

corrosion products, semi-conductive glazes on porcelain insulators and particulate pollutants.

Hydro-Quebec established the Hydro-Quebec Institute of Research (IREQ) in 1969 to provide a sound technological basis for Quebec's electric utility expansion and to provide research and testing facilities for other utilities and electrical manufacturers in Canada and throughout the world. In recognition of this national and international role, the Government of Canada provided substantial financial support to the Institute.

IREQ is located on a 600-acre site in Varennes near the Boucherville substation on the south shore of the St. Lawrence River about 18 miles from Montreal. This location was chosen to enable the Institute to be connected with Hydro-Quebec's 735-kv transmission system so that it could be used for testing and development purposes.

By the end of 1971 work on the complex had entered its third phase — construction of the high-power laboratory. Phase I, the administration building containing general laboratories, all staff offices, computers, workshops, a library and an auditorium, was completed in 1969 and became operational in 1970. The 60,000-sq-ft, 168-ft-high high-voltage laboratory (Phase II) became operational in October 1971. Utilizing impulse generators with outputs up to 6,400 kv and an energy content of 380 kilojoules, the high-voltage laboratory is capable of very sophisticated testing. The high-power laboratory, to commence operation in two stages in 1972 and 1973, will take its power source from the 735-kv transmission system but through the use of synthetic test circuits the effective short circuit power capability will greatly exceed that of the power system.

Projects under study involve: generation, transmission, distribution, system operation and power utilization. Many of the projects are under contract from interests in Canada, the United States and Europe while others are of particular interest to Hydro-Quebec. These include: studies to enable reduction in equipment costs; research into problems associated with high voltages, especially high-voltage direct current (HVDC) transmission technology; simplification of test standards; evaluation of existing and new insulation materials for cables; investigations into unconventional sources of generation, including fuel cells and thermo-nuclear fusion; studies of corrosion problems on lines and equipment; and research on the application of electrical energy to chemical synthesis.

9.6 Research and development expenditures

In 1970 Canada's current expenditures on research and experimental development in the natural sciences were estimated to be \$865 million, divided as shown in Table 9.3. The federal government is the major source of funds for research and experimental development providing 52% of the total current funds.

9.6.1 Federal expenditures

Information on the expenditures of the federal government on scientific activities is secured by two annual surveys carried out by Statistics Canada, one for the natural sciences and the other covering the human sciences. Each survey covers the actual costs of scientific programs for the preceding fiscal year and estimated expenditures for the following two years.

Natural sciences. In addition to research and experimental development, data are collected on five other classes of scientific activities in the natural sciences. These activities, often grouped as "related" scientific activities, include: scientific data collection, scientific information, testing and standardization, feasibility studies and scholarship programs. Data are also collected on personnel, sector of performance, object of expenditure, category of R&D, field of science and regional distribution of expenditures and personnel. Complete results are presented in the annual publication *Federal government activities in the natural sciences*, Catalogue No. 13-202.

Total federal government expenditures on activities in the natural sciences for 1972-73 were estimated at \$881 million, representing almost 6% of the total federal budgetary estimates. Scientific expenditures were reported by 29 departments and agencies; 11 of them spent more than \$10 million on scientific activities in 1972-73. R&D accounts for almost 72% of the total 1972-73 current expenditures; with slight variations this proportion has held constant for the past ten years. Scientific data collection — the gathering, processing, collating and analyzing of data on natural phenomena — is the principal related activity accounting for almost one half of the 1972-73 estimated expenditures for such activities. Table 9.4 shows federal scientific expenditures by type of activity and by major department or agency for the years ended March 31, 1972 and 1973.