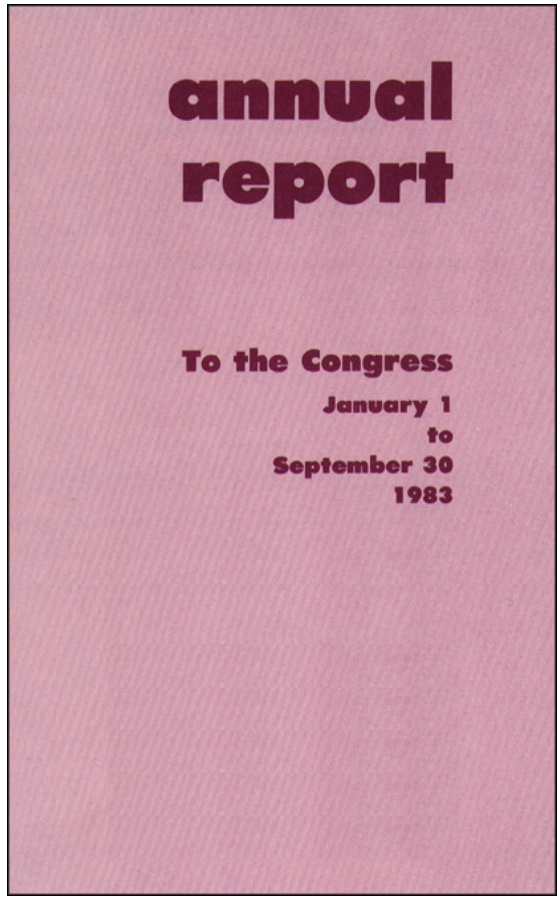
Annual Report to the Congress: January 1 to September 30, 1983

March 1984



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Section I.-Statements by the Chairman and Vice Chairman of the Board, TAAC Chairman, and the Director of OTA

CHAIRMAN'S STATEMENT-CONGRESSMAN MORRIS K. UDALL

The year 1983 was very productive for the Office of Technology Assessment. OTA made substantive contributions to about 60 different committees and subcommittees. They ranged from major, comprehensive reports to testimony and special analyses, Considering the complex and controversial nature of the issues OTA must deal with, it is commendable that its work continues to be given uniformly high marks for quality, fairness, and usefulness.

During 1983, OTA was active in such diverse areas as hazardous and nuclear waste management, acid rain analyses, cost containment of health care, technology and trade policy, Love Canal, wood use, and polygraphs. The evidence of testimony, briefings, other requests for assistance, as well as reception of OTA's products by committees emphasizes the contribution made by OTA to the legislative process.

VICE CHAIRMAN'S STATEMENT-SENATOR TED STEVENS

The lives of our citizens and the issues of government have increasingly been influenced by science and technology. Congressional committees and Members are drawn into the complexity of science and the controversies involving technology as they face the necessary decisions of government. OTA serves as a shared resource of technical and analytical expertise for all committees. OTA's organization and procedures enable it to draw on diverse outside sources of information and advice. This enables OTA to bring to committees a synthesis of national wisdom about key issues, and alternative options for Congress to consider.

The problems faced by Congress are getting increasingly complicated and technical. Over its first decade of existence, OTA has developed and tested a way of providing information that now makes it an essential tool of Congress.

TAAC CHAIRMAN'S STATEMENT-CHARLES N. KIMBALL

During 1983, the Technology Assessment Advisory Council (TAAC) examined several current and recently completed assessments, reconfirming that OTA effectively uses information and advice from across the Nation in carrying out its analyses and critically reviewing its work before publication. TAAC also reviewed the various activities associate with "delivery" of OTA's work, mainly to Congress.

In this regard it is important to note that, from the outset, effective communication with interested committees needs to be maintained. Delivery is far more than transmittal of a document; it is a process that begins with scoping of the work plan, continues in the form of briefings, testimony, and some interim documents, is formalized in publication of the formal report, and then is further employed (sometimes for years) in the form of selected deliveries and follow-on analyses.

Thus OTA's relatively small staff plays several key roles: formulation of studies, organization of work, analysis and synthesis of results, and delivery to Congress. We believe that no other Federal organization is comparably organized in this way, and that the agency is thus uniquely able to serve Congress in wrestling with complex sociotechnical issues.

TAAC has given some thought to the kinds of issues that continue to merit OTA's attention. These include:

1. long-term implications of advances in life sciences and their application to health care and biotechnology;
2. the general condition of science and technology in the United States, e.g., as it affects long-term economic competitiveness;
3. physical infrastructure issues, including transportation and utilities; and
4. national security questions, especially the impacts of technology.

During 1984, in response to TAB's invitation, TAAC will examine in more detail the kinds of issues we from outside Congress believe merit OTA's attention, At this point it is our impression that the present agenda of work is extraordinarily broad, clearly relevant to public policy questions, and of unusually high quality.

DIRECTOR'S STATEMENT-JOHN H. GIBBONS

"A sense of the future is behind all good politics. Unless we have it, we can give nothing—either wise or decent—to the world. "

C. P. Snow

By the time this report is printed we'll be well within Orwell's year. Of course Orwell picked 1984 rather arbitrarily—his famous novel was written in 1948 so he simply reversed the last two digits. But it serves to remind us of an enigma—the importance of thinking ahead, yet the impossibility to predict the long-term future of the human enterprise with any precision.

OTA was not created to predict the future, but rather to provide a perspective of implications for the future of alternative present actions, and to maintain for Congress a *sense* of the future and implications of emerging developments in science and technology.

The rapidly unfolding saga of science and technology was never more apparent than in 1983, and no abatement appears on the horizon. As usual, there is bad news along with the good. The microscopic world of cells, molecules, and solids of various kinds, combined with human scholarship and inventiveness, is yielding improved ways to communicate, save energy and other resources, diagnose and treat disease, better our crops, and entertain ourselves. But is also makes warfare all that more terrifying, undermines privacy, and revolutionizes our workplace in troublesome ways.

Since Orwell wrote "1984," the molecules of heredity have been discovered, The understanding of the splendid and spectacular mysteries of living things is growing at a blistering pace. We now know the complete chemical structure of some viruses, and are within striking distance of determining the total genetic specification of bacteria. The implications of the extraordinary advance in knowledge are a continuing activity at OTA.

While new knowledge merits a lot of investment and attention, existing resources and institutions are also keys to our survival, growth, and quality of life. Therefore OTA devotes considerable effort to analyzing the state and health of such resources as air and water quality, land productivity, materials, energy, international competitiveness of U.S. industry, the quality and cost effectiveness of health care, and critical areas of national defense.

It is neither possible nor desired that OTA be the fount of wisdom on such a broad array of topics. Therefore, by design, OTA is organized to catalyze and synthesize information on controversial technical issues and to present the facts and alternative options to Congress. Since these issues are of interest to many different congressional committees, OTA acts as a shared, nonpartisan resource for Congress and, through Congress, for the American people.

Section II.-Year in Review

The assessments carried out by OTA cover a wide spectrum of major issues that Congress and the country are facing. A brief summary of each report, published by the Office during the year* is presented in this section. The reader is cautioned that these are synopses of reports. They do not cover the full range of options considered or all of the findings presented in any individual report.

Wood Use: U.S. Competitiveness and Technology

The United States could greatly expand its role in world forest products trade over the next decade and become a net exporter of solid wood and paper products before 1990. For the past 30 years, the United States typically has imported more forest products than it has exported. However, because exports have grown faster than imports, the trade deficit has narrowed. This trend is likely to continue.

Wood Use
U.S. Competitiveness and Technology

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Global demand for a wide range of forest products is growing rapidly, and the best trade opportunities for U.S. producers appear to be in the paper markets of other industrialized nations, particularly Western Europe and Japan, In contrast to many basic U.S. industries, the forest products industry has distinct advantages over its foreign competitors. It is the most productive and among the most efficient in the world, benefiting from a vast and highly productive domestic forest resource.

To capitalize on international trade opportunities, the forest products industry and the Federal Government probably will have to make concerted efforts to promote exports. Although responsibility for developing foreign markets rests primarily with the private sector, Government action could assist in overcoming trade barriers which currently inhibit the competitiveness of U.S. wood products in foreign markets.

Past Government and private sector concerns regarding a possible domestic timber shortfall no longer seem justified. Future timber needs, especially for housing but also for other products, probably have been overestimated. The effects of intensive timber management and the ability of wood utilization technology to stretch the wood resource, have probably been underestimated.

If current trends toward more intensive forest management continue, domestic needs for wood probably can be met without dramatic price

*This OTA Annual Report represents a transition from calendar year reporting to fiscal year reporting. It therefore covers the period January 1 through September 30, 1983.

increases. To achieve the full economic potential of U.S. forestlands, however, some changes in policy would be needed, as would an estimated investment of $10 billion to $15 billion in intensive timber management over the next 35 to 50 years,

Although both the Government and private sectors are now investing in intensive timber management, it is unlikely that current trends will lead to full utilization of U.S. forests. Although the Federal Government does provide financial and technical assistance to nonindustrial private landowners, who own nearly 60 percent of the Nation's commercial timberland, this assistance is often limited by budget constraints and is not necessarily targeted to lands most capable of providing increased timber supplies. Greater emphasis on small-scale forestry research, technical assistance, education, and information programs, combined with more accurate channeling of such assistance to the most suitable recipients, could stimulate private forest productivity.

Under the guidance of the National Forest Management Act of 1976, the U.S. Forest Service periodically prepares programs for and assessments of the Nation's renewable resources. These programs, however, provide little analysis of policies and programs not administered specifically by the U.S. Forest Service, although there are many Federal, State, and local agencies which influence timber supply from public and private lands. The need for increased investments in forest productivity and research and development will be easier to establish with national timber production goals to serve as a guide.

Formulation of forest policy requires up-to-date information about forest acreage, inventories, and growth trends, and realistic assumptions about future demands for forest products. Improvements in the current system for estimating prospective timber supplies and demands are needed if decisionmakers are to have adequate information for design and funding of timber management programs, private landowner assistance, and research needs.

Existing and emerging technologies enable a broad range of wood products to be manufactured from currently underutilized hardwood species and from waste wood material. Expanded research in basic wood chemistry and engineering properties, and research on utilization of hardwoods and waste wood, could increase wood's long-term competitive position relative to other materials, as well as the competitiveness of the U.S. forest products industry. Increased research on hardwood and waste wood utilization could also extend U.S. wood supplies,

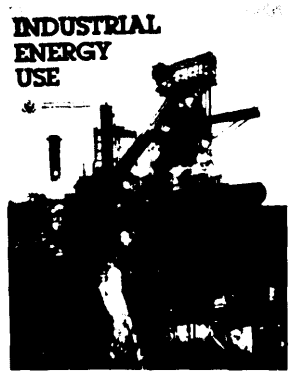
Commercial timber production is only one of the many uses for U.S. forestland. Broad-scale intensive forest management may result in increased soil loss, altered wildlife habitat, reduced water quality, and lower soil productivity. The environmental impacts of intensive forestry are not well understood, and further research on its effects will be needed if the practice becomes more widespread.

Significant changes in Federal programs and policies probably are not required to ensure that future domestic forest products needs are met. However, OTA has identified four general policy options which Congress could consider to increase the domestic and international competitiveness of the forest products industry:

1. Encourage research and development of forestry-related and wood utilization technologies, particularly small-scale forestry research suited to the needs of nonindustrial private landowners, basic wood chemistry and physical properties research, hardwood and waste wood utilization, and research on the environmental effects of intensive timber management.
2. Assist exporters through negotiated reduction in barriers to trade, including tariffs, quotas, and nontariff barriers.
3. Promote the use of U.S. wood products and building techniques overseas, using the Foreign Agriculture Service's experience in agricultural export promotion as a model.
4. Improve the quality of information needed for forest policy formulation, The greatest information needs are for up-to-date timber growth and inventory trends and improved forecasting methods which provide decisionmakers with realistic ranges of possible future timber supply and demand.

Industrial Energy Use

For many years to come, energy need not constrain economic growth in the United States. OTA projects that over the next two decades, investments in new manufacturing processes, a shift to less energy-intensive products, and technical innovation will lead to substantially increased energy efficiency. At the same time, these improvements will increase industrial profitability and competitiveness. As a result, OTA projects that the rate of industrial production can grow considerably faster than the rate of energy use needed for that production.



Corporate investment decisionmaking appears to recognize this link between productivity and energy efficiency, All corporate projects are evaluated in terms of product demand, competition, cost of capital, cost of labor, energy and materials, and Government policy. Energy-related projects are only part of an overall strategy to improve profitability and enhance a corporation's competitive position, OTA has found that corporate capital projects directed solely at improving energy efficiency are not given special status, although energy cost is an important consideration in investment decisions.

OTA examined the four most energy-intensive industries in the U.S. manufacturing sector: paper, petroleum refining, chemicals, and steel. Historical energy use was analyzed, new technologies identified that could improve energy efficiency, and future energy demand projected. In the paper industry, energy use has risen slightly since 1972, but the industry is now more energy self-sufficient. In 1981, the pulp and paper industry generated half of its energy needs from wood residues.

From now through 2000, projections for the petroleum refining industry show a decline in product output, but continued, if only slight, improvement in energy efficiency. Efficiency gains will be offset by a shift to high-sulfur, heavier crude oil feedstock, and a need for additional processing of raw materials to meet market demand for high-octane, unleaded gasoline.

Projections for the chemicals industry indicate an increase in energy efficiency through a combination of technological improvements to existing process equipment, technical innovation in developing new processes, and a shift from commodity chemicals, such as chlorine, to less energy-intensive specialty chemicals, such as pharmaceuticals.

As the steel industry rebuilds to meet foreign competition, production will grow slowly, and will show a large reduction in energy intensity due to greater use of two new processes: the replacement of ingot casting by continuous casting, and the substitution of electric arc furnaces for the blast furnace/basic oxygen furnace combination of traditional steelmaking.

OTA examined four policy options for their effects on industrial energy use. Two options were directed specifically at energy conservation investments, while the remaining two were aimed at stimulating all investment.

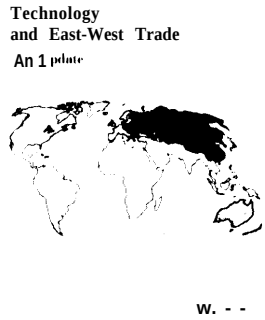
OTA's findings suggest that the most effective Government policies to promote the efficient use of energy are not those specifically targeted to energy use, but those that improve the economic outlook and investment climate by lowering interest rates and expanding demand for goods and services. Specifically, OTA concludes that:

- Reduction in capital costs would be the most effective means of stimulating investments that increase energy efficiency. It would also enhance the effect of the recently enacted accelerated cost recovery system (ACRS).
- ACRS depreciation is a positive stimulus to investment, and thus to energy conservation. But, this effect is only significant when industry is profitable and growing.
- Energy investment tax credits at a lo-percent level have little direct influence on capital allocation decisions in large American firms, and thus have little or no effect on energy conservation. However, energy investment tax credits aimed at third-party financing of energy production, such as cogeneration of steam and electricity, would be effective,

- A tax on premium fuels would stimulate investment in energy-efficient processes and products but would also have negative effects, For example, a premium fuels tax would increase the chemicals industry's vulnerability to foreign competition and adversely affect product sales of the petroleum refining industry.

Technology and East-West Trade: An Update

The recent controversies over trade sanctions and export controls have focused attention on the Export Administration Act, whose renewal is now before Congress. *Technology and East-West Trade: An Update,* discusses a range of legislative proposals in terms of four key policy perspectives:



- national security: making Soviet acquisition of militarily relevant Western technology as difficult and costly as possible;
- foreign policy: safeguarding the President's flexibility in using export controls to advance U.S. foreign policy interests;
- efficiency: making the licensing system more predictable, consistent, and efficient to enable U.S. exporters to plan ahead and to increase compliance; and
- trade promotion: reducing trade restrictions, especially foreign policy controls.

Some of these views are mutually compatible. For example, it is perfectly possible to strengthen national security controls while promoting flexibility in foreign policy controls. Some combinations, however, are inherently in conflict. The conflict between national security and export promotion is obvious, but there are others. For example, the very existence of foreign policy controls over exports introduces an element of unpredictability into export licensing, which works against both efficiency and trade promotion.

The perceived importance of national security controls has risen, as evidence has accumulated that the Soviets have a coordinated and effective program to obtain and exploit Western technology for military purposes. Soviet efforts include both legal and illegal transfers, More effective administration and enforcement of existing controls may be more productive than controlling additional items or categories,

While U.S. trade with the U.S.S.R. is small and likely to remain so, it is important for particular sectors (e. g., grain) and firms (e. g., Caterpillar). Retroactive and extraterritorial controls may have an adverse impact on West-West trade, which far exceeds East-West trade in importance to the United States.

The embargoes on grain and oil and gas technology dramatically illustrate the difficulties of a policy of trade leverage against the Soviet

Union. The sanctions did hurt vulnerable sectors of the Soviet economy, but probably not enough to make a real economic difference. In fact, although such calculations are highly uncertain, the sanctions may have done more damage to the U.S. economy than the Soviet economy. Nor did they change Soviet behavior. The Soviet Union may even have benefited from the public display of Western disunity following the imposition of the pipeline sanctions, which were applied to preexisting contracts of U.S. subsidiaries and licensees based overseas.

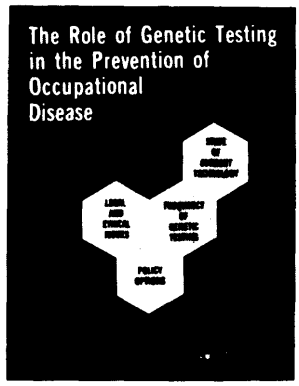
Moreover, tight U.S. export controls require the cooperation of our Allies to have a real effect on the U.S.S.R. Allied cooperation works reasonably well only where there is agreement on what should be controlled. Despite their agreement to conduct policy studies on East-West trade, there is little evidence that the West European countries and Japan will endorse the Reagan administration's position. Their future trade relations with the U.S.S.R. will be shaped more by their own domestic imperatives and worldwide economic forces than by U.S. concerns.

Although the principal issues remain much the same, the stakes in East-West trade have escalated since 1979, when Congress passed the Export Administration Act. Congress was unwilling then to make consistent choices between the goals of national security and export promotion. The result was ambiguous legislation, which has allowed Presidents Carter and Reagan to pursue their own policies, in each case giving foreign policy considerations priority over U.S. export trade.

This report is an update of a more comprehensive OTA report published in 1979.

Role of Genetic Testing in the Prevention of Occupational Disease

Genetic testing in the workplace is an emerging technology that could help reduce occupational disease, but there is concern about its potential misuse. Although none of the genetic tests evaluated by OTA meets established scientific criteria for routine use, existing evidence suggests the value of further research. Routine use of genetic testing, however, would raise significant legal, ethical, and policy questions.



Occupational disease has a serious and far--reaching impact both on society as a whole and on individuals. Genetic testing may be helpful in reducing the incidence of disease resulting from exposure to chemicals and ionizing radiation (e.g., X-rays). The testing encompasses two types of techniques. Genetic screening involves examining an individual for certain inherited genetic traits on the assumption that the traits may predispose the person to disease when he or she is exposed to potentially hazardous chemicals. Genetic monitoring involves examining a group of workers for environmentally induced changes in the genetic material of certain cells in their bodies. The underlying assumption is that the changes indicate exposure to hazardous agents (chemicals or radiation) and that the group may be at an increased risk for disease. The information that might be provided by genetic testing would allow employers or employees to take preventive actions, but some people fear that it could result in employees being unfairly excluded from jobs.

Because of conflicting accounts about the extent of testing in the workplace and the use of the results, OTA surveyed the Fortune 500 industrial companies, the 50 largest private utilities, and 11 major unions representing the largest number of employees in these companies. Of the 366 organizations responding, 6 currently were using one or more tests. 17 used some of the tests in the past 12 years, 4 anticipated testing in the next 5 years, and 55 stated they possibly would test in the next 5 years, Actions taken as a result of testing ranged from informing an employee of potential problems to changing or discontinuing a product. In view of the small number of organizations testing and inherent methodological limitations in the survey, generalization of the results to the entire survey population or US. industry as a whole is not warranted,

Although the law has generally not dealt with genetic testing, many existing legal principles are directly applicable to the issues raised by this technology. An employer is responsible for workplace safety, but would not be required to use genetic testing. Under the Occupational

Safety and Health Act of 1970, the Secretary of Labor could require genetic testing, if the techniques were shown to be reliable and reasonably predictive of future illness, or could regulate testing, but only in relation to employee health. The act grants no direct authority to protect employees or job applicants from employment discrimination.

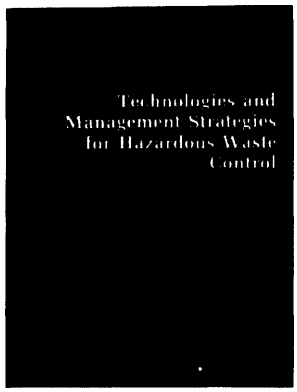
Job applicants or employees who were victims of adverse job actions because of their genetic makeup may have some rights under Federal and State antidiscrimination statutes, and, if genetic makeup were considered a handicap, under the Rehabilitation Act of 1973.

Ethical principles provide some guidance for the appropriate uses of genetic testing. Because of the low correlation between genetic traits or genetic damage from exposure and disease, it would be unethical, for instance, for an employer to deny an applicant a job because of test results.

Congress could take a number of specific actions to promote or control genetic testing. The options include funding additional research for the development of more reliable and predictive tests and constraining employment actions that may be taken on the basis of genetic testing.

Technologies and Management Strategies for Hazardous Waste Control

The Environmental Protection Agency's (EPA) regulations do not assure consistent nationwide levels of protection for human health from the potential effects of massive annual accumulations of hazardous waste.



These regulations for hazardous waste management do not effectively detect, prevent, or control the release of toxic substances into the environment, particularly over the longer term. Yet every year 1 metric ton (tonne) of hazardous waste is added to the environment for every individual in the Nation. Moreover, financial restraints and lack of technical resources will make it difficult for States to fulfill their increased responsibility for waste management policy.

Industry and government are spending $4 billion to $5 billion annually to manage the approximately 250 million tonnes of regulated hazardous waste generated each year, The annual costs are expected to rise to more than $12 billion (in 1981 dollars) in 1990. Some States have stricter definitions for hazardous waste than the Federal program, which regulates about 40 million tonnes annually.

As their responsibilities mount, States fear reductions in Federal support and seek a stronger policy role. States sometimes cannot raise even the required minimum 10 percent of initial Superfund cleanup costs—and they must assume all future operation and maintenance costs.

Because there are no specific Federal technical standards for determining the extent of Superfund cleanup, and because there is an incentive under EPA rules to minimize initial costs, remedial actions may be taken that will prove ineffective in the long term. Much of the $10 billion to $40 billion which will be needed for cleaning up the 15,000 uncontrolled sites of previous disposals so far identified maybe wasted. When Superfund expires in 1985, many uncontrolled sites still will require attention. It is estimated that only $1,6 billion will be collected under Superfund by 1985 for cleanup of these sites.

Inappropriate disposal of hazardous waste on land creates the risk of contaminating the environment, including ground water, which could cause adverse health effects and for which cleanup actions are costly and difficult. As much as 80 percent of regulated hazardous waste—some of which may remain hazardous for years or centuries—is disposed of in or on the land.

In addition, millions of tonnes of federally unregulated or exempted hazardous wastes are disposed of in sanitary landfills (meant for ordinary solid wastes) and pose substantial risks. Such exemptions cover all types of hazardous wastes from generators producing less than 1 tonne a month, and other types of waste, such as infectious waste.

Current policies are likely to lead to the creation of still more uncontrolled sites which will require Superfund attention. The unregulated burning of wastes as fuel supplements in home and industrial boilers may result in toxic air pollutants.

Greater use of alternatives to land disposal could increase industry's near-term costs significantly. However, years or decades from now, cleaning up a site and compensating victims might cost 10 to 100 times today's costs of preventing releases of hazardous wastes.

Federal policies may reduce industry's costs of land disposal by shifting some long-term cleanup and monitoring costs to government or to society as a whole. The effect may be to retard the adoption by industry of alternatives such as waste reduction and waste treatment.

A key policy issue is: Can unnecessary risks and future cleanup costs be eliminated by limiting the use of land disposal, and by making alternatives to it more attractive?

The Federal regulatory program for hazardous waste management was established by the 1976 Resource Conservation and Recovery Act (RCRA), primarily concerned with the proper management and permitting of present and future wastes; and the Comprehensive Environmental, Response, Compensation, and Liability Act of 1980 (CERCLA), or Superfund, enacted to deal with the many substantiated and potential hazards posed by old and often abandoned uncontrolled hazardous waste sites. The OTA study supports the need for greater integration by EPA of these two programs.

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Policy Options

OTA has identified four policy options—beyond maintaining the current Federal program—which could form the basis for an immediate and comprehensive approach to protecting human health and the environment from the dangers posed by mismanagement of hazardous waste:

1. Extend Federal controls to more hazardous wastes, and establish national regulatory standards based on specific technical criteria. Also restrict disposal of high-hazard wastes on land and improve procedures for permitting facilities and deregulating wastes.
2. Establish Federal fees on waste generators to support Superfund and to provide an economic incentive to reduce the generation of waste and discourage land disposal of wastes; impose higher fees on generators of high-hazard wastes that are land-disposed; provide assistance for capital investments and research and development for new waste reduction and treatment efforts.
3. Study the costs and advantages of classifying wastes and waste management facilities by degree of hazard to match hazards and risks with levels of regulatory control.
4. Examine the need for greater integration of Federal environmental programs to remove gaps, overlaps, and inconsistencies in the regulation of hazardous waste, and to make better use of technical data and personnel.

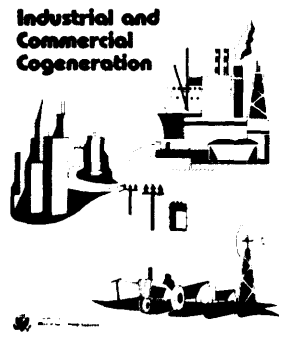
Key Issues and Findings

- Current monitoring practices and EPA requirements under RCRA–especially for land disposal sites—do not lead to a high level of confidence that hazardous releases will be detected and responsive action quickly taken.
- There are numerous technically feasible management options for hazardous wastes, but they are not being used to their full potential. On the whole, Federal programs indirectly provide more incentive for land disposal than for treatment alternatives that permanently remove risks, or for waste reduction—although technologies are available to reduce waste,
- States are being given increasing responsibilities by EPA without matching technical and financial resources. A lack of State funds often prevents Superfund cleanups. A Federal fee system on waste generators could also be used to support State programs. EPA should make better use of State data and expertise.
- Actions that enhance public confidence in the equity, effectiveness, and vigorous enforcement of government programs may reduce public opposition to siting hazardous waste facilities. Opposition may also be reduced by improvement in the dissemination of accurate technical information on issues such as waste treatment alternatives to land disposal,

- EPA's risk assessment procedures for selecting Superfund sites and for developing RCRA regulations have serious technical inadequacies that weaken protection of the public.
- Data inadequacies conceal the scope and complexity of the Nation's hazardous waste problems and impede effective control. There is a need for a long-term, systematic EPA plan for obtaining more complete, reliable data on hazardous waste, facilities, sites, and exposure to and effects from releases of harmful substances.
- Wastes can be classified into at least three categories of hazard and, combined with facility classes, might form a technical base for Federal regulatory policies.

Industrial and Commercial Cogeneration

Cogeneration–the combined production of electricity and useful thermal energy—could contribute significantly to reduced costs and greater planning flexibility for electric utilities, and to increased energy efficiency in industrial facilities, commercial buildings, and rural/agricultural areas. But cogeneration's potentially large market will be limited by technical, economic, and institutional constraints. These include the difficulties in using lower cost solid fuels; competition with conservation measures; mismatches between the ratio of need for electric and thermal energy and the ratios typically produced by a cogenerating unit. The high cost of investment capital will limit opportunities further.



To achieve potential long-term benefits for electric utilities, cogeneration systems must use abundant solid fuels and produce high ratios of electricity to steam (E/S). But the available high E/S systems can use only oil or natural gas. Therefore, research and development efforts should concentrate on developing high E/S cogenerators that can burn solid fuels cleanly, and on advanced combustion and conversion systems such as fluidized beds and gasifiers.

Utility ownership could increase the amount of production as well as the reliability of cogenerated electricity. However, such ownership is at a competitive disadvantage because the Public Utility Regulatory Policies Act of 1978 (PURPA) limits qualifying projects to those in which a utility owns less than 50 percent equity. If the PURPA limitation were removed, concerns about the possible anticompetitive effects of utility ownership could be alleviated through careful State review of utility ownership schemes.

For the near term, natural gas will be the preferred cogeneration fuel where the marginal or avoided cost rates for utility purchases of cogenerated electricity are based on the price of oil, and where natural

gas is available. In the long term, however, natural gas is likely to be too costly for natural-gas-fired cogeneration to compete economically with electricity generated at central station coal, nuclear, or hydroelectric powerplants.

Cogeneration also must compete for investment capital with conservation, which reduces steam loads—and therefore cogeneration's technical potential—and which often has lower unit capital costs and shorter payback periods than cogeneration.

Costs.—The mean capital costs for commercially available cogenerators tend to be 20 to 40 percent lower per kilowatt than central station generating capacity. Also, the relatively small unit size and the shorter construction leadtimes of cogeneration systems mean substantial interest cost savings during construction, and greater flexibility for utilities in adjusting to unexpected changes in electricity demand than the overbuilding of central station capacity.

Electricity Prices.—Cogenerators have potentially lower unit costs for generating electricity than central station powerplants. However, these savings will not necessarily mean lower electricity rates if the price paid to the cogenerator—based on avoided costs—is higher than the utility's retail rates. A price that is less than the utility's full avoided cost, with the difference going toward rate reduction, would share any cost savings from cogeneration with the utility's other ratepayers, but would not provide the maximum possible economic incentive to potential cogenerators.

Interconnection.—The primary issues are the utilities' legal obligation to connect generators with the grid, the cost of the equipment, the lack of uniform guidelines, and the uncertain potential for utility system stability problems. Most of the technical aspects of interconnection are well understood, but additional research is needed to determine whether many cogenerators not centrally dispatched will cause utility system stability problems. If PURPA is not amended to require interconnection, and if utilities do not interconnect voluntarily, then the cost of obtaining an interconnection order from the Federal Energy Regulatory Commission could be prohibitive for many potential cogenerators.

Air Quality Impacts.—Cogeneration will not automatically offer air quality improvement or degradation compared to the separate conversion technologies it will replace. Rather, its impact will vary considerably from case to case. Adverse local air quality impacts from cogeneration are most likely to occur in urban areas,

TECHNICAL MEMORANDA

U.S. Natural Gas Availability: Conventional Gas Supply Through the Year 2000

Describes and evaluates alternative estimates of the conventional natural gas resource base of the lower 48 States; describes and interprets past and current trends in discovery and production of this gas resource; and projects a credible range of potential (conventional) gas production for the next 15 to 20 years.

Quality and Relevance of Research and Related Activities at the Gorgas Memorial Laboratory

Examines the Gorgas Memorial Institute of Tropical and Preventive Medicine, Inc., and its research arm, the Gorgas Memorial Laboratory (GML). It focused on: the quality of research and related activities at GML, and the relevance of GML's work to Panama, tropical America, the United States, and the advancement of tropical medicine knowledge.

Diagnosis Related Groups (DRGs) and the Medicare Program: Implications for Medical Technology

Examines diagnosis related groups, their use in the Medicare payment system, and the potential impact on medical technology use and adoption and on technological change. Also examines the construction of DRGs, and discusses issues in implementation of the system.

Habitability Issues Related to Love Canal

Based on a report published by the U.S. Environmental Protection Agency (EPA) in May 1982, which was reviewed by a multidisciplinary team of consultants for several Federal agencies, the U.S. Department of Health and Human Services judged the Love Canal, N. Y., to be "as habitable as the control areas with which it was compared." OTA critically reviewed EPA's habitability decision.

Agricultural Postharvest* Technology and Marketing Economics Research

Examines the role of the public sector in postharvest technology and marketing economics research. It describes the development of the public sector research effort; measures the cost, benefits, burdens, and quality of the research; presents guidelines for the public and private research participants; and evaluates the public sector management and policy programs.

Unispace '82: A Context for Intonational Cooperation and Competition

Discusses the issues that arose at this international conference, the positions taken by the United States, and the lessons that can be applied to future international cooperation and future civilian activities in space.

Automation and the Workplace: Selected Labor, Education, and Training Issues

Discusses concepts for evaluating the impacts of manufacturing automation, and describes the conduct of education, training, and retraining for persons seeking or holding jobs in manufacturing industries.

BACKGROUND PAPERS

The Impact of Randomized Clinical Trials on Health Policy and Medical Practice

Provides materials about the history and conduct of randomized clinical trials (RCTS), a family of experiments designed to evaluate the efficacy and safety of medical technologies. It examines the levels of funding over time and the actual and potential use of RCTS in forming health policy. The paper also reviews the ways in which RCTS have affected different areas of medical practice. Finally, it draws together suggestions from the literature and from people knowledgeable in the field for more effective use of RCTS in policymaking and in improving the practice of medicine.

Water-Related Technologies for Sustainable Agriculture in U.S. Arid/Semiarid Lands: Selected Foreign Experience

Highlights examples of water-related technologies that have been successfully applied in arid and semiarid foreign countries in a manner not being applied in the United States—integrated irrigation management in Pakistan, intensive water use planning in Israel, cooperative plant breeding in Senegal, native game ranching in Kenya, and guayule production in Australia.

Sustaining Tropical Forest Resources: U.S. and International Institutions

Describes Government, academic, and private sector institutions in the United States that are developing or implementing technologies to sustain tropical forest resources.

Sustaining Tropical Forest Resources Reforestation of Degraded Lands

Describes the state of the art in use of forestry technologies to restore the productivity of tropical lands that have been degraded because of human activity.

Technology, Innovation, and Regional Economic Development: Cencus of State Government Initiatives for High-Technology Industrial Development

Identifies dedicated State government programs for high-technology firms.

The Information Content of Premanufacture Notices

The study assesses the extent to which current premanufacturing notice submissions either fulfill or compromise efforts to perform the preventive health and environmental protection mandate of the Toxic Substances Control Act.

Technology and Handicapped People, Background Paper #2: Selected Telecommunication Devices for Hearing-impaired Persons

Examines specific factors that affect the research and development, evaluation, diffusion and marketing, delivery, use, and financing of technologies directly related to disabled persons.

CASE STUDIES

Medical Technology and Costs of the Medicare Program: Variation in Hospital Length of Stay: Their Relationship to Health Outcomes

Examines evidence on how variations in length of hospital stay affect patient outcomes and the implications of changes in length of stay for quality of care, access, and Medicare program costs.

Medical Technology and Costs of the Medicare Program Efficacy and Cost Effectiveness of Therapeutic Apheresis

Examines the scientific literature on the safety, efficacy, and costs of the therapeutic apheresis (a costly procedure used to treat an increasing number of medical conditions) with particular emphasis on implications for the Medicare program.

Medical Technology and Costs of the Medcare Program: THe Effectiveness and Costs of Alcoholism Treatment

Examines the evidence of alcoholism treatment in a variety of settings: inpatient care, outpatient hospital care, community-based treatment centers, etc., as well as the effectiveness of various methods of treatment (chemical aversion therapy, group therapy, and Alcoholics Anonymous].

WORKSHOP PROCEEDINGS

Plants: The Potentials for Extracting Protein, Medicines, and Other Usefu; Chemicals

OTA conducted a workshop designed to identify technological opportunities and constraints for commercially developing protein, pharmaceuticals, chemicals, and other associated extracts from plants generally and tobacco specifically. OTA examined the potential impacts that such technologies might have on improving nutrition and food quality by increasing the availability of high-quality protein. Issues addressed include: quality of current data bases on chemistry of plant extracts; status of bioassay technologies; and social, economic, environmental, and political impacts that such new technologies might generate.

Section III. -Work in Progress

More than 25 projects were in progress during the period January I–September 30, 1983, including 11 new studies.

This section lists the titles of projects, as of September 30, 1983, by OTA's three divisions. For a fuller description of these projects, please refer to the current "Assessment Activities," OTA-PC-105, This booklet may be obtained from OTA by calling OTA's Publishing Office (202) 224-8996.

Energy, Materials, and International Security Division

Effects of technology on the American economic transition

Energy and Materials Program

Strategic responses to an extended oil disruption
Potential U.S. natural gas availability
Nuclear power in an age of uncertainty

Industry, Technology, and Employment Program

Wood in the U.S. economy, Vol. II—Technical Report
Technologies to reduce U.S. materials import vulnerability
Technology and structural unemployment: retraining adult displaced workers
Cleanup of uncontrolled hazardous waste sites under Superfund

International Security and Commerce Program

International competitiveness in electronics
Strategic command, control, communications, and intelligence systems
International cooperation and competitiveness in civilian space activities
Commercialization of land remote sensing (tech. memo)
Technology transfer to the Middle East

Health and Life Sciences Division

Food and Renewable Resources Program

Water-related technologies for sustainable agriculture in U.S. arid/semiarid lands
Technologies to sustain tropical forest resources
Technology, public policy, and the changing structure of American agriculture

Health Program

Evaluation of Agent Orange protocol (mandated study)
Health and safety control technologies in the workplace
Medical technology and costs of the Medicare program
Federal policies and the medical devices industry
Status of biomedical research and related technology for tropical diseases
Blood policy and technology

Biological Applications Program

Commercial biotechnology: an international analysis
Technology and aging in America
Alternatives to animal use in testing and experimentation

Science, Information, and Natural Resources Division

Communication and Information Technologies Program
- Patents and the commercialization of new technology
- Computerized manufacturing automation: employment, education, and the workplace
- Effects of information technology on financial services systems
- Information technology research and development
- Information and communication technologies and the office

Oceans and Environment Program
- Managing commercial high-level radioactive waste
- Acid rain and transported air pollutants: implications for public policy
- Wetlands: their use and regulation
- Technologies to measure, monitor, and mitigate ground water contamination

Science, Transportation, and Innovation Program
- Airport system development
- Civilian space stations
- Technology, innovation, and regional economic development
- U.S. passenger rail technologies

Section IV.-Organization and Operations

Created by the Technology Assessment Act of 1972 (86 Stat. 797), OTA is a part of and is responsible to the legislative branch of the Federal Government. OTA received funding in November 1973 and began operations as the second session of the 93d Congress convened in January 1974.

The act provides for a bipartisan Congressional Board, a Director, and such other employees and consultants as may be necessary to conduct the Office's work.

The Congressional Board is made up of six Senators, appointed by the President pro tempore of the Senate, and six Representatives, appointed by the Speaker of the House, evenly divided by party. In 1983, Cong. Morris Udall (D-Arizona) and Sen. Ted Stevens (R-Alaska) served as the Chairman and Vice Chairman, respectively, of the Board. The two posts alternate between the Senate and House with each Congress. The Board members from each House select their respective officer.

The Congressional Board sets the policies of the Office and is the sole and exclusive body governing OTA. The Board appoints the Director, who is OTA's chief executive officer and a nonvoting member of the Board.

The act also calls for a Technology Assessment Advisory Council comprised of 10 public members eminent in scientific, technological, and educational fields, the Comptroller General of the United States, and the Director of the Congressional Research Service of the Library of Congress. The Advisory Council advises the Board and the Director on such matters as the balance, comprehensiveness, and quality of OTA's work, and OTA's nongovernmental resources.

In providing assistance to Congress, OTA is to: identify existing or probable impacts of technology or technological programs; where possible, ascertain cause-and-effect relationships of the applications of technology; identify alternative technological methods of implementing specific actions; identify alternative programs for achieving requisite goals; estimate and compare the impacts of alternative methods and programs; present findings of completed analyses to the appropriate legislative authorities; identify areas where additional research or data collection is required to provide support for assessments; and undertake such additional associated activities as may be necessary.

INITIATION, PROCESSING, AND FLOW OF ASSESSMENTS

OTA's primary function is to provide congressional committees with assessments or studies that identify the range of probable consequences, social as well as physical, of policy alternatives affecting the uses of technology. Requests for OTA assessments may be initiated by:

. the chairman of any standing, special, select, or joint committee of Congress, acting alone, at the request of the ranking minority member, or at the request of a majority of the committee members;
- the OTA Board; or
- the OTA Director, in consultation with the Board.

The authorization of specific assessment projects and the allocation of funds for their performance is the responsibility of the OTA Board.

ORGANIZATIONAL STRUCTURE

The Office is organized into three operating divisions, each headed by an assistant director. The three divisions are Energy, Materials, and International Security; Health and Life Sciences; and Science, Information, and Natural Resources. They encompass assessments grouped in the areas of energy and materials; international security and commerce; industry, technology, and employment; biological applications; food and renewable resources; health; communication and information technologies; oceans and environment; and science, transportation, and innovation. See chart detailing OTA's organizational structure.

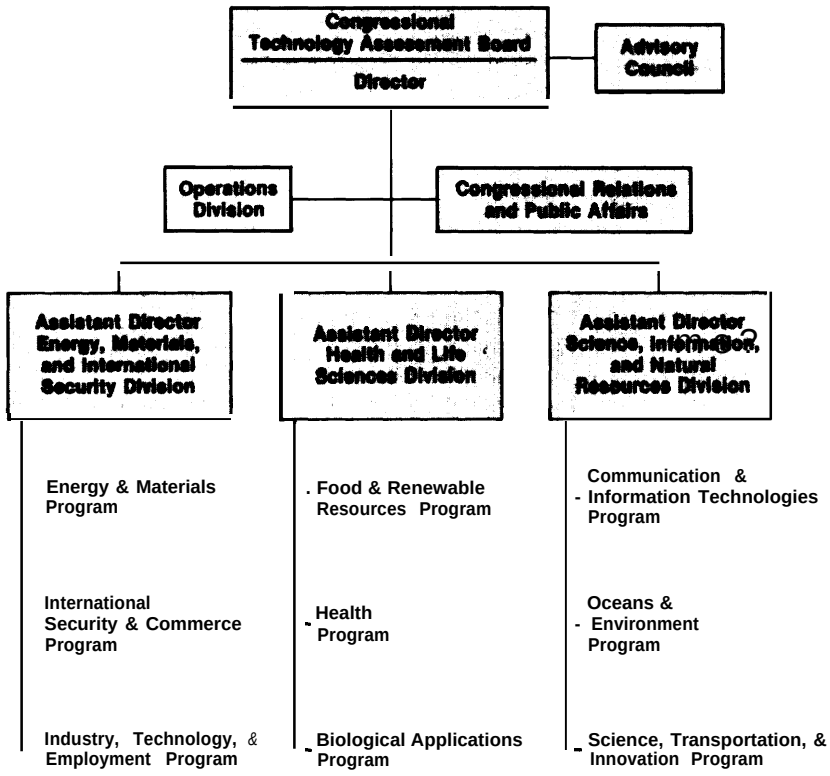
Staff professionals represent a wide range of disciplines and backgrounds, including the physical, biological, and environmental sciences, engineering, social sciences, law, and public administration. Professionals from executive branch agencies, detailed to OTA on a temporary basis, and participants in several congressional fellowship programs also contribute to the work of the Office.

Public Involvement

The private sector is heavily involved in OTA studies as a source of expertise and perspectives while an assessment is in progress. Contractors and consultants are drawn from industry, universities, private research organizations, and public interest groups.

OTA works to ensure that the views of the public are fairly reflected in its assessments. OTA involves the public in many ways—through advisory panels, workshops, surveys, and formal and informal public meetings. These interactions provide citizens with access to information and help OTA identify contrasts between the perspectives of technically trained and lay citizens.

OTA ORGANIZATION CHART



OPERATIONS

Publishing Activities

During the period January 1 through September 30, 1983, OTA delivered 36 published documents to Congress. These included: 11 assessment reports, 7 technical memoranda, 7 background papers, 3 health technology case studies, 1 workshop proceeding, and 7 administrative reports.

Requests for OTA Publications

During the period January 1 through September 30, 1983, OTA's Publishing Office received an average of 120 telephone and mail requests

per day. Additional requests were processed by OTA program offices and the OTA Congressional Relations and Public Affairs Office and are not included in the above statistics.

Private Sector Reprinting of OTA Publications

To date, 41 OTA publications have been reprinted (in whole or in part) by commercial publishers or private organizations. Among the reports reprinted during the 9-month period were the following:

- The International Council for Computers in Education, a nonprofit organization based in Eugene, Oreg., requested permission to reprint the *Summary: Information Technology and Its Impact on American Education* to be used in their international magazine THE COMPUTING TEACHER.
- Springer Publishing Co. (New York) reprinted the publication *Technology and Handicapped People.*
- The University of Phoenix requested permission to reprint the *Summary: The Implications of Cost-Effectiveness Analysis of a Medical Technology*. The document was used as learning material for a course on professional communications at the university.
- Harwood Academic Publishers (New York) requested permission to reprint the *Summary: Managing Commercial High-Level Radioactive Waste.*
- Pergamon International Information Corp. (Virginia) requested permission to reprint *MX Missile Basing* and *The Role of Genetic Testing in the Prevention of Occupational Disease.*
- Educational Research Service, Inc. (Virginia) reprinted the *Summary: Information Technology and Its Impact on American Education* in their periodical SCHOOL RESEARCH FORUM.
- ERIC Clearinghouse on Information Resources (funded by the National Institute of Education) requested permission to reprint the *Summary: Information Technology and Its Impact on American Education.*
- Nikkan Kogyo Shinbun-sha, a Japanese-based publishing company, requested permission to reprint in a Japanese version extractions of OTA's publication *Computer-Based National Information Systems.*

Private Sector Sales

The following is a partial listing of copies sold of reprinted OTA publications during calendar year 1983,

	Number of copies sold
Westview Press	
• Genetic Technologies: A New Frontier	3,905
• Technology and Soviet Energy Availability	395
c Cancer Risks: Assessing and Reducing the Dangers in Our Society	887
• Energy From Biological Processes: Technical and Policy Options	304
McGraw Hill Publishing Co.	
c World Petroleum Availability: 1980-2000	163
• Enhanced Oil Recovery Potential in the U.S.	75
• Energy From Biological Processes: Technical and Environmental Analyses	50
• An Assessment of Oil Shale Technologies	191
Allanheld, Osmun & Co.	
• Technology and East-West Trade	159
• Residential Energy Conservation	115
Q The Effects of Nuclear War	7,126
Cheshire Books	
c The Day After Midnight: The Effects of Nuclear War	12,000
	25,270

Sales of Publications

Government Printing Office.—Sales of OTA publications by the Superintendent of Documents continue to increase, In fiscal year 1983 the number of titles put on sale was 132 and GPO sold 33,125 copies.

National Technical Information Service. -NTIS sells scientific reports and papers that are, generally, not in great demand but are useful for scientific researchers. NTIS is the outlet for OTA's assessment working papers and contractor reports, plus those reports that are out of print by GPO. NTIS has sold 30,218 copies of OTA reports through September 1983.

Organizational Roster of OTA Staff as of September 1983

OFFICE OF THE DIRECTOR

John H. Gibbons, ***Director***
Sue Bachtel, Executive ***Assistant***
Holly Gwin, ***Secretary***
Barbara O'Bryan, ***Secretary***

Congressional Relations and Public Affairs Office

Edwin K. Hall, ***Director of CRPA***
Linda Long, ***Secretary***
Jean McDonald, ***Press Officer***
Annette Taylor, ***Assistant to the Press Officer***
Eugenia Ufholz, ***TAB/TAAC Relations***

Medical Services

Rose McNair, ***Resident Nurse***

ENERGY, MATERIALS, AND INTERNATIONAL SECURITY DIVISION

Lionel S. Johns, ***Assistant Director***
Beth Alexiou, ***Division Assistant***

Technology and Economic Transition

Henry Kelly, ***Project*** Director
Debra Harris, ***Administrative Assistant***

Energy and Materials Program

Richard Rowberg, ***Program Manager***
Thomas Bull, ***Senior Analyst***
Alan Crane, ***Project Director***
Nancy Naismith, ***Project Director***
Steve Plotkin, ***Project Director***
Mary Procter, ***Senior Analyst***
Pidge Quigg, ***Administrative*** Assistant
Jenifer Robison, ***Project Director***
James Ryan, ***Senior Analyst***
Edna Saunders, Secretary
Joanne Seder, ***Analyst***
Richard Thoreson, ***Senior Analyst***

International Security and Commerce Program

Peter Sharfman, ***Program Manager***
Douglas Adkins, ***Senior Analyst***
John Alic, ***Project Director***
Eric Bazques, ***Analyst***
Bruce Blair, ***Project Director***
Richard Dalbello, ***Analyst***
Martha Harris, ***Project Director***
Gordon Law, ***Senior Analyst***
Nancy Lubin, ***Analyst***
Dorothy Richroath, ***Editorial Assistant***
Jacqueline Robinson, ***Administrative Assistant***
Ray Williamson, ***Project Director***

Industry, Technology, and Employment Program

Audrey Buyrn, ***Program Manager***
Lance Antrim, ***Project Director***
Patricia Canavan, ***Secretary***
Carol Drohan, ***Administrative Assistant***
Wendell Fletcher, ***Senior Analyst***
Julie Gorte, Project Director
Joel Hirschhorn, ***Senior Associate***
Karen Larsen, ***Senior Analyst***
Suellen Pirages, Senior Analyst

HEALTH AND LIFE SCIENCES DIVISION

H. David Banta, ***Assistant Director***
Ogechee Koffler, ***Division Assistant***

Biological Applications Program

Gretchen Kolsrud, ***Program Manager***
Susan Clymer, ***Research Analyst***
Robert Cook-Deegan, Analyst
David McCallum, ***Senior Analyst***
Nanette Newell, ***Project Director***
Elma Rubright, *Administrative Assistant*
Louise Williams, ***Senior Analyst***

Food and Renewable Resources Program

Walter E. Parham, ***Program Manager***
Phyllis Balan, ***Administrative Assistant***
Nellie Hammond, ***Secretary***
Alison Hess, ***Research Analyst***
Barbara Lausche, ***Project Director***
Michael Phillips, ***Project Director***
Bruce Ross, ***Project Director***
Carolyn Swarm, ***Secretary***
Phyllis Windle, ***Analyst***

Health Program

Clyde Behney, ***Program Manager***
Anne Kesselman Burns, ***Project Director***
Virginia Cwalina, ***Administrative Assistant***
Hellen Gelband, ***Project Director***
Michael Gough, ***Senior Associate***
Jack Langenbrunner, ***Analyst***
Brenda Miller, Word ***Processor/P.C. Specialist***
Jennifer Nelson, ***Secretary***
Gloria Ruby, ***Analyst***
Jane Sisk, ***Project Director***

SCIENCE, INFORMATION, AND NATURAL RESOURCES DIVISION

John Andelin, ***Assistant Director***
Doris Smith, ***Division Assistant***

Communication and Information Technologies Program

Rick Weingarten, ***Program Manager***
Lauren Ackerman, ***Research Assistant***
Prudence Adler, ***Analyst***
Marjory Blumenthal, ***Project Director***
Beth Brown, ***Project Director***
Elizabeth Emanuel, ***Administrative Assistant***
Linda Garcia, ***Analyst***
Shirley Gayheart, ***Secretary***
Zalman Shaven, ***Project Director***
Jean Smith, ***Analyst***
Donna Valtri, ***Project Director***
Marsha Williams, ***Secretary***
Fred Wood, ***Project Director***

Oceans and Environment Program

Robert Niblock, ***Program Manager***
Chris Ansell, ***Research Analyst***
William Barnard, ***Project Director***
Kathleen Beil, ***Administrative Assistant***
Thomas Cotton, ***Project Director***
James Curlin, ***Senior Associate***
Robert Friedman, ***Project Director***
Joan Ham, ***Analyst***
Peter Johnson, ***Project Director***
Daniel Kevin, ***Analyst***
Jacqueline Mulder, ***Secretary***
Kay Senn, ***Secretary***
Paula Stone, ***Senior Analyst***

Science, Transportation, and Innovation Program

William Mills, ***Program Manager***
Phil Chandler, ***Analyst***
Marsha Fenn, ***Administrative Assistant***
Karen Gamble, ***Analyst***
Bryan Harrison, ***Word Processor Specialist***
Larry L. Jenney, ***Project Director***
Paul Phelps, ***Project Director***
Paula Walden, ***Research Analyst***

OPERATIONS DIVISION

Bart McGarry, ***Operations Manager***
Ann Woodbridge, ***Management Analyst***

Administrative Services

Thomas P. McGurn, ***Administrative Officer***
Susan Carhart, ***Director of Contracts and General Counsel***
Alexandra Ferguson, ***Contract Specialist***
Edith Franzen, ***Conference Center Coordinator***
Lisa Raines, ***Contract Specialist/Attorney***

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Budget and Financial Operations

Jane Easton, Budget and ***Finance Officer***
Joan Camino, Budget ***and Finance Assistant***
Carolyn Harris, Budget ***Specialist and Clerical Assistant***
Loretta O'Brien, ***Data Base Administrator***

Information Center

Martha Dexter, ***Manager, Information Services***
Suzanne Boisclair, ***Information Technician***
Vermille Davis, ***Information Technician***
Diane Rafferty, ***Asst.*** Manager, ***Information Services***

Personnel Office

William Norris, ***Personnel Officer***
Lola Craw, ***Personnel*** *Specialist*
Denise DeSanctis, ***Personnel Assistant***

Publishing Office

John C. Holmes, ***Publishing Officer***
John Bergling, ***Graphic Designer/ Illustrator***
Kathie S. Boss, ***Technical Specialist***
Debra Datcher, ***Administrative Assistant***
Joe Henson, ***Deputy Publishing Officer***

Appendixes

Appendix A
List of Advisors and Panel Members

ENERGY, MATERIALS, AND INTERNATIONAL SECURITY DIVISION

Energy and Materials Program

Industrial and Commercial Cogeneration Advisory Panel

James J. Stukel, ***Chairman***
Director
Public Policy Program
College of Engineering
University of Illinois

Roger Blobaum
Roger Blobaum & Associates

William H. Corkran
General Manager
The Easton Utilities Commission

Claire T. Dedrick*
Air Resources Board
State of California

Steven Ferrey
Energy Counsel
National Consumer Law Center, Inc.

Todd La Porte
Institute of Government Studies
University of California

Evelyn Murphy
c/o Evelyn Murphy Committee

Theodore J. Nagel
Senior Executive Vice President
American Electric Power Service Corp.

Thomas W. Reddoch
Associate Professor of Electrical Engineering
University of Tennessee

Bertram Schwartz
Senior Vice President
Consolidated Edison Co. of New York

Harry M. Trebing
Director, Institute of Public Utilities
Michigan State University

Thomas F. Widmer
Vice President, Engineering
Thermo Electron Corp.

Robert H. Williams
Center for Environmental Studies
Princeton University

Industrial Energy Use Advisory Panel

Herbert Fusfeld, ***Chairman***
Director
Center for Science and Technology Policy
New York University

E. Milton Bevington
President
Servidyne, Inc.

Harold Bogart
Consultant

Carlton Burtt
Equitable Life Assurance Society

William U. Chandler
Senior Associate
Worldwatch Institute

William Cunningham
Research Department
AFL-CIO

Gordon Geiger
Director of Technology
North Star Steel

J. M. Leathers
Vice President
Dow Chemical Co.

Harvey N. Morris
President
Harvey Morris Associates

John Myers
Professor
Department of Economics
Southern Illinois University

Henry Page
Manager
Federal Government Relations
Sun Refining & Marketing Co.

Rudolph G. Penner
Resident Scholar
American Enterprise Institute

Richard Pool
Associate Director of Energy
Kaiser Aluminum & Chemicals Corp.

*Ex-officio member from the OTA Technology Assessment Advisory Council

Rosalie Wolf
Treasurer
International Paper Co.

Nuclear Power in an Age of Uncertainty Advisory Panel

George Rathjens, ***Chairman***
Professor
Center for International Studies
Harvard University

James K. Asseltine
Commissioner
U.S. Nuclear Regulatory Commission

Jan Beyea
Senior Scientist
National Audubon Society

Richard Dean
Vice President
General Atomic Corp.

Thomas Dillon
Principal Deputy Assistant Secretary
for Nuclear Energy
U.S. Department of Energy

George Dilworth
Assistant General Manager
Tennessee Valley Authority

Linn Draper
Vice President
Gulf States Utilities

Victor Gilinsky
Commissioner
U.S. Nuclear Regulatory Commission

Fritz Heimann, Esq.
Counsel
General Electric Co.

Leonard Hyman
Vice President
Merrill Lynch, Pierce, Fenner & Smith

Robert Koger
Chairman
North Carolina Utilities Commission

Myron Kratzer
Vice President
International Energy Associates, Ltd.

Byron Lee
Senior Vice President
Commonwealth Edison

Jessica Tuchman Mathews
Vice President
World Resources Institute

Arthur Porter

David Rose
Professor of Nuclear Physics
Massachusetts Institute of Technology

Lee Schipper
Staff Scientist
Lawrence Berkeley Labs

James Sweeney
Director
Energy Modeling Forum
Stanford University

Eric Van Loon
Executive Director
Union of Concerned Scientists

Potential U.S. Natural Gas Availability Advisory Panel

William Vogely, Chairman
Department of Mineral Economics
Pennsylvania State University

Marc Cooper
Research Consultant
Consumer Energy Council of America

Lloyd Elkins
Petroleum Consultant

Ed Erickson
Professor of Economics and Business
Department of Economics and Business
North Carolina State University

Daniel Grubb
Vice President, Gas Supply
Natural Gas Pipeline Co.

John Haun
Professor of Geology
Colorado School of Mines

Donald Kash
Director
Science and Public Policy Program
University of Oklahoma

Harry C. Kent
Director
Potential Gas Agency
Colorado School of Mines

Lawrence Moss
Independent Consultant

Roy E. Roadifer
Chief Geologist
Mobil Oil Corp.

Benjamin Schlesinger
Principal
Energy and Environment Division
Booz, Allen & Hamilton, Inc.

John C. Sharer
Assistant Director
Unconventional Natural Gas
Gas Research Institute

John Weyant
Deputy Director
Energy Modeling Forum
Stanford University

Ex. ***Officio:***

John Schanz
Senior Specialist in Energy Research Policy
Congressional Research Service
Library of Congress

Strategic Responses to an Extended Oil Disruption Advisory Panel

Rodney W. Nichols, *Chairman*
Executive Vice President
The Rockefeller University

Al Alm
Deputy Director
U.S. Environmental Protection Agency

Richard E. Archer
Assistant Professor
Design Program
Southern Illinois University

Jan Brinch
Independent Consultant
Energy Analysis and Planning
Mueller Associates

Nazli Choucri
Professor
Department of Political Science
Massachusetts Institute of Technology

Ernest L. Daman
Senior Vice President
Foster Wheeler Corp.

Michael Del Grande
Manager, Energy and Environment
American Telephone & Telegraph Co.

Bob Hemphill, Jr.
Associate Director
Applied Energy Services, Inc.

Brad Holloman
New York State Energy Research Development Authority

Robert L. Judd
Director
Governor's Office of Appropriate Technology
State of California

Terry Lash
Deputy Director
Department of Nuclear Safety
State of Illinois

Ray Maliszewski
Assistant Vice President
Bulk Transmission Planning
American Electric Power Service Corp.

Hal Miller, Jr.
Vice President for Planning and Rates
Transco Energy Co.

Roberta Nichols
Vice President
Ford Motor Co.

Christopher Palmer
Director, Energy and Environment
National Audubon Society

Richard A. Rettig
Professor
Department of Social Sciences
Illinois Institute of Technology

Walter S. Salant
Senior Economist (retired)
The Brookings Institution

Joanna Underwood
Executive Director
INFORM

Fred Wilson, P.E.
Assistant to the Senior Vice President
Texaco, Inc.

Herb H. Woodson
Director, Center for Energy Studies
University of Texas

International Security and Common. Program

International Competitiveness in Electronics Advisory Panel

Katherine D. Seelman, ***Chairperson***
Consultant
New York, N.Y.

Jack C. Acton
Executive Vice President
Kennemetal Inc.

Steve Beckman
Research Analyst
Industrial Union Department
AFL-CIO

A. Terry Brix
President
Temar Ltd.
Seattle, Wash.

Richard P. Case
Lab Director
IBM Corp.

Ruth Schwartz Cowan
Associate Professor of History
SUNY-Stony Brook

William Kay Dairies
Executive Vice President
American Retail Federation

Leonard Dietch
Vice President, Product Development
Zenith Radio Corp.

Isaiah Frank
William Clayton Professor of International Economics
The Johns Hopkins University

F. Willard Griffith, II
President and Chief Executive Officer
GC International

Robert R. Johnson
Senior Vice President
Engineering and Information Systems
Energy Conversion Devices, Inc.

Richard A. Kraft
President
Matsushita Industrial Co.

E. Floyd Kvamme
Vice President and General Manager
National Advanced Systems

Geraldine McArdle
McArdle Associates
Reston, Va.

Charles Phipps
Vice President
Corporate Development
Texas Instruments, Inc.

K. M. Poole
Head, Integrated Circuit Planning Department
Bell Telephone Laboratories

Benjamin M. Rosen
Partner
Sevin Rosen Management Co.

Kate Wilhelm
Author

Robert B. Wood
Director of Research
International Brotherhood of Electrical Workers

Michael Y. Yoshino
Professor of Business Administration
Harvard Business School

Command, Control, Communications, and Intelligence Systems (C^3I) Advisory Panel

John S. Toll, ***Chairman***
President
University of Maryland

Lew Allen, Jr.
General, USAF (Retired)
Director
Jet Propulsion Laboratory

Al Babbitt
Vice President and General Manager
Command Systems
IBM Corp.

Neil Birch
President
Birch Associates, Inc.

Gerald Dinneen
Vice President
Science and Technology
Honeywell

Robert R. Everett
President
The Mitre Corp.

Edward Goldstein
Assistant Vice President
Financial Management
AT&T Co.

Arnold Horelick
The Rand Corp.

William Kaufman
Professor of Political Science
Massachusetts Institute of Technology

Glenn Kent
Lt. General, USAF (Retired)
The Rand Corp.

Isaac C. Kidd, Jr.
Admiral, USN (Retired)
Falls Church, Va.

Kostas J. Liopiros
Consultant
Annandale, Va.

William Perry
Managing Partner
Hambrecht & Quist

Jack Ruina
Professor of Electrical Engineering
Massachusetts Institute of Technology

Brent Scrowcroft
Lt. General, USAF (Retired)
Bethesda, Md.

Walter Slocombe, Esq.
Kaplan & Drysdale

Leon Sloss
President
Leon Sloss Associates

John D. Steinbruner
Director
Foreign Policy Studies Program
The Brookings Institution

John Stenbit
Vice President
Requirements & Group Development
TRW Defense Systems Group

Jerome B. Wiesner
President Emeritus
Massachusetts Institute of Technology

International Cooperation and Competition in Space Advisory Panel

Paul Doty, ***Chairman***
Center for Science and
International Affairs
Harvard University

Benjamin Bova
President
National Space Institute

Robert Evans
Vice President
IBM Corp.

Robert A. Frosch
Vice President, Research
General Motors Research Laboratories

Eilene Galloway
Consultant
Washington, D.C.

Ivan Getting
Consultant
Los Angeles, Calif.

Mireille Gerard
Administrator, Corporate and
Public Programs
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president
ERNO-USA, inc.

Wilbur L. Pritchard
president
Satellite Systems Engineering

Thomas C. Taylor
president
Taylor & Associates, inc.

Hans Traumann
Attache
Scientific and Technological Affairs
Embassy of the Federal Republic of Germany

H. J. Weigand
Consultant
Space Division
Messerschmitt-Bolkow-Blohm

Paul Wunsch
Manager, Instrument Requirement Branch
Teledyne Brown

Workshop: Skylab

Leland Belew
Consultant
Huntsville, Ala.

David Compton
Contractor
History Office
NASA/Johnson Space Center

John Disher
Consultant
Bethesda, Md.

Herbert Friedman
Chairman, Commission on Physical Sciences, Mathematics, and Resources
National Academy of Sciences

Owen Garriott
Astronaut
NASA/Johnson Space Center

Roger Hoffer
Professor, Department of Forestry and Natural Resources
Purdue University

Kenneth Kleinknecht
Manager, Procurement, Manufacturing and Tests for Spacecraft System
Martin Marietta

Charles Mathews
Consultant
Vienna, Va.

Jesco H. Von Puttkamer
Technical Engineer
Operations Management
NASA Headquarters

Edmond Reeves
Chief, Astrophysics Payload Branch
Spacelab Flight Division
NASA Headquarters

William Schneider
Vice President
Control Systems Activity
Computer Sciences Corp.

Robert Snyder
Chief, Separation Processes Branch
Marshall Space Flight Center

Airport System Development Advisory Panel

Don E. Kash, ***Chairman***
Director
Science and Public Policy Program
University of Oklahoma

James H. Anderson
Director, Office Buildings Division
General Services Department
E. I. du Pont de Nemours & Co., Inc.

Joseph Blatt
Consultant
Washington, D.C.

Clifford W. Carpenter
Manager, Airport Development
Boeing Commercial Aircraft Co.

Pierre Champagne
Director of Airport Planning
Transport Canada

H. McKinley Conway
President
Conway Publications

Charilyn Cowan
Staff Director, Committee on Transportation, Commerce and Technology
National Governors' Association

Thomas J. Deane
Vice President, Operating Facilities
Avis Rent-A-Car, Inc.

John Drake
Professor of Air Transportation
School of Aeronautics and Astronautics
Purdue University

William Garrison
Professor
Institute of Transportation Studies
University of California, Berkeley

Aaron Gellman
President
Gellman Research

John Glover
Supervisor, Transportation Planning
Port of Oakland, Calif.

Leonard Griggs
Airport Director
Lambert St. Louis International Airport

Richard L. Harris
Vice President, Public Finance
First Boston Corp.

John Hoyt
Principal Project Manager
Ralph M. Parsons Co.

Jack R. Hunt
President
Embry-Riddle Aeronautical University

Richard Judy
Director of Aviation
Dade County, Fla.

Alfred Kahn
Robert Julius Thorne Professor of Political Economy
Department of Economics
Cornell University

Leonard Martin
Vice President, Passenger Services
Piedmont Airlines

Dorn McGrath
Department of Urban and Regional Planning
George Washington University

Sonny Najera
Director
Division of Aeronautics
State of Arizona

Edmund Nelle, Jr.
President
Butler Aviation International

Jan Roskam
Ackers Distinguished Professor of Aerospace Engineering
University of Kansas

William Supak
Aviation Director
Port of Portland, Oreg.

William Wilson
Vice President, Properties and Facilities
Federal Express Corp.

Technology, Innovation, and Regional Economic Development Advisory Panel

William C. Norris, ***Chairman***
Chairman and Chief Executive Officer
Control Data Corp.

William J. Abernathy*
Professor
Graduate School of Business
Harvard University

William F. Aikman
President
Massachusetts Technology Development Corp.

Henry Cisneros
Mayor, City of San Antonio, Texas

Ella Francis
President
Parkside Association of Philadelphia

Aaron Gellman
President
Gellman Research Associates, Inc.

Don Lee Gevirtz
Chairman
The Foothill Group, Inc.

George W. Haigh
President and Chief Executive Officer
The Toledo Trust Co.

Quentin Lindsey
Science and Public Policy Advisor
Office of the Governor
State of North Carolina

Neal R. Pierce
Contributing Editor
National Journal

David V. Ragone
President
Case Western Reserve University

John Stewart
Assistant General Manager
Tennessee Valley Authority

Ellen Sulzberger Straus
President
WMCA Radio

Alexander B. Trowbridge
President
National Association of Manufacturers

Thomas L. Yount, Jr.
Commissioner of Employment Security
State of Tennessee

* Deceased.

Assessment of U.S. Passenger Rail Technology

Workshop: Railcar Manufacturing

Frank Cihac
Director of Technical and Research Services
American Public Transit Association

Ross Higginbotham
Director of Car Engineering
Mechanical Department
Amtrak

George Krambles
Consultant
Oak Park, Ill.

Richard Sklar
President
Entertainment Express Corp.

Jeffrey Stayer
Manager, Marketing, Planning, and Administration
Westinghouse Electric

Workshop: Magnetic Levitation

Robert Borcherts
Research Scientist
Ford Motor Co.

Mike Daly
Economic Development Director
City of Las Vegas, Nev.

John A. Darling
Director of Cost Analysis and Research
Santa Fe Railway

Ross Higginbotham
Director of Car Engineering
Mechanical Department
Amtrak

Roger Katz
Research Section Head
Sperry Corp.

George Krambles
Consultant
Oak Park, Ill.

Myles Mitchell
Director, Office of Freight and Passenger Research and Development
Federal Railroad Administration

Herbert Richardson
Associate Dean of Engineering
Massachusetts Institute of Technology

Richard Sklar
President
Entertainment Express Corp.

William Wieters
General Manager, Passengers Transport
Conrail

Workshop: Demand, Economic, and Institutional Considerations

Ross Capon
Executive Director
National Association of Railway Passengers

Steve Ditmeyer
Director of Research and Development
Burlington Northern Railroad

John Fischer
Transportation Analyst
Economics Division
Congressional Research Service

Anthony Gomez-Ibanez
Professor
John F. Kennedy School of Government
Harvard University

Ross Higginbotham
Director of Car Engineering
Mechanical Department
Amtrak

Mike Mates
Consultant
Washington, D.C.

Arrego Mongini
Deputy Associate Administrator
Northeast Corridor Improvement Project
Federal Railroad Administration

Gordon Peters
Senior Rail Transportation Specialist
Rail Division
New York State Department of Transportation

Lenore Sek
Transportation Analyst
Economics Division
Congressional Research Service
Library of Congress

Richard Sklar
President
Entertainment Express Corp.

Saul Sokolsky
Senior Engineer
Aerospace Corp.

Lou Thompson
Acting Associate Administrator
Passenger and Freight Services
Northeast Corridor
Federal Railroad Administration

Appendix B
OTA Act

Public Law 92-484
92nd Congress, H. R. 10243
October 13, 1972

An Act

To **establish an Office of Technology Assessment for the Congress us an aid in the identification and consideration of existing and probable impacts of technological application; to amend the National Science Foundation Act of 1950; and for other purposes.**

Be it enacted by the Senate and Rowe of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Technology Assessment Act of 1972".

Technology Assessment **Act of 1972.**

FINDINGS AND DECLARATION OF PURPOSE

SEC. 2. The **Congress hereby finds and declares that:**

(a) As technology continues to change and expand rapidly, its applications are-

(1) large and growing in scale; and

(2) increasingly extensive, pervasive, and critical in their impact, beneficial and adverse, on the natural and social environment,

(b) Therefore, it is essential that, to the fullest extent **possible, the consequences of technological Replications be anticipated, understood, and considered in determination of public policy on existing and emerging national problems.**

(c) The Congress further finds that :

(1) the Federal agencies presently responsible directly to the Congress are not **designed to provide the legislative branch with adequate and timely information, independently developed, relating to the potential impact of technological applications, and**

(2) the present mechanisms of the Congress do not and are not designed to provide the legislative branch with such information.

(d) Accordingly, it is necessary for the Congress to-

(1) equip itself with new and effective means for securing competent, unbiased information concerning the physical, biological, economic, social, and political effects of such applications; and

(2) utilize this information, whenever appropriate, as one factor in the legislative assessment of matters pending before the Congress, particularly in those instances where the Federal Government may be called upon to consider support for. or management or regulation of technological applications.

ESTABLISHMENT OF THE OFFICE OF TECHNOLOGY ASSESSMENT

Sec. 3. (a) In **accordance** with **the findings and declaration of purpose in section 2, there is hereby created the Office of** Technology **Assessment** (hereinafter referred to as the "Office") which shall be **within and responsible to the legislative branch of the Government.**

(b) The Office shall consist of a Technology Assessment Board (hereinafter referred to as the "Board") which shall formulate and promulgate the policies of the (Office, and a Director who shall carry out such pol;icies and administer the operations of the Office.

Technology Assessment Board.

(c) The basic function of the Office shall be to provide early indications of the probable beneficial and adverse impacts of the applications of technology and to develop other coordinate information which may assist the Congress. In carrying out such function, the Office shall :

Duties.

(1) identify existing or probable impacts of technology or technological programs;

(2) where possible, ascertain cause-and-effect relationships:
(3) identify alternative technological methods of implementing specific programs;
(4) identify alternative programs for achieving requisite goals;
(5) make estimates and comparisons of the impacts of alternative methods and programs;
(6) present findings of completed analyses to the appropriate legislative authorities;
(7) identify areas where additional research or data collection is required to provide adequate support for the assessments and estimates described in paragraph (1) through (5) of this subsection; and
(8) undertake such additional associated activities as the appropriate authorities specified under subsection (d) may direct.

(d) Assessment activities undertaken by the Office may be initiated upon the request of:
(1) the chairman of any standing, special, or select committee of either House of the Congress, or of any joint committee of the Congress, acting for himself or at the request of the ranking minority member or a majority of the committee members;
(2) the Board; or
(3) the Director, in consultation with the Board.

Infomation, availability.

(e) Assessments made by the Office, including information, surveys, studies, reports, and findings related thereto, shall be made available to the initiating committee or other appropriate committees of the Congress. In addition, an such information, surveys, studies, reports, and findings produced by the Office may be made available to the public except where-
(1) to do so would violatete security statutes: or
(2) the Board considers it necessary or advisable to withhold such information in accordance with one or more of the numbered paragraphs in section 552(b) of title 5, United States Code.

81 Stat. 54.

TECHNOLOGY ASSESSMENT BOARD

Membership.

SEC. 4. (a) The Board shall consist of thirteen members as follows:
(1) six Members of the Senate, appointed by the President pro tempore of the Senate, three from the majority party and three from the minority party;
(2 six Members of the House of Representatives appointed by the speaker of the House of Representatives, three from the ma majority party and three from the minority party; and
(3) the Director, who shall not be a voting member.

Vacancies,

(b) Vacancies in the membership of the Board shall not affect the power of the remaining members to execute the functions of the Board and shall be filled in the same mannner as in the case of the original Appointment.

Ch. 1 man and vice chai rman.

(c) The Board shall select a chairman and a vice chairman from among its members at the beginning of each Congress. The vice chairman shall act in the place and stead of the chairman in the absence of the chairman. The chairmanship and the vice chairmanship shall ● ltarnate between the Senate and the House of Representatives with each Congress. The chairman during each even-numbered Congress shall be selected by the Members of the House of Representatives on the Board from among their number. The vice chairman during each

Congress shall be chosen in the same manner from that House of Congress other than the House of Congress of which the chairman is a Member.

(d) The Board is authorized to sit and act at such plain and times during the sessions, recesses, and adjourned periods of Congress and upon a vote of a majority of its members, to require by subpena or otherwise the attendance of such witnesses and the production of such books, papers, and documents, to administer such oaths and affirmations, to take such testimony, to procure such printing and binding, and to make such expenditures, as it deems avisable. The Board may make such rules respecting its organization and procedures as it deems necessary. except that no recommendation shall be reported from the Board unless a majority of the Board assent. Subpenas may he issued over the signature of the chairman *of* the Board or of any voting member designated by him or by the *Board,* and ma be served by such person or persons as may be designated by such h airman or member. The chairman of the Board or any voting member thereof may administer oaths or affirmations to witnesses. Meetings. Subpena.

DIRECTOR AND DEPUTY DIRECTOR

SEC. 3. (a) The Director of theOffice of Technnlogy Assessment shall be appointed by the Board and shall serve for a term of six years unless sooner removed by the Board. He shall receive basic pay at the rate provided for level III of the Executive Schedule under section 5314 of title 5, United States Code. Appointment. Compensation. 83 Stat. 863.

(b) In addition to the powers and duties vested in him by this Act. the Director shall exercise such powers and duties as may be delegated to him by the Board.

(c) The Director may appoint with the approval of the Board, a Deputy Director who shall perform such functions as the Director may prescribe and who shall be Acting Director during the ● lmence or incapacity of the Director or in the event of a vacancy in the office of Director. The Deputy Director shall receive basic pay at the rate provided for level IV of the Executive Schedule under section 5315 of title 5, United States Code.

(d) Neither the Director nor the Deputy Director shall engage in any other business, vocation, or employment than that of serving ● s such Director or Deputy Director, as the case may be; nor shall the Director or Deputy Director, except with the approval of the Board, hold any office in, or act in any capacity for, any organization, agency, or institution with which the Office makes any contract or other arrangement under this Act. Employment restriction.

AUTHORITY OF THE OFFICE

SEC. 6. (a) The Office shall have the authority, within the limits of available appropriations, to do all things necessary to carry out the provisions o this Act, including. hut without being limited to the authority to--

(1) make full use of competent personnel and organisations outside the Office, public or private, and form special ad hoc task forces or make other ● rmngements when appropriate;

(2) enter into contracts or other arrangements as may be necessary for the conduct *of the* work of the Office with any agency or instrumentality of the United States, with any State, territory, Contracts.

or possession or any political subdivision thereof, or with any person, firm, association, corporation or educational institution, with or without reimbursement, without performance or other bonds, and without regard to section 3709 of the Revised Statutes (41 U.S.C. 5) ;

(8) make advance, progress, and other payments which relate to technology assessment without regard to the provisions of section 3648 of the Revised Statutes (31 U.S.C. 529);

(4) accept and utilize the services of voluntary and uncompensated personnel necessary for the conduct of the work of the Office and provide transportation and subsistence as authorized by section 5703 of title 5, United States Code, for persons serving without compensation;

80 Stat. 499; 93 *Stat.* 190.

(5) acquire by purchase, lease, loan, or gift, and hold and dispose of by sale, lease, or loan, real and personal property of all kinds necessary for or resulting from the exercise of authority granted by this Act; and

(6) prescribe such rules and regulations as it deems necessary governing the operation and organization of the Office.

Recordkeeping.

(b) Contractors and other parties entering into contracts and other arrangements under this section which involve costs to the Government shall maintain such books and related records as will facilitate an effective audit in such detail and in such manner as shall be prescribed by the Office, and such books and records (and related documents and papers shall be available to the Office and the Comptroller General of the United States, or any of their duly authorized representatives, for the purpose of audit and examination.

(c) The Office in carrying out the revisions of this Act shall not, itself, operate any laboratories, pilot plants or test facilities.

Agency cooperation

(d) The Office is authorized to secure directly from any executive department or agency information, suggestions, estimates, statistics, and technical assistance for the purpose of carrying out its functions under this *Act.* Each such executive department or agency shall furnish the information, suggestions, estimates, statistics, and technical assistance directly to the Office upon its request.

Personnel detail.

(e) On request of the Office, the head of any executive department or agency may detail, with or without reimbursement, any of its personnel to assist the Office in carrying out its functions under this Act.

(f) The Director shall. in accordance with such policies as the Board shall prescribe, appoint and fix the compensation of such 'personnel as may be necessary to carry out the provisions of this Act.

ESTABLISHMENT OF THE TECHNOLOGY ASSESSMENT ADVISORY COUNCIL

SEC. 7. (a) The Office shall establish a Technology Assessment Advisory Council (hereinafter *referred to as* the "Council"). The Council shall be composed of the following twelve members:

Membership.

(1) ten members from the public, to be appointed by the Board. who shall be persons eminent in one or more fields of the physical. biological, or social sciences or engineering or experienced in the administration of technological activities, or who may be judged qualified on the basis of contributions made to educational or public activities;

(2) the Comptroller General; and

(3) the Director of the Congressional Research Service of the Library of Congress.

(b) The Council, upon request by the Board, shall— Duties.

(1) review and make recommendation to the Board *on* activities undertaken by the Office or on the initiation thereof in accordance with section 3(d);

(2) review and make recommendations to the Board on the findings of any assessment made by or for the Office; and

(3) undertake such additional related tasks as the Board may direct.

(c). The Council by majority vote, shall elect from its members appointed under subsection (a) (1) of this section a Chairman and a Vice Chairman, who shall nerve for ouch time and under such conditions as the Council may prescribe. In the absence of the Chairman in the event of his incapacity, the Vice Chairman shall act as Chairman. Chairman and Vice Chairman.

(d) The term of office of each member *of the Council appointed* under subsection (a) (1) shall be four years except that any such member appointed to *fill* a vacancy occurring prior to the expiration of the term for which his predecessor was appointed shall be appointed for the remainder of such term. No person shall be appointed a member of the Council under subjection (a) (1) more than twice. Terms of the members appointed under subsection (a)(1) shall be staggered so as to establish a rotating membership according to such method as the Board may devise. Term of office.

(e) (1) The members of the Council other than those appointed under subjection (a) (1) shall receive no pay for their services as members *of* the Council. but shall be allow necessary travel expenses (or, in the alternative, mileage for use of privately owned vehicles and a per diem in lieu of subsistance at not to exceed the rate prescribed in sections 5702 and 5704 of title 5, United States Code), and other necessary expenses incurred by them in the performance of duties vested in the Council, without regard to the provisions of subchapter 1 of chapter 57 and section 5731 of title 5. United States Code, and regulations promulgated thereunder. Travel expenses. 80 Stat. 498; 83 Stat. 190. 5 USC 5701.

(2) The members of the Council appointed under subsection (a) (1) shall receive compensation for each day engaged in the actual performance of duties vested in the Council at rates of pay not in excess of the daily equivalent of the highest rate of basic pay set forth in the General Schedule of section 5332(a) of title 5, United States Code, and in addition shall be reimbursed for travel, subsistence, and other necessary expenses in the manner provided for other members of the Council under paragraph (1) of this subsection. Compensation.

UTILIZATION OF THE LIBRARY OF CONGRESS

SEC. 8. (a) To carry out the objective of this Act, the Librarian of Congress is authorized to make available to the Office such services and assistance of the Congressional Research Service as may be appropriate and feasible.

(b) Such services and assistance made available to the Office shall include, but not be limited to, all of the services and assistance which the Congressional Research Service is otherwise authorized to provide to the Congress.

(c) Nothing in this section shall alter or modify any services or responsibilities other than those performed for the Office, which the Congressional Research Service under law performs for or on behalf

of the Congress. The Librarian is, however, authorized to establish within the Congressional Research Service such additional divisions, groups, or other organizational entities as may be necessary to carry out the purpose of this Act.

(d) Services and assistance made available to the Office by the Congressional Research Service in accordance with this section may be provided with or without reimbursement from funds of the Office, as agreed upon by the Board and the Librarian of Congress.

UTILIZATION OF TIIE GENERAL ACCOUNTING OFFICE

Sec. 9. (a) Financia1 and administrative services (including those related to budgeting, accounting, financial reporting, personnel, and procurement) and such other services as may be appropriate shall be provided the Office by the General Accounting Office.

(b) Such services and assistance to the Office shall include, but not be limited to, all of the services and assistance which the General Accounting Office is otherwise authorized to provide to the Congress.

(c) Nothing in this section shall alter or modify any services or responsibilities, other than those performed for the Office, which the General Accounting Office under law performs for or on behalf of the Congress.

(d) Services and asistance made available to the Office by the General Accounting Office in accordance with this section may be provided with or without reimbursement from funds of the Office, as agreed upon by the Board and the Comptroller General.

COOPERATION WITH THE NATIONAL SCIENCE FOUNDATION

SEC. 10. (a) The Office shall maintan a continuing liaison with the National Science Foundation with respect to-

(1) grants and contracts formulated or activated by the Foundation which are for purposes of technology assessment; and

(2) the promotion of coordination in areas of technology assessment, and t e avoidance of unnecesary duplication or overlapping of research activities in the development of technology assessment techniques and pro programs.

Scientific programs, financing. 92 Stat. 360.

(b) Section 3(b) of the National Science Foundation Act of 1950, as amended (42 U.S.C. 1862(b)), is amended to read as follows:

"(b) The Foundation is authorized to initiate and support specific scientific activities in connection with mutters relating to International cooperation, national security, and the effects of scientific applications upon society by making contracts or other arrangements (including grants, loans, and other forms of assistance) for th conduct of such nativities. When initiated or supported pursuant to requests made by any other Federal department or agency, including the office of Technology Assessment, such activities shall be financed whenever feasible from funds transferred to the Foundation by the requesting official as provided in section 14(g), and any such activities shall be unclassified and shall be identified by the Foundation as being undertaken at the request of the appropriate official,"'

64 Stat. 156; 32 Stat. 365, 42 USC 1873.

ANNUAL REPORT

SEC. 11. The Office shall submit to the Congress an annual report which shall include, but not be limited to, an evaluation of technology. assessment techniques and identification, insofar as may be feasible. of tecnological areas and programs requiring future analysis. Such report shall be submitted not later than March 15 of each year.

APPROPRIATION

Sac. 12. (a) To enable the Office to carry out its powers and duties, there is hereby authorized to be appropriated to the Office out of any money in the Treasury not otherwise appropriated, not to exceed $5,000,000 in the aggregate for the two fiscal years ending June 30, 1973, and June 30,194, and thereafter such sums as may be necessary.

(b) Appropriations made pursuant to the authority provided in subsection (a) shall remain available for obligation for expenditure, or for obligation and expenditure for such period or periods as may be specified in the Act making such appropriations.

Approved October 13, 1972.

LEGISLATIVE HISTORY:

HOUSE REPORTS: No. 92-469 (Comm. on Science and Astronautics) and No. 92.1436 (Comm. of Conferance).
SENATE REPORT No. 92-1123 (Comm. on Rules and Administration).
CONGRESSIONAL RECORD, Vol. 118 (1972):
Feb. 6, considered and passed House.
Sept. 14, considered and passed Senate, unended.
Sept. 22, Senate agreed to conference report.
Oct. 4, House agreed to conference report.

U . S . GOVERNMENT PRINTING OFFICE : 1984 O - 25-360