Section II.-Year in Review

The assessments carried out by OTA cover a wide spectrum of major issues before Congress and the country. They examine a broad range of policy options and their potential impacts. To provide examples of the breadth and depth of OTA'S work, summaries of reports published by the Office in 1981 are presented in this section. Also included are summaries of Background Papers and Technical Memoranda issued by OTA on specific subjects analyzed in recent OTA reports or on projects in progress at OTA. Background Papers and Technical Memoranda are neither reviewed nor approved by the Technology Assessment Board.

The reader is cautioned that these are summaries of reports. They do not cover the full range of options considered or all of the findings presented in any individual report.

Technology for Local Development

Appropriate technology (AT) has been proposed by some as a solution to many of the social and economic problems created by large-scale, centralized technology. Ideally, AT emphasizes small-scale, energy efficiency, environmental soundness, community control, labor (rather than capital) intensiveness, and local resources.

The AT projects examined in OTA'S exploratory study exhibit a great diversity in size, complexity, and location. They range from attached solar greenhouses in New Mexico to a plant that converts municipal waste to steam heat in Akron, Ohio; from a heat-retentive house designed for low-income families in Alaska to a cooperative farmers' market in Louisiana; and from an innovative wastewater treatment plant in California to small-scale hydroelectric dams in New England.

These AT projects were generally successful in achieving local goals and involving local residents in the planning, construction, and management of their facilities. Several projects provided marketable training and work experience, and others improved the viability of existing local enterprises, notably the small family farm.

At the community level, these technologies promise considerable benefits in three substantive areas: 1) improving the delivery and reducing or stabilizing the cost of community services; 2) improving the profitability of small-scale agriculture; and 3) improving energy efficiency.

If these and similar projects are widely replicated, they could lead to significant benefits on the national level, including:

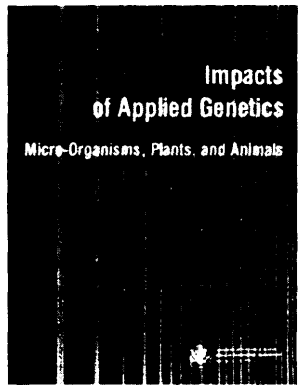
- energy conservation in the residential sector, which currently accounts for over 20 percent of U.S. consumption;
- lower production costs and more profitable marketing techniques for small-scale farmers, which might help to slow the conversion of the Nation's farmlands to nonagricultural uses;
- lower costs and greater flexibility in upgrading the Nation's sewage treatment facilities, whose costs might otherwise be beyond the available resources of Federal, State, and local governments;
- increased generating capacity at abandoned or underused damsites, which could substantially increase the Nation's supply of hydroelectric power; and
- significant savings or improved delivery in community health care services.

Many existing Federal policies and programs have been relatively successful in encouraging the development and adoption of AT projects like those examined. On the basis of these case studies, there ap pears to be no need for new legislation or major increased Federal involvement, though existing programs could be made more effective in four specific areas: 1) gathering reliable data on the design, cost, and performance of the technologies; 2) disseminating this information through regional demonstration projects and through the encouragement of local networking; 3) technical assistance, including community workshops for individuals and planning aids for municipalities; and 4) financial assistance, such as tax credits or cost-sharing for individuals and risk guarantees or tax-free financing for municipalities.

These case studies suggest that individuality, ingenuity, and local initiative are far from lacking in the United States.

Impacts of Applied Genetics; Micro-Organisms, Plants, and Animals

New genetic technologies developed in the last 10 years will have a maior commercial impact on the pharmaceutical, chemical, and food processing industries, probably in that order. These technologies, already in use in several industries, offer fresh approaches to filling basic needs such as health care, and food and energy supply. At the same time, they arouse concerns about possible risks to health and the environment and the effects on human values.



Genetic technologies open up new possibilities for developing vaccines for such intractable diseases as hepatitis and malaria. The availability of any one of these vaccines would improve the lives of tens of millions of people. Other pharmaceutical products likely to be affected in the next_ 10 to 20 years are most antibiotics, enzymes, antibodies, and many hormones.

The economic impact of genetic technologies on the chemical industry within the next 20 years is estimated at billions of dollars per year and cuts across the entire spectrum of chemical groups. These include pIastic and resin materials, synthetic rubber, pesticides, and the primary products from petroleum that serve as the raw materials for the synthesis of organic chemicals.

Large-scale availability of enzymes, made possible through genetic technologies, will play an increasing role in the food processing industry. Genetic techniques can transform inedible biomass into food for humans or animals and otherwise aid in the processing of food.

The application of genetic technologies to plants, combined with classical breeding methods, offers the promise of increased yield, resistance to disease, and improved nutritional value. Genetic technologies will probably not be used directly to affect animal production and products within the next 10 years. However, applications in the production of animal vaccines and hormones will likely be significant within that period.

Genetically engineered micro-organisms may be developed for use in three areas that require their large-scale release into the environment: oil recovery, pollution control, and mineral leaching. Technical constraints and questions about potential effects on human health and the environment are a major obstacle to their use.

No evidence exists that any unexpected harmful genetically engineered organism has been created. Still, few experts believe that molecular genetic techniques are totally without risk to health and the en-

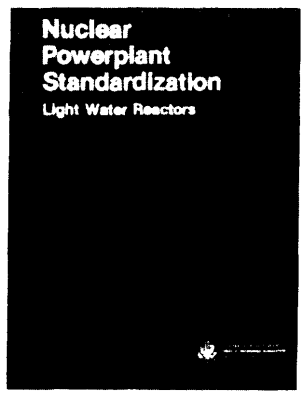
vironment. National Institutes of Health guidelines and current Federal laws appear adequate in most cases to deal with any risks. However, there is uncertainty about the regulation of production methods using engineered micro-organisms or their intentional release into the environment for those cases where the risk is not clear.

Last year's Supreme Court decision to allow human-tailored organisms to be patented will stimulate their commercial use. However, the option left room for Congress to overrule the decision, develop a comprehensive statutory approach, and decide which organisms, if any, should be patentable.

Current industry activity in genetics indicates that sufficient capital is available for specific production objectives. But some high-risk or low-profit areas of interest to society, such as pollution control or enhanced oil recovery, may need Government promotion if they are to be developed.

Nuclear Powerplant Standardization

Standardization of nuclear powerplants can bean essential element in maintaining a viable and safe program for nuclear energy. Virtually all of the existing 71 U.S. nuclear powerplants were uniquely designed and engineered by many different companies under changing regulatory demands, utility desires, and industrial standards. Navy reactors have been more nearly standardized, but this experience is not directly applicable to commercial powerplants. Therefore, there is no experience that explicitly proves that standardizing reactors would improve public safety. Nevertheless, the belief that safety benefits would result is intuitively valid and widely accepted by experts including the nuclear industry.



Some of the advantages of reducing diversity via standardization are that designers and safety analysts could better focus their efforts on perfecting existing designs; the licensing process could be stabilized; and the process for evaluating and implementing safety modifications for operating plants could be improved.

There has already been a significant consolidation of designs by each company involved. This trend would be greatly accelerated by single-stage licensing. Utilities could then order plants with preapproved designs and would have to get only site-specific features licensed. The Nuclear Regulatory Commission (NRC) could unilaterally implement single-stage licensing, but this change would be accelerated by congressional encouragement.

Another approach to standardization would be to have utilities use common procedures and terminology to facilitate information transfer among plants. The adoption of uniform reporting practices and industry-wide participation in review of operating experience would improve the dissemination of relevant safety and reliability information.

Standardization could involve the reactor and its associated safety systems (the "safety-block" concept) or even the entire plant. Such standardization would, to some extent, impose designs on companies that had not developed them. This commonality would eventually provide significant safety and licensing benefits. However, it would also disrupt the commercial industry causing problems which may outweigh these benefits. Congressional action would probably be necessary if these levels of standardization are desired.

Rapidly changing and uncertain safety regulations have been major impediments to standardization. A national safety goal for nuclear powerplants would greatly alleviate this problem. Debate and adoption of a quantitative definition of "how safe is safe enough" would provide a benchmark for determining the necessity for design changes.

Currently there is a lack of orders for new plants due to both lower growth in electricity use and lack of confidence by utilities in the licensing process. Standardization can significantly assist in restoring that confidence. However, NRC is currently devoting little time to standardization.

Standardization has clear potential for time and cost reductions and for gains in safety for new nuclear powerplants. At the same time, standardization is not a panacea and the other elements needed for a safe and efficient nuclear program should not be ignored.

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U.S. Industrial Competitiveness: A Comparison of Steel, Electronics, and Automobiles

A reorientation of Federal industrial policy could help the performance of the U.S. economy. Government policies that affect the international competitiveness of American industry—including those dealing with trade, taxes, technology, and regulation—suffer from fragmentation and lack of continuity. This puts U.S. industry at a disadvantage compared to several of our international rivals. There are no "quick fixes" to problems of economic efficiency and productivity, but unless the Government takes positive action, U.S. competitiveness will probably continue to deteriorate.

Although the causes differ, U.S. competitiveness in steel, electronics, and automobiles has in fact declined. Steelmaker are still closing facilities, steelworkers losing their jobs. Many of the TV sets—and all of the home video recorders—sold in the United States are now imported. In 1980, as American automobile firms lost more than $4 billion, imports from Japan continued to-rise.

In steel, productivity has not grown fast enough to offset rising wage levels. Public policies have not directly addressed modernization and productivity improvement.

Even in high technology portions of the electronics industry—such as computers and semiconductors—domestic firms have been unable to maintain the technological advantages on which their leadership in world markets depends. Government policies in support of R&D and innovation have had only limited positive effects on high technology industries—although the future strength of the U.S. economy depends on their continued success.

The automobile market in the United States has turned away from the larger cars that have been the heart of the domestic industry. The suddenness of this shift, which caught American automakers by surprise, was caused in part by Government policies that kept gasoline cheap and plentiful during the mid-1970's.

In all three industries, the conditions of international trade and competition are changing, with overseas rivals getting stronger.

Improving productivity, economic efficiency, and competitiveness have seldom been conscious objectives of Government policymakers. Such objectives cut across the jurisdictions of many congressional committees. Fashioning a more coherent industrial policy may require that Congress create a new institutional focus such as a select committee or task force. That new focus would enable Congress to ex-

plicitly consider the impacts of particular policies on the competitiveness of U.S. industries. Such policies include: taxes, for example, modified depreciation schedules for industrial plant and equipment; regulation, such as automobiles standard-setting; technology, for instance, Government funding supporting the education and training of engineers and scientists; and trade—e.g., export financing and export trading companies.

Moving toward a more consciously developed industrial policy does not imply Government picking "winners" and "losers" or relying on aid or support for certain sectors or firms. It does imply a broad redirection of policies affecting technology and innovation; savings and capitol investment; regulation, education, training, and economic adjustment; and international trade. Such an approach–which OTA terms "macroindustrial policy"—could help to maintain and strengthen U.S. competitiveness, increase employment opportunities and living standards, and moderate inflation.

Cancer Risks From the Environment

Environment factors have contributed to as much as 90 percent of recent cancer, according to estimates made in the last two decades. 'The "environment," by definition, includes all influences except inborn genetic factors, and represents cancer causes that are, at least theoretically, modifiable. At present, however, specific factors are associated with less than half of all cancers.

ASSESSM ENT OF
TECHNOLOGIES
FOR DETERMINING
CANCER RISKS FROM
THE ENVIRONMENT

Cigarette smoking is the cause of more cancer than any other known environmental agent. Occupational exposure to asbestos and some chemicals, some medical drugs, alcohol consumption, and exposure to radiation also cause significant but smaller proportions of the total cancer burden. Diet is associated with a large fraction of cancer, but little is known about the mechanisms involved. Major natural components of food, such as fat, are considered more important than additives and contaminants. Viruses, aspects of sexual and reproductive behavior, air and water pollution, and consumer products are linked to some cancers.

During the last half century, lung cancer mortality has increased dramatically in all races and sexes, accounting for all but a small part of the overall cancer mortality increase, Changes in mortality from cancer at other body sites have been smaller; some rising and some falling. Rates are higher and trends less favorable for blacks than for whites.

Epidemiologic methods are used to link cancers with exposures and behaviors that, in many cases, took place decades earlier. Because of such long-delayed effects, epidemiology cannot be used to predict whether newly introduced exposures of lifestyle changes will cause cancer. The public health goal of disease prevention and congressional mandates to reduce existing exposures and to protect against new hazards necessitate using laboratory methods to identify carcinogens.

The search for less expensive, quicker replacements for animal tests, which are accepted as predictive of human risk, but cost up to $1 million and 5 years to complete, has produced more than 100 different "short-term" tests. Certain of these tests are now used by industry for screening new chemicals, but no one test nor any known combination of tests is accepted as a substitute for animal tests. The use of short-term tests as a basis for regulation faces stern opposition, and is, at best, some years off.

Extrapolation methods have been developed to project estimates of human risk from laboratory results. The Federal Government uses an extrapolation model that attaches a higher risk to a given exposure level than do most other models. Some critics contend that it overestimates risk. At present, given limited scientific agreement, the choice of a model is a policy decision.

About 100 substances have been regulated as carcinogens under laws providing for reductions in carcinogenic exposures. However, uncertainties accompanying test data and risk estimates, as well as questions about benefits associated with some carcinogens, complicate regulatory decision-making.

Congressional issues include: gathering information about the occurrence of cancer; the distribution of carcinogenic risks; testing for carcinogenicity; and changes in the process used to make technical decisions for regulatory purposes.

MX Missile Basing

Five different basing modes for the MX missile appear to offer the prospect of providing survivability and meeting established performance criteria for intercontinental ballistic missiles (ICBMS). These are: multiple protective shelter (MPS) basing; MPS basing defended by a low-altitude antiballistic missile (ABM) system called LoADS; basing MX missiles in silos and relying on launching them before they could be destroyed by a Soviet attack (launch under attack, or LUA]; basing MX on small submarines; and air mobile basing in which MX missiles would be ejected from wide-bodied aircraft and launched in midair. But each of these alternatives has serious risks and drawbacks, and no basing mode is likely to provide a substantial number of survivable MX missiles much before 1990.

MPS basing would preserve the characteristics and improve the capabilities of present land-based ICBMS. The survivability of MX/MPS would depend on successfully concealing the location of a few hundred missiles among thousands of shelters. Confidence in the United States' ability to do this will be limited until prototypes have been tested; if the Soviets elected to continue to increase their inventory of warheads through the 1980's, more missiles and shelters would have to be added to the Carter administration's proposed "baseline" MPS system of ZOO missiles and 4,600 shelters to ensure MX survivability. MPS would have severe socioeconomic and physical impacts on the deployment region, and could result in the loss of thousands of square miles of productive rangeland.

Adding LoADS to an MPS system could be effective in forcing the Soviets to attack each shelter with two warheads only if both ABM defense and the MX missiles could be hidden from the Soviets and if the ABM defense system could work in the midst of exploding warheads. It is not now certain that these conditions can be met.

Basing MX missiles in silos and relying on launching them before they could be destroyed (LUA) would be technically feasible. However, LUA would require that the President be in continuous contact with the warning sensors and the strategic forces, and that he be prepared to make launch decisions quickly on the basis of information from remote sensors. Possible results of LUA errors include a successful Soviet first strike or an accidental nuclear war; consequently even a small possibility of error is an important consideration.

Deployment of MX missiles on small submarines would provide the United States with military capabilities nearly as good as land basing options. Such submarines would be highly survivable today and

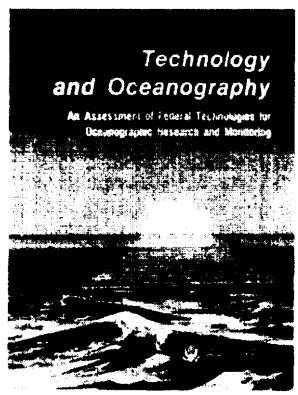
against all future antisubmarine warfare (ASW) threats that OTA was able to project. Small submarine basing would place far greater importance on the sea-based portion of U.S. strategic forces than in the past. This could have serious consequences if an unforeseen Soviet strategic ASW capability were developed.

Air mobile MX basing would be highly survivable provided that the aircraft took off immediately after receiving warning of an attack. If the Soviets chose to attack all of the airfields at which the aircraft could land and refuel, the United States would have to "use or lose" air-mobile-based MX missiles within the first 5 to 8 hours of a war.

The cost of the baseline MX/MPS deployment to the year 2000 is estimated by OTA in fiscal year 1980 dollars at $43 billion and could grow to more than $80 billion if the system were expanded to more than 12,000 shelters to cope with a plausible 1995 Soviet arsenal. Adding an ABM defense would reduce costs of meeting high future Soviet threats by 10 to 20 percent. Small submarine basing costs are estimated to be about $39 billion; the size of the force would not have to be expanded to meet an increased Soviet threat. Costs of an LUA system including the MX missile, warning sensors, and communications systems would be $15 billion to $20 billion.

Technology and Oceanography

Federal ocean research efforts to explore the ocean cost more than $2.5 billion in fiscal year 1980. Some 90 programs conducted primarily by eight Federal agencies range from basic science to resource development to the protection of the marine environment. Yet there is no comprehensive effort to plan and coordinate the development of new technologies to advance these programs.



Oceanographic research is complex; no single technology system is best suited for its tasks. Federally supported technologies include ships, satellites, buoys, submersibles, and other vehicles, as well as independent instrument systems. However, most experts agree that ocean engineering capabilities are inadequate and that important technology development work is not receiving needed attention in some key Federal agencies.

Congressional initiatives may be necessary to strengthen ocean technology development. For example, Congress could: establish a central office to support future ocean technology development in one or more agencies with authority to provide the expertise and project management capabilities for specific missions or program needs; call

for an evaluation of specific technology development needs not being met by established offices; establish an interagency ocean engineering strategy group with authority for technology transfer and other productive coordinating functions.

Most ocean research has been conducted from ships. New technologies have not replaced the need for ships but, instead, have identified new and more productive ways to use them. Yet Federal funding for the oceanographic fleet of about 79 ships has declined rapidly. The fleet is not being adequately maintained or upgraded, is decreasing in size, and will require replacement or rehabilitation over the next 20 years. The capabilities of the Federal fleet will continue to degrade without new funds or more efficient arrangements that reduce costs. Several years of debate have failed to resolve whether more centralized management systems with greater Federal control would produce savings greater than their additional cost, especially when funding today is already unable to meet the costs of the existing system.

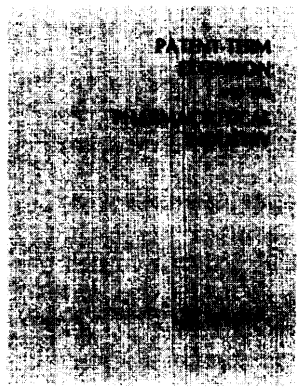
In the future, increased attention will be given to remotely operated and other unmanned vehicles, buoy systems and moored systems, as appropriate, for many specialized ocean data collection and monitoring tasks. New data links with satellites are making buoys and moored systems more effective.

Major satellite systems for oceanography could become the dominant thrust in ocean technology in the next two decades. The new National Oceanic Satellite System, now in planning, offers the potential of substantial improvements in ocean data gathering, but its projected total development cost of almost $1 billion makes current budgetary support doubtful.

Federal programs have not given adequate attention to the handling of oceanographic data, collected at great expense, for public use. Existing data systems are not meeting the research needs of many oceanographers. Satellites and other remote sensing systems with the potential for generating large volumes of data will compound one area of data management in the future.

Patent-Term Extension

Proposals to extend patent terms for products subject to premarketing regulations would, if implemented, provide additional incentives for conducting pharmaceutical research and development (R&D). But evidence is insufficient to determine whether these incentives by themselves would appreciably increase pharmaceutical innovation.



Patents were intended to promote innovation by providing inventors with the right to exclude others from making, using, or selling a patented invention. Because drug developers usually obtain patents before their drugs have been approved by the Food and Drug Administration, the length of the approval process can directly affect the length of time during the patent term that a new pharmaceutical is marketed (the effective patent term).

Drug developers believe that pharmaceutical research is becoming less profitable as a result of shorter effective patent terms, governmental actions encouraging competition from drugs generically equivalent to drugs with expired patents, and higher costs of research.

To date, the profits of the pharmaceutical industry have remained high, revenues have increased steadily, and R&D expenditures have increased to levels which more than compensate for the inflation in biomedical research costs. However, the effects of the decline in effective patent terms and the increased competition resulting from Government actions may not have been fully felt.

Patent-term extension has numerous implications for society, industry, and innovation. The extension would increase the attractiveness of research on drugs for large markets; it would not increase the economic attractiveness of research on drugs for small markets.

Drugs with extended patent terms would generate additional revenues when the majority of the proposed extensions are to begin in the 1990's. The long-term stability of the relationship between R&D expenditures and revenues suggests that increases in research activities would not occur until that time and that 8 or 9 percent of the additional revenues generated would be spent on R&D activities. Industry spokesmen maintain that increased R&D expenditures could be expected sooner because firms would make their research decisions on the basis of anticipated increases in revenues.

As a result of patent-term extension, the prices of drugs whose patents are extended would be higher during the extended period than they would have been without the extension. Consumers would, however, benefit if more and better pharmaceuticals were developed. It is

expected that both the benefits and the additional costs would affect the elderly and the chronically ill more than other segments of society.

Patent-term extension would delay and in some cases prevent the entry of firms primarily selling drugs that are generically equivalent to drugs with expired patents. The revenues of these firms are determined by the remaining market value of drugs with expired patents—and because of reduced marketing time—the remaining market values would be reduced.

Solar Power Satellites

Although it appears technically feasible for satellites to supply electric power to the Earth in the next century, there is too little information currently available to make a sound decision on whether to develop a solar power satellite (SPS) system.

A research program could provide this information. However, the urgency of pursuing SPS research depends less on resolving technical difficulties than on the future growth rate of electricity demand, the relative cost and flexibility of competing electric supply technologies, and the speed with which the major uncertainties about the SPS can be resolved.

The SPS concept envisions collecting solar energy in space and transmitting it to Earth for conversion to electrical power. 'Microwaves, infrared laser, and mirror reflection have all been suggested as transmission modes. Although it is not yet possible to choose an optimum SPS system, several alternatives to the reference system used for study by the National Aeronautics and Space Administration/Department of Energy offer significant improvements in size, cost, and feasibility.

Major uncertainties are associated with each of the proposed systems. Predominant among these are the environmental and health effects of transmitting energy, the size and location of receivers on Earth, the health risks to space workers from ionizing radiation, and the potential interference with other users of the electromagnetic spectrum. In addition, the high cost, complexity, and possible military impacts of SPS involve institutional and political considerations.

Any SPS system would also raise sensitive questions of international law and trade. Since developing SPS as a multinational rather than a unilateral system could provide significant economic and political advantages, these issues should be taken into account in SPS planning.

The cost estimates to demonstrate a full-scale SPS for the systems studied by OTA exceed $100 billion. Although these estimates are now

uncertain, demonstration costs are likely to be at least $40 billion (in current dollars). These costs are unlikely to come down for the generation of systems now under study, although it is possible that further innovations may reduce these estimates.

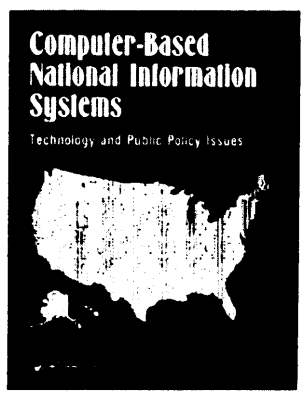
OTA also compared several potential future electricity sources: nuclear breeder, fusion, solar thermal, solar photovoltaics, and SPS. It found that while the capital costs and uncertainties are high for all these technologies, they are highest for fusion and SPS.

If future growth of demand for electricity is expected to be low, it is not necessary to initiate a specific SPS research program at this time. However, it maybe desirable to designate an agency to track research applicable to SPS, review trends in electricity demand, and monitor the progress of other electrical supply technologies.

A dedicated SPS research program, started now, might range between $5 million and $30 million per year. Research should focus on those areas most critical to SPS economic, technical, and environmental feasibility with particular attention to analysis of alternative SPS systems. Since the feasibility to SPS also depends on its social, political, international, and institutional acceptability, these aspects should be part of any research program.

Computer-Based National Information System

Computers have become a major technological tool of American society during the last quarter of a century. Recent developments in computer and communication technology promise within this decade an even more radical revolution in the way that information is collected, stored, used, and disseminated. These advances offer new Opportunities, for example, to improve productivity in the manufacturing and service sectors of the economy.



The development and use of computer-based national information systems—such as those already integral to air traffic control, military command and control, and electronic funds transfer—will be accelerated by major continuing advances in microelectronics, computer programing, and data communication. Small computers will become common in the home and business. Corporations will compete intensively to provide computer-based information services. The number and size of computer networks linking users and data bases anywhere in the country or the world will expand dramatically.

At the same time, computer-based information systems are generating public policy issues at a rate that maybe outstripping the ability of

the Federal Government to respond. The United States appears to lack a coherent "information policy" to guide the updating of the numerous laws and regulations, some overlapping and some potentially or actually conflicting, that affect the operators and users of information systems. Responsibility for setting policy is diffused throughout various agencies of the executive branch and committees of Congress.

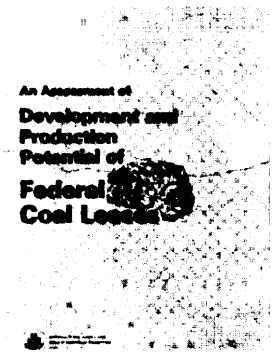
Continued innovation in information technology is a prime requisite for a healthy information industry that is competitive in the world market. It also offers the tools for improving the productivity of many sectors of the economy. Innovation depends on support for research and development on civilian applications of computer technology, vitality of academic computer science, and support for research on the impact of computers (e.g., the impact on employment).

New computer applications—such as an automated securities exchange, in-home information services, electronic publishing, and electronic mail—may introduce policy issues over secondary use of personal information, surveillance, and the possible need for new approaches to the protection of individual privacy. Also, the increasingly complicated systems now being designed and built will magnify the need for adequate protection of Federal information systems and vital non-Federal systems, and for the development of improved data security and cryptographic capability.

Large-scale information systems may also affect" Federal decisionmaking (the "automated bureaucracy"), constitutional rights (especially first, fourth, and fifth amendment rights), computer-related crime, international negotiations over the transborder flow of information and regulatory boundaries and definitions for computer-based devices and services.

Development and Production Potential of Federal coal Leases

Coal production from mines that include currently existing Federal coal leases ["Federal mines") could increase from 138 million tons in 1979 (about 15 percent of national production) to between 410 million tons and 500 million tons by 1991. Whether or not coal production will actually rise that far depends both on overall market demand and on competition from non-Federal mines and production from new Federal leases. The extent of increased market demand, not the availability of leased coal reserves, is expected to determine the amount of coal that will be produced from existing Federal coal leases.



The rate of growth in demand for electricity will probably be the single most important factor affecting demand for Western coal. Other major factors are coal transportation availability and cost and the growth of nonutility markets for coal, such as for-industrial use, synfuel production, and foreign exports.

Over 50 percent of the coal produced in 1979 from mines with Federal coal leases came from the Powder River basin of Wyoming and Montana, which has 56 percent of the Federal reserves under lease. In 1979, Federal mines in the Powder River basin had the capacity to produce an additional 75 million tons over what was actually mined. Demand for Powder River basin coal is likely to increase significantly over the next decade. However, production capacity from existing Federal leases and non-Federal coal properties in the basin could also increase substantially. As a result, there is potential for continued significant overcapacity in the Powder River basin over the next decade. Consequently, there is considerable debate about the timing, extent, and location of renewed large-scale leasing of Federal coal lands in that region. In contrast, little overcapacity is expected in the Southern Rocky Mountain coal regions during the same period. During the 1990's, demand for Western and Federal coal may grow rapidly, particularly if coal-based synfuels and exports of coal to foreign countries become important.

The Federal Government owns about 60 percent of the coal reserves in the Western States. By 1980, a total of 812,000 acres and over 16.5 billion tons of recoverable coal reserves in 14 States had been leased. More than 99 percent of these leased Federal reserves are in Colorado, Montana, New Mexico, North Dakota, Oklahoma, Utah, and Wyoming. The OTA report focuses on potential production from the 548 leases in these seven States.

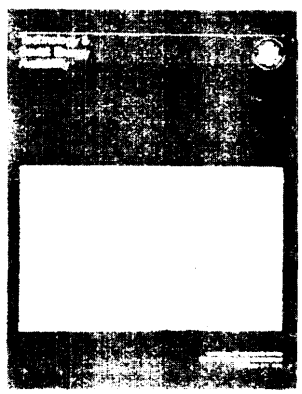
In 1980, 189 of these 548 leases, with 7.4 billion tons of recoverable reserves, were part of active mines. Another 118 existing leases (2.5

billion tons) with proposed mine plans pending approval could begin producing in the mid-1980's. No mine plans had yet been submitted for 241 leases. However, 75 of these leases (3.6 billion tons) are likely to be in production by 1991; another 65 leases (2.3 billion tons) could begin by 1991 contingent on markets for coal, including demand for synthetic fuels, and on railroad construction. There are 101 leases, with about 5 percent of the reserves, that are unlikely to be developed because of poor reserves, remote location, or environmental problems.

Less than 1 percent of currently leased Federal reserves are likely to be prohibited from mining because of environmental regulations concerning air quality, water resources, alluvial valley floors, return to approximate original contour, and wildlife. Mining of between 5 and 10 percent of leased reserves could be delayed because of unresolved environmental questions, but available evidence indicates that most can be mined.

Technology and Soviet Energy Availability

No U.S. policy of restricting Soviet access to energy technology is likely to succeed unless U.S. allies change their present views of their interests in this matter. A policy intended to bolster Soviet energy production would not succeed without significant changes in Soviet economic policy. A course of action seeking maximum commercial advantage for the United States in energy equipment sales would be aided by making the export licensing process more predictable.



The vast majority of the U. S. S.R.'S energy-related imports of technology are destined for its oil and natural gas industries, but it obtains most of these from sources outside the United States. There are a few energy technologies solely available from the United States, and a few instances in which U.S. equipment is preferred. But except for advanced computers, the U.S.S.R. is either not purchasing these items, is on the way to acquiring domestic production capabilities, or has demonstrated that such imports are not essential. Moreover, the United States does not produce the large diameter pipe that constitutes the U. S. S.R.'S single most important energy-related import.

Western technology has been and will continue to be important to Soviet energy development. In the long term, Western exploration technology and equipment may be crucial to the oil industry. But the

most vital area for such Western assistance is equipment for the construction of large diameter gas pipelines. This is the only area in which Soviet energy-related imports might be described as "massive."

Contrary to common belief, oil is not the key to Soviet energy performance in this decade. The relevant question is not how much oil the U.S.S.R. can produce by 1990, but how much energy. Predicting future Soviet energy production is a tenuous exercise, but to the extent that plausible outcomes can be identified, the Soviet's own goal of a small rise in oil output by 1985 is reasonable. On the other hand, prospects for the Soviet coal industry are poor; even the relatively modest 1985 targets are excessively optimistic. Soviet targets for nuclear power are overly optimistic—not because of lack of know-how, but because of shortcomings in the efficiency and capacity of producing the required equipment and constructing power stations. OTA also found that potentially large savings through energy conservation are not likely to be achieved.

Gains in total energy production will therefore have to come from gas. Proven Soviet gas reserves may be likened to the oil reserves of Saudi Arabia. This is the energy sector with the best prospects and performance record, and Soviet planners have accorded it high investment priority.

Gains in gas output could more than compensate—both in energy value and in hard currency earnings—for slowing growth in oil production. It is therefore highly unlikely that the Soviet Union itself or the Soviet bloc as a whole will become a net energy importer in the 1980's.

The extent to which the U.S.S.R. can capitalize on its tremendous gas potential will depend on its ability to substitute gas for oil, i.e., to convert to gas in boiler and industrial applications, and to add to the gas pipeline network. The rate of construction of new pipelines, both for domestic use and for export, is the most important determinant of the extent to which Soviet gas can be utilized.

Energy availability is a critical factor in the growth of the Soviet Union's domestic economy; energy exports provide over half of Soviet hard currency receipts; and subsidized energy sales to Eastern Europe are vital tools of Soviet influence in that region. From the perspective of Japan and some countries in Western Europe, Soviet energy industries are important customers for equipment and technology and a source of energy supplies.

U.S. food and Agricultural Research System

The structure of the U.S. food and agricultural research system may need to be changed if it is to function effectively and to meet the increased demand on its resources,

The United States is widely recognized as a leader in agricultural research largely because of technologies developed through sustained public support. Scientists now are concerned that new technologies may not be keeping pace with domestic and world needs. Unless major breakthroughs occur in new technologies, the world food problem is likely to worsen.

However, the U.S. food and agricultural research system is working under a number of constraints that diminish its effectiveness. These include lack of well-defined national agricultural goals, lack of a national research priorities process, underinvestment in research, confusion over roles of research participants, and a structure that inhibits the system from having a national research focus.

Lack of well-defined, achievable national goals for U.S. food and agriculture is a major deterrent to formulating a national policy to guide the research community in planning its agenda. Present goals are implicit but ambiguous and open-ended, such as to provide an ample supply of food. But this has little meaning in the absence of an agreement on what constitutes an ample supply. Explicit, well-defined and achievable goals could be set—either by the research community or by Government. If set by Government, public agencies and industry could respond by planning and conducting research that would more adequately meet national needs.

The United States has no satisfactory long-term process for evaluating existing research activities, potential research opportunities, and development of research priorities. Decisions are made on an ad hoc basis with insufficient coordination among Federal and State agencies. The research system could benefit from preparation of a national research agenda that could be updated at scheduled intervals.

U.S. Department of Agriculture (USDA) research expenditures are proportionately the smallest of any major Federal research agency and have remained level in constant dollars since 1967. Yet, the demands on agricultural research have increased and the cost of conducting research has increased substantially. The executive branch and Congress could reassess whether existing funding priorities in agriculture support are appropriate.

Under the present research structure, USDA's role is associated with broad regional, national, and international activities, and the

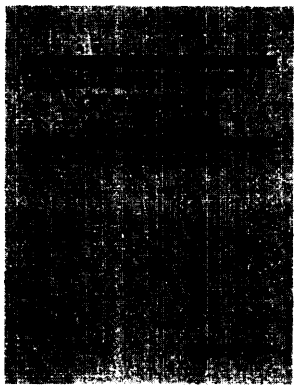
State agricultural experiment stations with local, State, and regional problems, insofar as Federal funds are concerned. However, considerable overlap exists and there is increasing concern that national issues are not receiving adequate attention. The OTA study presents a variety of options for congress to strengthen and clarify the roles of research participants.

USDA's structure hinders its ability to manage and conduct research with a national focus and to be fully responsible to the agricultural needs and interests of the United States. However, within the past few months, the executive branch has moved to improve some aspects of research management within USDA, particularly in its former Science and Education Administration. Still needed are improved procedures for managing research in the Agricultural Research Service and the Cooperative State Research Service.

The Agency for International Development (AID), the prime Federal agency involved in strengthening agriculture in developing nations, lacks the adequate technical skills and management structure for handling the job effectively. The OTA study indicates that AID could benefit through the establishment of technical bureaus centered around the major thrusts of AID programs. and by increased use of USDA as a technical resource.

Cost Effectiveness of influenza Vaccination

Influenza vaccination is a low-cost method of preventing illness and reducing productivity losses. Vaccination benefits all age groups, but is most cost effective among 'high-risk persons, i.e., the elderly and those with preexisting illnesses. Yet, the use of influenza vaccination is still at too low a level for society to reap substantially its potential benefits.



Over the period of 1971-78, approximately 150 million influenza vaccinations resulted in about 13 more years of healthy life. This was achieved at a cost of $63 per year of life gained, and, according to this OTA analysis, about $386 million in potential productivity losses were averted.

During the same period, influenza caused an estimated 127,000 deaths and cost about $1 billion for medical treatment. The illness also resulted in an average of 15 million days of work loss at an estimated productivity loss of $764 million in each of those years.

Although vaccination is the medically preferred method of preventing the illness, influenza vaccine has never received widespread acceptance by either health professionals or the public. Throughout most of the 1970's only 10 percent of the Nation's population received influenza vaccine; further, only about 20 percent of the population most susceptible to influenza-related illness were vaccinated. How-

ever, in 1976-77 when the Federal Government launched the National Influenza Immunization Program, these percentages doubled.

In spite of the incidence of the paralytic condition Guillain-Barre Syndrome (GBS) associated with the so-called "swine flu" vaccine in 1976-77, influenza vaccines have proven to be quite safe. Subsequent to that year, the incidence of GBS among influenza vaccinees has been virtually the same as that among nonvaccinees. About 5 percent of the adult vaccinees encounter a mild reaction. OTA estimates that the clinical effectiveness of influenza vaccine was about 60 percent in 1971-78.

At present, the Federal Government spends little effort to promote the use of influenza vaccine. Through its Food and Drug Administration, the Government evaluates the safety and efficacy of influenza vaccine, and through the National Institutes of Health and Centers for Disease Control it finances epidemiologic and biomedical research on influenza and influenza vaccines.

If the Government decided to promote the use of influenza vaccine, it could do so in three ways:

- The Public Health Service could fund a national campaign to stimulate private sector elements, e.g., health professionals, employers, labor unions, and the public, to increase its use of the vaccine;
- Congress could appropriate Federal funds for support of annual nationwide influenza immunization programs analogous to federally supported childhood immunization efforts; and
- Congress could authorize medicare to pay for influenza vaccinations.

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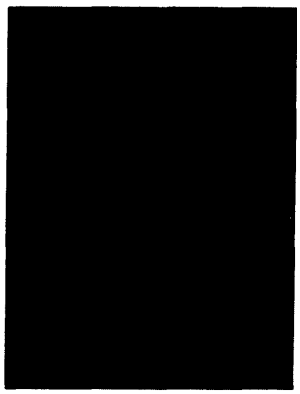
TECHNICAL MEMORANDUMS

Coal Export and Port Development

This Technical Memorandum explores four major issues: estimating the potential U.S. coal export market; development of foreign trade policy; the Federal role in dredging harbors; and the outlook for alternative technologies that might facilitate coal exports.



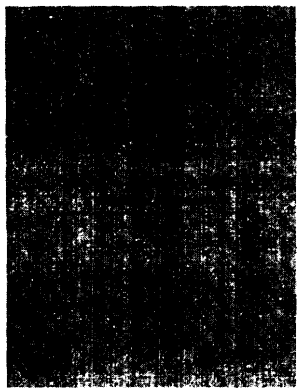
Indications are that sizable increases in future U.S. coal exports are achievable if the Federal Government and the private sector cooperate in encouraging these exports, and if developments in other countries do not dramatically alter present trends. However, without the development of a coherent, positive coal export policy. the United States risks losing a large share of the market to other coal-producing nations.

It is suggested that in order to promote U.S. coal exports, it is important reaffirm the U.S. commitment to increase domestic coal production, improve the coal transportation network, and encourage export trade. The resulting political climate would reassure importing nations as they assess U.S. reliability as a future coal trade partner.

OTA'S analysis indicates general agreement on the need for some changes in Federal dredging policies. The economic rationale for recovering dredging costs in some form of user fees from those who directly benefit is gaining acceptance. Technologies other than dredging that facilitate coal exports will probably be approached with caution by established industries because they are not perceived as near-term options. Alternative technologies include: coal slurry pipelines, midstream transfer of barges or ships, barge-carrying ships, pneumatic pipelines, and shallow-draft, wide-beam ships.

Patterns and Trends in Federal Coal Lease Ownership, 1950-80

This Technical Memorandum is part of OTA'S congressionally mandated study (Public Law 94-377] of current Federal coal leases. The full OTA report published in December 1981 is entitled: "Development and Production Potential of Federal Coal Leases."



Since 1920, the Department of the Interior has conducted a leasing program through which the private sector is given permission to mine coal in Federal lands. Over the past 60 years, about 17 billion tons of coal on 790,000 acres have been leased. Land currently under lease represents about 12 percent of the total coal reserves owned by the Federal Government. Federal coal lessees are contributing an increasing share of the coal industry's total production—from 1 percent in 1970 to 8 percent in 1979—when total production from leased land was 60 million tons. Production on leased land is expected to increase substantially over the next 5 years.

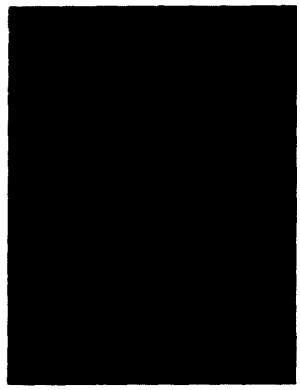
The history of the 528 coal leases in effect at the end of 1979 is traced and focus is placed on the coal lessees themselves: who they are, how and when they acquired Federal coal leases, and what they have done with those leases. Participants in the Federal coal leasing program between 1950 and 1980 are identified.

The number of lessees participating in the coal leasing program has nearly doubled over the past 30 years and the total acreage of leased land has increased eighteenfold. In 1950, unincorporated individuals and independent corporations held 72 percent of all land under lease. Today, the percentage of leased Federal coal acres they hold has decreased to 31 percent. The holdings of subsidiary corporations, which were 26 percent of the 1950 total, have risen to 43 percent in 1980, Multicorporate entities, defined as either joint ventures or two or more companies sharing interests in leases, now hold 25 percent of leased acreage, up from less than 1 percent in 1965.

The shifts in lease ownership have led to a greater variety of industries holding Federal coal leases. For 1950, OTA identified only four distinct kinds of businesses, each of which held at least 5 percent of all land under lease. Independent coal companies were the leading lease holders. By 1980, nine distinct kinds of businesses were identified as each holding at lease 5 percent of leased land, with electric utilities owning more Federal coal land than any other industry group. Integrated energy companies are the second largest lease holder today, with 20 percent of all acres under lease and producing 16 percent of all Federal coal.

Nonnuclear Industrial Waste: Classifying for Hazard Management

The management, or mismanagement, of industrial waste presents various levels of hazard to the Public. Nonnuclear industrial waste ranges ‘from being relatively harmless to being so extremely hazardous that it must be completely isolated from humans and the environment, destroyed, or detoxified. This technical memorandum is part of a comprehensive assessment of nonnuclear industrial waste scheduled for completion in 1982.

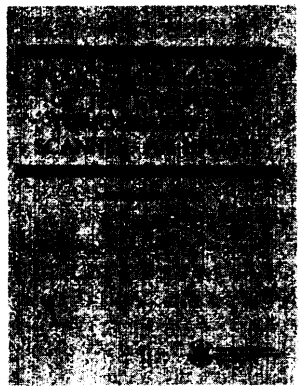


Some of the key findings of the OTA analysis are: 1) A well-designed degree-of-hazard classification system could provide a strategy for cost-effective management of nonnuclear industrial waste; 2) The objectives of a classification system are to identify with greater certainty those wastes that most severely threaten human health and environment; and 3) the benefits of using degree-of-hazard classification include concentration of regulatory action on the most hazardous wastes.

BACKGROUND PAPERS

Policy Implications of the Computed Tomography (ct) Scanner: An update

At the request of the Senate Finance Committee, this background paper updates the 1978 OTA report, "Policy Implications of the Computed Tomography (CT) Scanner."



The United States has the greatest number of CT scanners per population of any country in the world. In May 1980, there were 1,471 scanners, or 6.7 per million people. Within States, the number of scanners per million varies from 12.8 in Nevada to 2.4 in South Carolina.

The dramatically rapid rate of scanner diffusion (the process by which a technology enters and becomes part of the health care system) during 1975 and 1976 set the stage for OTA'S original study, An equally dramatic decline in this rate from 1978 through 1980 is the backdrop for the update.

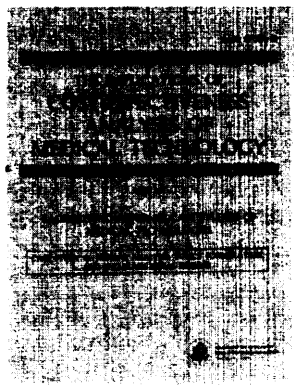
The decline in the diffusion rate has occurred during a period of changes in Federal policies toward medical technology affecting every stage of research, development, diffusion, and use of CT scanners.

CT scanners, which combine X-ray equipment with a computer and TV-like picture tube to produce cross-section images of the human body, revolutionized diagnostic medicine in the United States when first introduced in 1973. Over the past 7 years, new applications of existing and new technologies have rapidly expanded the field of "diagnostic imaging" (making pictures of the inside of the human body). R&D in this new field is described and information on new develop ments such as ultrasound and nuclear magnetic resonance scanners is presented.

Some key issues are: Can the relative advantages of the different technologies be demonstrated? Can Federal policies rationalize the use of the many technologies? Will new technologies merely be added on to existing methods, driving up costs and contributing only marginal benefits to people's health? An examination of public policy toward CT scanning may indicate how far we are from having effective policies to promote the efficient expenditure of our health care dollar.

The Implications of Cost-Effectiveness Analysis of Medical Technology

Analyzes the feasibility, implications, and usefulness of cost-effectiveness analysis (CEA) and cost-benefit analysis (CBA) in health care decision-making, including the current and potential use of CEA/CBA or related techniques in six health care activities: reimbursement programs, Professional Standards Review Organizations, health planning, market approval for drugs and medical devices, R&D programs, and health maintenance organizations.



In addition to the main report (published in August 1980), there are five background papers: 1) Methodological Issues and Literature Review, published September 1980; 2) Case Studies of Medical Technologies, consisting of 17 individual case studies, 15 of which (listed below) were published in 1981. The final two case studies (#9—The Artificial Heart; and #13—Cardiac Radionuclide Imaging and Cost Effectiveness) are in press; 3) The Efficacy and Cost Effectiveness of Psychotherapy, published October 1980; 4) The Management of Health Care Technology in Ten Countries, published October 1980; and 5) Assessment of Four Common X-Ray Procedures, in press.

Case Study **1:** Formal Analysis, Policy Formulation, and End-Stage Renal Disease.—Examines two instances of the use of formal analysis in the formulation of Government policies toward end-stage renal disease (ESRD). Focus is on the work of two committees, whose reports were an integral part of the ESRD policy formulation process in 1966 and 1967: 1) the Gottschalk committee, advisory to the U.S. Bureau of the Budget; and 2) the Burton committee, internal to the Public Health Service.

Case Study 2: The Feasibility of Economic Evaluation of Diagnostic Procedures: The Case of CT Scanning.—Computed tomographic (CT) scanning can now be used to detect diseases in other parts of the body. The use of this diagnostic technology has initiated a controversy of unprecedented proportions regarding tradeoff between the benefits and costs of CT scanning.

Case Study 3: Screening for Colon Cancer: A Technology Assessment.—Examines the available technologies used to screen for cancer of the colon: their development, evaluation, cost effectiveness, and use. Although cancer of the colon is second in frequency to cancer of the skin, second to cancer of the lung as a cause of death in men, and the third most common cause of cancer death in women, it is overall the most common of the "lethal" cancers.

Case Study 4: Cost Effectiveness of Automated Multichannel Chemistry Analyzers.—A multichannel chemistry analyzer is a technology capable of performing many laboratory tests simultaneously on a single sample of serum at extremely high speeds. The study reviews the evidence concerning the cost effectiveness of the three cardiac enzyme tests used to diagnose heart attacks.

Case Study 5: Periodontal Disease: Assessing the Effectiveness and Costs of the Keyes Technique.–Over 90 percent of the adult population in the United States is at some time afflicted with some degree of periodontal disease. The Keyes treatment technique essentially involves the use of simple and inexpensive oral hygiene measures and plaque (bacterial) control by the patient.

Case Study 6: The Cost Effectiveness of Bone Marrow Transplant Therapy and Its Policy Implications.—Bone marrow transplant (BMT) therapy is a relatively new medical technology used to treat aplastic anemia and acute leukemia. The data used in the case study for the CEA of BMT therapy were obtained from the UCLA Bone Marrow Transplantation Program and were collected on 107 patients with aplastic anemia and acute leukemia who were given BMT therapy.

Case Study 7: Allocating Costs and Benefits in Disease Prevention Programs: An Application to Cervical Cancer Screening.—Examines the financial incentives of various interested parties to fund cervical cancer screening and examines the cost effectiveness of screening under various conditions.

Case Study 8: The Cost Effectiveness of Upper Gastrointestinal Endoscopy.—Upper gastrointestinal endoscopy refers to looking at the upper gastrointestinal tract from the esophagus to an upper portion of the small intestine. The instrument used is a flexible fiberoptic endoscope.

Case Study 10: The Costs and Effectiveness of Neonatal Intensive Care.–Neonatal intensive care consists primarily of using highly sophisticated life-support systems to compensate for an infant's lack of full development. The most common technologies are respirators and positive pressure breathing devices for treatment of respiratory distress syndrome, a disorder caused by the infant being born before the lungs are ready for breathing air.

Case Study **11:** Benefit and Cost Analysis of Medical Interventions: The Case of Cimetidine and Peptic Ulcer Disease.—Peptic ulcer is a common disease that affects millions of Americans at some time during their lives. Since March 1978, cimetidine has been prescribed in approximately 60 percent of all ambulatory visits for ulcer disease.

Case Study 12: Assessing Selected Respiratory Therapy Modalities: Trends and Relative Costs in the Washington, D. C., Area.—In its analysis of trends in the use of different respiratory therapy methods, based on data from the Washington, D. C., area, the case study found that the number of IPPB treatments per 100 admissions

decreased about 70 percent, and ultrasonic nebulizer treatments approximately 75 percent. The number of simple aerosol treatments increased over 300 percent and incentive spirometry treatments increased more than 100 percent.

Case Study 14: Cost Benefit/Cost Effectiveness of Medical Technologies: A Case Study of Orthopedic Joint Implants.—The purpose of this study is the assessment of the feasibility and potential usefulness of undertaking cost-effectiveness/cost benefit analysis (CEA/CBA) of orthopedic joint prostheses.

Case Study 15: Elective Hysterectomy: Costs, Risks, and Benefits.—This study concludes that none of the analyses of the risks, costs, and benefits of hysterectomy has found it to be cost effective for sterilization or the prevention of uterine cancer. Most of the costs and risks of hysterectomy occur in the present, whereas the savings and benefits occur when uterine diseases are avoided in the future.

Case Study 16: The Costs and Effectiveness of Nurse Practitioners.—The concept of using nonphysician health professionals to perform basic medical services traditionally provided by physicians emerged in the mid-1960's amidst widespread concern over a perceived physician shortage. Currently there are 22,000 physician extenders in active practice: 13,000 NPs and 9,000 PAs.

Case Study 17: Surgery for Breast Cancer.—Statistics indicate that when breast cancer is discovered in a localized state, the 5-year survival rate is 85 percent. Almost 50 percent of women with breast cancer eventually die of the disease.

TESTIMONY

- House Committee on Interior and Insular Affairs, Subcommittee on Public Lands and National Parks: MX Missile Basing
- Senate Committee on Finance: The Professional Services Review Organization and its potential in medical technology assessment activities
- Senate Committee on Governmental Affairs, Subcommittee on Energy, Nuclear Proliferation and Government Processes: Biomass
- Senate Committee on Labor and Human Resources: National Centers for Health Statistics, Health Services Research, and Health Care Technology
- Senate Committee on Labor and Human Resources: National Library of Medicine Report and the Medical Library Assistance Act
- House Committee on Appropriations, Subcommittee on Interior: Department of Energy's conservation programs
- House Committee on Energy and Commerce, Subcommittee on Energy Conservation and Power: Cogeneration and small power production
- House Committee on Energy and Commerce: OTA Assessment on Determining Cancer Risks from the Environment as it relates to the Toxic Substances Control Act
- Senate Committee on Judiciary, Subcommittee on Administrative Law and Government Relations: Regulatory Procedure Act of 1981
- House Committee on Veterans Affairs: OTA oversight of VA Agent Orange Study
- House Committee on Energy and Commerce, Subcommittee on Health and Environment: Clean Air Act and its relationship to energy development
- House Committee on Interior and Insular Affairs, Subcommittee on Energy and Environment: Nuclear Power Plant Standardization
- House Committee on Science and Technology, Subcommittee on Investigations and Oversight: Energy Models and their role in energy policy analysis
- House Committee on Science and Technology: Needs and benefits of health data and health information systems
- Senate Committee on Appropriations, Subcommittees on Defense and Military Construction: MX Missile Basing
- House Committee on Science and Technology, Subcommittee on Energy Research and Production: H. R. 1909: Nuclear Waste Research, Development, and Demonstration Act of 1981

House Committee on Interior and Insular Affairs, Subcommittee on Public Lands and National Parks: MX Missile Basing

- Senate Committee on Environment and Public Works: Interstate air pollution
- Senate Committee on Finance: U.S. trade policy
- House Committee on Science and Technology, Subcommittee on Investigations and Oversight: Toxic substances research and the National Toxicology Program
- House Committee on Merchant Marine and Fisheries: Promotion, financing, and facilitation of maintenance and deep draft improvement projects for U.S. ports
- House Committee on the Judiciary; Subcommittee on Courts, Civil Liberties and the Administration of Justice: Patent term extension
- House Committee on Science and Technology, Subcommittee on Energy Development and Applications: District heating and cooling
- House Committee on Science and Technology Subcommittee on Energy Research and Development: The High-Level Radioactive Waste Management and Policy Act and H. R. 1993: The Radioactive Waste Research, Development and Policy Act
- Senate Committee on Energy and Natural Resources and Senate Committee on Environment and Public Works, Subcommittee on Nuclear Regulation: The High-Level Radioactive Waste Management and Policy Act and H. R. 1993: The Radioactive Waste Research, Development and Policy Act
- House Committee on Science and Technology, Subcommittee on Science, Research, and Technology: Use of animals in medical research and cancer testing
- Senate Committee on Energy and Natural Resources: S. 1544: The State and Local Energy Block Grant Act of 1981
- Senate Committee on Environment and Public Works: Proposed legislation (S. 1706 and S. 1709) related to acid precipitation control
- House Committee on Energy and Commerce, Subcommittee on Fossil and Synthetic Fuels and House Committee on the Interior and Insular Affairs, Subcommittee on Energy and the Environment: Alternatives to the Alaskan natural gas transportation system
- Senate Committee on Banking, Housing, and Urban Affairs: The West Siberian gas export pipeline
- House Committee on Energy and Commerce, Subcommittee on Oversight and Investigations: Hazardous waste sites
- Senate Committee on Veterans Affairs: Agent Orange Study
- House Committee on Government Operations, Subcommittee on Commerce, Consumers, and Monetary Affairs: Santa Fe International—energy technology transfer
- House Committee on Science and Technology, Subcommittee on Oversight and Investigations: Soviet energy availability