nology for breeder type reactors for about 1995. The assumed timing of the reactor installations is keyed to the staging of augmentation water deliveries in years 1990, 2000, and 2010. Replacement plants will also be required at the end of the 30-year service life for each dual-purpose plant.

While it is recognized that the full benefits of 1995 technology will not be available for the first-stage installation, the same reactor costs have been used throughout the study period to simplify the analysis. Since two of the three installation stages and all the replacement reactors will be built after 1965 and will have the advantage of further technological improvements, it was considered that the 1995 assumptions adequately represent average conditions over the period. Also, in view of the long-time period and the attending uncertainties involved, further refinements reflecting different levels of technology for various specific installations would not be expected to enhance the accuracy of the projections at this time.

The nuclear reactors are assumed to be of the fast breeder type. This reactor concept is an advanced type and will require further development, testing, and demonstration. The Atomic Energy Commission, American industry, and foreign countries have extensive programs for the development of fast breeder power reactors using various designs. Emphasis is being directed toward development of this type of reactor because it is predicted that its use will be essential to permit the nuclear industry to achieve the expansion projected by the end of this century.

Development of high-grain breeder reactors will increase the efficiency of fuel utilization. This will have the effect of permitting the economic use of lower grade uranium ores, and will thereby extend the available resources. The breeding feature results in very low fuel cycle costs, and hence these reactors have a potential for producing low cost heat and power.

The design used for cost estimates in this report is based upon those developed by the Argonne National Laboratory in 1966 for a sodium-cooled, fast breeder reactor. The Atomic Energy Commission provided base estimates for two 5,000-megawatt thermal (mwt) reactors at a single station. Because of the time period involved, the individual sizes may be smaller or larger. The use of a station with multiple reactors would provide added flexibility of operation. Multiple reactors, also would reduce the hazard to electric systems which rely on the plant for firm power and would have to carry spinning reserves to protect against the possibility of an emergency reactor shutdown. From the base figures, costs were derived for reactor capacities to meet the heat requirements for each stage of desalting plant installation.

In addition to the heat energy required for desalting, the reactors will provide heat for the production of electric power. The power production will exceed the requirements for the pumping of project water in each stage, and, as explained previously, the financing and marketing of power in excess of project needs would be the responsibility of non-Federal entities and are divorced from the financial analysis in this report. Because the reactor concept used in the present study has been developed primarily for commercial power production, large amounts of electric power will be produced. According to recent estimates prepared by the Federal Power Commission, however, approximately 4,500 megawatts (mw) of new generating capacity will be required each year by about 1990 to meet anticipated commercial load growth in southern California, Arizona, and southern Nevada. About one-half of the 4,500-mw load growth, or 2,200 mw, represents the requirement for commercial baseload generating capacity. Furthermore, future technology may yield concepts which could decrease the amounts of electric power produced.

The output of the reactors and turbine generators and uses associated with each stage are as follows:

Stage (year)	Total reactor capacity (megawatt-tons)	Powerplant installed capacity (megawatts)	Auxiliary power in plant (megawatts)	Project pumping (megawatts)	Available for commercial sales (megawatts)
1990	13, 050	3, 615	452	567	2, 596
2000	6, 525	1, 807	225	283	1, 299
2010	6, 525	1, 807	225	283	1, 299
Total	26, 100	7, 229	902	1, 133	5, 194