

AEC



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Remarks by  
Dr. Glenn T. Seaborg, Chairman  
U. S. Atomic Energy Commission  
to the  
Woman's National Democratic Club  
Washington, D. C.  
February 6, 1967

#### WOMEN AND THE YEAR 2000

It is not often that I'm privileged to have an audience as attractive or as charming as this one at this hour of a working day. Despite these pleasant surroundings, however, I'm a bit nervous because I'm supposed to combine in one talk both women and the future - two subjects that I have never been able to analyze with confidence - even when I've considered them singly.

When Mrs. Horace Busby, of your program committee, invited me to speak on this occasion, she wrote that I should talk "about the year 2000 and the changes that will have been wrought by then in the lives of women..." As soon as I saw the word "wrought" in her letter of invitation, I realized that in preparing my talk for today I would have to take greater cognizance of the feminine point of view. For, as you know, the word "wrought" - to a woman - means fashioned, as in the case of jewelry, or elaborately ornamented, as in the case of tapestry. But to a man and a chemist like myself "wrought" means hammered or beaten into shape by tools, or "wrought iron," which contains less than three percent carbon and has one or two percent of slag mixed with it.

There is, however, one reason why a male chemist like myself would be willing to forego an opportunity to speak

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about metallurgical chemistry in favor of talking to an audience more interested in jewelry and tapestry. For as Dr. Samuel Johnson said about two centuries ago, "One of the last things we men are willing to give up ... is the supposition that we've something to say of interest to the opposite sex." My wife and two daughters know that I am deeply committed to this principle.

I don't think that Dr. Johnson claimed to have any special knowledge of the women of the eighteenth century and I certainly don't consider myself an expert on the woman of today. I haven't read any of the writing by women on the Modern Woman, such as the books by Betty Friedan and Simone de Beauvoir. Neither have I read volume two of the Kinsey Report. And my librarian told me that I am so far down on the waiting list for the recent best-seller by Masters and Johnson that all of her copies of this graphic study on sex will probably be worn out before I get a chance to read it.

As to the future and women's lives in the year 2000, I think that one of the most interesting things in life is how unsure we are of the future and how often the future fails to bear us out. It is not easy to think tomorrow's thoughts today, for the future is hidden even from those who make it. I should also say that many of the predictions that I shall make this afternoon will be well on their way toward implementation much before the year 2000.

But we must not merely look toward the future; we must act toward it. Since the future is the past come home to roost, we must build a better future by deepening our understanding of the past and by taking a firm grip on the present. The men and women who can build a better future are those who know that greater things are possible and that they themselves can help bring them about.

The idea that I want to stress most of all in remarks this afternoon is my conviction that a better future for our country depends to a very significant extent on making a more effective utilization of the talents and abilities of American women. On this objective I am optimistic about the prospects for improvement. In the year 2000, I think that our society will be much more enlightened than it is today with respect to the role and position of women. By the turn of the century, we will be doing much more to help our

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women appreciate the diversity of roles they can play and the growing values of high-level skills and education. We will be doing much more to encourage women of all ages to prepare themselves to cope more effectively with the challenges of the present and future. At the same time, I think that women themselves will have greatly enlarged their ambitions as individuals, will be aspiring to a broader role and higher position in our society, and will be acquiring much better training toward meeting these expanded responsibilities.

But this brighter future for the women of 2000 will not simply evolve out of forces already set in motion. We must create the conditions that will make it a reality, and I believe that we will do what is required.

One area that bears heavily on the future of women and one that must be improved is education. Since I have spent most of my career in college and university education, I am alarmed especially by the declining percentage of women in proportion to our total population who are college graduates and holders of advanced degrees. Among people who are twenty-five or older, only three-fifths as many women as men are college graduates. In 1930 women earned 40 percent of all masters and other second level degrees, but only 32 percent in 1965. Among the recipients of doctoral and equivalent degrees during this same period, the percentage of women fell from 15 to 11 percent. Perhaps these trends are partly responsible for the fact that during the last 25 years the number of college and university faculty positions held by women has declined from 28 to 20 percent. These figures reflect what I consider to be a deplorable and needless underdevelopment of women's talents. They indicate a direction that our society must begin now to reverse or for which we must pay a high price in future years.

By the year 2000 I hope that we will have developed different patterns in the education of our more talented female youth. The prospects for broadening educational opportunities (especially if our national wealth continues to grow as expected) and for strengthening our society's appreciation of the value of college and post-graduate education for women should result in the preparation of a larger percentage of women for professional careers. If this occurs the role of women in the professions could be considerably more prominent in the year 2000 than it is today.

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During the past 15 years there has been a significant and steady decline in the percentage of women among all workers in professional, technical, and kindred occupations. Currently women comprise only three percent of our nation's lawyers and only six percent of our physicians. One development that would help to alleviate this situation would be a re-orientation of the thoughts of many people about the kind of curriculum that girls should pursue. Many parents - especially many fathers - hold the assumption that girls cannot excel in mathematics, that it is not quite feminine to major in the sciences, or that an engineering or a medical curriculum should be strictly a male endeavor. But experience has clearly shown that girls can excel in these subjects and that women can succeed in scientific, technical, and medical careers. By the year 2000, I think that this fact will be generally accepted, and that women will be taking much better advantage of educational and professional opportunities in these fields.

I also think that in the year 2000 we will attach more importance to education for married women - both as preparation for community service and for reentry into the labor force when their children reach an age where mothers are more able to work outside the home. In 1964 and 1965, I had the pleasure of working with an outstanding lady who has very successfully combined family life (including four children) with public service and career, Dr. Mary I. Bunting, who took a one year leave of absence from her position as President of Radcliffe College to serve as a Member of the Atomic Energy Commission. Among "Polly" Bunting's many contributions to the AEC was the strong support and encouragement that she gave to our programs for equal employment opportunities for women and for the part-time employment of professional women.

By the turn of the century, housewives in general should have more time for study due to automation, more money for educational expenses due to the expected rise in family incomes, and more opportunities for continuing their education due to the increased availability of local colleges and universities. There will probably be many day care centers to enable student mothers to undertake part-time study, and local colleges may even have supervised nurseries and playgrounds to keep young children occupied while mothers attend class. For mature women wishing to enter the labor force but without marketable skills, there will probably be scholarships and educational guidance counseling of both an academic and vocational nature.

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This broadening of the educational opportunities for women will enable them to make an even stronger contribution to civic affairs in the year 2000 than they are making today. I believe that women make a very special contribution to public life because their sense of the responsibilities of child-rearing and their desire to cultivate excellence in family life are preeminent qualities that cause women in public life to foster a broad concern for human welfare. It is natural that those who bring life into the world should attach the greatest importance to making a better life for all people. Perhaps James Stephens, the Irish poet, articulated another reason why women have made such an important contribution to the development of social and humanitarian policy when he said, "Women are wiser than men because they know less and understand more."

One reason I believe that the active and constructive participation of women in public life will be extended and strengthened by the turn of the century is that prejudice against women in politics - although still very apparent - is diminishing. I also believe that the impact of other factors affecting political participation by women will be reduced. Today the relatively low proportion of women in public office reflects, to a considerable extent, the low proportion of women who are prominent in those private occupations that normally lead to political activity and advancement. But women's prominence in the professions is likely to increase, and more married women will plan ahead for a career after the age of their children permits it.

Moreover, during their early married lives women's political participation is limited by the need to work near their homes. But the very high proportion of political work that is done by women at the precinct level demonstrates their interest and skill in political activity. During their earlier married years more women will apply themselves to a grassroots political apprenticeship of service as members of school boards, town councils, state legislatures, and so forth.

As a result of these changes that I think will occur in women's lives - a steady erosion of the prejudice against women in politics, a stronger career orientation on the part of women, and increased participation by women in local affairs - the opportunities for women to contribute to public life will be substantially broadened.

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During the twenty-first century, I think that, compared to our times, many more women will be elected to serve in the United States Senate and House of Representatives and in state legislatures. I also think that the range of government positions to which women are appointed will be wider. Especially in some state governments, convention has thus far tended to exclude women from offices except those dealing with juveniles, school affairs, health, welfare, and libraries. But this should change, and by the turn of the century there will be many more women in federal and state legislative offices, in the upper levels of both federal and state executive branches, in federal, state, and local judicial offices, and in the higher diplomatic positions. If this prediction comes true, I think our society will benefit substantially as a result of making a greater utilization of the abilities of women in government and public affairs.

Women's role in politics will not be the only aspect of their lives that will change. There will also be important advances in other areas of importance to women. One effect of these changes will be a reduction in the amount of time that women will have to spend on traditional household tasks. This will permit women to devote more attention to activities outside the home, such as those I have been discussing.

By the year 2000, the widening impact of the computer will undoubtedly be extended into the home. For example, some people foresee small household computer consoles connected to a large complex of central station computers that would help with family budgeting, tax calculations, school work, purchasing and menu planning by providing such assistance as banking and credit, library and reference sources, and mail order and shopping services. It is also possible that homes of the future will be equipped with something like a teleprinter, so that the family's daily newspapers, magazines, and books will be brought to the home not by old-fashioned delivery but through facsimile reproduction or some other form of high speed printing.

Many homes in the year 2000 will probably have automated kitchens. The housewife may make out her menu for the coming week, put the necessary foods into storage spaces, and give instructions to her kitchen computer. At the prescribed time mechanical arms would get out the pre-selected food, cook it, and serve it.

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As for grocery shopping, housewives who prefer not to go to the store may be able to shop by videophone, which will enable them to check the prices and quality of groceries at the local supermarket and to place an order without leaving the house.

By the year 2000 or not too many years thereafter, housewives may be relieved of many of the ordinary household chores of today. Many wives will probably have a robot "maid" that is trained to the requirements of her particular home and as programmed to carry out several standard household operations when switched on by the housewife. Professor M. W. Thring of the University of Sheffield thinks that the commercial availability of robot maids is a real possibility as soon as the next twenty years, provided that the necessary applied science and financial support are made available.

These household robots would not look at all like a human being; instead they would be shaped like a box and have one large eye on the top, several arms and hands, and long narrow pads on each side for moving about. Those of you who are now thinking that you would be terrified to have such a mechanical being moving about the house (even opening doors and going up and down stairs) should remember that it can be switched off, unplugged, or stopped without difficulty at any time, and even directed to put itself away in a cupboard. One can imagine an advanced, multi-arm version of the robot housekeeper that would be able to do a variety of tasks simultaneously - such as washing windows, sweeping floors, vacuuming rugs, dusting furniture, cleaning woodwork, brewing coffee, and picking up your husband's clothing. By the year 2000 you may have even trained your husband to pick up his own clothing. But I don't think that anyone will ever devise a robot that could fit two and three year old children into snowsuits and overshoes.

For housewives of the twenty-first century who prefer animate rather than mechanical domestic servants, there may be a choice other than the robot. About two years ago, the RAND Corporation came out with a Report on a Long Range Forecasting Study (by T. J. Gordon and Olaf Helmer) which forecasts future developments in a number of important areas. The RAND panel mentioned that by the year 2020 it may be possible to breed intelligent species of animals, such as apes, that will be capable of performing manual labor. During the twenty-first century, those houses that don't have a robot in the broom closet could have a live-in ape to do the

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cleaning and gardening chores. Also, the use of well-trained apes as family chauffeurs might decrease the number of automobile accidents.

By the turn of the century consumer goods will have become even more abundant in a society of continuously rising affluence. And like today, the preferences and tastes of American women will determine the form of many of these products. The latest improvements will come into service as a result of frequent model changes and the introduction of new products. Advertising will continue to create new demand, and consumers will continue to enjoy the ads even more than they enjoy the products.

As to women's fashions in the year 2000, I am sure that there will be even more opportunity for ingenuity and upmanship by fashion conscious women than there is today. Low cost, disposable dresses made from new synthetic fabrics could enable women never to be seen more than once in the same outfit. Wedding dresses made of these new materials would no longer be made to be worn by granddaughters, but fathers of the bride will welcome the decline in initial costs of dresses their daughters would wear only once. There is one thing I am certain about with respect to women's clothes in the year 2000: those designs that are the most fantastic to us men will continue to become universally accepted among women.

The women of the twenty-first century will also probably purchase and serve food produced by a very highly mechanized agricultural industry and by radically different techniques, such as large-scale ocean farming and the fabrication of synthetic protein. Radiation will be used to preserve the quality of many food products that housewives will buy at automated supermarkets. And doubtlessly, even the preparation time for minute rice and instant coffee will be shortened.

As for some of the advances women can look forward to in medicine, by the turn of the century there will be considerable progress in some very important areas. And it is even possible that there will be breakthroughs resulting in a major impact on health and life expectancy. In the coming century many more people will live to the ripe ages of, say, 75 or 80 or beyond, and older people will live out their lifespans in greater comfort than they do today. But unless

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there are major breakthroughs in our understanding and control of ageing, the larger number of people who will then celebrate their ninetieth or one-hundredth birthdays will still be likely to owe more to their parents' genes than to medical science.

By the year 2000 we should have better control over infectious diseases. While total eradication of infectious diseases is not likely, I do look for significant advances in immunization, and it is possible that general immunization against bacterial and viral diseases will be available.

I also believe that we will make remarkable progress against cancer. It will be possible to lower the incidence of cancer by reducing or eliminating many deleterious factors in our environment. And there are also possibilities for immunizing people against viruses that may cause some kinds of cancer and for developing new and more highly effective chemical and biological approaches to cancer therapy.

In the case of children with defects due to heredity and metabolic anomalies, our knowledge of genetics, biochemistry, and molecular biology should increase to the point where most of these personal tragedies can be prevented and many of those that do occur could be corrected if treated at an early age.

There will also be a rather sophisticated medical technology concerned with both natural and artificial replacements of damaged body components - what is sometimes called "spare parts medicine." Organ transplantations will be common practice. A variety of prosthetic devices will have become feasible, such as artificial hearts powered with radioisotopes, plastic heart valves, artificial kidneys and lungs, and artificial limbs. Some artificial limbs should even be controlled by the brain - that is, they may be operated by electric impulses generated in appropriately connected muscles by the person thinking of the movements he desires to make.

The use of drugs for personality management will be more effective and more widespread than it is today, at least for people suffering from depression and other emotional disturbances. For those people who are mentally healthy but chronically irritable, there has been discussion about the possibility of an "anti-grouch" pill. Some people have already argued that a variety of personality

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control drugs should be made available to the general public as a way of ensuring that husbands are ambitious, wives understanding, and children well-behaved. Of course, we would be wise to allow a few disagreeable characters to carry on as such, if only to provide material for TV and the movies. A world in which there is no one to laugh at or criticize might prove intolerable.

One of the best medicines will continue to be relaxation, and by the year 2000 many women in the United States will find it commonplace to be spending an occasional weekend in Europe or Asia. Future developments in aviation technology are likely to have a profound effect on foreign travel. By the turn of the century the hypersonic transport aircraft, successor to the supersonic jet, will undoubtedly be in commercial service. These hypersonic planes would travel at speeds of 4,000 to 6,000 miles per hour and would reduce the flight time from New York to London, for example, from the present six hours to about 30 minutes - which is less time than it takes me to commute from my home to my downtown office. Passengers on these hypersonic aircraft will feel about the same as they do today on present jets; that is, there probably won't be any sensation of the increased speed.

In my remarks this afternoon, I have made so many predictions that I am now going to offer to come and have lunch again with this group in the year 2000. At that time, I will reread this speech, and we can tally up the number of predictions that came true as well as those that somehow went awry. I hope that when I come back 33 years from now what I have said today will be more of a status report on the lives of women at the turn of the century than a source of post-luncheon laughter.

The twenty-first century is closer than we think - closer than the first inauguration of President Franklin D. Roosevelt. One of the reasons I am grateful for your invitation to speak to you today about the year 2000 is that I share your feeling that the time has already arrived when we must think more about the kind of world we want in the future and what we should do now to make it a reality.

Some of the problems that will confront the women of the year 2000 will be how to make good use of the increased leisure time that will be available due to automation, how to keep physically fit in a society with so many labor-saving

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devices, how to effectively combine home and family with careers and contributions to public affairs, how to keep education and skills up-to-date, and how best to transmit the values of our society to the succeeding generation.

In future years we are going to be confronted more and more with the dilemma that modern science and technology favor discoveries and inventions with potentially radical implications, while many other forces in society lean in conservative directions. In the years to come, many of the most significant issues and developments will involve a clash of these two opposing tendencies.

Women of the twenty-first century will be involved with these problems more deeply than ever before, and the contribution that women make to their solution will be greater than ever before. The words of Virginia Woolf that "women have served all these centuries as looking glasses possessing the magic and delicious power of reflecting the figure of man at twice its natural size" will be as accurate in the year 2000 as they are today.

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G-14-67  
IMMEDIATE RELEASE JANUARY 23, 1967.

Note: This release being issued simultaneously by AEC, Washington, D. C.

**AEC TO LOCATE FAST FLUX TEST FACILITY  
AT RICHLAND, WASHINGTON**

The Atomic Energy Commission has selected Richland, Washington, as the site for the Fast Flux Test Facility (FFTF). The FFTF will be the AEC's major fuels and materials test irradiation facility in the liquid metal fast breeder reactor (LMFBR) program, and will contribute as well to other fast flux test programs.

The AEC already has an FFTF project management organization at its Pacific Northwest Laboratory at Richland, operated by the Battelle Memorial Institute. Conceptual design and development efforts for the facility have been proceeding under the direction of this organization.

The location of the test facility at Richland will enhance the ability of the laboratory to manage the development, design, construction and test operation. The laboratory has been using the talents and resources of other AEC laboratories and industry in a concerted effort to develop the best design concept for the facility.

Development of economic fast breeder reactor fuel elements is an integral part of the AEC's high priority objective of demonstrating the capability for economic operation of commercial large size breeder power plants. Such plants will assure the economic use of the nation's nuclear resources for power production. To accomplish this objective, facilities will be needed for irradiation testing under realistic fast reactor operating conditions.

The test facility will provide an adequately controlled and instrumented environment in a fast neutron flux for testing instrumented fuel specimens, fuel rods, fuel subassemblies, fuel claddings and structural materials; and for testing

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fuel up to and including failure in a dynamic (flowing) sodium coolant.

To carry out this program, the Commission is considering a reactor of about 400 thermal megawatts, with a very high intensity of neutrons (neutron flux of about  $10^{16}$  to the 16th power per square centimeter per second) containing instrumented closed and open loops, and facilities for rapid insertion and removal of test specimens. Facilities for interim fuel examination, including disassembly, reassembly of specimens and reinstrumentation, capsules and rods, will also be provided.

The FFTF is estimated to cost \$87,500,000, of which \$7,500,000 has been authorized by the Congress for the fiscal year 1967.

Concurrent with the FFTF effort, an intensive program is under way to upgrade and improve the capability of the Experimental Breeder Reactor No. 2 (EBR-2) at the AEC's National Reactor Testing Station in Idaho, the only U. S. fast flux irradiation facility now available.

The LMFBR program will utilize EBR-2 and other fast reactor facilities, including the Zero Power Plutonium Reactor being built in Idaho, as well as other facilities such as those at the AEC's Argonne (Illinois) National Laboratory, and the Southwest Experimental Fast Oxide Reactor under construction in Arkansas. Most other reactors now operate with thermal (slow) neutrons rather than with fast neutrons. Thermal reactor environments cannot be reliably substituted for prototype fast reactor environments because of differences in conditions imposed on the test specimens. However, the thermal reactor test facilities at Idaho are being used to the maximum extent to supplement the use of the EBR-2.

Argonne, which is conducting LMFBR research and development with facilities at Illinois and at Idaho Falls, Idaho, and the Los Alamos (New Mexico) Scientific Laboratory are currently assisting in conceptual design and development activities for

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the FFTF. In addition, the LMFBR program office at Argonne is assisting AEC in the development of overall and detailed plans for, and coordination of, the total LMFBR effort.

Major industrial firms participating directly in the FFTF program include Atomics International, Canoga Park, Calif.; Atomic Power Development Associates, Detroit; General Electric Company, San Jose, Calif.; Idaho Nuclear Corporation, Idaho Falls, Idaho; and Westinghouse Electric Corporation, Pittsburgh.

The continued use of industrial contractors to perform for AEC facilities the functions similar to those that will be required for future LMFBR power reactors will strengthen the base of national industrial reactor capability. Continued maximum use of these contractors plus other laboratories and industrial organizations will be required throughout the project. These capabilities are being identified and organized to work directly under the FFTF project management organization at Pacific Northwest Laboratory.

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G-13-67

HOLD FOR RELEASE AT 9 A.M., P.S.T., JANUARY 24, 1967.

Note: This release being issued simultaneously by AEC, Washington, D. C.

Richland, Washington, January 24 -- The Atomic Energy Commission will place in standby another of the plutonium production reactors at Richland, Washington about July 1, 1967. The decision was made following an AEC review of currently projected requirements for reactor products in defense and civilian programs.

The latest reactor shutdown will reduce the number of AEC operating production reactors to nine -- five at Richland, and four at the Savannah River plant near Aiken, South Carolina. In 1964 and 1965 the Commission shut down three reactors at Richland and one at Savannah River.

This curtailment in plutonium production will result in budgetary savings of \$6 million in FY 1968.

About 275 personnel positions will be affected. Every effort will be made by the Commission and its contractors to absorb the employees in other activities at Richland or to assist them in seeking employment elsewhere. Also, the Commission will continue its cooperation with the nearby communities in efforts to attract new industries and activities to the area.

Plutonium is formed in a reactor when uranium-238, the more abundant uranium isotope, captures neutrons released by the fissioning uranium-235 atoms. The Richland plant, established during World War II, was the initial site for the production of plutonium in the U. S.

The Commission has concluded that currently projected requirements for national defense can be met with the reactors remaining in operation. The reactor to be shut down will be selected in the near future. The three Richland reactors already



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shut down are "DR" on December 30, 1964; "H" on April 21, 1965; and "F" on June 25, 1965.

All the Hanford reactors except "N," which was brought to criticality in late 1963, were transferred from operation by the General Electric Company to Douglas United Nuclear on November 1, 1965. General Electric Company will continue to operate "N" Reactor until June 30, 1967 when it will be transferred to Douglas United Nuclear.

This and earlier actions taken by the Commission in 1964 and 1965 reflect the restraint being exercised by the United States in the production of plutonium and enriched uranium. At international disarmament discussions the U. S. has proposed a world-wide agreement to halt the production of fissionable materials for use in weapons.

The Richland plant is located in Southeast Washington on the Columbia River. Facilities at the plant represent an investment of about \$1.2 billion and the annual payroll is about \$75 million.

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G-64-67

IMMEDIATE RELEASE

Note: This release being issued simultaneously by AEC, Washington, D. C.

Richland, Washington, May 31 -- The U. S. Atomic Energy Commission now forecasts that nuclear power plants will have a generating capacity of between 120,000 and 170,000 net electrical megawatts by the end of 1980. AEC Chairman Glenn T. Seaborg announced the new estimate today and placed the most likely figure near the middle of the range, about 150,000 megawatts. Dr. Seaborg spoke at the annual meeting of the Canadian Nuclear Association in Montreal. The forecast is a revision of one prepared by the AEC last year, which estimated an installed capacity at the end of 1980 of between 80,000 and 110,000 megawatts. It reflects the surge of orders placed, as well as plans announced, by utilities for nuclear power plants during the past year. The new AEC forecast and recent projections of utility and manufacturing organizations show this rising demand for nuclear electric power. The forecast is based on data, for individual utilities throughout the country relating to installed electric generating capacity at the end of 1959; additions to capacity -- both conventional and nuclear, but not including peaking facilities -- from 1960 through 1966; and planned additions from 1967 through 1973. Data for utilities located in the same area of the country and having similar economic conditions were combined into groups. The average percentage of annual growth in new generating capacity from 1959 through 1973, both conventional and nuclear, was computed for each of these groups. The same percentage was then applied to the period from 1974 through 1980. The growth rates for individual areas were in the range of four to ten percent, with a national average of about six percent. In areas -- primarily on the east and west coasts, in the north central region, and in the Tennessee Valley -- where nuclear plants currently are operating, being constructed, or planned,

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it was assumed future growth would be mainly in nuclear generating capacity and, in other areas, would be mainly in conventional generating capacity. A number of uncertainties, such as the total increase in electric generating facilities, the fraction of the increase that will be nuclear, and changes in construction schedules, were considered in arriving at the range of 120,000 to 170,000 megawatts.

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