



Canadian Nuclear  
Safety Commission

Commission canadienne  
de sûreté nucléaire

Canada



# Regulatory Oversight Report for Canadian Nuclear Power Generating Sites: 2018

Commission Meeting  
November 6, 2019  
CMD 19-M30.B



CNSC Staff  
Presentation

[e-Doc 5992027 \(PPTX\)](#)  
[e-Doc 6031090 \(PDF\)](#)





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# OUTLINE

- Introduction
- General results for nuclear power plants (NPPs) and waste management facilities (WMFs)
- Highlights for each NPP and the WMFs
- Closing remarks



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## CNSC RORs

- **November 6, 2019** Canadian Nuclear Power Generating Sites
- **November 7, 2019** Use of Nuclear Substances in Canada
- **November 7, 2019** Canadian Nuclear Laboratories Sites
- **December 11, 2019** Uranium Processing and Nuclear Processing Facilities
- **December 12, 2019** Uranium Mines, Mills and Historic and Decommissioned Sites

## Reporting on licensee performance based on CNSC oversight



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# INTRODUCTION



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## Changes in 2018 ROR

- Section for Gentilly-2 provided in French
- More detail on Indigenous engagement/consultation and licensees' public information/disclosure programs
- New plain language summary for translation in supplemental CMD
- Direct references to inspection reports and Commission actions for information
- Licence conditions handbook changes in supplemental CMD 19-M30.A
- Rating methodology
  - Removed “overall ratings” for NPPs and WMFs
  - Reviewed criteria for Fully Satisfactory ratings
  - Some specific areas were not rated



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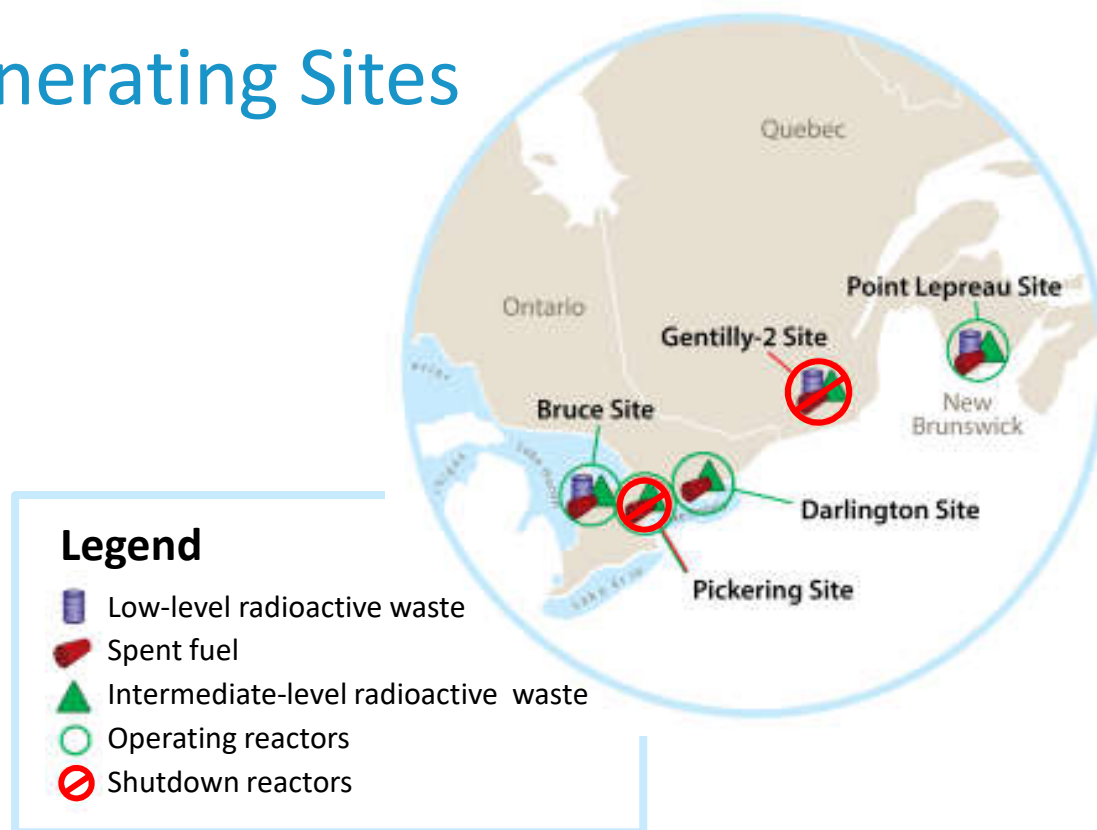
# Nuclear Power Generating Sites in Canada

## 5 NPPs

- 18 operational reactors
- 1 reactor in refurbishment (Darlington Unit 2)
- 3 shutdown reactors in safe storage (Pickering Units 2 and 3 and Gentilly-2)

## 5 WMFs

- Darlington, Pickering and Western WMFs have separate licences
- Point Lepreau and Gentilly-2 WMFs are covered by the NPP licence





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# Indigenous Engagement and Consultation

- CNSC staff prioritizing Indigenous engagement and consultation
- In 2018, CNSC staff signed engagement terms of reference with
  - The Saugeen Ojibway Nation
  - Historic Saugeen Métis
- CNSC staff working on terms of engagement with other groups

**Building relationships with all interested  
Indigenous groups**



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# CNSC's Compliance Verification Program

- Extensive, risk-informed program
  - ~18,000 person-days of effort for NPPs and ~500 person-days for WMFs
  - CNSC staff includes more than 30 site inspectors at NPPs
- Verification of compliance with requirements
  - ~100 inspections, >1,400 findings in 2018 compared to ~120 inspections, >1,500 findings in 2017
- Other activities provide additional information
  - Desktop reviews, surveillance/monitoring, and technical assessments
  - Review of event, periodic, and other licensee reports
  - Tracking of licensee corrective actions







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# GENERAL RESULTS FOR NPPs AND WMFs



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# Performance Ratings for NPPs

SA: Satisfactory  
FS: Fully Satisfactory

Safety and control area	DNGS	PNGS	Bruce A	Bruce B	Point Lepreau	Gentilly-2
Management system	SA	SA	SA	SA	SA	SA
Human performance management	SA	SA	SA	SA	SA	SA
Operating performance	FS	FS	FS	FS	FS	SA
Safety analysis	FS	FS	FS	FS	FS	Not Rated
Physical design	SA	SA	SA	SA	SA	SA
Fitness for service	SA	SA	SA	SA	SA	SA
Radiation protection	SA	SA	FS	FS	SA	SA
Conventional health and safety	FS	FS	FS	FS	FS	SA
Environmental protection	SA	SA	SA	SA	SA	SA
Emergency management and fire protection	SA	SA	SA	SA	SA	SA
Waste management	SA	SA	SA	SA	SA	SA
Security	SA	SA	SA	SA	SA	SA
Safeguards and non-proliferation	SA	SA	SA	SA	SA	SA
Packaging and transport	SA	SA	SA	SA	SA	SA



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# Performance Ratings for WMFs

SA: Satisfactory  
FS: Fully Satisfactory

Safety and control area	DWMF	PWMF	WWMF
Management system	SA	SA	SA
Human performance management	SA	SA	SA
Operating performance	SA	SA	SA
Safety analysis	SA	SA	SA
Physical design	SA	SA	SA
Fitness for service	SA	SA	SA
Radiation protection	SA	SA	SA
Conventional health and safety	SA	SA	SA
Environmental protection	SA	SA	SA
Emergency management and fire protection	SA	SA	SA
Waste management	SA	SA	SA
Security	SA	SA	SA
Safeguards and non-proliferation	SA	SA	SA
Packaging and transport	SA	SA	SA



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## General Observations (1/2)

- All reportable events were of low safety significance
  - Licensees took appropriate follow-up actions
- Reactor trips and other transients at NPPs were infrequent and managed safely
- Accident frequency and severity for conventional health and safety continued to be low for NPPs and WMFs

**All NPPs and WMFs operated safely**



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## General Observations (2/2)

- Public and environment were protected
  - Radiological releases to environment (water, air) were below derived release limits and action levels
- Reported radiological doses to workers did not exceed regulatory limits
- Licensees met requirements related to nuclear security and Canada's international obligations
  - IAEA safeguards conclusion: all nuclear material in Canada remained in peaceful activities, including material at the NPPs and WMFs

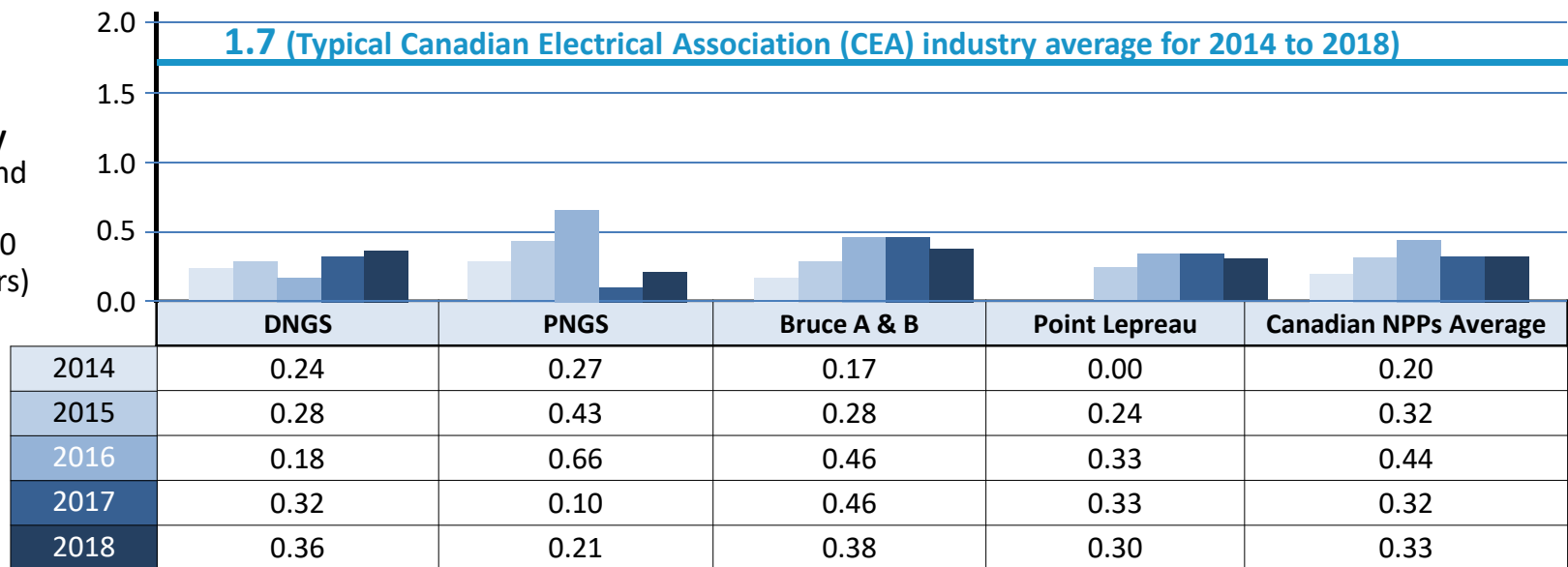
**CNSC staff confirmed environment protection,  
worker safety, and security**



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# Trend of Accident Frequency

**Accident Frequency**  
(fatalities and injuries per 200,000 person-hours)



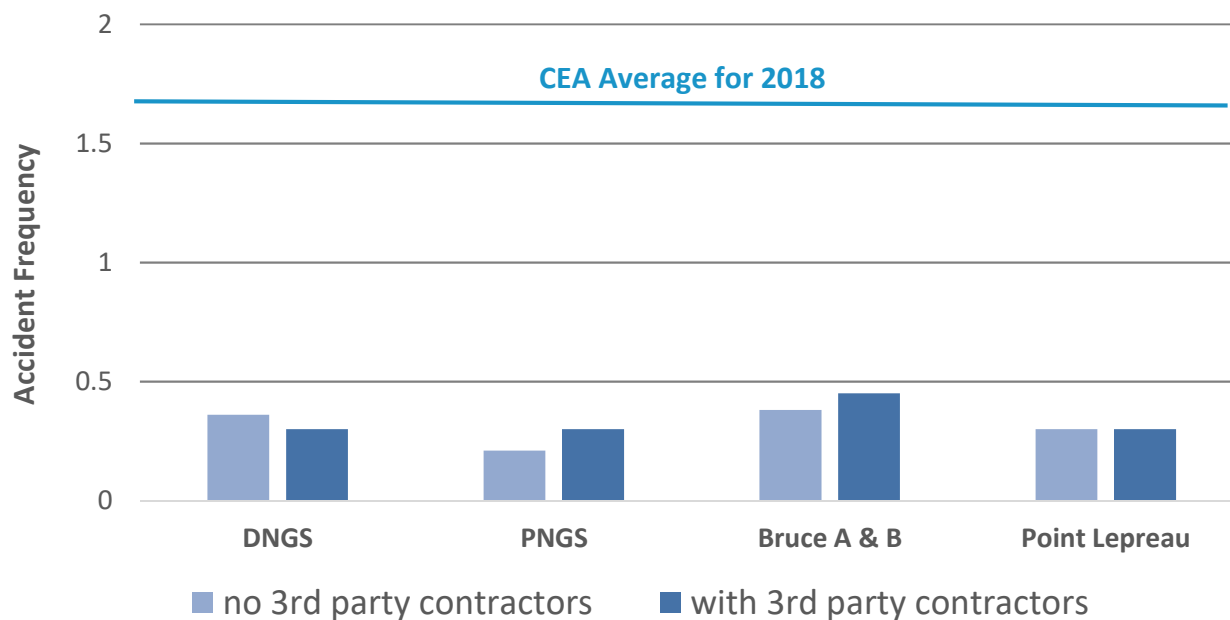
**Data excludes third party contractors**

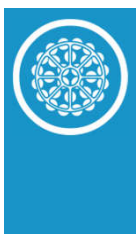


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# Accident Frequency for 2018 with 3<sup>rd</sup> Party Contractors

**Accident Frequency**  
(fatalities and injuries per 200,000 person-hours)

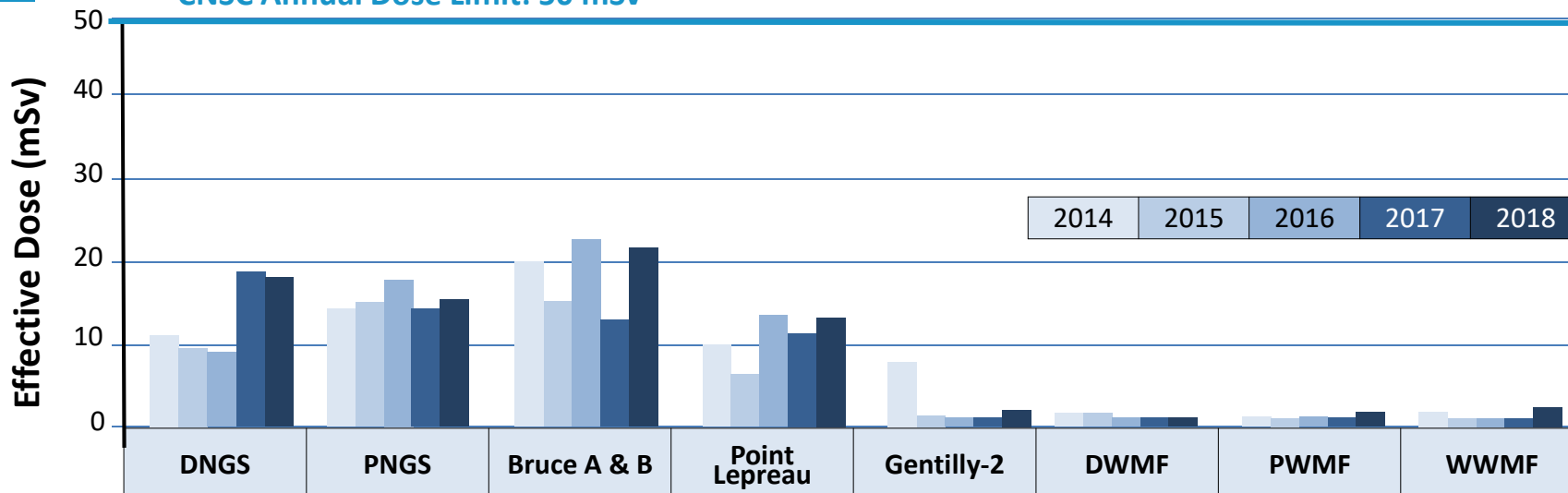




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# Trend of Annual Maximum Dose to Workers

CNSC Annual Dose Limit: 50 mSv



**Reported radiological doses to workers well below regulatory limits**





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## Notable Developments (1/3)

- Licensees committed to conduct future self-assessments in accordance with REGDOC-2.1.2, *Safety Culture*
  - CNSC reviewing recently submitted implementation plans
- CNSC tracking implementation plans for REGDOC-2.2.4, *Fitness for Duty, Volume I: Managing Worker Fatigue*
- CNSC revising REGDOC-2.2.4, *Fitness for Duty, Volume II: Managing Alcohol and Drug Use*, resulting in adjustment to implementation plans



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## Notable Developments (2/3)

- Licensees continued to implement:
  - REGDOC-2.4.1, *Deterministic Safety Analysis*
  - REGDOC-2.4.2, *Probabilistic Safety Assessment for NPPs*
- OPG and Bruce Power have submitted whole-site probabilistic safety assessment (PSA) methodologies for all multi-unit sites
- Pickering, Bruce A and Bruce B risk aggregation results were submitted.



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## Notable Developments (3/3)

- Maintenance backlogs and deferrals for critical components continued to decline
- CNSC staff monitored various activities to confirm pressure tube fitness for service
- “Implementing plans” at Darlington, Pickering and Bruce for Ontario’s Provincial Nuclear Emergency Response Plan approved in 2018 and early 2019
- Full-scale emergency exercise Synergy Challenge at Point Lepreau included recovery activities



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# HIGHLIGHTS FOR EACH NPP & THE WMFs



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# Darlington Nuclear Generating Station (DNGS)

## Licensed to operate from Jan 2016 to Nov 2025

- Units 1,3, 4 – Operational
- Unit 2 shutdown in October 2016 for refurbishment
- Commission authorized OPG to operate Units 1-4 up to 235,000 equivalent full power hours (EFPH)

**LCH was revised in 2018**

**New-build: OPG notified CNSC of intent to renew licence to prepare site beyond 2022**





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## Darlington Nuclear Generating Power Station Highlights (1/3)

- Continued CNSC monitoring and compliance verification for refurbishment
  - In 2018, OPG completed component removal at Unit 2 and was in component installation phase
- Integrated Implementation Plan (IIP) progressed per schedule
- Next major steps
  - Unit 2 return to service planned for Q1 2020
  - Unit 3 refurbishment scheduled to begin in 2020



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## Darlington Nuclear Generating Power Station Highlights (2/3)

CNSC staff through their continued oversight confirmed that:

- Outage management performance continued to be strong during planned and forced outages of the operating reactors
- Preventive maintenance deferrals and backlogs for corrective and deficient maintenance were better than industry averages and stable or trending down
- Chemistry control was strong and compared favourably with industry averages



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## Darlington Nuclear Generating Power Station Highlights (3/3)

- CNSC staff continued increased radiation protection oversight in response to findings related to
  - Hazard posting and contamination control
  - Review and verification of radiological survey results
  - Characterization of alpha hazards
- CNSC staff issued two requests under GNSCR 12(2) following separate alpha contamination events related to refurbishment
  - OPG to self-assess its implementation of the radiation protection program
  - OPG to implement changes to its confirmatory alpha bioassay program
- Staff closed both requests in 2019, with ongoing monitoring of OPG's follow-up actions





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# Pickering Nuclear Generating Station (PNGS)

## Licence to operate renewed in Sept 2018 for 10-year period

- Commission authorized OPG to operate Units 5-8 up to 295,000 equivalent full power hours (EFPH)
- End of operations (2024) and transition to safe storage (2028) to start within licence period
- OPG completed a periodic safety review (PSR) to support continued safe operation
- Integrated implementation plan (IIP) identified practicable safety enhancements

## LCH was revised in 2018

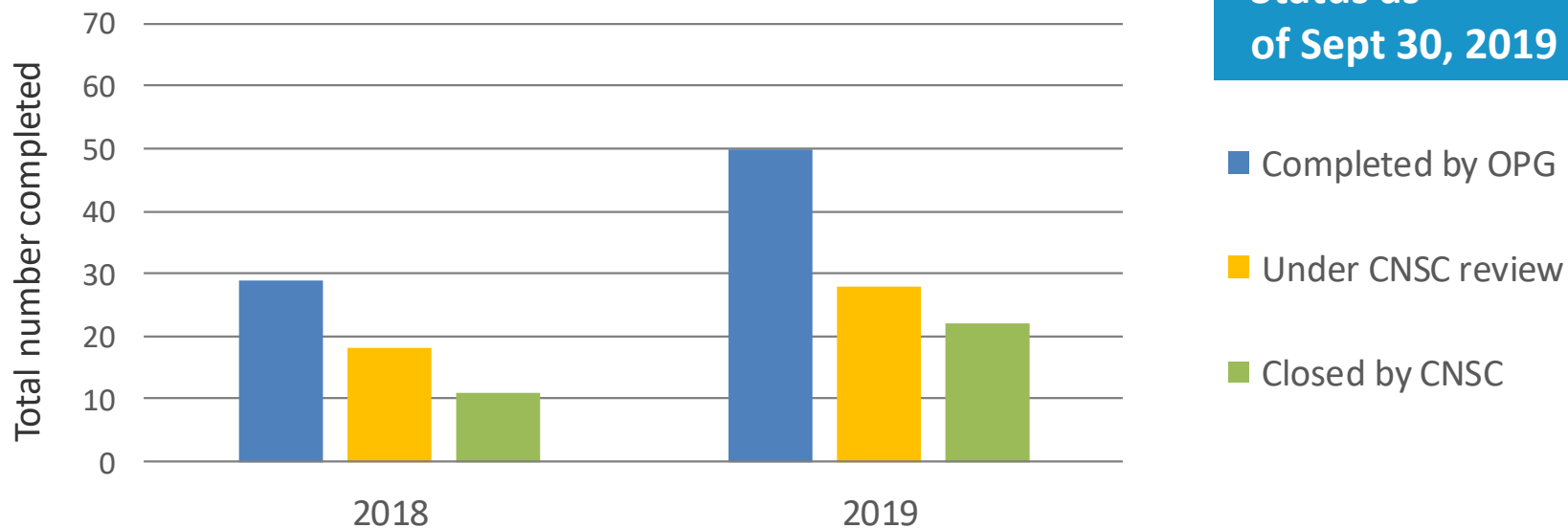




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## Pickering Nuclear Generating Station Highlights (1/3)



**OPG making satisfactory progress on IIP actions**



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## Pickering Nuclear Generating Station Highlights (2/3)

### **Key Integrated implementation plan (IIP) actions completed by OPG**

- Phase 2 of emergency mitigating equipment
- Availability of fire protection system water to steam generators, primary heat transport (PHT) system, and calandria
- Power and support service connection upgrades to ensure functionality of one main containment pump
- Unit 1 and 4 PHT aging related safety analyses for loss of flow, small-break loss-of-coolant, and neutron overpower protection scenarios
- Revised fuel channel periodic inspection program



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## Pickering Nuclear Generating Station Highlights (3/3)

- OPG and CNSC staff implementing Commission direction from 2018 licence renewal
- CNSC staff confirmed that preventive maintenance deferrals and backlogs for corrective and deficient maintenance continued to trend downward
- OPG implemented 20 new or updated REGDOCs and CSA standards

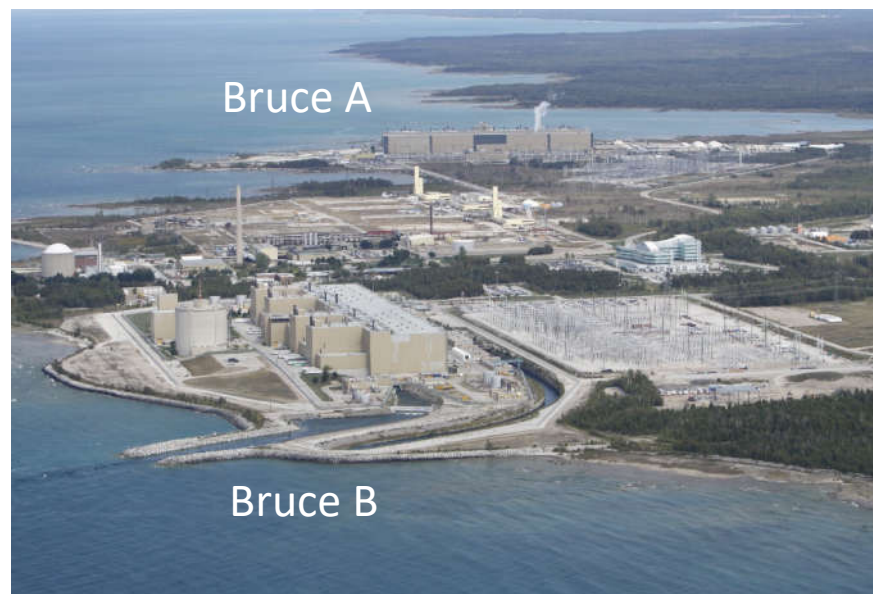


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# Bruce A and Bruce B Nuclear Generating Stations

## Licence to operate renewed in Oct 2018 for 10-year period

- Bruce Power completed PSR for renewal and major component replacement (MCR) outage
- Commission authorized Bruce Power to operate Bruce A and B units up to 300,000 EFPH
- CNSC staff monitoring integrated implementation plan (IIP) progress





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## Bruce A and Bruce B Highlights (1/3)

- Bruce Power and CNSC staff implementing Commission direction from 2018 licence renewal
- CNSC staff also focused on
  - *Fisheries Act* authorization
  - Demonstration of adequate fracture toughness of pressure tubes should Heq concentration exceed 120 ppm
  - Preparations for MCR and completion of IIP



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## Bruce A and Bruce B Highlights (2/3)

- Bruce Power enhancing fitness-for-duty programs to minimize exceedances of hours-of-work limits for certified staff
- CNSC staff accepted Bruce Power's updates of fire protection assessments
- CNSC staff confirmed that special safety systems for all units met availability targets with two exceptions
  - No significant safety impact
  - CNSC staff satisfied with corrective actions



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## Bruce A and Bruce B Highlights (3/3)

CNSC staff confirmed that:

- Preventive maintenance deferrals and corrective maintenance backlog in 2018 were better than industry averages and trending down
- Bruce Power have an effective radiation protection program
  - Reported doses to workers were below dose limits and action levels
  - No action level exceedances for surface contamination
- Environmental protection program met requirements





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# Point Lepreau Nuclear Generating Station

**Licensed to operate from July 2017 to  
June 2022**

**NB Power continued PSR to support  
next licence period**

- December 2018, CNSC staff accepted PSR basis document
- CNSC staff reviewing safety factor reports submitted in December 2018, March 2019





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## Point Lepreau Highlights (1/2)

- October 2018, NB Power conducted full-scale Emergency Exercise Synergy Challenge
  - Tested preparedness, response and recovery capabilities with emphasis on recovery
  - CNSC inspection identified both good practices and areas for improvement
- August 2018, New Brunswick Emergency Measures Organization issued new Point Lepreau Nuclear Off-Site Emergency Plan



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## Point Lepreau Highlights (2/2)

- CNSC inspected Solid Radioactive Waste Management Facility
- No forced outages in 2018

### CNSC staff confirmed

- All special safety systems met availability targets
- Preventive maintenance deferrals and backlogs for corrective and deficient maintenance trending down
- Conventional health and safety work practices and conditions contributed to high degree of personnel safety



Réunion de la Commission, le 6 novembre 2019  
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# Installations de Gentilly-2

## Permis de déclassement d'un réacteur nucléaire de puissance de juillet 2016 à juin 2026

- Les activités de déclassement à Gentilly-2 (Campagne de stockage à sec) suivent leur cours





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## Gentilly-2 Faits Saillants (1/2)

- Suite au retrait de la brigade incendie industrielle, Hydro-Québec a traversé la première année sous le protocole d'entente pour la brigade incendie industrielle avec la Ville de Bécancour
- Des modifications ont été apportées à la conduite des effluents liquides, et acceptées par le personnel de la CCSN
- De nouvelles limites opérationnelles dérivées, mises en place afin de refléter l'état de l'installation, ont été accepté par le personnel de la CCSN



Réunion de la Commission, le 6 novembre 2019  
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## Gentilly-2 Faits Saillants (2/2)

- La CCSN a inspecté les installations de gestion de déchets
  - Hydro-Québec a implanté les améliorations demandées
- La CCSN a complété une visite de suivi de la mise en œuvre de REGDOC 2.2.2, *La formation du personnel*
- La CCSN a inspecté la sécurité et a recommandé des améliorations





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# Waste Management Facilities



Darlington Waste Management Facility (DWMF)



Pickering Waste Management Facility (PWMF)



Western Waste Management Facility (on Bruce site) (WWMF)



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## DWMF, PWF and WWMF Highlights (1/4)

- OPG operated DWMF, PWF, and WWMF in 2018 in accordance with the operating policies, principles and operational safety requirements
- Maximum reported worker doses at WMFs were small fractions of regulatory limits
  - Maximum dose at DWMF was 1.4% of limit (0.7 mSv)
  - Maximum dose at PWF was 3.0% of limit (1.5 mSv)
  - Maximum dose at WWMF was 5.0% of limit (2.5 mSv)
- There were no lost-time injuries at any WMF in 2018
- CNSC staff confirmed that releases to environment from WMFs were low
  - Below environmental action levels and <1% of derived release limits





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## DWMF, PWMF and WWMF Highlights (2/4)

- OPG implemented Version 2 of REGDOC-2.10.1, *Nuclear Emergency Preparedness and Response (2016)*
- Human performance management was satisfactory, with CNSC inspections confirming
  - OPG staff worked in an organized and safe manner
  - Worker training records were appropriate for the tasks being performed



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## DWMF, PWMF and WWMF Highlights (3/4)

- OPG updated its fire protection documentation
  - CNSC staff were satisfied with PWMF and DWMF fire protection documents
  - CNSC staff found that WWMF fire protection documents needed clarification
    - CNSC staff reviewing additional revisions
- OPG was not conducting annual drills to test fire response capability at the WMFs
  - OPG committed to conduct annual fire drills at each WMF with mutual aid activation
  - In 2019, CNSC staff observed first set of fire drills



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## DWMF, PVMF and WWMF Highlights (4/4)

- In 2018, OPG reported nine events to CNSC of low safety significance
  - Four at DWMF
  - Two at PVMF
  - Three at WWMF
- Example: loss of communication with IAEA surveillance system at WWMF
  - No impact on safeguards
- CNSC staff were satisfied with OPG's actions to address the events and corrective measures



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# CLOSING REMARKS



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## Engagement on 2018 NPGS ROR

- Notice of Meeting and Participant Funding posted on April 10, 2019
- Five applicants awarded funding to review and submit comments
  - Gordon Dalzell
  - Benoit Poulet
  - Canadian Environmental Law Association
  - Grand Conseil de la Nation Waban-Aki
  - Lake Ontario Waterkeeper
- Interventions received from the funded participants and four other interveners

### Interventions summarized in supplemental CMD 19-M30.A



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## Engagement on 2018 NPGS ROR

- Some main themes noted from interventions
  - INES reporting to IAEA
  - Fitness for service of pressure tubes
  - Tritiated water emissions from Western WMF
  - Radionuclides and the National Pollutant Release Inventory
  - Local groundwater quality in the vicinity of NPGSs
  - Availability of event reports to public
  - Scope of information provided on Indigenous relations
  - Public's attitudes on nuclear safety



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## Next Steps

- Revise the NPGS ROR
  - Fix identified errors and omissions
  - Address comments from interveners and Commission, as needed
  - Edit English and French versions
- CNSC staff to confirm closure of non compliances that were not resolved by the end of 2018; will provide updates in next ROR
- Prepare for publication (March 2020)
- Continue to fulfill Commission requests for information updates



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## Final Conclusions

- Effective CNSC compliance verification program
- Issues identified during compliance verification activities and events were either addressed or are being addressed by licensees
- Licensees implementing new requirements, and conducting other activities to improve safety
- SCAs rated either Satisfactory or Fully Satisfactory
- Reported doses to workers and public were below regulatory limits
- Public and environment were protected

**Operations at NPPs and WMFs were conducted safely**





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