

February 16, 2010

Pickering Nuclear: A Legacy of Service

Since the early 1970s, the Pickering generating stations have contributed significantly to meeting Ontario's energy needs through the safe and reliable production of electricity from nuclear power. These stations are safe to operate and have the capability to support the needs of Ontario's electricity system.

1. An Overview

The Pickering Nuclear site consists of two nuclear generating stations, Pickering A and Pickering B.

Pickering A was the first multi-unit CANDU station to be designed and constructed in the 1960s. The station entered service during the years 1971-1973 and has four 515 MW CANDU reactors. In 1997, Pickering A was temporarily laid up to enable OPG's predecessor, Ontario Hydro, to focus on improvements to its nuclear performance. Two of Pickering A's reactors (Units 4 and 1) have since been returned to service; the two other reactors (Units 2 and 3) are being placed in permanent safe storage after OPG determined that the business case did not support their refurbishment.

The Pickering B nuclear station is adjacent to Pickering A. Pickering B, like Pickering A, consists of four CANDU nuclear reactors (Units 5-8), which have a combined power output of 2064 MW. Construction of Pickering B began in 1974. Pickering B's four units came into service from 1983 to 1986. Pickering A and B share some common systems, including a common vacuum building structure.

Pickering B's four CANDU reactors produce enough electricity for a city of about one million people, throughout the day and night.

Pickering A and B represent the first large-scale commercial CANDU site with early world class performance. Design improvements were incorporated as units were built and brought into service. In their years of operation, the stations have achieved important milestones in safety and performance. They have also played a major role in the development of nuclear technology and in fuelling the growth of Ontario's economy. Collectively, the two stations have a capacity of approximately of 3,100 MW. Over 2,800 regular employees work at the stations out of a total nuclear workforce of nearly 8,000 employees. This workforce is headquartered in Durham Region, Ontario.

To the end of 2009, Pickering A and B combined produced more than 672 terawatt-hours (TWh) of electricity – enough power at current consumption rates to serve the entire Province of Ontario for more than four years.

Pickering Nuclear: An Historically Important Asset to Ontario

Throughout their 40 years of service, Pickering A and B have created a record of achievement and success which has benefited Ontario.

- Pickering was considered a major scientific achievement when designed, and it was the largest nuclear site in the world when constructed.
- From 1973 to 1977, a Pickering nuclear unit was the best performing unit in the world in terms of capacity factor.
 - In 1973, Pickering overall produced more energy than any other nuclear station in the world at the time and had the highest net capacity factor in the world.
 - In 1976, Pickering Unit 3 was ranked first in performance in the world. Two other Pickering units were ranked second and fourth in world performance.
 - In 1977, Pickering A Unit 3 achieved the highest capacity factor in the world.
 - Pickering's three other reactors ranked third, fourth and sixth in the world in terms of capacity factor.
- In the 1980s when Pickering B came into service, its units also scored very high in terms of global performance.
 - In 1985 Pickering B Unit 7 ranked first in lifetime performance with an 89.3 per cent capacity. Unit 7 was also the seventh best performing reactor in the world for 1985.
 - In 1988, Pickering B Unit 6 tied for first place among world nuclear units with a 100 per cent capacity.
 - In 1988, Pickering B Unit 7 ranked first in lifetime performance with an 89.6 per cent capacity factor.
 - In October 1994, Pickering B Unit 7 established a new world record for continuous operation with 894 days of continuous service.
- Under OPG, the Pickering stations have continued to achieve, and be recognized for important production accomplishments and milestones.

- **August 2003:** Ontario Energy Minister John Baird visits Pickering Nuclear staff to thank them for their efforts and hard work following the August 14 power blackout.
 - **July 2005:** During a record heat wave in Ontario, three units at Pickering B operate near 100 per cent capacity while the remaining unit, which was undergoing a planned outage, returned to service in time to help meet the high electricity demands brought on by the heat wave.
 - **December 2005:** Ontario Energy Minister Donna Cansfield visits Pickering Nuclear to thank employees for bringing Pickering Unit 1 back online from its Return to Service "virtually on time and on budget."
 - **January 2006:** Pickering B Unit 7 achieves one year of consecutive on-line operation.
 - **March 2009:** CANDU Owners' Group reports that Pickering B Unit 6 was the 5th best performing CANDU reactor in the world for 2008.
 - **December 2009:** With a capacity factor of 90 per cent, Pickering A Unit 1 is currently having its best performing year since 1978.
- The Pickering stations represent the first generation of commercial CANDU reactor development. They have been extremely important in terms of making possible the design refinements for the later generation Bruce and Darlington stations; teaching operators how best to maintain the stations, and identifying areas for research and development. The operation of the Pickering stations has led to the high performance achievements of these later designs, as well as the CANDU 6 stations used worldwide.
 - Even though the Pickering A and B stations are first generation CANDU stations, together they have produced more than 672TWh over their lifetimes. At the rate of current consumption, that is enough electricity to power the entire province of Ontario for more than four years.

2. Rigour in Maintenance and Inspection

As OPG's learning and understanding of its nuclear fleet has grown, so has the company's commitment to maintenance and inspection. As part of its commitment to performance excellence, OPG regularly undertakes programs to ensure robust plant condition and to maintain safety and reliability for the long term.

Under OPG, Pickering has launched programs to improve planned outage performance, enhance production, strengthen overall efficiency, and reduce corrective maintenance backlogs. Examples include the following:

- **2000:** Successful completion of the Pickering Vacuum Building Outage, involved temporary shut-down of all Pickering units. The Pickering VBO takes place every 10 years.
- **2002:** Universal Delivery Machine (UDM) arrives at Pickering site. The UDM allows inspections and maintenance to be performed at a much faster rate than that allowed by existing technologies – leading to shorter and more efficient outages.
- **2002:** Successful completion of Pickering B Unit 5 outage. Over 13,000 tasks completed, representing the largest single outage to date ever completed on Pickering B. Outage duration was 121 days compared to a planned duration of 117 days. The extension of only four days was one of the best planned-outage performances in recent history at Pickering B.
- **2003:** Completion of Pickering B Steam Boilers using Hot Chemical Cleaning, begun in 2001. The \$90-million project was completed in 30 months and involved cleaning all four Pickering B units. Its purpose was to significantly reduce the probability of forced outages due to boiler tube leaks. Similar to cleaning a tea-kettle, periodic cleaning helps OPG's boilers operate more efficiently and reliably.
- **2004:** Launch of a major program to improve performance of Pickering B – with the goal of having the station achieve and sustain a capacity factor of 85 per cent and a five per cent forced loss rate by 2007.
- **2006:** Completion of a major four-year Spacer Location and Repositioning (SLAR) program at Pickering B. The program was developed to ensure that no contact exists between the pressure tube and the calandria tube within the station's fuel channels -- a critical prerequisite for improved performance. Since 2002, the program involved the inspection and maintenance of over 1,500 of the station's fuel channels.

- **2009:** Completion of the Pickering B Unit 6 planned outage two days ahead of schedule.
- **2004 – 2007:** From 2004-2007, Pickering B reduced its corrective maintenance backlogs from 368 per unit to the industry standard of fewer than 25 per unit through a focused effort by its maintenance staff. Maintenance backlogs are an indicator of the condition of a station. The fewer backlogs, the more robust the station and its condition.

Additional major projects undertaken by Pickering B over the last five to six years include:

- **Implemented and maintained Environmental Qualification (EQ) program.** This means that Pickering A and B have confirmed that all required safety systems, equipment, components, etc. are qualified to perform their safety functions and will withstand and operate in a harsh environment, such as a loss of coolant accident or a stem line break. The multi-million dollar program was launched more than 12 years prior to its completion in mid-2004. With the EQ completed, Pickering joins those at the top of the nuclear industry with systems that will operate reliably in any operating environment.
- Completed upgrades to fire protection equipment.
- Improved Plant Condition Index, which is a measure of equipment reliability.
- Improvements to systems and components following the 2003 Blackout:
 - Completion of upgrades to service water systems: The causes of the failure of units to survive the loss of grid have been remedied. Issues related to emergency response and information systems that arose during the event have been addressed;
 - An Auxiliary Power System was installed consisting of two 45 MW combustion turbines with an investment of approximately \$100 million. It has been commissioned and is ready for use;
 - A self-assessment was completed that reviewed all corrective actions initiated as a follow-up to the 2003 event.
- **External inspections and reviews:** Since 1999, the prestigious World Association of Nuclear Operators (WANO) has conducted at OPG's invitation 10 peer reviews of OPG stations and over 40 technical support missions or assist visits. WANO is an industry organisation created to improve safety at every

nuclear power plant in the world and its peer reviews help our nuclear plants excel by providing OPG with important feedback from industry experts. Recognizing that its industry peers can be its most conscientious and insightful critics, OPG invited WANO to review the Pickering nuclear station on a number of occasions. Pickering A has been peer reviewed by WANO twice: in 2006 and in June 2009. Pickering B has had four WANO peer reviews: December 2000; November 2003; June 2006; and the latest in July 2008.

OPG's nuclear plants, including Pickering A and B are also regularly reviewed by the Nuclear Safety Review Board (NSRB) -- a group of external senior nuclear executives from across North America that provides advice and recommendations on the safety and reliability of OPG's nuclear plants. Over the past 12 months each of OPG's nuclear stations has been visited by the NSRB.

Additionally, the federal nuclear regulator, the Canadian Nuclear Safety Commission (CNSC), has offices on-site at each OPG nuclear station. The CNSC also conducts nuclear plant licence hearings and reviews licence applications according to regulatory requirements. Commission's staff enforce compliance with the Nuclear Safety and Control Act, regulations and any licence conditions set by the Commission.

- **Pickering A Return to Service:** In 1997, the Pickering A nuclear station was placed in voluntary lay-up as part a major nuclear improvement program undertaken by Ontario Hydro, OPG's predecessor. OPG has since returned to service two of the station's four reactors. The two other reactors are being placed in a state of permanent safe storage.
- Restarted in 2003 and 2005, Pickering A Units 4 and 1 underwent upgrades to their components and systems.
 - **Sept. 2003:** Pickering A, Unit 4 is commercially available for service, following a lay-up period of six years. Since January, 2001, employees "completed almost 35,000 tasks, including the replacement or modernization of many major system components." Although the project was significantly over budget and behind schedule when completed, OPG learned valuable lessons from the challenges encountered. When the time came to undertake the restart of Unit 1, OPG applied these lessons with positive results.
 - **Nov. 2005:** Pickering A Unit 1 is officially synchronized to the provincial grid, as electricity flows from this unit to the Ontario consumer for the first time since December 1997. Adopting a "plan-the-work, work-the-plan"

approach, OPG successfully completed the refurbishment of Unit 1 on-time and virtually on budget. The project encompassed more than 1.9 million hours of work, 40,000 tasks, and almost 3,000 people at its peak.

Pickering A's commitment to maintenance and inspection continues on these units today. Also, the safety and environmental record at Pickering A, as well as its commitment to conservative decision-making continues to be very strong.

3. Commitment to Safety and the Environment

OPG's commitment to plant performance has continued to strengthen over the years and will continue to do so throughout the station's operating life.

In their quest for excellence, the Pickering station and its employees strive to raise the performance bar ever higher. This is demonstrated not only by a focus on effective and ongoing maintenance but also by an increasingly strong safety and environmental record.

Safety

Safety is OPG's fundamental value, and OPG operates the Pickering stations according to the highest standards of public and workplace safety. No OPG employee or member of the public has ever been harmed as a result of radiation from the company's nuclear stations or nuclear waste management facilities.

OPG's performance in the area of nuclear safety continues to improve. At Pickering B, for example, the number of reactor trips and transients on the units has improved over the past several years. In 2007 there was only one reactor trip that occurred with the four units at power. This is better than the industry benchmark value of one trip per unit per year. Standby Generator reliability at the stations has also been improved.

The source of Pickering's safety success is its safety culture. OPG has recruited experts from across the industry to ensure its safety culture remains robust. In 2005, Pickering B undertook a safety culture assessment which concluded there was a strong nuclear safety culture at the station.

In September 2009, as part of its business case analysis for the potential refurbishment of Pickering B, OPG completed an **Integrated Safety Review (ISR)** of the station. The report concluded the station demonstrates a high level of compliance with modern codes and standards. In addition, no issues were identified that would limit the safe, long term operation of the station and no gaps were found that would

affect the station's current safe operation. There were also no discrepancies identified in the report that required additional modifications to the plant to meet current safety standards. The 20-volume, 5,000-page ISR Report was completed over a three year period and was subjected to a rigorous third-party verification process that included validation from the International Atomic Energy Agency. The IAEA is the world's nuclear inspectorate and has more than four decades of verification experience.

OPG also undertakes periodic and regular nuclear emergency simulation exercises to ensure public and employee safety in the unlikely occurrence of an event at its nuclear generating stations. Earlier this year, the company conducted a thorough re-examination of the time required to evacuate a 10-kilometre area surrounding the Pickering nuclear plant during an emergency. OPG concluded that under an emergency scenario involving the venting of gas, it would take about 5-6 hours to evacuate the 10-kilometre area surrounding the station. This is considered more than enough time for a safe evacuation to be conducted. Even in the unlikely event of this worst case scenario, no venting would occur for more than 48 hours.

The following examples, taken from OPG's Pickering operations, demonstrate OPG's strong safety commitment and provide compelling evidence of OPG's experience and expertise as safe nuclear operator of the Pickering nuclear generating complex.

Safety: Workplace Milestones

- Pickering nuclear employees regularly work for extensive periods of time without experiencing any Lost-Time Injuries. This is a powerful testimony to the strong safety culture at OPG's nuclear plants. Most recently, Pickering B achieved 5 million person-hours worked without a lost-time accident in September, 2009.

Safety: Licences and Ratings by Canadian Nuclear Safety Commission (CNSC)

- Like all nuclear stations in Canada, Pickering Nuclear is licensed by the CNSC, the federal nuclear regulator. In June 2005, the CNSC approved the renewal of the operating licence for Pickering A, extending the duration of the licence from two to five years -- the maximum renewal period. Pickering B received its second five-year licence renewal from the CNSC in 2008. In June, 2009 when the CNSC released its annual *Staff Integrated Safety Assessment of Canadian Nuclear Power Plants*, Pickering A and B both received "satisfactory" ratings. In their report, the CNSC stated all Canadian nuclear stations operated safely in 2008.

Safety: Community and Third Party Recognition

- **2008:** Oct: The Safe Communities of Pickering-Ajax (SCOPA) presents OPG with its Ambassador for Safety Business Partner Award during an Oct. 9 conference in Ajax.
- **2009:** OPG receives ZERO Quest Gold Award from the Electrical and Utilities Safety Association, recognizing OPG's ability to maintain a high level of safety management and safety performance for four consecutive years. OPG is the only company in the Zero Quest program to reach this milestone.

Pickering B: Radiological Safety:

All Canadians are exposed to naturally-occurring radiation, mostly from the sun and from radon which is found in soil as well as in manmade sources such as X-rays. Exposure to radiation in humans, as measured in microsieverts, is on average 1,770 microsieverts a year for Canadians. In 2006, living near the Pickering nuclear plants would have added 2.8 microsieverts to this amount over the course of the year. In contrast, the food and water we consume each year accounts for approximately 300 microsieverts.

Airborne and waterborne effluents from the Pickering (and Darlington) nuclear stations are routinely monitored. On an on-going basis, OPG conducts radiological environmental monitoring programs (REMP) in the vicinity of its nuclear power stations to determine the radiological impact to the public resulting from the operation of these stations. The data from these tests is compiled and provided to the public in annual reports, posted on OPG's website. Pickering's recent achievements in radiological safety include:

- Station collective radiation exposures reduced by 25 per cent in 2006 and a further 25 per cent in 2007
- 45 per cent reduction in areas requiring special contamination control measures (Zone 3 – i.e., inside the plant)
- 20-year low for production of low level radioactive waste.

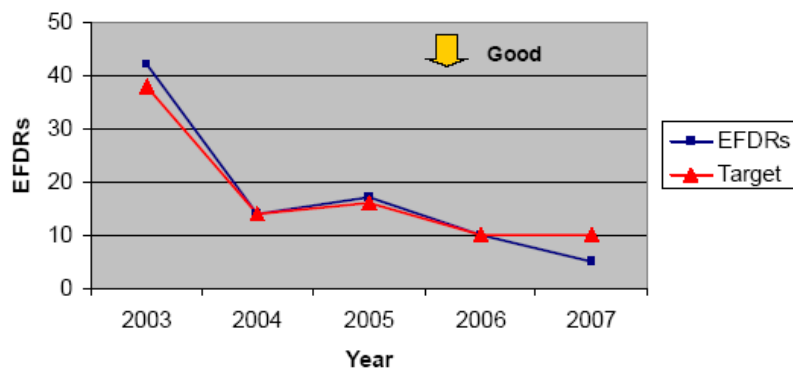
In short, the lakes and groundwater around Durham's nuclear stations (Pickering and Darlington) are safe. In its operational history, OPG has never exceeded regulatory limits on radioactive releases into the environment, and typically releases are extremely small when compared to the regulatory limits.

Ontario's regulatory limit for tritium drinking water levels is 7,000 becquerels per litre. However, OPG has set its own internal target much lower, at just 100 Bq/l. In 2006, water tested at the closest municipal water treatment plants to OPG's stations measured between five to seven Bq/l, a trace amount. Durham Region routinely samples (twice daily) at local municipal water treatment plants and the results are consistently below our internal target of 100 Bq/l.

OPG also reports on a regular basis to local agencies such as the Durham Nuclear Health Committee and the Durham Region Works Department.

Pickering B: Human Performance. Human Performance is key to nuclear safety, and OPG Nuclear is committed to excellence in human performance. Coaching at all levels has become a way of life at Pickering B. The station provides its First Line Managers with enhanced training, coaching and mentoring to improve their skills as coaches. Effective Human Performance is measured by the number of Event Free Day Resets (EFDRs) that occur -- the fewer, the better. From 2003-2007, Pickering B has seen a significant decline in the number EFDRs – attesting to its strong focus on human performance.

Pickering B EFDRs 2003 to 2007



Environment:

Pickering is equally committed to achieving excellence in its environmental performance. Below are select examples of the stations' environmental initiatives, achievements and recognitions.

1995

- Biodiversity activities begin at Pickering Nuclear with the funding of a project to improve the natural environment in Duffin's Creek Marsh.

1998

- Pickering Nuclear develops a biodiversity and natural areas management program to improve the natural habitat of its site and immediate surrounding areas – including Hydro Marsh (on site) and neighbouring Frenchman’s Bay and Duffin’s Creek.

1999

- Wildlife Habitat Council (WHC) awards Pickering nuclear its Corporate WHC certification, recognizing meaningful wildlife habitat management programs.
- Pickering Nuclear receives ISO 14001 certification for its environmental management system.

2001

- Pickering Nuclear is awarded “Corporate Habitat of the Year” award at the Wildlife Habitat Council’s annual symposium in Baltimore, Maryland.

2002

- Pickering Nuclear receives environmental award for “outstanding environmental performance” at the City of Pickering’s 2001 Civic Awards ceremony

2007

- Pickering Nuclear wins Wildlife Habitat Council 2007 Corporate Habitat of the Year. This award was given in recognition of Pickering’s positive contributions and lasting impact on the site’s wildlife habitat. Pickering also received the Wildlife at Work re-certification.
- Pickering Nuclear receives environmental award for “outstanding environmental performance” at the City of Pickering’s 2007 Civic Awards.
- Pickering Nuclear receives Signature of Sustainability recognition from the WHC.

1999-present

- Pickering Nuclear maintains ISO 14001 certification for its environmental protection program throughout this period.

OPG has also been recognized by the community for its contribution to a sustainable environment including recognition as an Eco Business Leader by Durham Sustainability.

In addition, the Pickering station and its employees regularly support and participate in tree plantings in the Pickering community and support numerous not-for-profit local environmental initiatives through OPG's Corporate Citizenship Program.

4. Commitment to the Community

OPG has been and remains a steadfast partner with the community of west Durham. Our leaders and employees are committed to helping improve the lives of its residents through contributions of time and money to assist with community, education and environmental initiatives.

Since 1999, OPG has helped support more than 1,200 not-for-profit community, educational and environmental initiatives and programs – including student awards -- in the Pickering area.

OPG also purchases numerous products and services from Ontario based businesses. In 2008, OPG purchases of goods and services originating from its Pickering nuclear operations totalled \$50 million.

OPG has a long history with Pickering – over 40 years -- and a long future through continued operation and through the decommissioning years. OPG takes pride in being an open, transparent, active and engaged member of the Pickering community and is equally proud of the support the community has given it over the years. The examples listed below demonstrate the strength of OPG's commitment to the Pickering region. This commitment will continue going forward

1999

- Establishment of the Pickering Community Advisory Council (CAC) to provide advice and feedback to Pickering management on key issues. Management reports regularly to the CAC and proceedings are published on OPG.com.

2000

- **May-June:** First Pickering Neighbourhood Walk: OPG employees visit more than 12,000 households in the Pickering and Ajax areas to provide local residents with information and answers questions about OPG. A "Mini" Neighbourhood Walk lasting three days was organized in September. Both walks reached a total of 16,000 households.

2001

- **Feb.** Opening of OPG's 777 Brock Road facility for 450 Pickering nuclear employees. OPG invested \$4.5 million in enhancements to the building prior to moving in as a 20-year tenant.
- **March:** OPG announces a major donation of \$1 million to the Ajax and Pickering Health Centre to help establish the OPG Nuclear Medicine Clinic.
- **May:** Second Pickering Neighbourhood Walk reaches 7,000 homes and involves 200 OPG employee volunteers.
- **Dec.:** Official opening of the OPG Nuclear Medicine Clinic at Rouge Valley Ajax and Pickering Hospital. Earlier in the year, OPG contributed \$1 million to help create this facility.

2002

- **Feb.:** Opening of 777 Brock Road building to accommodate 450 Pickering Nuclear support Employees.

2003

- **Jan.:** Pickering Public Affairs Manager Pat O'Brien is awarded Rotary International's highest honour, the Paul Harris Fellow Award in recognition of his contribution to the community. The award was presented by the Pickering chapter of Rotary International.
- **Oct.:** Pickering nuclear station receives 2003 Business Excellence Award from the Ajax-Pickering Board of Trade for its community support and contribution to the local economy.

2005

- **June:** Official opening of 889 Brock Road facility in Pickering. The building will house OPG's nearly 500 nuclear support staff.
- **Oct.:** OPG announces contribution of \$10 million over a five-year period to Durham-based University of Ontario Institute of Technology

2006

- **May:** Third Pickering Neighbourhood Walk.
- **May:** Pickering Nuclear receives the City of Pickering's 2005 Civic Award for outstanding support for and participation in community activities.

2007

- **Oct.:** Don Terry, Pickering Nuclear Public Affairs Manager, receives Pickering Rotary Club Community Leadership Award.

- Oct.: Pat McNeil, OPG SVP Nuclear Generation Development, receives the Business Person of the Year award from the Ajax-Pickering Board of Trade.

2008

- **Jan.:** Pickering Public Affairs Manager, Don Terry, officially installed as President of Ajax-Pickering Board of Trade at its 2008 President's Inaugural Dinner.
- **Feb.:** Durham College celebrates its 40th anniversary and thanks OPG for hiring Durham graduates by holding a special luncheon in OPG's honour.
- **May:** Public hearing is held in Ajax on Pickering B's relicence. The hearings featured robust dialogue between CNSC members, OPG staff, CNSC staff, and public intervenors. There were 16 supportive interventions from elected officials, organizations and individuals within Pickering's host communities. All interventions from Pickering and Ajax were positive.

2009

- Corporate Citizen of the Year - United Way of Ajax-Pickering-Uxbridge
- Award of Merit - Whitby Sports Hall of Fame
- Eco Business Certification - Ajax-Pickering Board of Trade
- Ajax Civic Award to Don Terry - Town of Ajax
- Local Business Award to Ajax-Pickering Board of Trade (Don Terry, Chair) - City of Pickering
- Howard Sokolowski Award to OPG Senior Vice President Patrick McNeil - Ajax-Pickering Hospital Foundation
- Corporate Lands for Learning Certification - Wildlife Habitat Council
- August: Jacquie Hoornweg, Director Nuclear Public Affairs installed as President and Chair for the Durham Strategic Energy Alliance;
- **Nov.:** OPG Nuclear recognized by the international Wildlife Habitat Council with the CEO award for Conservation, Stewardship and Education.

5. Conclusion

The Pickering Nuclear Generating Station has provided a long standing contribution to the economy and people of Ontario during its four decades of operation. Throughout its long history, Pickering Nuclear and its employees have remained faithful to their core goals -- generating safe and reliable electricity; contributing to the growth of Ontario; operating in an environmentally responsible manner; and enhancing the quality of life of the community where they operate. These will continue to be the stations' goals for many years to come.

For More Information, Contact:

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