Summary

Coal can be America's most productive domestic energy source well into the 21st century. No other fuel, however, evokes such memories of environmental damage and social disruption. Although new programs, practices, and legislation have addressed many of these problems, their adequacy and effectiveness are uncertain, and new concerns are emerging. Thus, coal's future is a mixture of promise and risk.

This report analyzes the role that coal combustion may play in the Nation's energy future, the factors that will shape that role, and the impacts that may result.

SUPPLY AND DEMAND

A tripling of coal production and use by 2000 appears to be possible without either substantial regulatory relaxation or major technological innovations. Such rapid growth may be in the national interest even though total energy demand will probably grow more slowly than it has in the past. However, several factors might inhibit this rapid rate of development Primary among these is the likelihood that demand for coal will not rise this quickly. Coal is not normally the fuel of choice unless it offers a large cost advantage. Many users will prefer oil and natural gas as long as they are available, despite their higher prices, because of their greater convenience and lower capital investment requirements. Recent regulations have increased the cost of mining and burning coal, thus reducing its attractiveness. The 1978 National Energy Act discourages large new facilities from burning gas or oil, but additional legislation or other incentives may be required if coal's share of the energy system is to be further increased. If demand does triple, several potential supply constraints could still interfere with achieving a tripling of coal supply. Mine-to-market transportation systems will need upgrading and expansion. Federal coal leasing may have to resume. Conflicts between mine labor and management could escalate to the point where national production is compromised. Some communities, particularly in the East, may need assistance to accommodate the required development. Public concerns about the siting of mines, powerplants, and other facilities may delay expansion.

In addition, questions have been raised about the reliability of available control technologies and their ability to meet environmental regulations. Significant problems with these technologies could constrain future coal use. The technological viability of fluegas desulfurization (FGD) to meet proposed air pollution emission standards is a focus of this controversy. A growing body of evidence, however, indicates that this technology will be adequate though expensive. Safe disposal of FGD sludge also appears to be feasible technologically, but expensive. Finally, requirements of the Surface Mine Control and Reclamation Act will raise the cost of coal but should not pose technical barriers to meeting demand.

ENVIRONMENT AND PUBLIC HEALTH

This report does not identify any significant violations of existing environmental standards that inevitably would result from a substantial rise in coal use. However, some adverse environmental impacts are likely to occur with increased coal mining and combustion because of conscious economic tradeoffs, tack *of* efficient control devices or insufficient enforcement of existing standards. For example, some underground mines will cause acid mine drainage or subsidence problems long after their abandonment; permanent controls for these

problems are not available for all mining situations. Some emissions may prove to be inadequately regulated because of scientific uncertainty concerning the cause and significance of their effects. Emissions of sulfur dioxide, nitrogen dioxide, carbon dioxide (CO_2) and fine particulate will all increase significantly by the end of the century under a high coal scenario and present or pending regulations. Increases in coal-related air pollution may cause or aggravate three potential environmental problems whose magnitude and importance cannot yet be evaluated adequately. Additional evidence of these problems could force a reappraisal of our environmental control strategy or even our commitment to increased coal development.

First, fossil fuel combustion (along with the clearing of forest land) appears to be causing an atmospheric CO_2 buildup that may lead to significant changes in global climate. $C0_2$ is not likely to become a serious problem before the next century, but if it does, a dramatic worldwide reduction in both fossil fuel combustion and deforestation may be the only way to halt or reduce climate change. Coal is the fossil fuel of greatest concern because of its large reserves and high carbon content; presumably, the faster coal use increases the sooner a critical point will be reached and the more difficult it will be to switch to nonfossil fuels.

Second, there is a possibility that present ambient air standards are inadequate to protect the public health from problems resulting from long-term exposure to low levels of pollutants. Some controversial analyses suggest that current exposure levels may be responsible for tens of thousands of premature deaths annually. Increases in emissions of coal combustion-related pollutants could aggravate existing problems.

Third, acid rain, which has been linked to e_x-tensive damage to aquatic ecosystems and may also cause terrestrial damage, may increase as a result of increased emissions of sulfur and nitrogen oxides from coal combustion.

If additional evidence confirms current concerns, further reduction in air emissions may be desirable to reduce the health and environmental risks associated with increasing U.S. coal use. Existing coal-burning facilities would be primary targets for emission regulations, since many of these will not be stringently controlled under State air quality enforcement plans. The technical and economic problems of retrofitting capital-intensive control systems on existing plants can be severe. Thus, emission reductions may be most efficiently realized by supplying these facilities with cleaned coal. The various techniques for coal cleaning (physical desulfurization, solvent refined coal, and synthetic fluids) may become the primary component of a national strategy for achieving the dual objective of increased use of coal and an improved environment.

OCCUPATIONAL SAFETY AND HEALTH

Considerable improvement has been recorded in reducing mine fatalities since the enactment of the 1969 Federal Coal Mine Health and Safety Act, but there has been no reduction in the rate of disabling injuries, and the total number of injuries has been increasing. In 1977, 139 coal workers were killed and about 15,000 suffered a disabling injury — each of which cost an average of almost two months lost time. A tripling of production, under the assumptions of this report, will result in approximately 370 fatalities and 42,000 disabling injuries per year.

The prevalence of coal workers' pneumoconiosis should be lower in 2000 than it was in 197o as a result of the Federal respirable dust standard, but thousands of workers will nevertheless be disabled by various respiratory diseases (collectively called black lung disease). Furthermore, important questions

have been raised concerning the effectiveness of enforcement of the existing dust standard and the adequacy of the research on which it is based.

COMMUNITY IMPACTS

Coal development brings both beneficial and adverse social and economic consequences. Communities with diversified economies are better equipped to deal with rapid development and are more likely to benefit. Where existing services are already under severe stress, coal development is likely to bring additional social and economic problems. Public services and facilities will not be able to expand sufficiently to cope with increased demand. Tax revenues will not increase fast enough to finance needed improvements.

Some communities in Appalachia will be particularly vulnerable to these adverse impacts, Stagnant coal demand and excess production capacity during the 1920-70 period led to depressed economic conditions in the mining industry and communities. Inadequate services and facilities are a legacy of these conditions. Increased coal production without substantial new revenues and technical aid from the Federal or State governments is likely to exacerbate current inadequacies in housing, transportation, health care, and other public and private services,

Some western communities may suffer serious social and economic dislocations if mining expands too rapidly. States with underground reserves are especially vulnerable. Development of these reserves will require many new workers and will bring substantial population growth to sparsely populated areas. Mining of Indian coal may create significant social problems on reservations. However, with some exceptions, the tax revenues that could be generated by coal development can provide significant opportunities for economic benefit. To minimize economic dislocations, provision will have to be made to overcome the initial shortfalls of funds that follow the onset of development. Also, mismatches between areas absorbing the impacts and those reaping the economic benefits must be resolved.

Finally, the diversified economies of many Midwestern coal counties will allow them to benefit from coal development. These counties combine the population and adequate service base needed to absorb development without severe stress.

The following section describes some of the related policy issues that Congress may consider, A detailed summary of the entire report is found in the overview of chapter 1.

ISSUES AND OPTIONS

Legislative activity bearing on coal will fall into three categories: further amelioration of negative impacts; promotion of coal to reduce the use of other fuels; and oversight to ensure that existing legislation is being appropriately implemented, This section lists the major steps discussed in this report that Congress may consider, The options are not recommendations. Some, in fact, may be contradictory. The options are intended only to show how this analysis can be used to reach a given end, the desirability of which depends in part on the perspective of the policy maker. Cross references to the relevant sections of the main report are included.

Control of Coal-Related Air Pollution

Coal combustion is accompanied by a risk of health damage (possible increased inci-

dence of illness and premature death) and ecological disturbances (e. g., by acid rainfall) from air pollution.

Although existing pollution sources are rapidly being controlled by State implementation plan (S1P) regulations and new sources will be subject to new source performance standards and other regulations, ambient concentrations of fine particulate and nitrates could rise rapidly (and those of sulfates more slowly) during the next few decades if coal development continues at the expected rate. The reasons for these increases include: failure of particulate control requirements to distinguish among different particle sizes, allowing the use of controls that are less effective in controlling the smaller (and more dangerous) particles; unavailability of efficient NOx controls; and basing of S I P emission control requirements on local impacts only, thus allowing certain sources to escape tight controls because their pollution is widely dispersed.

The tradeoff between emission requirements and costs of control is severely complicated by the scientific controversy surrounding the effects associated with these pollutants. Scientists still do not agree on the existence or importance of some of the effects or their precise cause.

Text discussions:

Options

- Increase Federal research emphasis on the impacts and mechanisms of long-range pollutant transport. Increase Federal effort on development of more effective, less expensive controls for NO_x, S0x, and fine particulate, Emphasize clean fuels and low cost technological controls suitable for retrofit.

If the public health and ecological risks are seen as sufficiently dangerous that further limitations should be applied before the risks are better defined by further research, the following actions should be considered:

- Establish emission and ambient standards for fine particulate.
- Revise the Clean Air Act to allow direct Federal control of existing sources of pollution. Actions could range from requiring recently built facilities to comply with NSPS requirements, to selective emission reductions on large facilities when their State Implementation Plan requirements are lenient or when they are located in areas that are the source of problems associated with long range transport of pollutants.
- Revise the Clean Air Act to allow regional and/or Federal control of siting of major facilities when they might contribute to pre-existing long range transport problems.
- Give maximum priority to development of NO_x controls.

The Role of Cost Benefit Analysis in Environmental Decisionmaking

The need to weigh costs against benefits has recently become a critical topic of debate in regulatory decision making. An array of environmental decisions affectin$_g$ coal development will be affected by the outcome of this debate. For example, the Environmental Protection Agency has recently proposed new source performance standards (NSPS) for sulfur dioxide emissions from coal-fired utility boilers. The additional cost of installing and operating the equipment (flue gas desulfurization) to meet these standards is of great concern to utilities. Alternative strategies have been proposed that could grant utilities somewhat relaxed standards that could be met at lower cost. No one, however, has produced a convincin$_g$ analysis of the relative value of the different strategies in ameliorating adverse impacts — public health risks, crop, ecological and material damage, etc. — to compare with the costs.

The NSPS debate shares a common problem with other environmental issues: the costs of controls are more easily computed than their environmental benefits. Thus, a fair balancing of costs and benefits in setting environmental standards is always difficult and frequently impossible.

Text discussions:

Option A:

Maintain the status quo. The present regulatory emphasis is on the use of "Best Available (pollution) Control Technology, " although the agencies have used legislative language requiring consideration of the cost of achieving the standards as a restraint on how expensive the required controls can be. (The degree of their "restraint" is of course a subject of some disagreement).

Option B:

Require regulatory agencies to develop and publish "impact statements" that state their estimates of the costs and benefits of proposed standards and regulations.

Option C:

Establish a mechanism to decide whether a forthcoming standard must be set by an explicit balancing of costs and benefits. The basis for this decision would be the state of the art of impact assessment for the pollutant in question.

Occupational Health

Despite a strict. standard for respirable coal mine dust mandated by Congress in 1969, miners continue to be exposed to harmful dusts and fumes. The current standard should greatly lower the number of miners disabled by coal workers' pneumoconiosis if it is complied with regularly, Exposure to nonrespirable dust (associated with other respiratory diseases) and other toxic substances is neither measured nor regulated. Hearing loss is another major occupational hazard. The present dust and noise sampling programs are of questionable reliability. Some mines may not be in compliance even when their sample data say they are. Even with current standards and diligent compliance, it is likely that thousands of miners will show evidence of work-related lung disease in the future.

Text discussion . . ChVI

Options

- Reassess the inherent safeness of the current respirable dust standard.
- Consider alternatives to current dust sampling, including continuous in-mine monitoring, and possibly more effective ways of carrying out sampling, such as miner- or MS HA-control of the program.
- Encourage the establishment of health standards for other harmful substances — nonrespirable dust, trace elements, fumes, etc. — that are now unregulated.
- Consider lowering the Federal noise standard for mining.
- Promote occupational health training for miners.

Occupational Safety

Coal mining involves higher probabilities of occupational death and disabling injury than almost any other trade. Although coal's fatality rate has improved considerably with the implementation of the 1969 Federal Coal Mine Health and Safety Act, the frequency and number of disabling injuries — about 15,000 in 1977– has not improved. Both fatalities and injuries will rise in proportion to increases in production unless accident frequency rates are lowered.

Text discussion: Safety . . . . . Ch. VI

Options

- Consider the feasibility of requiring or encouraging conversion to the "safest available mining equipment" (adjusted to individual mine characteristics), consist-

ent with the intent of the 1969 and 1977 Federal mine safety laws.

- Establish Federal safety standards for mine equipment.
- Require 90-day apprentice training before a miner is allowed to operate an unfamiliar piece of mobile mine equipment.
- Clarify the right of individual miners to withdraw from conditions of imminent danger under Federal law.
- Establish Federal limits on fatality and injury frequency for different kinds of mines. Substantial penalties could be levied against mine operators exceeding these limits.
- Establish performance standards for the Mine Safety and Health Administration.

Community Impacts

In communities where coal mining has dominated local life, rapid coal growth tends to produce a broad range of socio-economic problems. The chronic underdevelopment of community services and facilities associated with earlier coal development has left a substantial legacy of needs. Where mining has been a negligible factor in local affairs as in the West, rapid growth can easily overwhelm existing institutions. The level of current need and ability to manage growth depends on site-specific conditions, coal company policies and the local tax system, among other factors. Expanding mining communities suffer from a lack of housing, planning capability, experience with Federal programs, and money to develop services and facilities concurrently with mine development. Such needs can be expected to be met at the state and local level after mining growth stabilizes if the local economy is healthy. Chronically underdeveloped and temporarily overwhelmed communities, however, would benefit from Federal assistance if appropriate funding channels can be devised.

Text discussion: Eastern . . . . . Ch. VI
Western . . . . . Ch. VI

Options

- Enact a national severance tax on coal (or on other fuels to avoid an economic disincentive to use coal) to help finance needed improvement in impacted communities.
- Provide loans or subsidies for programs to provide better public services in these places, possibly through a public, nonprofit coalfield development bank.
- Develop programs that would encourage economic diversification in coal-dominated regions.
- Require operators to submit a "community impact statement" to local and Federal officials before mining begins.
- Promote access to land in communities where it is presently unavailable for housing.
- Improve flood control measures in Appalachian coalfields as a way of encouraging investment in coal and noncoal development and housing.
- Maintain roads by enforcing coal truck weight limits and institute a highway coal haulage tax to fund road reconstruction.
- Institute a rural health care system for coalfields.

Labor-Management Relations

The history of coal's labor-management relations is a chronicle of turmoil caused by uncertain markets, hostile attitudes, and inequities. Although lost time from strike activity increased in the 1970s over the 1950s and 1960s, no enduring coal shortage has been experienced, even during the 3'/2 month UMWA strike in 1977-78. Strikes disrupt normal production patterns, but experienced coal purchasers take adequate precautions by accumulating large stockpiles. As more and more coal is likely to be mined in non-UMWA operations, strikes may decline in national importance. Nevertheless, the potential for intermittent disruption will exist as coal assumes a more central role in the Nation's energy system. Government intervention has generally been resisted by both unions and operators, and it has not been effective. Harsh measures aimed at either party may do substantial long-term damage to labor-management relations even when they work in the short term.

Text discussion:

Industry Profile . . . . . Ch. IV
Labor Profile Ch. IV
Collective Bargaining Ch. IV
Workplace and Community Implications . Ch. VI
Options . . . . Ch, VI ll

Options

- Create contingency plans for emergency coal shortages.
- Promote programs to improve social conditions in the coalfields, thereby removing sources of conflict.
- Plan for government seizure of the mines in the event of a crippling strike.

Increasing the Use of Coal

This report assumes coal use will grow substantially. Such growth is consistent with present expectations of energy needs, supply of alternative fuels and potential constraints on coal supply. National policy could seek to further increase coal's share of the total energy supply, perhaps to reduce dependency on foreign oil or nuclear power. Measures to stimulate demand would then be considered. The mining industry is expected to be able to meet any plausible demand for at least the next decade, but thereafter, constraints on production could become serious, especially if demand rises very rapidly,

Options

- Increase demand for coal by strengthening penalties and incentives in the National Energy Act. Industrial users will be the most likely target for such initiatives (chapter ll).
- Improve technology to make coal combustion more attractive. Clean coal and synthetic fuels are essentially the only ways of using coal in small furnaces and boilers while meeting clean air standards. Fluidized bed combustion may be an asset to industrial use of coal (1 l l-G and IV-L)
- Facilitate supply by ensuring an early resumption of Federal leasing (IV-A), and improving the transportation systems (IV-J).
- Reduce the costs and constraints of mining and combustion by easing regulatory standards. Although this study has not found any fundamental incomparability between increased coal use and existing environmental regulations, reclamation and emission controls are expensive. A less drastic step would be to institute more flexible regulations designed to be less stringent where the potential for damage is less.

Oversight

Legislation has addressed many major impacts created in the past by coal production and use. Some issues and programs may require particularly intensive oversight to assure that congressional intent is being carried out. The list below identifies the most important such programs discussed in this report.

- Development of long-range air-pollution transport models and emplacement of ambient air-quality monitoring to determine the effect of siting and energy policy decisions. Epidemiological and ecological studies to determine the impacts of air quality changes (V. B.).
- Enforcement of control of surface mine runoff during operation and reclamation, especially for small mines. Development of ways to control acid mine drainage and subsidence from abandoned underground mines (V.C. and D.).
- Enforcement of adequate dust control in mines through sampling or continuous monitoring (V1.A.).
- Resumption of leasing of Federal coal with appropriate safeguards (IV.A. and Vl 1. A.2.).
- Development of Federal strategies to assist the upgrading of the coal transportation system (IV. j .).
- Enforcement of current mine safety and health standards through inspections and penalties.
- Conversion of oil and gas burning facilities to coal under the National Energy Act (1 l and Vl 1. A.8.).