

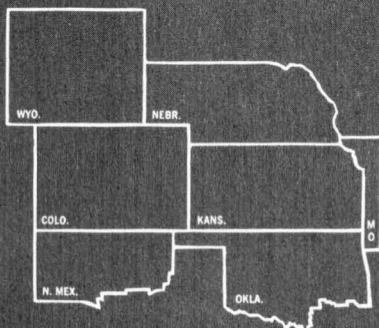


# *monthly review*

APRIL 1968

Uranium: A New  
Commercial Energy Source . . . . . page 3

Social Security—  
Development and Financing . . . . . page 10



FEDERAL RESERVE BANK OF KANSAS CITY

*Subscriptions to the MONTHLY REVIEW are available to the public without charge. Additional copies of any issue may be obtained from the Research Department, Federal Reserve Bank of Kansas City, Federal Reserve Station, Kansas City, Missouri 64198. Permission is granted to reproduce any material in this publication.*

# URANIUM: A NEW COMMERCIAL ENERGY SOURCE

By Richard F. Young

**U**RANIUM—a dense, hard, nickel-white metallic element usually regarded as rare—is actually present in the earth's crust to a greater extent than such "common" elements as mercury, silver, or iodine. The bulk of uranium seems to be present in the upper 12 to 13 miles of the earth's solid crust, although minor amounts of uranium are found in basalt rocks such as those forming ocean floors. It also is found in very small quantities in meteorites and traces have been isolated in sea water.

During much of the period after the discovery of uranium, relatively little interest was directed toward it. In 1938, however, Otto Hahn and Fritz Strassman discovered that the uranium nucleus undergoes fission when bombarded with neutrons, with the accompanying release of several neutrons and very large amounts of energy. This raised the possibility of release of nuclear energy in a sustained chain reaction. In 1942, the now famous work of Enrico Fermi and his associates ushered in the atomic age by proving the technical feasibility of a controlled chain reaction. Development for military purposes proceeded under urgent wartime conditions and the mushroom cloud became the symbol of this new energy source.

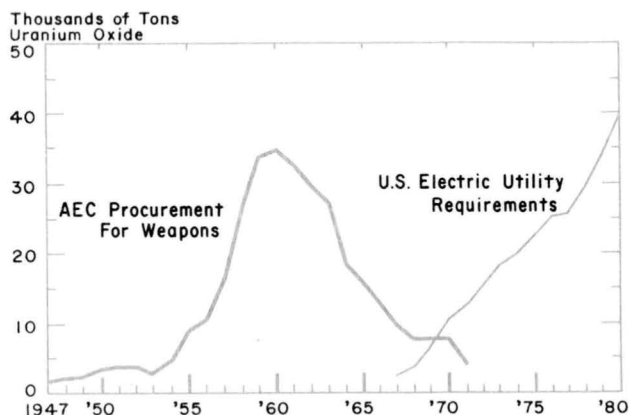
Nuclear weapons have proved their destructive capabilities. However, used to peaceful and productive ends, one pound of uranium—if it could be completely consumed by the fission process—would yield as much energy as three million pounds of coal. Unlike the fossil fuels—coal, oil, and gas—where energy is released by the molecular interaction of fuel and oxygen, nuclear energy is produced by the interactions within the nucleus of the atom.

Defense demands sustained a uranium rush

of considerable proportions during the 1940's and 1950's. Personal fortunes were made by individual prospectors and amateur geologists, and land and uranium stock speculation became rampant. During this time, the Atomic Energy Commission (AEC) regulated the purchase and stockpiling of this strategic metal. Then, in 1958, the bubble burst when AEC reserves caught up with defense needs. Due to the lead time on long-term contracts, AEC procurement for weapons peaked in 1960 and followed a downward course with each succeeding year (Chart 1). Then, nearly a decade after defense demand began to decline, total demand for uranium was spurred by the adaptation of nuclear energy to civilian needs. The subsequent growth in civilian demand has resulted in a second uranium rush even greater than the uranium hunt of the 1950's.

Foremost among the civilian uses of uranium is that required by electric power generators.

**Chart 1**  
**DOMESTIC URANIUM DEMAND**



SOURCES: Remarks by Allan E. Jones, Manager, Grand Junction Office, USAEC, presented before the Ninth Annual Minerals Symposium, Uranium Section, Moab, Utah, May 22, 1964; and Kerr-McGee Corporation estimates.

A major turning point in the development of atomic energy was reached with the rapid and widespread acceptance of nuclear power plants; for historical purposes, 1966 may well mark the year nuclear power really came of age.

#### DEMAND SITUATION

The years ahead undoubtedly will witness considerable population growth and rapid technological progress—forces which will stimulate vast increases in world demand for electricity. The notion that population growth and industrial progress will spell an increase in power demand and consumption is underscored by speculation that a substantial increase in average per capita requirements for electricity also is likely to take place.

At present, the demand for electrical energy doubles every 8 to 10 years, twice as fast as the growth in demand for total energy. Total energy consumption is expected to increase by 50 per cent between 1965 and 1980 and by 250 per cent between 1965 and 2000. In 1965, less than 1 per cent of the electric generating capacity of the Nation was nuclear. It is estimated that 23 to 30 per cent will be nuclear by 1980 and about 50 per cent by the year 2000.<sup>1</sup>

Another pertinent factor is the growing market share of new operating capacity being captured by nuclear facilities. Last year, domestic utilities placed orders for nuclear plants amounting to more than half of the capacity of all new electric power plants purchased. Long-range forecasts indicate that, by the turn of the century, virtually all new large generating plants will be nuclear.<sup>2</sup>

Late in 1962, the AEC's report to President Kennedy indicated a belief that by 1980 nuclear power would account for approximately 40,000

megawatts.<sup>3</sup> Since that date, a series of upward revisions have been published with the current estimate amounting to three or four times the original one. The swing to nuclear plants is gaining momentum so rapidly that private forecasts now predict capacity as great as 200,000 megawatts by 1980.

Nuclear plants are being built at a pace that not even their strongest supporters thought likely as recently as two years ago, as nuclear fuel captures the major share of the new market. In short, the nuclear power age has arrived and the power plant of the future is here today. Behind the power industry's rapid and dramatic turn to nuclear generation lies the fact that power cost per kilowatt hour is very attractive in large nuclear plants that can be base loaded, that is, operated at, or near, capacity a high percentage of the time. The growth of nuclear power does not spell a sudden end to fossil-fuel generating facilities. Indeed, with the rapid growth in total demand for electricity, the Nation may well need all available capacity. In this sense, it is not strictly a question of substitution or replacement but, rather, of which type of power generator will best fulfill the burgeoning need for more electric power.

Atomic plants can produce large amounts of electrical energy at relatively little cost per unit. These facilities appear subject to those economies pertinent to large-scale operations; only in areas of low-cost gas, or unusually low-cost coal, or with low power demand, are nuclear plants unable to compete successfully with fossil fuels.<sup>4</sup>

#### ROLE OF THE AEC

Nuclear power must be considered the offspring of the AEC—the major purchaser of uranium to date. The agency's facilities enrich natural uranium and transform it into a usable fuel. The major objectives of Federal uranium

<sup>1</sup>"Nuclear Power May Supply Half of all Electricity by Year 2000," *Heating, Piping and Air Conditioning*, May 1967, p. 51.

<sup>2</sup>Glenn T. Seaborg, "Meeting World Nuclear Fuel Requirements," *Nuclear Engineering*, February 1967, p. 98.

<sup>3</sup>One megawatt equals 1,000 kilowatts.

<sup>4</sup>John T. Sherman, "Uranium," *Engineering and Mining Journal*, February 1967, p. 129.

**Table 1**  
**FUEL COST COMPONENTS**  
(In per cent)

Uranium Oxide .....	33
Conversion .....	5
Enrichment .....	37
Fabrication .....	33
Reprocessing .....	10
Plutonium credit .....	(12)
Uranium credit .....	( 6)
	100

NOTE: These figures represent approximations. They will vary, depending upon such factors as the price of uranium oxide, cost of conversion, and degree of enrichment.

SOURCE: Gordon P. Corey, "U. S. Nuclear Power Strides Augur 150,000 MW by 1980," *Electrical World*, May 15, 1967, p. 84.

supply policies are to: (1) establish toll enrichment<sup>5</sup> as the preferred means for obtaining enriched uranium from the AEC, (2) help assure a viable domestic uranium mining and milling industry, and (3) provide incentives for private industry to expand its exploration for new uranium reserves and its production capability to meet forecasted commercial requirements. The Federal Government also can provide broad support in gathering and disseminating information on the status of resource development, production capability, and requirements; and the development of basic knowledge about uranium.<sup>6</sup> In pursuing its goals, the AEC procures raw materials, produces nuclear materials, and attends to weapons development and fabrication, reactor development, and physical research.

In transforming natural uranium into fuel, enrichment and fabrication play very important roles. Uranium enrichment remains the domain of the AEC, a fact partly attributable to the strategic value of uranium and the importance of the enriching process to the production of nuclear weapons.

The price of nuclear fuel is crucial in determining the long-run competitive position of

nuclear power. The cost of nuclear fuel includes charges for raw uranium oxide (yellow cake), conversion, enrichment, fabrication, and reprocessing, reduced by credits for depleted uranium, plutonium, and other by-product recoveries. Approximate relationships of the cost components for a typical nuclear unit are found in Table 1.

Lead time also is important in producing fuels because there is about a 9- to 12-month interval required to purchase uranium concentrate, convert it to a gaseous state, and carry out toll enrichment at an AEC diffusion plant.

As a monopsonist—a single buyer controlling the demand for the product of a large number of sellers—the AEC has been able to regulate the price of uranium ore for many years. How rapidly the nuclear power industry advances depends largely upon the price and supply of fuel. Without proper price incentives, mining operations may not be economically feasible. The AEC price will be maintained at \$8 per pound of uranium oxide ( $U_3O_8$ ), in specification grade concentrates, through 1968.

The rapid development of nuclear power facilities plus new efforts toward ore deposit discoveries portend the possible development of new demand and supply relationships.<sup>7</sup> In this vein, Wilfrid E. Johnson, Commissioner, AEC, has stated that:

... Except for some remaining uncertainty as to the size of the commercial market in 1971 and 1972, after expiration of AEC purchase contracts, it appears that we may anticipate a relatively smooth transition from a Government to a private market. On the other hand, the rate of nuclear orders and corresponding uranium requirements, coupled with the current tight uranium market, have caused some concern over both short-term and long-term nuclear fuel availability.<sup>8</sup>

<sup>5</sup>"Enrichment" is the process of improving the quality of uranium by increasing the percentage of the material suitable for use as nuclear fuel. The AEC levies a charge, or "toll," for performing this service.

<sup>6</sup>Wilfrid E. Johnson, "Government and the Uranium Industry," Address before the Atomic Industrial Forum, Chicago, Ill., November 6, 1967, p. 11.

<sup>7</sup>U.S., Bureau of Mines, *Commodity Data Summaries*, January 1967, p. 158.

<sup>8</sup>Johnson, p. 4.

### EXPLORATION EFFORTS

The resurgence of activity in uranium, due to electric power generation, has encouraged an expansion in exploration. Estimated power needs require a cumulative output of a quarter million tons of uranium fuel valued at approximately \$4 billion between now and 1980. The AEC currently recognizes only about 60 per cent of that amount in uranium reserves, necessitating the discovery of tremendous additional reserves and providing the impetus for renewed activity in uranium exploration. It has been estimated that prospectors drilled as much as 10 times as many feet of earth and rock in 1967 as in 1966, and that the uranium industry will invest about \$1 billion by 1980 to find new deposits to meet projected demands for a surging nuclear power industry. It also is expected that most of the domestic uranium producers will be operating at or near capacity into the 1970's.

The character of exploration has changed markedly from that of earlier periods. The lonely prospector and the weekend geologist of the 1950's have been replaced by large corporations supporting vast exploratory activities. The number of major companies in the uranium business is several times the number a decade ago and includes many of the major petroleum companies. Most of these firms are relatively new to the field but their well-trained staffs and financial capabilities make them particularly well suited for these operations. It is estimated that 8 to 10 million feet of exploratory drill holes will be drilled in the next 3 years. Indications are that the industry must find not only new uranium deposits, but whole new districts to meet long-term requirements.

### RESERVES, IMPORTS, AND BREEDER REACTORS

Requirement estimates lead to the question of whether uranium supplies will be available at prices reactor users can afford. If the nuclear

power industry is to avert a fuel shortage, relief must be found from pressure on the domestic supply of uranium. There are answers to this problem, however. New reserves may be discovered through the extensive and intensive current and planned exploration projects. The AEC could lift its present embargo on the use of foreign ore in the United States, and breeder reactors—capable of generating more fuel than they consume—may be developed into a commercial reality. Each of these prospects will now be discussed in turn.

Current reserves in the United States are estimated at 200,000 tons of uranium oxide, which can be mined and sold at a price of \$10 a pound, or less, or 350,000 tons if a price of up to \$15 a pound for uranium is acceptable. (The current AEC price of uranium is \$8 a pound.) If one assumes a requirement for an eight-year forward reserve, which the AEC considers reasonable, production through 1980, plus reserves necessary at that time, must total 650,000 tons; this means that roughly a half million tons of uranium must be found between now and the end of 1980.<sup>9</sup> Improved exploration technology, such as the use of airborne electronic sensing devices, is being developed, and drilling and mapping are proceeding at a rapid pace.

A second alternative in providing for uranium needs exists in the easing of import restrictions, an action which might be taken by 1973 or earlier. The Commission has indicated that it might remove the restrictions on foreign uranium for domestic use when its members have reasonable assurance of the viability of the domestic uranium industry. The Commission has taken the position that imports are to augment, not replace, domestic production.<sup>10</sup>

Before the end of the century, breeder reactors may begin to reduce the demand in some segments of the uranium industry. Development of the breeder reactor is expected

<sup>9</sup>Johnson, p. 3.

<sup>10</sup>Johnson, pp. 10-11.

ultimately to cut fuel costs substantially, possibly by two thirds or more. Breeder reactors, however, may be 15 to 20 years away from making a commercial impact and certainly it will be a long time before breeders will have a significant effect on total uranium requirements. It is unlikely that many full-scale breeders will be in service before the late 1980's or that an optimum mix of breeders and thermal reactors can be achieved before the 1990's. Even then, annual uranium requirements may continue to rise.<sup>11</sup>

While none of these three possibilities appear capable of dealing with all of the potential pressures upon the domestic uranium supply, some combination thereof may serve to forestall any possible shortage.

#### PROBLEM AREAS

Because little air pollution is attributable to nuclear-powered utilities, the growing public concern over air pollution has focused on coal-fueled power generators. However, there is concern about the thermal pollution of water by nuclear plants. Vast amounts of water are utilized by nuclear generators to cool various pieces of operating apparatus. Present day nuclear power plants operate with lower steam pressure than do plants burning coal, oil, or gas; hence, the nuclear plants are less efficient and discharge about 50 per cent more waste heat through their condenser cooling systems.<sup>12</sup> As a result, in the Northwest, nuclear power generators have raised the temperature of nearby lakes and streams to the detriment of fish and wildlife.<sup>13</sup> This problem also has been encountered in the Northeast. The problem is acute in fresh water streams where the water temperature is raised downstream as well as at

the point of discharge. Giant cooling towers and other devices have been suggested as possible solutions to this problem and it appears that the long-run benefits may more than cover the initial additional cost.

On the other hand, warm water discharged by nuclear plants has had a positive effect in increasing oyster yields off the east coast. Thermal "pollution" of coastal waters might well be the key in reviving the American lobster industry since New England lobstermen have contended that those waters are cooler than usual, thereby reducing the number of lobsters in that area.

The possibility of accidents in atomic power plants is another problem. A piece of sheet metal triggered an incident last year at the Enrico Fermi Atomic Power Plant on the shores of Lake Erie and the investigations are still continuing. Engineers at the Fermi plant insist, however, that even the worst blowup could not rupture the reactor's thick shield.<sup>14</sup>

There also are hazards connected with uranium mining. Efforts are underway, however, to improve the miners' environment and to protect men from conditions that cannot practicably be further improved, to develop better methods of monitoring the exposures men are subject to, and to better understand the relationship between exposure and lung cancer incidence.<sup>15</sup>

As serious as these difficulties are, none are presently thought to be insurmountable. Solutions are thought to be largely a matter of priorities and cost and should not seriously hinder the long-run recovery of the uranium industry or the development of nuclear power.

#### DISTRICT URANIUM AND NUCLEAR ACTIVITIES

Developments in the uranium and nuclear power industries are of considerable interest

<sup>11</sup>Gordon P. Corey, "U.S. Nuclear Power Strides Augur 150,000 MW by 1980," *Electrical World*, May 15, 1967, p. 145.

<sup>12</sup>Burt Schorr, "Generating Plants Pose a 'Thermal Pollution' Threat to Rivers, Lakes," *The Wall Street Journal*, December 1, 1967, pp. 1, 21.

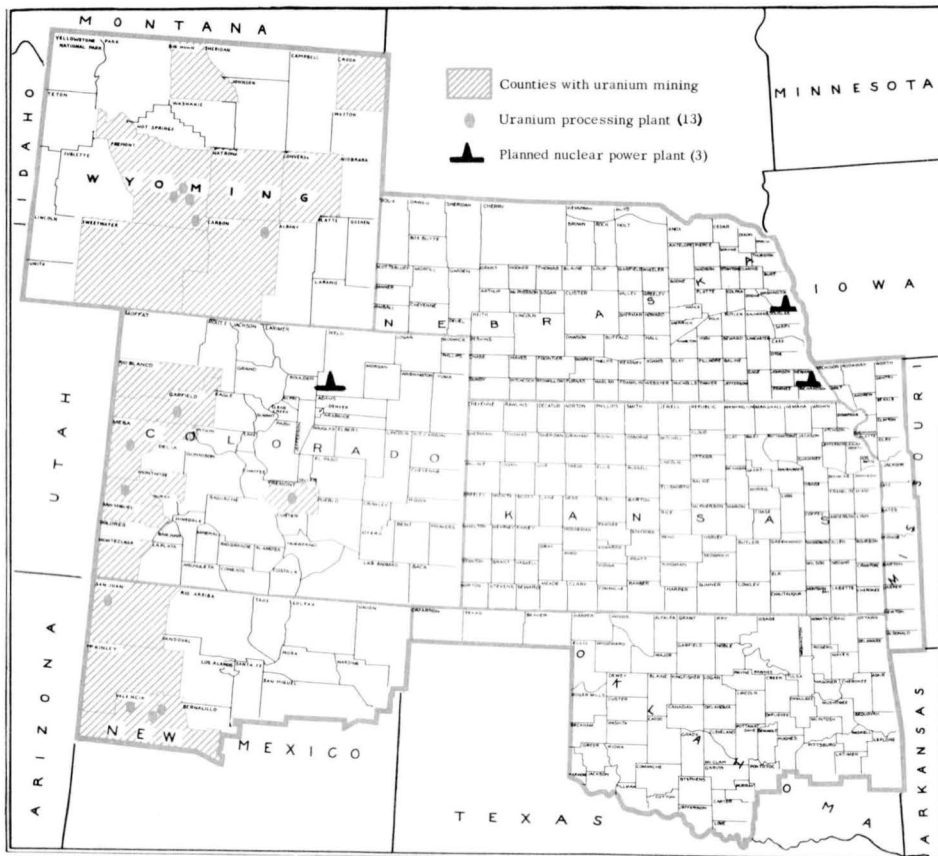
<sup>13</sup>Anthony Netboy, "Nuclear Power on Salmon Rivers," *The Nation*, October 9, 1967, pp. 337-339.

<sup>14</sup>"Eight-Inch Piece of Sheet Metal Triggered Accident in Atomic Plant," *The National Observer*, November 6, 1967, pp. 1, 10.

<sup>15</sup>U.S., *Congressional Record*, 90th Cong., 1st Sess., 1967, Radiation Hazards Compensation Act, pp. S17002-S17010; and Johnson, p. 13.

## Chart 2

### URANIUM MINE, PROCESSING PLANT, AND PLANNED POWER PLANT LOCATIONS, 1966



SOURCE: U. S., Department of Interior, *Minerals Yearbook*, Vol. III, 1965; Vols. I-II, 1966.

to the Tenth Federal Reserve District. Since 1960, more than 80 per cent of the tonnage mined and more than 75 per cent of the value derived from the Nation's uranium mines can be attributed to three District states—New Mexico, Wyoming, and Colorado. In 1966, about 600 mines in all of the uranium-mining states produced 4.3 million tons of ore valued at \$84 million. The percentages of value produced in the three leading states were: New Mexico—46 per cent, Wyoming—21 per cent, and Colorado—13 per cent.

Chart 2 and Table 2 indicate that not only is more than three fourths of the Nation's uranium production taking place in the District but that 17 counties in three states account for all of the District's output. The latest AEC estimates showing economically re-

coverable uranium deposits are, from the District's point of view, very encouraging. These deposits are principally in the Ambrosia Lake area near Grants, New Mexico (about half of the total), in the Gas Hills and Shirley Basin areas of west central Wyoming, and in the Urvan mineral belt in western Colorado.<sup>16</sup>

The District is the dominant area of the Nation in uranium mining and processing. At the end of 1966, uranium processing was carried on at 17 plants in 14 locations. Only four of these plants are located outside the Tenth District. District plant sites include Canon City, Grand Junction, Rifle, and Urvan, Colorado; Bluewater, Grants, and Shiprock, New Mexico; and the Gas Hills, Shirley

<sup>16</sup>Corey, p. 84.



**Table 2**  
**URANIUM ORE PRODUCTION**  
(In millions)

	1960		1961		1962		1963		1964		1965		1966	
	Tons	Value	Tons	Value	Tons	Value	Tons	Value	Tons	Value	Tons	Value	Tons	Value
U. S.	8.0	\$152	8.0	\$148	7.1	\$138	5.6	\$116	5.7	\$112	4.4	\$ 84	4.3	\$ 84
Colo.	1.1	23	1.3	22	1.1	18	1.0	16	0.8	13	0.6	11	0.6	11
N. Mex.	3.8	62	3.6	62	3.5	64	2.3	41	2.1	38	2.0	38	2.1	41
Wyo.	1.4	27	1.5	28	1.3	26	1.2	24	1.2	23	1.0	18	1.1	18

SOURCE: U. S., Department of Interior, *Minerals Yearbook*, Vol. III, 1965; and U. S., Bureau of Mines, *Commodity Data Summaries*, January 1967.

Basin, and Jeffrey City areas of Wyoming. There are two plants in Grants, New Mexico, and three in the Gas Hills of Wyoming.

There are currently plans for power-generating nuclear reactors in two District states. Construction is expected to begin in 1968 on a plant in Colorado and two installations are now planned for eastern Nebraska. The plant at Platteville, Colorado, will have a capacity of 330,000 kilowatts (KW) and a startup date of 1971. The Nebraska plants—at Fort Calhoun and Brownville—will have capacities of 457,400 KW and 778,000 KW, respectively, and startup dates of 1971 and 1972.

Economies resulting from large-scale operations appear to make nuclear power more easily adaptable to more densely populated and highly industrialized regions. While it may be some time before large areas of the District have electrical power from nuclear-energized sources, the District—and certainly the District states of New Mexico, Wyoming, and Colorado—will enjoy the revenues accruing to uranium mining-processing regions.

#### CONCLUDING COMMENTS

More direct comments about the strengths and weaknesses of nuclear power seem appropriate at this point. The advocates of atomic power have some rather distinct advantages in that the development of nuclear energy is a part of national policy and enjoys heavy Government support. Strength also is drawn from the fact that a relatively few, very large,

technically oriented firms are devoting large sums to research and development in this area.

Proponents of the further development of nuclear power point out that, where power can be consumed in very large quantities, nuclear energy is relatively inexpensive. Other advantages include the fact that, since nuclear fuel is compact, the price of nuclear electricity does not depend upon the location of the plant. Additionally, if breeder reactors are successful, an essentially inexhaustible source of energy will be available on the earth's crust. It is possible for nuclear power plants to be almost pollution free.

The disadvantages of nuclear energy center on two aspects. At present, nuclear energy is cheap only if generated by very large plants. Secondly, elaborate and expensive precautions are required to assure safe operation of nuclear power plants. In addition, the disposal of radioactive wastes is relatively complicated.<sup>17</sup>

If the industry continues to capitalize upon inherent strengths and overcome current problems, the outlook for uranium appears extremely bright as the industry makes the transition from weapons demand to fueling electric power generators. The growth in demand for electric power in this Nation signifies expansion for an industry providing a growing share of new generating capacity.

<sup>17</sup>Alvin M. Weinberg, "Uranium—Coal, Rivals or Partners?" *Mechanical Engineering*, March 1967, pp. 32-33.

# Social Security— Development and Financing

By James R. Ukockis

SINCE ITS inception in 1935, the Social Security program has undergone a number of legislative changes. These changes, coupled with the maturing of the program, have led to manifold changes in its importance for both the Nation as a whole and for individual citizens. Moreover, the changes in the last few years have been especially significant since they involved important new kinds of benefits and revenue sources.

In light of these developments, it is appropriate to review the history of the program and focus some attention on the issues involved in the means now being used to support it. Reviewing the major changes in the program provides perspective for judging current and future revenue needs. Previous considerations of Social Security revenues have tended to be limited to the immediate problem of whether or not revenues could be expected in adequate amounts. This article will examine some issues involved in present revenue arrangements.

Because the revenue and benefit sides of the Old Age, Survivors, Disability, and Health Insurance (OASDHI) program are closely related, it is impossible to consider revenues apart from the program as a whole. Perhaps the most basic issue is how one views the role of the program. At one extreme is the view that it is essentially a retirement and insurance plan which relates the security received to previous experience as a member of the labor force. At the other extreme is the view that the program is a major part of this country's effort to provide for the minimum needs of its less fortunate citizens.

## DEVELOPMENT

The original Social Security Act was passed in 1935 and covered a large proportion of the

workers in commerce and industry. It required that a 1 per cent tax be paid by both the employer and the employee on the first \$3,000 of earnings per year. In addition, the original Act included a schedule of gradual rate increases for the ensuing years which was to rise to a maximum rate of 3 per cent in 1949 and thereafter.

Over the years, the coverage of the program has been expanded repeatedly. In 1940, just under 58 per cent of all persons in paid employment were eligible for coverage, but by 1967 the figure had increased to about 93 per cent. Legislation during the 1940's extended coverage to railroad workers for the survivor benefits in effect under Social Security. Gratuitous coverage also was granted during this period to certain veterans of World War II. The 1950 Act was one of the most sweeping in terms of expanding coverage. On a compulsory basis, it brought regularly employed farm and domestic workers, nonfarm self-employed persons (except professional groups), and Federal civilian employees not under the Federal employee retirement system into the program. State and local government employees not under retirement systems and employees of nonprofit institutions were added on an elective basis. In 1954, coverage was extended to certain additional regularly employed farm and domestic workers, farm self-employed, and certain professional self-employed people (lawyers, doctors, dentists, and other medical groups were excluded). At the same time, state and local government employees under retirement systems, who had been excluded by the 1950 Act, were allowed the option of joining the system. The 1956 Act extended coverage further, adding members of the uniformed services and most remaining professional self-

employed persons (doctors of medicine being the major exception). Self-employed doctors of medicine and interns were brought into the program by the 1965 Act. The legislation of 1967 further included all ministers and members of religious orders on a compulsory basis, except in cases where expressed religious objections were involved.

Benefits provided in the original Act included monthly benefits to retired workers and a lump-sum payment at death. The 1939 Act contained provisions extending benefit payments to the dependents of a retired worker, provided the wife was over the retirement age of 65 and the children under 18. Benefits also were provided to such dependents in the event the covered worker was deceased. The 1956 Act lowered the retirement age for women to 62, but provided permanently reduced benefit amounts for retirement at that age. Benefits to disabled workers between the ages of 50 and 64 also were incorporated into the program at that time. The 1958 Act extended disability benefits to the dependents of the disabled worker, subject to the same conditions as applied in the case of retired workers. In 1960, the minimum age 50 requirement was eliminated for disability benefits. The following year, the retirement age for men was lowered to 62, as had been done earlier for women. The 1965 Act further reduced the minimum eligible age for widows to 60, and raised the age of eligible dependent children from 18 to 21, provided they attend school. Two entirely new types of benefits also were inaugurated in the 1965 Act: hospital and related benefits, and a supplementary medical coverage program available on a voluntary basis, both for people aged 65 and over. In 1967, the minimum eligible age for disabled widows was set at 50 years old.

Table 1 shows the average benefit amounts received under various circumstances for selected years from 1940 to 1967. During that period, the average monthly benefits paid to

retired workers increased almost four times. The 1967 Amendments to the Social Security Act provided for a minimum increase in all monthly benefits of at least 13 per cent. Further, the increase in the taxable earnings called for in the 1967 legislation will lead to still higher average monthly benefits in the future by raising the maximum allowable earnings on which calculations of benefit amounts are based.

The development of the financing arrangements of the Social Security program is summarized in Table 2. Since 1937, the maximum annual earnings subject to Social Security taxes have increased from \$3,000 to \$7,800 and the tax rate paid by employees and employers has increased from 1 per cent to 4.4 per cent each. Self-employed persons originally were taxed at the rate of 2.25 per cent in 1951, and currently are taxed at a rate of 6.4 per cent. The rate paid by self-employed persons historically has been three fourths of the combined rate paid by the employees and employers for Old Age, Survivors, and Disability Insurance, but for the Health Insurance the rate is the same as that paid by employees. The supplementary medical benefits provided by the 1965 Act are

**Table 1**  
AVERAGE BENEFITS UNDER OASDHI  
FOR SELECTED YEARS AND CIRCUMSTANCES

	Retired Worker*	Surviving Widow of Retirement Age*	Disabled Worker*	Hospital Insurance†	Medical Insurance‡
	(per month)	(per month)	(per month)	(per claim)	(per bill)
1940	\$22.60	\$20.28	—	—	—
1945	24.19	20.19	—	—	—
1950	43.86	36.54	—	—	—
1955	61.90	48.69	—	—	—
1960	74.04	57.68	\$89.31	—	—
1965	83.92	73.75	97.76	—	—
1966	84.35	74.10	98.09	\$615.00	\$86.00
1967	85.11	74.59	98.27	649.00	62.00

\*All figures are for end of year except 1967, which is average for August.

†Figure for 1967 is for June.

‡Figure for 1966 is for period December 3, 1966, to January 20, 1967; figure for 1967 is for period June 30, 1967, to August 3, 1967.

SOURCE: Social Security Bulletin, December 1967.

**Table 2**  
**DEVELOPMENT OF OASDHI TAX BASE**  
**AND RATES**  
**1937 - 1968**

	Workers Eligible for Coverage			Rates*	
	Number (In millions)	As Per Cent of Total Employ- ment	Base — Maximum Taxable Earnings	Employee and Employer (each) (In per cent)	Self - Employed
1937	—	—	\$3,000	1.000	—
1950	38.7	64.5	3,000	1.500	—
1951	49.6	79.4	3,600	1.500	2.250
1954	49.9	79.5	4,200	2.000	3.000
1957	59.7	90.5	4,200	2.250	3.375
1959	60.3	90.5	4,800	2.500	3.750
1960	61.2	90.7	4,800	3.000	4.500
1962	63.0	90.9	4,800	3.125	4.700
1963	64.0	91.2	4,800	3.625	5.400
1966	71.1	92.3	6,600	4.200	6.150
1967	—	—	6,600	4.400	6.400
1968	—	—	7,800	4.400	6.400

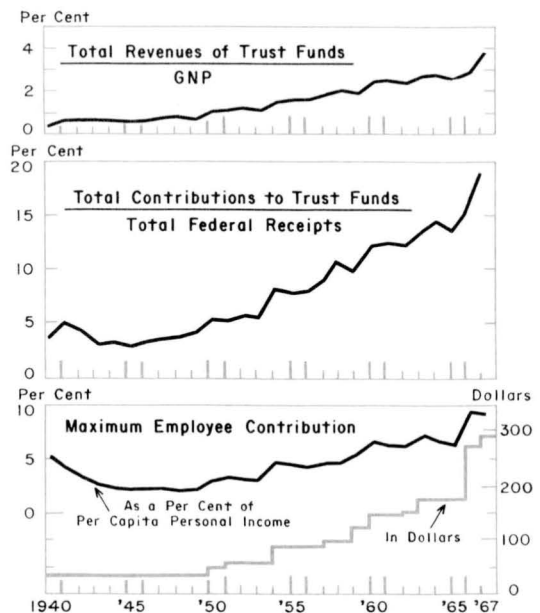
\*Rates shown include Disability Insurance starting 1957 and Hospital Insurance starting 1966.

contingent upon payment, by those over 65 desiring coverage, of a monthly voluntary contribution which was to be increased to \$4 in April 1968. The total contributions received for the supplementary medical coverage are matched by appropriations of general revenues. Neither voluntary contributions nor appropriations of general revenues on a continuing basis had been used by the Social Security program prior to 1965. The 1967 Act, in addition to raising the maximum taxable earnings, contained a new schedule of future rate increases which rises gradually to a high of 5.9 per cent each for employees and employers in 1987.

Not surprisingly, these developments in coverage, benefits, and financing are reflected in measures of the relative importance of the program (Chart 1) to total national economic activity measured in terms of gross national product (GNP)—the total value of all goods and services produced. The total revenues of the trust funds which make up the OASDHI program have increased from .37 per cent of

GNP in 1940 to 3.94 per cent in fiscal 1967—over a tenfold increase. If the total contributions made to the trust funds (total revenues less interest on reserve fund assets, one-time appropriations, and certain interfund transfers) are related to total receipts of the Federal Government, the results vary from 3.76 per cent in 1940 to 19.03 per cent in fiscal 1967. To the individual, the growing importance of the Social Security tax may be indicated by noting that his maximum contribution has increased from \$30 a year under the original Act to \$343.20 a year in 1968. Even when allowance is made for increases in personal income, the tax has increased in relative importance. In fact, the maximum employee contribution expressed as a per cent of per capita personal income almost doubled between 1940 and 1967. Another indication of the impact of the Social Security tax for many individuals is that, in 1967, a married man with two chil-

**Chart 1**  
**MEASURES OF THE RELATIVE IMPORTANCE**  
**OF THE OASDHI PROGRAM**



SOURCES: Calculated from Social Security Administration and Survey of Current Business publications.

dren (taking the minimum standard deduction) had to earn in excess of \$4,340 before his Federal personal income tax exceeded the amount paid in Social Security tax. Thus, in aggregate and individual terms, the economic significance of the Social Security program has increased considerably in recent years.

### FINANCING

The issues related to the current revenue measures of the Social Security program may be divided into two groups: those related to specific revenue measures and those related to the financing arrangements as a whole. The first group necessitates consideration of each specific revenue source: the taxes on employees-employers and the self-employed, hospital and medical contributions, interest earnings, and transfers from general funds. The second group, which is not dealt with in this article, concerns questions such as the distribution of the burden, growth, the cyclical implications, and the implications for security and flexibility.

The tax on employees historically has been an effective revenue producer—paid with little serious objection and subject to few compliance problems. While recognizing this, we also should recognize most of the favorable reception has been accorded when the impact of the tax on individuals was substantially less significant than at present. Whether the favorable reception will continue to characterize the still higher tax projected for future years is difficult to judge.

It has been pointed out that the existence of an annual maximum for the employee tax tends to produce undesirable seasonal variations in income flows.<sup>1</sup> Most persons whose annual income exceeds the maximum amount taxable for Social Security will exceed the maximum some time before the end of the year. After the tax has been fully paid, the take-home pay of such persons increases until

the start of the following year, when deductions are resumed. The result is a considerable variation in quarterly revenue collections for the Social Security Administration. A number of schemes designed to eliminate this trait, while keeping a ceiling on the annual taxes paid, have been proposed but at the very least they complicate the administration of the tax significantly.

In past years, the use of a payroll tax was felt to have some benefit as an aid in the enforcement of income taxes. The widespread use of withholding plans, however, has tended to minimize the contribution of the tax in this regard.

Two of the more commonly stated advantages attributed to the tax on employees are related to benefits. One of these is that the relationship between the employee tax and benefit levels serves to reduce the pressure for benefit increases. The point appears less than certain for a number of reasons. For example, there is no one-to-one relationship between the taxes individuals pay and the benefits they may expect to receive, meaning a person could pressure for a dollar increase in benefits reasonably certain that his tax would go up by something less (the difference being paid out of the tax on employers, interest earnings, etc.). Furthermore, benefit increases may favor some individuals more than others; for example, higher benefits for dependents mean more to a married person than an unmarried one, but both would be subject to the same tax increase. Yet, experiences of other countries suggest a tax on employees does induce some added responsibility.<sup>2</sup> The other advantage often attributed to the tax on employees is that it gives rise to the feeling by recipients the benefits are theirs as a matter of right. The importance of this feature also may be overrated.

A tax on employers for Social Security, used in many countries besides the United

<sup>1</sup>Tax Foundation, Inc., *Economic Aspects of the Social Security Tax* (New York: the Foundation, 1966).

<sup>2</sup>Eveline M. Burns, *Social Security and Public Policy* (New York: McGraw-Hill Book Co., 1956), p. 158.

States, also poses questions, such as who actually bears the burden of the tax since it is widely recognized that employers may shift a tax to their employees or customers through lower wages or higher prices. Since we cannot determine exactly who bears the burden of the employer tax, it is interesting to consider each of the alternative possibilities. If the burden rests on the employer, it is not in harmony with viewing the Social Security program as a way for individuals to provide for themselves in years to come. If the burden is shifted to employees, what is the rationale of continuing the present employer tax? Would it be better to abolish the employer tax and change the employee tax so as to more directly determine how the total burden is distributed among workers? The last possibility—the burden passed to consumers through higher prices—also weakens the link between workers' taxes and their benefits and raises the question: Why continue taxing employers? Yet, there may be some appeal to having a share of the burden distributed among the population in a pattern related to how much of labor's effort they consume in goods and services.

There are also issues related to the specific form of the tax presently used. The present tax rate on employers is equal to the rate paid by their employees. Since the productivity of labor, and hence wage levels, varies from industry to industry, the impact of the tax also varies. For example, in 1962 the average proportion of total wages subject to tax was 80 per cent for manufacturing firms and only 67 per cent in mining.<sup>3</sup> Further, the employer tax may encourage individual firms to substitute capital equipment for labor in order to reduce this element of total production costs although technical problems, financial difficulties, and union resistance undoubtedly act as barriers to such substitution. If the present form of the employer tax does favor some

industries and production methods, the tax needs to be reevaluated.

The tax on self-employed persons produced total revenues equal to less than 10 per cent of the amount derived through employee and employer taxes in 1965.<sup>4</sup> To self-employed individuals, however, the tax may have significant impact since the entire contribution is paid by one person rather than divided between employees and employers. Being a blend of the employee-employer taxes (in the sense that the self-employed rate is halfway between what each of the others pays alone and their combined rate), many of the issues related to those taxes are relevant here also. For example, questions again arise concerning the directness of the tie between taxes paid and the benefits expected, and the extent to which the burden of the tax may be shifted to consumers through higher prices. Again, while the present arrangement perhaps has a certain flavor of fairness, relating it to either an insurance or welfare view of the broad objectives of the program is difficult.

The mandatory Hospital Insurance contribution, which is currently levied at the rate of .6 per cent (out of the total 4.4 per cent OASDHI levy on employees and employers), simply may be considered as part of the employee and employer taxes and treated accordingly. The voluntary monthly contribution paid for the Supplementary Medical Insurance, on the other hand, is quite different. Established by the 1965 Act in conjunction with the Medicare program, persons over 65 may decide whether to enroll in the program during specified time intervals. Certain provisions in the law serve to discourage persons from remaining outside the program until medical expenses are imminent. Yet, the existence of any option at all gives rise to the question: Who will choose not to participate? Two groups come to mind—those with exceedingly low

<sup>3</sup>Tax Foundation, p. 23.

<sup>4</sup>U.S., Department of Health, Education, and Welfare, Social Security Administration, *Social Security Bulletin, Annual Statistical Supplement, 1965*, p. 31.

incomes, and those who feel they run a very low risk. Those who elect not to participate because they judge the risk to be small are probably few. However, to the extent persons can correctly anticipate what the risks are, the absence of such persons from the program has the effect of increasing the benefit costs per person of those who do elect to enroll. Those with low incomes who elect not to enroll are, in effect, putting the burden of their medical expenses on other public and private agencies. If higher rates for the voluntary coverage should prove necessary in the future, the problem could become more acute. The basic issue therefore is one of deciding how large a role the OASDHI program is going to play in financing medical care for persons over 65. The present arrangement does harmonize with the view of Social Security as an insurance device, but is not likely to satisfy those with more of a welfare outlook. To provide for the minimum medical needs of everyone over 65 through the Health Insurance program might require a mandatory, and perhaps broader, source of revenues than currently used.

Interest earnings are derived from the Social Security reserve funds by investing them in debt obligations of the Federal Government. These interest earnings are paid out of general revenues. Thus, to the extent that reserves are built up and invested, interest earnings enable the Social Security Administration to pay for part of its benefits by use of general revenues.

As mentioned earlier, the continuing appropriation of general revenues for the Supplementary Medical Insurance program contained in the 1965 Act represented a new development in that it enabled general funds, other than interest income, to be used. Yet, there is some precedent for using general funds. In 1949, Congress authorized appropriations from general revenues but no appropriations actually were made and the authorization was repealed in the 1950 Act. It also should be noted that

Britain and New Zealand have used general revenues for their social security programs.<sup>5</sup>

Objections to the use of general revenues in this country are founded on the fear that using general revenues will tend to cause demands for overly generous benefits and unduly high program costs or alternately, that Congress might be less willing to liberalize benefits if the funds are to come from general revenues. The issues are much the same as the assertion of fiscal discipline being derived from the employee tax. If, in fact, the use of an earmarked employee tax does exert some discipline on the program, then relying on other more general revenue sources would appear to entail less fiscal discipline.

A question which goes begging in any discussion of general revenue support relates to the institutional arrangements or limitations governing their transfer to the Social Security program. Given a concern for fiscal discipline, to make appropriations on a regular basis with no guidelines as to amounts would be least satisfactory. A somewhat restricted approach would be to limit general revenue appropriations to one third of the total contributions paid into the trust funds—in effect, making the Federal Government an equal partner with employees and employers in supporting the program.<sup>6</sup> Another would be to limit the appropriations to amounts necessary to maintain the “real” value of the accumulated reserve, i.e., make up any losses in the value of the reserves owing to inflation. With accumulated reserves of, say, \$20 billion, an increase of 1 per cent in prices would therefore necessitate an appropriation of about \$200 million. Another alternative arrangement which appears unlikely to involve extensive fiscal discipline problems would be to use appropriations only in conjunction with the extension of coverage to

<sup>5</sup>Burns, p. 172.

<sup>6</sup>Senator Robert F. Kennedy once introduced a bill, endorsed by 10 of his colleagues, which proposed a form of this idea. See Dan Cordtz, “Social Security: Drifting Off Course,” *Fortune*, LXXVI, No. 7 (December 1967), p. 208.

additional persons. Each time new persons are brought into the program, a problem arises in paying for the benefits of those who become eligible for them before their contributions have continued long enough to fully provide the necessary financing. Since over 90 per cent of those in paid employment or self-employed are currently eligible for coverage, the appropriations necessary under such an arrangement would be minimal and eventually would cease.

#### SUMMARY

Since 1935, the Social Security program has changed greatly in terms of its coverage, benefits, and financing. The coverage of the program has been expanded continually and currently includes about 93 per cent of persons in paid employment, as compared to only 58 per cent in 1940. Benefits have been increased both in terms of eligibility and the amounts of the benefits. Correspondingly, the financing of the program has undergone numerous changes. The basic employee-employer tax has risen from the original maximum of \$30 each to \$343.20 in 1968, through higher rates and a larger maximum taxable earnings base. Taxes on self-employed persons, voluntary contributions for medical insurance, and limited matching appropriations from general funds also have been introduced.

Each revenue source used by the program is subject to different points of view and, in some cases, questions of fact. Concerning the tax on employees, the more important issues turn on subjective reactions to the tax—how it will be received by taxpayers as the base and rates are increased further, the fiscal discipline it imposes on demands for increased benefits, and the extent to which participants view their payments as being for a retirement and insurance program. The tax on employers involves a critical question of fact: Does the employer bear the burden or does he shift it to his employees or customers through lower wages or higher prices? No matter who bears the burden, however, some difficulties are en-

countered in trying to relate the tax to objectives of the Social Security program as a whole. Further, serious implications for resource allocation are present since the tax does not fall uniformly on employers in different industries. Because the tax on self-employed persons is only three fourths as much as the combined employee-employer taxes and it is paid by one party rather than divided between two, there is a possibility it may have some impact on the form of business organization. On the other hand, as a blend of the employee-employer taxes, many of the issues involved in those taxes are relevant for the self-employed tax also. The voluntary monthly medical contribution paid by those over 65 who elect to participate in the Supplementary Medical part of the program must be considered with explicit reference to the objectives to be served. Whether this part of the program seeks to provide low cost insurance or to provide the major portion of the medical needs of those over 65 has a great bearing on the adequacy and wisdom of this form of financing. The advisability and extent to which general funds should be used to pay for certain types of Social Security benefits may hinge largely on whether their use will lead to demands for overly generous benefits. If such revenues were to be widely regarded as unlimited or involving little sacrifice, the costs of the program could quickly exceed sensible proportions.

An empirical evaluation of the Social Security program indicates it is likely to continue growing, though stemming more from greater benefits per individual than from covering more occupations as in the past. To the extent that this occurs, more revenue will be needed to provide the necessary additional financing. As additional revenues are needed, the sources of these revenues are likely to be reviewed more carefully. The most realistic methods of financing future additional benefits will be contingent upon the philosophy underlying the Social Security program.