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Proceedings of
THE SOUTHWESTERN ASSEMBLY
April 17-20, 1958

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THE RICE INSTITUTE
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THE SOUTHWESTERN ASSEMBLY

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A Typical Panel Discussion at Fort Clark Ranch
ATOMS FOR POWER
United States Policy in
Atomic Energy Development

Proceedings of
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April 17-20, 1958

A Conference Sponsored by
The Rice Institute in Cooperation with
The American Assembly, Columbia University

at
Jones College, The Rice Institute
and
Fort Clark Ranch, Brackettville, Texas
THE AMERICAN ASSEMBLY

The American Assembly is dedicated to the belief that the free citizens of a democracy can make up their own minds on public questions if they have access to sound, unbiased facts. Established at Columbia University in 1950 by Dwight D. Eisenhower, it is an affiliate of Columbia, with offices in the Graduate School of Business, and is now incorporated as an educational institution by the Regents of the University of the State of New York.

The American Assembly seeks to supply background, define issues, stimulate discussion and evoke conclusions in matters of large public interest. It holds two or more national conferences each year on subjects chosen for importance and timeliness by the American Assembly Board of Trustees. Authorities are retained to write objective background papers presenting essential data and defining the main issues in each subject. This material is made available to participants before sessions of the Assembly. At the non-partisan conferences about sixty men and women widely representative of American leadership meet for several days to discuss the Assembly topic. Their conclusions and recommendations receive wide news coverage.

Major subjects that have been considered by previous Assemblies include relations with Western Europe, monetary policies and inflation, economic security for Americans, the United States and the United Nations, perspectives and prospects in American agriculture, and the United States and the Far East.

Regional assemblies, such as the Southwestern Assembly, are held under the joint auspices of the American Assembly and certain selected universities.
THE SOUTHWESTERN ASSEMBLY

The Southwestern Assembly, co-sponsored by the Rice Institute and the American Assembly of Columbia University, was held at Rice and at the Fort Clark Ranch, Brackettville, Texas, April 17-20, 1958. The subject of discussion was Atoms for Power: United States Policy in Atomic Energy Development. This subject previously had been discussed at the Twelfth American Assembly held at Arden House, Harri man Campus, of Columbia University, October 17-20, 1957.

The background materials prepared for the Columbia discussions were made available to the participants of the Southwestern Assembly. The Final Report of the Twelfth American Assembly, however, was not seen by the Southwestern panel members. On the other hand, the agenda prepared for the American Assembly—except for relatively minor changes—was used at the Fort Clark panel sessions. It is included as a part of this report.

George R. Brown, Chairman of the Board of Trustees of the Rice Institute, was a member of the Twelfth American Assembly. When Henry M. Wriston, President of the Assembly, suggested that the Rice Institute sponsor a Southwestern Assembly on the same subject, Mr. Brown proposed that the actual panel discussions be held at the Fort Clark Ranch, far from the distractions of a large city. This counter-proposal was accepted. Accordingly the participants met on the Rice Campus at the Mary Gibbs Jones College for the initial luncheon and for the organizational briefing. The entire party was then transported by private planes to the Ranch.

Membership in the Assembly was comprised of some seventy leaders in public affairs representing agriculture, business and industry, science, engineering, medicine, labor, commerce, banking, the clergy, the law, the press, military
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services, and education both private and public. The roster was drawn from the States of Louisiana, Michigan, Missouri, New Mexico, New York, Oklahoma, Pennsylvania and Texas.

ACKNOWLEDGEMENTS

The Southwestern Assembly required an unusual amount of planning and cooperation because of the fact it was held at two places separated by more than 300 miles. Fortunately the Rice Institute staff had the benefit of the advice and assistance of two of the Trustees of the American Assembly who live in Houston: Mrs. Oveta Culp Hobby, President, The Houston Post, and L. F. McCollum, president, The Continental Oil Company. Their statements regarding the Assembly comprise a part of this report.

Henry M. Wriston, President, and Clifford C. Nelson, Vice-President of the American Assembly, were very helpful both in the planning and operational stages of the Assembly. The Rice Institute is also grateful to Brown & Root Construction Company, Dow Chemical Company, Continental Oil Company, Humble Oil & Refining Company, Tennessee Gas Transmission Company, Texas Eastern Gas Transmission Company, and Westinghouse Electric Company for supplying the company planes which made the trips to and from the Fort Clark Ranch possible. Thanks are also due several individuals whose private planes expedited the solving of transportational difficulties.

The principal speakers, Robert McKinney and J. A. Hutcheson, complicated their already complex schedules in order to fit into the Fort Clark program and their cooperation is deeply appreciated. Members of the Administrative and Service staff of the Assembly, whose names are listed elsewhere, as well as the companies which loaned their services,
also deserve the thanks of all the participants. Miss Carolyn Cason, Director of Food Services, and Whitlock Zander, Alumni Secretary of the Rice Institute, and Bob Ross and Mrs. Loraine Dahlstrom, Manager and Resident Manager respectively of the Fort Clark Ranch, all played important roles in making the Southwestern Assembly a success.

Finally the Rice Institute and both the American and Southwestern Assemblies are deeply indebted to Mr. and Mrs. Herman Brown and Mr. and Mrs. George R. Brown for making the fine facilities of the Fort Clark Ranch available to the Institute and thus to the participants in the Assembly.
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SCHEDULE

THURSDAY, April 17

11:30-12:30  Assemble, Jones College Lounge, the Rice Institute Campus, Houston
12:15   Luncheon, Jones College
1:15 Comments on organization and introductions—Carey Croneis
Welcome—George R. Brown, Chairman, Board of Governors, the Rice Institute
The American Assembly—Henry M. Wriston, President
3:00- 3:15 Departure by plane for Fort Clark Ranch, Bracketville, Texas
5:30- 6:30 Social Hour, Fort Clark Ranch Headquarters
6:45 Dinner, Ranch Headquarters
8:30 First Panel Discussions, Las Moras Hall

FRIDAY, April 18

7:45- 9:00 Breakfast, Ranch Headquarters
9:30 Panel Discussions, Las Moras Hall
10:45 Coffee
1:00 Luncheon, Ranch Headquarters
2:30 Panel Discussions, Las Moras Hall
3:45 Coffee
6:00 Social Hour
7:00 Dinner, Ranch Headquarters
8:30 Address—Robert McKinney, U.S. Representative, International Atomic Energy Agency, Vienna

SATURDAY, April 19

7:30- 8:30 Breakfast, Ranch Headquarters
8:45 Panel Discussions, Las Moras Hall

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10:00 Coffee
11:45 Luncheon, Ranch Headquarters
1:00 Bus Leaves for Short Excursion to Piedras Negras, Mexico
5:30 Social Hour and Barbecue, Ranch Pool Area
Remarks—W. V. Houston, President, the Rice Institute
Address—J. A. Hutcheson, Vice President in Charge of Research, Westinghouse Electric Company, Ranch Headquarters

SUNDAY, April 20
7:45-8:45 Breakfast, Ranch Headquarters
9:00 Plenary Session, Ranch Theatre
10:15 Coffee
12:00-1:15 Buffet Luncheon, Ranch Headquarters
1:30-1:45 Planes depart for Houston, San Antonio and Dallas
THE OPENING LUNCHEON

JONES COLLEGE COMMONS

April 17, 1958

At the first luncheon session of the Southwestern Assembly, Carey Croneis discussed the plans and projected procedures for the entire meeting. President Wriston outlined the history, organization and functions of the American Assembly essentially as printed elsewhere in this report. His statement at the close of the meetings is also included.

George R. Brown made the speech of welcome which, in condensed version, follows:

"Ladies and Gentlemen:

"Dr. Houston is still in Virginia and, in his absence, I want to welcome you on behalf of the American and Southwestern Assemblies and the Rice Institute.

"Immediately after World War II we at Rice developed a long range program, the objectives of which we have essentially achieved. This program consisted of limiting our students for a period of ten years to an enrollment of 1800, building an outstanding faculty, increasing research and graduate facilities, and completing a building program costing approximately 20 million dollars. During this period of little more than a decade, our costs per student have gone from about $350.00 to more than $1800.00 per year. Despite these costs, students attend the Rice Institute tuition free.

"This year we have completed the fine residential colleges—in the Commons of one of which we are now meeting—and have doubled the number of students living on the campus, which is something over 1,000.

"Again I welcome all of you here today, and I hope that after lunch you will join me in a short walk through the
campus, so that you may see some of the developments of which I have been speaking.”

STATEMENT OF MRS. OVETA CULP HOBBY
WITH REFERENCE TO THE AMERICAN ASSEMBLY
AND THE SOUTHWESTERN ASSEMBLY

“The American Assembly seeks to tap the great reservoir of wisdom and experience which is one of our greatest national resources and to bring to bear on major national problems the clearest and most constructive thinking of which the American people are capable.

“In a free society, it is important that public policy flow, if possible, from a consensus that is the product of careful analysis and mature consideration. The American Assembly seeks to promote this consensus in selected areas. To accomplish this, the broadest possible participation by those who are able to make a helpful contribution is required.

“Regional assemblies like the Southwestern Assembly on Atoms for Power clearly are an important element in the program of the American Assembly and the achievement of its objectives. Even more importantly, they make a real and significant contribution to public understanding of the particular problems involved. Not only do they help to insure the formulation of wise decisions as a basis for solution of these problems but they also enable us, as a nation, to dip deeply into the great pools of leadership capacity with which we are so richly endowed.”

STATEMENT OF L. F. MCCOLLUM WITH REFERENCE TO THE AMERICAN ASSEMBLY AND THE SOUTHWESTERN ASSEMBLY

“In a free society such as ours, the minds, efforts, and energies of many of our most capable leaders are necessarily
directed primarily toward the solution of specific problems in their own fields of activity. However, there has been, and is today, a growing need for our nation to direct the talents of its leading citizens toward the solution of basic national and international problems. The people of our nation and, in fact, the people of the world have never lived through a period in which such problems have loomed so large or have been so pressing. Survival hinges on the solution of these problems.

"The American Assembly was established with the objective of giving leaders from all walks of life the opportunity to meet each other, to reflect upon and discuss problems of this scope and character, and to make their ideas available to the American people. The Assembly was designed to be a breeding place for new ideas—a place with an atmosphere conducive to serious meditation and enlightened inspiration.

"These aims and objectives are carried over from the American Assembly into regional assemblies, such as the Southwestern Assembly. Atoms for Power is a particularly appropriate subject for the Assembly to consider. The history of many civilizations demonstrates beyond all doubt that abundant supplies of energy at low cost are the cornerstone of industrial and economic progress and national security."

**Statement of Henry M. Wriston with Reference to the American Assembly and the Southwestern Assembly**

"The Southwestern Assembly was a great success from our point of view because it was magnificently managed with efficiency and economy.

"Since it is not possible to bring to Arden House all qualified citizens who can constructively participate in the American Assembly, the regional assembly programs have conspicuous benefits. The Assembly in Texas, as an outstand-
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...example, brought to bear on a major national problem—the development of atomic power in the United States—points of view distinctive to the area and of value both for their diversity and their competence.

"It is our earnest hope that as the American Assembly engages in studies of public policy in the future, it can again enlist the interest and cooperation of the Rice Institute."
Identification of Issues and Objectives of Atomic Power Development

1. What are the central issues confronting the United States in atomic power development today?
   a. In the atomic power program within the United States?
   b. In the international atomic power program?

2. What should be the controlling objectives in the United States domestic program for the development of atomic power?

   Considering, among other things, such factors as: United States power needs, long-run and short-run; the advantages of United States leadership in the worldwide race for foreign atomic markets (in developed and underdeveloped countries); the advantages of United States scientific and technological leadership in the nuclear field; the demands of United States foreign policy; the demands of national security policy; our national fiscal resources—should the controlling objective or objectives be:
   a. Development of commercially competitive nuclear power as early as possible?
   b. Development of reactor technology on a broad basis as an experimental foundation for more effective long-run attainment of competitive nuclear power?
   c. Pursuit of a and b as simultaneous and roughly coordinate goals?
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d. Maintenance of a limited experimental power program with major attention devoted to development of other peaceful uses? Or of other sources of power?
e. Long range investigations to discover new reactor concepts and principles?
f. Other objectives?

3. What should be the controlling objectives of the United States international atomic power program? To further the United States position with respect to:
   a. World leadership in the peaceful uses of atomic energy?
   b. National security?
   c. Foreign economic policy and foreign aid?
   d. Foreign trade?
   e. Arms control and the development of international safeguards?
   f. Interests and policies in other ways?

SECOND AND THIRD SESSIONS

Appraisal of the Atomic Power Program Within the United States

1. Is the domestic program achieving the desired objective?
   a. What are the appropriate standards for measuring the progress that has been made to date?
      (1) Numbers, types and size of reactors constructed or under construction.
      (2) Broadened base of participation by industry (suppliers, utilities, etc.).
      (3) Total power produced, or to be produced by a given date.
      (4) Cost of power.
      (5) Relative position in the above respects of the
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United States, United Kingdom and Union of Soviet Socialist Republics.

(6) Others, e.g., absolute criteria.

b. In what respects have we lagged in achieving the desired objective?
   (1) In the government directed program.
   (2) In the private program.
      (a) The Power Demonstration Reactor Program.
      (b) The Independent Industrial Program.
   (3) New developments.
   (4) Uses other than power.

c. What are the principal roadblocks to progress present and future—technological, economic, security, safety?

2. Has there been a proper allocation of responsibility between government and private industry?
   a. Has there been a wise, effective division of effort and adequate coordination between the government and private programs? What should be the focus of attention of the government program? Of the private program? To what extent should they complement, supplement or duplicate each other?
   b. How has the national government succeeded in discharging its multiple assignment as operator, regulator and promoter of atomic activity? Is such an assignment appropriate? Is the federal governmental machinery controlling atomic power development adequate to its task? What is the proper role of the States?
   c. Has the performance of private industry lived up to expectations? Is it able and willing to play a larger role?
   d. What is the relevance, if any, of the “public versus private power” dispute to the debate over acceleration of the national government’s construction of full scale demonstration reactors in the United States?
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e. What special problems in the field of labor management relations are raised by atomic hazards and other considerations peculiar to atomic industry?

3. What changes, if any, should be made in the nature and scale of effort of the domestic program today, and in the operations, functions and relations of government and industry in the conduct of the program?

FOURTH SESSION

Appraisal of United States Program in International Development of Atomic Power

1. What is the relative importance of atomic power and other uses of atomic energy in terms of United States foreign policy objectives?

2. Is the international program attaining the desired objective?

   a. Is the United States making the best use of the multiple instruments available for the execution of its international policies and programs?
      (1) Bilateral agreements for cooperation.
      (2) International Atomic Energy Agency.
      (3) Regional arrangements.
      Is their use properly coordinated?

   b. Is our governmental and other machinery adequate to the task of implementing our foreign program in the atomic power field?

   c. Is the United States maintaining political and economic leadership in the foreign atomic power field? Is it meeting its commitments to other nations?

   d. Are there significant opportunities for American industry in atomic power development abroad? What, if
anything, could further be done by the government to enhance these opportunities?
e. How are United States atomic power activities abroad contributing to foreign economic policy generally, including the foreign aid program as it relates to both developed and underdeveloped countries?
f. Does the United States foreign atomic power policy meet the demands of national defense? Collective security? Armaments Control?
g. Is United States policy toward the International Atomic Energy Agency satisfactory and in harmony with general United States policies toward the United Nations?
h. What is the effect of program on United States national economy?
i. How should United States policy toward EURATOM be developed in the light of NATO and of our aims to assist in the economic rehabilitation and integration of Western Europe?
j. Are there any other aspects of United States plans or activities in the international atomic power field which should receive special attention in an evaluation of the foreign atomic power program?

3. What changes, if any, should be made in the policies and programs of the United States for international power development?
ATOMS FOR POWER: INTERNATIONAL STATUS

Address by Robert McKinney, U.S. Representative, 
International Atomic Energy Agency, Vienna

I have been asked to speak on some of the broad international political and economic implications of atomic power. A few prefatory remarks about the new world organization in this field would therefore seem in order.

The charter of the International Atomic Energy Agency is the product of unanimous agreement between 82 nations which belong to the United Nations or its specialized agencies. At present, it has been ratified by the governments of 65 nations. We are an independent world agency, autonomous, and associated with but not a subsidiary of the United Nations.

We are not a political assembly. We are not a trade association. We are a technical operation which may eventually pay its own way. Depending on the particular circumstance, we may function as manufacturer, wholesaler, distributor, broker, as purveyor of scientific, technical, engineering, auditing or financial services, or as a research complex.

The Agency will sponsor research throughout the world, it will assist in reactor construction, and it will handle isotopes and reactor fuels. Undoubtedly at a later period it will have its own processing and storage plant. International regulation of waste disposal and establishment of radiological standards are Agency business. The Agency will conduct an extensive training program—aimed particularly at developing a body of atomic specialists in the less advanced countries able to carry on their national programs.

Let us think of the International Atomic Energy Agency,
Robert McKinney, U. S. Representative to International Atomic Energy Agency
therefore, as a business, as a new but practical venture in which the member nations have invested in the firm expectation that we will earn a good return.

I should note that only nine out of 65 member nations, three out of 23 governors, and four out of 26 senior Agency officials are from Iron Curtain countries. Certainly our balance of geographical representation will make ideological subversion most difficult. If the performance during our first six months is any indication, I believe the board members and Agency officers now working together will surprise us by their progress. And our high enthusiasm cannot help but bring about an understanding which will make itself strongly felt in negotiations among our member nations in other fields.

**Atomic Training**

The relatively few people now at work in atomic fields throughout the world largely chose their vocations and finished their university training before nuclear energy had been given much attention by our basic educational systems. In consequence, many of those now pioneering on this exciting frontier have entered from other fields—often too late and with too little background for their own fullest attainment and satisfaction.

Our hopes for the future must rest on our ability to interest young people in science and engineering, particularly in the peaceful uses of atomic energy. The attractions are many and great. Already, atomic energy has attracted some of the world's most brilliant minds. Yet I am convinced that the really great figures of the atomic age are still to come. It is the young men and women in high school and college laboratories today who will be the Nobel Prize winners of tomorrow. And some of them will undoubtedly owe the prizes for
their atomic discoveries to the training programs the IAEA is establishing today.

Many countries have already made constructive contributions to the Agency’s training programs. For our part, the United States has contributed one million dollars in fellowships. We plan to contribute a research reactor and laboratory facilities. Such essentials as these are not “give-aways.” Instead, they represent a planned and balanced scheduling of the things we have to do today to ensure that the next generation of nuclear workers will be equal to their tasks.

The Less Advanced Countries

The Agency Statute specifically charges us with a responsibility for assisting the less-advanced countries with their atomic programs for electric power, medicine, agriculture, industry, and research. New and underdeveloped nations are acutely conscious of the potential benefits of atomic energy. They are resolved that they shall not be passed over by the atomic age as they feel they were by the industrial revolution. Regardless of the poverty of their means, they aspire to earn their share and not be petitioners for an atomic dole. Anxiety that nuclear energy was destined to become just one more big power advantage explains why the President’s creative proposal of four years ago for creation of the Agency uncovered such abundant response. We hope to give these countries the benefit of our long and costly experience in nuclear development. A pooling effort such as the Agency provides will mean for these countries a great saving in time, resources and money.

The Need for Atomic Power

Everywhere, every day, the need for electricity is growing—particularly in fuel-short nations. For example, Italy, with
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12 million kilowatts of electric generating capacity now installed, sees her power demand doubling in nine years. Turkey, which has only one-half million kilowatts of installed capacity, sees her requirements doubling in less than five years. Careful surveys of future power requirements in many countries convince us that the world demand for electric power would at least double over the next ten years—given any expectation of meeting that demand.

Without atomic power, that expectation cannot be fulfilled. Four out of every ten people in the world live in countries where any significant expansion of electric output is impossible, unless that expansion is based on the uncertainty of imported fuels. As I see it, this means that through the Agency and otherwise we must stimulate the early construction of civilian atomic power plants abroad in as many countries as are able to make use of them.

The essential raw material of the Agency is nuclear fuel for firing civilian atomic power plants abroad. We will not have carried out one of the main charges laid upon the Agency by our founding nations unless and until we have made civilian atomic power an important contributor to the energy needs of a world at peace. If all goes well, by far the largest part of our business will be eventually devoted to dealing in one way or another with enriched and natural uranium, with thorium and plutonium.

Here for the first time, by international agreement, we have at hand the means for furnishing dependable supplies of nuclear fuels and reactor materials to fill the world’s otherwise inevitable energy deficit. Certainly there is no comparable international organization which can assume long-term obligations for supply of conventional fuels—that is, of oil and coal—stable in quantity and stable in price. So, when viewed in perspective, the Agency takes on truly great significance.
The goal of the United States must be to maintain and continuously make visible world technological leadership in all fields. If we are the first to make civilian atomic power cheap, safe, and simple, we will have won an important advantage in this struggle. But if another nation does so first, the defeat will be even more important—for it could be taken, by extension, as evidence that we are no longer first in the military atomic field. This is true because atomic military developments are necessarily shrouded in secrecy. There can, however, be firsthand observation of atomic supremacy in the peaceful uses of atomic energy. The degree of leadership displayed in civilian atomic energy may be projected by many into estimates of military nuclear strength.

Because of the way world opinion works, it seems to me necessary for the United States to establish and hold world leadership in civilian atomic power as a cornerstone to technological leadership, because we want to do all we can to ensure that our military atomic capability remains a deterrent to aggression. It is essential that the world be kept aware of this leadership. In this endeavor, there can be no better evidence of leadership than reactors of American design or fired with American fuels feeding electricity into light globes and electric motors throughout the world. Over the long run, news stories of new reactors built abroad will do more than news stories from weapons proving grounds.

And the task of demonstrating leadership in nuclear power development is one which our friends and allies in the free world must help to bear. For our part, we can provide people, know-how, and materials for research and development and testing; we have built and can continue to build demonstration plants here in the United States. For their part our
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friends and allies must, by building additional demonstration plants, help gather the body of broad operating experience which can only come from actually running on-the-line atomic power stations. Our friends cannot, and I am sure they will not, sit back and play no part in this competition. The stakes are as high for them as they are for us. Nor can any of us do our parts by often establishing goals for atomic power development, but seldom starting actual construction.

The Ice Pack Begins to Break

The reactor construction programs which are now shaping up in Western Europe, Great Britain, and Japan give promise that the ice pack in which atomic power has long been frozen is finally breaking, and that international collaboration will give great impetus to these and other programs for civilian atomic power, leading to actual on-the-line operation of more civilian reactors at an earlier date than was thought possible even a few months ago.

An extensive market is beginning to take definite form and American industry's stake in it is real. Because the International Atomic Energy Agency will be an international focal point for all these projects, by assuring that potential weapons materials are accounted for and through other forms of support and assistance, the Agency cannot help but be a focal point in the American atomic energy industry. In one or another of the Agency's activities throughout the world, our presently suffering atomic industrialists will see new markets and new help to their salesmen.

But the manufacturing volume implied by the growth of civilian atomic power programs throughout the world is only part of the benefits the United States can expect. International collaboration in the peaceful uses of atomic energy invariably and inevitably is accomplished by a further re-
lease from the restraints of atomic secrecy. Perhaps the most noteworthy example occurred in connection with the first Geneva Conference in 1955. I feel confident that the second Geneva Conference will be the occasion for further presentation of new data on exploitation of both fission and possible fusion power. And there can be no doubt that the effect of our joint activities in Vienna, as need is demonstrated and confidence gained, will be the gradual but positive broadening of existing atomic knowledge and the generation of new knowledge.

PROBLEMS OF REACTOR DEVELOPMENT

As I said a moment ago, what we need most of all to speed our search for low-cost reactors is a large body of actual operating data from plants designed for civilian purposes. We all know the difficulties involved in dealing with new systems as expensive as reactors. Every atomic decision, by business or government, has many ramifications. How will the research and development be financed? What about fuel costs and buy-back prices? Who should have first crack at being permitted to sponsor specific projects? Should public power enterprises be given priority, or should they bid competitively against private utility systems? Where should the first reactors be located? What are the potential hazards to people who live near these reactors and how should these risks be insured?

In our United States program each atomic power demonstration plant is a special case, characterized by its own special problems and special design. A few precedents are being established in limited areas, but the large sums of money involved make it imperative that, until our experience is broader, these precedents be regarded as part of a develop-
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Advantages of an International Program

Not all problems of domestic reactor development apply in making decisions about atomic power programs abroad. Yet reactor operating data developed abroad would make a marked contribution to the body of technical knowledge and fund of operating experience required to hasten low cost atomic power here in the United States.

Such an international atomic power demonstration program, however, carries with it the further important values I touched upon before.

International development of nuclear power, under the American and now the Agency concept, will be accompanied by the means of insuring against diversion to military purposes. This requires a sound and certain inspection system. Our proposals to this effect during negotiation of the Statute were first received with misunderstanding and apprehension by many governments. Yet in the end it was unanimously acknowledged that such controls were indispensable to an atmosphere of mutual confidence in which the peaceful uses of atomic energy could flourish.

What International Inspection Means

The nations which founded the IAEA were willing to pay the price for controls—even if it included outside audit. What was achieved was indeed a political breakthrough. For the first time, East and West agreed that an international body should have an inspection system as an integral part of enforcing international agreements. Foreseeing the growth of civilian atomic power throughout the world, our Statute pro-
vides that the Agency inspectors "shall have access at all
times and to all places and data and to any person who by
reason of his occupation deals with materials, equipment or
facilities which are required by this Statute to be safe-
guarded, as necessary to account for source and special fis-
sionable materials, supplies and fissionable products and to
determine whether there is compliance with the undertaking
against use in furtherance of any military purposes."

Already have the somewhat technical phrases of the
Agency statute covering safeguards been spelled out in black
and white in this world's great languages. To men like you,
their deep meaning requires no interpretation. But let me
paraphrase them in the basic language of hope, so that men
in the street do not find themselves overwhelmed by the
scare headlines of the Space Age: We now have the prospect
that men and women everywhere can watch the building up
of supplies of nuclear fuels in the hands of their neighbors or
even of their potential enemies without fear that they will be
used as weapons against them.

For this interpretation of our Statute into the language of
hope to achieve its full meaning, the International Atomic
Energy Agency must and will now get on with the task of
designing specific procedures which will be workable and
compatible with technical and economic considerations. The
criteria employed in the system so designed, I am sure, will
have worldwide application. Compatible standards must be
applied not only in Agency projects, but also in atomic plants
brought into being under regional or bilateral arrangements.
This step is a matter of the highest priority because it can
lead eventually to our real goal of universal atomic inspec-
tion. Looking to this ultimate goal, we will press for early
coordination by the Agency's Board of Governors of meas-
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uries to develop a materials accountability program, including the important first step of training Agency inspector personnel.

**Civilian Atomic Power vs. Military Stockpiles**

As I come toward the end of my remarks, I should like to summarize and emphasize the reasons why civilian atomic power is one of the main product lines of the International Atomic Energy Agency.

One reason is that atomic power holds promise of becoming profitable because it alone can make available an extensive new energy source to fuel-short, energy-hungry nations.

Another reason is the significant consideration that, if fissionable materials in substantial amounts are devoted to the generation of civilian atomic power under an arms control agreement, the world can create a device—backed up by a real profit motive—which will siphon off nuclear materials from weapons stockpiles. This will not only lessen military potentials throughout the world; it will convert an extremely costly component of these military potentials—fissionable materials—from a sterile status into a status of financial gain and economic benefit.

There is a third important reason. There must be uniform, world-wide rules for health and safety in the atomic field in order to remove this controversial subject from the arena of national political bias and ideological propaganda.

When mankind intrudes on nature's balance of matter, there sometimes result dangerous sources of radiation, the malignancy of which cannot be extinguished or shortened. The most extreme form of radiation danger would of course arise from a war fought with nuclear weapons. Certainly
hazards inherent in using radiation to treat or diagnose man's diseases, accidents involving atomic plants, or in weapons tests for that matter, would be microscopic by comparison. In this problem of radiation, we will all agree that the world must move into every aspect of the Atomic Age with caution, lest we open a Pandora's box to plague our children.

It takes all kinds of people to make a world—even to make a single field such as atomic energy. In the West, many people are working to bring forth to fruition the promise of peaceful applications of the atom. I am sure there are some folks on the other side of the Iron Curtain who want to do the same thing.

There can only be one answer on either side of the Iron Curtain to the problem of controlling hazards of radiation. That answer is obvious, simple and direct: practical and feasible international standards strictly enforced. That the International Atomic Energy Agency is the pioneer in the field of world atomic regulation and is empowered by its Statute to move broadly in the entire field of radiation hazards is genuine cause for world-wide enthusiasm about this new organization.

I do not mean to imply by what I have said here tonight that civilian atomic power is any panacea. I would be the first to agree that, by itself, civilian atomic power is certainly not the answer to the world's quest for peace. Our quest for peace will test our genius to develop many different but complementary mechanisms. If we do succeed in ending the threats to civilization inherent in atomic war—and we must—we will owe our success to the sum total of the workable mechanisms which we devise. Here we lay open the fundamental problem of our age—that progress in human technology has seriously outstripped progress in human relations.
While science has led the way to new conquests in both the microcosmos and the macrocosmos—with pushbutton war ever more feasible—the nature of international relations is such that we can expect no equivalent mock-up for pushbutton peace. Our hopes boil down to the hope for political breakthroughs by men intent on achieving international understanding.

Some folks think the United States objective of diverting fissionable materials from military to peaceful uses is no more than a pious, unattainable dream. Because of what I have already seen of the Agency’s operation, however, I do not share these doubts. I have been convinced by the evidence. Bit by bit, this evidence piles up in the earnest conversations among earnest men about what we have been thinking in long, wakeful flights to Vienna from Ankara, Karachi, Jakarta, Seoul, Tokyo, Washington, Rio de Janeiro, Stockholm, London, Paris, Rome, Bucharest, and Moscow. None can realize better than we the great pressures on the nations most advanced in nuclear technology—that is, on those nations now able to make weapon materials in quantity—to get on with concrete action for using substantial amounts of these weapon materials for civilian atomic power. These pressures come not only from the forces of world opinion; they come also from the deep, diastrophic forces of history.

By itself and alone, propaganda can make no answer to these pressures. They will intensify, until countered by action. And the climax of these forces and counterforces approaches, because the world has now created in Vienna a proving-ground in which the technical prowess and the moral determination of the great powers are on permanent, continuous, open demonstration in side-by-side comparison for judgment by men of all nations. This proving-ground is
no place for disembodied promises. Like the proving-ground of any other practical business, it must be filled by real, live products which people can see and touch. Because the world has the Agency as a proving-ground, the Union of Soviet Socialist Republics will not be able to convince anybody that its known allocations of uranium 235 to civilian purposes, and particularly the 50 kilograms offered to the Agency, are in any way comparable to the dedication by the United States of America of one hundred thousand kilograms to these uses. Half of our commitment is ear-marked for power plants abroad. Five thousand kilograms is our commitment to start the IAEA in business, and we have also offered to match the commitments of other nations until mid-1960.

No juggling with figures can overcome the significance of this offer. In fact, as a result of side-by-side comparison at the Agency proving-ground, the world has begun to realize that the Soviet offer to contribute to the growth of international civilian atomic power must be increased—substantially increased. Otherwise, the parsimonious offer of reactor fuel and the Soviet claim that they have curtailed their military potential by suspending weapons tests, standing side by side, will make each other look hollower with every passing day.

And if the world had at hand a like opportunity for comparison and inspection in the military atomic field, it would soon learn that the Soviet pronouncement now current in the headlines is only the peculiar way of saying, Moscow style, that Russian bomb experts must return to shop and laboratory to work on their 1959 and 1960 models. Only by this process of continuing open comparison in both peaceful and military atomic fields will the USSR be forced into bona fide agreements, enforceable by inspection.
CONCLUSION

How great have been the peaceful atomic achievements of the United States the world is only now beginning even faintly to understand. These achievements, however, will become visible to the world at large as the International Atomic Energy Agency moves toward its objective of applying the peaceful atomic achievements of all nations on a world-wide scale.

Success in this endeavor could eventually point the way to international cooperation on the limitation of nuclear armaments.

Establishing international standards for health and safety of workers, communities and nations involved in reactor operation leads logically to international studies of general radiation hazards.

Misuses for propaganda poison the wellsprings of every household in the world. I therefore hope that it is as clear to you as it is clear to me that, just as the threat to peace lies in the hostile uses of atomic energy, our real promise lies in the peaceful uses.
GREETINGS TO THE SOUTHWESTERN ASSEMBLY

By Dr. W. V. Houston, President of the Rice Institute

May I take this opportunity to extend to all of you my somewhat belated welcome to this Southwestern Assembly. I can only apologize for not being here to greet you on Thursday. But I want to do more than welcome you; I want to congratulate ourselves on having you and to thank you. I want to express my appreciation, and that of the Rice Institute, for your willingness to come together to discuss important questions, questions on which decisions must continually be made. In our country, decisions are made in conformity with effectively expressed public opinion. It is in gatherings like this that ideas can be developed, and principles formulated, to influence the future of this nation and of the world.

For the past fifteen or twenty years people universally by fits and starts, but at an increasing average rate, have been awakening to the fact that the science of the past century, and the technology of the past fifty years are producing most profound changes in our modes of living. This is true in our international relations, and perhaps most importantly in our modes of thinking of ourselves, our philosophies of life. The last war contributed greatly to this realization. Even before it actually began, the scientific and technical skill of the United States, Britain, and Germany was being mobilized. Radar and anti-submarine devices were developed at great speed. But it was not only for devising and developing weapons that science and technology were used. Problems of organization, of logistics, and even the detailed planning of patrol schedules, were subjected to scrutiny by persons skilled in the application of mathematically formulated principles.
And then what one might call the "great awakening" came with the disclosure that the United States had built a nuclear bomb, a bomb whose destructive power lived up to the most terrible predictions of its designers. Reactions to this were varied. Some were reassured with the thought that we now had in our possession a weapon with which we could dictate terms to the rest of the world. Others, and particularly the scientific and technical people, realized that the demonstration of such a weapon would immediately stimulate others to produce similar ones. And you all know the development of thinking and opinion since 1945 along this line.

And then just last October, the people of this country were both surprised and shocked when the Russians launched the first earth satellite. The reaction was more violent than was probably justified. Apparently many people had not realized that scientific and technical development is no special property of the United States. Everyone seemed to want to blame somebody for what was regarded as a loss of face, and eventually attention and blame seemed to center on the schools of the United States. Possibly this vigorous attention to their shortcomings will improve our school system a good deal. But correction of any situation through schools is a long range program.

Among the many activities stimulated by the Sputnik, you will remember, were Senator Johnson's Subcommittee hearings. I had the opportunity to listen to some of the testimony given before that committee. It seemed to me a statesmanlike procedure. Much of it referred to dull matters of organization and administration, of course. But the testimony that commanded the intense attention of everyone, that quieted a normally noisy room, that brought the television cameras into action, was testimony referring to the next great adventure lying ahead for the human race, the conquest of space.
The possibility of human exploration of space outside the earth’s atmosphere was likened to the possibility opened up in the fifteenth and sixteenth centuries for the exploration of the oceans and the western continents. The parallel is apparent. In that age the technological and the scientific development was in the navigation and in the propulsion of ships. It was no small problem for a ship captain to determine his position after weeks out of sight of land. But there were also great commercial and government flurries, extensive and costly planning of expeditions, and extended conflicts over the division of the spoils.

Out of that great age of exploration came a realignment of world power. The influence of the Italian city states declined, to leave the Spaniards and the Portuguese to divide the unknown world between themselves. Such an arrangement, satisfactory as it was to them, did not last long. It was soon superseded by the rise, as a naval power, of that fog-shrouded island in the north Atlantic from which so much of our tradition has come. From the long, long contest between England and Spain there eventually emerged the new principle of the freedom of the seas guarded by the British Navy, a principle of international freedom we recognize today as vital to the commerce and the general security of the world.

Looking backward, the results of that adventurous age seem normal and in the end beneficial. But I am sure there were many in Spain in 1492 who had no desire to sail the western seas.

And today possibly most of us here will be content to live out our lives without seeing the other side of the moon. Nevertheless we can all realize, and to conduct ourselves properly we must realize, that the next century will be a century of exploration, of promise for the whole human race.
The areas of nuclear power, discussed here this weekend, are only part of the questions facing us. For power alone, without a technology to use it, is only a symbol. But power and technology together are not enough. The understanding sympathy of peoples for peoples must be added. The adventure is upon us in all its phases. In this adventure for our people and for our country we have no wish to be left behind.

Just how to play our part in this future is the main problem before us. We do not always see eye to eye on procedure. Men in government, men in science, are after all only men, and argument quite often grows sharp and shrill. I am now and then reminded of the deep cleavage between the Churchill and the Astor coteries, over Hitler's Germany, in the early days when there was still a hope of dealing with it. After one stormy party Lady Astor is reported to have said to Mr. Churchill, "Winston, if you were my husband, I'd put poison in your coffee." And after a twinkling moment, Mr. Churchill replied, "Nancy, if you were my wife, I'd drink it."

But our contentions cannot be allowed to obscure our goals. We must see to it that our country plays a salient part in the adventure that lies ahead.

For our final consideration this evening we shall hear from one who is actively engaged in the technology of the future. Dr. J. A. Hutcheson is Vice-President of the Westinghouse Corporation, in charge of research and engineering. A short time ago the Westinghouse Corporation had the responsibility for building over half of the nuclear reactors under construction outside the Iron Curtain countries.

An engineer, and particularly a research engineer, must, as you know, have a remarkable combination of qualities. First, he must be a visionary. His imagination must range the whole gamut of human desires and ambitions and possibili-
ties. But he cannot be merely a dreamer. He must plot the path to this dream in exact detail. Every nut and bolt, every wire and switch, every vacuum tube and transistor must be fitted to the whole system to perform its precise function. He has to be a man of stature, his head in the clouds and his feet on the ground. And so I am especially glad that we have Dr. Hutcheson to speak this evening on "The Next Fifty Years" as seen by that kind of engineer.
THE NEXT FIFTY YEARS

Address by J. A. Hutcheson, Vice-President, Westinghouse Electric Corporation, Pittsburgh

Tonight, I would like to guess aloud as to what the future might look like say about the year 2000. I’m not going to try to cover all aspects of this question. Rather, I’m going to confine myself to making some guesses as to the future needs for electrical energy and how these needs may be satisfied.

Now as any engineer knows, the process of extrapolation provides a means of predicting what is going to happen in a given situation based upon what has already happened. Again, as any engineer knows, this process is not completely reliable. However, not having a good working crystal ball in my possession, I’ll have to rely on predicting the future based on the past.

First of all, I’m going to assume that everyone knows where we are. By this I mean that everyone has a reasonably good idea of the size of the various elements of our economy. With this assumption, I’d like to take a portion of your time to examine more closely the situation existing today in several industries which I believe are basic to our economy.

I’m sure you’ll pardon me if I first talk about the electrical industry. Today we find ourselves in an industry which is capable of generating 150 million kilowatts of electrical power. Also, we find ourselves in an industry which is and has been doubling in size every decade since the turn of the century. We see nothing which is likely to change this. Therefore, we expect this to continue at this rate well into the future.

Upon examination, we find that population growth alone
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does not account for this. In fact, it has taken more than fifty years for the population of the United States to double. Clearly, then, our per capita use of electrical energy has increased substantially. One main reason for this becomes clear to those of you who remember back say thirty years ago. At that time, television was a laboratory experiment; electrical refrigerators were just coming into being; and deep freezers were not in existence. Some homes had electrically operated washing machines—no one had an electric dryer. Toasters were available, but electric percolators were rare. We had electric lights all right, but we didn’t use them in the quantities we do today. Electric stoves were available, but electric water heaters were like the proverbial hen’s teeth. Now admitting all this, it may not be clear why these things require so much electrical energy. Perhaps this example will help to clarify the matter. If all the television sets in the country are turned on at one time, such as happens when the President is to appear, the power required for them alone is equal to one-tenth of the total generating capacity in the nation. To get an idea as to what might happen if every home that has a television set were to be equipped with a home air conditioning unit (and some people think this day is coming soon) then the power required to operate these would equal today’s ability to generate power.

Of course, another important reason for the increased utilization being made of electrical power is that industry has turned to this as a means for augmenting the output of the labor force. Here the examples are so numerous that to try to even give an impression of them is beyond the scope of this talk. However, I will mention one—the aluminum industry. All of you know how aluminum has become a very important material being used for thousands of purposes ranging from pots and pans to airplanes. What you may not know is that the amount of electric power required in one factory
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producing aluminum is enough to supply a very large city. So much for the growth of the electrical industry and how it came to be that way. Let's take a look at what has happened in another major industry—steel. Upon examination, we find that the amount of steel in use in this country has doubled every twenty years. Here, again, it's not at all difficult to look around us and see why this has happened. We see a tremendous growth in building and can therefore visualize the demand for steel whether it be for girders or rails. If your life is anything like mine, you get an excellent, yes, sometimes too intimate, feel for the way we have continued to increase our demand for steel in the form of automobiles. Here, again, I could go on with hundreds of additional examples, but I'm sure you could too, so let's say no more about steel.

Instead, let's talk about communication. In this field I'm sure I don't need to point out how this industry has grown. I'm sure everyone here has at least one telephone and one radio set, whereas I'm equally sure this was not the case thirty years ago. It's very clear, I am sure, that our use of these devices has grown much faster than our population. In fact, our communications industry has doubled in less than ten years.

In the transportation industry I've already mentioned our use of automobiles which has already grown to the point that we have to undertake drastic road building programs to let us use them effectively. Similarly, the rate at which we have taken to the air for rapid long distance transportation is nearly ten times the rate of growth of our population.

By now I imagine you already know the point I am making, which is this: Our standard of living has increased substantially, and we show no signs of a lessening of our desires to increase it further. Things which a few decades ago were considered luxuries, or were not available at any price, are
today commonplace and are now thought of as necessities. This is what has caused our industries to expand at a rate far in excess of our population growth.

The basic ingredients of an economy are raw materials and available energy. Clearly we must have the materials from which we can make the goods which we demand; and equally clearly, we must have the energy available to process these materials into the desired form. Energy is required to mine the ores which contain the metals we use; energy is required to refine the ores; energy is needed to modify the shape of the metals we employ; in fact, energy is an essential ingredient in all phases of the production of goods. Therefore, one might expect to find some correlation between the use of energy and the standard of living. Examining this point, we find that there is this correlation. If we express the energy used in all forms in terms of the tons of coal we would burn to get the same amount of energy, we find that in the United States our use of energy is equivalent to the use of 8 tons of coal per person per year. In Europe, exclusive of the U.S.S.R., we find that the per capita consumption of energy is equivalent to the use of \( 2\frac{1}{2} \) tons of coal per year. The Japanese use energy equivalent to one ton per person per year. By contrast, in the rest of Asia, where nearly one-half of the world’s population resides, the use of energy is equivalent to one hundred pounds of coal per person annually. Thus, we find as we guessed, there is good correlation between the use of energy and the standard of living.

Now to start guessing about the future, it’s obvious that we, and like us, all the people in the world, will need more and more basic materials. It is equally obvious that as we take these materials from Mother Nature, we must be depleting the supply she has provided. Let’s examine this point a bit further. To do this, I would like to use two common materials, copper and iron, for our study.
Looking first at copper, we find that in the 18th century the use of copper ores in which the copper content was less than 13 per cent was considered impractical. By 1900, the average grade of copper ore being processed was about 5 per cent. By 1950, the average grade of ore used had dropped to .9 per cent, and ore containing as little as .6 per cent was being processed. Although copper consumption is much smaller than that of iron, in order to obtain the copper we use today, it is necessary to handle a quantity of copper ore each year which is equal to the amount of iron ore produced in the United States annually.

The situation relating to iron is quite similar. At the present time, our iron-producing facilities need ore containing about 50 per cent iron. At our present rate of usage, the supply of ore of this quality available in the United States will last about fifteen years. Since 1935, engineers have been developing processes for the enrichment of lower grade ores, starting with ores having as little as 35 per cent iron. Through these developments, increasing use is being made of such ores. However, again at the present rate, the ore of this quality available in the United States will last no more than an additional 25 years. By the time another half century has passed, we will depend for our iron either on the use of still lower grade ores or on the importation of higher grades.

As we use lower grade sources of our raw materials, we must put relatively larger amounts of energy into the system of production. We must handle larger quantities of materials; we must dig deeper into our mines; or we must transport our ores from more distant points, all of which require additional energy.

This leads me to examine the second problem which requires our attention: the production of ever increasing amounts of energy. At the present time, essentially all of our energy comes from fossil fuels, including in this category,
coal, natural gas and petroleum. Together, these account for 96 per cent of our energy supply. The remaining four per cent comes from water power. Again, it is pertinent to look at the world resources of fossil fuels. We find that estimates of these resources vary widely, so to make use of them I have chosen to take the most optimistic and the most pessimistic estimates and give both of them to you. Thus, we find that, combining all fossil fuels into one category and expressing this in terms of equivalent tons of coal, the most optimistic estimate of the world’s resources amounts to 8,000 billion metric tons and the most pessimistic estimate is 800 billion metric tons. At the present world rate of consumption of energy, the time for exhaustion of the world’s reserves is 4,000 years optimistically, or 400 years pessimistically.

Let’s take a second look at the fuel situation. Remember the foregoing figures relate to the world’s resources and the use by the people of the world at the present rate. These figures then allow nothing for an increase in world population or an increase in standard of living throughout the world. The present world population is over 2.6 billion. According to a United Nations’ estimate, the world population will be 3.6 billion by 1980. Again remember the relative standards of living of the world’s people and assume that all of them want to achieve a standard of living equal to that which we enjoy today. Now let’s examine what would happen to the world’s fuel supply if a world population of 3 billion people were enjoying our present standard of living. In this case, the optimistic estimate of the exhaustion time of our fuel supply drops from 4,000 years to 230 years, while the pessimistic estimate drops from 400 years to 23 years. I am not going to attempt a prediction of what is going to happen. Suffice it to say that the trend is in a direction such that by the end of this century the problem of the supply of energy to maintain our standard of living may well be acute.
Let me finally direct your attention to another major problem—that of the production of the goods we want. From figures I have given earlier in this talk, it is clear that our demands for goods is growing at a rate much greater than the rate of growth of our population. As our labor force grows at the same rate as our population grows, it is evident that each laborer must become more productive if we are to continue to get the goods we want. This does not mean that in order to become more productive each laborer must work longer hours and harder. Rather, as I see it, it means each laborer must have more tools provided him so that he can produce more in a given time without working any harder. The provision of these tools we have been calling automation. Automation is not something brand new. Far from it, automation is a present-day word used to describe something that has been going on for a very long time. Consider, for example, the manufacture of ordinary electric lights. My company makes these at the rate of ten a second, day in and day out. These lights are made by machines with very little human effort. This has been going on for decades at rates per machine not significantly smaller. As an idle thought, I wonder how many seconds it would take one of you to assemble a lamp if I gave you all of the necessary raw materials, or even if I gave you all of the component parts in final form? Shall I ask you to estimate how much a lamp would cost at today's labor rates if assembled by hand? But this is not a talk extolling the virtues of automation. Rather, the point I am making is that this technique which we now call automation is a technique which has been developing over a long period of time, a technique which must and will continue to develop so that we can continue to enjoy an improving standard of living.

From the foregoing all too brief analysis, three main points stand out.
1. The ever higher standard of living which we have come to expect and which other world peoples are now more actively seeking will result in an increased use of electrical energy by each of us in our homes.

2. An improved standard of living will require the production of more goods, in turn requiring the availability of more materials the production of which is made possible only through the expenditure of increasing amounts of energy.

3. The fact that our labor force grows at a slower rate than the rate of growth of our demand for the goods produced requires that we provide labor with more tools and more electrical energy so that our demands for goods can be satisfied.

The conclusion, then, is obvious. Our need for electrical energy will continue to increase at about the present rate as long as our standard of living continues to improve. At the present rate of growth, we will need sixteen times as much electrical energy in the year 2000 as we have available today. Clearly, we must concern ourselves with the basic source of energy which we convert into electrical energy. Today this basic store of energy is mainly coal. Tomorrow, however, we must be prepared to get it from other sources, the most promising of which at present is atomic energy. Fortunately, we have time to develop this new energy source in a logical, efficient manner. Your deliberations here today, along with those of others in different places at other times, helps to assure that we as a nation will use this time to best advantage and thus make certain that our sons and daughters will be able to enjoy a continuous improvement in their way of life quite comparable to the improvement which has so enriched our own.
FINAL REPORT: ATOMS FOR POWER

United States Policy in Atomic Energy Development

FOREWORD

The Final Report of the Southwestern Assembly was drafted by Carey Croneis and W. O. Milligan. It was, however, based on the substance of, and in many cases the phraseology of, summaries prepared by panel secretaries William Akers, Earle Barnes and Guy McBride after each session of their own particular panel. That the resultant composite document rather faithfully represented the consensus of the separate panels is demonstrated by the fact that the Report, as printed here, contains relatively few modifications resulting from actions taken at the Plenary Session.

INTRODUCTORY STATEMENT

The participants in the Southwestern Assembly reviewed as a group the following statement with reference to Atoms for Power at the close of their discussions. There was broad general agreement on the Final Report but it is not the practice of the American Assembly or its regional groups to include the signatures of the panel members. Furthermore it should not be assumed that every participant subscribes to every statement incorporated in the Report.

GENERAL OBJECTIVES

The prime objective of the over-all United States atomic energy program should be to further in every possible way all the legitimate interests of all of the people of the United States.

Detailed operating objectives involve consideration of ac-
celerated and enhanced nuclear studies both at home and abroad. With specific reference to atomic power programs, detailed technical objectives should include both elementary and advanced research and educational programs, pilot plant studies, demonstration reactors, and commercial prototypes. Contributions made at the international level should engender good-will among our friends all over the world. The resulting amity should be reflected in improvements in the prospect for world peace. This in turn should further, in an effective and fundamental fashion, the interests of all the peoples of the world as well as of all the citizens of the United States.

**Specific Objectives**

1. In the field of nuclear science the United States is faced with the stern necessity (a) of maintaining a position of world leadership in science and technology, and (b) of maintaining world leadership in the development of the peaceful uses of atomic energy.

2. Both from the national and the international points of view development in the field of atomic power must take into account not only the long-range interest of the United States but the immediate needs of the rest of the world. The Assembly recognizes that the cost of atomic power is not at present competitive in the United States with energy derived from conventional fuels; and present technology does not indicate that it can become so in the near future. In some parts of the world which are now lacking in energy resources, however, it is obvious that costs will be calculated on bases entirely different from those used in the United States.

3. The development of a domestic program for nuclear sci-
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ence should stem from a joint effort of Government and industry. Private industry has demonstrated its willingness to accept its share of the program. The Government will have to continue to assume a large portion of the cost of research and development. Appropriations relating to specific designs and installations should, generally, be applied as assistance to enterprises attempting the work; fundamental research may be appropriately performed in Government laboratories, universities, or private laboratories under contract.

4. The continued development of international atomic power should be an extension of the domestic program. The Southwestern Assembly heartily endorses the leadership and participation of the United States in the International Atomic Energy Agency. Continued sound leadership is necessary in order that this Agency achieve its maximum possible value at both international and domestic levels. Through this Agency research and education will be stimulated, and domestic atomic power industries ultimately will find additional profitable world markets.

The members of the Southwestern Assembly trust that full publicity—at home and abroad—will be given to the present and future activities of the International Atomic Energy Agency and that, through sound educational programs, a full appreciation of health-hazard safeguards and of safeguards against diversion to military uses will be brought home to the peoples of all countries.

Degree to Which Objectives Are Being Attained

The Southwestern Assembly believes that an effective, workable division of effort between government and private programs is emerging in the field of nuclear power. The proper focus of the government nuclear program should be
research and development which it should underwrite directly or indirectly in an attempt to extend the prototype effort. Some progress has been achieved in this direction.

The private programs should include, among other things, full-scale demonstration plants aimed at the reduction of cost of electric power from nuclear sources. Although it has not yet done so to any very effective degree, the government should recognize the unusually high costs involved in all atomic programs by maintaining an economic climate favorable to those industries cooperating in the essential development work.

Concerning the efficiency with which the national government through the Atomic Energy Commission has discharged its role, it is agreed that it has been reasonably successful considering the inherent limitations of a tremendous administrative facility.

Another complication in the discharge of the national government's responsibilities in the nuclear power program has been one created by the Congress itself through its apparent desire to assume tight executive control of the entire atomic program. It was the consensus of the Assembly that, even in the face of this difficulty, the good-will of the personnel involved on both sides has thus far managed to further a promising degree of cooperation between industry and government.

Obstacles Which Tend to Slow Down Realization of the Objectives

The Southwestern Assembly is acutely aware of the relevance of the "public versus private power" dispute with reference to the construction and operation of "full-scale demonstration" reactors in this country. The Assembly believes
that no demonstration reactor built and operated by the Government should become another basis for a further movement toward government competition with private power companies.

Stated in a specific fashion, obstacles to the rapid and efficient development of atomic power are:

a) The failure to date of the Congress to set the objectives and the allocations of effort and costs between Government and industry.

b) The hesitancy on the part of some sections of private industry to commit their own resources under the presently loosely stated and changing rules.

c) The lack of economic motivation for the accelerated development of a domestic atomic power program by private industry.

d) The failure of the Government to develop adequate communications with both our citizens and the rest of the world regarding the facts and issues involved.

e) Government secrecy which presents some obstacles to both our domestic and foreign programs. The Assembly recognizes that military considerations may still demand classification of certain information pertinent to the peaceful use of atomic energy.

f) Limitations in the number and quality of technically trained people.

The very listing of these obstacles constitutes a series of unstated but obvious recommendations to the Government regarding what should be done to remove them.

EDUCATIONAL AND TRAINING PROBLEMS

The Southwestern Assembly believes, however, that no portion of the Nation's effort to further progress in its broad
atomic program is more important than the proper education of its future leaders in scientific—and, indeed, in non-scientific—fields. Realizing that crash programs in this area are likely to be ineffective, and that the entire subject is one of unusual complexity, the Assembly contents itself with pointing out only one small facet of the educational problems involved.

Any consideration of the domestic nuclear power program reveals a notable weakness in the Nation's capacity to produce, in significant numbers, people having first-hand experience with so-called high flux reactors. At the present time, all such reactors are in government laboratories, and reactor time for university use at these facilities is severely limited.

The cost of a suitable high flux reactor, with associated facilities, is estimated to run to more than a score of millions of dollars. It is apparent that such a facility should be utilized by a group of universities rather than by a single one. Members of the Assembly are aware that significant training and research in this and in other atomic fields will be achieved by utilizing markedly less expensive reactors. Obviously several types of reactors should supplement one another in any effective over-all national training program. The Southwestern Assembly also realizes that reactors are by no means the only types of training adjunct required for the education of our future nuclear scientists.

The Assembly recognizes that government regulation of a university facility might be necessary in the areas of safety and security; this is especially true with regard to fissionable by-products; but it is believed that it should be possible, even under substantial government subvention, to provide freedom to pursue varied fundamental researches. The develop-
ment of the optimum number of scientists for the Nation's basic manpower requirements will undoubtedly demand both governmental and industrial cooperation in the underwriting of their training.

In order that all available and latent scientific talent may be fully utilized, all major areas of the United States must be included in the active program. The Assembly believes that the Southwest is ready to make the required effort and contribution.
THE SOUTHWESTERN ASSEMBLY

ROSTER

AGNEW, Dr. Colvin H., University of Texas, Medical Branch, Galveston.

Akers, W. W., Chairman, Chemical Engineering, Rice Institute, Houston.


Baker, James A., Jr., Chairman, Texas National Bank, Houston.

Barnes, Earle, Dow Chemical Co., Freeport.


Blair, Robert H., Blair-Vreeland, Corpus Christi.

Bonner, Tom, Chairman, Physics Department, Rice Institute, Houston.


Brown, George R., Executive Vice President, Brown & Root, Inc., Houston.

Brown, Herman, President, Brown & Root, Inc., Houston.

Bruce, A. D., Chancellor, University of Houston.

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Calvin, Dr. D. Bailey, Dean of Students, University of Texas Medical Branch, Galveston.

Casberg, Dr. Melvin, Vice President for Medical Affairs, University of Texas, Austin.

Casey, Bob, Judge of Harris County, Houston.

Clark, Dr. R. Lee, Director, M. D. Anderson Hospital, Houston.

Clawson, W. W., Vice President, Magnolia Petroleum Co., Dallas.

Collier, Everett, Assistant Editor, Houston Chronicle, Houston.

Cronesis, Carey, Provost & Professor of Geology, Rice Institute, Houston.

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Doherty, W. T., President, Mound Co., Houston.

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Goodrich, B. D., Vice President, Texas Eastern Transmission Corp., Shreveport, La.


Hallock, H. R., Executive Vice President, Texas Atomic Energy Research Foundation, Ft. Worth.
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HOOVER, Dennis T., Dallas Times Herald, Dallas.
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Hume, John, President, Technical Services, Inc., Dallas, Secretary-Treasurer of Texas Atomic Energy Research Foundation.
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KING, Frank H., The Associated Press, Dallas.
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NORTON, Frank, Mercantile Securities Bldg., Dallas.
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Peden, Phil, Civil District Judge, Houston.
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RICHTER, George H., Dean & Professor of Chemistry, Rice Institute, Houston.
ROBINSON, Rev. Newton, First Christian Church, Amarillo.
SCHACHTEL, Rabbi Hyman, Congregation Beth Israel, Houston.
SCHINDLER, Walter G., Rear Admiral, Commandant, 8th Naval District, New Orleans, La.
SHANNON, Jack, Humble Oil & Refining Co., Houston.
SIMMONS, James P., Commercial Bank & Trust Co., Midland.
SLICK, Tom, San Antonio.
SMITH, George M., Dean, Baylor University, Waco.
SMITH, Noyes D., Jr., Shell Development, Houston.
SUTTLE, A. D., Humble Oil & Refining Co., Baytown.
SYMONDS, Gardiner, President, Tennessee Gas Transmission Co., Houston.
THOMPSON, Howard A., Development Assistant, Rice Institute, Houston.
WIGGINS, D. M., Executive Vice President, Citizens National Bank, Lubbock.
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WRISTON, Henry M., President, The American Assembly, Columbia University, New York, N. Y.

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ASTON, Mrs. J. R.  LYNCH, Mrs. W. W.
BAKER, Mrs. James A., Jr.  McBRIDE, Mrs. Guy T.
BROWN, Mrs. George R.  MCKINNEY, Mrs. Robert
BROWN, Mrs. Herman Bruce, Mrs. A. D.  MASTERS, Mrs. W. H.
CASBERG, Mrs. Melvin  MILLIGAN, Mrs. W. O.
COLLIER, Mrs. Everett  PEDEN, Mrs. Phil
CRONEIS, Mrs. Carey  REISTLE, Mrs. Carl E., Jr.
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RICHTER, G. H.—Discussion Leader
MCBRIE, G. T.—Secretary

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Anderson, Dillon
Bass, Perry D.
Bonner, Tom
Butler, George A.
Calhoun, John C., Jr.
Clawson, W. W.

Collier, Everett
Dillard, Raymond L.
Fulton, R. H.
Goodrich, B. D.
Hallock, H. R.
Hintze, Dr. Guenther
Karcher, J. C.

Lynch, W. W.
Mitchell, Albert K.
Peden, Phil
Robinson, Newton
Schindler, Walter G.
Smith, Noyes D., Jr.
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Hume, John—Discussion Leader
Akers, W. W.—Secretary

Blair, Robert H.      Huxley, Marvin          Murchison, John
Brown, George R.      King, Frank H.          Dabney
Casberg, Dr. Melvin   Kurth, Ernest L.          Parish, W. A.
Clark, Dr. R. Lee     Lazarus, Maurice         Schachtel, Hyman
Doherty, W. T.        Lovelady, M. H.          Simmons, James P.
Flanagan, John C.     Maxfield, Dr. J. R., Jr.  Smith, George M.
Francis, Charles I.                          Suttle, A. D.
**PANEL III**

*Reistle, Carl E., Jr.—Discussion Leader  
Barnes, Earle—Secretary*

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| Baker, J. A., Jr. | Harrison, Dr. Frank  
| Brown, Herman | Hinkle, Clarence  
| Bruce, A. D. | Hoover, Dennis T.  
| Calvin, Dr. D. Bailey | Hunter, Phelan  
| Casey, Bob | Jones, E. N.  
| Collie, Marvin | Little, R. N.  
| Gillingham, W. J. | MacGowan, Charles F.  
|                | Masterson, W. H.  
|                | Norton, Frank  
|                | Pope, Kenneth  
|                | Symonds, Gardiner  
|                | Wiggins, D. M.  
|                | Wood, James Ralph |