

BRUCE A NUCLEAR GENERATING STATION UNITS 3 AND 4 RESTART

As the newest player in an electricity market short of supply but long on promise, Bruce Power saw the Bruce A generating station as a mine of untapped potential back in the summer of 2001.



The plant in the foreground is Bruce A Nuclear. Bruce A Units 3 and 4 are pictured on the front left of this photo. Photo courtesy of ASLF.

A few months earlier, the fledgling company had assumed control of North America's largest nuclear facility and began studying the massive Bruce A complex that had been laid up for more than three years. Though challenging, Bruce Power knew there were some strong incentives for contemplating a restart of two of the station's four idled units.

For the first time in more than a century, Ontario's electricity market had recently opened to competition and private companies were being asked to help offset a pending supply shortage. Nationally, the Canadian government had committed itself to the Kyoto Protocol, and restarting Units 3 and 4 represented 1,500 MW of emissions-free electricity.

Against this backdrop, the company conducted the most comprehensive assessment ever performed on a CANDU station. It decided a restart would be technically and economically viable as long as the two units could be brought back online in compliance with the latest safety and industrial standards.

Bruce Power knew from the outset that such a complex project would pose several challenges. Not only did it have to restart the two nuclear units in less than two-and-a-half years, it had to simultaneously improve production at the four other units it operated at its Bruce B station.

The company felt strongly that to successfully restart the 750 MW (each) units—originally commissioned in 1978

and 1979 and removed from service in 1998 by their previous operators—it had to assemble the right team. Such a team had to be composed of companies with complementary expertise and restart experience.

The team members also had to share a commitment to accomplish what had never been done before—restart two laid-up nuclear units back-to-back. The players on the team consisted of Acres International, Oakville, Ontario; Sargent & Lundy LLC, Chicago, Ill.; and E.S. Fox Ltd., Niagara Falls, Ontario, collectively called the ASLF team. RCM Technologies also played a key role on the restart team, with responsibility for all the environmental qualification modifications.

The work scope included engineering, procurement and construction of more than 45 different modification projects. The projects ranged from maintenance overhauls of existing equipment to installation of a new qualified power system (QPS) and a new secondary control area (SCA). Safety, fire and seismic systems were all upgraded to meet or exceed current regulatory standards. The team completed approximately 300 design change notices per unit, installed 37 miles of new cable and made 200,000 electrical connections. The project scope grew when all Canadian nuclear facilities underwent major mandated enhancements to improve



Bruce A Nuclear's temporary qualified power supply (QPS). Photo courtesy of ASLF.

security. By the project's completion, more than five million work hours had been expended.

Innovative technical approaches to the SCA and QPS, the two key safety systems, enabled the project to proceed and meet the restart schedule. The QPS involved the provision of two 2-MW emergency power diesel generators and the

associated distribution and control systems to power this backup safety system.

The SCA design called for the provision of a secondary control room and the necessary controls and monitoring equipment to allow the plant to be safely shut down, cooled and contained in the event that the main control rooms were rendered uninhabitable. The SCA project was initiated after some of the other restart work had begun. Its completion required an aggressive effort to ensure it remained off the critical path. Because specific operability criteria limited the number of suitable locations for the SCA room, significant engineering work went into locating the room in the plant. Each option entailed extensive renovations to the existing plant. The other concern was response time of the SCA. Cabling used in the SCA had to be sized to ensure that electronic signals from the SCA resulted in rapid shutdown responses.

ASLF was responsible for the engineering, procurement and installation of most of the modification projects, including SCA and QPS. ASLF also provided support for the commissioning activities. To provide additional reassurance that the designs were adequate and environmentally compatible, Bruce Power assembled a team of experts to perform third-party reviews on a wide range of project activities from the design of critical control systems to routine building services calculations.

The team successfully overcame every obstacle. Unit 4 was restarted on Oct. 7, 2003, and Unit 3 on Jan. 8, 2004. Results to date have shown that Units 3 and 4 are very reliable. With the addition of 1,500 MW of nuclear generating capacity, Bruce Power now has six of its eight units operational and generates enough emission-free energy to supply about 20% of Ontario's electricity needs.

"Few people outside our community will ever truly understand how massive and complex our restart project has been," said Duncan Hawthorne, Bruce Power's CEO.

The project established an integrated approach of a single team consisting of the owner—Bruce Power—and multiple contractors, including ASLF. This approach serves as a model for future restarts, or other large multifaceted projects, that require the complementary teaming of individual firms to effectively accomplish work. 