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ECONOMIC IMPACT OF HYDRO-QUEBEC'S NUCLEAR ACTIVITIES

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Presented by R. Emard, Nuclear Operations Director, at the Canadian Nuclear Association/Canadian Nuclear Society's annual conference held in Montreal, June 5 to 8, 1994.

Tills

Introduction

I proudly accepted this invitation to discuss the economic and social spin-offs generated by Hydro-Québec's nuclear activities. It seemed quite appropriate, in these times of economic uncertainty and high unemployment, to give an account of the nuclear activities in Quebec, most of which are generated by the operation of the Gentilly 2 nuclear station.

During the next few minutes I will summarize the economic impact and high-quality jobs created on a regional, provincial and international basis.

(Main stages of nuclear development at Hydro-Québec)

Nuclear Development at Hydro-Québec

Nuclear technology was first introduced at Hydro-Québec in the mid sixties with the construction of Gentilly 1, an AECL prototype power plant operated by Hydro-Québec personnel.

During this period, expertise in nuclear station planning, commissioning and operation was transferred from AECL to untried Hydro-Québec staff recruited from the community. Also, at that time, nuclear technology was being introduced at various universities in Québec.

As a result of the decision to stop operating the Gentilly 1 plant, about 25 million dollars were put into research and development to design a safe decommissioning process for nuclear power plants. This not only produced significant economic spin-offs for the community, but Hydro-Québec and AECL gained a valuable expertise in nuclear plant decommissioning.

The Arrival of Gentilly 2

Construction work on Gentilly 2 started in November 1973. The project's overall cost, including commercial operation startup, was nearly 1.4 billion dollars. A total of 8350 person-years were required to complete the work.

It is mostly during this period that the infrastructure and technology required for nuclear plant construction, operation and maintenance were developed in Quebec.

Gentilly 2 is Hydro-Québec's only nuclear plant. Its 675 megawatt generating capacity provides nearly 3% of Hydro-Québec's total power output. It is located halfway between Montreal and Quebec City, on the south shore of the St. Lawrence

River, near the Bécancour Industrial Park.

All nuclear activities take place at the Gentilly site. These activities fall under the Nuclear Operations Directorate and they are divided along operational, functional and support lines. To underscore their diversity, I have listed below the main activities falling under this directorate.

(Slide #1: Nuclear Operations Organization Chart)

Operation. The operation group is composed of the shift crews, the operator trainees, the fuelling machine operating team and a chemistry team. The operation and maintenance team from the Bécancour Gas Turbine Power Plant was recently added to the operation group.

Radiation Protection and Maintenance. This group is comprised of the various mechanical, electrical, instrument and service, and maintenance teams. It also deals with radiation protection, both functional and support, and industrial safety.

Technical Services. This group is the guardian of the Gentilly 2 design concept and has complete technical responsibility. It includes all system engineers and it is responsible for safety and licensing activities. It also carries out projects and modifications. Technical Services also coordinates all nuclear research and development.

Technical Training. It supervises technical training on operation, radiation protection, industrial safety, etc. It also supervises and coordinates any personnel training authorized by government agencies and it conducts control room simulator training.

Support Services. This group is being reorganized but it is mainly responsible for budgeting, procurement, documentation and automatic data processing services. It is also involved in quality assurance and the implementation of the audit program. In addition, it provides a planning, coordination and control team; one of the responsibilities of this team is to integrate and coordinate work programs initiated by the various Nuclear Management units, based on current objectives.

Gentilly 2: One of the Region's Main Employers

To perform these activities, 664 permanent jobs were created along with about 70 temporary person-years. As a result, Gentilly 2 has become one of the region's main employers. As shown on the next slide, over 70% of these jobs are highly specialized and multi-skilled:

(Slide #2: Job Distribution in Various Classifications)

- 123 professional engineers from various specialties, i.e. civil engineering, physics engineering, nuclear engineering, mechanical engineering, process engineering, electrical engineering, and probably others. These engineers have also received extensive training on nuclear and conventional system supervision;

- 131 technicians trained in various fields such as computer science, electronics, instrumentation and control, chemistry, environmental science;

- 214 specialists including control room operators, fuelling machine operators, system maintenance specialists and service maintainers;

- 89 office workers responsible for clerical work, accounting, budget control support, drafting;

- 53 specialists in the fields of basic and applied science, all university and college graduates;

- finally, 54 managers holding jobs ranging from supervisor to senior executive officer; these employees have diverse backgrounds, i.e. tradesmen, technicians, former shift supervisors and also professional engineers.

Economic Impact

The preceding two slides show the type of activities performed by our employees and the type of jobs they hold.

(Slide #3)

We will now look at the economic impact of the station. I will use the station expenditures for 1993, including those related to the Bécancour Gas Turbine Power Plant.

Out of a total of 99 million dollars in expenditures, nearly 58% or 57.3 million are used for wages paid to Nuclear Management personnel.

Equipment and supplies, including heavy water and fuel, cost a total of 16.3 million dollars. Another 18 million was allocated to pay for a wide range of professional services, such as training and engineering consultants provided by AECL and other firms.

Nearly two million dollars out of a total of 4.5 million, under "Miscellaneous Expenditures", were used for various fees and permits, and almost half a million dollars was spent on contract work.

Distribution of Regional Economic Spin-Offs from Nuclear Operations

The above economic data reflect overall outlays from Gentilly 2. However, to better portray Gentilly 2 as a driving force in the economy of the region, I will describe the location and types of spin-offs generated by the station.

Gentilly 2: A Major Economic Driving Force in Two Regional Municipalities

The Bécancour Regional County Municipality encompasses the Gentilly site. It basically includes the town of Bécancour and its immediate surroundings.

The Francheville Regional County Municipality encompasses the greater Trois-Rivières area on the north shore of the St. Lawrence River.

The Bécancour MRC
(Slide #4)

The following is based on 1993 data:

Wages paid to the 191 employees living in the Bécancour area total slightly more than 15 million dollars a year. Also, the station spent about 2.4 million dollars in the Bécancour area for various purchases, including municipal and school taxes.

The Bécancour Gas Turbine Power Plant

A gas turbine plant was built on the Gentilly site for two key reasons. First, Hydro-Québec needed a plant to meet peak power requirements. Second, Gentilly 2 needed a plant to restore power to its auxiliaries in the event of a grid failure. The Bécancour plant generates nearly 400MW.

Plant construction generated an initial investment of 311 million dollars. In addition, to support its commitment to environmental development, Hydro-Québec allocated 3.8 million dollars to three regional agencies. This money will be used to design and implement environmental initiatives related to natural resources, heritage sites and public education.

The Francheville MRC
(Slide #5)

The 452 employees residing in the greater Trois-Rivières area receive over 35 million dollars in wages every year.

Also, about 1.8 million dollars were spent in the greater Trois-Rivières area in 1993 for a variety of professional services. As a result, this provided a major boost to our consultants and suppliers.

Nearly 1.8 million dollars were spent for contract work in 1993, and local purchases alone generated over 1.6 million dollars in business. To sum up, economic activities in the area surrounding the station total more than 50 million dollars a year.

Spin-Offs at the Provincial Level
(Slide #6)

Most expenditures within the Province of Quebec, outside the two regions mentioned above, were for wages, equipment and supplies and for professional services. Such expenditures totaled about 31 million dollars.

Purchases Outside Quebec
(Slide #7)

Nearly 10 million dollars were paid out to various suppliers outside Quebec for such things as fuel and heavy water.

Gentilly 2 Fosters Technological Development

Although it is not easy to quantify, Gentilly 2's technology and quality assurance requirements, in its business dealings, create a need for specialized training and, as a consequence, high wage jobs.

Gentilly 2 also spurred the expansion of several private businesses. Our special requirements gave the opportunity to various suppliers to develop leading edge technologies and train highly qualified personnel. This new expertise has allowed many of these businesses to expand into national and even international markets.

During the 1986-1988 period, we invested about 21 million dollars for the design, manufacture and installation of a control room simulator and related infrastructures.

Gentilly 2 is also active on the international scene. Several of our experts have been sent to Rumania to supervise the construction and commercial startup of the Cernavoda Nuclear Power Plant. Technical exchanges were established with Électricité de France to assess the feasibility of a long-term maintenance project and the preservation of the station's life cycle potential. This subject will be covered by Michel Ross later on during this conference.

We have signed a cooperation agreement with the Blayais nuclear site and we have been exchanging data with them for five years.

We provide simulator training services to the Embalse Nuclear Generating Station in Argentina, a station with characteristics similar to Gentilly 2. This station periodically sends personnel to Gentilly to train on our simulator in order to develop their operating skills in normal and abnormal situations.

Valuable Technological Innovations

R & D activities aimed at solving specific station problems have led to the development of a wide range of high-quality products which, in many cases, can be exported to CANDU sites or other industries.

To give one example, our experts designed the equipment and procedures required to conduct reactor building containment tests without shutting down production, i.e. low-pressure testing. A patent was issued for this innovation and Gentilly 2 also received a quality award (Méritas) from Hydro-Québec.

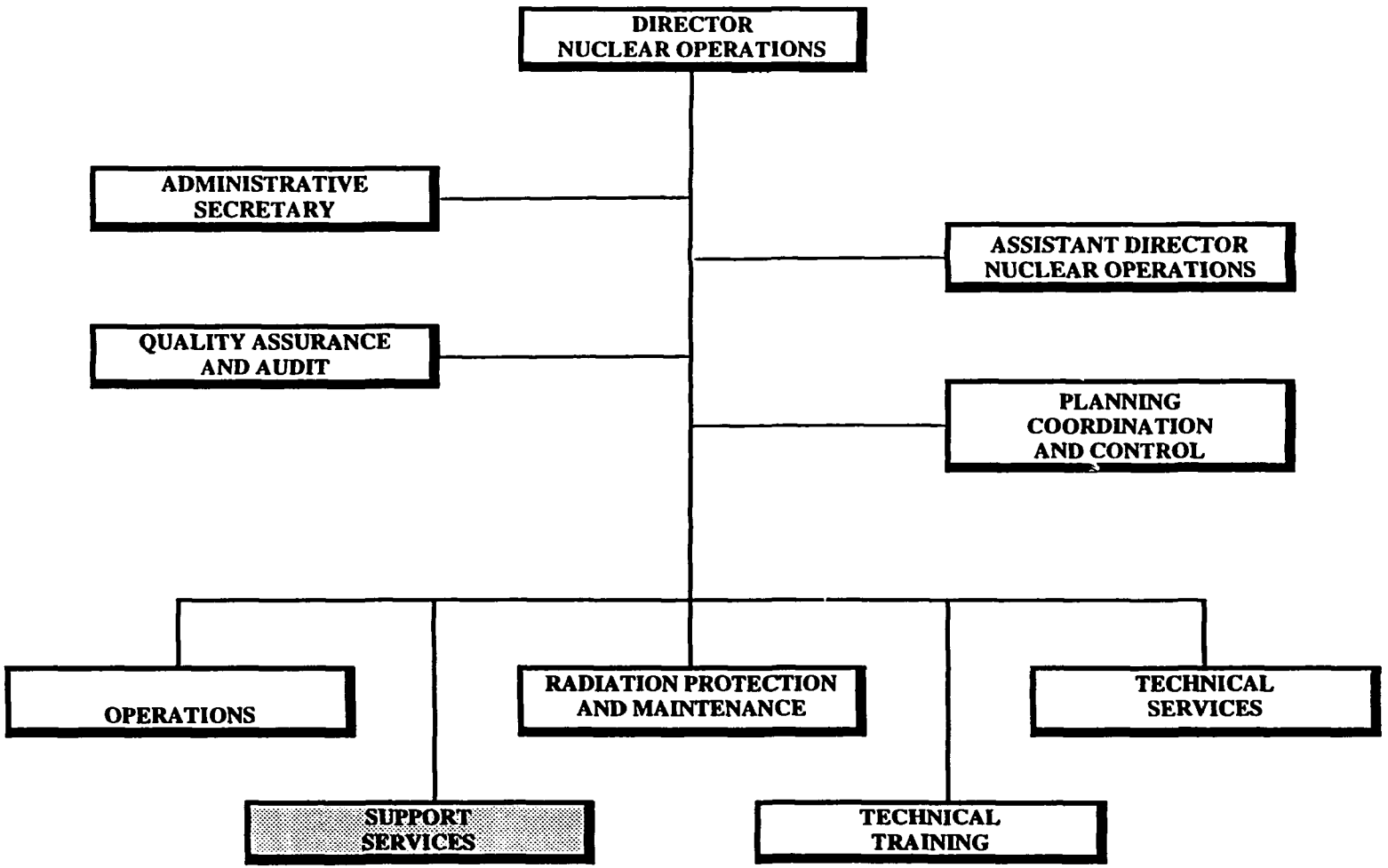
Also, Gentilly 2 employees gained a unique experience in flux detector replacement; as a result, we modified original equipment and tools and we revamped flux mapping and calibration analyses. This experience was put to use in 1992 when flux detectors were replaced at another CANDU 600 site.

We have many more projects on stream and numerous challenges which will help stimulate the local economy and also create more high-quality jobs.

In closing, I would like to point out that these achievements were made possible by the remarkable determination, motivation and initiative shown by all Gentilly employees. I also wish to emphasize that Gentilly 2 employees have always given priority to safety over production. I thank you for your attention.

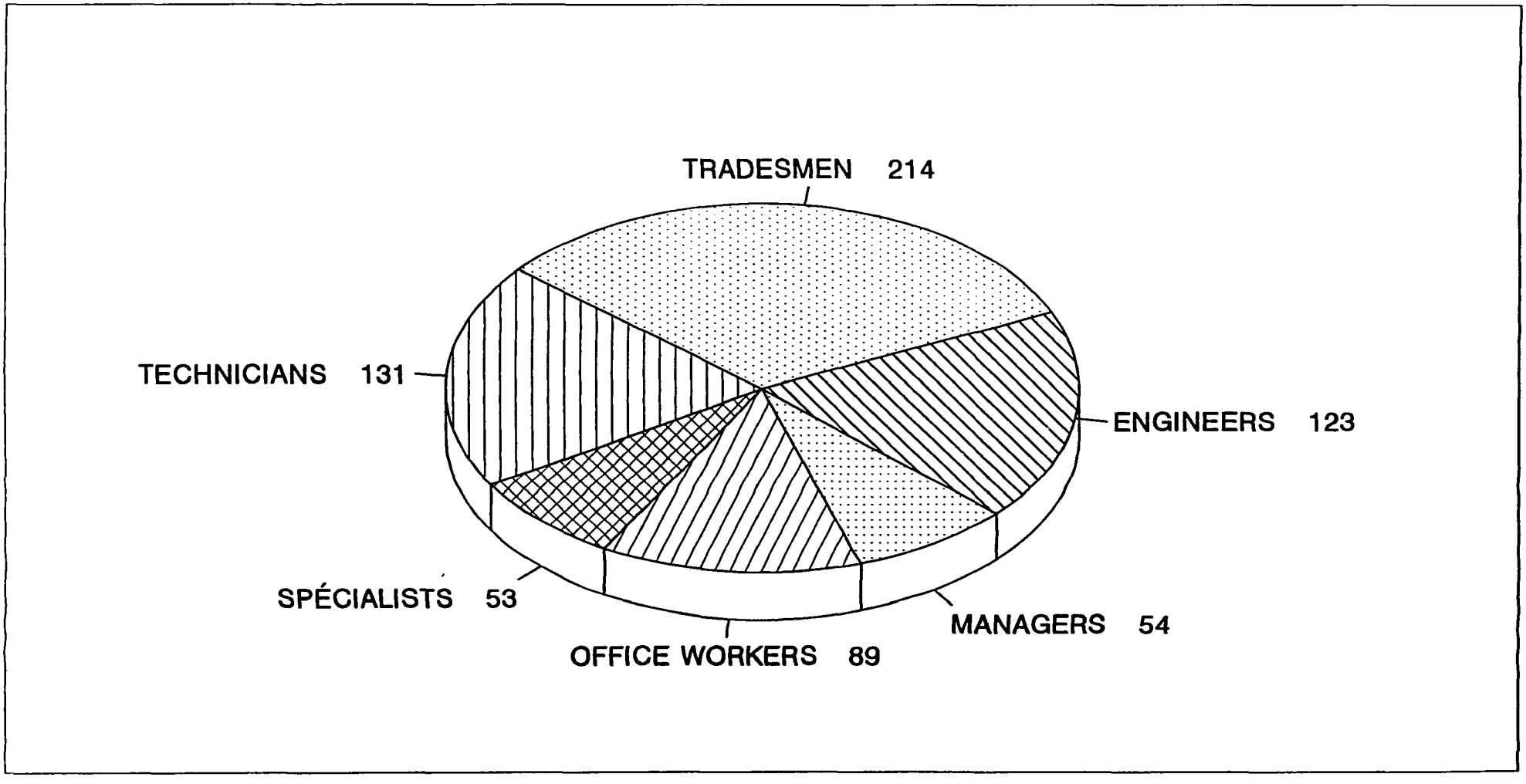
ANNEXES

NUCLEAR OPERATIONS ORGANIZATION CHART



NUCLEAR OPERATIONS DIRECTORATE

JOB DISTRIBUTION (TOTAL: 664)

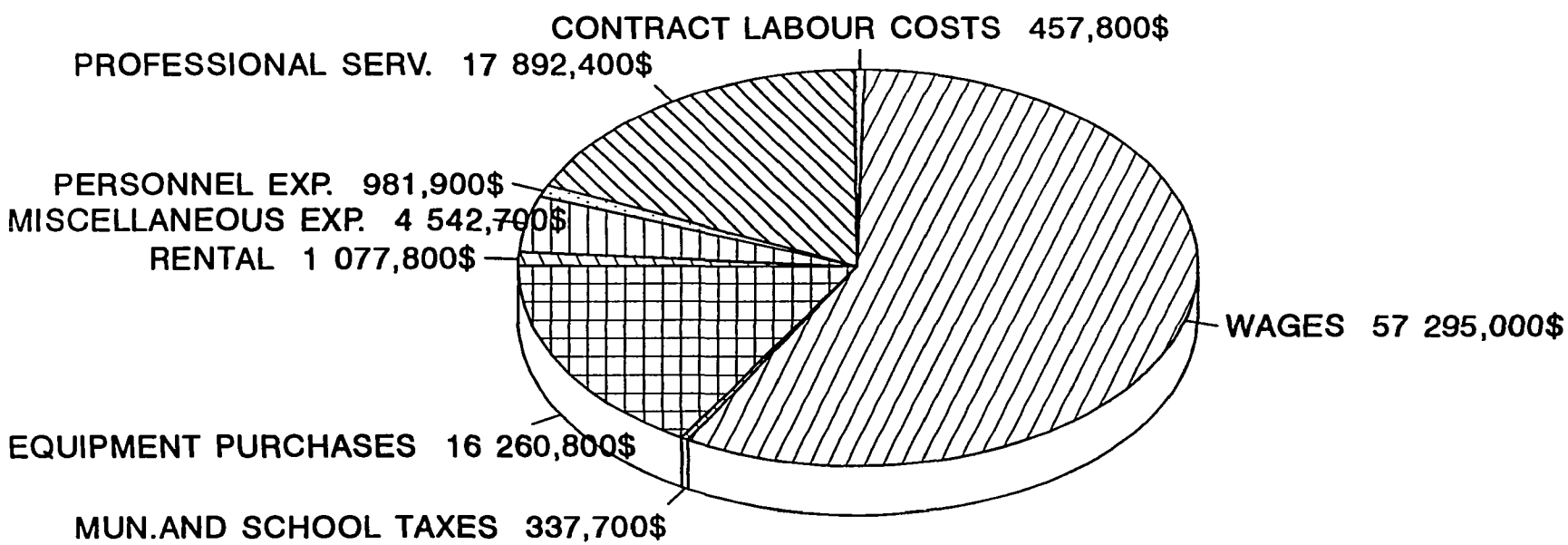


YEAR 1993

(POST93A.CH3)

NUCLEAR OPERATIONS DIRECTORATE

DIRECT ECONOMIC IMPACT



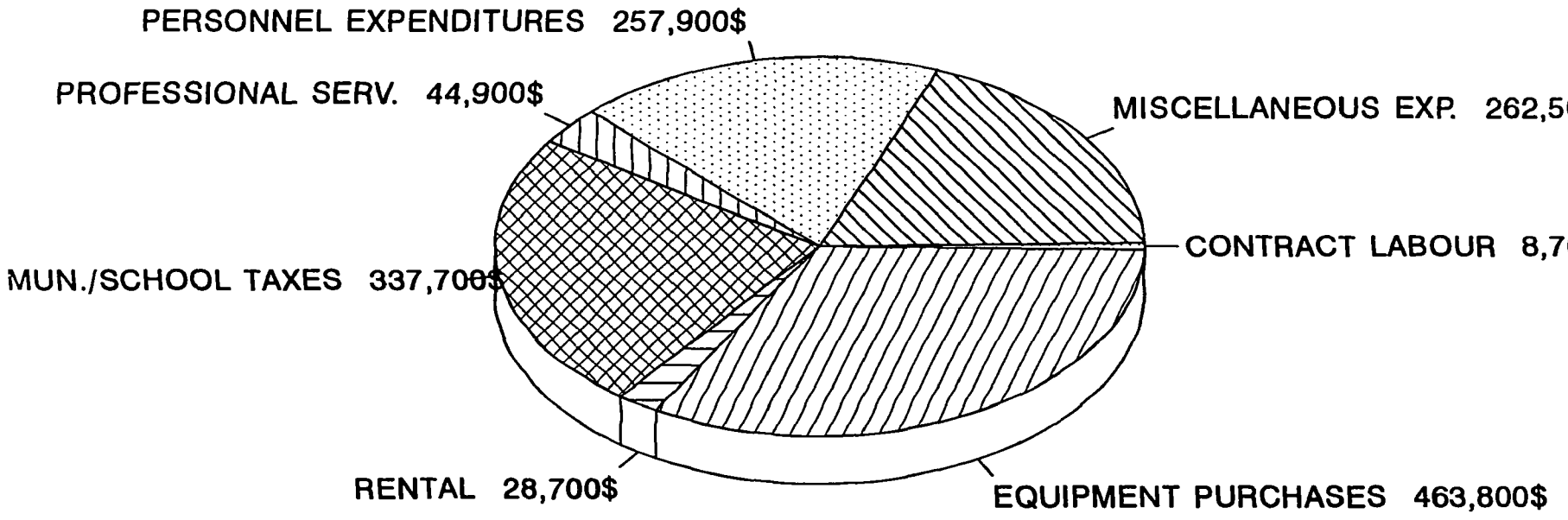
DISTRIBUTION BY TYPE OF EXPENDITURES: 98 846,100$

YEAR 1993

(GRAPH6A.CH3)

NUCLEAR OPERATIONS DIRECTORATE

ECONOMIC IMPACT - BECANCOUR MRC



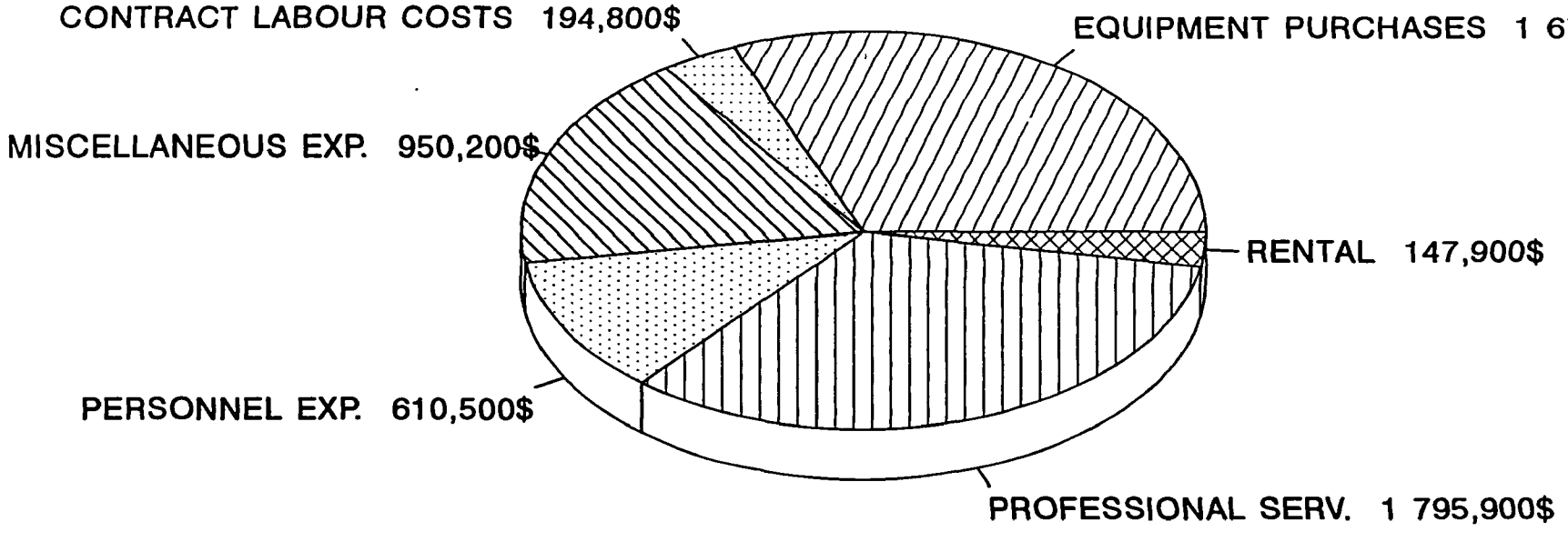
DISTRIBUTION BY TYPE OF EXPENDITURES: 1 404,200$

YEAR 1993

(GRAPH2A.CH3)

NUCLEAR OPERATIONS DIRECTORATE

ECONOMIC IMPACT - FRANCHEVILLE MRC



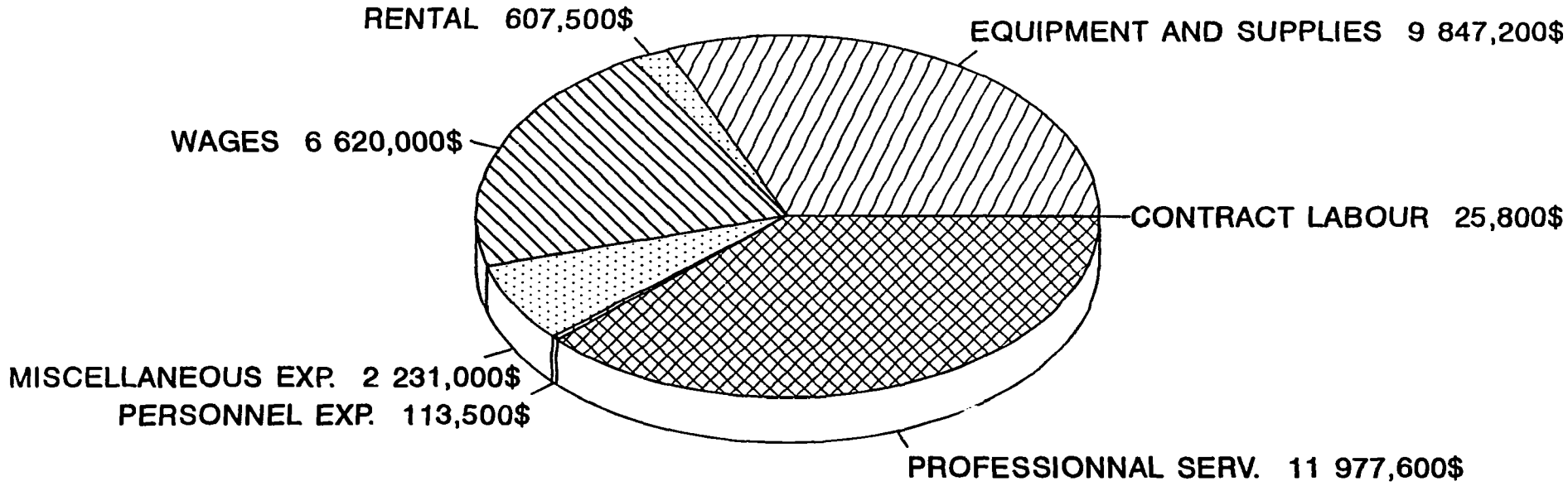
DISTRIBUTION BY TYPE OF EXPENDITURES: 5 376,500$

YEAR 1993

(GRAPH4A.CH3)

NUCLEAR OPERATIONS DIRECTORATE

ECONOMIC IMPACT - YEAR 1993



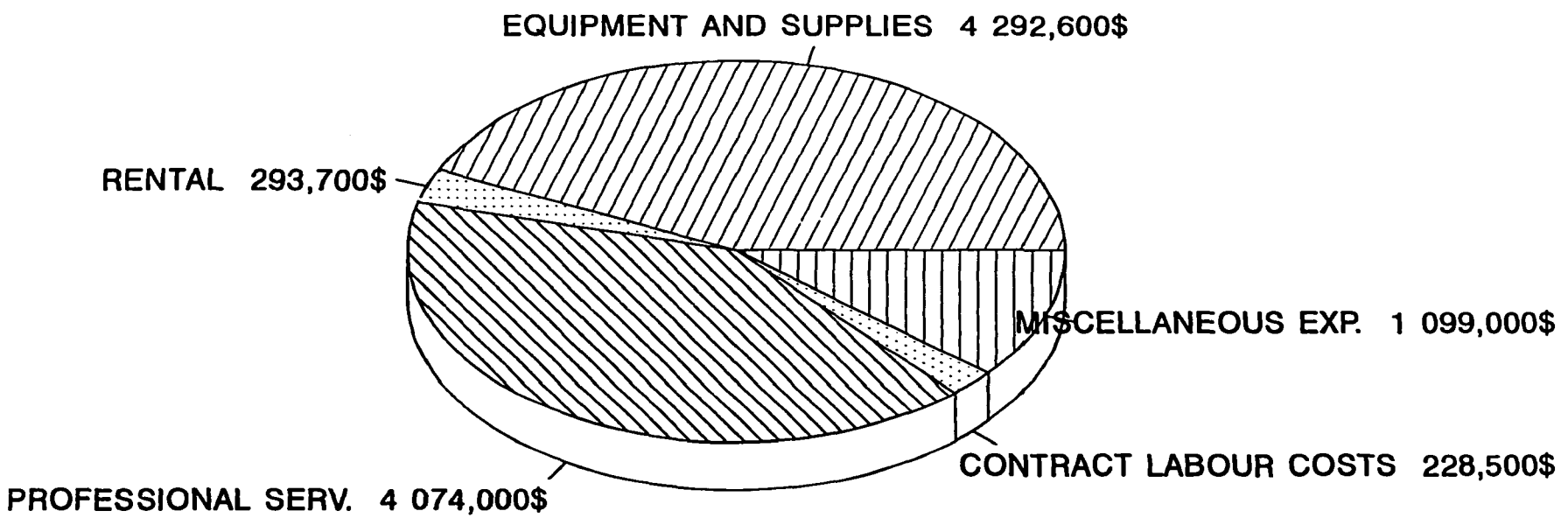
EXPENDITURES WITHIN QUEBEC*: 31 422,600$

*PROVINCE OF QUÉBEC (OUTSIDE THE BECANCOUR & FRANCHEVILLE MRCs)

(GRAPH9A.CH3)

NUCLEAR OPERATIONS DIRECTORATE

ECONOMIC IMPACT



PURCHASES OUTSIDE QUEBEC: 9 987,800$

YEAR 1993

(GRAPH8A.CH3)