# THE HISTORICAL SIGNIFICANCE OF THE DOUGLAS POINT NUCLEAR POWER PLANT

submitted to the Ontario Heritage Trust

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The Douglas Point nuclear generating station, located between Port Elgin and Kincardine on Lake Huron, represents a significant milestone in the technological and economic development of Ontario and Canada.

The facility, which operated for almost 18 years from 1966 to 1984 and is now dwarfed by the surrounding Bruce Power complex, was the prototype commercial-scale CANDU nuclear power plant. While the smaller "Nuclear Power Demonstration" (NPD) facility near Rolphton, Ont. (commemorated by an OHF plaque in 2002) represented the "test-of-concept" prototype that demonstrated technical feasibility, Douglas Point, ten times the power and a serious contributor to the Ontario electricity grid, demonstrated commercial operation and established the CANDU product. (Douglas Point was, in fact, the facility for which the name "CANDU" was coined, although this term was later applied generically to the product and the original CANDU became known simply by its geographic location, Douglas Point.)

Douglas Point's historical significance lies in the launching of not only Ontario's (and Canada's) large-scale nuclear power program, but also (and, remarkably, simultaneously) Canada's nuclear power export industry. During its career Douglas Point also achieved a number of technological "firsts" that made the designer, Atomic Energy of Canada Ltd. (AECL), and the provincial electrical utility, Ontario Hydro (now Ontario Power Generation), world leaders in power reactor development and operation.

The story of Douglas Point begins shortly before the outbreak of World War II, with the German discovery of nuclear fission. Scientists everywhere immediately realized the potential of this new energy source, and in Canada Dr. George Laurence conducted some of the world's first "critical pile" fission experiments at the National Research Council (NRC) laboratories in Ottawa.

Meanwhile, a handful of French scientists escaped to Britain from Paris with almost all the world's supply of heavy water (about 200 kg), just ahead of the German invasion. They and the heavy water eventually ended up in Montreal. The end of hostilities in 1945 found this country with the second largest nuclear research infrastructure in the world (after the U.S.).

Part of this legacy was the ZEEP nuclear research reactor at the NRC's Chalk River Laboratories (about 200 km north-west of Ottawa), the only non-U.S. reactor at the time.

ZEEP was commemorated in 1966 by a plaque from the Archaeological and Historic Sites Board of Ontario.

With the wartime diversion out of the way, scientists again turned to the alluring peaceful potential of nuclear energy. In 1950 George Laurence, then at Chalk River Laboratories, began advocating a Canadian power reactor based upon natural uranium fuel and heavy water – both areas of domestic expertise.

August of 1951 saw the formal publication of "An Atomic Power Proposal", by Dr. W.B. Lewis of Chalk River Laboratories. The following year saw the establishment of Atomic Energy of Canada Ltd. (AECL), a crown corporation with nuclear power development as a major pillar of its mandate.

In 1954 the "Nuclear Power Group" was established at Chalk River Laboratories (now part of AECL), under the leadership of Ontario Hydro's Harold Smith. This handful of representatives from electric utilities, engineering companies, and manufacturers, joined with AECL's scientists to forge the fundamental design of a prototype heavy-water-moderated, natural-uranium-fuelled power reactor that could compete with coal-fired plants. All but the latter of these goals were met by the 20 MW NPD plant, which started operation on the shore of the Ottawa River, 15 km upriver from Chalk River Laboratories, in 1962. The final goal, economic viability, required a commercial-scale power plant.

By 1956 the Nuclear Power Group at AECL was already working on the preliminary design of the commercial prototype. In 1957 the Group submitted its radical proposal of a horizontal, pressure-tube design, motivated partly by the difficulties of scaling up the original single pressure-vessel design of NPD to commercial proportions, and partly by the development of Zircaloy, an alloy of zirconium that enabled the use of metallic pressure tubes in large reactors. This bold proposal not only set the course for Canada's unique line of CANDU reactors for years to come, but also turned the clock back on NPD's construction, then underway. Although NPD's small size made the pressure-tube concept unnecessary, the decision was made to completely redesign it with this added feature, making it a true technical prototype of the CANDU fleet.

In 1958 a new engineering arm of AECL, the Nuclear Power Plant Division (NPPD), was established in Toronto for the design of the commercial plant, initially with Harold Smith as General Manager (still on loan from Ontario Hydro). The NPPD also had oversight over the modifications at NPD, in order to facilitate efficient communication between the simultaneous projects.

Federal Cabinet approval for Douglas Point was received in June 1959, and 2,300 acres on Lake Huron's shoreline were acquired for the project. Site clearing began in February 1960. The estimated project cost at this time was $81.5 million, with a target date of 1965 for full operation.

A number of "first-of-a-kind" issues delayed the construction of Douglas Point, and start-up ("first-criticality") was finally achieved on November 15, 1966. First generation of electricity came in January of 1967, and full commercial operation was declared on September 26, 1968. Douglas Point pumped 220 MW into the Ontario grid for the next 16 years, gradually improving in performance over the years as its operators learned the tricks and lessons that prototypes typically give up only in their own time.

However, the delay in full operation meant that many of Douglas Point's lessons were applied directly to Ontario Hydro's first two large-scale CANDU reactors (each more than twice as big as Douglas Point) at Pickering, first announced in 1964. This early "cross-fertilization" of overlapping projects represented the first and most important contribution of Douglas Point's operation to the Canadian nuclear industry.

Douglas Point symbolized not only the coming of age of Canada's nuclear power program (and the legacy of bold wartime decisions and post-war innovative nuclear research), but also the entry of Canada into the global power reactor market. The remarkable boldness of the time resulted in three international reactor orders even before Douglas Point was complete: two duplicates of Douglas Point to be built in India and announced in 1963 (both still in operation today, having spawned an entire domestic industry in that country based on heavy-water technology), and one in Pakistan based on a scale-up of NPD, announced in 1964.

In Canada, Douglas Point was the genesis of AECL's nuclear engineering capabilities. The Nuclear Power Plant Division in Toronto soon moved, under John Foster, to a new technology park in Mississauga, where it underwent several metamorphoses but today still houses the main plant engineering offices of the company. In 2005 Canada's CANDU reactor remains a competitive and leading design in the global market, with major features that are directly traceable to the engineering decisions at Douglas Point.

In 1984 the decision was made to shut down Douglas Point permanently, rather than take on an enormous pressure-tube refurbishment project that was then required (the same fate would befall NPD three years later). The era of CANDU prototypes was over: industrial development had taken over, and resources were best spent elsewhere.

During its brief but important career Douglas Point contributed enormously to the learning curve of the Canadian nuclear industry, and to that of operators who went on to fill the control rooms at the Pickering, Bruce, Darlington, Gentilly, and Pt. Lepreau stations elsewhere in Canada. There were many "firsts" during Douglas Point's operation, one of the most significant being the world's first use of a digital computer program to control a power reactor. A pioneer in this application of computers, Canada used experience gained at Douglas Point to implement full computer control at Pickering (another world first), and at all CANDUs since.

As with the NPD project at Rolphton, Douglas Point demonstrated the symbiotic benefits that can come of federal/provincial/private cooperation in research and development. The partnership forged in those pioneering years between AECL and Ontario Hydro

continued and prospered – and served as a model for other utilities in Québec and New Brunswick that later installed CANDU reactors. The participation of private manufacturing and engineering firms has evolved into a well-established nuclear industry to which most CANDU construction and design contracts are now channelled.

Douglas Point now sits silent on the shoreline of Lake Huron, lost amongst the sprawling buildings of Bruce Power's 5,000 MW operation (alone supplying 1/5 of Ontario's needs), but symbolizing the genius, tenacity, and teamwork that got it all started 40 years ago.

References:


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