CANADA'S NUCLEAR-POWER STATUS

The following is the text of a paper read by the President of Atomic Energy of Canada Limited, Mr. J.L. Gray, to the annual conference of Atomic Industrial Forum in Washington, D.C., on November 28:

"The 20,000 KWe Nuclear Power Demonstration (NPD) station has been in operation for some months now and is not only producing electric power very successfully but it is producing very significant results needed to confirm some of the basic design concepts of the heavy-water pressure-tube reactor system.

"The reactor went critical in April and the station reached full power before the end of June. By the end of August most of the improvements and modifications shown by the commissioning programme to be necessary had been completed. The usual type of mechanical difficulties common to any new high-pressure water system have been experienced. Some fittings have required repair and replacement and the life of the seals on the main pumps must be improved; but there are no faults in evidence, or expected, that will cause lengthy and major delays in operation.

"The protective system and (perhaps more particularly) the regulating system are performing very satisfactorily. The operators are well pleased with the completely automatic start-up and steady-state regulation of the plant.

"The results of the initial physics information from the first approach to criticality were disturbing when first observed. The majority of the difference between predicted and actual critical height has now been accounted for. The main error resulted from an underestimate of the effect of the depleted uranium used in the fuel for initial loading. The temperature and moderator level coefficients of reactivity were close to the predicted values, and our original estimates of fuel burn-up remain unchanged.

"Heavy-water losses during the run-in period and up to date are within the amounts allowed for. The unrecoverable loss will probably stabilize by next spring to less than 15 pounds a day, or 3.5 per cent a year. In full-scale plants, we can clearly see ways of reducing this to less than our target of 2 per cent a year, which is equivalent to about a tenth of a mill a kilowatt hour.

FAMILIAR CONSTRUCTION PROBLEMS

"This plant, as it stands, is a fine engineering job, but it was not built without experiencing many of the problems common to the construction of 'first-off' nuclear plants. We had some major delays in equipment supplies, some very difficult construction problems were met, and in the supply and installation of some equipment the initial quality of workmanship did not meet the standards required for nuclear plants. The effect of this sort of trouble was the normal one of delay in completion, resulting in an increase in cost.

"Over a period of four and a half years from late 1957 to the spring of 1962, the cost estimates for the plant facilities rose steadily from the original figures to a final cost that was up by nearly 20 per cent. There are the usual standard explanations for this increase that are a familiar story. The original estimate was based on a conceptual design only, the final job necessitated additional work not in the original design, the difficulty of meeting the rigid specifications was not fully appreciated, and the form of contract and job organization were not conducive to lowest cost.

USING LESSONS LEARNT

"The problems associated with delays and increase in cost taught us many lessons and, fortunately for the overall Canadian programme, we have been able to make use of them while they are still fresh in our minds. We are applying them to our second nuclear-power project and they are already reflecting savings and additional control that more than make up for our troubles with NPD. Probably most important is the evolution of a system of organization to handle the design, specifications, purchasing and construction of a full-scale nuclear-power plant. Our present form of organization, although only today's stage in the evolution, is proving to be very successful under our specific conditions.

"In our second nuclear plant, the full-scale 200 megawatt Douglas Point Generating Station employing the CANDU reactor which we are building in Ontario, we have a rather unique arrangement between a Federal Government agency and a public utility.

"Atomic Energy of Canada Limited, the national atomic-energy agency corresponding in large measure to the Atomic Energy Commission in the United States, is designing and building the station. The site belongs to the Hydro-Electric Power Commission of Ontario, the country's largest utility, and they are providing the 30-mile transmission link with their system. When the station is built, Ontario Hydro will operate it for AECL and will buy energy at the same rates at which they purchase energy from interconnected utilities such as Detroit Edison and Niagara Mohawk. When, after two or three years, the plant has proved itself, the utility will purchase it from AECL at a price that is calculated to render the cost of energy from it equal to the cost of energy from a contemporary coal-fired station. The difference between this price and what it cost AECL to build the plant is regarded as part of the national cost of developing nuclear power in Canada. AECL's initial investment, apart from research and some development expenses, amounts to about 93 per cent of the capital cost; Hydro's contribution, including salaries of certain personnel engaged in the work, amounts to about 7 per cent.

"Ground was broken at Douglas Point about two years ago. At the present time, civil construction is nearly complete. All buildings are closed in and internal structure is ready and is now receiving the first of the equipment. The plant is still scheduled to be completed in 1964 and to be in commercial service in 1965.

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