observation of moving individuals. In most other examples given as evidence for the validity of equilibrium biogeography, such inference is impossible and direct observation of disperal rates will be required. Until such observations have been made on a number of systems, the equilibrium theory of island biogeography must be considered a hypothesis, and one which is difficult to test. To the extent that it can be accorded provisional acceptance because of work done to date, all we can say is that there often appears to be approximate short-term constancy of species numbers and a fair amount of turnover. Much of the latter may prove to involve transient movement, with or without breeding. Finally, for the equilibrium theory of island biogeography as for any other empirical statement about how nature is structured, we must be aware of the possibility that, when the field observations are made, they will show that certain taxa (or ecosystems) conform more closely than others to the theory.

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A Western Perspective on Energy: A Plea for Rational Energy Planning

Federal energy programs, possible effects of energy development activities, and suggested actions.

Bill Christiansen and Theodore H. Clack, Jr.

Dwindling supplies of energy and materials resources pose what may be the most significant problem for the United States in the last quarter of the 20th century. The nation's response to these shortages could prove to be the measure of its ability to respond to crises in an equitable and farsighted manner. Our absolute dependence on energy and raw materials demands the most stringent exercise of reason in coping with shortages. Errors in allocating resources and poor judgment in the pursuit of alternative means of using our remaining natural resources will have international repercussions that will persist for generations.

In its search for solutions to the energy crisis, the nation has turned to the Rocky Mountain region. Immense reserves of accessible fossil fuel are perceived as the short- and mid-term answers to the energy crisis. National leaders believe these resources will allow the nation to develop strategies to avoid recurrences of the energy crisis. As a consequence, the federal government and the energy industry have prepared plans to develop western energy resources. These plans have been proposed despite evidence that they are *not* the answer to the energy crisis; they also ignore the possibility that western coal and oil shale reserves may have far greater value as future sources of hydrocarbons than as simple fuels for the present.

Limitations of Current Plans

Many of the federal and industrial plans to resolve the energy crisis are objectionable in several respects. Beneath the bureaucratic and technical jargon, these plans propose maintenance of the status quo—continued annual growth in the consumption of resources. None of the plans seriously addresses the concept of limits to growth. All are based on the assumption that increasing economic growth is feasible and necessary to national survival. No major policy statement portrays resource conservation as a central part of a successful solution to shortages, although the importance of energy conservation is given more emphasis in a publication of the Energy Research and Development Administration—*ERDA* 76-1 (*1*). Concern with the expenditure of irreplaceable energy resources is conspicuous by its absence. The public is not aware, nor has it been informed, that severe energy, food, and materials shortages are likely to be with us for the foreseeable future.

Two major federal plans exhibit these shortcomings. If implemented, these plans will have significant political, social, and environmental effects, and they

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will commit the nation to a policy that may prove unsatisfactory.

The first proposal (*2*) outlines the Administration's plan to achieve the objectives of Project Independence. Enactment of an "Energy Independence Act" does not appear imminent. Nonetheless, this proposal is an important indicator of federal energy planning.

The intent of the Energy Independence Act was to reduce oil imports by 2 million barrels per day in 1977 (1 barrel of petroleum = 160 liters) and 3 to 5 million barrels per day by 1985. No other goals were outlined within the proposal, nor was substantive discussion of many of the costs and constraints associated with accelerated development of our finite resources included. A more responsible proposal would have included discussions of the burden the plan would impose upon already sorely pressed capital markets, present and imminent constraints in the availability of materials, and shortages in the skilled labor required by energy development. Some discussion of severe development-induced, socioeconomic effects on communities and the potential degradation of environmental quality should also have been included.

National energy supplies beyond 1985 were to be provided by technological developments of coal and nuclear fuels that are as yet commercially undemonstrated. The alternative of careful husbandry of finite energy sources in order to maximize our future options was not evaluated, nor was there any evidence that the question of the ability of the nation's energy resources to sustain massive and long-term use had been fully explored. This question must be considered in light of the recent downward revisions in the estimates of oil and natural gas reserves by the National Academy of Sciences and the U.S. Geological Survey (*3*). Lieberman (*4*) has recently suggested that mineable uranium reserves may have been drastically overestimated, and he further emphasizes the importance of this question.

Energy conservation was given a secondary role in the Federal Energy Administration (FEA) document (*2*); development of energy supplies was primary. Conservation was viewed only as an aid to the reduction of oil imports and not in its fundamental role as an essential component of a long-term policy that recognizes that the world's energy resources are finite. The impact of the proposed program on the environment was inadequately evaluated. The authors limited themselves to discussing gross and aggregate effects and minimized their actual severity by referring to national and regional pollution levels. Such aggregate figures are meaningless in interpreting specific pollution effects. The organisms affected by the program, including human beings, will be responding to site-specific impacts, not to aggregate ones. Unsupported assumptions that environmental controls are inimical to an energy program can be found throughout the document, although it lacked explicit documentation of the validity of these assumptions.

Finally, the document clearly implied the intention of the Ford Administration and the FEA to abrogate state rights and policies in the realm of energy development. The Energy Independence Act would have permitted the federal government to approve or disapprove state utility siting procedures and air quality standards and to preempt public service regulation commissions. Although the environmental impact statement indicated that the states would be given some voice in these matters, the conclusion that the federal government intends to have the final say is inescapable.

The second document of interest, issued by the Department of the Interior in 1974, outlines the federal government's plans to expand leasing of federal coal and the reasons for doing so (*5*). In reviewing this document, the Montana state government found that it failed to adequately address the major issues of coal development in the northern Great Plains and that it justified the expansion of federal coal leasing on the basis of controversial and questionable assumptions. We also found that it disregarded expressed state views and positions regarding federal leasing and that it did not meet the requirements of the National Environmental Policy Act.

More specifically, the proposed policy statement on coal considered the major environmental issue of expanded leasing to be only whether leasing should be regulated under an orderly system or allowed on a laissez-faire basis. Prudence alone would dictate orderly leasing on a controlled basis. We consider the real leasing questions to be: (i) Is expanded leasing really necessary if consumption of alternative forms of energy is encouraged and if existing, nonproductive leases are put into production? (ii) What kinds and amounts of coal-based industrialization are likely to result from coal leasing? (iii) Are the nation's energy needs really best met by Project Independence (as the proposal suggests) and the attendant wholesale exploitation of the nation's dwindling, irreplaceable natural resources? (iv) Is a massive shift from eastern and midwestern coal to western coal necessary, or even responsible, on the basis of the economic and social costs?

Several questionable assumptions were evident in the proposal. We will mention only a few. The first was that Project Independence would work. The second was that energy use would continue to grow at an annual rate of 3.6 percent. This assumption contradicts one goal of Project Independence, which is a slight reduction of growth in annual energy use. The policy statement does not address other, perhaps more practical, alternatives, such as the Ford Foundation Energy Project "technical fix" and "zero energy growth" scenarios (*6*). The final assumption was that reclamation of mined land is an established fact. In reality, adequate long-term land reclamation has yet to be proven practical for arid or semiarid western lands. Although some revegetation has been acomplished in Montana, no revegetated area has been subjected to sustained grazing or browsing. The National Academy of Sciences has determined that the reclamation of mined land may not be feasible in some arid and semiarid lands (*7*).

The FEA proposal to resolve the energy crisis is more than a year old. A recent FEA publication, *National Energy Outlook* (*8*), appears to share many of the shortcomings of the Energy Independence Act. The Office of Technology Assessment (OTA) has noted similar weaknesses in another major federal energy document published by the Energy Research and Development Administration (ERDA) (*9*). *ERDA-48: A National Plan for Energy Research, Development and Demonstration: Creating Energy Choices for the Future* presents a plan to reach national energy self-sufficiency (*10*). The OTA criticized the shortsighted and narrow technological approach within this plan, labeling it a plan without a policy. We have not yet reviewed the new edition of ERDA's plan—*ERDA 76-1* (*1*). However, the Western Governors' Regional Energy Policy Office (WGREPO) has indicated that similar problems are contained within the newer plan (*11*). Of prime concern to WGREPO is the minimal role ERDA would give the states in planning and policy-making. Moreover, a press release by ERDA indicates that *ERDA 76-1* "essentially reaffirms the basic thrust of *ERDA-48*, namely that . . . we must move quickly to develop new energy sources" (*12*).

The interim edition of the policy statement on coal (*5*) is nearly 2 years old. The final edition of this document (*13*) does little to clarify the issues raised in

the earlier draft. Many of the objectionable items in the earlier edition that were noted by Montana, other states, and public interest groups are still to be found. Judging from recent announcements by Secretary of the Interior Thomas F. Kleppe, we are expected to live with those items.

Federal energy planners should have attended more carefully to their reading of some of the vast popular and scientific literature addressing the energy crisis. One article of interest, by H. G. Roseman (*14*), predicts the life-span of the nation's energy reserves. Roseman demonstrated that a hypothetical energy resource base capable of sustaining 1000 years of use at current energy consumption rates would be depleted in 104 years if energy consumption continued to grow at a rate of 3.5 percent per year. A resource base capable of sustaining 2000 years of use at today's rates would be depleted in 120 years at 3.5 percent increase in consumption per year. Finally, a 10,000-year reserve would be exhausted in 170 years under the same conditions of growth.

We doubt that any scientist of natural resources would posit the existence of a fossil fuel reserve that would sustain even 1000 years of exclusive use. It is extremely difficult to escape the conclusion that the nation must do something about leveling its currently increasing use of energy very soon.

Additional disquieting statistics from the Bureau of Mines of the Department of the Interior (*15*) indicate that, in 1975, the United States imported substantial portions of critical raw materials (Fig. 1). The Bureau of Mines suggests that our imports of these materials will increase. Many of the nations from whom the United States imports these materials are potentially as unstable and hostile to our nation as the Arabs are said to be. Many of those nations are relatively nonindustrialized. How long can we expect other nations to ship us their nonrenewable resources, particularly when their standards of living often are much lower than ours? Where do we intend to go for those resources when our suppliers grow tired of our greed?

The authors of Project Independence and other federal plans have apparently not considered these limits as they have developed equations to solve the energy crisis. Their plans focus on resolving our crisis by increasing the supplies and consumption of nonrenewable energy resources in the hope that some miracle of

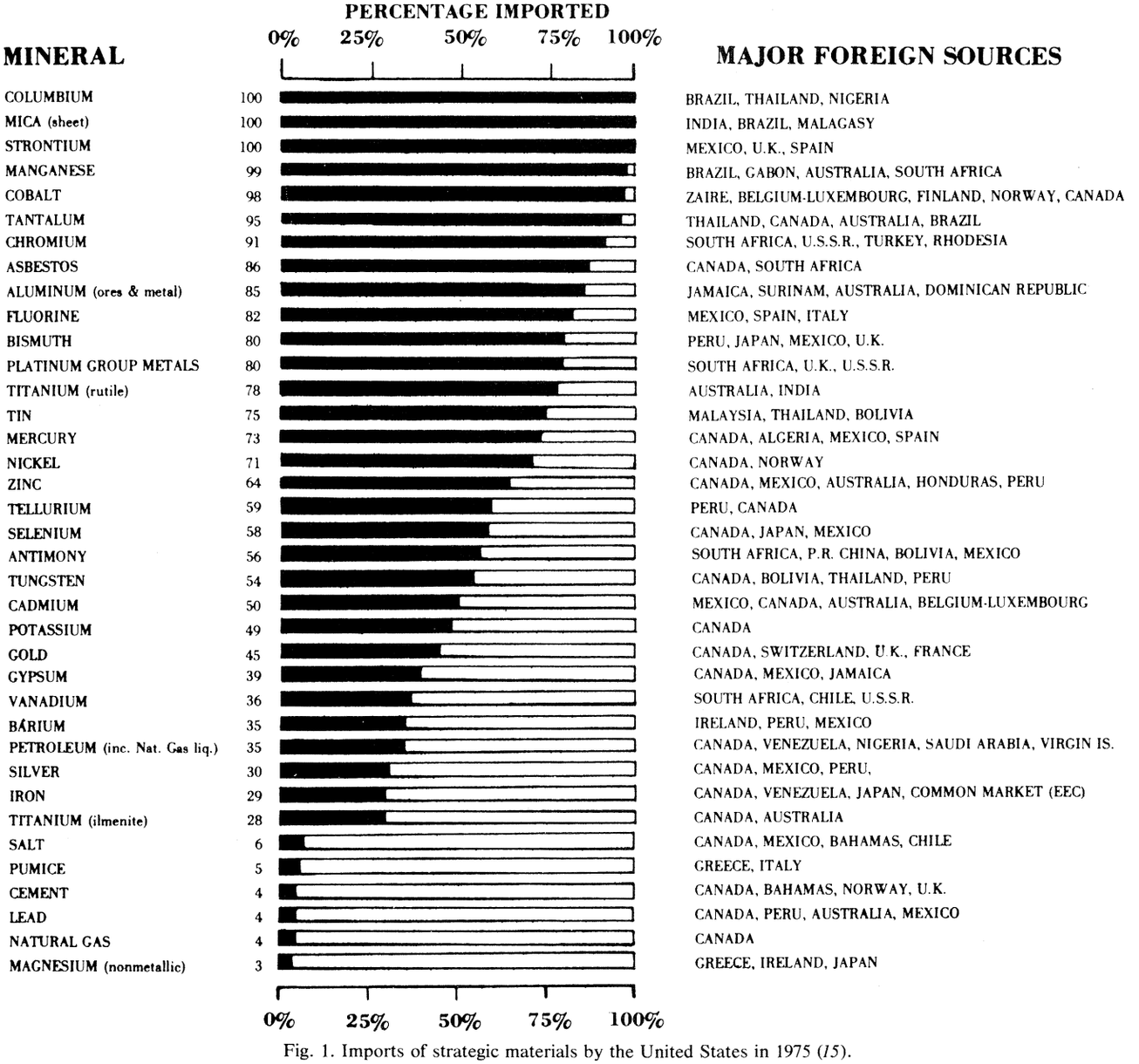

Fig. 1. Imports of strategic materials by the United States in 1975 (*15*).

technology will sustain us in the future.

Two of the great technological hopes, nuclear technology and synthetic fuels from coal and oil shale, fall further behind and become more costly with every press release. Public and scientific concern with reactor safety is evident; the breeder reactor has been delayed. Even the most enthusiastic proponent of fusion reactors will not claim that they will be available soon.

Processes that gasify coal and efficiently deliver large amounts of energy [900 to 1000 Btu/ft^3 (1 Btu/ft^3 $\cong 3.8 \times 10^4$ joule/m^3)] have not been demonstrated to be practicable on a commercial scale; plans to build coal gasification plants have been indefinitely postponed or dropped. Studies of the processes of creating synthetic fuels indicate that the final product of any such conversions will be very costly. Major federal plans reflect no awareness of these facts.

We contend that a reassessment of the nation's definition of growth and the value ascribed to it is necessary if we are to survive the energy and materials crises for more than an eyeblink of time. The nation has long had proof that the resources on which it depends are finite. The public has recently seen evidence that the United States is approaching the limits of some of those resources. If the nation continues to grow as it has in the past, it will become more and more dependent, in a more specialized manner, on increasingly scarce energy and materials reserves. Sooner or later (the sooner the better) our nation must accept the concept of limits to growth in a finite world. To do otherwise is to rely upon a latter-day version of the alchemist's dream of the transmutation of metals. We find no evidence in major documents of the federal government or in the utterances of our national leaders that these matters have been considered. We find such an omission alarming.

Effects of Energy Development

Beyond the issues of proper resource allocation and growth lies that of the impact of the pursuit of rapid and large-scale energy development. Massive strip mining and the conversion of coal to other forms of energy will have significant effects on the social and natural environments—particularly in the cases in which development takes place in rural areas.

The coal development profiles constructed by the Northern Great Plains Resource Program (NGPRP) (*16*) project coal production in Montana to range between 58 and 393 million tons per year by the year 2000 (1 ton = 0.907 metric ton). These profiles also foresee as many as 17 new strip mines, 4 thermal electric plants, and 7 gasification plants in Montana by that date. Virtually all the estimated 102 billion tons of low-sulfur strippable coal in Montana are located in the rural eastern third of the state. The impact of coal development at the scale envisioned by NGPRP would be staggering.

Current coal development in Montana is limited in comparison to federal projections. Montana is the site of five major strip mines and the sequential construction of two 330-megawatt coal-fired generating plants. Even the 22 million tons of coal mined in the state last year made a significant social impact.

Construction of thermal electric plants in rural Montana has resulted in a large influx of residents. The population of the town of Colstrip grew from 423 in 1970 to 2682 in 1975. The closest major trade center is Billings, Montana, some 210 km away. This rapid increase in population has imposed heavy demands on local government services and facilities and has drastically changed the perceived quality of life of area residents, new and old.

Many of the characteristics of 19th-century boomtowns are appearing in latter-day coal boomtowns. ElDean Kohrs, a Wyoming clinical psychologist, describes the "Gillette Syndrome" in contemporary western boomtowns as being typified by the "4-D's"—drunkenness, depression, deliquency, and divorce (*17*). Crowded and unsanitary living conditions, lack of basic community services, lack of recreational outlets, lack of community identity, impermanence, and long hours at unrewarding tasks contribute to the development of the Gillette Syndrome.

Studies conducted under the aegis of the NGPRP (*16*) reveal that many western rural areas are unprepared for industrialization. These studies also document major negative effects of such industrialization. Although focusing on resolving difficulties associated with development, Gilmore (*18*) has further documented the stress imposed on rural areas by energy-related industrialization.

Residents of coal development areas have reported negative effects upon their life-styles. Uncertainties regarding the rate, scope, and type of energy development have made economic decisions difficult for agricultural interests. Ranchers and farmers report a contempt for property rights on the part of newcomers. Trespass, open gates, destruction of property, hazing of cattle, and so on, have become epidemic. Many complain that lies and deception are common practices of land speculators and mining interests in their attempts to put together sizable leases (*19*).

Country and town folk report having to lock their houses and cars for the first time in their lives. Women say they are now reluctant to go out alone. Many local families avoid bars and other local gathering places because they now feel that they are potential subjects of abuse and, in some cases, provoked fights. Many residents report that much of the joy of their lives has been lost and replaced by hostility, suspicion of former acquaintances and friends, and a sense of having to fight everyone for survival. Some mention that they have been forced to lower their standards of what constitutes a desirable life-style and that they wonder how much more social change will be tolerable (*19*).

Population growth induced by development has severely strained already limited local government services. Health care services in the areas of development were marginal before development; the same services must now meet the needs of a greatly expanded population. School systems are overcrowded and some classes have been dropped. Public water and sewage disposal systems are used to their limits (*20*). However, revenues generated by Montana's newly enacted tax laws may alleviate these conditions in the future.

Local government units responsible for providing basic community services are ill equipped to cope with increased demands. Lacking manpower, fiscal resources, and any certainty regarding the ultimate scope of development, many government officials are at a loss to decide what to do. These difficulties are compounded by traditional rural antipathy toward planning and by confusion about the relative responsibilities of local, state, and federal governments.

Similar effects have been noted among providers of services, both commercial and voluntary (*20*). According to Turner and McCaw (*21*), only financial institutions, and not all of them, are making plans to cope with the changes industrialization is expected to bring. Some local businessmen are delaying plans to expand the range of their services until the limits of their potential markets are known. Markets in housing and land are similarly affected. Housing and land are scarce and rents are increasing, while local interests are reluctant to extend themselves with investments in the event of a sudden reversal of growth. Recent

developments in Rosebud County, Montana, can only increase the reluctance of the commercial sector to respond to rapid population growth. The population boom in that county, attracted by the construction of two 330-megawatt generating plants, may be turning to a bust as the construction force leaves the site.

The number of anticipated effects of energy development on the environment is large. Complete documentation will require more data collection and field experience.

Strip mining and the construction of energy facilities will destroy rangeland and, hence, diverse native plant species at the mine site. Because of their adaptation to the rigors of the northern Great Plains, native plant species are sensitive to "unnatural" interventions such as changes in soil constituents, permeability, and moisture—interventions that strip mining will impart. Despite reports to the contrary [for example, (*22*)], reclamation of mined lands in the northern Great Plains is not yet a certainty, if reclamation is defined as returning the land to its premining condition. Although introduced plant species can be made to grow in reclaimed areas, they can seldom duplicate the characteristics of native species in resistance to climatic conditions and foraging by livestock and wildlife. Many reclamation efforts in Montana use fertilizer, a resource based upon fossil fuels, to aid in establishing initial stands of vegetation. We have not yet learned whether such stands can survive when fertilizer is withdrawn (*23*). If continued applications of fertilizer are essential to successful reclamation, that practice will become an expensive one, both in resources and in dollars. One must question whether reclamation can be afforded in this case, particularly by farmers and ranchers. If reclamation becomes too expensive, can the nation afford strip mining?

The NGPRP has estimated that, under optimum conditions, it will require 10 years to restore rangeland and 25 years to restore wildlife habitat (*16*). Under optimum conditions, it will take 5 years to restore monocultures. The NGPRP schedule requires seed as well as time, but supplies of native plant seeds to support large-scale reclamation efforts may be inadequate.

Development of energy conversion facilities will require vast amounts of land for plant sites, transmission facilities, housing, commercial facilities, and the like. Further, energy conversion requires water, a scarce resource in those areas of Montana that are slated for development. Plans to build dams, diversions, impoundments, and aqueducts have been proposed to resolve the water problem. However, the costs of these plans as they relate to the environment, society, the economy, the natural resource base, and existing land uses have not been examined.

Disruption and pollution of shallow aquifers also are consequences of strip mining. In some coal beds, the major aquifer may be a coal seam slated for mining. In other areas, coal seams may be overlain by aquifers that will be disturbed when the coal is removed. Depending upon the location of the mine site, mining may deplete both subsurface and surface waters.

Surface waters will be affected by energy development in several ways. Some energy development activities will require that surface waters be diverted at regular intervals. Pollution of surface waters can result from (i) increased sedimentation originating from erosion of mine spoil; (ii) introduction of soluble minerals from runoff, spoil seepage, or groundwater; or (iii) fallout of airborne pollutants from energy facilities. Changes in the thermal balance of streams may result from diverting water periodically. Finally, increased populations will impose additional demands on surface waters.

Other federal publications on energy development alternatives indicate that equipment to control pollution can reduce the amount of some emissions, although it cannot eliminate pollutants entirely. Some conversion processes produce carcinogenic compounds or byproducts. Most processes that convert coal will emit harmful gases, toxic materials, and particulates in large quantities (*24*). Combustion of Montana coal will produce oxides of nitrogen, sulfur dioxide, and particulate emissions containing harmful trace elements (*25*). If many energy conversion facilities are located in Montana, cumulative air pollution will become serious.

Fallout of airborne effluents can contaminate streams, the soil, and plant communities (*26*). Some effluents are incorporated by plant tissues to the detriment of certain plant species. Ingestion of such contaminated plants can damage livestock, wildlife, and humans. Contamination of plant communities, water, and soil by airborne effluents poses threats to human health, agriculture, and wildlife.

Energy development will directly affect critical dimensions of wildlife habitat; the destruction of which will result in decreased wildlife populations (*16*). Some aquatic species are susceptible to changes in water quality, flow rate, and temperature. Change or deterioration of their habitat usually leads to their replacement by less desirable species. Food species and other requirements of wildlife populations will be reduced or eliminated, sometimes permanently. Many resident animal species rely on specific foods at specific times of the year, remote or special areas for breeding, and winter ranges. Increased human populations will occupy habitats formerly occupied by wildlife. Recreational activities will also increase pressures on wildlife species. The NGPRP report has indicated that coal development will result in reduced wildlife populations (*16*).

Many changes in land use will result from energy development. Rangeland and wildlife habitat will be used for mine sites, conversion plants and associated facilities, homesites, municipal and commercial sites, transportation arteries, and so on. We do not yet know the impact of the ownership of large tracts of land by remote industrial interests. If reclamation is successful, large areas of potential agricultural, range, and wildlife lands may be retained by corporate entities. The use to which such corporate lands will be put must be determined, and some provision should be made to ensure that successfully reclaimed lands are returned to appropriate uses.

A Suggested Course of Action

The public and their elected representatives must define the optimum use of the nation's remaining energy reserves before an irrevocable decision is made concerning their fate. Classic market principles are unlikely to provide an answer to that question that is acceptable in light of the needs of future generations. In reaching a definition, careful attention must be paid to alternatives to wholesale development and to the known and predictable costs associated with each. The public and their officials should recognize that any allocation will entail resource losses, many of which will be permanent. If that decision is to be responsible and equitable, it must be reached with full recognition and consideration of those losses. The nation must ask itself if Montana and other relatively unspoiled rural areas are to be perceived of value only insofar as they are underlain by fuels and other materials resources. In light of worldwide food, materials, and energy scarcities, it is pos-

sible that the optimum use of substantial portions of the nation's coal reserves will entail leaving them in the ground.

It is easy to criticize what has been done to meet the nation's energy crisis. It is far more difficult to suggest alternatives. In the remainder of this article, we will outline steps we feel the federal government and the states should pursue in concert.

1) The problem should be rationally and comprehensively assessed. As we have remarked, the federal government has not yet indicated that it has completed such an assessment of the nation's energy crisis. If it has been made, it has been neither formally announced nor broadly disseminated.

To be sure, the government and numerous research organizations have identified shortages in various energy resources and have projected these shortages into the future. Similarly, a broad range of solutions to these shortages has been proposed. However, these projections and proposals suffer a serious weakness in that they have not been presented in conjunction with a comprehensive analysis of known energy reserves, of activities related to the development of energy and natural resources, and of the policies and activities that led to the problem in the first place.

The nation's leaders should now assimilate and synthesize the wealth of scientific data accumulated worldwide regarding the availability of renewable and nonrenewable natural resources. Our nation must acknowledge that the world faces immediate shortages in a great number of nonrenewable natural resources. We must also take into account the concern of the National Aaademy of Sciences that the world will not be able to feed itself by the year 2000.

Our leaders must seriously analyze the past activities of our nation to determine the events that have produced our present crisis. We suggest that the root cause of our difficulties is the nation's belief that infinite economic growth (as traditionally defined) is both good and possible. We suggest that another cause is infatuation with quick answers that ignore long-range effects. Finally, we suspect that our reluctance to acknowledge natural limits that are placed upon all activities bears examination.

Although the ability to develop a rational and comprehensive assessment doubtless exists in many quarters, only a national effort can accomplish the task in the time available to us. And only an open, national effort can gain the credibility that such an assessment must have if it is to affect subsequent courses of action.

2) Specific plans must be developed. Having analyzed our crisis, our national leaders must develop specific plans to eliminate or mitigate it. If implemented, such plans will vitally affect most sectors of the nation's economy and our lifestyle. For this reason, and in contrast to existing proposals, these plans must closely examine secondary and tertiary effects and project them over an appreciable length of time. Here again, accumulated scientific data must be used, difficult as it may be.

Any national planning effort undertaken must be conducted openly and with maximum attention to the wishes and opinions of the public, for denial of public access comes only at the loss of practicality, vital and relevant information, and credibility. Finally, any plans must be specific in order to ensure that they are understandable, debatable, and, ultimately, acceptable to the public.

3) Alternative energy futures should be considered. Our continuing to increase our annual use of energy is but one of several equally attainable energy futures. For example, the Ford Foundation Energy Policy Project (*25*) presents three feasible national energy futures: (i) historical growth scenario—assuming that energy use will continue to grow much as it has in the past; (ii) technical fix scenario—assuming similar amounts and proportions of goods and services, but with a slower rate of energy growth (about one-half that of the historical growth scenario) resulting from a national effort to reduce energy demand through conservation; (iii) zero energy growth scenario—assuming a deceleration in demand such that annual energy consumption in the year 2000 would be just over half that required if the historic rates of energy growth continue [100 quadrillion Btu's (1 Btu = 1055 joules) versus 185 quadrillion Btu's]. The Ford Foundation Energy Policy Project maintains that all three scenarios are feasible, both technically and economically, without severely disrupting the quality of life in the United States.

At the same time the nation is considering various energy futures, it must develop and engage in a comprehensive program of energy conservation. This program must critically examine many aspects of our current way of life and, probably, suggest some changes in it. This undertaking is a national responsibility. Efforts of individual states would probably have little effect, and the states might work at cross purposes. Further, no state has the perspective to develop or the authority to enforce a truly effective conservation program.

4) A commitment to preserve natural and social values is necessary. Hard-won environmental legislation has recently drawn increasing fire from industry and from some elements within the federal government. It must be remembered that such legislation was enacted in response to real needs and with public support. The nation cannot afford to cast aside its recognition of the dependence of society and humanity upon a healthy ecosystem.

Recent activities concerned with energy development in the West demonstrate that the nation's leaders learned little from the natural and social disasters that accompanied the development of resources in the East. The social costs attendant on rapid rural industrialization to develop sources of energy in the West have been and will continue to be discussed. National leaders must learn that environmental and social problems cannot be wished away or eliminated solely by the application of funds. These leaders must recognize that the magnitude of some potential problems can only be approximated and that, so far, solutions to many of those problems have not been demonstrated. Ways to ensure that energy development is compatible with rather than destructive of these valuable systems must be sought and incorporated into legislation that will guarantee that energy development activities will be of net benefit to the nation and to the region in which the development takes place. A federal statute regulating the siting and operation of strip mines is a first and crucially important step. We suggest that other statutes, applying to the siting, construction, and operations of energy conversion facilities, be enacted in the near future. We insist that any such statutes reflect the right of individual states to enact more stringent standards of performance, should their citizens so desire them.

Montana has enacted a number of sound laws controlling the exploitation of nonrenewable natural resources. We will mention only a few. First, the Montana Strip and Underground Mine Reclamation Act, which requires that mined lands be returned to sustained productive use under natural conditions, is said to be the toughest in the nation. Despite industry warnings to the contrary, coal production in Montana has increased exponentially since the law was passed. Second, the Coal Conservation Act requires industry to recover all available

strippable and marketable coal in a given mine area. The intent of this law is to prevent the waste of coal and the remining of reclaimed land. And finally, a siting law requires that major energy facilities meet criteria such as demonstrated public need and environmental and social compatibility.

The Resource Indemnity Trust Fund will ensure a financial return from the exploitation of nonrenewable resources for future generations of Montanans. This fund is to be used to remedy ill effects of that exploitation. Montana has also enacted a new tax on the gross proceeds of coal production. These tax revenues will be used to mitigate immediate and long-term effects of coal development and to fund research and development of alternative energy sources that rely on renewable resources.

5) Commitment to public access and information is essential. Recent national events should have taught us that excluding the public and their elected representatives from the decision-making process can lead to disaster. If nothing else, these events have taught citizens to be even more suspicious of and cynical about their government.

Our national leaders must regain a belief in the ability of the American people to act rationally and responsibly. The energy crisis impinges most heavily upon the public, and it is the public that must be consulted if the crisis is to be resolved. In order to achieve vital public input and cooperation, the federal government and the national leaders must open the analytic, planning, and decision-making processes to public scrutiny. They must work to inform the public and other levels of government before decisions are made. They must seek the suggestions of the public and their representatives and use them in reaching decisions.

We hope that the nation will rise to the energy challenge by becoming an acceptable model for other nations confronting energy and materials crises. Rather than repeating the mistakes of the past, let us embark upon a rational course that holds promise for future generations here and abroad.

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