introducing it.

Metals and minerals are the only natural resources unique and absolutely essential to industrial civilizations. All urban civilizations are totally dependent on them. Without them world population would immediately drop back to the former maximums of nomadic and agrarian civilization. Because of the few people engaged in the production of minerals, the public and also the majority in Congress have not yet recognized this.

Yours truly,

ESKIL ANDERSON, *President.*

NATIONAL WESTERN MINING CONFERENCE AND EXHIBITION,
Denver, Colo., June 17, 1969.

Hon. GORDON ALLOTT,
New Senate Office Building,
Washington, D.C.

DEAR SENATOR ALLOTT: The National Western Mining Conference and Exhibition in Denver has been sponsored annually by the Colorado Mining Association and Affiliated Groups. At the 72nd National Western, February 1, 1969, the Conference adopted, as has been its custom for these many years, its Resolutions, and a statement of Policy. These are attached along with the Resolutions for 1968.

Strong support of a National Minerals Policy has been a unanimous stand by the miners attending the National Western Mining Conference for over eleven years.

The Resolutions Committee has received the fine assistance of miners from our sister states in the West, who have helped us in our deliberations. Mining Associations with whom we have counseled in the past—especially concerning a National Minerals Policy—include representatives from Utah, Wyoming, South Dakota, North Dakota, Oklahoma, New Mexico, Arizona, Nevada, California, Washington, Oregon, Idaho and Montana.

The cooperation of these Western miners for our common objective, namely, a strong domestic mining industry through adoption of a National Minerals Policy, is of great satisfaction to us and certainly should be additional incentive to Congress for adoption of S–719.

Your personal sponsorship of this important legislation is gratefully acknowledged, and we do join you in urging that S–719 is adopted this Session.

Very truly yours,

DOUGLAS V. WATROUS, *President.*

AMERICAN QUICKSILVER INSTITUTE,
Los Altos, Calif., June 3, 1969.

Senator GORDON ALLOTT,
Senate Office Building,
Washington, D.C.:

The mercury mining industry urges the approval of your bill creating a national minerals policy and prompt and vigorous development of such a policy. Our industry's experience in the past and in the immediate present is that the national minerals policy at the present time is to thoroughly destroy the domestic mercury mining industry.

S. H. WILLISTON,
President.

STATEMENT OF S. H. WILLISTON, PRESIDENT, AMERICAN QUICKSILVER INSTITUTE

BRIEF HISTORY OF NATIONAL MINERALS POLICY AS APPLIED TO U.S. MERCURY PRODUCTION OVER THE LAST 30 YEARS

United States mercury mine operations are small business. The average number of employees of the six largest producers who supply some 75 per cent of the U.S. production is less than 100 men per mine. Major consumers and principal dealers are big business. Government policy has rarely, if ever, given any consideration to the producing end of the industry and the industry, over the years, has learned not to rely on Government promises and not to count on fair play when dealing with the Government. A few examples give the reason for that feeling.

In World War II Italy, principal producer of mercury, was a member of the Axis. Spain, which produced the balance of the world supply was, to say the least, an unfriendly neutral. It fell upon the United States as a producer to supply all of the mercury for all of the Allies' requirements, including supplies to Russia. Six operators supplied 70 per cent of the production in 1941. The same six operators furnished 75 per cent of the supply when peak production reached 60,000 flasks per year, all that was needed to take care of requirements. The U.S. Government, in effect, granted guarantees against loss to new producers but would grant no contracts to those who supplied the bulk of the domestic production. At the end of the war the price collapsed and by 1949 every domestic producer but one was closed and during that time the U.S. Government purchased for the Stockpile from Italy appreciable amounts of mercury.

In the early 50s, during the Korean affair, the U.S. Government notified the domestic industry that the Stockpile was filled and would not purchase domestic metal. Within two weeks of this statement the A.E.C. removed half of the Strategic Stockpile on secret Presidential approval with the proviso that they replace this metal in the Stockpile. The Government placed contracts with Spain and attempted to place contracts with Italy to replace the metal taken by A.E.C.

In the negotiations with Spain the U.S. Government promised that this metal would go into the Stockpile and would never be sold in the consuming market. Neither the proviso of the A.E.C. to replace the metal taken from the Stockpile nor the promise to the Spanish Government was ever kept.

Somewhat later some very flowery statements were put out by our Government in Washington laying out a program for a healthy domestic industry to make possible profitable mercury mining over the years and a floor price was established by some pencil-pushing bureaucrat. For several years the price remained above the floor but when, near the end of the program, the price dropped to the floor level the Government, through technicalities and specifications for containers which could not be met, did its best to evade the commitment. The technicality was "a standard, seamless flask" and, since "standard flasks" were not "seamless" and "seamless flasks" were not "standard", they thought they had avoided the commitments. The truth of the matter was that they had spent the appropriated money for other things and it was only under threat of a Senate invesigation that they reluctantly lived up to their commitment.

In 1963 the A.E.C. finished with its mercury-lithium program and declared 50,000 flasks surplus to its needs. These 50,000 flasks, which had been taken from the Stockpile, were reluctantly placed back into the Stockpile. In 1964 the A.E.C., instead of replacing the metal in the Stockpile as included in their original agreement, declared an additional 72,000 flasks of mercury surplus.

The Congress has wisely provided that metals taken from the Strategic Stockpile may not be sold without Congressional authority but these 72,000 flasks which came from the Stockpile and were equal in purity to Stockpile specifications were turned over to the G.S.A. for sale under the Surplus Property Act without any approval or authority by Congress under the technicality that it had been removed from the Stockpile by Presidential approval for emergency needs and, when no longer needed, could be sold as surplus by G.S.A.

More material was declared surplus in 1966 and still more in 1967. Part was given free to Government agencies and some 10,000 flasks were distributed helter-skelter to high schools and colleges throughout the United States, but a total of 75,000 flasks was sold in the open market. Government sales roughly equal U.S. production, and supply approximately 20 to 25 per cent of the U.S. market.

Most of this material went to dealers who were also members of the New York Commodity Exchange and this material was made eligible for delivery on that Exchange. Consumers rarely bid for Government metal and, so far as I know, no metal producers nor consumers have used the New York Commodity Exchange. That was strictly a dealers' and speculators' paradise supplied with Government material.

After five years of competing with our own Government in the mercury market the announcement has recently been made that the A.E.C., "under severe pressure", has declared another 15,000 flasks surplus, and O.E.P. has declared another 74,000 flasks excess to strategic metal requirements.

This material is now hanging over the market while the price rapidly declines and the domestic industry wonders how long it has to live.

Some 15,000 to 20,000 flasks of mercury a year are smuggled out of Mexico to avoid payment of export tax, production tax and Mexican income tax. Most of this comes into the U.S. in the Brownsville, Texas region. This material can go through U.S. Customs and pay the U.S. duty or it can be placed in bond or it can be smuggled into the U.S. U.S. Government import statistics do not show any such import duty paid into this country. There is no evidence that any appreciable amount of this goes into bond for re-exporting. It seems very probable that much of this material is not only smuggled out of Mexico but smuggled into the U.S. The State Department is fully cognizant of this smuggling but no Government agency makes any attempt to stop it.

With this as an example of National Minerals Policy, how do you expect any little industry to survive, whether it be strategic or not?

Senator Moss. I should have announced earlier, and will announce now, that, when we finish the testimony, the record will be held open for 10 days. If any of the witnesses or any others who are here would like to amplify their testimony or if there is something that they have heard that causes them to want to put into the record a comment, that may be done for a 10-day period after the oral testimony is completed. Then the record will be printed.

In other words, we are seeking the widest kind of comment and information that we can get, just so it is on the subject of the bill generally. It will be possible for any of the witnesses to file a written statement amplifying or extending his testimony or for others who have not been called as witnesses, but who feel they have a contribution they could make to our record, to file a statement.

Thank you, Mr. Rigg.

I think we have time for one more witness and then we will recess until 2 o'clock. When we come back, we will start promptly to see if we can complete our list of witnesses early in the afternoon. We are going to start with Secretary Dole when we return.

Dr. Osborn, vice president for research at Pennsylvania State, will be our next witness. We are pleased to have you come, sir.

STATEMENT OF DR. ELBURT F. OSBORN, VICE PRESIDENT FOR RESEARCH, PENNSYLVANIA STATE UNIVERSITY

Dr. OSBORN. Thank you, Senator Moss. I am vice president for research at the Pennsylvania State University. My field of research and teaching is geochemistry, and for a number of years I was dean of our College of Mineral Industries. I am also a member of the National Academy of Engineering, and serve as chairman of the Mineral Science and Technology Committee of the National Academies. In this last capacity I have been in charge of preparing a report referred to by Mr. Boyd, entitled "Mineral Science and Technology: Needs, Challenges, and Opportunities."

It is principally in connection with the findings and recommendations of this report that I welcome the opportunity to testify briefly concerning the need for a national mining and minerals policy. Our committee report will be available soon, and in the meantime the final draft of the summary and recommendations of this report have been handed to Senator Moss.

Our Mineral Science and Technology Committee was asked to study and report on the current state of mineral science and technology in the United States with special emphasis on the situation in universities.

This charge to our committee, in 1966, was the result of a request by Dr. Walter Hibbard, then Director of the U.S. Bureau of Mines, to Dr. Sietz, then president of the National Academy of Sciences. Dr. Hibbard was alarmed at what appeared to him to be a deteriorating state in mineral education and research, and the consequent adverse effect of this on the ability of the U.S. Bureau of Mines to carry out its mission. He requested this study by an academy committee for guidance to the U.S. Bureau of Mines. The committee members and those of its six panels are from universities, other private nonprofit organizations, industry, and State agencies.

What we found was alarming.

The prosperity and future health of this Nation depend on its nonrenewable mineral resources just as they do on its renewable agricultural resources. In the case of the latter, Federal and matching State funds have continually supported education and research on agricultural resources at a university in each State since the first Hatch Act of 1887.

As a consequence, we have continually trained the experts we need in these fields at the many excellent colleges of agriculture in the country, and through research and extension programs have put into effect efficient production and conservation programs with respect to agricultural crops, forests, soils, wildlife, watershed management, et cetera.

We can be very thankful for the wisdom exhibited by Congress, first in creating the land-grant colleges, and then 82 years ago in providing funds to establish and continually maintain the State agricultural experiment stations.

In the case of our mineral resources we have had no such foresight. We have wasted our coal resources and potentially valuable underclays, and I say this with feeling, coming from Pennsylvania, and in addition, in the coal regions, are now plagued with ground subsidence, stream pollution, and fires in waste material and abandoned

mines. Domestic production of essential materials, for example, silver and gold, has fallen off as we become more and more dependent on undependable foreign sources.

In the last decade the net value of mineral imports over exports tripled, with 1966 imports valued at $6.7 billion compared to exports of $3.4 billion. We are losing out in mineral technology to other nations. As is pointed out in our report, a step in the direction of losing control of our destiny. These things have happened because we have not treated mineral resources in the same serious and responsible way that we have treated agricultural resources.

Let us glance further at what is now happening.

As our mineral resource problems increase in severity, it is an almost incredible fact that the number of mining departments in universities is actually decreasing. Mining departments decreased from 26 to 17 in the 5-year period 1962–67. That is, one-third of the Nation's university departments for education and research in mining closed their doors during the past 5 years for which we have the record.

Comparable departments in colleges of agriculture, such as entomology, plant patholgy, horticulture, agronomy, et cetera continue throughout the United States to carry on strong programs aimed at solving the problems and keeping the United States ahead in agricultural science and technology, and this is possible because of a farsighted national policy providing, among other things, continuing Federal and State appropriations to the agricultural colleges.

I was going to say a little bit more about that, but this has already been referred to. I might add that we have the State experimentation and agricultural college at Penn State so that I have the background and know what I am talking about.

Strong university research and instruction programs, analogous to those in agriculture, should be in progress on the whole spectrum of mineral problems, from extraction of molybdenum or uranium from very low grade resources to the safe and wise disposal of uranium byproducts, and we in Pennsylvania are worried about this latter, the byproducts from reactors where we are licensing about one new reactor a month in the country. A lot of them are in Pennsylvania and we have no safe place in Pennsylvania that we know of to bury the residual material.

We should be doing research from basic studies of rock mechanics to planning for future sources of crushed rock for construction in metropolitan areas, and from systematic geological mapping of the United States to intensive geophysical and geochemical studies of the whole continental crust that may lead to earthquake and volcanic eruption predictions as well as to the finding of new ore deposits.

But such is not the case. Research and education in these mineral fields is on a pitifully small scale. Strong programs should exist in each of the departments of mining, mineral preparation, extractive fuel science, and mineral economics. These are the departments we call mineral research and education, and the mineral science and engineering field are not glamorous.

Neither, however, are the agricultural science and engineering fields, but these are supported by both Federal and State appropriations because they deal with agricultural resources.

In the Federal Government, funding of our Bureau of Mines is too small to make this an appropriately effective organization, and funding of the Geological Survey is inadequate for the job to be done.

On the State level, very little is done in mineral science and technology except for a very few States, notably Illinois.

We have continuing disasters such as the recent mine explosion in West Virginia and the oil leak in the Santa Barbara Channel. After such disasters, we rush in teams to find out what happened and everybody is very sorry about the whole thing including the cost in money.

But such disasters are inevitable and will continue, probably growing worse, unless long-range education and research are carried out. And I submit that we have a model in the way agricultural resources have been treated that should be adopted, and as soon as possible.

We have recently made two small starts in the direction of placing mineral resources on a basis similar to agricultural resources. First, the Office of Water Resources Research was established in the Department of the Interior by congressional action in 1964. Through this agency, funds are annually appropriated to each State to support an institute for research on water resources. This was in my opinion, a very significant move.

Research and education with the training of specialists in water resources will increase in importance annually. Because of this wise action by Congress, we can have some hope, that frankly we did not have before, that our water resources picture may actually improve rather than continuing to deteriorate.

Second, by act of Congress in 1966, the United States Bureau of Mines was granted the authority to support research projects and fellowship programs at universities. When funds are provided, it is possible that this will be a step toward developing an effective program of research and of training mineral scientists and engineers.

Every State has important, essential mineral resources—sand, gravel, building stone, industrial minerals, et cetera, and in addition may have one or more of metallic ore, petroleum, natural gas, or coal. Although they may be privately owned, these resources are nevertheless a public trust. The public pays for their misuse. We are sure doing it in Pennsylvania, I say parenthetically, and succeeding generations will hold the public—not the minerals industry—accountable.

Research and education must be carried out continually and on the large scale required so that appropriate regulations and practices can be put into effect to insure that conservation in its true and broad sense can be universally practiced in this country with regard to our nonrenewable resources.

We need to accelerate the development of a thoughtful, farseeing national mining and mineral policy. Government experts, industry representatives, and the public should all have their say, and the extremely complex national and international situations relative to minerals have to be taken carefully into consideration.

But we must move now to avert possible disaster before the year 2000. In this statement I have suggested one step, that is, to proceed for mineral resources as we have done in agriculture.

Thank you.

Senator Moss. Thank you very much, Dr. Osborn. That is a very interesting and, I am sure, very valid equation to point out what we

have done in the field of agriculture and neglected to do in the field of mineral resources. It is a good yardstick to be able to apply and say what we ought to be doing on the mineral side.

I appreciate too having this draft copy of the report of the Mineral Science and Technology Committee in the National Academy of Sciences, National Academy of Engineering, and National Research Council entitled "Mineral Science and Technology," and you were chairman of the committee that compiled this report.

I understand that this is only a draft and there will be a final report printed soon. I want to make sure that reference is in the record to this, so that it will be incorporated by reference and will be used by the committee.

In the time that I have had to skim through it, I can see that it is a very comprehensive and penetrating analysis of the problem and one that we are certainly glad to have. We appreciate having you, Dr. Osborn, not only because of your long background in the field, but also because of the fact that you have been through this recent work of compiling this report and have given a great deal of thought and research to the problem we have. To have you endorse the principle of an overall minerals policy is a great support to the bill that is before us.

Senator Allott?

Senator ALLOTT. I was once giving a speech, Doctor, and I was constantly thrown off balance by a man in the front row who insisted on yelling "Amen, Amen," I was very tempted to do this to you. So I say my "Amen" now to you. I couldn't agree with you more.

As far as I am aware, I believe Colorado is the only State in the Union which still has a school of mines which is a school of mines alone. That is not to say that other universities do not have schools in which these are incorporated, but I think we have the only one now that is left in the United States.

I have found in the last few years a remarkable lethargy among the people in our Government to the importance of research and advancement in this particular area. It is astounding that in an attempt to get into the various avenues of the research facilities of the Government, which all together counting developmental research, amounts to some $17 billion a year, that just a small amount has come into this area.

Your analogy, I think, to the agricultural field is a very fortunate one and a very good one and one I think which this committee can utilize. I take it that you see in this bill the beginning of an approach to the particular aspect of this whole industry in which you are interested.

Dr. OSBORN. Yes. I was very pleased to see a copy of the bill which Senator Moss sent me. I think this is the way to start, from what little I know of the operation of the Federal Government. I think this is the move. My emphasis on the agricultural programs which, as you know, are tremendously extensive and successful, is that here we have the experience. We know how to do this and it has worked. So many other things that have to do with the minerals industries, and we have discussed some in our report, are so controversial. They have to do with taxation and have to do with public land or something and we can talk about them for the next 10 years in Congress and still the departments of mining are disappearing and the boys are going off into other fields and so on.

But there cannot be any argument about the mechanism of operation of something that has operated so successfully as the Hatch Act for agricultural experiment stations and its successors. This has just worked wonderfully. The agriculturalists at Penn State, at the agriculture school at Cornell or Illinois or Texas A. & M.——

Senator ALLOTT. Or Colorado.

Dr. OSBORN. Or Utah.

Senator ALLOTT. C.S.U.

Dr. OSBORN. These fellows are real pros. They are dedicated. They spend their lives doing research in agriculture and they love it. It doesn't have to be a glamorous field to attract somebody. It is stable.

In mining, people are in and out. We have a pattern and we ought to move on it.

Senator ALLOTT. Thank you very much.

Senator Moss. Thank you, Dr. Osborn.

We will be in recess now until 2 o'clock and we will start very promptly at 2.

(Whereupon, at 12:30 p.m. the subcommittee recessed until 2 p.m. the same day.)

AFTER RECESS

(The subcommittee reconvened at 2:05 p.m., Senator Frank E. Moss, chairman of the subcommittee, presiding).

Senator Moss. The hearing will come to order and we will proceed with the witnesses. I appreciated the cooperation of everyone this morning when it appeared we would not be able to sit this afternoon. I asked the Government department witnesses to go over because we could get them on another day, but now it looks as though we are going to have time to finish all that are on the list.

I will now ask the Honorable Hollis M. Dole, Assistant Secretary of the Interior for Mineral Resources, if he would come forward and present his testimony. We are glad to have you, Secretary Dole, and we appreciated your consideration in waiting until this afternoon until we could reach you.

Mr. DOLE. Mr. Chairman, with your permission I would like to have Mr. Jack O'Leary, Director of the Bureau of Mines, and Dr. Montis Klepper, Acting Chief Geologist of the U.S. Geological Survey, to accompany me.

Senator Moss. We are very happy to have those two gentlemen. Will you be seated there with Secretary Dole and we will be glad to hear from all three of you if you have a contribution that you want to make.

You may go ahead, Mr. Secretary.

Mr. DOLE. Thank you.

STATEMENT OF HOLLIS M. DOLE, ASSISTANT SECRETARY, MINERAL RESOURCES, DEPARTMENT OF THE INTERIOR; ACCOMPANIED BY JOHN F. O'LEARY, DIRECTOR OF THE BUREAU OF MINES, AND MONTIS KLEPPER, ACTING CHIEF GEOLOGIST OF THE U.S. GEOLOGICAL SURVEY

Mr. DOLE. Mr. Chairman and members of the Subcommittee on Minerals, Materials, and Fuels, I appreciate the opportunity to appear

before you today to discuss S. 719, a bill to establish a national mining and minerals policy.

We in the Department of the Interior welcome the introduction of S. 719 and we support the objective of the bill in that it would state the intent of the Congress with respect to a mining and minerals policy of the Federal Government.

Although we believe that the Department of the Interior has adequate existing authority to meet the policy declarations of the bill, enactment of S. 719 would be a timely reassertion of the historic minerals policy responsibilities of the Congress.

The minerals industries are bound loosely together by their national trade oragnizations; there are no established national goals with which they can identify. At times they feel thwarted in their efforts by a seemingly unsympathetic attitude by the Federal Government and by the lack of a unified Federal effort on their behalf. A national minerals policy will provide goals toward which industry and Government can work together.

There are more than 2 dozen Federal agencies involved with minerals policy in one way or another, ranging from those of the Treasury Department which deal with gold and gold prices, and taxation, to the Geological Survey and Bureau of Mines which deal directly with the identification and recovery of mineral resources.

Considering the complexities of overlapping functions and areas of jurisdiction among these agencies, it is no wonder that coordination of their work has in the past been difficult. I believe that a national minerals policy which states the national aims of the United States will result in identifying more clearly the proper role of each of the agencies involved.

Development of a minerals policy will necessarily force us all to take another look at some of the legal problems which face industry and government in the minerals field. As an example, should we recommend changes in the mining and the leasing laws? If so, how should they be changed? Is taxation in the minerals field equitable? If not, how can it be made equitable?

The thrust of this bill, as we see it, is to make a congressional declaration that the national interest requires (1) the encouragement of the domestic mining and minerals industry, (2) the development of domestic mineral resources to meet the needs of industrial growth and national security, and (3) the fostering of research into mineral exploration, mining, mineral processing and use, and metallurgy.

The emphasis is on the word "domestic" and this requires some elaboration.

We do not interpret this bill to mean that the United States should meet all of its minerals needs from domestic sources.

Because of the global nature of mineral supply and demand, Federal policy must give full recognition to this important feature of the mineral industry. The United States already depends on imports for many mineral commodities that are vital to its economic growth and national security. In the future even larger quantities of certain minerals will have to come from foreign sources if domestic demand is to be satisfied without marked increases in cost.

As is the case with all other nations, the United States is not now, nor likely to be, self-sufficient in all essential mineral raw materials.

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Moreover, in some notable instances the prospect of obtaining even a small fraction of requirements from domestic deposits is small.

On the other hand, we produce certain commodities that can compete successfully for overseas markets. It is obvious, therefore, that we must seek, on mutually favorable terms, access to supplies on the world market that are not available from domestic sources. At the same time, we must work to retain and expand world markets for U.S. mineral production in order to maintain favorable trade balances.

Our Nation does require a minerals capability sufficient to prevent either political or economic blackmail by foreign interests. The key to this is the continued assurance of a broad spectrum of domestic mining companies and a pool of capable manpower.

Our national security demands no less.

Now, let us explore what our future mineral requirements might be, the present trend on meeting them, and problems we might face.

Despite the attention that the "population explosion" has received, a much greater explosion has taken place with little public recognition and less public concern. I speak of the explosion in the consumption of minerals.

For decades American minerals consumption has substantially outgained our population growth. In the past century our population grew more than 400 percent but our minerals consumption grew more than 4,000 percent.

Today, per capita demand for minerals in the United States amounts to about $150 per person per year. By the year 2000 the Bureau of Mines believes that our per capita mineral demand will be approximately $420.

Great as our increase is, per capita minerals consumption in the rest of the world is rising at an even greater percentage.

Our problem begins to come into focus when we look at the trends for domestic production of minerals and domestic demand.

Demand in this country is expected to quadruple by the end of the century, but domestic mineral production can only be expected to triple by the year 2000. The resulting gap between demand and production is the cause for deep concern.

At the present time this Nation is producing annually about $25 billion worth of primary minerals and consuming approximately $32 billion worth. By the end of this century, when our population according to the latest Bureau of Census median projection will be 320 million, we expect production to increase to about $66 billion annually, and consumption to approximately $135 billion. In other words, the present annual deficit of $7 billion will increase to $69 billion by the year 2000. Our current production deficit is about 22 percent of consumption requirements. It was only 9 percent in 1950, and if present trends continue it will rise to more than 50 percent in the next 30 years.

Copper is an example of the change taking place. Just 50 years ago the United States was the world's largest leading exporter of this commodity. Now this Nation is the world's leading importer.

The implications of dependence upon imported minerals are clear when World War II and the Korean crisis are recalled. We learned some lessons then. We found that there are a number of minerals which deserve to be called the strategics because they were critical

to our war efforts. In the most part they are ferro-alloy metals—metals that impart special properties such as hardness and strength to steels, even though they are used in small amounts.

Chromium, nickel, and vanadium are important in the manufacture of stainless steel. Tungsten, a hardner, is important for cutting tools; cobalt also is used for high-speed tool steel. Manganese is one of the most important metals in this group, for without it the manufacture of steel is almost impossible.

In large measure the strategics must be imported, and their sources range from the Orient to South Africa. Manganese, for example, comes from several parts of Africa, the Soviet Union, India, and Brazil.

Although the United States can utilize secure domestic sources for some of these strategics in times of emergency, their quality and mode of occurrence leads to increased costs.

One of the plain facts that we must face is that, whatever our desires, we may at any time find the overseas sources of some of these important minerals dried up because of foreign political or economic developments. Growing nationalism and political instability increasingly raise doubts about the assurance of supplies originating in some foreign areas.

Not only is this nationalism growing in the many new countries created out of the colonial empires of Britain, France, Belgium, and the Netherlands, but also it is arising in nations with a long history of political independence—such as many of our neighbors to the south. The world trend appears to be working against the movement of unprocessed raw materials across international boundaries.

Many host countries are seeking to increase their economic benefits from indigenous mineral industries which produce for export. Not only do they want a greater participation in operations but also they are seeking to locate a greater proportion of the "downstream" processing operations in the host countries. Such moves increase the cost to the consuming country and have an adverse impact on the consuming country's balance-of-payments position due to the higher import costs and the reduced return from foreign operations.

Not all of this growing uncertainty of supply is attributable to the desire for economic growth on the part of the less-developed nations. The Soviet Union has interrupted exports of manganese and chrome for economic purposes, and it has used international trade in minerals to further its political goals. Further, the Communist countries have disturbed free world markets for tin and gold by erratic offerings and withdrawals.

It is too early to determine the ultimate effect of recent moves in Chile and Peru involving the copper industry but their actions do have a bearing on the discussion we are having today. Mexico's efforts to guide sulfur exports are another symptom of the trend of affairs.

The result of all this is a lowering in the "confidence factor" for our mineral supplies originating in foreign areas. Most certainly, in our own self-interest, we must expect to consider the possibility of obtaining more of our essential mineral commodities from sources within our own borders.

The U.S. trade balance on minerals is heavily negative, since we now are a large importer but a small exporter. However, to date much of our minerals balance-of-trade deficit has been made up by payments

coming into the United States from the foregin operations of large American minerals companies. By far the largest portion of this comes from petroleum operations.

Another problem which is of interest is the minerals exploration situation overseas and in the United States. It is difficult to pin down any substantial details of these private exploration operations, but one fact is clear: minerals activity in the rest of the world is expanding much faster than in the United States.

In general, foreign mineral resources have been thought of as higher grade and therefore more attractive. Foreign labor costs have been lower, and entry in the foreign areas on favorable terms has been relatively simple, up to recent times at least. Many countries have been offering advantages in taxation and concession agreements that are far more attractive than what is available here at home.

We must recognize, however, that all of these factors which in the past have encouraged foreign operations by American companies are now changing, and at a minimum their continued attractiveness over any long term is questionable. This may well be the time for a renewed look at the opportunities and the needs for mineral exploration and development here at home. Our leaner domestic deposits may no longer be out of reach—an important example is the development of domestic taconite, a low-grade iron ore.

Sometimes we have heard it said that—just as the mom and pop grocery and the independent corner drugstore are going out of the picture—the day of the individual prospector and the small mining operator is past. Undoubtedly the sophisticated and costly technological developments in recent times tip the balance toward larger mining companies able to command sufficient capital and technical skills, but I suggest to you that ways should be considered to keep the individual prospector and the small operator in business. I am not convinced that the large open pit is "the only way to fly."

The government which can devise means of encouraging family farms and aiding small business with purchasing set-asides and special loan programs ought to be able to work out means of sustaining the valuable and knowledgeable minerals work force which today languishes in the doldrums.

Perhaps some of our difficulty is that government itself has paid far too little attention to minerals supply and the domestic mining industry. Perhaps other aspects of natural resources have taken the limelight.

All of us are aware of the many Federal and State agencies which work with water. They study its quality, its supply, its diversion, salinity, shortages or superabundance, movement above and below ground, storage, recreation aspects, and so on. In recent times attention also has been directed to our Nation's land resources and the varying mix of uses which the land can sustain now and in the future. But we take very little time to assess the mineral situation in any depth, and we seem to do very little in publicizing either the problems or the progress that we are having in the development of our essential minerals base.

As we consider this mining situation at home, I would say to you—and I say it with all the emphasis that I can muster—any national policy which does not recognize the need of domestic industry to enter upon and explore our public lands will result in a United States that

is increasingly weaker because of its dependence upon uncertain, interruptable, foreign sources of minerals.

I do not believe that we want to get into any deep discussion today of the problems of access to mineralized lands, but I do want simply to note that in the West where the great portion of all nonfuel mineral development has taken place—and where we can continue to expect to find most of our reserves—the Federal lands are increasingly the target of interests which would prevent their use by the minerals industry.

Isn't it strange that man is so blissfully unaware of the importance of minerals in his life and of the problems that the minerals industry faces? Of course, there are a few communities in this Nation where the importance of minerals is recognized. I would suggest that this is true in Butte, in Lead, in Tucson and possibly in Denver. But what of the man in Baltimore or St. Louis or San Francisco—what does he know or care about the minerals industry? And what are we doing to improve his knowledge and understanding?

The "man in the street" must be made to realize that mining is a basic source of income; that it is the major cargo for American railroads, inland waterways and trucks; that it is a major payer of local, State and Federal taxes and that above all it is the "mother industry" for most of the American industrial economy.

Now, if you consult the statistical tables you will find that U.S. minerals provide only some 3 percent of the gross national product. But this is only the beginning—it is only the point of an inverted pyramid which depicts our industrial economy resting upon a small but absolutely essential minerals base.

Let us look at it another way. If you were to select 100 men as representative of the work force directly dependent upon minerals production in the United States, you would find that it requires only three of those men to mine the ore but it takes 14 to produce the metal and 83 to fabricate, distribute, and sell the ultimate product. If we could get our "man in the street" to appreciate some of these facts, we would be making a good start. But there is still more that needs to be understood. Such things as—

The large amount of capital that goes into the search for minerals and the high risk of the investment;

The great length of time needed to find, develop, mine, and produce a mineral deposit—truly the effort put into today's search for minerals will determine the amount available 10, 20, 30 years from now;

That mineral deposits are immovable—they are where they are and they must be exploited there; and

That deposits are replaced only through finding new ones, and the finding is becoming more difficult all the time.

Certainly a better understanding of the mineral industry by the people of the Nation will lead to the development of a better national minerals policy.

I want to refer briefly to a formidable problem that is plaguing the mineral industries. This is the matter of environmental pollution. The problems that arise from mineral supply cannot be treated apart from environmental degradation that stems from the mining, treatment, and use of any mineral substance. The growing national concern for pollu-

tion of air, land, and water, together with the ultimate disposal of all mineral-based waste products and reclamation of the land for other uses, must influence every program undertaken to alleviate the mineral supply. Indeed, it should be a key element in a national minerals policy.

It is clear that such a policy must call attention to the problems of the environment in a reasonable and balanced fashion. It should recognize that responsible mining companies are undertaking reclamation of their mined lands, and it might well urge that the industry do more to make the public aware of this good stewardship.

The industry and the Nation must also devote increasing attention to the health and safety dangers which so long have been mistakenly viewed as an inevitable accompaniment of mineral extraction. This need not be true any longer, for we are finding that modern technology, if skillfully and diligently used, can work wonders in improving the safety and health of miners.

In the professional areas of mining and earth sciences, we are facing a crisis. Our colleges and universities are not producing enough graduates in the mineral sciences to meet our expanding needs. In fact, we are losing ground. This year, for example, American universities are graduating a total of only 110 mining engineers, and many of these are foreign students who are returning to their own countries.

Equally alarming is the fact that in 1967 only 17 educational institutions had an accredited curriculum in mining engineering. The median number of seniors was approximately six. There were at the same time 19 graduate programs in mining with a median participation of eight graduate students, and half of these were foreign nationals.

I seriously believe that our long range domestic mineral position is far more critical than any of us would like to think. We are not on the verge of a minerals shortage, but unless an aggressive program to improve our mining and minerals technology is launched now, America faces the possibility that our economic growth and hence our standard of living will begin to be limited by resource constraints within 20 to 30 years.

I want to make it crystal clear, Mr. Chairman, that the United States is not running out of minerals. Our country is richly endowed in these resources. The crucial issue is that we are running out of minerals technology.

This deterioration of our minerals technology is, in fact, the major conclusion of a recent study on mineral science and technology conducted by the National Academy of Sciences, the National Academy of Engineering, and the National Research Council, to be published this summer. In the words of the study:

> Despite the key role of minerals in our society, and the vastly increasing worldwide demand for mineral products, mineral technology in the United States is in a declining state, and serious trouble lies ahead for the country unless corrective actions are taken promptly.

This potentially disastrous trend must be reversed to prevent collapse of the Nation's competitive position in mineral raw materials. It can be reversed, in my opinion, through provision of financial assistance to students in mineral science and engineering, financial assistance for basic research in minerals-related sciences in American universities, and implementation of regional institute programs for an

interdisciplinary approach to problems in the fields of mineral science, engineering, and technology.

In conclusion, Mr. Chairman, I would like to state that in my opinion a national minerals policy has much in common with foreign policy and other national policies dealing with complex problems—a policy always exists but it is seldom stated succinctly and often seems to have conflicting elements. I believe, however, that a national minerals policy should consider as cardinal elements the following:

1. Minerals, water, and fuels are keystones of the Nation's economy and security; thus the central objective is to assure an adequate and dependable supply of these vital materials to the people of our country;

2. The methods of private enterprise are accepted as the most efficacious way of performing industrial tasks in the United States, and private industry should be encouraged to find, develop, and produce the mineral supplies needed for the Nation's economy;

3. The Federal Government, on the other hand, contributes to mineral development through policies that permit and encourage exploration and mining; through activities, such as geologic mapping and long-range research, that must precede or supplement the work of private industry; and through the publication and dissemination of economic and technical data related to mineral resources;

4. Acquisition of mineral supplies for short-term needs should be governed mainly by the principle of least cost consistent with national security, with conservation practices necessary for wise development and use in the long-term, and with intangible social or political values;

5. Long-term needs require maximum efficiency in the recovery and reuse of mineral resources, and minimum loss through waste and contamination; wise-use conservation practices are an essential component of the Nation's mineral policy;

6. For reasons of both economy and security, the long-term goal is to assure that domestic sources make their optimum contribution; to achieve this, it is necessary continually to emphasize research and development, for most of long-term supplies must come from sources that either are not within the realm of present technology or are not now competitive; our past achievements in obtaining new supplies at progressively lower costs demonstrate the process of creating resources through research, and it is this approach on which we must rely;

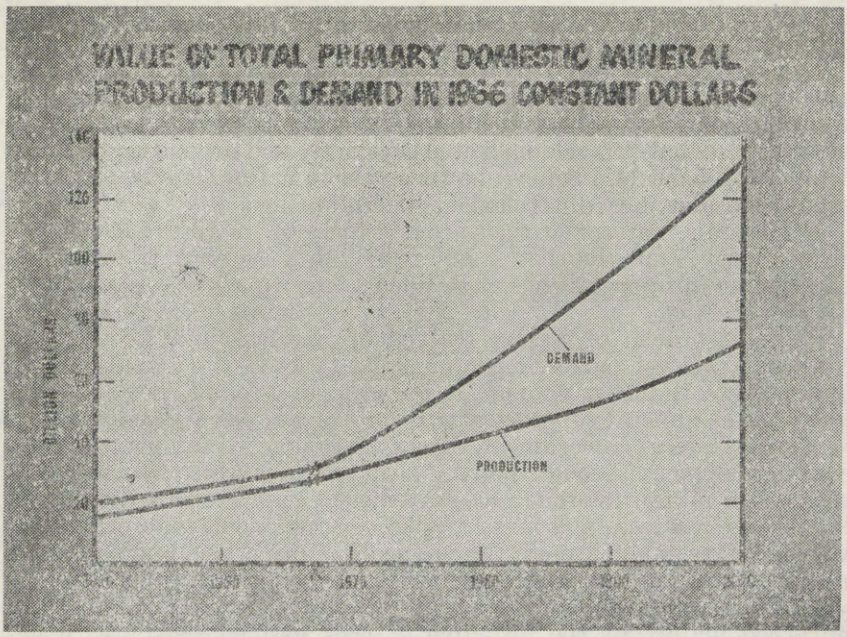
7. Most minerals and fuels are a part of our total land resource, and they should be extracted in ways that cause the minimum possible permanent loss of the land for other uses.

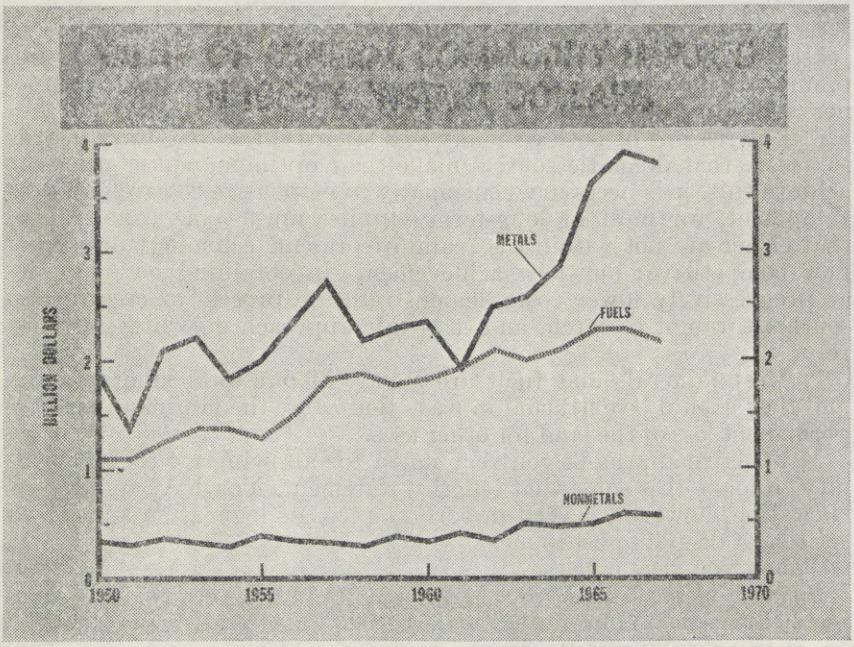
Mr. Chairman, thank you very much for allowing me the opportunity to make this somewhat lengthy statement. You have under consideration, however, a very important piece of legislation and it is a subject of deep interest to me.

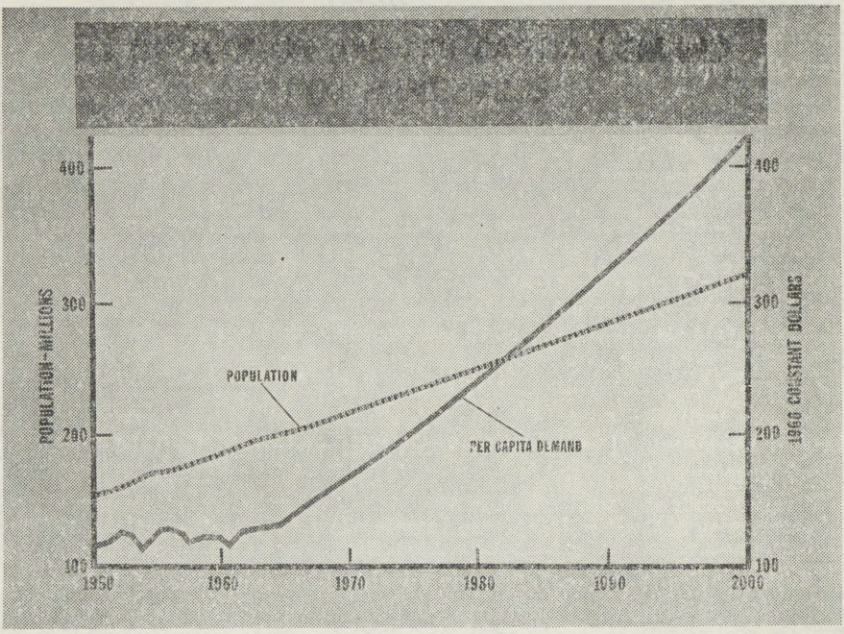
Thank you very much.

Senator Moss. Thank you, Mr. Secretary, for a very fine and complete statement. Your statement is accompanied by some charts that are very revealing and they can be printed also in the record along with your statement.

(The charts referred to follow:)


VALUE OF TOTAL PRIMARY DOMESTIC MINERAL
PRODUCTION & DEMAND IN 1966 CONSTANT DOLLARS
DEMAND
PRODUCTION


BILLION DOLLARS
METALS
FUELS
NONMETALS
1950
1955
1960
1965
1970


POPULATION—MILLIONS
1960 CONSTANT DOLLARS
POPULATION
PER CAPITA DEMAND
400
300
200
100
1950
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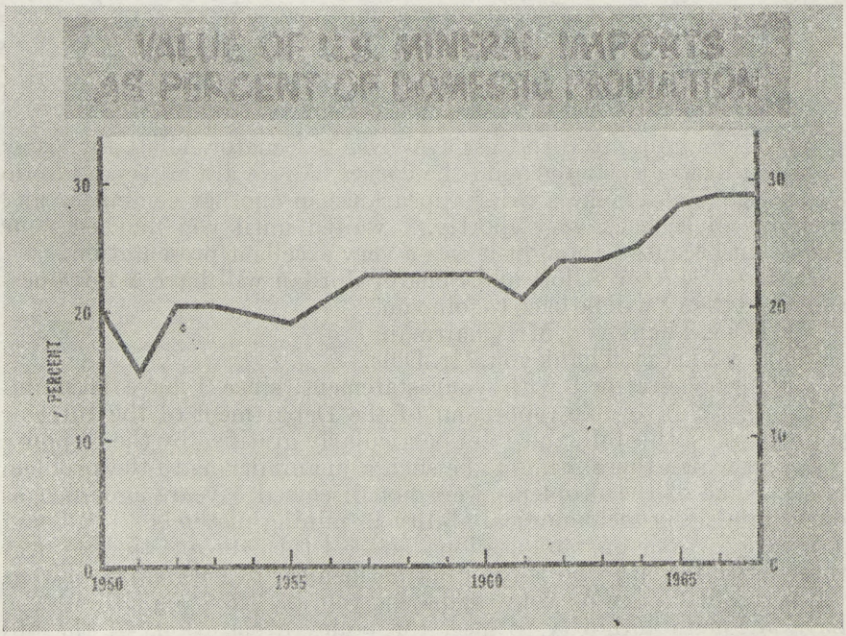
1970
1980
1990
2000


VALUE OF U.S. MINERAL IMPORTS
AS PERCENT OF DOMESTIC PRODUCTION
PERCENT
30
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1950
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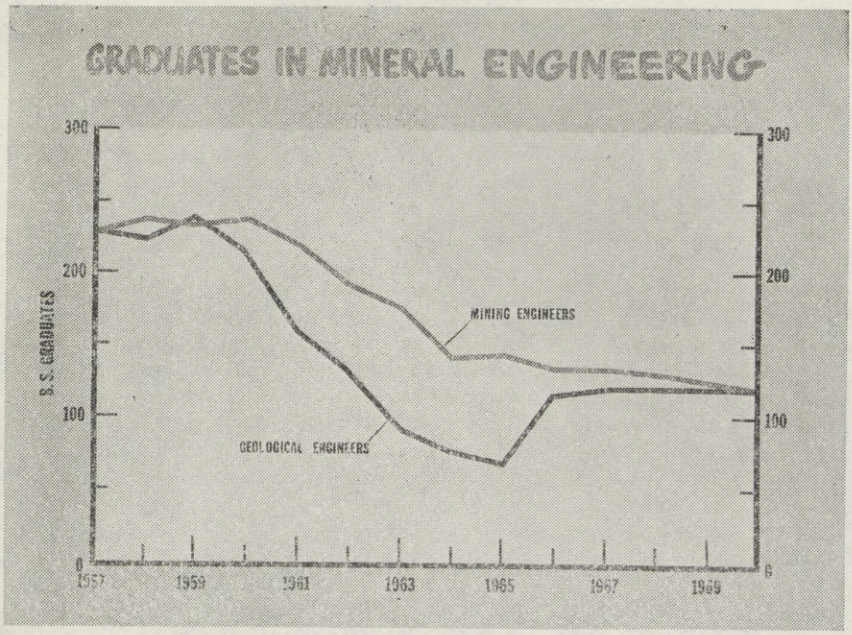

Senator Moss. I think that you have made a very comprehensive statement of the whole problem surrounding this minerals industry and the current state of it, including our decline in training of engineers and our faltering in the field of research as compared with some other industries and I appreciate the attention that you have given to it. I am very pleased to have you bring your associates with you.

Now I am going to turn the gavel over to Senator Allott for a few minutes. I have to step around the corner. As we are all trying to do two jobs, I must make a brief appearance in another committee and then I will be back very shortly. I waited until you finished your statement because I thought it was a very excellent presentation.

Perhaps Senator Allott and Senator Jordan will have a few questions and then I will be back to join you.

Mr. DOLE. Thank you, Mr. Chairman.

Senator ALLOTT. Thank you, Mr. Dole.

I am very gratified with your statement, since I have been unable to get a favorable report out of the Department of the Interior for 8 years on this bill, and I am particularly gratified by the response today in which there seems to be such a unanimity as to the problem areas. Some of the problems were not discussed 5 years ago such as our diminishing technological ability in mining methods.

I have just one or two questions before I turn the questioning over to Senator Jordan, who is the ranking member of this subcommittee.

On the first page of your statement you say that you believe you have adequate authority to meet the policy declarations of the bill but it would be a timely reassertion of the historic minerals policy responsibilities of the Congress. If I were writing that, I would take the "re" from in front of the assertion because I do not know that

there is a minerals policy in this country and this is exactly what I am seeking to do.

We have educational policies, we have welfare policies, we have social policies, hopefully we have foreign policies. We have policies on everything. Really, and I am not being at all facetious, if I were to approach you cold and say, "What is the policy of the Federal Government with respect to the mining and minerals industry," how would you answer that?

Mr. DOLE. I think that I would answer it as I did, Senator Allott, in the next paragraph down where I say, "There are more than two dozen Federal agencies involved with minerals policy in one way or another." Then I go on and say, "Considering the complexities of overlapping functions and areas of jurisdiction among these agencies, it is no wonder that coordination of their work has in the past been difficult. I believe that a National Minerals Policy which states the national aims of the United States will result in identifying more clearly the proper role of each of the agencies involved."

In other words, sir, what I am trying to say is that, like a foreign policy or other policies, we have many but they have not been coordinated and I think that this bill which you and your colleague have introduced will do a great deal in bringing together a lot of information we do not now have and it will tend to coordinate this.

Senator ALLOTT. I am looking backward. I personally feel that it is far beyond the coordination matter because outside of our supported mineral exploration and some research, this certainly has been the stepchild.

The thrust of the bill is to declare that the United States has a definite interest in having an economically viable mining and minerals industry. When you consider some of the implications of the old Paley report, when you consider some of the views that have been propounded in Congress and out, over imports vis-a-vis exports and local mining, I do not think we have that policy.

Now you have made it perfectly clear that we cannot expect to be self-sufficient. We have grown too complex. I do think that if we can establish this policy we can, through other legislation, and through other means, effect the sort of thing which will bring this country back in a mining and minerals way.

I am thinking, for example, of the time—and I cannot give the year but this was a few years back—when there was some very large lead-zinc production and fantastically cheap prices turned up in Africa. I do not even remember the country now. But when this started flooding the country the price fell out from under our lead and zinc. Then we had a lot of flurry here to try and protect our lead and zinc people and as a result we created bad international problems with those countries.

I have the feeling that if we do establish this as a minerals policy, then we will not encourage other countries to engage in vast production enterprises of minerals with the idea that there is an endless market in the United States and that they will take over our market. In this way I think we can make a very definite contribution to the foreign policy of our country and our relationships with other countries.

Mr. DOLE. I would agree with you 100 percent. I think it is entirely incumbent upon the United States to have a strong domestic minerals industry if for no other reason than to prevent the encroachment of other countries upon our good nature, if you wish, or upon our markets here or upon our manufacturing ability. I think that if we do not have a good, strong domestic mining industry we will be running the risk of this continually happening.

Senator ALLOTT. I would like to give one specific example of how this problem may arise. We are all aware of what happened to us in various minerals during World War II and during the Korean incident in which we paid through the nose because we did not have local production to fufill our demands.

Last September I was in Peru and at that time President Belaunde was in power there. Our relationship with Peru at that time was on a very fine level. We had over 570 Peace Corpsmen in there and they were tickled to death to have them there. Just about a week after I left, in fact about 3 or 4 days, they had a change in government—I did not contribute to it.

Think of the impact that would have on this country—we are in a war—if we were in a war of much larger proportion and scope and we were dependent upon that country for the supply of a single metal. The way the world is changing today, the way the situation is developing in South America, it seems to me that we do have the strongest kind of national interest here. When I say national interest, I also mean a national interest of security in orderly development. Do you agree with that?

Mr. DOLE. I certainly do. I would say as the mineral demands of our Nation and other countries increase over the years that this will become more and more critical because of the amount of mineral materials that we will be using and undoubtedly will have to import. So the stronger we can make our domestic mineral industry, the more we can find out about what we do have in this country that will be available, the more secure we will make our defense position.

Senator ALLOTT. Thank you very much.

Senator Jordan.

Senator JORDAN. Thank you, Mr. Chairman.

Mr. Dole, I want to thank you for what I regard is a very fine statement indeed; it is constructive, it is analytical, it is going to be very helpful to us on this committee and I hope will lead toward the final realization of the national minerals policy.

I was impressed by one statement you made when you said, I believe, we are not running out of minerals in this country, we are running out of minerals technology. In other words, I judge you believe that there are enough undiscovered minerals in this country if we have the know-how to go and find them and the exploration incentives to locate them and develop a way to get them out.

Mr. DOLE. This is right, Senator Jordan. As a former distinguished director of the U.S. Geological Survey once stated, mineral resources are actually created by man's own thinking and his ingenuity. I feel that if we have enough emphasis on the training, on the background, on the teaching of people yet to come, we will not have to run out of minerals. We will find ways to treat these difficult ores, how to search for them and how to produce them.

To get back to your statement, I think that with greater emphasis on minerals technology training that we need never fear of running out of minerals. But unless we do have that, I think we run this chance.

Senator JORDAN. You said also, "Because of the global nature of mineral supply and demand, Federal policy must give full recognition to this important feature of the mineral industry." You make a strong case toward the need to keep our import channels as clear as we can and open so that we may always have access especially to the strategic minerals that this country needs for defense purposes.

I am a little concerned about the other side of the coin when you say: "On the other hand, we produce certain commodities that can compete successfully for overseas markets. It is obvious, therefore, that we must seek, on mutually favorable terms, access to supplies on the world market that are not available from domestic sources." Then you go on with this: "At the same time, we must work to retain and expand world markets for U.S. mineral production in order to maintain favorable trade balances."

Are you recommending that we export a lot of minerals that might be in surplus this year and in short supply in 10 years?

Mr. DOLE. No, Senator Jordan, that was not my intention in this statement. My intention was to point out that there are certain minerals which we can export successfully. In Senator Allott's State of Colorado they have very large molybdenum deposits, for instance. We sell a lot of molybdenum throughout the world. Those mineral deposits we have in abundance and can be competitive throughout the world. I think those markets should be open to us to export this type of material.

Senator JORDAN. Going on further with your statement you say: "In the past century our population grew more than 400 percent but our minerals consumption grew more than 4,000 percent." Then on the next page you use copper as an example and say: "Just 50 years ago the United States was the world's leading exporter of this commodity. Now this Nation is the world's leading importer."

If we had a minerals policy that was more than short range, would it have been advisable to withhold the development and export of some of our copper, we will say, since you brought that up, so that we would not now be on the copper import basis?

Mr. DOLE. Senator Jordan, if I may reply to that, I would say no. Any time you put restrictions on mineral development you cut down the ability to go out and do more exploration and to find more deposits. In other words, the only way new deposits of minerals are found is having a healthy industry that has the means whereby they can go out and make these large investments necessary to find new deposits. Any time you put restrictions on the search for minerals, you, as a result, cut down on the supply.

Senator JORDAN. Then irrespective of the fact that Senator Allott's State of Colorado has substantial supplies of molybdenum for export, you would think it entirely a good minerals policy to seek other molybdenum deposits for export?

Mr. DOLE. Indeed.

Senator JORDAN. Even if the long range might indicate that we would face a molybdenum shortage?

Mr. DOLE. Once again I would state, Senator Jordan, that to conserve minerals you do not leave them locked up in the ground, you determine ways better to get them out of the ground and to utilize lower

grade resources and you maintain the capability to go out and do further exploration. Once you find a deposit and leave it unmined, this to me is unsound mineral practice. A mineral deposit must compete with other mineral deposits around the world, and the way you maintain this competitive position is to continually refine your methods for searching, for mining, and for production. This is, to me, the capitalistic system.

Senator JORDAN. I appreciate that if the whole world were capitalistic and we were operating under those rules worldwide, that would hold true. But I am concerned about acute shortages that might develop in minerals that we have mined, developed, and exported only to learn in future years that the supply might be held tightly in the hands of people who are not capitalist minded, who are not free trade minded, and who are not disposed to deal with us.

Mr. DOLE. This is one of the reasons why I feel we must have a strong domestic mineral industry so that we will have this capability to continue research and to continue to explore and to continue to mine. That way if they decide to hold certain of these commodities, we will not be in a position where we will be wholly dependent upon them.

Senator JORDAN. Are we dependent on any of the unfriendly countries for the imports of copper?

Mr. DOLE. No, sir; we are not.

Senator JORDAN. Where does most of the copper come from?

Mr. DOLE. Let Mr. O'Leary answer that.

Senator JORDAN. Surely.

Mr. O'LEARY. The bulk of our imports are coming from Chile and Peru.

Senator JORDAN. And they are friendly, are they?

Mr. O'LEARY. They are not unfriendly.

Senator JORDAN. I will ask Mr. Rockefeller about that.

Do you think, Mr. Dole, that a national minerals policy should include some research in the area of recycling, reuse of minerals, recovery of minerals that have already been used in production and then put out on the dump to depreciate and waste away?

Mr. DOLE. I certainly do. The recovery of, for example, automobile scrap of various kinds, utilization of materials now that have been thrown away, I think is an area that deserves a great deal more attention than it has had in the past.

Senator JORDAN. Has your department given this any thought or does this come under some other agency?

Mr. DOLE. This comes under the secretariat that I have under my jurisdiction. The Bureau of Mines has several projects along this line, and if you would like to have Mr. O'Leary speak to these, I am sure he would be glad to respond.

Senator JORDAN. Yes, I wish he would because it seems to me it is utterly wasteful to pile the material up to rust away and to be completely wasted. Even if the removal of it calls for a little capital investment, we should, at least, get it out of the dump yard.

Mr. O'LEARY. Sir, the Bureau of Mines for a good many years has had a small effort going on recycling of scrap which has had, in perspectively, relatively large payouts. We are now, for example, taking a look at municipal refuse and we find that after municipal refuse is burned out it has an average B.t.u. of 5,000 per pound as contrasted

with coal which is 9,000 to 16,000 per pound. Eighty percent of the ash is either minerals or glass.

We are investigating right here in College Park ways in which we can recover the metallic values in the ash of municipal refuse. In addition we have for many years been involved in recovery of radiator scrap. Right now in the heavy metals program we are working on the recovery of precious metals from electronic scrap. We have worked extensively with the steel industry in the reprocessing of automobile scrap. This program, however, is one which continues, as I say, to be modest and one which could stand a substantial increase.

Senator JORDAN. I wish someone would develop a process by which we could rid our country of these dumps and recycle minerals that are wasting away there.

Mr. DOLE. Especially the automobiles, I might add.

Senator JORDAN. That is right. This is a big problem.

Mr. DOLE. I would certainly agree with you there.

Senator JORDAN. I think it is worth spending—I was going to say whatever money it takes but I would not say that. I think we are spending a substantial sum to get a recycling process that will work on that trend.

Mr. DOLE. This type of conservation would be very much in the national interest.

Senator JORDAN. Mr. Dole, you make a statement just in one sentence here and I wish you would develop it a little bit when you say, ". . . that U.S. minerals provide only some 3 percent of the gross national product. But this is only the beginning—it is only the point of an inverted pyramid which depicts our industrial economy resting upon a small but absolutely essential minerals base." You were talking about the U.S. minerals industry. I think that needs developing because I think it is very important. In fact, while the statistical tables account for only 3 percent of the gross national product, the direct and indirect escalation from that 3 percent was very substantial. I wish you would develop that a little bit here orally for the record if you would.

Mr. DOLE. I thank you very much for bringing this up because I think this is probably the least understood part of the minerals industry and makes up part of our problem. If you stop to think for just a minute, in your agricultural industry it is practically all mechanized now. Without the harvesters, without the equipment that is now on the large farm, our farmer would not be nearly as productive as he is.

The same in our timber industry. Without the trucks, the chain saws, the highly mechanized sawmills—all of these are metallic materials. Without these metallic materials, the lumber industry would not be the efficient industry we have today.

Now I would be glad to submit something to you for the record on this but this is the message: that minerals form the base of the American economy that is so important and is so unappreciated, because without the metals and minerals to do all of these things we would not be the efficient Nation we are today.

Senator JORDAN. It seems to me that point is important and needs some development.

In what areas do you find the minerals products being competed against by other commodities, products of the forest and plastics and

so on? Do you find that the mineral market is being encroached upon by other competing products?

Mr. DOLE. Actually I believe that the minerals market itself is the most competitive of all the markets, it competes one with the other. This control of prices on various metals, artificial controls, I do not think is needed, because if the price of one commodity goes up you have substitution by another material. I think the producers of these metals are cognizant of this and they try their best to see that they get the optimum price without the encroachment of the other metallic materials. The metals industry is its own best competitor and therefore that should be handled with great care in trying to control prices.

Senator JORDAN. What you are saying is that the market place is the best judge of what materials should be used?

Mr. DOLE. Thank you for saying it for me. That is exactly right; yes, sir.

Senator JORDAN. Thank you, Mr. Dole.

Thank you, Mr. Chairman.

Senator ALLOTT. I would like to ask just a question or two along the lines that were explored by Senator Jordan. I am looking at what I call my bible, Commodity Data Summaries, Bureau of Mines, U.S. Department of the Interior. I am looking at lead, and under production I find "mined in 1968" which is an estimate, of course, 325. Refinery, primary ore, 45; secondary, 556. The secondary is recovery; is it not?

Mr. O'LEARY. Yes.

Senator ALLOTT. So the total consumption of lead in 1968 in the United States, realizing that these are all estimated figures, was 1,290. What would that be, 1,000 tons?

Mr. DOLE. One million two hundred ninety thousand tons.

Senator ALLOTT. Or twelve hundred ninety thousand; either way.

Mr. DOLE. Yes.

Senator ALLOTT. Tons. And of that we had a secondary recovery of lead of almost 50 percent.

Turning over to another area, in the zinc area we do not find as good a picture although it was very good a few years ago, it ran almost upon the same basis as lead. At that time it was running about a third from mining and about a third secondary and about a third imports, but now I find that mining is 526,000 tons and the secondary redistilled slab zinc is only 77,000 tons now. The total consumption is thirteen hundred forty thousand. Offhand do you know of any reason for that?

Mr. O'LEARY. Maybe you would want to know why the secondary recovery has dropped so much in zinc.

Mr. DOLE. Inasmuch as it was Mr. O'Leary that developed that I will turn you over to the director if you don't mind.

Senator ALLOTT. I think you should.

Mr. DOLE. It was Mr. O'Leary himself who developed that bible about 6 years ago.

Mr. O'LEARY. I think what we are caught in there is a statistical problem. It rose steadily to 80,000, 90,000 tons a year, about the same percentage year in and year out. There is, however, a shortage. I think if you look back 3 or 4 years you will find that time when zinc was in very

tight supply. There is a tremendous recovery of scrap during those periods. It then slides downhill.

In addition, Senator Allott, there is a very large recovery of zinc scrap in copper-base alloys that does not show on that sheet, so the zinc recovery figure is really a good deal better than it looks in that particular calculation.

Senator ALLOTT. Now just on the same subject and not to get too far away from it because I think these are interesting questions that were raised about molybdenum. I must say that while there are other great developments in the world, too, the so-called Henderson project in Colorado, which envisions approximately a $200 million development, is illustrative of the huge risks, the huge gambles that have to be taken in the mining industry. That is the only place I can think of.

Also, in addition to this it is also illustrative of what can be done in the area environment, because prior to the time that this was ever gotten off the ground it involved years of working with people who were primarily interested in environment and keeping the national scene.

I notice that in the molybdenum section in this book, on page 97, that in 1968 we produced 94 million; Canada, 24; Chile, 10; Peru, 2; the rest of the free world totaled 132 million. Of course we do not have any figures on the production of molybdenum behind the Iron Curtain; do we?

Mr. DOLE. No, we do not.

Senator JORDAN. Do we have any information about where the main sources of molybdenum are outside the free world?

Mr. KLEPPER. We have limited information on sources but not on actual reserves or production.

Senator JORDAN. Where are they?

Mr. KLEPPER. There are geological sources of molybdenum in Manchuria, major deposits in North Korea also.

Senator JORDAN. We won't get to them soon; will we?

Mr. KLEPPER. Not likely.

Senator JORDAN. Thank you very much.

Senator Moss. Thank you very much, gentlemen. I missed out on a good bit of the questions and answers but I will follow the record very carefully. We appreciate your appearance and your testimony here today.

Our next witness is Mr. Charles Kendall, General Counsel, accompanied by Mr. William Lawrence, Chief of the Materials Policy Division of the Office of Emergency Preparedness.

We are happy to have you gentlemen with us and we will be glad to have your testimony.

STATEMENT OF CHARLES KENDALL, GENERAL COUNSEL; ACCOMPANIED BY WILLIAM LAWRENCE, CHIEF, MATERIALS POLICY DIVISION, OFFICE OF EMERGENCY PREPAREDNESS

Mr. KENDALL. Mr. Chairman and members of the committee, the Office of Emergency Preparedness appreciates Chairman Jackson's invitation to appear before this committee to discuss the provisions of S. 719, a bill to establish a national mining and minerals policy.

S. 719 would declare it to be the policy of the U.S. Government to foster and encourage: (1) the development of an economically sound and stable domestic mining and minerals industry; (2) the orderly development of domestic mineral resources and reserves necessary to assure satisfaction of our industrial and security needs; and (3) mining, mineral, and metallurgical research to promote wise and efficient use of our mineral resources. Responsibility for carrying out this policy would be given to the Secretary of the Interior.

The Office of Emergency Preparedness is aware of, and vitally concerned over, the current status of the minerals industry. Estimates indicate that in the next 30 years, worldwide mineral consumption will approximate the total of man's previous consumption. Based on present production growth rates, severe shortages of major minerals may become a constant part of future U.S. industrial life. Copper, nickel, and platinum shortages of the past few years may only be samples of future problems.

The Office of Emergency Preparedness strongly concurs in the intent of S. 719. The need for a minerals policy designed to promote efficient utilization of natural resources is well recognized. We question, however, two possible implications of S. 719 as currently proposed.

Our first concern is that sole responsibility is placed in the Secretary of the Interior. While the Department of the Interior is the Government's principal agent in domestic minerals affairs, and as such must be heavily involved in a national minerals program, other agencies do have responsibilities in the minerals area. The Departments of Commerce and State are concerned about mineral consumers' needs and foreign sources of supply. The Office of Emergency Preparedness is concerned over assuring defense emergency supply. The Atomic Energy Commission's interest is obvious.

Secretary Dole mentioned there were two dozen interested agencies. I will not start on those.

Secondly, the bill may be read as promising that satisfaction of all mineral needs through domestic production is possible. As a matter of fact, all major industrial nations, with the possible exception of Soviet Russia, are net importers of some portion of their minerals and ores needed for industrial production.

The United States may be characterized as a "have not" Nation with respect to several minerals. We are dependent on foreign sources for the chromite, columbium, and tin consumed in this country. Practically all of our manganese ore, sheet mica, platinum, rutile, and tantalum come from overseas.

We are also dependent on foreign sources for most of the antimony, cobalt, nickel, bauxite, and silver consumed in the United States. Although such dependence represents a possible source of vulnerability to needed supplies, such dependency cannot be avoided. The stockpiles of strategic and critical materials represent insurance against the withholding of supplies. International trade economically provides necessary raw materials and to some extent conserves our own resources and, of course, stimulates economic growth both here and abroad.

Certainly the Government should foster and encourage the development of minerals production. The form which that encouragement may most effectively take is a matter which will require careful and

extended consideration. More research is needed into the beneficiation of low grade ores and the development of mineral substitutes. Without the employment of new and improved methods of discovery and processing we can only expect a continuing decline in our production relative to our requirements. These methods will require more technicians and specialists, and that in turn requires adequate employment opportunities in the field. Industry and Government cooperation is an essential element of the long-term growth and vigor of a domestic mining and minerals industry.

It is our understanding that the Department of the Interior is recommending changes in the bill's language to meet the concerns I mentioned. If it is so amended, we would support enactment of S. 719.

Senator Moss. Thank you very much, Mr. Kendall.

I understand the Office of Emergency Preparedness endorses the principles of the bill and you are simply pointing out to us one or two places where it might not be entirely clear as to what is intended by the bill.

Mr. KENDALL. That is correct, Mr. Chairman.

Senator Moss. And you have reiterated for us these problems that give rise to the introduction of the bill, the fact that we have continued decline in production of some of our minerals, that we simply have to import and stockpile some materials because we do not have them available.

Mr. KENDALL. Correct.

Senator Moss. We appreciate your coming to testify. Does Mr. Lawrence have anything to add?

Mr. LAWRENCE. No.

Senator Moss. We appreciate your being here.

Senator Allott.

Senator ALLOTT. Thank you.

I would like to go into the first matter, which is the sole responsibility placed by this bill on the Secretary of the Interior. You do not say, do you, Mr. Kendall, that a national minerals policy can be implemented if it is placed in three or four secretaryships in the Federal Government?

Mr. KENDALL. I would think, sir, essentially that it would be a responsibility of the present to be carried out by his lieutenants, his principal agent in the field of domestic minerals. But so far as foreign sources of mineral supplies are concerned, the Secretary of State is interested and, as Secretary Dole has pointed out, several other agencies.

Senator ALLOTT. This is true in almost any area in which we explore in Congress. I do not exactly get the gist of your first concern. I realize that the Department of Commerce, the Department of State, OEP certainly, has an interest in one facet of this very definitely, as does the Atomic Energy Commission. We have to make some agency of the Federal Government responsible for this, and the one that is involved here and the place where the Congress has put the responsibility for mining minerals is the Department of the Interior. With respect to public lands upon which exploration may occur, again you have the Department of the Interior. I am not sure whether you are trying to say here that we should make several departments responsible for this or not.

Mr. KENDALL. No. As I have suggested, I think you might indicate that it is the responsibility of the executive branch to carry out this policy rather than any particular department or, if you wish, you could say that the Secretary of the Interior shall be responsible to carry out this policy when he exercises his authority under such programs as may be authorized under law that are put upon him, the onus when he exercises any authority granted him by the Congress, any law that he uses in performing mineral functions to follow the policy.

Senator ALLOTT. Well, if this is carried out in the way I hope it will be, we might ultimately see executive agreements or treaties which would definitely come within the jurisdiction of the State Department. I don't think anybody here would contend that this would be the primary function of the Interior Department. The Interior Department would have to be concerned.

Mr. KENDALL. I assumed that, sir.

Senator ALLOTT. If you have language that you would like to suggest, I think the committee would be very happy to consider it.

Then on your second point I just would like to say this: I do not think anybody with any knowledge about this area at all thinks that we can be completely self-reliant in this very complex technological world in which we live in all minerals, although I would call to your attention that I believe it was tungsten that they said the United States had none of at all. We put a subsidy on tungsten and we had so much of it running out of our ears that the Congress had to take the subsidy off and leave a lot of our miners holding the bag here just about 10 years ago, maybe a little more than that.

So there is no telling what we can develop if we get the impetus behind the technological breakthrough, if we get the engineers and the people who are skilled in the areas of mining and mineralogy, geology, et cetera. There is no telling what we could recover in this country and we may have actually great reserves of some of the minerals that we are importing now.

Mr. KENDALL. That is perfectly possible, sir.

Senator ALLOTT. I think tungsten is probably a prime example of that.

Is Mr. O'Leary still here?

Senator Moss. No, I think he left.

Senator ALLOTT. All right. Thank you.

Senator Moss. Thank you, gentlemen.

Senator Jordan.

Senator JORDAN. Just one or two short questions.

You express a concern that I feel, too, that the estimates indicate that in the next 30 years worldwide mineral consumption will approximate the total of man's previous consumption. Now that is quite a mouthful. If I read it right, you calculate that in the next 30 years the world will use as much minerals as has been used since the beginning of recorded history to now. Is this what you are saying now?

Mr. KENDALL. Even beyond recorded history, including some copper instruments that we are able to find in our geological investigations.

Senator JORDAN. You go way back.

Mr. KENDALL. Yes.

Senator JORDAN. From the time of Adam, we will say.

Mr. KENDALL. Yes.

Senator JORDAN. Well, that is a long way back. We will reserve that comment for the head of the table.

Knowing as you do that that is true, does it not give you some concern that we are exporting some strategic minerals that very well might be in short supply in the foreseeable future? Look at what happened to copper by Mr. Dole's statement. Now he thinks wherever we find minerals that are salable on the world market we ought to dig them up and sell them. Do you agree?

Mr. KENDALL. I am not a mining man; I am a lawyer, Senator Jordan. But it has been, as I understand it, the experience of the mining industry that if you need it and there is a sufficient reward you can find it. The example of tungsten is perhaps a good one. If there is a sufficient incentive, supplies can frequently be found. We would not want to interfere with international trade in these materials in the interest of saving them for ourselves because if the deposit is not developed it might not be useful to us for several years. In terms of an emergency at least, which is a particular concern of the Office of Emergency Preparedness, material in the ground that is not developed may not actually serve any useful purpose during the period of emergency.

Senator JORDAN. Your main concern is insuring that for defense purposes there is an abundant supply of strategic minerals?

Mr. KENDALL. That is correct, sir.

Senator JORDAN. You go along with Mr. Dole then in saying that as far as you are concerned it is all right to export worldwide?

Mr. KENDALL. I bow to to his opinion, he has so much greater know-how in the field.

Senator JORDAN. All you say is you want it right now and not tomorrow?

Mr. KENDALL. That is right, sir.

Senator JORDAN. All right.

Senator MOSS. Thank you, Senator Jordan.

Thank you, gentlemen. We appreciate your appearance and we are glad to have your testimony.

Mr. S. David Freeman, Director of the Energy Policy Staff, Office of Science and Technology, is next. Mr. Freeman is accompanied by Mr. Weinhold. We are pleased to have you gentlemen here. You may proceed, sir.

STATEMENT OF S. DAVID FREEMAN, DIRECTOR, ENERGY POLICY STAFF, OFFICE OF SCIENCE AND TECHNOLOGY; ACCOMPANIED BY J. FREDERICK WEINHOLD, TECHNICAL ASSISTANT

Mr. FREEMAN. Thank you, sir.

We appreciate this opportunity to present the views of the President's Office of Science and Technology on the important subject of establishing a national mining and minerals policy. Dr. DuBridge asked me to express his regrets as being unable to appear before you as he is appearing before another committee of the Congress today. Dr. DuBridge has supplied a statement for the record.

Mr. Chairman, my statement is available and it is my intention to just summarize it and give you the highlights of the statement. In some sense it is cumulative of testimony that has already been pre-

sented today by others who are perhaps closer to this particular problem than I. I do think it might be helpful for the record to indicate the views of the President's Office of Science and Technology in the respects in which we concur with the views of those who are more eminently familiar with the problem.

Senator Moss. That will be very satisfactory. The full statement will be in the record at the end of your remarks and you emphasize those parts that you feel you should for the committee here.

Mr. FREEMAN. Thank you, sir. My own responsibilities are with energy policy, those minerals Senator Allott mentioned—coal, natural gas, oil, uranium and shale oil which make up our energy supply.

If it is not presumptuous for me to do so, I believe that this committee should be complimented and the sponsors of S. 719 should be commended for focusing public attention on a very important area of public policy which in my experience seldom receives the spotlight and public attention which I think it deserves.

My own work is in the energy field but I believe the observation is certainly equally true for all minerals. We seldom are able to focus on problems of future supply when existing supplies appear to be adequate, and perhaps this is one reason that there is not the public attention. Perhaps the general public feels that the future will take care of itself as far as mineral supplies are concerned, but those of us who study the problem to any extent at all know that the future will not take care of itself.

Government policies play a major role in our mineral supply and they must be reviewed and, more importantly, they must be revitalized if the needs of the next decades are to be adequately met. New policies are especially necessary for many reasons, including the problems of the quality of our environment which others have mentioned.

As this committee well knows, there has been no broad, comprehensive review of our Nation's policies with respect to supply and demand of minerals by the executive branch since the report of the President's Materials Policy Commission, the so-called Paley Commission Report completed in 1952. A fresh assessment on a continuing basis rather than an ad hoc basic certainly seems to be in order. It is needed to determine periodically supply with respect to attention needs. It is also needed to be sure that science and technology is being brought fully to bear on the problem areas.

S. 719 seems to us, as far as the Office of Science and Technology is concerned, to be a timely vehicle for accelerating the efforts needed to meet these public concerns. S. 719 would have the salutory effect of facilitating the effect of a minerals policy from a broad, long-term national prospective. Our Nation is becoming increasingly dependent on fuels, metals, and other minerals to satisfy the needs of a modern, industrial society. As a matter of fact, I think both of the things that we see before us are a product of minerals and energy. Our increasing dependence on minerals in a broad sense parallels our rising standard of living. Adequate mineral supplies are therefore essential for the longrun economic development of the Nation.

Dr. DuBridge's report on the bill stresses the need for improved technology to meet the Nation's longrun needs for economical minerals resources and he mentions several novel approaches which may

prove feasible if we devote the necessary research and development effort. An important function which adoption of S. 719 would serve is to focus attention on the need for a systematic program of putting science and technology to work on the minerals problem, and the need is more urgent than most people realize because of the long leadtime for developing any major technological improvements.

I feel sure that the national minerals policy envisioned by S. 719 would include recognition of the mounting public concern for the protection of the environment. The cost of meeting future mineral needs should include necessary measures to protect the health and safety of those who work in the mines and processing plants as well as to protect the quality of the environment in mining and disposing of wastes.

Various forms of pollution are inherent in most present mining operations and, as lower grade ores are mined, even more solid wastes will be produced. We must be sensitive to the multiple uses of the surrounding area with which mineral operations may conflict. There is an obvious need for a vigorous program of developing new technology in which the environmental problems are considered as an important design criteria along with productivity. Indeed, technological developments may prove the only feasible solution for economically meeting our growing mineral requirements while preserving our land, water, and air resources.

As might be expected, the Office of Science and Technology stresses the role of technology in providing the primary long-term solution for improving the U.S. minerals industry. We have done so because traditionally this Nation has made progress by improving the productivity of its industries and workers through technology and education. Problems may be temporarily alleviated by protection of domestic industries, but this tends to distort major segments of the economy and to increase the real cost of living.

Increased productivity through adaptation of new technology has resulted in a standard of living for the U.S. worker second to none. The minerals industries have an important role to play in our future progress, and we must devote a greater effort to developing better technology if we are to meet our future needs. It seems to us that a congressional declaration of policy to that effect, as is contemplated by S. 719, would be a useful step in that direction.

We envision that the Department of the Interior would take the lead in identifying the areas where research and development of new technology would be most useful. While this first step would be conducted or funded by the Government, its purpose would be to encourage industrial and university efforts as well as substantive Government work. We have had recent experience and cooperation with the Bureau of Mines in contracting with the large industrial firm of TRW, Inc., which has experience in new technologies utilizing the systems approach to develop an R. & D. plan for underground coal mining.

This is to a certain extent an experiment in which we are trying to ascertain how advanced technologies and methods from other industries could be applied to resolving the interrelated problems of coal mine health, safety, and productivity. Hopefully, it may provide a model for subsequent efforts on other mineral problems.

Another aspect of the problem that concerns us is the need to stimulate research and development in the minerals area in the universities. Dr. Osborn this morning, I believe, documented this need most adequately. The figure that sticks in my mind which is quite surprising and perhaps shocking to most people is the fact that our Nation's universities graduated a total of only 110 mining engineers this year. Support of significant new university research projects by industry and Government should enable the universities to attract more students and faculty members and hopefully reverse the downward trend of interest in this important area of our economy.

As I mentioned at the outset of my testimony, my own experience is in the energy field. As Senator Allott made clear at the outset of the hearing, while the fuels are certainly minerals they do present a distinct area of public policy consideration. There is one case history in the energy field, however, to which I should like to allude because I believe it is relevant to the need for S. 719. I refer to our shale oil resources concentrated in the Rocky Mountain area. I believe that it is fair to say that development of our shale oil resources has been greatly inhibited by the lack of any clear governmental policy to guide its development.

It is, of course, true that the technology has not yet been demonstrated on a commission basis but the fact remains that the bulk of this potential sources of hundreds of billions of barrels of oil is located on Government land and that, unlike the development of atomic energy, there is no well-planned program for facilitating the entry of this resource into the mainstream of our commercial energy supply.

In view of the tremendous future demand for energy facing this Nation it would seem prudent that we develop a policy that would at least determine whether the shale resource can compete with other forms of energy. I realize that there are great differences of opinion as to the ingredients of a shale oil policy, but I should hope that all would agree that Government should develop a national policy that is in the public interest even if the task is difficult.

I believe the status of our shale resource is an outstanding example of why a bill such as S. 719, which will encourage the development of research to promote the wise and efficient use of our mineral resources, could serve the Nation well.

Mr. Chairman, I now would like to just briefly summarize the views of the Office of Science and Technology on this subject.

1. We believe that an adequate supply of low-cost minerals is essential to the long-run economic development of the Nation.

2. Technological developments are the basic long-run solution to the minerals supply problem.

3. The mounting concern over the quality of our environment should be recognized as a part of our national minerals policy and will require increased research and development efforts to provide economical solutions.

4. Increased productivity rather than protection of domestic industry provides the best long-term policy.

5. The policy questions, especially those with respect to energy minerals, involve many agencies in addition to the Department of the Interior.

In conclusion, we would like to emphasize our support for the efforts initiated by the sponsors of S. 719 and your committee to establish a minerals policy for the United States. We believe that certain language changes suggested by the Department of the Interior are desirable and with such changes we urge enactment of the bill.

I hope that we can be of assistance in supporting and carrying out the commendable purpose of S. 719—to lay down the congressional guidelines for the development of a minerals policy for the Nation which will enable that industry to continue to play its rightful role in improving the standard of living of all Americans.

Thank you.

Senator Moss. Thank you very much, Mr. Freeman, for your fine statement and analysis for the bill and the needs of the Nation which it is designed to meet. We are glad to have the endorsement of the Office of Science and Technology. Dr. DuBridge has indeed written to the committee and we have a statement of his that accords with what you have brought today from that office.

We are glad to have your assistant appear with you. If he has anything to say in addition, we would be glad to hear from him.

Mr. WEINHOLD. No.

Senator Moss. We are pleased that you are here today and prepared to answer questions.

We understand your assignment is primarily in the energy field but there is an interrelationship in all minerals and energy so we are glad to have your comments.

Senator Allott, do you have any questions?

Senator ALLOTT. Yes.

I appreciate also the fact that Dr. DuBridge has taken such an interest in this because it underscores in my mind the emphasis that has been placed by you today and by others—many others, as a matter of fact—upon the loss of our educational ability in the number of graduates we are putting into this field in this country.

I purposefully in my opening statement eliminated shale oil. I note that you have been doing extensive study in this area for the reason that it has particular problems and many of them are legal in nature although certainly the aspects of this which relate to the development of our technological know-how in the whole area of earth resources could certainly be applicable to this bill.

Thank you very much, Mr. Freeman.

Mr. FREEMAN. Thank you.

Senator Moss. Senator Jordan, do you have any questions?

Senator JORDAN. No questions.

Senator Moss. Thank you very much, gentlemen. We appreciate your appearance.

(The statement referred to follows:)

STATEMENT OF S. DAVID FREEMAN, DIRECTOR, ENERGY POLICY STAFF, OFFICE OF SCIENCE AND TECHNOLOGY

Mr. Chairman, members of the subcommittee, we appreciate this opportunity to present the views of the President's Office of Science and Technology on the important subject of establishing a national mining and minerals policy. Dr. DuBridge asked me to express his regrets at being unable to appear before you himself but he has submitted a report to the Committee for the record.

My particular responsibility in the Office of Science and Technology is to direct a small Energy Policy Staff which was established about two years ago to assist in coordinating the work of the various agencies in government with responsibilities in the energy field. My work and experience is therefore primarily concerned with those minerals that are a source of our nation's growing demand for energy—coal, natural gas, oil, uranium, and those that are a potential source such as shale oil. Our work is necessary because there are a number of agencies with varied and important responsibilities in the energy field. The insensity of interfuel competition in the marketplace means that government policies with respect to any one form of energy invariably have an impact on the others. Our task is to try to assure that government policies are evenhanded and addressed to future needs and opportunities.

I believe this Committee and the sponsors of S. 719 should be commended for focusing public attention on an important area of public policy which seldom receive the spotlight of public attention that it deserves. One reason why the problems of future supply of energy and the other minerals are frequently ignored may be because the public generally takes their continued existence for granted. However, we know that the future will not take care of itself. In a very real sense our batting average on actions needed today to meet the problems of the next decade is one of the sternest tests of whether we are living up to our heritage as a nation.

Government policies play a major role in our mineral supply and they must be reviewed and revitalized if the needs of the next decades are to be adequately met. New policies are especially necessary if we are to face up to the fact that extracting minerals from the earth and converting them into energy and materials has a profound effect upon the quality of our environment. New policies and new technology are needed to minimize the adverse impact on the environment if future generations are really to benefit from our material abundance.

As this Committee well knows, there has been no broad, comprehensive review of our nation's policies with respect to supply and demand of minerals by the Executive Branch since the report of the President's Materials Policy Commission, the so-called Paley Commission report, completed in 1952. A fresh assessment on a continuing basis certainly seems in order not just to determine supply with respect to potential needs but to be sure that science and technology is being brought fully to bear on the problem areas, including the new dimensions of public policy such as protecting the environment. S. 719, which would establish a national mining and minerals policy, seems to us to be a timely vehicle for accelerating the efforts needed to meet these public concerns.

S. 719 would have the salutary effect of facilitating the development of a minerals policy from a broad, long-term national perspective. Our nation is becoming increasingly dependent on fuels, metals and other minerals to satisfy the needs of a modern, industrial society. Our increasing dependence on minerals in a broad sense parallels our rising standard of living. Adequate mineral supplies are therefore essential for the long-run economic development of the nation.

Dr. DuBridge's report on the bill stresses the need for improved technology to meet the nation's long-run needs for economical minerals resources. He mentions several novel approaches which may prove feasible. An important function which adoption of S. 719 would serve is to focus attention on the need for a systematic program of putting science and technology to work on the problem. And the need is more urgent than most people realize because of the long lead time for developing any major technological improvements.

I feel sure that the national minerals policy envisioned by S. 719 would include recognition of the mounting public concern for the protection of the environment. The cost of meeting future mineral needs should include necessary measures to protect the health and safety of those who work in the mines and processing plants as well as to protect the quality of the environment in mining and disposing of wastes. Various forms of pollution are inherent in most present mining operations and, as lower grade ores are mined, even more solid wastes will be produced. We should be sensitive to the multiple uses of the surrounding area with which mineral operations may conflict. There is an obvious need for a vigorous program of developing new technology in which the environmental problems are considered as an important design criteria along with productivity. Indeed, technological developments may prove the only feasible solution for economically meeting our growing mineral requirements while preserving our land, water and air resources.

We have stressed the role of technology in providing the primary long-term solution to improving the U.S. minerals industry. We have done so because traditionally this nation has made progress by improving the productivity of its industries and workers through technology and education. Problems may be temporarily alleviated by protection of domestic industries, but this tends to distort major segments of the economy and to increase the real cost of living. Increased productivity through adaptation of new technology has resulted in a standard of living for the U.S. worker second to none. The minerals industries have an important role to play in our future progress, and we must devote a greater effort to developing better technology if we are to meet our future needs. Certainly a Congressional declaration of policy to that effect—as is contemplated by S. 719—would be a useful step in that direction.

We envision that the Department of the Interior would take the lead in identifying the areas where research and development of new technology would be most useful. While this first step would be conducted or funded by the government, its purpose would be to encourage industrial and university efforts as well as subseqent government work. At the moment, the Office of Science and Technology, in cooperation with the Bureau of Mines, is working on one project which may point the way to such efforts. We have recently contracted with TRW, Inc., a large industrial firm with experience in new technologies utilizing the systems approach, to develop an R&D plan for underground coal mining. This is an attempt to ascertain how advanced technologies and methods can be applied to resolve the interrelated problems of coal mine health, safety and productivity. Hopefully, it may provide a model for subsequent efforts on other mineral problems.

Stimulation of research and development in the minerals area should in time help to alleviate the shortage of highly trained technical manpower required for the future. It is my understanding that our nation's universities graduated only a total of about 110 mining engineers this year. Support of significant new university research projects by industry and government should enable the universities to attract more students and faculty members and hopefully reverse the downward trend of interest in this important area of our economy.

As I mentioned earlier, my own experience is in the energy field. While the fuels are certainly minerals, they appear to present a distinct area of public policy consideration. The value of our annual domestic petroleum production, for example, exceeds the combined value of all the non-fuel metals and minerals. There are important economic and policy issues with respect to the fuels minerals that concern many governmental interests beyond the authority of the Department of the Interior.

Petroleum offers a case in point. The issues of import policy, tax policy, and other questions make it very difficult for a single agency to formulate overall policy. As you know, our present oil import policies are quite controversial and President Nixon took early action to order a comprehensive review of oil import policy which is now under way. To accommodate the many interests and points of view involved, the President established a Cabinet-level task force, consisting of seven department heads, plus observers from six other agencies, to make the review.

There is one large potential source of petroleum which presents another case in point. I refer to our shale oil resources concentrated in the Rocky Mountain area. I believe it is fair to say that development of our oil shale resources has been greatly inhibited by the lack of any clear governmental policy to guide their development. It is, of course, true that the technology has not yet been demonstrated on a commercial basis. But the fact remains that the bulk of this potential source of hundreds of billions of barrels of oil is located on government land and that, unlike the development of atomic energy, there is no well-planned program for facilitating the entry of this resource into the mainstream of our commercial energy supply. Opinions, of course, differ as to the share of the energy market which shale oil could capture if its development were encouraged. However, in view of the tremendous future demand for energy facing this nation it would seem prudent that we develop a policy that would at least determine whether the shale resource can compete with other forms of energy. Otherwise this vast source of potential energy cannot be called upon to play its rightful role in meeting the nation's energy needs.

I realize that there are great differences of opinion as to the ingredients of a shale oil policy, but I should hope that all would agree that government should develop a national policy that is in the public interest. I believe the status of our shale resource is an outstanding example of why a bill such as S. 719, which will encourage the development of research to promote the wise and efficient use of our mineral resources, could serve the nation well.

As I mentioned earlier, the magnitude and impact on the overall economy of our sources of fuel supply may make it desirable to treat them separately. The multi-agency involvement in energy is pointed up by the role of our Office in coordinating energy policy on a government-wide basis. Indeed, the fact that this Subcommittee is entitled Minerals, Materials and Fuels, suggests that the Committee considers the fuels minerals as a separate category. I feel sure that S. 719 is not intended to disturb existing responsibilities of other agencies in the energy field and if there is any question on this score, I am sure that you will want to clarify it.

Let me now briefly summarize our views:

1. An adequate supply of low-cost minerals is essential to the long-run economic development of the nation.
2. Technological developments are the basic long-run solution to the minerals supply problem.
3. The mounting concern over the quality of our environment should be recognized as a part of our national minerals policy and will require increased research and development efforts to provide economical solutions.
4. Increased productivity rather than protection of domestic industry provides the best long-term policy.
5. The policy questions, especially those with respect to energy minerals, involve many agencies in addition to the Department of the Interior.

In conclusion, we wish to emphasize our support for the effort initiated by the sponsors of S. 719 and your Committee to establish a minerals policy for the United States. We believe that certain language changes in the text of S. 719 suggested by the Department of the Interior are desirable and with such changes we urge enactment of the bill.

I hope that we can be of assistance in supporting and carrying out the commendable purpose of S. 719—to lay down the Congressional guidelines for the development of a minerals policy for the nation which will enable that industry to continue to play its rightful role in improving the standard of living of all Americans.

Senator Moss. Professor Pfleider has a time problem to catch a plane, and we will hear from him next. Professor Pfleider is from the School of Mineral and Metallurgical Research, University of Minnesota.

STATEMENT OF EUGENE P. PFLEIDER, SCHOOL OF MINERAL & METALLURGICAL RESEARCH, UNIVERSITY OF MINNESOTA

Mr. PFLEIDER. Mr. Chairman, I appreciate being taken out of turn so I can catch the plane.

Senator Moss. We do not want you to miss an airplane. We are pleased to have you come and testify.

Mr. PFLEIDER. It is nice to be here.

My reason for being here is to give a case example of a kind of technology that we must develop in order to meet some of the needs of the mineral industry.

You have a copy of my statement before you, Mr. Chairman, and with your permission I would just like to highlight it and use a few slides which I think might give you a better idea of it than perhaps if I go through the statement.

Senator Moss. We would be pleased to have you proceed in that way. The statement in full will be in the record.

Mr. PFLEIDER. Thank you.

(The statement referred to follows:)

STATEMENT OF EUGENE P. PFLEIDER, PROFESSOR OF MINERAL ENGINEERING, UNIVERSITY OF MINNESOTA, AND CHAIRMAN, RAPID EXCAVATION COMMITTEE NAS/NAE OF NRC

U.S. MINERAL POLICY SHOULD SPONSOR UNDERGROUND RESEARCH AND DEVELOPMENT

The problem

Mr. Chairman and members of the Senate committee, the mining industry of the World, and particularly of the United States, has made a complete reversal from underground to surface mining methods since the turn of the 20th Century. This has occurred even as average ore grades were decreasing and strip ratios rising.

In the early 1900's there were over 100 underground mines producing from the three iron ranges of Minnesota—today there are none. Practically all of our coal prior to 1930 was mined underground; today over one-third is from surface operations and that percentage is increasing. Although world mining has not changed to surface techniques as rapidly as has the U.S. industry, the shift is escalating and will approach our figures shortly. A comparison of World and U.S. production figures are shown in table 1, taken from the AIME Surface Mining volume, and the trend rates for the U.S. are depicted in Fig. 1.

TABLE 1.—ESTIMATED WORLD AND U.S. PRODUCTION OF CRUDE ORES BY SURFACE MINING, 1964

(TABLE 1.1-1 FROM AIME SURFACE MINING VOLUME)

	World			United States			Total U.S. percent of world
	Millions of tons			Millions of tons			
	Total	Surface	Percent	Total	Surface	Percent	
Metallic ores	1,800	900	50	458	376	82	25
Nonmetallic ores	1,090	850	85	148	114	77	15
Clay, stone, sand and gravel	3,000	3,000	100	1,657	1,621	98	55
Coal	3,000	1,000	33	504	176	35	17
Total	8,800	5,750	65	2,767	2,287	83	31

There are various authorities, including Allsman [1] and Howard,[2] who feel that future conditions will force a reversal of this trend—with a gradual shift back to underground. One imporant reason is the exponentially rising standards for minerals, as shown in tables 3 and 4 of the NAS report on Rapid Excavation, Publication 1690, 1968. Furthermore, changing public attitudes on environmental control will, to some extent, tend to increase the cost of surface operations. Perhaps the greatest effect will come from improved geological and geophysical techniques that will uncover mineral deposits beyond the economic depth of surface stripping. Furthermore, as present pits reach their stripping limits a changeover to underground should result. A comparison of the potential zones available to underground versus surface mining methods is presented in Fig. 2. An interesting potential in this respect is the underground mining of Minnesota taconites.

But such shifts will be slow in coming if we fail to escalate our productivities in underground excavation methods considerably more rapid than that in the past. Surface mining today has productivity rates of 100 tons-per-manshift (tpms) for small ferrous and non-ferrous mines up to 500 tpms for large coal and industrial mineral operations, when including all waste or ore handled. By comparison, underground mining achieves rates of but 10 to 60 tpms; or about one-tenth of those for surface methods. It is small wonder that strip ratios of 5 to 1 are possible in metal ore mining and up to 60:1 for coal operations.

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TABLE 2.—AVERAGE EXCAVATION COST PER CUBIC YARD OF MATERIAL EXCAVATED (CRUDE ORE AND WASTE)

Mineral	Surface mining	Underground mining
Metals	$0.88	$4.34
Nonmetals	1.94	6.78
Coal	.15	4.00

Source: Taken from table C.4 of Operations Research, Inc., report for the U.S. Bureau of Mines.

The impact of these productivity differences are clearly shown in table 2, taken from a report [3] prepared in 1967 for the Bureau of Mines.

This same phenomenon has been occurring in the construction industry. In the early part of the century, New York was building its subway system. Tunnels for railroads and highways were relatively common, because it cost too much to excavate large quantities of surface rock by hand held drills and hand shovels or horsedrawn scrapers. Today, massive equipment excavates and transports millions of yards of rock or earth quickly and cheaply. Until recently there was plenty of open space for such activity, and few people worried about the aesthetics.

Planners have tended to consider solutions to pressing problems only in the terms of current technological capabilities. These can and must change. Sweden, given the need and favorable rock conditions, has done an outstanding job in adopting underground excavation for mining purposes as well as total defense and peaceful uses.[5] Its mining engineers, aided by the government, have developed futuristic concepts of underground excavation that match our space program. Fourteen large control centers and shelters have been constructed at vital points. Most of these centers are used also for garages, warehousing, educational and recreational centers, and even industrial manufacturing. For several decades many of Sweden's large hydro-electric stations have been constructed in rock. The development of an underground technology has permitted these construction feats at reasonable costs. To some extent the U.S. is doing the same with the NORAD project in Colorado.

Other countries are turning to the use of tunnels and subways increasing by more. Hamburg, Munich, Montreal, Toronto and Paris are constructing or extending their subway systems. Japan is driving a 20 km tunnel between the islands of Honshu and Hokkaido. England and France are planning a 30-mile bore under the English Channel. The Mont Blanc tunnel through the Alps by the French and Italians is an epic in tunnel driving using conventional drill-and-blast methods. Such developments will have spin-off benefits to underground mining, if our industry is properly encouraged.

All of these efforts are extending our knowledge and reducing the fear of planners to consider underground excavation. Furthermore, the advent of the continuous boring machine for tunnel, shafts and raises is to some extent revolutionizing our concepts. This unit, together with that of rubber-tired drilling, loading and hauling equipment underground, have been responsible for increasing productivities some 50 to 100% in the past 15 years.

However, this rate of improvement is still inadequate to stem the constant encroachment of surface excavation methods, since the latter is experiencing even greater gains. As expressed in the report of the Rapid Excavation Committee of the National Academy of Engineering,[4] "For a long time surface excavation * * * have received even larger consideration by corporate and governmental planners concerned with urban and resource development. * * * The net result is that demands for underground excavation from the construction and resource sector are residual, i.e., projects are planning as subsurface only when there is practically no alternative."

The Background of the Problem

Why is it that the technology of underground excavation has lagged behind that of the surface?

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First, geological conditions are a principal design consideration in underground excavation. Because of the great variations in rock types, structure and strengths—most of which cannot be predicted in advance of the headings, it is difficult both for the designer and the contractor to achieve the most economic solution. Furthermore, it is generally impossible to select a one-purpose excavator.

Secondly, space is confined—requiring a high concentration of rock disintegration energy at the working face as well as the complete coordination of the disintegration, removal and support systems. All of this must be done while providing for the comfort, health and safety of the workmen. The result of these factors is that the current process is expensive and has a rather slow rate of sustained advance.

In addition to these factors, the Rapid Excavation Committee [4] found that the following interrelated technical and commercial features retarded technological change:

(1) inadequate technical knowledge on which to base design for both the opening and the excavator, and

(2) inadequate industrial incentive to develop better equipment.

We must have better means of predicting rock conditions so as to select the best routes or the preferable method of attack. Better information on rock mechanics will permit a more rational design, oftentimes at substantial savings in cost.

The markets for surface excavation equipment are large and expanding; sufficient to entice any manufacturer to innovate and market new designs. In fact, many of the new concepts being used underground are modifications of units originated for surface applications—for example, the highly mobile front-end loaders on rubber-tired wheels. By contrast, the more specialized units for underground use do not command nearly as broad a market. Hence it is a gamble for both the manufacturer and the consumer to try radical designs even if they are favored with a substantial R and D budget.

This limited demand of the past, coupled with the great variability of underground projects both in mining and construction, has been an impediment to industrial incentive. Seldom does the "heavy construction industry" have a sustained interest in the whole excavation process—planning, design, construction and the manufacture and supply of equipment. Further there are few if any standard tunnel diameters around which a boring unit can be built, and patents on new innovations seldom have validity. Thus, the cost of innovations must generally be borne by a single project, and if it fails the contractor must bear the entire cost plus paying a penalty for lost time. As a consequence, there is a natural tendency to go conventional.

Although underground mining operations have more flexibility in design and greater incentive to innovate, here again the cost to a single producer or to a manufacturer meeting a singular condition is oftentimes too high.

A further deterrent stems from the difficulty in finding design engineers and planners who are familiar with underground operations; as well as workmen who are willing to tackle the working conditions. These factors can, of course, be overcome by the training of personnel and the exchange of physical effort by easily-controlled equipment operating in a pleasant environment.

Despite these obstacles, private enterprise has made some real gains in underground productivity—largely directed toward the ingenious incremental changes in equipment or techniques. But these improvement rates are inadequate to make underground methods a realistic alternative or to hold rising costs in check. "A radical change in the scope of thinking about underground excavation is needed to achieve that desirable goal."

Impact of environmental control

Much is being written today on the future impact of environmental control—of the air and the land. In our mineral industry, reclamation is becoming a byword. There is a definite and important relationship between the development of better and cheaper underground excavation and an aesthetically pleasant surface.

The report [4] of the Rapid Excavation Committee describes this relationship succinctly in the following words:

"As the nation's gross national product (GNP) increases and discretionary expenditures become a larger portion of total expenditures, national concern for the quality of the environment increases at a faster rate than the rates of growth of the economic expenditures that generate the concern."

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"This urbanization trend poses problems of great complexity to the nation. Certainly one problem is related to the construction of the physical plant required by the urban complexes—how to create transportation and utility systems efficiently and economically—but at the same time neither unduly disrupt living patterns nor necessarily defile the natural environment. Certainly another problem is related to the mining of minerals required by the industrial sector * * * how to tap resources efficiently and economically without disfiguring the countryside."

"* * * current concern about environment is providing an appreciable increase in the number of these residual public needs, e.g. parking spaces and water and vehicular tunnels. Moreover, new needs are being defined that seemingly can be satisfied only by placing greater demands on underground excavation technology * * *. In most of these proposals, all costs are passed on to state or federal taxpayers, and these costs are on the rise."

One of the currently-suggested solutions to this problem is the application of increasingly stricter environmental controls, and this is being done. Another and better answer is to so improve our underground excavation techniques that the planners have an alternate choice. Such is the course followed in the proposed Sloop project for the Safford copper deposit, featuring the use of atomic energy and *in-situ* leaching; and in the oil shale projects where either large-scale room-and-pillar mining methods or *in-situ* burning are being considered.

Potential for Underground Excavation

Various estimates have been made as to the potential for underground excavation within the next decade or two. A recent study [3] for the Bureau of Mines, based in part on a survey of federal agencies, indicates that during the eight-year period of 1968–1975, underground activity will comprise about 1000 miles of tunnels (subways: 85 miles; urban highways: 123 miles; intercity highways: 210 miles; water supply: 528 miles) and over 5 billion tons of crude ore (metals: 874 million; nonmetals: 899 million; coal: 3,346 million).

The NRC/NAE Committee on Rapid Excavation, assuming conservatively that underground excavation will (*a*) maintain its relative share (22%) of the construction-oriented market; (*b*) maintain its relative share of the coal-mining market; and (*c*) lose its relative share of the remainder of the mining-oriented market to the extent that its current value will remain contsant; estimated the demands as presented in Table 3.

TABLE 3.—ESTIMATED CUMULATIVE U.S. UNDERGROUND EXCAVATION DEMANDS FOR THE DECADES 1970–79 AND 1980–89

[In billions of constant 1964 dollars]

	1970–79	1980–89,
Construction-oriented demand	13	22
Mining-oriented demand [1]	16	18
Total demand	29	40

[1] Includes coal-oriented demands amounting to $12,000,000,000 and $14,000,000,000 in the decades 1970–79 and1980–89, respectively.

Note: This is table 6 in report of Rapid Excavation Committee, p. 42.

These quoted estimates can be considered conservative, in the sense that they include only the conventional uses of underground excavation. They do not, for example, include such potentials as underground storage of oil and gas, warehousing, or for recreational and educational centers or industrial plants as used in Sweden and now envisioned for the model cities being proposed.

The Solution and the Benefits

What, then, is the solution to our problem?—A massive and sustained development and research effort is required to reverse the almost total domination of mining and of public construction by surface excavation methods.

The planners, designers and engineers of the future must be educated to the advantages of this 4° dimension—i.e. below the surface—much as the pioneers of aviation and now Von Braun and his group have conquered outer space. Their accomplishments were made largely through the expenditures of tens of billions

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of dollars of governmental monies; but the spin-off effects have been tremendous. We need that same zeal of conquering new horizon below the surface, realizing that there are many side benefits, such as—

(*a*) Direct costs reductions—resulting in savings both from normal UG applications and from those surface projects converted to UG because of the cost reductions;

(*b*) Preserved surface land values;

(*c*) Reduced surface activity disruption costs;

(*d*) Aesthetic benefits to surface environment; and

(*e*) Improvement in our balance of payments position—the U.S. is becoming increasingly more dependent on imports of their mineral demands; iron ore (40%), copper metal (22%), lead and zinc (27%). The U.S. trade deficit for mineral products was approx. $3.2 billion for 1966, and of this $1.5 billion was for metal and nonmetal ores and $1.7 billion for energy fuels.

Furthermore, a stemming of this tide toward mineral imports can provide tens of thousands of jobs for our citizens.

The Rapid Excavation Committee [4], in addressing itself to these points, made the following recommendations:

1. Over and above current government and industry research and development efforts, a 10-year, $200 million, federally funded research program should be immediately undertaken and vigorously pursued to establish the technological basis for reducing the cost and improving the sustained rate of advance of underground excavation.

2. Individual research projects should be selected for inclusion in the program on the basis of their potential contribution—

(*a*) to the coordination of the several elements of the underground excavation process into a highly engineered system

(*b*) to the improvement of the basic knowledge required to subsequently effect engineering advancements in the several cited areas of—

(1) Geological conditions
(2) Rock mechanics
(3) Rock disintegration
(4) Materials handling
(5) Ground control
(6) Environmental control and safety

3. As an essential element of this supplemental research effort, a federally funded field laboratory should be established and equipped to test full-scale integrated excavating systems on a range of geological conditions.

4. Within the government, an interagency committee should be immediately established—

(*a*) to recommend how federal sources may be used efficiently to initiate and maintain the research program;

(*b*) to coordinate the overall research program; and

(*c*) to interpret research results and disseminate pertinent information to all parties with interests in rapid excavatiton.

5. A government/industry/academic advisory committee should be established concurrently to assist the interagency governmental committee and to vigorously encourage and assist industry to use the research results in the development and application of improved underground excavation equipment and processes.

By following such recommendations, the Committee feels that the knowledge gained will set the stage for reducing over-all underground excavation costs by at least 30 percent and increase the sustained rates of advance some 200 to 300 percent by 1990.

If this objective can be achieved, the net saving on the $35 billion of construction-oriented underground construction (estimated as a minimum for the 1970–1979 period in Table 3) is $2.5 billion when discounted at the government's cost of borrowing at 6%—more than 12 times the cost of the research program. Looking at it another way, the internal rate of return on the $200 million research investment, if predicated only on the savings from government-oriented projects, would be about 40% per year.

The economic justification cited above does not include the benefits derived by the U.S. because of its improved ability to produce its mineral requirements at competitive costs; with a resultant improvement in our balance-of-payments. Nor do the calculations consider the side benefits of improved environmental conditions or the faster travel speeds in the metropolitan areas.

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The Committee[4] further concludes that, "If the public sector initiates this added research effort and concurrently evolves a realistic technology transfer plan, the competitive nature of the excavation industry is such that the engineering development needed to convert research results into operable equipment and processes will be privately made."

Shouldn't such benefits merit equal consideraiton for just a fraction of the funds going into outer-space research? And isn't it worth the coordinated efforts of the civil engineer, the planner, and the mining engineer—working with the mining, construction and equipment manufacturing industries—to bring this about?

Since underground excavation is multi-disciplinary, and a world problem, we must call on talents from all fields, including those from abroad, to assist in the solution. Toward this end, the professions are holding numerous symposia to determine the present "state of the art." The Tunnel and Shaft Conference held at the University of Minnesota last May, and the Symposium on Research and Development in Rapid Excavation, scheduled at Sacramento State College in October, are but two of such meetings. Additionally, the American Institute of Mining, Metallurgical and Petroleum Engineers, as well as the American Society of Civil Engineers are establishing committees to further this greatly needed development in the art and science of underground excavation.

The Congress of the United States is the only arm of the government that can initiate this program of converting large potential tonnages of underground mineral resources to the economic reserve status. This it can do by sponsoring a long range, coordinated R. & D. effort on a total underground excavation system as a part of the country's Mineral Policy.

In closing, I wish to thank the Committee for permitting me to make this presentation in support of the Minerals Policy Bill.

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[1] Allsman, Paul T., "Current and Future Status of Surface Mining," Chapter 1.1 in Surface Mining Volume, *AIME* (1968) : 3–16. E. P. Pfleider, Editor.

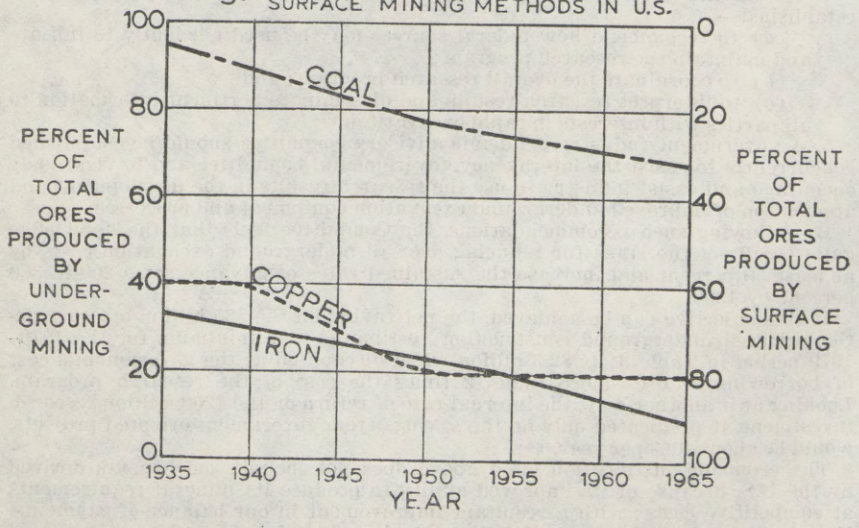
[2] Howard, Thomas E., "Rapid Excavation," *Scientific American* (November 1967) : 10 pages.

[3] Lago, A., Williams, P. D., Nisselson, H., and Kushner, H. D., "Projections of Applications and National Benefits of a New Rapid Excavation Technology," Operations Research, Inc., for the U.S. Bureau of Mines (Sept. 8, 1967) : 112 pages.

[4] National Academy of Sciences, "Rapid Excavation—Significance, Needs, Opportunities" (August, 1968).

[5] Kastrup, Allan, "Rock Excavations for Total Defense and Peaceful Uses," *Bulletin E. 45 The Swedish Institute, Stockholm* (1962) : 17 pages.

Fig:1 TREND FROM UNDERGROUND TO SURFACE MINING METHODS IN U.S.



(From tables 1.1-3 to 1.1-5 of Surface Mining AIME)

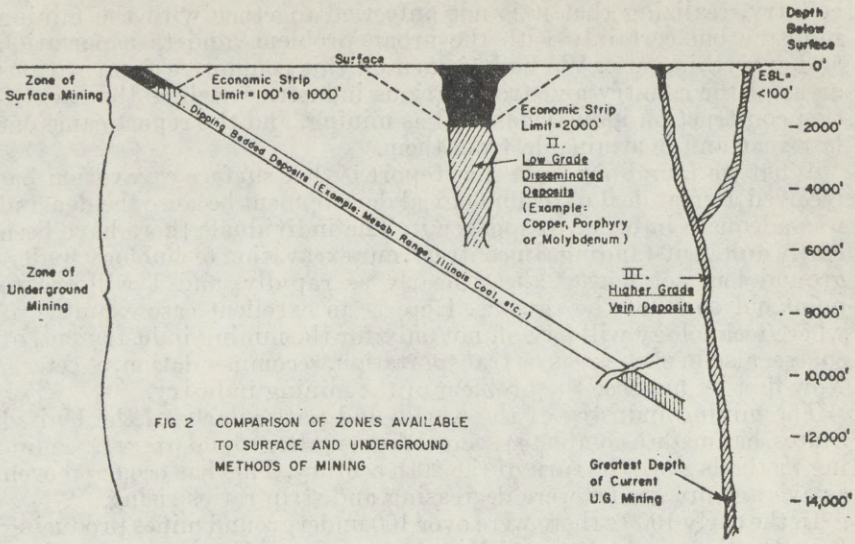


FIG 2 COMPARISON OF ZONES AVAILABLE TO SURFACE AND UNDERGROUND METHODS OF MINING

TABLE 3.—ESTIMATED CUMULATIVE DEMAND FOR SELECTED RESOURCES FOR THE DECADES 1970–79 AND 1980–89

Resource	Demand 1960 [1]	Growth rate [2] (percent)	Demand [3] 1970–79	Demand [3] 1980–89
Iron in ore (contained metal, million long tons)	59.4	3.0	915	1,230
Molybdenum (contained metal, thousand short tons)	15.9	6.0	375	672
Aluminum (primary metal, million short tons)	2.06	5.0	42	69
Copper (primary metal, million short tons)	1.74	2.0	23	53
Zinc (primary metal, million short tons)	1.05	2.5	15	19
Lead (primary metal, million short tons)	.64	2.0	9	10
Coal (million short tons)	436	2.0	5,819	7,094
Petroleum (billion barrels)	3.19	2.5	46	59
Natural gas (trillion cubic feet)	12.87	3.0	198	266
Aggregates (billion short tons) [4]	1.13	6.0	27	48
Sulfur (million long tons)	7.5	4.0	133	197
Phosphate rock (million long tons)	17.0	2.5	244	312

[1] As reported in Landsberg et al., op. cit.
[2] Approximate compound growth rate which would give the same medium forecast results when applied to the 1960 demand figures as are reported in Landsberg et al., op. cit.
[3] Derived by applying the growth rate to the 1960 demand.
[4] Sand, gravel, crushed stone, and slag used in construction.

TABLE 4.—ESTIMATED CUMULATIVE DOMESTIC PRODUCTION IN THE DECADES 1970–79 AND 1980–89

Resource	1970–79	1980–89
Ferrous metal ores (contained metal, million long tons)	650	870
Nonferrous metal ores (primary metal, million short tons)	70	110
Coal (million short tons)	5,820	7,090
Crude petroleum (billion barrels)	70	90
Stone and clay (billion short tons)	20	40
Chemical and fertilizer minerals (million long tons)	300	330

Mr. PFLEIDER. Most of my statement is based on the report of the National Science Committee on Rapid Excavation. This committee was appointed about 2½ years ago and sponsored by a group of governmental agencies in order to look into the problem of how we can lower the costs and improve the speed of excavation throughout the

country, realizing that it is not only tied together with the mining industry but certainly with the urban problems and transportation and everything else. We had 16 men on this committee from various areas of the country and from various industries such as the excavation construction industry as well as mining, and the report came out last year and is attainable from them.

What we found out from that report is that surface excavation has received a great deal of technological development because the demand was adequate in order to sponsor it. The individuals there have been really quite outstanding. In contrast, our excavation technology underground has not moved ahead nearly as rapidly, and I will try to point out some of the reasons. Here is an excellent case example of where technology will pay off not only for the mining industry but, of course, also in such areas as transportation, recommendation, et cetera. Now first let me pose the problem of the mining industry.

The mining industry of the world, and particularly of the United States, has made a complete reversal from underground to surface mining methods since the turn of the 20th century. This has occurred even as average ore grades were decreasing and strip ratios rising.

In the early 1900's there were over 100 underground mines producing from the three iron ranges of Minnesota, today there are none. In fact, two of the ranges have been shut down. Practically all of our coal prior to 1930 was mined underground, today over one-third is from surface operations and that percentage is increasing. Although world mining has not changed to surface techniques as rapidly as has the U.S. industry, the shift is escalating and will approach our figures shortly.

The next two slides I think will give you a little bit of a view. I am sorry that the people in the audience cannot see these but they are probably quite familiar with them and I was told it is more important that you members of the committee see them.

Senator Moss. I think so.

Mr. Pfleider. This will give you a fast preview of how we have been shifting from underground to open-pit mining. Our technology is increasing much faster in surface mining.

The next slide gives you also an idea that 83 percent of all of the material mined in the United States today is obtained from surface operations in contrast with 65 percent. Now you will see the figure of 3 billion tons of total production, and if you use the escalation factors that have been recorded by other gentlemen you will see what this will imply, of course, as the years go by.

There are various authorities who feel that future conditions will force a reversal of the trend, and I am certain one of those will be a gradual shift back to the underground. One important reason is the exponentially rising demands for minerals as already related to you and as quoted in tables 3 and 4 in the back of the report that you have. Furthermore, changing public attitudes on environmental control will, to some extent, tend to increase the cost of surface operations.

Perhaps the greatest effect will come from improved geological and geophysical techniques that will uncover mineral deposits beyond the economic depths of surface stripping. Furthermore, as present pits reach their stripping limits a changeover to underground should result. A comparison of the potential zones available to underground versus

surface mining methods is presented in figure 2. I think this is quite dramatic because you can see what we are operating in at the present time.

The deepest pit mine you would probably conceive of as being in Utah is 2,000 feet in depth. In the iron ranges in Minnesota we can probably take the Mesaba down to about 500 feet in depth, which is the economic strip limit. Now when you get into the thin-veined, high-grade mines of the type that you have so often in Idaho and Colorado, and to some degree in Utah, you will see that you can only go perhaps 50 or 100 feet and you are beyond that limit. So we have vast amounts of material laying down to the range of 14,000 feet which is the deepest underground mining in the world that we have today, that we can reach hopefully some day to meet these growing needs.

I think you can see from the scale of this the potential that we must develop. This means that we have to develop better exploration techniques which means improved geology and geophysics as well as improved mining techniques. This, to some degree, I hope, reinforces the statement by Mr. Dole that the potential lies there if we only reach it.

Now just to give you an idea of what we are thinking of, in the State of Minnesota this next slide will give you—well, I am sorry that it is not a little clearer but this is an underground model of a potential deep seated taconite mine. We supposedly have quite a reserve of taconite in Minnesota which was developed, incidentally, by the kind of technology that you are speaking of and that is the reason that we are even competitive today.

The State of Minnesota spent many dollars trying to develop the taconites between 1910 and 1950. We had that kind of leadtime so that we would be ready when the high-grade ores played out and we could serve some of the needs of the country. Some of our products in Minnesota today are not truly competitive. There are extensions down deep representing hundreds of billions of tons that if we can develop properly both miningwise and metallurgicalwise they can improve our products so that we can compete better. These are just some cases.

I might mention at the same time we have very large reserves of low-grade copper and nickel ores in Minnesota, very, very large quantities, and here nickel is the most strategic. We have the greatest supply in Minnesota but we will not be able to mine until we improve mining and improve technological techniques.

So why has this come about? Well, these shifts back to underground are going to be slow unless we improve our technology. For instance, surface mining today has productivity rates of 100 tons per man-shift (tpms) for small ferrous and nonferrous mines up to 500 tpms for large coal and industrial mineral operations, when including all waste or ore handled. By comparison, underground mining achieves rates of but 10 to 60 tpms or about one-tenth of those for surface methods. It is small wonder that strip ratios of 5 to 1 are possible in metal ore mining and up to 60 to 1 for coal operations.

Now the impact of these productivity differences are illustrated in the next slide to some degree when you see the costs. Here you see surface mining varying from 15 cents a cubic yard to $2 whereas in underground they are going anywhere from $4 to $7 a cubic yard. Most of

the figures in the surface area would be in the low ranges there. So our real problem mining-wise does exist underground.

This same phenomenon has been occurring in the construction industry. In the early part of the century, New York was building its subway system. Tunnels for railroads and highways were relatively common, because it cost too much to excavate large quantities of surface rock by hand held drills and hand shovels or horsedrawn scrapers. Today massive equipment excavates and transports millions of yards of rock or earth quickly and cheaply. Until recently there was plenty of open space for such activity, and few people worried about the esthetics. We know now, of course, this situation is changing.

Planners have tended to consider solutions to pressing problems only in the terms of current technological capabilities. These can and must change. Sweden, given the need and favorable rock conditions, has done and outstanding job in adopting underground excavation for mining purposes as well as total defense and peaceful uses. Perhaps the technological development of underground has also been advanced to some degree, of course, by such projects as the Norad in Colorado.

All of these efforts are extending our knowledge and reducing the fear of planners to consider underground excavation. Furthermore, the advent of the continuous boring machine for tunnel, shafts, and raises is to some extent revolutionizing our concepts. This unit, together with that of rubber-tired drilling, loading, and hauling equipment underground, has been responsible for increasing productivities some 50 to 100 percent in the past 15 years.

I am sure that some of you are familiar with this boring machine, but I do have the next slide which shows—well, this is pretty dark but it is operated by one or two men and advances into the face, fragments the rock. It collects it and carries it out in a continuous integrated systems approach which of course we must develop in underground mining if we are going to achieve the kind of liquidity that we need.

Senator ALLOTT. What is the maximum face?

Mr. PFLEIDER. On most of these machines about 8 to 10 feet. In South Dakota, the Mesabi Dam, those tunnels were as much as 28 feet in diameter so we can visualize going up that high.

Senator ALLOTT. I made a remark in my opening statement about the applicability of these techniques to such things as subways. This is a valid observation.

Mr. PFLEIDER. Yes, sir. This is where we can get the crossover developments that we so need between construction and mining, and of course, for new space age concepts as well. We will have some breakthroughs perhaps.

However, this rate of improvement is still inadequate to stem the constant encroachment of surface excavation methods, since the latter is experiencing even greater gains. As expressed in the report of the Rapid Excavation Committee of the National Academy of Engineering:

> For a long time surface excavation * * * have received ever larger consideration by corporate and governmental planners concerned with urban and resource development. * * * The net result is that demands for underground excavation from the construction and resource sector are residual, i.e., projects are planned as subsurface only when there is practically no alternative.

I think this has been happening in the mining business as well.

Now what is the background of this problem? Why has it come about?

First, geological conditions are a principal design consideration in underground excavation. Because of the great variations in rock types, structure, and strengths—most of which cannot be predicted in advance of the headings—it is difficult both for the designer and the contractor to achieve the most economic solution. Furthermore, it is generally impossible to select a one-purpose excavator.

Second, space is confined, requiring a high concentration of rock disintegration energy at the working face as well as the complete coordination of the disintegration, removal, and support systems. All of this must be done while providing for the comfort, health, and safety of the workmen which to some degree we have not done too well.

In addition to these factors the Rapid Excavation Committee found that the following interrelated technical and commercial features retarded technological change:

1. Inadequate technical knowledge on which to base design for both the opening and the excavator; and
2. Inadequate industrial incentive to develop better equipment simply because the market is not there.

The markets for surface excavation equipment are large and expanding, sufficient to entice any manufacturer to innovate and market new designs. In fact, many of the new concepts being used underground are modifications of units originated for surface applications: for example, the highly mobile front-end loaders on rubber-tired wheels. By contrast, the more specialized units for underground use do not command nearly as broad a market. Hence it is a gamble for both the manufacturer and the consumer to try radical designs even if they are favored with a substantial budget.

Now, let me say that private enterprise has really made some true gains largely directed toward the ingenious incremental changes in equipment or techniques, but these improvement rates are inadequate to make underground methods a realistic alternative or to hold rising costs in check. Hence, a radical change in the scope of thinking about underground excavation is needed to achieve that desirable goal.

I just want to make one brief statement about the impact in environmental control in this problem of underground excavation. Much is being written today on the future impact of environmental control of the air and the land. In our mineral industry, reclamation is becoming a byword. There is a definite and important relationship between the development of better and cheaper underground excavation and an esthetically pleasant surface.

Now one of the currently suggested solutions to this problem is the application of increasingly stricter environmental controls, and this is being done. Another and better answer is to so improve our underground excavation techniques that the planners have an alternate choice. Such is the course followed in the proposed Sloop project for the Safford copper deposit, featuring the use of atomic energy and in situ leaching and in the oil shale projects where either large-scale room-and-pillar mining methods or in situ burning are being considered.

Speaking about the potential for underground excavation the Committee visualized that between the period of 1968 and 1975, an 8-year period, there would be some 1,000 miles of tunnels and over 5 million tons of crude ore that could be and probably will be mined underground.

I can show this next table briefly, it gives you an idea of the mining oriented demand in the next two decades of $16 million and $18 million. Just a modicum of improvement in technology will represent a very sizable saving which ultimately, of course, revolves back to the people of the country and to the Government in reduced costs. So we feel that the cost of any major program which the Committee recommended could be paid back in savings in a relatively short period of time.

So what is the solution to the problem? It is a massive and sustained development and research program coupled from the stimulus of education in this field to reverse the almost complete domination of mining in the public construction by surface mining methods.

The planners, designers, and engineers of the future must be educated to the advantages of this four-degree dimension: that is, below the surface, much as the pioneers of aviation and now Von Braun and his group have conquered outer space. This indeed can be done if we will apply the kind of energies that we are speaking of today. There are many advantages such as direct cost reduction, the esthetic benefits, improvement in our balance of payments which have been mentioned.

The Committee therefore made this one recommendation which I want to highlight. It says that over and above current Government and industry research and development efforts, a 10-year $200 million federally funded research program should be immediately undertaken and vigorously pursued to establish the technological basis for reducing the cost and improving the sustained rate of advance of underground excavation. This is the case example that I was telling you about that could fit into this program.

I think it is essential that a reasonable portion of such funds, certainly in the order of several million dollars, must be allocated to the improvement of mineral education. This is a woeful education with few men going into it as has been expressed to you already. If this objective can be achieved—the net saving on the $35 billion that you saw on the screen—there would be a net saving of $35 billion, and at the Government cost of borrowing on more than 12 times the cost of research program. We are trying to indicate to you that this is just good business from the standpoint of carrying on such a program.

In conclusion, the Congress of the United States is the only arm of the Government that can initiate this program of converting large potential tonnages of underground mineral resources to the economic reserve status. This it can do by sponsoring a long-range, coordinated research and development effort on a total underground excavation system as a part of the country's mineral policy.

In closing, I wish to thank the committee for permitting me to make this presentation.

Senator Moss. Thank you, Professor Pfleider, for bringing this to us. This is a very interesting discussion on the need for additional research and development on underground mining and pointing out the limitations to open pit mining. Since I live within view of the Bing-

ham copper pit, I know how much overburden has to be moved in order to get that ore out, and I could understand your chart when it showed 2,000 feet is the approximate limit of an ore body. I am sure this adds greatly to our record, and I appreciate the great deal of research and background that you have in this field.

Senator Allott?

Senator ALLOTT. I have no questions. I appreciate your remarks, too, because particularly this still is one of the vast unexplored areas that we have to get into. You have a very peculiar physical location there where you have access to attract large amounts of knowledge with respect to the dirt and earth removal. You had all kinds of it on the Mesabi Range and I think this is one of the great areas where we are going to get to in the future.

Thank you very much.

Senator Moss. Senator Burdick.

Senator BURDICK. I want to thank the gentleman for a fine statement. I would like to ask a question off the record.

(Discussion off the record.)

Senator Moss. Back on the record.

Senator Jordan.

Senator JORDAN. Thank you for a very good paper; it is very constructive and it will add a good deal to our library of information here.

Senator Moss. Thank you, sir. We appreciate it.

Mr. Morrison, the vice president of Eastman Dillon and Union Securities & Co. Is Mr. Morrison here? I guess not.

Mr. Eisenach, vice president, western operation of Climax-Molybdenum Co. Is Mr. Eisenach here?

Mr. Edward H. Peplow, Jr., manager of the Arizona Mining Association. Very glad to have you, Mr. Peplow. We have heard from Utah and Colorado and now we are going to hear from Arizona.

STATEMENT OF EDWARD H. PEPLOW, JR., MANAGER, ARIZONA MINING ASSOCIATION

Mr. PEPLOW. Thank you.

Mr. Chairman and gentlemen, the Arizona Mining Association is composed of 12 major companies who annually produce from their Arizona properties more copper than is produced in the other 49 States combined. We speak, therefore, for a very important segment of the Nation's hard-rock mining industry, and one on which a large part of the Nation's industrial competence depends.

We are convinced that the welfare of the mining industry can be advanced to an important degree by the establishment of a national minerals policy as set forth in S. 719. We sincerely and urgently recommend its adoption by the Congress.

In urging its passage, we would point out that this involves not only the welfare of the mining industry, but the welfare of the entire Nation as well. The reasons for our convictions are as follows:

Two abilities distinguish civilized man from stone-age man. One is his ability to harvest, save, plant, and reap seed. The other is his ability to use metals. Anthropologists have long agreed that an accurate index of the degree of advancement of a given culture is that

culture's ability to use metals. And copper is one of the more important metals, if not the most important, as index.

The culture of the United States of America today is the most advanced culture the world has ever evolved. The index I have just mentioned sustains this belief, for the United States today uses some 20 pounds of copper per person per year. The world's next most advanced culture, that of Western Europe, today consumes approximately 14 pounds of copper per capita per annum, followed closely by Japan, with a little over 12 pounds of copper per person per year. And so it goes on down the list until you reach the emerging nations of Africa, where the consumption is in the order of a few ounces per person per year.

We agree with Senate bill 719 that, in order to sustain this culture, we must:

> Foster and encourage: (1) the development of an economically sound and stable domestic mining and minerals industry; (2) the orderly development of domestic mineral resources and reserves necessary to assure satisfaction of industrial and security needs; and (3) mining, mineral, and metallurgical research to promote the wise and efficient use of our mineral resources.

We feel the values of the three objectives stated above are self-evident. We feel sure, also, that the bulk of the testimony at this hearing has reemphasized that these goals can be attained only through the preservation of the competitive, free enterprise system, and that undue interference with the operation of that system by governmental controls is dangerous and intolerable.

The establishment of a clearly enunciated national minerals policy as set forth in S. 719 will go far toward preventing the sort of administrative confusion and conflict that has been more and more marked in the last few years. By providing both the governmental administrators and the mining industry with a clear definition of national policy, this legislation would take a basically important step toward providing for the economic stability of the domestic mining industry.

We submit, further, that such stability is essential to the orderly development of domestic reserves necessary to assure satisfaction of industrial and security needs. Without such reserves, the defense posture of this Nation will be seriously hampered, and its position in international affairs will be jeopardized. Whenever we become dependent upon foreign sources for metals and minerals essential to the maintenance of its industrial plant, the United States will be dealing from a position of weakness, rather than strength, in international affairs.

These considerations of supplying our own industrial and defense needs are of paramount importance, of course. It is of primary interest to all Americans that the rate of our industrial production continue high in order to insure both defense needs and our continued domestic prosperity.

We do not, however, suggest that affluence for affluence's sake is sufficient. We suggest, rather, that the affluence resulting from our strong and stable industrial production is the factor responsible for our having the most advanced culture in history, and we emphasize that it is not simply a materialistic culture. It includes all the miracles of medical accomplishment, accomplishment in the arts, in pure science, in recreational facilities, in health and welfare programs, and in uni-

versal public education. Without our industrial prosperity, none of these attributes would exist.

We think it is a very clear and simple relationship: The industry which supports our metals-based culture must have an assured supply of domestically produced metals and minerals to sustain it. In the volatile atmosphere of current international tensions, we submit that to count on any other nation to supply us with the basic materials which we can provide for ourselves is tantamount to national suicide.

We submit further that there should be a clear enunciation by the Congress of a national minerals policy as provided in S. 719 or this country very soon will face serious problems. We all know there are rapidly growing confiicts involving the uses of the public lands of the United States. We do not disparage any of those proposed uses—wilderness preservation, recreation, urbanization, grazing, timber production, and so on. Nor do we discount the seriousness of the growing problems of environmental control.

We do, however, view with very real concern a tendency on the part of important groups within the country to advocate the foreclosing of mining to attain their immediate goals. Anything that limits this Nation's ability to provide itself with the essential materials necessary to sustain its metals-based culture is clearly inimical to the best interests of the Nation as a whole.

Thus, enunciation by the Congress of the simple, clear, and eminently reasonable national mining and minerals policy set forth in S. 719 will provide welcome and necessary ground rules for the guidance of future legislation, future administrative policy and future actions by concerned land-user groups. It will, in short, obviate a great deal of nonproductive bickering and stimulate constructive discussion and action toward the wise and efficient use of those mineral resources upon which our national security and prosperity depend.

Mr. Chairman, the Arizona Mining Association, therefore, respectfully and urgently recommends to the Congress of the United States the speedy passage of Senate bill 719.

We thank you for this opportunity to express our views.

Senator Moss. Thank you, Mr. Peplow, for a fine statement. I am pleased to have you bring the endorsement of the Arizona Mining Association.

As you indicated early in your testimony, Arizona is one of the most important mining States, and has a very active association in that State. You set forth very well, I think, the reasons for your belief that we should have this declaration of policy that would be provided by the bill before us.

Senator Allott.

Senator ALLOTT. I have no comment except to thank you very much, Mr. Peplow, not only for your own fine statement but for the support of the Arizona Mining Association. Personally I think your own statement reflects a very full understanding of the problems, all of the problems associated with this development and the balance which you set out in your statement. I applaud completely.

Mr. PEPLOW. Thank you, sir.

Senator Moss. Senator Jordan.

Senator JORDAN. Mr. Peplow, I have just one question. How much wilderness area do you have in the State of Arizona?

Mr. PEPLOW. I do not have an accurate figure, Senator, but it is somewhere in the neighborhood of, I would say, 10 million acres.

Senator JORDAN. Is any of it mineralized?

Mr. PEPLOW. Yes, sir.

Senator JORDAN. Are you permitted to prospect in this area?

Mr. PEPLOW. Until 1983.

Senator JORDAN. Some reports have reached me and other members of this committee that there is a lack of cooperation on the part of Federal administrators in prospecting now on these wilderness lands. Have you encountered any of that in your State?

Mr. PEPLOW. We have encountered a considerable lack of cohesion in administrative policy. In some instances it is perfectly all right to use a helicopter to transport your geophysical equipment into the wilderness and make your surveys on the spot. In other cases they say, no, you may not use the helicopter, it interferes with the gain. So you have to pack this equipment on your back. We do find a great disparity in administrative procedures.

Senator JORDAN. Would it be helpful if a uniform procedure were spelled out as part of the national minerals policy?

Mr. PEPLOW. Yes, sir; it would. I think even more important is the fact that, as several people pointed out in this morning's testimony, the most intensive and the most sophisticated mineral survey we can make today is completely invalid tomorrow. Today all we can say is that as of this moment so far as we can see, which is down to this level, there is no presently usable deposit of minable ore. Tomorrow somebody might come along with a machine that can proceed instead of 10,000 feet to 15,000 feet. Some day we might be able to use yesterday's waste rock and call it ore. This has been the history of mining throughout 115 years in Arizona. We are today mining yesterday's waste rock.

Any mineral survey that we make on any wilderness or any land at all today is invalid tomorrow. Thus, I think part of the national minerals policy should take this very seriously into account and provide some means whereby we do not block ourselves off permanently and forever from these future reserves that inevitably we are going to need as a nation.

Senator JORDAN. Thank you, Mr. Peplow.

Senator Moss. Senator Fannin, a member of this committee, has joined us. I would like to call on Senator Fannin to see if he has any remarks to make.

Senator FANNIN. Thank you.

First of all I want to apologize for being unable to be here earlier, especially to hear one of our fine men from Arizona. He has testified before us on previous occasions. We are very proud of Mr. Peplow; he does a commendable service for the State of Arizona and certainly is highly qualified in his line of activity.

I am sorry I missed the testimony. I have hurriedly looked at the statement and I heard what you said in the last minute or two. I would like to ask you a question. We have one problem that we were talking about in the finance committee concerning dust control and what is being done in Arizona. At the mine near Tucson, where they have a dust problem, they have equipment to settle the dust arising from the

material taken off of the surface to make it possible for mining the ore beneath. Can you explain the dust control measures being used?

Mr. PEPLOW. Yes, Senator Fannin. I think you are referring to the Twin Buttes problem.

Senator FANNIN. Yes, Twin Buttes.

Mr. PEPLOW. The Anaconda Co. has undertaken one of the world's outstanding programs of planting vegetation on the dikes that will impound the water. They have spent a great deal of money undertaking an extensive research program and they are planting the faces of those dikes and the tops of those dikes with native and exotic grasses and desert growth which will be a dust control measure in itself.

The company uses something in the order of more than a million gallons of water a day to lay the dust on the roads. At is comes off the conveyor belt into the hopper there are continual sprays of water at the top. Then as it comes out of the bottom of the hopper to load the 100-ton belly dump trucks there are sprays of water there so that the material, as it is transported, does not blow. This is a very expensive program, of course.

Senator FANNIN. I realize that.

Mr. Chairman, I know what Senator Allott and you have provided in this legislation. I am very much in agreement and I am a cosponsor of the bill. I did want to bring out the fact that dust control is one of the programs we never think very much about. It should be provided special consideration, I think, in consideration of this legislation.

What came up concerning dust control in the Finance Committee was a matter that was considered in regard to the investment tax credit and whether or not the equipment that is being provided would come under this provision. Naturally they were asking for certain allowances and there is a great controversy over whether or not some of the industries should be provided special privileges in this regard. I knew that this project in Arizona was a costly procedure but a very essential one because we do have communities nearby.

It is estimated that in this one county near Tucson about 17 percent of the total copper produced in the United States may be developed. Do you recall the exact percentage that was involved?

Mr. PEPLOW. I think it is 15 percent, Senator, but with the new Serata property coming in this year and Twin Buttes coming on production it very easily could be up closer to 20.

Senator FANNIN. I am saying this because of the many complaints that we have from the standpoint of restoration of the areas of open pit mining. Of course it has been true in coal mining. I know in this one one instance that, when you look at this area now, part of it has already been transformed back into not its native position but at least it has the appearance of the desert and it really is quite impressive. I know that this is an expensive procedure and something that I think will be demanded more as time goes along.

Mr. PEPLOW. Senator Fannin, last year we had a hearing in Tucson concerning the withdrawal of 7½ square miles of land for the use of the Smithsonian Institution in building an astrophysical laboratory on Mount Hopkins. At that time the State Mine Dust Inspector testified that the dust generated in that particular mine is far below the legal

minimum standards, that it is far below that generated by farmers working their desert fields just in front of the dykes.

Senator FANNIN. This is because of the sprinkling and the other equipment being utilized?

Mr. PEPLOW. Right.

Senator FANNIN. Of course, we know that dust control is something that is also involved insofar as the smelter is concerned. The great demand by the public that we have some smoke abatement and, of course, control of the sulphuric acid that emanates from the stacks influences this. I realize that these developments cost considerable money but that they are essential.

Mr. PEPLOW. I can tell you, sir, that in the second half of the decade of the 1960's Arizona mining companies will have spent something more than $35 million in a voluntary program of smoke abatement. They are now doing everything that is technologically possible to do and they are continuing their research and they are continuing their installation of new equipment as fast as their new equipment is involved. This figure of $35 million is a substantial figure and I do not think there is any other segment of the air polluting part of our economy in Arizona that can make a similar statement.

Senator FANNIN. Mr. Chairman, I realize that this is not the intent of the legislation; in fact, I hasten to mention that the important consideration would be a policy program.

Thank you very much.

Mr. PEPLOW. Thank you, sir.

Senator MOSS. Thank you, Mr. Peplow. We appreciate your testimony very much.

Dr. Charles Park of Stanford University. Is Dr. Park here?

Dr. James D. Forrester, dean of the College of Mines, University of Arizona. Is Dr. Forrester here? His statement will be printed at this point.

(The statement referred to follows:)

STATEMENT OF DR. JAMES D. FORRESTER, DEAN, COLLEGE OF MINES, THE UNIVERSITY OF ARIZONA

Gentlemen, I have reviewed in detail the bill, S. 719, being proposed by Senator Allott of Colorado, and other Senators, to establish a national minerals policy under the title of "The Mining and Minerals Policy Act of 1969." Inasmuch as I believe your committee is scheduled to begin hearings on this bill on July 9, 1969, I am taking the liberty of writing you my full endorsement of Senator Allott's measure which I think will serve, in some degree at least, to insure the logical future of domestic mineral supplies in the United States.

In my judgment, much of the high standard of living we enjoy as Americans and of greatness of the United States as a preeminent, modern-day world power, stem from the wealth of mineral resources which occur broadly in the United States and, just as importantly, they come also from: 1) the opportunities which have been afforded our vigorous and intrepid people to produce mineral commodities and; 2) the resultant magnificent industrial enterprises that have been brought into being. We cannot afford to work to the disadvantage of these enterprises and, in so doing, tend to curtail and inhibit the production of raw mineral materials upon which we are so dependent.

Mining is the overall procedure of creating *new* wealth by obtaining mineral substances from where they exist naturally on, or beneath, the earth's surface. To conduct its operations, present-day mining involves tremendous investments of capital, and manpower and, likewise, it requires complex engineering and research practices and complete management "know how" in order to initiate and to maintain the production of such substances, many of which occur in very

low grades of richness or quality and in various natural associations of special complexity. Indeed, other than for that of the geologic environment, every other one of the several factors governing the production and treatment of mineral commodities; such as a suitable complement of manpower; reasonable opportunities to acquire operating rights; nondiscriminatory taxation; et cetera, reflect the controls and influences imposed by the society of our citizens. Not the least of the qualifying factors is that of the "political climate" within which the mining enterprises must work.

As I have indicated above, the future of mining is of vital importance to the total welfare of the people of the United States and, therefore, any progressive and realistic step, such as that being proposed in Senate Bill 719 by Senator Allott and some of his fellow Senators, to insure the continued supply of our domestic, raw metals and mineral materials will be of beneficial character. This will be especially true if the bill is adopted and subsequently administered in full cognizance of the need to maintain the rights of private enterprise.

Thank you for your kind attention and interest.

Senator Moss. Do we have anybody for the Association of State Geologists? That statement will be printed at this point.

(The statement referred to follows:)

STATEMENT OF PETER T. FLAWN, PRESIDENT, ASSOCIATION OF AMERICAN STATE GEOLOGISTS

The Association of American State Geologists is a national association with membership limited to the state geologists or their equivalents from each state. It represents forty-eight states and Puerto Rico.

State geologists are fully informed about the mineral industries in their respective states. They have a comprehensive view of the relationship between the mineral industry, society, and the environment. They have no special interest other than the well-being of their respective states.

The Association of American State Geologists supports Senate Bill 719 calling for establishment of a national minerals policy. At present, many federal departments, bureaus, and offices make policies that affect the mineral industry. These independently conceived policies are uncoordinated and commonly operate at cross purposes. United States mineral policy should have definite goals or objectives. It should insure a secure flow of mineral raw materials at the lowest cost consonant with national security. Federal expenditures for research and development in mineral techology should be at a level commensurate with the importance of mineral raw materials to our economy.

Senator Moss. This seems to complete my list. Is there anyone here who came to testify who has not had the opportunity and would like to testify?

Let me reiterate that the record will be open for 10 days and any additional statements that anyone wishes to make on the general subject of this bill will be received and placed in the record at this point.

We apparently had some witnesses who were expected to be here who did not appear and we will get a communication to them indicating that they may put their printed statement in the record if they wish to do so.

STATEMENT OF WILLIAM C. EPLER, SECRETARY, ARIZONA SMALL MINE OPERATORS ASSOCIATION

To The Subcommittee on Minerals, Material, and Fuels of the Senate Committee on Interior and Insular Affairs: The Arizona Small Mine Operators Association, with more than 3,500 members and local councils throughout Arizona working for the interests of small miners, prospectors and holders of individual mining claims, as well as for the benefit of the entire mining industry, wishes to express its endorsement of the National Mining and Minerals Policy proposed in S. 719, and to urge the adoption of the measure by the Congress

of the United States. We respectfully request that this statement be made a part of the July 9, 1969 hearing record.

For more than a century, the individual prospector and small mine operator have formed the backbone of the mining industry. They have been the men who have soured the face of the earth, particularly here in the West, and have expended the necesssary diligence, patience and hard work to make the discoveries of minerals and metals so vital to the strength of this nation. There are those who say the day of the individual prospector and the small mine operator is over. It is true that in this day and age the investments needed to bring a modern mine into profitable operation are staggering. But the financing can usually be found—*after* the discovery has been made. As leaders from the major mining companies readily point out, many of the discoveries led to a number of major producing properties of today were made by individual prospectors and small mine operators. In other words, the small and large operators need each other and work in greater harmony than is popularly supposed.

Over the past 20 years or so, it has become increasingly difficult for prospectors to locate, hold and obtain clear title to land encompassing their discoveries. The policies of various agencies of the federal government controlling and administering the public lands have often been in conflict with our historic mining laws and government policies in effect for a century or more. One effect of this is the growing difficulty in locating, developing and producing metals and minerals vital to the economy and national defense of this nation. If we continue down this same road, it will not be long until this country finds itself in an extremely critical position in regards to many vital raw materials.

The statement of fundamental principles and objectives contained in S. 719 will, we believe, go a long ways in providing the basic platform on which can be constructed the protection and encouragement vitally needed by the domestic mining industry.

The prospectors and small mine operators vigorously believe in the basic principle of multiple use of the public lands. They also strenuously oppose the setting aside for single-purpose use of vast areas of our public lands. As the old saying has it, "Gold is where you find it." No one can say today where the valuable discoveries of tomorrow will be made. Also, with changing economics and technology, "worthless" rock of today often becomes the source of the vital needs of tomorrow.

While S. 719 is vital to the future of the domestic mining industry, it presents no threat to the interests of any other segment of our citizens. It does not seek favored treatment for the mining industry, only lays the groundwork for fair and equitable consideration.

The more than 3,500 members of the Arizona Small Mine Operators Association heartily endorse adoption of S. 719, a measure the industry needs with increasing urgency.

STATEMENT OF FRANK C. WACHTER, PENNSYLVANIA GLASS SAND CORP., HANCOCK, W.VA., SPEAKING FOR THE NATIONAL INDUSTRIAL SAND ASSOCIATION

Mr. Chairman and gentlemen of the committee, my name is Frank C. Wachter. I am Vice President and Secretary of the Pennsylvania Glass Sand Corp., of Berkeley Springs, West Virginia. This Statement is presented in behalf of the National Industrial Sand Association of which my corporation is a member and its Public Relations Committee of which I am Chairman. The National Industrial Sand Association, which represents the industrial sand industry in the United States, supports S. 719, the "Mining and Minerals Policy Act of 1969," introduced by the senior ranking Republican of this Committee, Senator Allott.

The members of the National Industrial Sand Association were recently informed at their annual meeting of the introduction of S. 719. The bill was carefully considered by both the Board of Directors and the membership at large. A unanimous resolution was adopted establishing the Association's support of this proposed legislation.

The members of the National Industrial Sand Association account for 90 percent of the production of industrial sands in the United States. Industrial sands are the essential ingredient in many products necessary to our society. The industry mines and processes a mineral of limited occurrence that is essential for the manufacturing of a countless diversity of products consumed by our country in both peace and war. As the indispensable ingredient in glass, it becomes

walls and windows in buildings, mirrors, curtains, light bulbs and fixtures, boat and automobile bodies, food and beverage containers, laboratory and hospital equipment, television tubes, tableware, eyeglasses and other optics, windows in spacecraft.

In other ceramic products, also as an ingredient, it becomes power line and other insulators, chinaware and porcelain ware, cooking ware, household appliances, pottery, bathroom fixtures, floor and wall tiling.

Its outstanding resistance to heat makes it a necessity to the iron and steel foundry industries which use it as a surface lining in the conveyance, casting and molding of molten metals, making possible the production of countless metal products; to name only a few of the most important: auto, railroad, aircraft engines and parts, and industrial machinery.

The abrasive characteristic of the mineral finds its use, "sand-blasting," to polish metal products for final use, to clean building exteriors and ship hulls, and as an ingredient in all the well-known household cleansers, in grinding wheels and buffing compounds.

Other uses are too endless to mention, but it is obvious that without this mineral we could not defend ourselves in war, and in peace we would not have housing, transportation, food, entertainment, or even hospitalization, as we know them.

The Association agrees with Senator Allott's observation that there is a need for a Federal policy to foster and encourage the domestic mining industry and to provide for the orderly development of our mineral resources. Our industry is indeed alarmed that the essential contribution of our mining and its products is not recognized by the Federal Government. It would seem that our nation has policies for everything except for a consideration of the basic mining materials necessary to our economy. The spread of urbanization and the many standards and regulations imposed on our industry by local levels of government, the States and the Federal Government should be recognized before hasty decisions are made which will duplicate existing problems. We hope by the enactment of this bill that our industry and other mining industries will be afforded the considerations which have been established for the other industries of our country.

Our industry is proud of its contributions to the economic stability of our country and has at the same time been conscious of its responsibility in the field of reclamation and conservation. Our Association has published "Shaping The Land," a reclamation research report for the planned use of industrial sand deposits, published through the sponsorship of the active members of our Association. This publication is but a sample of the reclamation consciousness of our industry and the industry's wise use of its mined lands. Copy of this publication is attached to our filed statements for the Record.

Our Association vigorously supports Senator Allott's positive and constructive view of the mining industry of our country.

On behalf of the National Industrial Sand Association and the members of the industrial sand industry throughout the United States, I sincerely hope that this Congressional Subcommittee will favorably consider this bill.

(The publication, "Shaping the Land," is in the files of the committee.)

STATEMENT OF HENRY H. KIRWIN, EASTERN ROCK PRODUCTS, INC., UTICA, N.Y., SPEAKING FOR THE NATIONAL SAND AND GRAVEL ASSOCIATION

My name is Henry H. Kirwin. I am Comptroller of Eastern Rock Products, Inc., of Utica, New York. This statement is presented in behalf of the National Sand and Gravel Association of which my corporation is a member and of which I am President. The National Sand and Gravel Association, which represents the sand and gravel industry in the United States, supports S. 719, the "Mining and Minerals Policy Act of 1969," introduced by the senior ranking Republican of this Committee, Senator Allott.

The National Sand and Gravel Association has represented the sand and gravel industry in the United States for over fifty years. Our industry, in terms of mine units produced, is the largest member of the mining family. Without sand and gravel, the construction program of the United States and every community in it would be impossible. Sand and Gravel are basic construction materials, and are the major ingredient of portland cement concrete.

At the present rate of sand and gravel production in the United States, and assuming that production does increase in response to growing demand, our industry will have to double its present annual sand and gravel production of 900 million tons by 1992. I use this year because the American Society of Planning Officials estimates that by that time, increased demand will mean that we shall actually have to produce 42 billion tons in order to provide the basic facilities for the expected population growth by 1992. By the year 2000, it is expected that our country's total population will be 350 million persons. Great construction programs of all classifications will have to be undertaken and carried out. Every conceivable form of building must be increased if the country is going to provide all of the facilities which a population of these staggering dimensions is going to need for basic accommodations.

As a part of its preview of the future, the National Sand and Gravel Association has made several surveys of land use by the sand and gravel industry, in order to ascertain the extent of existing sand and gravel reserves. Based on current demand, and not allowing for the expected increase, presently held reserves for sand and gravel production will be exhausted in less than 18 years, taking the country as a whole. There is an ill-founded assumption that sand and gravel is an inexhaustible natural resource.

Accordingly, the Association agrees with Senator Allott's observation that there is a need for a Federal policy to foster and encourage the domestic mining industry and to provide for the orderly development of our mineral resources. Our industry is indeed alarmed that the essential contribution of our mining and its products is not constantly recognized by the Federal Government. It would seem that our nation has policies for everything except for a consideration of the basic mining materials necessary to our economy. The spread of urbanization and the many standards and regulations imposed on our industry by local levels of government, the States, and the Federal Government should be recognized before hasty decisions are made which will duplicate existing problems. We hope by the enactment of this bill that the sand and gravel industry and other mining industries will be afforded the considerations which have been established for other industries of our country.

Our industry is proud of its contributions to the economic stability of our country and has at the same time been conscious of its responsibility in the field of reclamation and conservation. Our Association has published five comprehensive reclamation research reports for the planned use of sand and gravel sites. These publications are but a sample of the reclamation consciousness of our industry and the industry's use of its mined lands. Copies of these publications are attached to this statement for the record.

Our Association vigorously supports Senator Allott's positive and constructive view of the mining industry of our country.

On behalf of the National Sand and Gravel Association and of the sand and gravel producers throughout the United States, I sincerely hope that this Congressional Subcommittee will favorably report out S. 719 to the full Committee.

(The attachments are in the files of the Committee.)

STATEMENT OF W. L. CARTER, EXECUTIVE VICE PRESIDENT, NATIONAL CRUSHED STONE ASSOCIATION

The National Crushed Stone Association desires to express its complete support of the objectives contained in S. 719 and our appreciation for your committee's consideration of this important measure. It is of vital importance to the future well-being of this Nation that the critical role now—and to be—performed by the members of this industry and those producers of other minerals in the development of our industrial and security needs be recognized, as has been done in S. 719.

Without an adequate supply of crushed stone—the mineral our members produce—the great roadbuilding, rail, and airport projects which permit the free flow of goods in commerce and provide the principal means for the movement of people and equipment in times of peace and of emergency would come to a halt, the construction of dams which produce the electricity to light the homes of millions of our citizens and to power the great plants whose products are essential to our lives could not be accomplished, and our basic industries—steel, lead, glass, paint,

agriculture, to point out a few, would be without an ingredient needed to produce their own end items. Yet, at times, particular legislative actions—both Federal, State, and local—have been taken (or proposed) that seem to be unmindful of the essential need for this mineral.

Because piecemeal legislation frequently tends to reflect a specific sentiment that prevails at the moment, it is, as S. 719 recognizes and as we also believe, the course of wisdom to have a national policy that will foster and encourage a sound and stable mining and minerals industry and the orderly development of domestic mineral resources and reserves. And, in our view, the immediate pronouncement of such national policy cannot be overemphasized in light of the rapid growth of our population. When one considers the population expected by the year 2000 and the heavy demand that the needs of such population will make upon all minerals, including stone, the initiation of a national policy which places the importance of minerals to the well-being of our country in its proper perspective cannot be long delayed.

Many seemingly divergent interests will be considered by the Congress in the implementation of the national policy envisioned by S. 719, but we fervently hope that the Congress will continue to recognize as does S. 719, the crucial role that has been—and must be—performed by the mineral industries in satisfying our growing national requirements.

We strongly endorse S. 719.

STATEMENT OF LOREN E. THOMPSON, SR., PARKERSBURG DIE & TOOL CO., PARKERSBURG, W. VA.

DEVELOPMENT OF SAPROLITE GOLD DEPOSITS, APPALACHIAN MOUNTAIN REGION

Mr. Chairman, I wish to take this occasion to extend to you my appreciation and also to the Committee, as well as others, for their interest and efforts in trying to solve the gold miners' problems. I further express my sincere appreciation, at this time, for being able to speak before this Committee in support of the current issues which are expected to bring some relief to the gold mining industry and also to the Federal Government in its balance of payments deficit.

My comments are unorthodox in nature. They do not deal with the effects of the monetary systems or problems. Sufficient conjecture has already been expressed along these lines. My remarks deal with the basic problems from the miners' viewpoint, grass root technology if you please.

My name is Loren E. Thompson, Sr., of Parkersburg, West Virginia. I am the owner of the Parkersburg Die and Tool Company of Parkersburg, West Virginia. I engage in various types of manufacturing. These include general machine shop items, machine tools, special equipment, design, research, and development of specialties, defense work for the government both civilian and military. One of the products of my research and development work is the "Split-Water Process" of mining. "Split-Water Process" is the technical term I apply to the technique of mining Saprolite ore.

Mr. Chairman, with your permission, I would like to introduce a few basic remarks which should be made part of the record. These remarks cover an area of potential minerals and mining that might otherwise be forgotten as these hearings proceed.

All economists recognize the fact that mankind's constant endeavor to achieve in his manner of living, his manner of education, his manner of exploring new fields in all phases of science, his manner of expanding, his manner of helping his fellow man, his very manner of existing, has, in fact, been a constant stimulant for man to look and search for and to develop new types and sources of raw materials.

In no other time in history has the endeavor been so centered around the development of rare metals and minerals and their discovery, by-products, mining and refining techniques.

In this connection, all stable economy has for its basic foundation, the ability of man to produce from the great storehouse of creation—the earth itself. In conjunction, each generation always has been able to find the correct equilibrium in its economy by adjusting the various factors of value of natural resources produced from the earth.

In our time, we look at the effort of the American Government in the early 30's to re-adjust the economy of the United States, or in fact, the whole earth

by the revaluation of the mined gold reserves. While only a short decade has transpired since this adjustment, it must be remembered that the pace of man's economy is moving much faster today than in the early part of the 20th century.

Inflationary trends already have overtaken the progress of the last readjustment of our economy and has long destroyed the correct equilibrium of balance. Therefore, no other alternative is available to our government in attempting to retard the rapid pace with which inflation is now destroying this equilibrium of balance but to re-evaluate our metal and mineral reserves. This, in turn, will automatically advance the progress of mineral and mining development.

New methods of mining, new techniques of processing and recovery are constantly being looked for by men of vision in these various fields. In addition to the development of new kinds of equipment new mineralized areas and locations. In most cases unproven in worth and value, are being prospected and evaluated.

These new valuations, in most instances, call for and demand the complete new development of technical devices and machinery to effect satisfactory recovery from the scattered value which occurs in mineralizations that, by reason of necessity, now at this time, must be made possible to develop. The "Split-Water Process" of mining and recovery is one of the products of this urgent demand.

In conjunction, the Appalachian Mountain system of the Eastern United States is one area of extreme importance in considering the possibility of developing new minerals and new sources of mineral supply. Other areas of the continental United States and other sections of the earth may also be considered; in fact all of these sections likewise must be considered important in view of the situation as it exists today.

I, having observed the moving trend of the economy for many years, have, in fact, studied many of the pros and cons and possibilities of the development of these low paying mineral areas which, in many instances, cease to be properly identified as belonging to the submarginal group.

However, the correct analysis, in the terms of general mineralization, would immediately identify and place these sources of mineral in the single category of producers of one or two outstanding value elements if it were not for the complex co-existence of many strategic elements in the general mineralization of these mineral deposits.

This common co-existence of many elements, in turn, leave the possibility of development and recovery of values in a very complete complex field and often very technical and beyond the realm and reach of the average thinking of ordinary field personnel. This fact alone has delayed the proper development of many economically sound mineral and mining projects.

Many field trips have been enjoyed while studying the possibility of development of satisfactory technical equipment to overcome this difficulty. These field trips have taken me from the various mineral belts of the Appalachian Mountain Ranges to the Central and Southern Sahara Mountain Ranges of Senora, Mexico.

The Southern Appalachian Mountain Region, consisting of parts of the State of Maryland, Virginia, North Carolina, South Carolina, Georgia, and Alabama contain several thousand square miles of mineral zones. Many individual mineral belts are found in these southern states. The Piedmont Region, starting near Washington, D.C., crossing the state of Virginia, North Carolina, and into South Carolina, is one of the defined mineral zones. The Blue Ridge Region in North Carolina, the Upper Piedmont Region, and the Piedmont Plateau have caused the state of North Carolina to classify its "Gold Deposits" into the following mineral belts:

1. The Eastern Carolina Belt.
2. The Carolina State Belt.
3. The Carolina Igneous Belt.
4. The Kings Mountain Belt.
5. The South Mountain Belt.
6. The Mines West of the Blue Ridge or The Western Belt.

These mineral belts extend across the State of North Carolina, into South Carolina, and into the State of Georgia.

The State of Georgia embodies probably the largest and most extensive mineralized zones in its upper Piedmont Belt and lower Piedmont Belt. The mineralized zones extend across the state from the northeast to the southwest. The State of Alabama has five mineralized zones which cover six counties.

The mineralized zones are very large and are listed as follows:

1. Ashland Mica Schist.
2. Wedowee Formation.
3. Tallodega Series.
4. Hillabee Schist.
5. Pickneyville Granite.

These Appalachian States, with their various mineral zones covering millions of acres, contain unimaginable amounts of wealth in mineral elements. Gold is the leading element of value in all of these mentioned regions. The values for the most part are found in Saprolite ore.

The term "Saprolite" is a Greek word meaning "rotten rock". This decomposed matter starts at the grass roots and extends to an average of from one to three hundred feet into the mineral formation. Usually, below this depth, the formations are hard and are generally found in the originally composed state.

Many attempts have been made in the last one hundred years to mine or recover gold from the Saprolite ore. All attempts have ended in failures. Ironically nature still retains all of this wealth in its natural storehouse, while for the most part the geographic areas involved are in a distressed condition. Unemployment is high and job opportunities are few. Many of the areas described are included in most of the recent distressed area legislation, anti-poverty measures and general public relief enactments. Considerable of the area described is also included in the more recently coined word covering the distressed areas of these regions as "Appalachia". The term "Appalachia" has already been elevated to its proper place of being. Regretfully, from my point of view, under the present neglectful circumstances, the entire gold mining industry is now virtually in "Appalachia".

Regardless of how regretful, our national gold reserve is declining very rapidly. Unfortunately, our sincere and active efforts to explore, develop, and operate new gold mines is declining at a much faster rate, while such an abundance of potential wealth is available, not in a region such as the wilds of an unexplored land, or in a country containing impassible mountains, or in deserts which defy the existence of men, but in a region surrounded by all of the benefits of man's advanced civilization, including the effort of the last several Administrations to bring assistance to these regions through the enactment of various assistance and anti-poverty programs including the constructions of much needed highways and roads, schools and school programs, education programs and help to various municipalities, cities and villages. All are very much needed, helpful and much appreciated in the local areas.

However, none of the measures acted upon tend to provide a source of continued employment for the people, or assisted to any extent, in the manner of developing the potential resources of the regions, which would enable the local residents to be gainfully employed. The present proposed legislation, S. 719, and other companion measures, contain a clause to encourage exploration, development and commencement of new gold mining. The enactment of these measures are most urgently needed at this time to further the development of these regions and to take whatever advantage that may be available in already enacted measures which may apply to the ares involved.

Problems? Yes, we have problems and we intend to overcome these problems and we are overcoming these problems. Nevertheless, we must have relief from the economic distressed condition which now plagues all of the gold mining industry whether located in the Eastern Appalachian Mineral Belt or in the great mining states of the West which have so proudly contributed to the great development of this nation through their minerals and metals.

As an introduction to some of our problems, I would like to quote, at this point, from Bulletin No. 38, Department of Conservation and Developments of the State of North Carolina. (The remarks about the recovery of gold can be applied to all of the Southern Appalachian mining states.)

"Since the revival of gold mining in North Carolina in 1930, two other processes were experimented with, and both were soon abandoned.

"The first process was tried on the Saprolite ores of the Portis Mine in Nash County and later at the Black Ankle Mine in Montgomery County. It is reported that over $150,000 were spent in trying to prove this particular process, which was known as the 'Centrifugal' or 'Lewis Process.' The soft decomposed rock or Saprolite was dug by a steam shovel and delivered to the plant by dump trucks. The ore was dumped on a grizzly, the large fragments of quartz

and hard rocks were thrown aside, and the fines dropped on bucket elevators. The bucket elevator hoisted the material to the top of the plant and emptied it into a 40-ton log washer or disintegrator. From the log washer the material is emptied on a screen. The course material was stacked for later grinding in ball mill, while the fines went direct by trough and pipe into the centrifugal machine.

"The centrifugal machine consisted of cylindrical bowl mounted in such a manner that it would revolve at varying speeds. The centrifugal machines were used in batteries of four and were said to handle fifty tons each of ore per day. The inside of the bowl was lined with horizontal grooves about ¼ inch in depth. The sludge or disintegrated material was fed by 4 inch pipe down the center, and the material was discharged at the bottom of the bowl. The bowl was revolved at varying speeds, depending on the consistency of the sludge entering it. The material was discharged by the centrifugal motion over the sides of the bowl while the mercury, and any gold it might have picked up, was caught in the grooves. Since the ore consisted of a great deal of very plastic clay which had the tendency to pack into the grooves when the machine revolved, thus causing some of the mercury and gold to be discharged over the rim, the process was a complete failure. The ore, according to assays, showed an average of about $2 per ton, while the machine recovered only $0.40 to $0.60 per ton.

"After this failure at the Portis Mine, the entire plant was removed to the Black Ankle Mine in the North-Eastern part of Montgomery County. After several futile attempts to operate this plant profitably, it was finally abandoned. A great deal of the machinery is still at the property.

"The second process recently attempted in North Carolina is an electrical or Gardner process. The plant erected at the Parker Mine, near New London in Stanley County, did not prove successful and was soon abandoned. Various reasons are given for the abandoning of this process at the Parker Mine, among which are: the clay or Saprolite did not contain sufficient gold; the process failed to recover the gold; and there was some dispute between the man financing the proposition and the engineer in charge.

"The plant consisted of a revolving drum or disintegrator, sluice boxes, the necessary screens, and the electrical amalgamator. The ore was mined with drag, emptied on a grizzly, the course material piled for later grinding, and the fines shoveled by hand into the disintegrator. Some large quartz pebbles were also placed in the disintegrator to help break up the plastic clay. The sludge from the disintegrator emptied on a screen which took out bits of wood, leaves and other foreign materials. The clay sludge emptied into sluice boxes with riffles for collecting the coarse gold. The fine gold was to be recovered by the electric amalgamator.

"The electrical amalgamator consisted of two copper plates, one above the other, about one inch apart. The plates were silvered, the top plate on the bottom and the bottom plate on the top, then mercury applied to both plates. The two plates were used as electrodes for an alternating current. As the sludge passed between the plates the electric current caused the precipitation of the gold either on the top or the bottom plate, depending on the flow of the current.

"Since the above electrical amalgamator did not prove successful on the ores in North Carolina, further developments were made, and at the present time two of such machines are being used at the recovery plant built near Gold Hill to recover the Gold Hill tailings. The present amalgamator consists of a shaking table about 2½ to 3 feet in width and six feet in length. Mercury pools are placed at regular intervals across the table, about three or four to each table. Immediately above the mercury pools there are three vertical aluminum plates. The table is covered with rubber, as this proves to be the best material for it. As the sludge is passed over the table the electric current is turned on and the table is made to vibrate. The process did not prove successful, and, after an expenditure of $8,000,000, the plant was abandoned.

"A pilot plant of this type has been erected at the James Laboratory, Newark, New Jersey, by Mr. Frank J. Gardner, New York City, in cooperation with Mr. U. S. James. Several batches of low grade ore have been shipped from North Carolina to the plant, and it is reported that the values have been recovered up to 98% of that contained in the ore. All types of ores have been tried, the hard ores ground and the softer ones disintegrated by various methods. However, this process did not prove successful on the North Carolina ores.

"It is impossible to give any definite information as to the value of the placer deposits in North Carolina. These deposits are usually spotty, of indefinite value

and quality, and it is only through careful investigations that the values can be determined. Records show that they were quite variable, ranging from a few cents to as high as $20 per cubic yard. Generally speaking, however, the values are less than $1 per cubic yard. In the vicinity of Portis Mine, in Nash County, some of the gravel deposits show from 10 cents to 50 cents per cubic yard, while the Saprolite show from $1.50 to $12 per cubic yard, with an average of $2 to $3. Numerous assays have been made by various companies on the Portis property, which shows an average of better than $2 per yard.

"At the Parker Mine, in Stanley County, the placer and Saprolite deposits show a gold content from 10 cents to $2.50 per yard. However, the values are not uniformally distributed, as there seems to be a concentration on the surface from four to six inches in depth with a further concentration on the bedrock, with little or no values in between.

"Saprolite deposits in Montgomery and Randolph Counties show values from 50 cents to $3 per yard, usually rather spotty, and it is impossible to give the average of the deposits until further prospecting is done. In some sections, however, there are possibilities for commercial production.

"In the placer and Saprolite deposits the gold is usually fine; although in certain localities, as the Reed, Parker, and Portis Mines, some coarse gold is found. Some very fine nuggets have been found at the Reed and Parker Mines.

"Due to the nature and distribution of the placer deposits in North Carolina, every known method has been used in an attempt to recover the gold from the Saprolite materials. These methods included hand panning, sluice boxes, rockers, hydraulicking, log washers, Snodgrass machines, trommels, centrifugal machines, and in three instances, dredges. A great many of the processes used have been failures, due to the clayey nature of the deposits.

"The most successful methods attempted so far on a large scale have been hydraulicking, Snodgrass machines, and trommels. The old reports show that dredging methods attempted on the Catawba, Uharie Rivers and fishing creek proved unsuccessful. Various reasons have been given for the failures of these dredges. The older inhabitants of the above sections state that the companies were unable to secure sufficient properties, others state that the dredges were not able to handle the clayey materials.

"In such sections of the State, especially at the Portis and Parker Mines, the abundance of plastic clays has made the recovery of the gold an impossibility. Several methods have been tried out unsuccessfully to disintegrate the clays. The clay is so tenacious that if trommels are used, the gold is so pulverized that it floats out in the clay slimes. The Snodgrass Machines and log washers have also proved unsuccessful because the quartz fragments tend to prevent the revolving of the blades within the drums. After the clay has been thoroughly disintegrated by these methods, the gold is worn so fine that it floats out in the slimes and does not come in contact with the amalgamation plates.

"Two problems will have to be solved before many of the placer deposits can be operated profitably in North Carolina. The first problem is the disintegration of the clay without the pulverizing of the gold to such a fineness that it floats out in the slimes. The second problem is the recovery of the gold from the clay slimes at economical cost regardless of the fineness of the gold. If these two problems can be solved and the ore can be handled at low cost, there are many placer and Saprolite deposits in the Southeastern United States which could be worked profitably.

"A process of disintegration will have to be worked out in which the gold will be eliminated in the very beginning so that it will not be pulverized to such a fineness that it will be impossible to recover it. After the clay has been completely disintegrated, some process of recovery will have to be devised to recover the fine gold from the clay slimes. All processes so far attempted have been failures due to the inability of the operators to recover the fine gold by straight amalgamation and on the English blankets, as the clay, more or less in a colloidal state, coats the plates in such a manner that the gold never comes in contact with them. Also the burlap blankets and English blankets become so covered with the fine clay that the gold floats off in the water."

It appears, from the quoted remarks, that there are several problems which will have to be overcome before any extensive gold mining can be done in the Appalachian states, with any degree of success. Reference is made to the fact that the values are spotty and range from 10 cents per yard to $20 per yard, but generally average less than $1.00 per yard with some of the Saprolite averaging

between $2.00 and $3.00 per yard. Further reference is made to the remarks about the technical problems which will have to be solved. 1. The disintegration of the clay. 2. The recovery of the gold from the clay slimes. If these two problems can be solved there are many Saprolite deposits in the Southern states which can be worked at a profit.

I am pleased to advise that after a long and trying period of research and development, starting in 1940, excluding the war years, with an expenditure of approximately $500,000, I have achieved a complete break-through on the last two problems.

The "Split-Water Process" is a mining technique which has been designed to process clayed ores which contain gold, silver, platinum, copper, rutile, ilmenite, titanium oxide, zarconium, etc. This process is the only known process capable of reducing tenacious mineral clays which contain the values in the Saprolite mining belts of the Appalachian Mountain Range into a refinable concentrate rendering the values in marketable condition.

The "Split-Water Process" has the unique features of being able to dissolve the tenacious clayed materials causing the ore gangue to go into a perfect state of suspension, thereby eliminating the clay balls which have robbed the values in all of the known attempts in mining this material.

The "Split-Water Process" has additional capacity to deslime the ore gangue after it is put into a state of suspension thereby recovering all the fines of selected specific gravity classification. No chemicals or agents are required. The gold is recovered as free natural grains as produced by nature from the quartz. The sands and gravels are all classified and made available for sale as a by-product or for building materials.

The ore gangue, which consists of Saprolite, mineralized zones, schists, gneises, decayed rock formations or any other type of ore which may contain recoverable values, usually have such scattered and dissimulated values that the quantity of value in each field ton would not pay to process from the usual mining or milling standpoint.

The "Split-Water Process" has been specifically designed, since most of the ores are now oxidized or weathered in place, in some cases to depths of 200 to 300 feet, to reduce the tremendous bulk of the field ore conveniently into a field concentrate with a ratio of approximately from 100 to 1.

The various parts of the field gangue are divided into the correct classifications and may be marketed as a number of by-products. The valued elements, such as metallic minerals, oxide elements and all various forms of recovered values may be refined to suit the available market to the best advantage.

Mining machines employing the technique as just described are complicated and very expensive to manufacture. A complete "Split-Water Process" installation costs $1,000,000 for a 500-ton unit, and a 2,000-ton unit would cost $2,000,000. Technical management is exacting and requires considerable advanced planning with long range views. Investment capital mounting into the millions of dollars will be required.

In viewing these facts, the problems appear insurmountable with the present $35 price of gold. Financing in these amounts cannot be arranged for easily unless tremendous potentials in deposits are proven and the general public more enlightened.

However, the enactment of S. 719 and any other companion measures which augment its intent would immediately stimulate the incentive of the speculative investors. At least some public knowledge would be gained that the government is trying to assist through affecting Legislative measures to make it economically possible for an abandoned mine to be re-opened or for the acquisition, development and operation of new mines. The enactment of this Legislation is long overdue and is virtually imperative at this time to make possible the acquisition of the necessary capital to acquire and develop mines with the present high cost of capital equipment.

The present high cost of gold production will not lessen in the present foreseeable future. However, quite to the contrary; additional higher cost of operations will undoubtedly occur. With the present price of gold, only the operations of the most richest properties or unusual discoveries can be maintained at a profit to investors. Even with these, no margin is conscientiously available to management which will permit prospecting and exploration of new ore bodies or the development of new techniques both of which are absolutely as necessary to the gold mining industry as any other of our national industries such as the production of petroleum and its products, mining of coal and its by-products,

the steel industry and the lumber industry, only to name a few. These industries have all been assisted by the Federal Government in various ways at different times. At least the price of their commodities are not under absolute government control.

Considering the present price of gold, millions of acres of Saprolite ore deposits might be considered sub-marginal for first-class speculative risks, even though very rich streaks occur quite frequently.

In order to mine these Saprolite zones profitably, considerable testing or surface-blocking-out is required. This exploration work in Saprolite zones is very technical and very expensive. Special trained crews are required and portable equipment which produces actual mining values using the "Split-Water Process" technique is expensive to manufacture and operate.

The enactment of S. 719 and any other companion measures, would immediately stimulate the possibilities for the acquisition of funds for exploration and development work to prove the mining potentials of the mineral deposits.

The gold mining industry deserves and is entitled to whatever benefit these measures may or can provide toward gold mine assistance and gold mine revitalization. Even these measures will not cure or provide 100% effective assistance for all the miners' problems. Assistance is required in several forms to enable the gold mining industry to get started again. Financial, technical, academic assistance are all required if the industry is to regain its rightful place in our progressing economy.

Financial assistance in various forms is badly needed since the industry is faced with extremely high cost "get started" period. Enactment of the current Legislation and any companion measures will be a step in the right direction at this time.

Assistant payments or subsidized operation cost will enable capital to be obtained from many investors who will feel assured of at least a minimum reasonable return on their investment. The neglectful plight which the gold mining industry has been forced into, first by the War Production Board Order No. L–208 and then by the continued refusal of the various administrations to take action on this individual product of a very vital segment of this Nation's economy, has, in fact, damaged to a near unrepairable extent, the gold mining industry's ability and opportunity to acquire capital investment funds from public investors.

Consequently, new public knowledge and assistance will be necessary to enable the gold mining industry to get started again.

The enactment of the present proposed legislation will not only assist gold mines but also will in effect assist other related industries. Many of the minerals areas have little or no industry to furnish gainful employment for the people who live there. The proposed legislation is sound and logical. It does not extend any further into the world monetary system than to convince foreign observers that action is being taken to maintain our dollar with ample gold reserves showing the fact that our natural resources are still more than ample to maintain the stability of our country's economy.

Foreign observers are fully aware of the fact that the hard shell of our credit and monetary stability could well be broken by the "inconsistent and uncontrollable" "do nothing attitude" of the various central government departments. Once the backbone of our reserves is depleted to the place where it is too late it would be very hard to recover from that position since one of the most expensive necessities of mining and development work is *time* and at that point, that will be a commodity that cannot be legislated into existence.

Looking over my own past experience as limited or as broad as it may be, nevertheless, I am most surely appraised of the problems and difficulties that face the mining industry at large at this time. In my individual case, the "development of the gold bearing Saprolite ores" of the Appalachian Mountain Region, it appears like a one-man battle against an unconquerable foe possessed with an unyielding might which can never be conquered. The gold mining industry in each section of this country is faced with similar unconquerable obstacles, all of which can be overcome and will be overcome. The gold mining industry will not stand idle or useless, nor will the American people stand for this industry to remain idle or useless for long.

The American people have always been able to overcome various difficulties whenever they arise and in this case, if it requires new Legislation, that will also be enacted.

Where has the normal common sense American reasoning gone? In this instant Gold—and the benefits arrived by its users are beyond dispute. Our technological growth has long departed from the horse and buggy pace.

Gold, the noblest of the metal elements has again shown who is King of the field regardless of the present position which has geen taken by those who consider these hearings as only a means of exploiting the monetary uses of gold and therefore attempt to maintain its dollar value is only tied to its monetary use; and accordingly strictly subject to its previously declared monetary value regardless of how long ago or under what condition that value was established.

Our present technological and industrial advancement includes such a critical list of applications that the monetary consideration of gold is virtually secondary to the field of thought even at this time. Our technological advancement demands this metal which is without substitute. Regardless of opposition, our Congress must take this situation under control now.

Time is rapidly running out. As previously stated, time is the most expensive necessity of mining and development work. "Our domestic get-ready" program such as prospecting, testing, development, recovery, know-how, and finances, all must be started now.

What will our government do for this metal—Oh, No! Buy it from the foreign governments at prices ranging from $200.00 to $500.00 per ounce and put this burden back on the people who have lost virtually already their economic opportunity to engage in domestic gold mining by the existance of this present situation, in the form of taxes—all to the benefit of the foreign powers who are now exclusively preparing for that day.

Apprehension has been expressed about a two price system for gold if any measures are passed by Congress which will assist our domestic gold production. How thoughtful we are for our foreign neighbors, but not for our domestic miners. Nor for an industry that has contributed already beyond question to the greatness of this nation and this government. The element of time is running out on this situation, Mr. Chairman, Members of this Committee. It is now already an emergency.

Yes, there will be only a one price system and that will be the price set by the European Foreign Powers who have even virtually at this time acquired most of the gold which has given our government the power of command for so long a time.

We will simply be told that the United States commanded the situation for some 30 odd years by its $35.00 price and now a new group of control has taken over and the foreign industrial and military powers consider the gold a stratigical element and should not be sold back to the United States. Yes, we will pay unless this Committee can be successful in its present and continuous efforts to remedy the situation.

The cost to recover from our present position caused by the neglect of this situation, which has been permitted to develop without control, will be staggering. We will have to pay many times any imaginary amount that we might think or deem to be reasonable if the situation is not corrected immediately. Why not pay this cost to our own people to whom the debt has long been owed.

For our own economical benefit, for our own development for our own safety and security. Not foreign interest.

Therefore, I urge that every possible effort be made to persuade the present or approaching sessions of Congress to act on these Measures. They are not only vital to the gold mining industry and its benefactors, but they are vital to the American people and to our American Government.

Chaos will not befall us, as some have expressed but on the contrary a great American industry will start to grow again and brings new economic vigor to many sections of our nation and new strength to our economy and low investment opportunities for American capital at home—not abroad.

Mr. Chairman, gentlemen, I thank you for this opportunity to express these views. As in the past, I shall continue in my endeavor to bring the gold mining industry to the Appalachian States.

SUPPLEMENT TO TESTIMONY

Mr. Chairman, if there be no objections voiced, I would like to have the following statement to be added to the record as I think it is very pertinent to these Legislative Measures which are the object of the present Hearings. For the general public's consideration, if anyone should read the minutes of this

Hearing and unthoughtfully think the Measures involved in these Hearings only constituted "another piece of Western Mining Legislation", then under such circumstances I would like to call their attention to the contents of my previous testimony "Development of Saprolite Gold Deposits, Appalachian Mountain Region" showing the fact that six Eastern States are specifically mentioned in my statement and several more could be.

The Measures embodied certain fundamental remedies, aids, and assistance to restore and revitalize the American Gold Mining Industry. This includes all of our States. Yes, even our Gold-Rich States of the Eastern part of our nation located in the Appalachian mineral areas which are waiting to be developed.

The enactment of the current Measures would be extremely beneficial in helping to bring the Gold Mining Industry to our Eastern States—a reality which I have been working toward for so long.

I thank you, Mr. Chairman and your Committee, and as previously expressed, I will continue in my efforts to bring the gold mining industry to the saprolite mineral deposits of the Eastern United States.

STATEMENT OF THOMAS L. KIMBALL ON BEHALF OF THE NATIONAL WILDLIFE FEDERATION

Mr. Chairman, I am Thomas L. Kimball, Executive Director of the National Wildlife Federation which has national headquarters at 1412 Sixteenth Street, N.W., here in Washington, D.C.

Ours is a private organization which seeks to attain conservation goals through educational means. The Federation has independent Affiliates in 49 States. These Affiliates, in turn, are composed of local groups and individuals who, when combined with associate members and other supporters of the National Wildlife Federation number an estimated 2½ million persons.

We welcome the invitation to comment on this proposal.

In our opinion, Mr. Chairman, the Subcommittee can make a real contribution to the cause of conservation by developing a sound mining and minerals policy, one which gives recognition and consideration to all values and resources in the overall public benefit. We also are confident and hopeful that the Public Land Law Review Commission, in its current deliberations, will give consideration to the development of such a policy.

Rather than comment in detail about S. 719 at this time, I should like to set forth a few basic principles which the National Wildlife Federation has adopted after lengthy debate and deliberation in annual conventions. These basic principles follow:

1. Any mining law which allows land in Federal ownership to go to patent should be repealed, with the extraction of minerals being accomplished under provisions of the Mineral Leasing Act. Leasing arrangements, however, should provide for security of tenure and exclusive use of the amounts of surface land necessary to justify investments. When mining ceases, the surface must be restored, where practicable, to the original condition, with surface rights being retained in public ownership.

2. The mining law of 1872 is outdated and does not give proper consideration to other values such as watershed protection, water pollution, timber production, and fish and wildlife and recreation. Attention must be given to more than the pure economics of mining. And, of course, the Subcommittee is well aware of the abuses and spurious claims which have been perpetrated in the guise of "mining."

3. A new mining law for all construction mineral materials should be developed to handle the difficulties currently involved with the "common varieties" controversy. We are opposed to any provisions, however, which would permit the opening of additional lands to mining claims which could go to private patent.

4. A national policy on oil shale should direct that the Federal Government continue in oil shale technology and research, with all exploitation of minerals located on public lands being accomplished under leasing arrangements allowing control of the surface resources to remain with the Federal Government. Before any program can be put on a sound basis, however, order must be brought out of the present chaos on claims on oil shale lands. Because such a tremendous public wealth is involved, we wonder why the Federal Government does not conduct the research and development necessary for the economic extraction of

oil from the shale? If the Government does the research, then all oil companies, large and small, could have an opportunity to compete equally for the leases and a fair share of the oil value could be obtained for public purposes.

In general, we would have two other comments to make.

First, we think that the "Mined Lands Conservation Act" proposed by the Interior Department some months ago has much merit and the role of the Federal Government must be spelled in some manner such as this.

Second, a partial solution to many of the complex mining problems in the West would appear to rest in legislation to require recordation of mining claims in U.S. land offices. It is inconceivable that the Federal Government does not have an idea of the claims filed against its lands.

Thank you again for the opportunity of making these remarks.

STATEMENT OF R. G. MOORE, ASSOCIATE EDITOR, PAY DIRT

To the Subcommittee on Minerals, Materials and Fuels of the Senate Committee on Interior and Insular Affairs: The publication Pay Dirt, the official voice of the Arizona Small Mine Operators Association, wishes to express its endorsement of the National Mining and Minerals Policy proposed in S. 719, and to urge the adoption of the measure by the Congress of the United States. We respectfully request that this statement be made a part of the July 9, 1969, hearing record.

No segment of the entire mining and minerals industry is in greater need of a sound and continuing national minerals policy than is that group composed of the prospector, the claim owner and the small mine operator. These are the men upon whom the nation depends to search for and discover those mineralized areas from which future production of minerals and metals will come, production essential for our industrial age and for national security.

This obligation to society and country cannot be fulfilled unless there is access to the public domain, plus the assurance that the lands (with minor exceptions) will remain open to exploration, to discovery and location in the spirit of the free-enterprise system.

The prospector and small mine owner are true conservationists. As a result they endorse the basic principle of multiple use, and strenuously oppose the setting aside for single-purpose use vast areas of our public lands. No one knows in advance where valuable mineral deposits may be found, yet the discovery of new sources of supply is essential to meet growing national requirements. Finding new sources of minerals and metals takes time; exploring and pre-engineering takes time; and developing new mines takes time. Therefore, the men who are responsible for meeting the nation's future needs must have the assurance of continuing government policies which will protect their investments of time, energy and capital.

In the past they have relied on the protection provided by the basic principles of the present mining law. We believe this protection should be preserved, and augmented by the statement of fundamental principles and objectives contained in S. 719.

MONTANA BUREAU OF MINES AND GEOLOGY,
Butte, Mont., July 2, 1969.

CHAIRMAN, COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
U.S. Senate,
Washington, D.C.

DEAR MR. CHAIRMAN: I am State Geologist for Montana and Director of the Montana Bureau of Mines and Geology, situated at Butte, one of the world's great mining districts. The Montana Bureau of Mines and Geology is a public service agency established by law in 1919 to promote efficient development of Montana's mineral resources, including metals, nonmetals, coal, oil, gas, and water supply. It is vitally concerned with anything that affects the future mineral resource development of the State; particularly when, within the next several decades, our nation will be faced with decreasing mineral production and increasing demand from an expanding population that enjoys the highest standard of living in the world.

I have learned that on July 9 hearings will begin on S. 719, a bill to establish a Natural Minerals Policy, introduced by Gordon Allott. I will not be able

to appear in person so wish to make a written statement to be included in the records of the hearing.

Mr. Allott's statement in introducing the bill fully established its need, and I can add but little other than my full endorsement of it. The general public, especially in the densely populated areas of eastern United States, has little appreciation of the importance of the mineral industry to their every day existence. To most of them, in the worlds of H. Byron Mock, Vice Chairman, Public Land Law Review Commission, "Knowledge of mining is only storybook lore." But were you to deprive the average American of all the benefits of mining and the mineral industry, you would reduce him to a stark-naked half-starved creature grubbing for roots with his fingers with not even a stone hammer to protect himself from the beasts of the field—for nothing can be done to lift man above the level of the animals without the use of metallic tools and machines and other products of the mineral industry. Yet with this absolute dependence on the mineral industry for its very existence, the general public would shackle the industry with prohibitive rules and regulations which would make it virtually impossible to operate efficiently and profitably. Yes, we do need a National Minerals Policy, and we need to state it in bold, black letters and to state how important it is to our every day life. I would go one step further than S. 719 and state that the production of needed minerals should have first priority in Public Land use, because their occurrence is so limited that they must be mined where found. One cannot start a copper mine anywhere except where nature has provided a copper deposit, and such deposits are rare indeed when the total area of the Nation is considered.

Respectfully submitted.

UUNO M. SAHINEN,
Director and State Geologist.

WYOMING MINING ASSOCIATION,
Riverton, Wyo., July 17, 1969.

Hon. FRANK E. MOSS,
Chairman, Subcommittee on Materials, Minerals, and Fuels, Committee on Interior and Insular Affairs, U.S. Senate, Washington, D.C.

DEAR SENATOR MOSS: The Wyoming Mining Association endorses S. 719, the proposed Mining and Minerals Act of 1969. We consider this to be much needed legislation and urge favorable action by your Subcommittee and by the Congress.

We have had an opportunity to review the testimony by a number of those appearing before your Subcommittee who spoke in favor of S. 719. Rather than to be repetitious, we wish to state that we are in agreement with the views presented and recommend them for your consideration.

Please make our endorsement a part of the record of the hearing.

Respectfully submitted.

R. W. BEAMER, *Executive Secretary.*

STATE OF ARIZONA,
DEPARTMENT OF MINERAL RESOURCES,
Phoenix, Ariz., July 21, 1969.

SUBCOMMITTEE ON MINERALS, MATERIALS, AND FUELS,
SENATE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Senate Office Building,
Washington, D.C.

GENTLEMEN: A statutory duty of the Department of Mineral Resources, State of Arizona, is "to assist in more extensive exploration and development of the mineral resources of the State." It follows that the department supports S. 719, a bill to establish a national mining and minerals policy, now before you.

The need for such a policy long has been urged by many, but to our knowledge, never by mining industry representatives so able and unified as those who testified at your hearings on S. 719 on July 9th. I have read copies of the statements presented to you by the panel of American Mining Congress witnesses and by Edward H. Peplow, Jr., Executive Secretary, Arizona Mining Association and John B. Rigg, manager of the Colorado Mining Association, and endorse them wholeheartedly.

These men did not overemphasize our dependence upon a sufficiency of minerals, the problems of supplying our future demands, the projected enormity of our

demands in a few years, or the need of a national minerals policy which tends to more stable and cooperative development and efficient use of our mineral resources.

The problems of the domestic mining industry have multiplied in the last decade, and as Mr. Andrew Fletcher, Honorary Chairman, St. Joseph Lead Company, stated to you, "With the steep acceleration of global consumption, we believe that exploration for new discoveries and improved utilization of existing mines must be encouraged. We think this requires a national mining and minerals policy as contemplated by S. 719." Mr. Fletcher's "We" refers to the members of the American Mining Congress but I am sure the others of the mineral industry agree with him.

It is good to read that the Secretary of the Interior has expressed to you a belief in the desirability of such a national policy and a deep concern about the long-range mineral position of the Nation.

Enactment and pursuance of policies such as those set forth in S. 719 would greatly improve the chances of the mineral industry to meet our future mineral demands as it has done so well in the past.

Sincerely,

FRANK P. KNIGHT, *Director.*

UTAH MINING ASSOCIATION,
Salt Lake City, Utah, June 5, 1969.

Hon. FRANK E. MOSS,
U.S. Senate,
Washington, D.C.

DEAR SENATOR MOSS: Our Association has noted with considerable interest S. 719, a bill to establish a national mining and minerals policy, introduced by Senator Allott of Colorado with whom you, Senator Bennett and others joined. The directors and officers of this Association have instructed me to indicate to you and other members of Congress our support for this bill.

The members of the Utah Mining Association produce over 95% of the metallic minerals in the state and over 50% of the nonmetallics, excepting coal and petroleum. Total minerals production in Utah now exceeds $500 million yearly, but has shown only very modest growth. It is generally accepted that the future development of this state is primarily dependent upon the expansion of Utah's minerals industries and related manufacturing.

From a national viewpoint, a strong argument in favor of establishing a national mining and minerals policy was presented by Dr. Walter R. Hibbard, Jr., who in 1968 was Director of the Bureau of Mines. On March 21, 1968, he summarized for the Senate Subcommittee on Minerals, Materials and Fuels, a comprehensive study by the Bureau on the adequacy and dependability of the supply of mineral materials required by our economy. This study, originally motivated by Presidential and governmental concerns, clearly defines the weakening position of our domestic metals and minerals industries in the face of huge demand and in spite of the importance of these industries to our security and national economy.

This Association believes that the establishment of a national mining and minerals policy will serve to support the industry substantially in its objective of supplying the nation's minerals needs in a responsible, economic manner. Passage of Senate Bill 719 would establish such policy.

Respectfully yours,

PAUL S. RATTLE.

STATE OF ALASKA,
DEPARTMENT OF NATURAL RESOURCES,
College, July 3, 1969.

Hon. GORDON ALLOTT,
New Senate Office Building,
Washington, D.C.

DEAR SENATOR ALLOTT: I endorse S. 719 and strongly urge that it be passed. It will help insure stability, reserves, and productivity of the mining industry, all of which are badly needed.

Please enter this statement into the record of the forthcoming hearing. Thank you.

Sincerely,

JAMES A. WILLIAMS,
Director, Division of Mines and Geology.

INTERNATIONAL INSTITUTE FOR RESOURCE ECONOMICS,
Washington, D.C., July 18, 1969.

HON. GORDON ALLOTT,
New Senate Office Building,
Washington, D.C.

DEAR SENATOR ALLOTT: The witnesses at the recent hearing on your S. 719 deplored the decline in the number of persons receiving degrees in mineral engineering. None of the witnesses presented the reason for this decline.

The thrust of the testimony by Dr. Osburn of Pennsylvania State University, who cited a National Academy of Engineering study, was that a shortage of mineral engineers exists and that the solution is a federal subsidy for mining schools.

We are sure that such a subsidy would result in higher salaries for the administrators; however, since our Fact Sheet indicates that mining engineers are grossly underpaid, we do not believe that a shortage of mining graduates will be corrected by any other method than by simply increasing the financial rewards. In other words, the "decline of mining schools from 26 to 17 in five years" is a result of rational decisions by high school graduates. This will not change until the employers of mining engineers become less parsimonious.

Since your Committee deserves ALL the facts, we respectfully request that this letter and the attached Fact Sheet be inserted into the record as our Statement.

Very truly yours,

WALLACE D. BARLOW, P.E., *Director.*

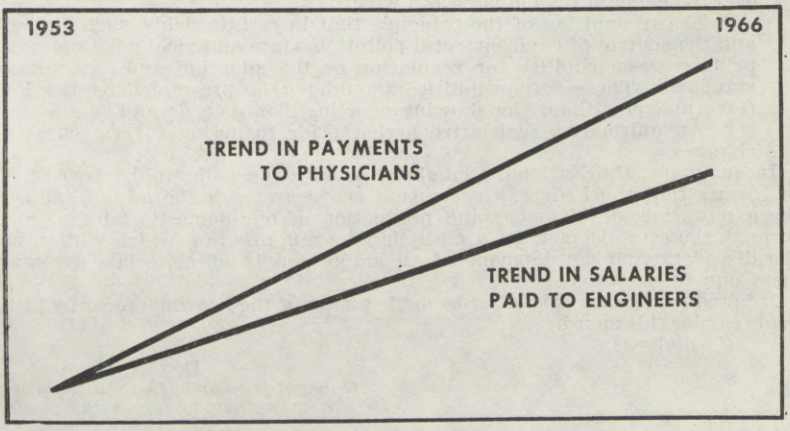
FACTS REGARDING SALARIES PAID TO MINING ENGINEERS

1. Mining Engineers are at the bottom rung of the ladder, according to the Engineers Joint Council.

	Field	Salary
Median Salaries in 1968	Business Machines	$15,200
	Electrical/Electronic	14,850
Engineer with Ten Years of Experience	Construction	13,350
	Petroleum	13,300
	Utilities	12,300
	Transportation	11,850
	Mining	11,750

2. The rate of increase of mining engineer's salaries is the lowest of any field of engineering-4% per year, according to the National Society of Professional Engineers.

3. A comparison of engineering salaries with earning by other professionals indicates that the hardship, danger and isolation associated with the practice of the profession of mining engineering is not compensated for by the salaries paid.



CHAMBER OF COMMERCE OF THE UNITED STATES,
Washington, D.C., July 16, 1969.

Hon. FRANK E. MOSS,
Chairman, Subcommittee on Minerals, Materials, and Fuels of the Committee on Interior and Insular Affairs, New Senate Office Building, Washington, D.C.

DEAR SENATOR MOSS: The Chamber of Commerce of the United States takes this opportunity to comment on S. 719, the proposed "Mining and Minerals Policy Act of 1969."

The National Chamber endorses the stated objectives of S. 719. We recognize the need for a national mining and minerals policy as being essential for a vigorous and prosperous mineral industry which will, in turn, help guarantee the security of our country, enhance its economy, and contribute to its general well being.

S. 719, as introduced, proposes that it will be the continuing policy of the Federal Government to foster and encourage (1) the development of an economically sound and stable domestic mining and minerals industry; (2) the orderly development of domestic mineral resources and reserves necessary to assure satisfaction of industrial and security needs; and (3) mining, mineral, and metallurgical research to promote the wise and efficient use of our mineral resources.

The adoption of a national mining and minerals policy, such as proposed in S. 719, would not in and of itself bring the stated objectives into reality. Implementing the policy statement will be the responsibility of the Congress, the Department of the Interior, and the mining industry. It would, however, delineate certain broad policy guidelines for future minerals development, and provide the opportunity and impetus for the vigorous, innovative and competitive development of our domestic mineral resources.

In this connection we are pleased to note that S. 719 requires that the Secretary of the Interior include in his annual report to the Congress a report on the state of the domestic mining industry, together with such recommendations for legislative programs as may be necessary to implement the objectives of the act.

In the review of these reports and proposed legislative programs, we would recommend that the Secretary and the Congress give consideration to and recognize the need for—

1. The continued exploration, development and production of all minerals and materials which have values, and whose extraction is a legitimate and desirable use of land;

2. An assurance that administrative regulations adopted by Federal agencies relating to mining and minerals are not inconsistent with the stated policy objectives of S. 719 and that such regulations are jointly established and uniformly administered by the appropriate Federal agencies;

3. The management of Federal activities by only those governmental agencies which are technically qualified. The Bureau of Mines and the Geological Survey of the United States Department of the Interior should be maintained to assure high standards of technical assistance to the national welfare, to industries in general and to the mineral industry in particular; and the activities of these two agencies should be utilized for the overall benefit of the industry as a whole;

4. The recognition of the principle that in certain fields, such as land use and the control of environmental pollution, state and local governments have primary responsibility for regulation or the adoption and enforcement of standards. These responsibilities should not be preempted by the Federal Government without the showing of a justifiable need; and

5. An affirmative legislative action prior to major governmental policy changes.

In summary, the National Chamber endorses the policy objectives of S. 719 and urges that the Federal Government cooperate with the mining industry in the exploration, development and production of our domestic mineral reserves through the establishment of a realistic minerals program which will encourage the discovery and development of an ample supply of materials necessary to meet our future needs.

It is requested that this letter be made a part of the hearings record which was made earlier this month.

Cordially,

DON A. GOODALL,
General Manager, Legislative Action.

UNIVERSITY OF IDAHO COLLEGE OF MINES,
DEPARTMENT OF MINING ENGINEERING AND METALLURGY,
Moscow, Idaho, July 16, 1969.

HON. GORDON ALLOTT,
Senate Subcommittee on Materials, Minerals and Fuels, Committee on Interior and Insular Affairs, Washington, D.C.

DEAR SENATOR ALLOTT: Will you please note and add my comments to the record of hearing for Senate bill S. 719?

I am J. R. Hoskins, Professor and Head of the department of Mining Engineering and Metallurgy, College of Mines, University of Idaho and for nearly 30 years a professional mining engineer active in the industry.

Previous statements on record show the importance of the entire mineral industry to every person in the world today. No part of our present or future activities can be accomplished without use of the product whether fuel, metal or composite. Even the plastics and paper would not be possible without mineral industry products for their manufacture.

The common misconception of saving our domestic mineral supply by foreign exploitation has also been restated. It is clearly understood in the industry that mineral supply and demand can be balanced; but, that this balance is not necessarily an economic one. Without a price tag, pollution, or beautification domestic production of any metal can meet the demand. With economic limits, the impact of foreign trade from better deposits is influential. In national emergencies, time and transportation supersede the economic factor in influencing the production of minerals.

Basically, ignoring the strategic questions and power politics involved in an adequate supply of minerals during an emergency, a shortage of minerals is an inadequate technological ability. As in the history of flying, man thought of it when he first noticed birds but it was only through technologic advances that he could generally go from a few precarious miles to transporting 100's of tons of materials at the speed of sound or go to the moon. So in the mineral industry, all of the metal and energy in the rocks at our feet cannot be made available without know-how. Because it is one of the oldest industries and apparently self-sustaining, federal support in advancing the technology has been minor compared to most other fields. With support for research, the potential to supply needed minerals for our advancing society at an economic level is as possible and near as going to the moon. Without, we will continue on a crisis to crisis program. The need for concerted, well programed policies is obvious.

Being one of the few remaining universities trying to maintain a balanced and progressive educational and research program in mineral industry activities, we find it discouraging both financially and academically to continue the programs we know must be maintained if we are to do our appointed task successfully. Other activities, although important but not as basically important to national welfare as agriculture and mining, receive adequate federal financing to continue and advance both facilities and research. Programs in mining activities get little or no support. This in turn affects teaching and research personnel and further the general national attitude prevailing is reflected by student attendance. On one hand you cannot slap the industry publicly for being unsafe, unsanitary and unfeeling toward mankind and his activities and on the other then expect young people or professional specialists to associate themselves with the professon to alleviate these ills without inducement. Support and encouragement through federally sponsored financing and policy must be forthcoming to offset the past and present defaming of the industry.

Nearly every state in the Union has both engineering schools for applying technical knowledge to the betterment of mankind, and agricultural schools for advancing the capabilities in production of food. Mining engineering on the other hand is taught in less than 20 institutions and this resulted in somewhat under 1000 graduating engineers to continue the profession. The reasons given for these conditions? It is uneconomical to maintain a low enrollment curriculum (two honored institutions closed their mining curricula for this reason in June 1969). Students want to associate with activities that are socially oriented and acceptable (even a research proposal to determine the cause of low enrollment did not gain federal support).

It is obvious to those of us involved in mineral industry education, that financial support is needed through federal funding. But, even more important is the image of the industry to recruiting of personnel. Federal policy supporting mining

as a welcome and important industry rather than an undesirable stepchild to be regulated would help change the image beneficially.

Sincerely,

J. R. HOSKINS.

UNIVERSITY OF UTAH COLLEGE OF MINES AND MINERAL INDUSTRIES,
DEPARTMENT OF MINING AND GEOLOGICAL ENGINEERING,
Salt Lake City, Utah, July 7, 1969.

SENATE INTERIOR COMMITTEE,
U.S. Senate,
Washington, D.C.

DEAR SIRS: I wish to submit my wholehearted support to S. 719. It is imperative that a national mining and mineral policy be adopted without further delay. Domestic mineral industries have been ignored far too long. The result has been an increased dependence on foreign mineral wealth, a rapid decline of enrollment in domestic mining schools, and continued apathy and ignorance of the general public toward mining and mineral resources. If these trends continue, the nation will surely lack self-sufficience in a variety of mineral raw materials, and more important, the technical ability to find and produce mineral raw materials will be unavailable.

A national mining and minerals policy must be established to foster and encourage our educational institutions in training of scientists and engineers capable of discovering and exploiting domestic mineral resources in a wise and efficient manner. By the effective use of our natural resources we will be able to cope with those emergencies that could destroy us as a first-rate nation.

Sincerely yours,

JOHN E. WILLSON,
Professor, Mining Engineering.

STANFORD UNIVERSITY,
DEPARTMENT OF MINERAL ENGINEERING, SCHOOL OF EARTH SCIENCES,
Stanford, Calif., July 7, 1969.

Hon. GORDON ALLOTT,
Committee on Interior and Insular Affairs,
U.S. Senate,
Washington, D.C.

MY DEAR SENATOR ALLOTT: I have read Bill S. 719, Mining and Minerals Policy Act of 1969, and I urge your support of this measure.

I believe, and others will undoubtedly testify, that it is in the national interest to foster and encourage an economically sound and stable domestic mining industry, and to develop domestic mineral resources and reserves in an orderly fashion, consistent with industrial and security needs, but it is the next I wish to enlarge upon.

To promote wise and efficient use of our mineral resources through mining, mineral, and metallurgical research is the soundest means to implement the foregoing. The key to research is education and therefore I should like to see the Department of the Interior's Geological Survey and Bureau of Mines take an active role by providing manpower and funds for education, supporting graduate study, and contracting research at the leading universities in the minerals fields.

Respectfully submitted.

Prof. FREDRICK C. KRUGER,
Chairman of the Department.

THE PENNSYLVANIA STATE UNIVERSITY,
COLLEGE OF EARTH AND MINERAL SCIENCES,
University Park, Pa., July 1, 1969.

Hon. HENRY M. JACKSON,
Old Senate Building, Washington, D.C.

DEAR SENATOR JACKSON: It is understood that hearings will be conducted by the Senate Interior Committee on July 9 1969 with regard to the establishment of a national minerals policy. In particular, bill S. 719 introduced by Senator Allott of Colorado will be considered.

The establishment of such a policy is viewed as most critical to the welfare of our nation having both immediate implications and long range effects on the

multifarious relationships of our national society. Among these are: defense considerations, international monetary—balance of payment policies, domestic monetary problems, labor policies, agriculture, transportation, urban development, the space program, research policies and new areas such as the development of unknown mineral resources under the oceans. In addition, may I urge that special consideration be given to relationships with three other areas: environmental control, manpower, and safety. I find a lack of correlation between these areas and attempts at mineral policies.

The activities of the mineral industries as well as the utilization of its products bear closely upon environmental problems affecting our air, water and land (including solid waste disposal). The history of the development of our country and the parallel development of the mineral industries suggests the need for the study of these interfaces and thoughtful decisions in the national interest rather than limiting, potentially damaging restrictions.

With regard to manpower, our forefathers wisely foresaw the need and established "Schools of Mines"—many in our Land-Grant Institutions. The roles the graduates of these institutions have played in our national growth, I suspect is not generally appreciated. Time has changed these institutions and their programs, new disciplines have reached accepted professional status; but today the low enrollment in these curricula provides cause for alarm. Such is not the case in many countries. One such discipline, whose total, current, annual graduate list in the United States probably is less than 25, is Mineral Preparation Engineering. A specific example is detailed in the attached letter statement, issued two years ago. These engineers provide the direction for the recovery of as little as 0.01 percent of tungsten from our ores, for concentrating iron ores to an efficiently usable level, for controlling the sulfur content of coals, as well as controlling the environment surrounding the recovery and use of our ores. The nation's future mineral supply is highly dependent upon these professionals as it is unlikely our mineral resources will increase in quality. Will we, as a nation, be forced to the dependent role of importing such a vital commodity as iron ore? This question becomes more complex when it is realized we have huge resources of low grade ores! Modern developments of science and technology have also changed the requirements for skilled workers in the nonprofessional fields.

Some safety aspects of mineral extraction are now before the public. These must be properly integrated into a national mineral policy.

Although philosophies, sciences and technologies, industries and academic-research programs encompassing conservation of mineral products do exist, a clearly-stated, guiding national policy is lacking. This is to urge that careful attention be given to the establishment of a national minerals policy and especially to the interfaces of such a policy with environmental control, manpower requirements and safety considerations in the extraction of our minerals. A properly delineated national mineral policy is essential for maintaining an orderly fulfillment of the basic raw material needs of our people.

Very truly yours,

HAROLD L. LOVELL,
Director, Mine Drainage Research Section, and Associate Professor, Department of Mineral Preparation.

[Enclosure]

[From the Pittsburgh Press, July 24, 1969]

PROF. CITES PENN STATE'S ROLE IN RESEARCH ON POLLUTION

The article in the July 9 Press by Meteorologist Athelstan Spilhaus requires elucidation.

The academic and research program of the Department of Mineral Preparation at the Pennsylvania State University continues to serve the State and nation in the philosophical, technological and economical concepts of conservation as partially set forth in the above article.

Our program (including graduate degrees) is detailed in the University General Catalog and Department Brochure which include this statement:

"A growing national conservation philosophy is evolving which necessitates the recovery of non-renewable elements from discarded mineral wastes. The mineral

preparation engineer is now in demand to solve two of the nation's most urgent problems, air and water pollution."

Our alumni serve a wide variety of industries and governmental agencies, especially in Pennsylvania and in Pittsburgh, in the above cited technical areas as well as in the processing of new mineral materials.

Pittsburgh now holds a predominant role as a location of existing industry based on the proposed "symbiosis."

Research in our department has for years led to recovery of valuable mineral materials into forms usable by industry. We do not hesitate to develop interdisciplinary programs involving basic physical and social sciences to accomplish these goals.

Certainly our current researches in mine drainage waters and coal refuse piles are specific examples. The basic concept and detailed research leading to the use of certain coals in the treatment of mine drainage, which is now an industrial reality, as has been cited by The Press, was done at Penn State.

The original research pilot plant to treat coal culm material, located at Barnesboro, Pa., was designed here and constructed by a Pittsburgh firm.

Thus, a philosophy, a technology, an industry and an academic-research program in the conservation of mineral products does exist. At the State level, the Pennsylvania Department of Mines and Mineral Industries has a nationally outstanding program. At the Federal level many agencies are concerned, especially as set forth in the recent Solid Wastes Disposal Act.

The requirements of our nation in the future as indicated by the current exceptionally strong demand for mineral preparation engineers and the equally significant sparsity of such graduates suggests much can be accomplished by acquainting young men and general industry to the challenges of this vital, interesting and potentially profitable branch of mineral science and engineering.

HAROLD L. LOVELL,
Associate Professor, Head, Department of Mineral Preparation, University Park.

WEST VIRGINIA UNIVERSITY SCHOOL OF MINES,
Morgantown, W. Va., July 18, 1969.

Subcommittee of Materials, Minerals, and Fuels of the Senate Committee on Interior and Insular Affairs.

GENTLEMEN: I should like to comment as follows on the legislation being introduced to establish a national minerals policy (Bill S 719).

As everyone knows, minerals constitute a very important sector of the foundation that supports our material economy. They are vital to the future of the nation and to the well being of its citizens. These minerals at one time were thought to be essentially inexhaustible. Many of them even today are regarded as being abundant. We know now, however, that our reserves in many of the necessary minerals are limited and that in many cases these reserves are scant. In some cases we are almost totally dependent upon foreign supplies for our needs. These resources are not renewable and once exhausted are gone forever. Consequently a carefully thought out policy for their location, production, and use should be placed in operation, both at the state and national level.

Such a plan will be a complex one and one that needs careful consideration. Hence, early in the plan provision should be made to provide adequately trained people in sufficient numbers to lay out this policy. Further, the people who will develop this policy will need adequate and accurate information for its development and implementation.

Trained personnel from many disciplines will be needed but foremost among them will be geologists, mining engineers, metallurgists, fuels experts, geochemists, and many others. These people are trained in mineral technology departments which in many cases are located in mining colleges and departments. Today these departments are rapidly closing their doors because of inadequate support and because many educators and political leaders in executive positions do not fully understand the urgency of the need for mineral departments and mining schools. This problem should receive early attention when formulating the minerals policy.

Also research in the mineral areas, especially as to mineral location, production, and utilization is at a seriously inadequate level. Every state should have a a mineral experiment station tied in with the State University. At present, most do not have such. The experiment stations should have adequate financial support, be above political influence, and provided with the best trained people available.

Among many others is the problem of where the young people are to come, who are to be trained in our mineral colleges and departments, and who will staff our research stations. It is a curious fact that today in those nations who need and make most use of minerals that the young people who are to engineer the mines and manage the plants show little interest in entering the profession and trades essential for the production of the minerals needed. The same reluctance is reported to not exist among the less fortunate nations who in some cases would like to dispossess us. In the long run, this problem, if not corrected, is certain to become most serious for us. Information on this situation should be obtained and policy laid down to assure us of the necessary personnel to provide the scientific, engineering and managerial personnel as well as the skilled labor needed to locate our mineral reserves, produce them as completely as possible, and to convert them with as little loss as possible into a form or state in which we can use them.

Action on these three aspects of the mineral problem is needed now.

Very truly yours,

CHARLES T. HOLLAND, *Dean.*

UNIVERSITY OF MISSOURI, ROLLA,
SCHOOL OF MINES AND METALLURGY,
DEPARTMENT OF MINING AND PETROLEUM ENGINEERING,
Rolla, Mo., July 3, 1969.

Hon. GORDON ALLOTT,
U.S. Senate,
Washington, D.C.

DEAR SENATOR ALLOTT: Permit me to endorse your bill, S. 719, to establish a national mining and minerals policy.

The statement of the three objectives in Section 2 will provide a justification for many actions which are now open to charges of partisan politics. While I doubt that this policy statement will eliminate such charges, it will at least provide a basis for reply to those charges, and a reference point for considering future legislation.

I would hope that the Secretary of the Interior would consider minerals industry education in his implementation of this policy. This is not a plea for funds. It is a hope that various publications of his Department which presently paint an unattractive picture of the mining industry, both as a part of the landscape and as a place to work, will be changed; and that importance of minerals engineers and scientists and their interesting work will be emphasized.

Very truly yours,

ERNEST M. SPOKES, *Chairman.*

UNIVERSITY OF KENTUCKY,
COLLEGE OF ENGINEERING, DEPARTMENT OF CIVIL ENGINEERING,
Lexington, Ky., July 8, 1969.

SENATE INTERIOR COMMITTEE,
Senate Office Building,
Washington, D.C.

GENTLEMEN: This letter is to solicit support for passage of Bill S. 719 to establish a national mining and minerals policy.

One of my reasons for supporting this bill is to develop support for perfecting a liquefaction process whereby the hydrocarbons are sold as liquid fuel and the remaining nearly sulphur-free carbon can be used in coal fired power plants. This would ease the air pollution problem and "upgrade the product" (coal) for a greater monetary return per ton mined.

This process might conserve our dwindling uranium ore reserves in that nuclear fuel could power the coal liquefaction process and the carbon be used to fire electric power plants. Thus, the more abundant coal reserves could be used for wide-spread power generation while the smaller uranium reserve could be used at relatively few coal conversion plants located regionally.

Thank you for your attention to this request for support of S. 719.

Yours very truly,

TED D. HALEY, A.P.M.E.

VIRGINIA POLYTECHNIC INSTITUTE, COLLEGE OF ENGINEERING,
DEPARTMENT OF MINING ENGINEERING,
Blacksburg, Va., July 11, 1969.

Senator GORDON ALLOTT,
The Interior and Insular Affairs Committee,
Washington, D.C.

GENTLEMEN: This letter is in support of S. 719—a proposed bill to create a national mineral policy. The bill is strongly supported by our staff for several reasons, and it is hoped that it will be accepted and implemented as part of our Federal policy.

Several considerations seem to be especially important in this matter:

1. The mineral industry is the foundation of our industrial economy, providing one of the three basic raw materials, "animal," "vegetable," and "mineral."
2. No nation can hope to sustain international leadership and be a world power without a strong basic mineral industry.
3. It is important to our national security to maintain a strong mineral industry to supply strategic minerals from domestic production in case of emergencies.
4. Higher education in the mineral industry is in a state of crisis due to lack of support, and training of the professional manpower required for a viable industry is being seriously neglected. While Federal aid has substantially strengthened the educational programs for NASA, AEC, and DOD, none has been extended to the mineral industry. More talent must be recruited, trained, and retained in the industry to contribute significantly to progress.
5. The balance-of-payments problem is intimately related to the domestic mineral industry and substantial progress could be anticipated under a more creative and vigorous national mineral policy.

It is hoped that the Committee will embark upon a discussion of this issue and that the result will provide an enlightened policy in this critical area.

Sincerely yours,

J. RICHARD LUCAS, *Head.*

MICHIGAN TECHNOLOGICAL UNIVERSITY,
DEPARTMENT OF MINING ENGINEERING,
Houghton, Mich., July 1, 1969.

Senator FRANK E. MOSS,
Chairman, Subcommittee on Minerals, Materials and Fuels, Committee on Interior and Insular Affairs, Washington, D.C.

DEAR SENATOR MOSS: I am writing to lend what endorsement I may to S. 719 toward the establishment of a national minerals policy. One feature of our present minerals situation that I have not seen emphasized is the urgency in time. At a very minimum growth rate of 3% in our minerals requirements, few people realize that what we consumed in the last 25 years will be consumed in like amount in the next 14 years. With the lead time that elapses through the processes of search, discovery and production, the urgency for immediate attention should be obvious. All of this must be done from a deteriorating resource base and within an enveloping social ecology restriction.

May I reiterate my hearty endorsement of whatever top-level attention may be brought to focus on this problem and right now for the enactment of S. 719.

Very truly yours,

WALFRID BEEN.

WHITE PINE, MICH., *July 14, 1969.*

Hon. GORDON ALLOTT,
Senate Interior Committee,
Washington, D.C.

DEAR SENATOR ALLOTT: I am writing in regard to Bill S. 719 which you introduced in the United States Senate January 28, 1969, to establish a national mining and minerals policy.

As a Professor of Mining Engineering, an operator of mines, and a mining consultant, I wholeheartedly support the establishment of a sound domestic mineral policy. For 22 years I have worked in the industry in a variety of positions. As a student in mining engineering at the Missouri School of Mines from 1946 to 1950, I received my basic fundamentals in the industry. As a Mining

Engineer and mine supervisor from 1950 to 1957 with Bethlehem Steel Company, I participated in mining operations from the grass roots up, and coped first-hand with domestic mineral problems. From 1957 to 1962, I studied at the University of Wisconsin, receiving a Master of Science in 1959 and PhD in 1962 in Mining Engineering. This theoretical training and advance study into technical problems increased my insight into the broad problems of the industry. Since 1962 to the present, I have been a Professor of Mining Engineering at both the University of Wisconsin and the University of Missouri—Rolla. I have also worked with over 20 major mining companies on mine management and rock mechanics problems. With this background, I feel qualified to comment to you and your Committee on my thinking in regard to a domestic mineral policy for the United States of America.

The entire industrial complex of the United States is dependent upon an adequate and continuing supply of minerals. Regardless of where you are, look about you and you find that everything you see which has been constructed by man has been derived from products of the mineral industry. Agricultural products such as cotton, soy beans, wheat, corn, etc., would not be available in abundance if it were not for the fertilizers supplied by the mineral industries. Our vast complex of industrial buildings, equipment, highways, homes, air fields, autos, etc., are more directly constructed from minerals, plastics, stone and similar mineral products. The domestic mineral industry has, in recent years, become a common "Whipping Boy" for conservation groups, governmental agencies, park and wilderness advocates, etc., all of which probably consider their attacks on the industry justified in virtuous endeavors. Many of these groups give little or no consideration to the effects of their proposed action upon the United States in regard to the continuing supply of minerals for our economy. Setting aside vast tracts of land as wilderness areas to be untouched by man when the potential minerals of these areas have not been ascertained can seriously affect domestic exploration and production. To pose unrealistic and impossible regulations for the industry to operate within our competitive society can also cause mineral production to lag. In essence, the public is uninformed and often uninterested in the problems of the miner. Everyone wants to have the end products of a mine, but no one wants a mine where they can see it.

This attitude on the part of our own populous is bad enough, but when we couple with this the fact that foreign sources of ores are becoming more and more difficult to obtain due to the nationalistic policies among foreign governments, problems of mineral supply in the future become, indeed, staggering. Recent developments in Peru, Chile, Bolivia, and many other countries would seem to indicate that these countries are going to place many more restrictions upon our development of their mineral deposits. Also, if we do not have a strong domestic mineral position developed, we are fair game for price increases which are unfair but for which we would have no recourse but to pay. These conditions naturally force us to intensify our search within our own boundaries to supply the needs of our industry.

In the next 30 years the population of our country will nearly double, and the per capita consumption of mineral products will probably more than double. For the mineral industry to meet these demands, even with the most desirable economic conditions, is a near impossible task. If handicaps are placed in front of the industry through a lack of policy on the part of the United States Government in the development of domestic minerals, there is no question but what the entire country will eventually suffer. Therefore, I urge you to do everything possible to pass Bill S. 719 to insure that a sound, orderly, and research-oriented domestic minerals policy will be established in the United States.

Respectfully submitted.

DR. JAMES J. SCOTT, Ph. D.

COLORADO SCHOOL OF MINES,
THE UNIVERSITY OF MINERAL RESOURCES,
Golden, Colo., July 17, 1969.

Senator GORDON ALLOTT,
Washington, D.C.

DEAR SENATOR ALLOTT: Having been on an extended trip, I have just become aware of the Senate Interior Committee hearings on your Bill S. 719, "Mining and Minerals Policy Act of 1969".

Although we were not present at the hearings to support you and S. 719, I trust you are aware of, and have been making use of, a report submitted early this year to the National Academy of Science and Engineering. This is the result of a two-year effort by the Mineral Science and Technology Committee of the Academy, and was made up from the reports of six panels, including a panel on Mining, of which I was chairman. My efforts on this panel were possible because of industrial contributions to the Mining Department here to meet our staff needs, and partially free my time. Attached is a copy of the Abstract (pp. 1 & 2) from this report. Mr. Earl Hayes of the Bureau of Mines, or Dr. Klingsberg of the Academy have copies of the report, and the needs of the mineral industry are certainly spelled out in it.

Thank you for your efforts in our behalf.

Yours very sincerely,

JOHN J. REED,
Head, Department of Mining Engineering.

[Enclosure]

ABSTRACT

This study covers the importance of the mining industry, its needs and opportunities to fulfill the Nation's needs, and the consequences if these needs are not met.

Mining is the production of the solid mineral raw materials upon which our industrial strength is based. Mining technology is also essential in rock, excavation and support as in tunnels, highway cuts, subways, underground chambers, and similar civil engineering projects.

The needs of our industrial economy require that our mineral production be doubled in the next few decades, and thousands of miles of tunnels be driven. Our most critical need to accomplish this is to increase mining engineering education and research by several fold.

During 25 years prior to 1962 the mining engineering departments in the nation numbered from 26 to 30, and produced up to 500 engineers annually. In the next 5 years this total dropped to only 17 departments which produced 138 engineers in 1966.

The mining research effort is badly understaffed, under financed, and far behind our needs. Mining is a predominant contributor of technical knowledge in such important areas as rock excavation and support, rock mechanics, and underground ventilation. Mining is also an important contributor of knowledge on bulk haulage, control of noxious gases and dusts, and environmental heat tolerance and control. Although the U.S. mining industry has made commendable progress in research recently, to meet rising costs and foreign competition, many immediate and future needs are still not being met. At the same time the shortage of technical manpower is critical.

Therefore, the Panel recommends:

1. Strongly increased continuing industrial support for mining engineering education and research, with supplementary long term Federal assistance, to be concentrated in institutions with an established record of superior performance.
2. That the Assistant Secretary for Mineral Resources of the Department of the Interior should assume promptly a much larger and effective coordinating role with respects to the bureaus and offices underneath him, and other agencies dealing with minerals policy.
3. Full educational cooperation between States to make mining education available to residents of every State at in-State tuition rates supplemented by appropriate financing transferred by the State of residence.
4. Increasing public awareness of the role of the mining industry through:
   (*a*) Public displays, television programs, popular magazine articles, and literature for school distribution.
   (*b*) Emphasis on the benefits of the mining industry in all relevant government publications.
   (*c*) Short orientation courses for high school teachers and counselors.
   (*d*) Summer "involvement" work in the mineral industry for high school and junior college teachers.
   (*e*) U.S. postage stamps on the mineral industry.

5. That the AIME expand its current efforts in producing texts, reference books, and a "Mining Abstracts", with the cooperation of the mining schools, publishers, and some Federal funding.

6. The U.S. education of more foreign mining students, but with full actual costs met by funds from home, or the U.S. Government if in our national interest.

NATIONAL WESTERN MINING CONFERENCE—RESOLUTIONS AND DECLARATION OF POLICY, DENVER, COLO., FEBRUARY 1, 1969

PREAMBLE

The National Western Mining Conference and Colorado Mining Association acknowledges its responsibility to the United States and to those nations of the free world to assist in continuing to provide mineral resources which are the initial basis of all wealth. The Conference and Association further recognizes that attendant to this responsibility the mining industry will continue to be faced with the obligations to make large capital outlays; to face highly speculative risks and to continue to improve those technical skills which allow the mining industry to continue its growth in order to meet the increased products demand. The members of the Conference further recognize that in meeting their responsibilities in discovering and producing mineral resources it must do so on a basis which, to the extent possible, is compatible with the ever increasing social pressures for the multple use of and the conservation of land areas within this nation.

The National Western Mining Conference feels that it is essential, because all segments of American society are the beneficiaries of such social pressures which are now being asserted against the growth of mineral discovery and development, that the mining industry must not be required, and cannot realistically bear the entire burden of such restrictions. It is the position of the National Western Mining Conference that in almost all facets relating to the manner in which minerals are discovered, produced and marketed the mining industry must have the encouragement, assistance and the aid of governmental authorities, particularly in the areas of international policy, taxation and regulation of mining securities; it must have the benefit of increased public encouragement; and a careful balancing must be made between the need of meeting the material needs of society and the hope for preserving in an untouched state the land resources from which mineral resources of necessity must be produced. We need a National Minerals and Fuels Policy.

On the basis on these general considerations and in the sincere hope that during the periods ahead mutual cooperation between the mining industry and all branches of government will make it possible to distribute equitably on our entire society the burdens now being carried largely by the mining industry, these resolutions are submitted:

Environmental Quality

The Mining Industry supports the need to enhance and maintain the quality of our environment; the cost of general welfare must be borne equally.

These principles should govern efforts to conserve and improve the environmental quality of our land, air, and water resources in the public interest:

1. Land restoration and air and water quality controls must be regarded with respect to the overall public welfare, including the public need for minerals.

2. Programs and regulations must vary with geographic locations and varying local conditions which demand that regulation of land restoration and air and water quality be vested in the states.

3. Necessary regulations and quality standards for land restoration and air and water pollution should be reasonable.

4. Provisions must be made for appeal and judicial review of all administrative decisions.

5. Legislative action must be taken to provide economic relief from the uneconomic expenditure borne by industry in controlling and improving environment. The action should include incentive measures such as tax investment credits, accelerated depreciation deductions and ad valorem tax exemptions.

Taxation

The Mining Industry is confronted with constantly increasing costs, inflated costs of capital, uncertain and fluctuating market conditions, the cost of social policy and the ever-present need for exploration for development of long range

ore reserves, to replace depleted ores and to meet future demands. The tax climate at all levels of government must recognize these problems and encourage continuation and expansion of existing operations and development of new ones. We urge the following tax policies:

1. Continuation of at least the present percentage depletion allowances and deduction of expenditures for exploration and development; State tax laws providing the depletion and depreciation allowances at least equal to federal law.

2. Recognition that research and increased investments for air and water pollution control, and preservation or restoration, of the earth's surface are an extra burden imposed on industry for the general welfare which do not increase the productive value of property. Tax credits or accelerated depreciation should allow recovery of these costs; the states should also recognize their interest in those environmental controls by reducing property taxes on these facilities.

3. Legislative relief from the final and proposed regulations on "gross income" from mining.

4. Sufficient allowance for depreciation and tax credits to provide the incentive for investment for replacement of machinery and equipment necessitated by accelerated technical obsolescence.

5. Adoption of the so-called "roll-over" principle by which capital gains tax would not be imposed on sales of mining properties, the proceeds of which are promptly reinvested in mines.

6. Preservation of the right of states to offer incentives for increased mining through formula for allocation of interstate income to states under the Multi-State Tax Compact, solution to interstate tax problems by interstate cooperation, instead of federal action.

7. Eliminate property tax assessment on inventories of concentrates and stockpiles in recognition of the fact that accumulations of these result only from interruption of the normal flow from mine to market, and do not increase production values of mine operations.

8. A shift from the increasingly burdensome property tax as the major support of schools to some form of income or sales tax which is equitably imposed and distributed in order to provide an adequate system of education for all children, wherever located, with due consideration for efficient administration.

9. Recognition of the unfairness of taxing both corporate earnings and dividends to shareholders.

Public Lands

Mining Laws—The most important of these is that the basic principle embodied in the mining laws, the right of individuals to go onto public lands to search for, discover, develop, and acquire title to metals and minerals lying within the public domain, be retained.

We urge:

Amending both Federal and State mining laws in ways that will encourage the search for mineral deposits and yet will prevent the use of these laws by persons seeking public lands for nominating purposes.

Multiple use—The public lands should be used in as many beneficial ways as their resources permit. No area should be closed to exploration for minerals or to mining in the absence of a compelling national interest.

Wilderness Areas—The 1964 Wilderness Act clearly provides that the mining laws apply to the areas designated as wilderness areas to the same extent that such laws applied to such areas prior to the passage of the Wilderness Act. Bona fide exploratory and development work should not be unreasonably impeded by regulations.

Federal Leasing Policy—Policies should be designed to encourage exploration for and development of leasable mineral properties. The Bureau of Land Management, Forest Service, and Bureau of Indian Affairs should coordinate their policies to assure that their policies are realistic, equitable and consistent.

Interstat of States—The administration of lands under the jurisdiction of federal agencies is a subject of intense concern to the states; the views of such states should be sought and carefully considered in determining federal public land policy.

Withdrawals—Provide legislation with limiting the power of the President and governmental agencies and departments to withdraw or reclassify or classify areas of public land from access for any single of the various uses which they should serve under the multiple use concept. Require public hearings and Congressional approval pior to final withdrawal of any substantial area and periodic review of the need for continued withdrawal.

Fiscal Policy

Fiscal policy must promote growth, productive investment and financial health, without inflation.

1. Fiscal programs must be designed to avoid large planned and unplanned deficits which are the primary causes of inflation. The people have a right to know when a planned deficit may occur.

2. Private funds must be available at reasonable rates for sound economic growth to finance investments. Wide and erratic changes in the monetary climate have increased costs and made sound planning difficult. Private investment is the source of prosperity. Without investment in more efficient mines, plants and equipment, the real resources and income of our citizens cannot be increased. Government must encourage investment by continued improvement in tax treatment, depletion and depreciation rules and marketability of mining securities.

International Policy

Our economy must have a ready and ample supply of raw materials and although we must, to a certain extent, depend upon imports to meet such supply, it is necessary that the greater portion of America's mineral supplies be developed from domestic sources. To insure such end international bartering is opposed; the sale of imported goods in this country at prices below the prices prevailing in the countries of their origin must be stopped; import controls must be made more flexible to encourage a sound domestic mining and metals industry and, where necessary and possible, the increased costs being encountered by the domestic mining and metals industry should be a consideration in the fixing of quotas for foreign imports. It is specifically important that the Anti-Dumping Act of 1921 be clarified, strengthened and fully enforced. It is also urged that the United States Congress defer any reductions of duties under the Trade Expansion Act of 1962 until a true evaluation based upon experience can be gained.[1]

Gold

1968 action in world financial markets demonstrates that government control of gold is but a temporary fiction; that while irresponsible deeds shrink the value of our money, the demand for gold will become uncontrollable.

The present system of inflation now being used by these powers is an underhanded method of robbing the people.

Therefore, we counsel the United States government to forestall an impending financial cataclysm by establishing a domestic price for gold that will result in a sufficient production of that metal.

We advocate procedure for freeing gold from governmental control similar to that being successfully used in the freeing of silver from such control. Gold consumption for industrial use is rising rapidly; 7,200,000 ounces were used in 1968, thus further adversely affecting our balance of payments.

1. Congress promptly enact legislation reported favorably by the House Rules Committee of the 90th Congress providing relief payment to domestic gold producers.

2. The administration carefully consider the role of gold in the world monetary system and the American monetary system and review the re-evaluation question.

3. Restriction on ownership of gold by our citizens be removed.

4. We recommend the General Services Administration be authorized to purchase gold at a price not to exceed $75.00 per ounce to replenish the critical stockpile of gold for national requirements.

Silver

Consumption of silver in the United States has exceeded production by substantial amounts for many years. This shortage will be corrected only if the price of silver is allowed to reach its free market level. We recommend—

1. Proper revision of the Treasury's policy of selling silver and an inventory of silver to establish an orderly transition to a free silver market;

2. The minting of a one dollar coin containing silver to be resumed; the manufacture of the 40% silver one half dollar be continued and Treasury surplus silver to be used in coinage; and

3. The removal of the prohibition on the private melting of silver coins.

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[1] We unqualifiedly recommend the passage of the Dominick Amendment to prevent outflow of gold to debtor nations seeking gold.

Non-Ferrous Metals

The present temporary sufficiency of lead, zinc, copper, tungsten, beryllium and uranium demonstrates the correct viewpoint of this organization. The effect of fair prices for metals have proved through the years that this is a simple means for encouraging production.

Solid Fossil Fuels

To insure the availability of low cost energy, we urge the adoption of governmental policies which will stimulate the development of technologies by both private and public agencies for the effective utilization of our vast coal and shale resources. To that end, we urge the government to implement policies:

1. Encouraging coal research and use;
2. Stimulating the prompt development of processes and techniques designed to eliminate air pollution without placing arbitrary and premature limitations on solid fuel uses;
3. Liberalizing the percentage depletion allowances for coal, lignite and oil shale to eliminate the discrimination which now exists with respect to these fuel sources so that they may compete on an equal basis with other fuels;
4. Resulting in legislation or other administrative action to provide appropriate safeguards to prevent disruption of domestic energy production and unwise reliance on foreign energy sources;
5. Preventing government subsidization of any basic domestic energy source in competition with any other domestic form of energy;
6. Assisting in the development of expanding world markets for coal;
7. Adopting a realistic leasing policy designed to encourage development of our oil shale reserves by private industry with adequate safeguards for the public; and
8. Repealing Section (2)c of the Mineral Leasing Act of 1920 to encourage the development of coal reserves in the West.

Mine Safety

The industry needs and wants to preserve the lives and health of people engaged in it.

Regardless of where the authority is, the ultimate responsibility for safety lies with men on the job and safety-minded management. The proliferation and confusion of authority within various Federal Agencies over mine safety only hinders the objective and has a harmful effect on the safety of the people of the industry. What the men in the mines need from the Federal government is the type of safety research information which can be coordinated through and supplied by Interior Bureau of Mines. Authority for mine safety is ample in the States; Federal authority should be limited to assistance to the States in the exercise of their responsibility for carrying out mine safety.

Management members of the National Western Mining Conference pledge full cooperation with State authorities and the Bureau of Mines in preserving and advancing the safety of all people in our industry.

Uranium

Substantial new nuclear power plant announcements in 1968, continue to provide a solid basis for expansion of the nation's uranium industry.

The expanded activity in the industry underscores the need to maintain a constant flow of information between the industry and the Atomic Energy Commission in order to allow the AEC to be fully informed with respect to domestic reserves of uranium.

The uranium industry has made substantial progress in improving the radiation protection of uranium miners. The industry believes that the guidelines recommended by the Federal Radiation Council and adopted by the President on July 27, 1967, provide adequate protection for uranium miners against radiation hazards and the new Regulation by Labor Department are untested, unlawful, unrealistic and unnecessary.

We recommend the Federal Radiation Council for establishing a working group representing the industry, labor, and government agencies to coordinate the efforts of all interested parties in updating the technology and information necessary to achive fair and reasonable radiation exposure standards.

We commend the Atomic Energy Commission for all that it has done to encourage private industry in the development of the uranium industry.

We recommend—

1. The uranium mining industry continue to assume the major responsibility for the exploration and development necessary to maintain uranium ore reserves at a level high enough to support an expanding nuclear power industry.

2. The Atomic Energy Commission continue to collect uranium reserve data and publish a national reserve figure regularly.

3. That no change in current uranium import policy be made until the viability of the domestic uranium industry has been clearly established.

Appreciation

The National Western Mining Conference and the Colorado Mining Association extend their heartiest appreciation and great thanks to the Colorado Mining Industrial Development Board and the Interior and Insular Affairs Committee of the House of Representatives for their continuing interest and careful work on behalf of the industry.

Particular praise is extended to Congressman Wayne Aspinall, Chairman of the House Interior and Insular Affairs Committee, Senators Gordon Allott and Peter Dominick for their unstinting efforts on behalf of the industry and sound fiscal policy.

The cooperation of Governor Love and the Members of the Colorado General Assembly are gratefully acknowledged.

Our warmest thanks and appreciation for the unselfish and great efforts of the manager of the Colorado Mining Association, Mr. John B. Rigg; a great Convention for Jack.

Thanks and appreciation to Bob Palmer for his effort on behalf of the mining industry.

We appreciate the fine assistance of the miners from our sister states in the West who have helped us in our deliberations. Special thanks to the Arizona Mining Association, Utah Mining Association, Wyoming Mining Association, Northwest Mining Association, California Mine Operators Assocation, Nevada Mining Association and the Black Hills Mineral Producers Association for their contributions to these resolutions.

Resolutions of the Colorado Mining Association and National Western Mining Conference and a Declaration of Policy

The United States has advanced to position of world leader. Even in this position its currency faces destruction. Bad money is driving out good. The new economics threatens to deprive the people of the method of measuring national budget, inflation, the national expenditures and the state of the economy by stating that gold backing serves no purpose. Gold as a measure of money cannot lie.

The industry favors multiple use of the public lands. National policy must recognize the paramount public welfare and encourage and support the right of each citizen to use, produce and enjoy the resources which are his heritage; our resources are available for the benefit of all and should not be locked away solely for the pleasure of any group, no matter how well intentioned.

A national minerals policy for all mined resources is essential. This policy must include protection from dumping and must equate the cost of metals with the requirements of a balance of trade, protection of the wage scale of our workers, the maintenance of production to insure our national safety, and the cost of environmental controls.

We urge the citizens of the United States to voice preference for the free enterprise system and to oppose favored treatment of industry, capital or labor. A managed currency with any measures of its management hidden from the people will result in exhaustion of the treasury and depletion of both economic and real resources. Honesty and integrity in fiscal and monetary policy are essential to a sound and healthy government. We urge the people to awake to the necessity for reaffirmation of sound constitutional principles which are the base of our republic.

Gold

Domestic gold consumption for 1966 for industrial defense, dental and art use was approximately 6.9 million ounces, which was over three times domestic gold production for 1966 of 1.7 million ounces. This gap between domestic con-

sumption and production of gold was even greater for 1967, with production approximately 1.5 million ounces and consumption estimated between 7 and 8 million ounces, which created a significant drain upon our national gold monetary reserves. Any substantial addition to the gold reserves of the United States will strengthen confidence in our weakening dollar.

The 1968 National Western Mining Conference endorses the gold relief legislation now before the Congress of the United States, which provides incentive and relief payments by the Federal Government to both current and potential gold producers to stimulate, encourage and increase domestic gold production by revitalizing the domestic gold mining industry of the United States.

Monetary Policy

Gold remains the final basis of settlement in international accounts and is not likely to be successfully displaced by any monetary units based on credits alone. The maintenance of a monetary stock of gold is vital as a check on the treasury and on the politician.

We believe that at least 25% gold backing is necessary to provide a measure of money supply and to prevent inflationary printing of money without the consent of the Congress.

Dumping and Barter

Acquisition of minerals by the government through barter to fill the national defense stockpile is opposed—unless such needs cannot be met from domestic sources.

The sale of imported goods in this country at prices below the prices prevailing in the countries of their origin is unlawful, if injurious to domestic industry under the terms of the Antidumping Act of 1921; if the administration cannot or will not give adequate protection under the existing act, we urge its amendment.

Import controls are required to assure the maintenance of a sound domestic mining and metals industry but should permit the importation of supplies of foreign materials and metals where domestic needs so require. Flexible statutory import controls capable of meeting changing needs should be enacted to replace fixed duties, controls and quotas now in effect in certain instances.

Import protection or control accorded to any metal or mineral can be effective only if equivalent compensatory customs treatment is established on the related fabricated and manufactured items containing such metal or mineral.

Public Lands

The tense world situation stresses the need for America to be strong, not only in manpower, but in materials so vitally necessary for our defense. Our growing need for minerals for peacetime uses requires a healthy mining industry to satisfy present and future demands. The public lands are a substantial source of these requirements.

The Public Land Law Review Commission is charged with the responsibility of recommending to the President and the Congress those actions, administrative or legislative, which should be taken to assure "that the public lands of the United States shall be (a) retained and managed or (b) disposed of, all in a manner to provide the maximum benefit to the general public." Careful and detailed studies have been conducted to assist the Public Land Law Review Commission in formulating recommendations for improvement, clarification and legislation involving the multiple use of the public lands for maximum benefit of all. Specific proposals have been made by the American Mining Congress, the Colorado Mining Association and various state mining associations, companies and individuals.

The Colorado Mining Association endorses the proposals of the American Mining Congress and particularly emphasizes the following for careful consideration by the Land Law Review Commission:

1. Retain the basic principles of the Mining Law of 1872, without recodification.
2. Retain the concept of multiple use.
3. Retain the Prudent Man Doctrine as the basis for discovery.
4. Redefine "common variety materials".
5. Establish a form of exploration claim to protect pre-discovery investments.
6. Eliminate distinction between lode and placer claims, establishing a single type of mining claim.
7. Eliminate extralateral rights.
8. Eliminate association placers.

9. Permit location of 20-acre mining claims by reference to the public lands survey.

10. Establish rules for presumption of abandonment of an unpatented mining claim.

11. Establish a uniform system for locating claims and eliminate any required location work.

12. Reform the quasi-judicial procedure now used in the administration of land laws.

13. Limit the length of time which public land may be withdrawn from entry and provide for continuing review of withdrawals and procedures.

14. Establish a procedure for acquiring suitable surface area for disposal of waste or other necessary uses.

15. Insure access across public lands (even if withdrawn) to mining or milling operations.

We commend the Public Land Law Review Commission on the manner in which it has conducted its work and offer our continuing assistance and support.

Taxation

The mining industry is confronted with constantly increasing operating costs and inflated costs of capital investments, magnified by increasingly restrictive governmental regulations with reference to water and air pollution control, safety and preservation or restoration of the earth's surface; uncertain and fluctuating market conditions; and the ever-present need for risk-involved exploration for development of long range ore reserves, to replace depleted reserves and to meet future metal demands. The tax climate at all levels of government must recognize these problems and encourage continuation and expansion of existing operations and development of new ones. We urge the following tax policies:

1. Continuation of adequate percentage depletion allowances and deduction of expenditures for exploration and development.

2. Sufficient allowance for depreciation to provide the incentive for investment for replacement of machinery and equipment necessitated by accelerated technical obsolescence.

3. Provision of incentives for mining development through income tax credits for investment in new or expanded mine plant facilities, and for increased expenditures for research and experimentation.

4. Recognition that investments for facilities for control of air and water pollution are an extra burden imposed on industry for the general welfare which do not increase the productive value of property by allowance of investment credits, and relief from added property tax costs on such facilities.

5. Preservation of the right of states to offer incentives for increased mining through formulas for allocation of interstate income to states under the Multi-State Tax Compact, a solution to interstate tax problems by interstate cooperation, instead of by federal action.

6. Continuation of reduced rates of property tax assessment on inventories of concentrates and reduction of rates on stockpiles of ore in recognition of the fact that accumulations of such inventories result only from interruption of the normal flow from mine to market and do not increase the productive value of mining operations.

7. A shift from the increasingly burdensome property tax as the major support of schools to some form of income or sales tax which is equitably imposed and distributed in order to provide an adequate system of education for all children, wherever located, with due consideration for efficient administration.

8. Recognition of the unfairness of taxing both corporate earnings and dividends to shareholders.

9. Capital gains of inflated dollars which are re-invested in other productive assets should not be taxed.

Uranium

Sharp increases in nuclear power reactor requirements have stimulated a new wave of intensive uranium exploration. We commend the Atomic Energy Commission and the Joint Congressional Committee on Atomic Energy for their continued reliance on private industry to furnish additional uranium requirements.

We recommend that:

1. The mining industry continue to have the major responsibility for the exploration and production of nuclear raw materials.

2. The government, through the Atomic Energy Commission, continue to collect uranium reserve statistics and publish a national reserve figure.

3. The mining industry and the various private and governmental agencies concerned work together to determine for the future safe guidelines for radiation control.

Environmental Quality

The mining industry is cognizant of the multi-faceted problems of land conservation in conjunction with the mining operations of today. Concerted efforts are being directed by the mining industry programs that enhance the reclamation of "mined land's." Conservation of the "mined lands" through the industry-initiated reclamation programs demonstrates the industry's willingness and capability to cope with the problems. To this end, the mining industry will aid in defining and achieving an appropriate balance of interests.

The mining industry is aware of the air and water quality control problems throughout the nation. The industry recognizes the need for air and water quality control and recommends that control may best be obtained through voluntary industry efforts aided by tax incentives to those who install and maintain equipment or take preventive measures designed to reduce or eliminate air and water pollution. The mining industry will continue to meet its responsibility, along with other industries, to advance quality control technology.

The mining industry has contributed extensively toward the alleviation of water pollution; it recognizes its continuing responsibility along with others to study and improve the techniques for preservation of water.

The control and improvement of the quality of our environment must be approached with the public welfare as the foremost consideration; this includes maximum development and utilization of our resources. Control of environment necessarily includes the expansion of resource utilization and improvement of the economic welfare; public benefits of environmental control must be balanced against the benefits of economic expansion and resource utilization.

Metals

Our national requirement for metals continues to increase with the growth of our population and the expansion of the nation's economic base. We regard with alarm any inhibitions by the government or its agencies preventing the improvement of mining methods and the expansion of the metal mining industry.

Conclusions by various agencies respecting the quantity of available resources in the metals have universally proved to be wrong; free enterprise has always found additional supplies, sometimes to the extent of glut. The satisfaction of national demand for metals requires a comprehensive policy promoting domestic mining, research and development of refining and reduction techniques, and the elimination of burdens inhibiting competition.

Mined Fuels

The nation's projects demands for energy are of such magnitude that a sound national policy on all energies must be followed. We are blessed with abundant reserves of coal, oil shale, and perhaps other fuels yet unknown. We believe these valuable national resources require—

1. Adequate funds be provided to maintain expanded research in fuels and their by-products;
2. No arbitrary limitations should be placed on fuel uses;
3. The percentage depletion allowance on solid fossil fuel and shale should be equal to the competition with these fuels;
4. The executive branch should continue efforts to assist in developing expanded export markets for coal; and
5. Proposed oil shale leasing policy is unfavorable to development for the citizen.

Mine Economics and Finance

The current shortage of money, the higher interest rates, the necessity for more and more advanced technology are making most difficult the task of the mining industry in satisfying demands for metals. If the industry is to remain competitive, satisfying the need for metals and minerals in an expanding world, its capital investment per employee will continue to exceed that of all other industries. It is essential that government at all levels provide the best atmosphere possible to encourage the financing of mines and promote and maintain a free enterprise economy.

Mine Safety

The responsibility for mine safety has been placed with one agency of the federal government with a clear invitation to the states to organize for active participation. The industry pledges its full cooperation. Mine safety remains a major responsibility of the industry and safe working conditions are the responsibility of the companies with corollary responsibility of the employees. The efforts of the U.S. Bureau of Mines and Agencies and Organizations of the states are recognized and appreciated. Adequate support for these activities is essential.

We urge the Congress to pass S. 2686 or similar legislation to accomplish its purpose.

Appreciation

The National Western Mining Conference and the Colorado Mining Association extend their heartiest appreciation and great thanks to the Colorado Mining Industrial Development Board and the Interior and Insular Affairs Committee of the House of Representatives for their continuing interest and careful work on behalf of the industry.

Particular praise is extended to Congressman Wayne Aspinall, Chairman of the House Interior and Insular Affairs Committee, Senators Gordon Allott and Peter Dominick for their unstinting efforts on behalf of the industry and sound fiscal policy.

The cooperation of Governor Love and the Members of the Colorado General Assembly are gratefully acknowledged.

Our warmest thanks and appreciation for our past Executive Secretary, Bob Palmer, for his 34 years of continuous effort on behalf of the mining industry; Bob is still "Mr. Mining" to us.

Our warmest welcome, thanks and appreciation for the unselfish and great efforts of the new manager of the Colorado Mining Association, Mr. John B. Rigg; a great first Convention for Jack.

We appreciate the fine assistance of the miners from our sister states in the West who have helped us in our deliberations. Special thanks to the Arizona Mining Association, Utah Mining Association, Wyoming Mining Association, Northwest Mining Association, California Mine Operators Association, Nevada Mining Association and the Black Hills Mineral Producers Association for their contributions to these resolutions.

Senator Moss. Unless there is something more from the members of the committee, the hearing will now be adjourned.

(Whereupon, at 4:15 p.m., the subcommittee adjourned.)

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