



## **Supplementary Information**

### **Presentation from Bruce Power Inc.**

In the Matter of

#### **Bruce Power Inc. – Bruce A and B Nuclear Generating Station**

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Request for a ten-year renewal of its Nuclear Power Reactor Operating Licence for the Bruce A and B Nuclear Generating Station

**Commission Public Hearing – Part 2**

**May 28-31, 2018**

## **Renseignements supplémentaires**

### **Présentation de Bruce Power Inc.**

À l'égard de

#### **Bruce Power Inc. - Centrale nucléaire de Bruce A et Bruce B**

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Demande de renouvellement, pour une période de dix ans, de son permis d'exploitation d'un réacteur nucléaire de puissance à la centrale nucléaire de Bruce A et Bruce B

**Audience publique de la Commission –  
Partie 2**

**28-31 mai 2018**





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# **Bruce Power Operating Licence Renewal**

Part 2 Hearing – May 28, 2018

# Overview



**Mike Rencheck**  
**President and CEO**



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# Welcome to Kincardine

- Appreciate the CNSC hosting Part 2 in our community
  - Great opportunity for local involvement in the process
  - Our neighbours know us best
  - Important to hear directly from those who live, work & interact with Bruce Power & our employees every day



# Agenda

- Update items discussed in Part 1
  - Operational Performance
  - Probabilistic Safety Analysis
  - Emergency preparedness
  - Fitness for service – fuel channels
  - Environmental assessment
  - Community & Indigenous relations

# Operational performance

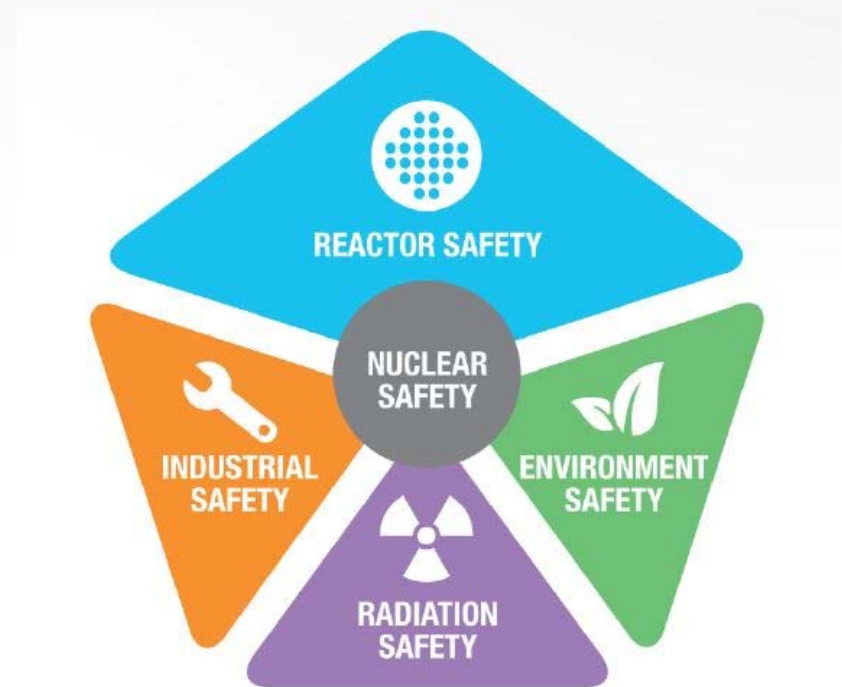


**Len Clewett**  
**Executive Vice President & Chief Nuclear Officer**

**Bruce Power™**  
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# Safety First

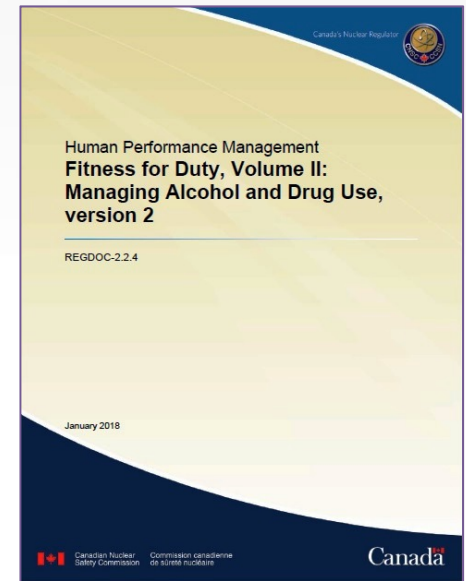
- Human performance
  - Stations achieved equivalent of eight years of operations without a significant event
- Continuous improvement
  - Initiative to improve recognition of risks
  - Training on track to complete this year





# Fitness for Duty

- Working with industry to:
  - Identify best international practices
  - Establish policies/procedures that comply with REGDOC & preserve worker confidentiality
  - Secure qualified third-party testing administrator & lab
- Plan to comply with new requirements by July 1, 2019, with exception of random testing (Dec. 1, 2019)
  - Regular updates provided to CNSC staff



**Bruce Power's existing, multi-faceted program effectively ensures workers are fit for duty.**

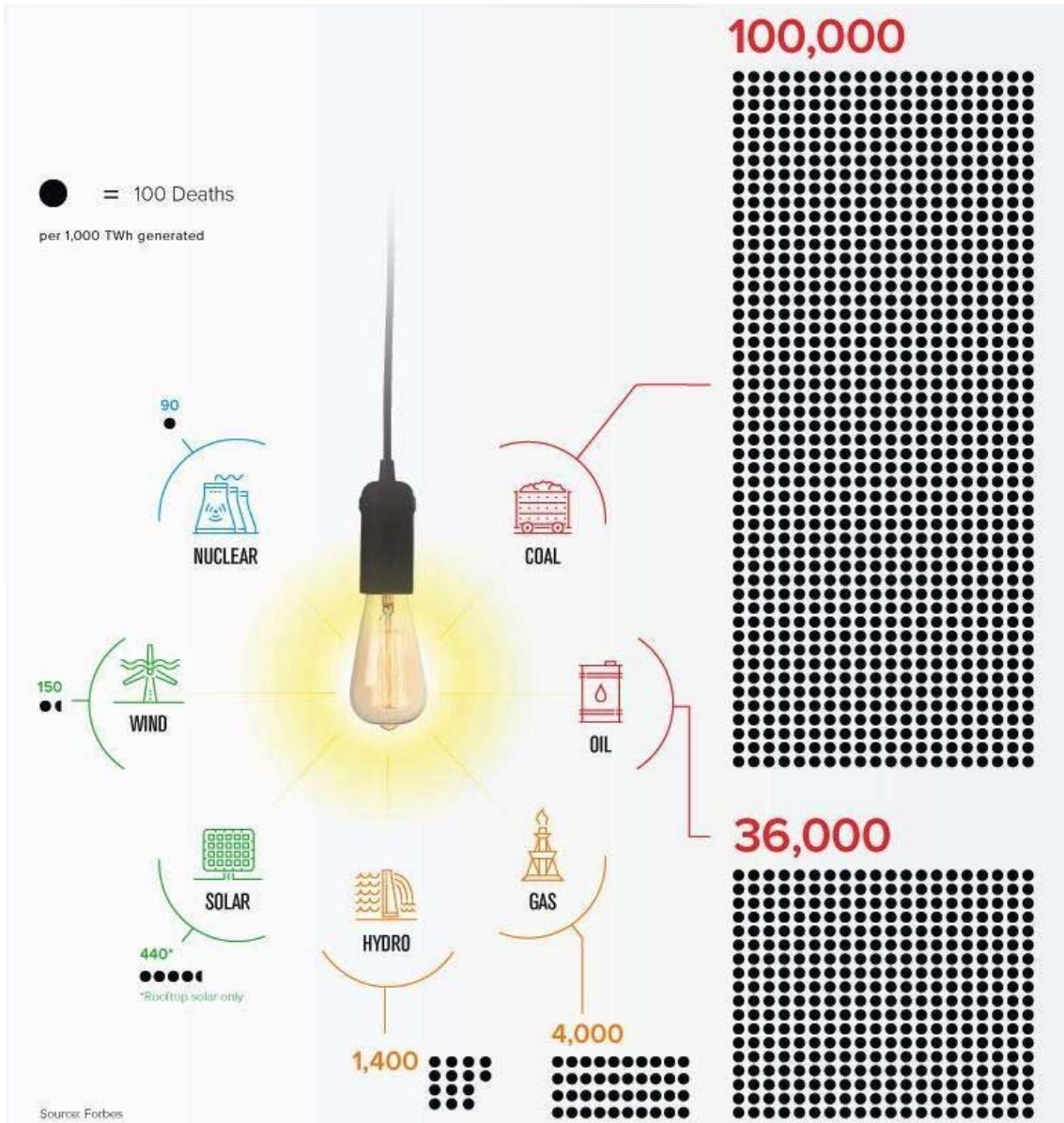
# Safety analysis & emergency planning



**Frank Saunders**  
VP, Nuclear Oversight & Regulatory Affairs



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Source: Cambridge House

'The World's Safest Source of Energy Will Surprise You' published by Visual Capitalist, May 10, 2018

*“The reality is that nuclear energy is much more comparable to renewables like solar or wind, in terms of safety. . . (the) data explains why the majority of scientists classify nuclear as a sustainable and safe energy source, along with other renewables.”*

Jeff Desjardins  
Editor-in-Chief, Visual Capitalist

# Probabilistic Safety Analysis

- Tool to monitor plant risk, optimize maintenance practices & maximize the reliability of systems, structures & components
- PSA confirms risk of a large radioactive release is extremely low - once every 100,000 to one million years



**The risk of traditionally analyzed, in-plant events are less than once in a million years, which is on par with world's best operators.**

# Probability of ....

Crashing your car (per 20,000 km)



0.0076 →



A train derailling on the main line (per 20,000 km) 0.0052 →

Breaking a bone (per month)



0.0011 →



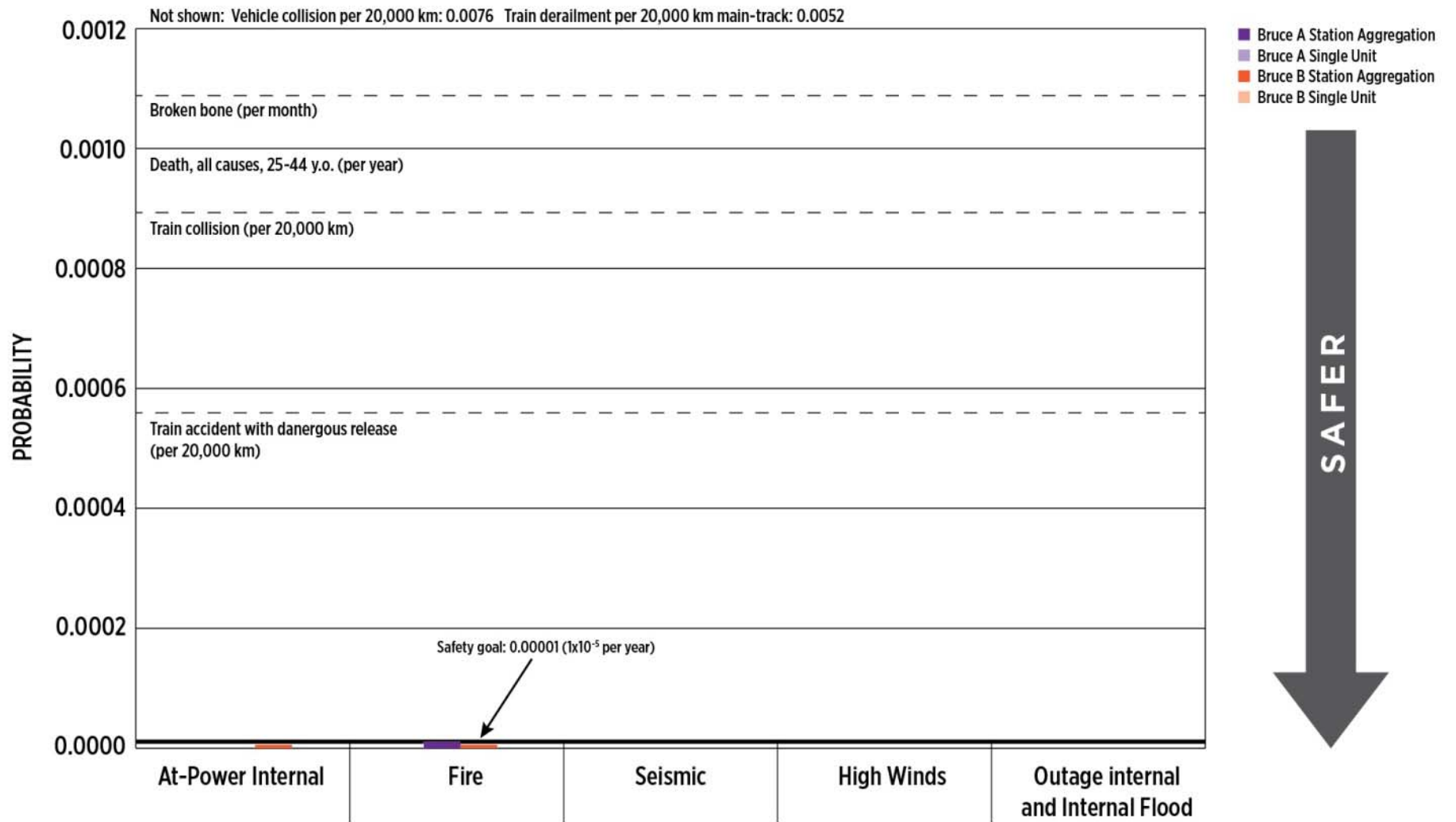
A train collision (per 20,000 km) 0.00089



Train accident with dangerous release (per 20,000 km) 0.00056

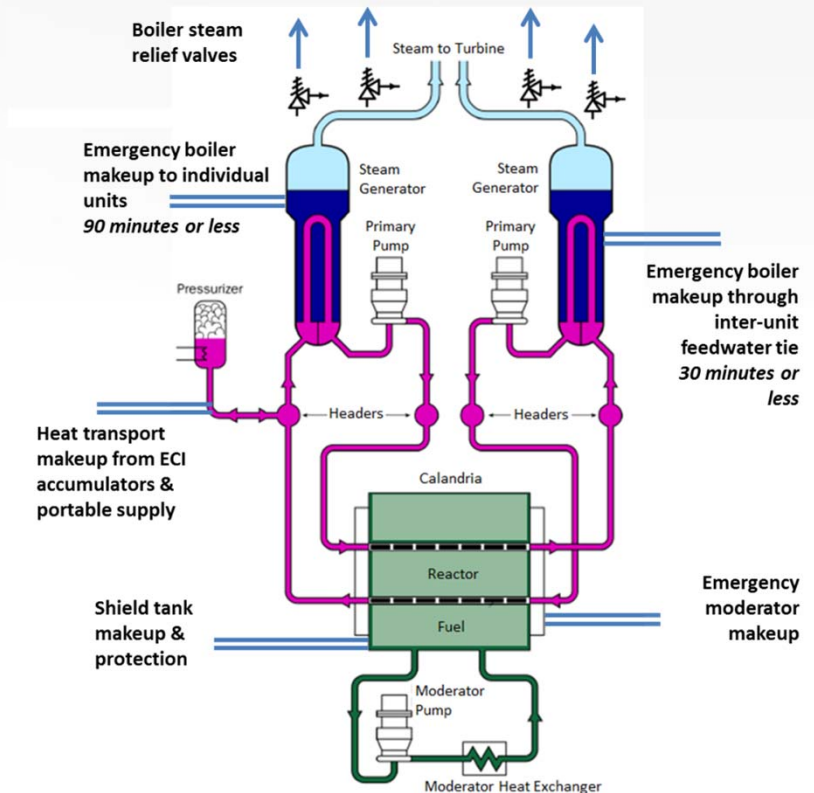
**0.00001** Safety Goal – once every 100,000 years

**0.000001** Bruce Power's Administrative Target – once every one million years



# Prevention & mitigation

- PSA results include conservative benefits from use of Emergency Mitigating Equipment (EME)
  - Reduces frequency of damage from many internal event sequences by a factor of 10
- Part of series of post-Fukushima projects to:
  - I. Prevent accidents***
  - II. Mitigate impacts***
  - III. Prevent releases***



# Accident prevention projects complete

- In place by 2012-2013
- Focused on additional make-up water
  - High-capacity pumper trucks & dry hydrants
  - Redundant EME connections to steam generators and irradiated fuel bays

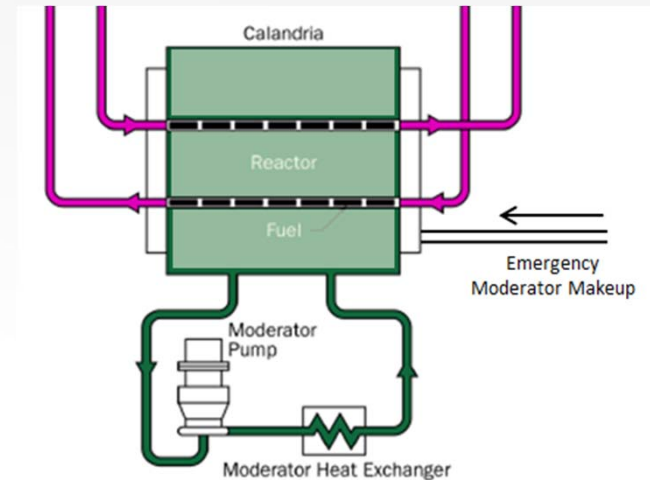


**Rapid installation of high-priority mods to add another layer of prevention**



# Mitigation projects nearing completion

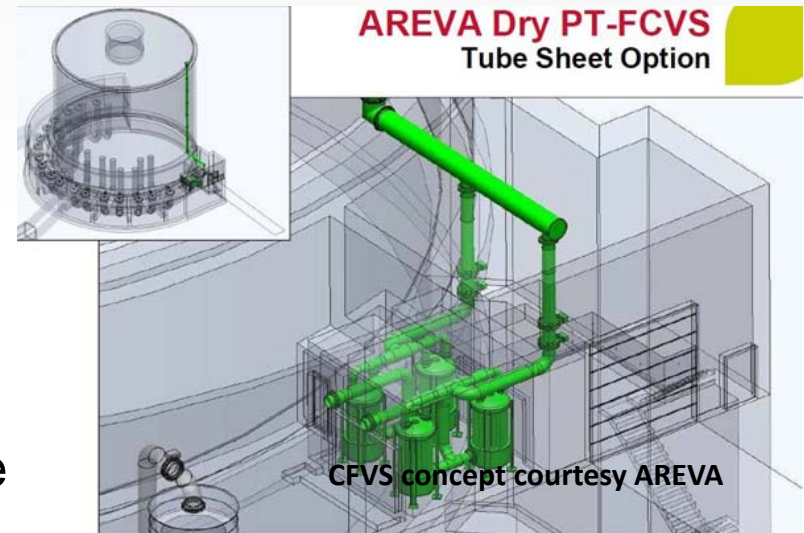
- Severe Accident Management toolkits installed:
  - Hardware & tooling to apply EME to primary heat transport system, moderator system & shield tank
  - Allows responders to physically link EME to plant systems
- Currently installing permanent, quick EME connections to provide a redundant and fast-connection path
  - All operating units outfitted by 2019  
(5 units complete; 2018 - 2 units; 2019 – 1 unit)



**At least one pathway in place for all units  
with more enhancements in progress.**

# Prevent releases – CFVS by 2022

- Containment Filtered Venting System (CFVS) to prevent release of radioactivity to the public
  - Passive system for filtration of radioactive releases from containment
  - Maintains containment within design pressure
  - Refined release calculations will be shared with province to assist in emergency planning

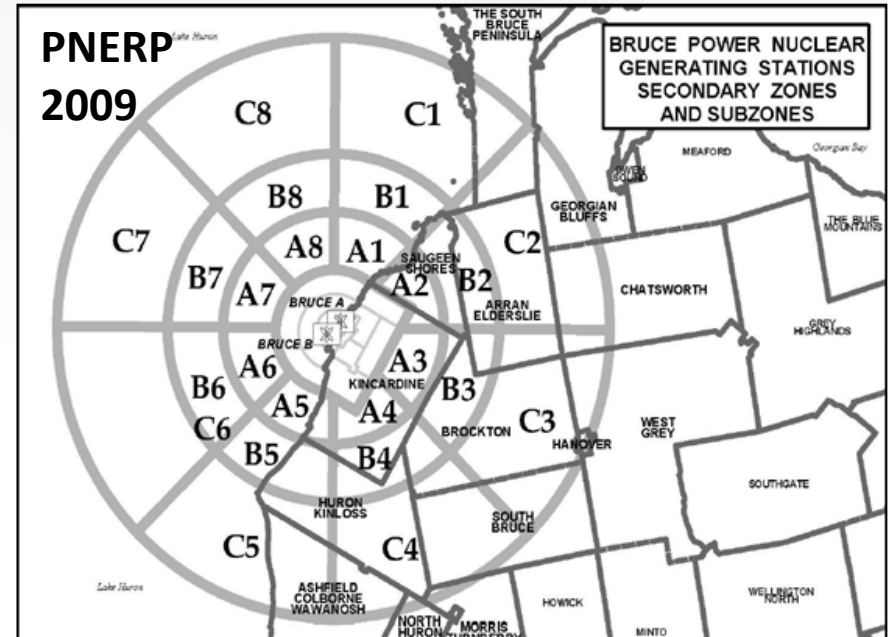
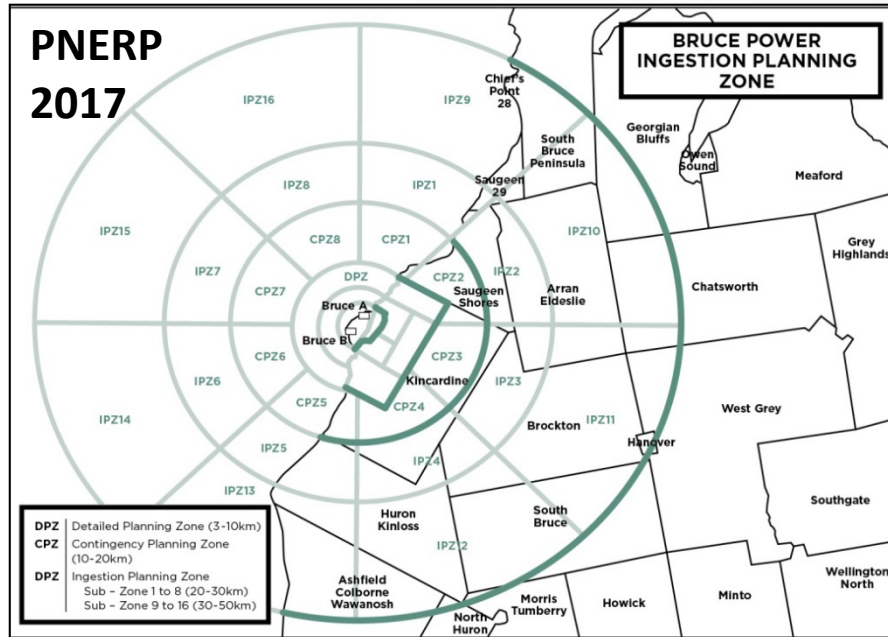


**Emergency Mitigating Equipment prevents events. Filtered venting will prevent large releases and the need for evacuations.**

# Emergency preparedness

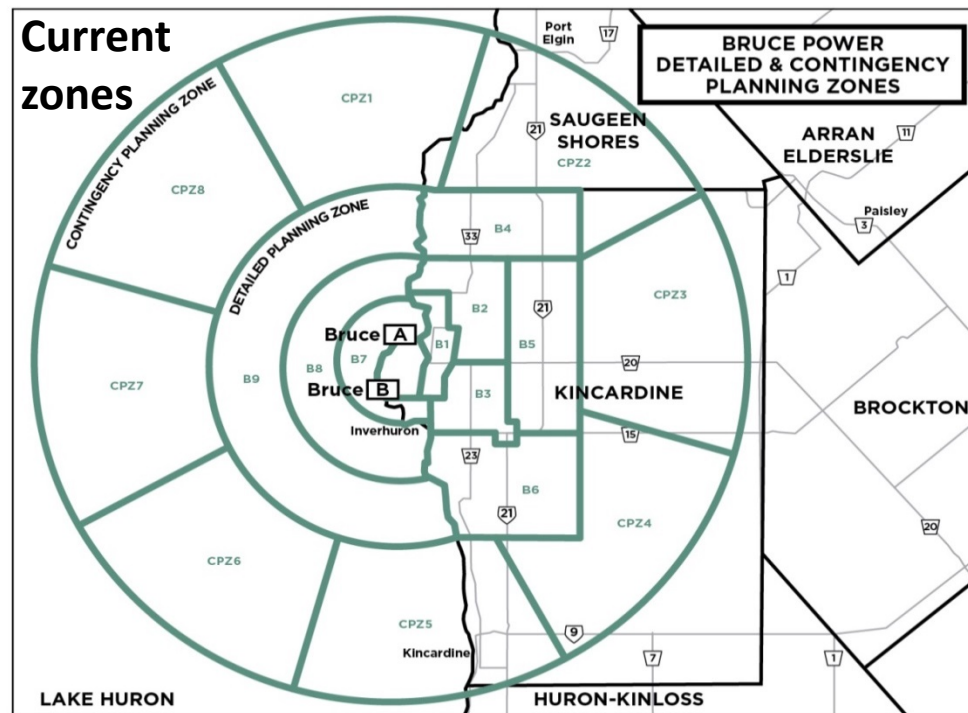
- Provincial Nuclear Emergency Response Plan (PNERP) revised in 2017 to better align with Canadian standards (CSA, CNSC) & international guidance (IAEA)
- Changes made to:
  - Define Generic Intervention Levels (formerly known as Protective Action Limits) & align with recent changes in Health Canada guidelines
  - Update descriptions of accident scenarios, including severe accidents
  - Clearly describe key emergency response activities for various accident scenarios
  - Ensure training & exercise requirements are consistent with national & international standards

# Updated planning zones



**Bruce Power Emergency Plan changes to adapt new PNERP being drafted for implementation.**

# Reducing risk



**Filtered venting practically eliminates the need for evacuation & will greatly reduce emergency planning zones.**

# Helping our community prepare

- Working with municipal partners to enhance regional infrastructure & readiness
  - Helping Kincardine & Saugeen Shores finalize municipal plans & identify alternate facilities beyond 20 km planning zone
  - Participating in Rural Interoperability Optimization study to improve communications among response agencies in Bruce, Grey & Huron counties

**A new Regional Interoperability Plan will be complete by the end of 2018.**



# Investing in community preparedness



*Emergency vehicle donated to the Grey Bruce Huron Branch of St. John Ambulance*



*Air Light Support Vehicle donated to the Grey County Fire Chiefs Association*



*The Hon. Marie-France Lalonde, Ontario's Minister of Community Safety and Correctional Services, attends Bruce Power's launch of a \$100,000 fund to invest in community safety initiatives between 2018 and 2020.*

# Ongoing improvements

- Updating plume modelling analytical software to align with the new Generic Intervention Levels
- Enhancing mobile decontamination capability
- PNERP updates will be validated in 2019 during ***Huron Resilience*** emergency response exercise with province, municipalities
- Chance to further test DLAN, our emergency data transmission system





# Hydrogen equivalent predictions & fracture toughness model validation



**Gary Newman**  
**Chief Engineer & Senior Vice President**



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# Outlet RJ Heq predictions

Probabilistic – MCR (97.5 percentile upper bound)		
Unit	EFPH	Heq, ppm
3	~ 245000	92
4	~ 255000	81
5	~ 300000	120
6	~ 245000	99
7	~ 300000	120
8	~ 300000	103

Deterministic – MCR		
Unit	EFPH	Heq, ppm
3	~ 245000	102
4	~ 255000	104
5	~ 300000	151
6	~ 245000	121
7	~ 300000	147
8	~ 300000	139

**Note: Current fracture toughness model validated to 120 ppm, further updates planned for end of 2018 (140 ppm) and 2019 (160 ppm)**

# Time to reach 120 ppm at the outlet RJ

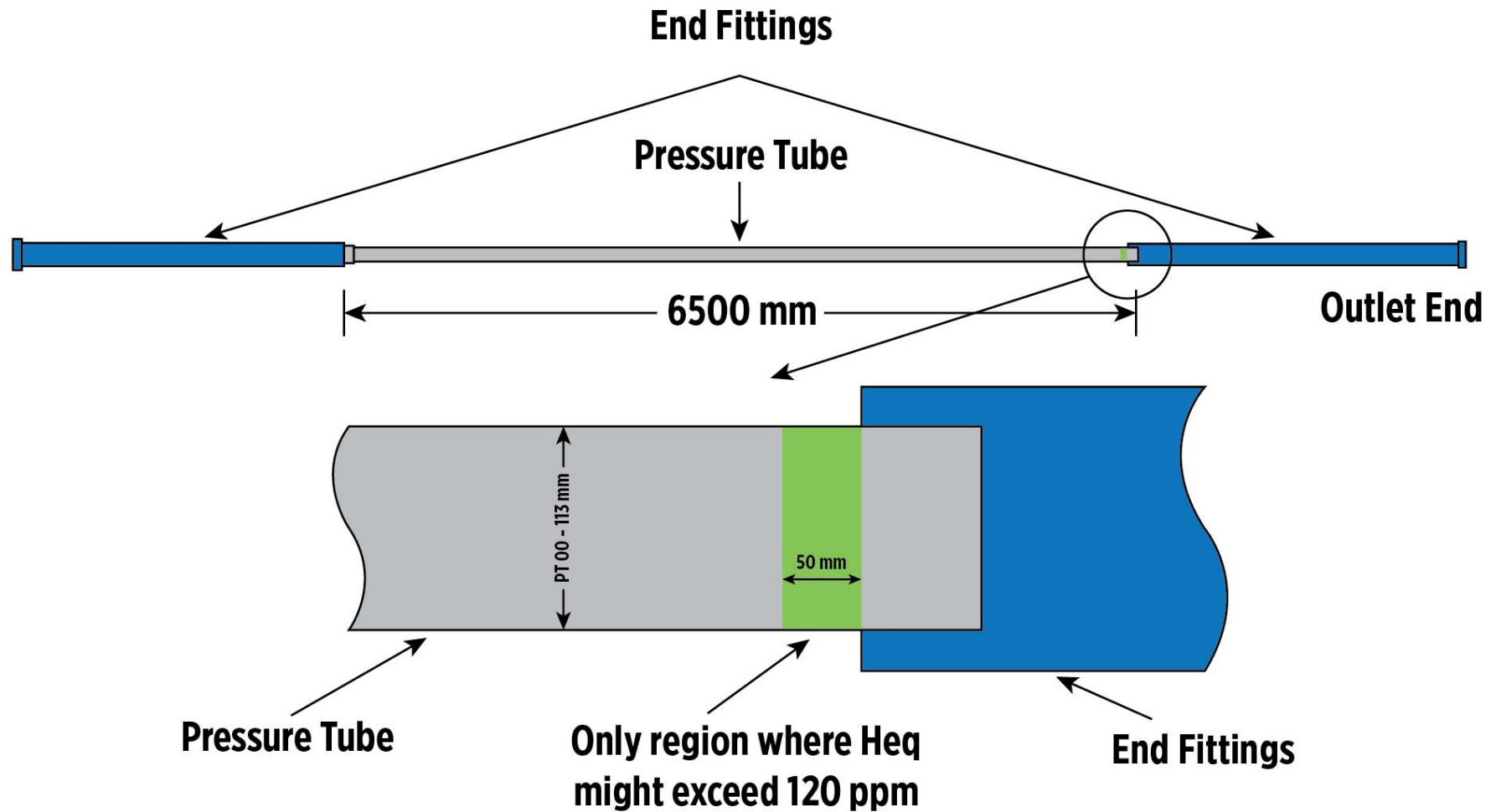
## Based on Deterministic Heq Predictions

Unit	EFPH	Date
3	Beyond MCR	
4		
5	247609	Feb 2020
6	243128	Nov 2019
7	252818	Jan 2022
8	274126	Oct 2026

## Based on Probabilistic Heq Predictions

Unit	EFPH	Date
3	Beyond MCR	
4	Beyond MCR	
5	Beyond MCR	
6	Beyond MCR	
7	299603	April 2028
8	Beyond MCR	

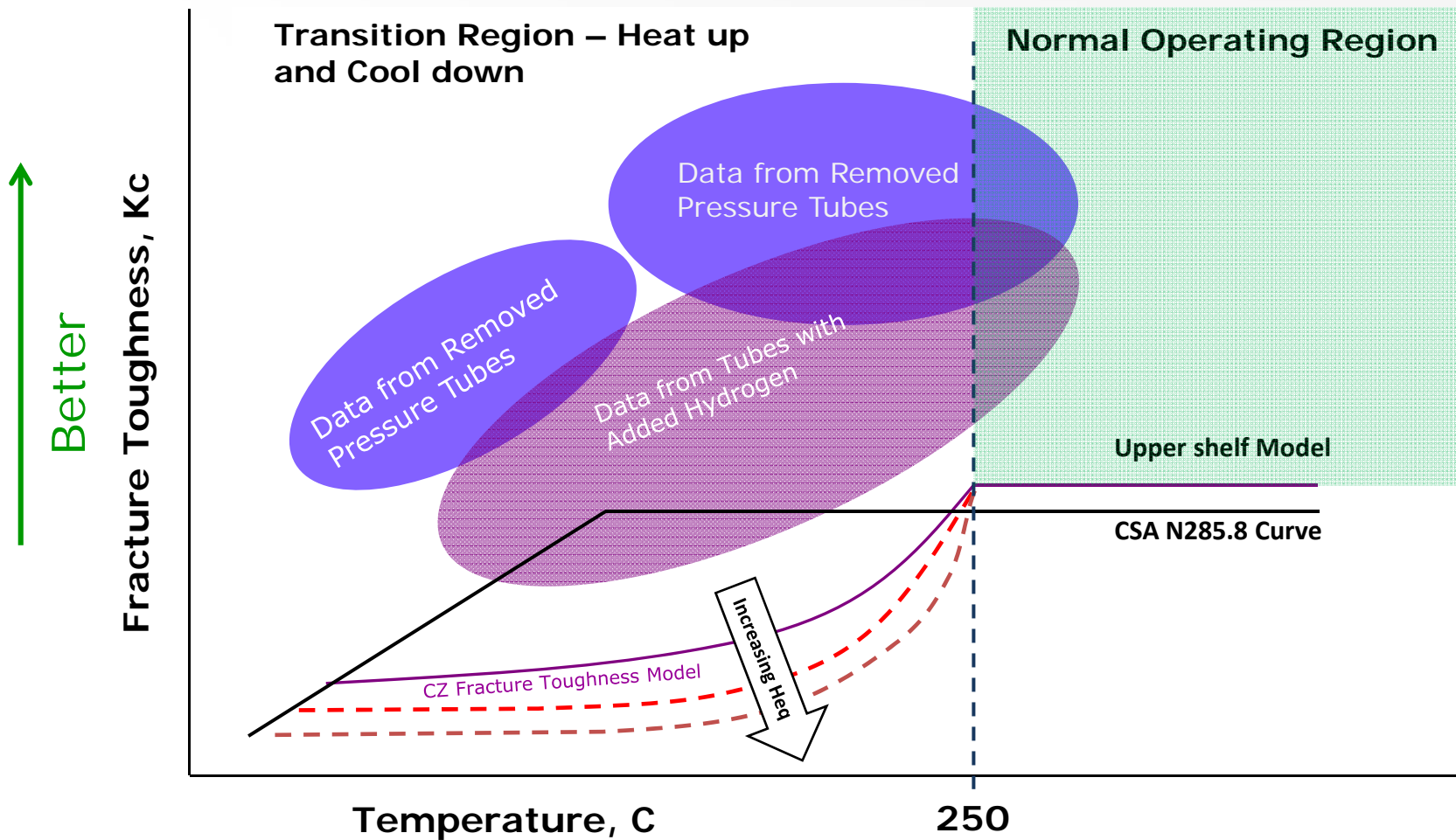
# Region with higher Heq



# Validation of fracture toughness models

- By end of 2018, the limit of upper shelf fracture toughness model extended to 140 ppm Heq
- By Q2 2019, the limit of upper shelf model extended to 160 ppm Heq
- By end of 2019, the limit of the cohesive-zone based model (for the transition temperature region) extended to 160 ppm Heq
- The schedule is subject to confirmation of performance of high concentration burst test results
- Burst tests beyond 2020 will be determined later with considerations of results from prior tests

# Updated fracture toughness model



# Current burst test plan

Year	Test #	Target [Heq] (ppm)	Pressure Tube Material	T(° C)
2018	n/a	As-received	Mid reactor	250
	BT-33	80	Inlet	250
	BT-34	80	Inlet	<250 (if upper shelf at 250)
	BT-35	80 or TBD	Inlet	<250 (if upper shelf at 250)
	BT-36	160	Outlet	250
	BT-37	160	Outlet	<250 (if upper shelf at 250)
	2019	BT-38	160	Outlet
BT-39		160	Outlet	<250 (if upper shelf at 250)
BT-40		160	Outlet	<250 (if upper shelf at 250)
BT-41		160	Outlet	<250 (if upper shelf at 250)
BT-42		80 or TBD	Inlet	<250 (if upper shelf at 250)

**Note: Further testing in 2020 and beyond to be defined once 2018/2019 burst test program is completed**

# Environmental Assessment, Community & Indigenous Relations



**James Scongack**  
**VP Corporate Affairs and Environment**



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# Environmental Assessment (EA)

- Commitment to the environment extends beyond regulatory compliance: continuous improvement & environmental stewardship are also key principles in Bruce Power's Environmental Policy
- Bruce Power conducted an EA under the Nuclear Safety and Control Act as part of this License Application
  - Environmental Risk Assessment characterized baseline environmental conditions and the impact of on-going operations
  - Demonstrates a low to negligible environmental impact
- EA builds on numerous studies since its formation in 2001 that have fully captured all operational and life extension activities, including Major Component Replacement

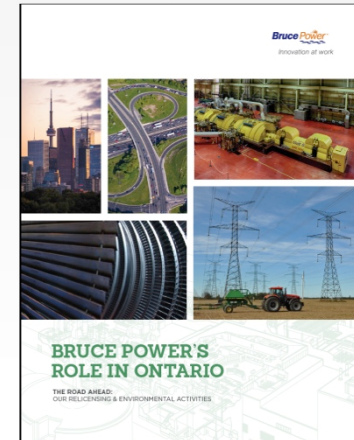
**Environmental factors are well understood. All work contemplated in the Licence Application has been previously carried-out and was subject to follow-up monitoring and verification.**

# Environment – anticipating the future

- Impacts of climate change being reviewed as part of a joint study launched with the Council of the Great Lakes Region
- Independent university-based Research & Development:
  - Ongoing investment of \$7 million since 2010, with additional \$1.7 million of granting agency funding awarded to:
    - Quantify effects of thermal, chemical and radiological exposures on Lake and Round Whitefish
    - Determine population distribution of Lake and Round Whitefish in Lake Huron and the Great Lakes
    - Investigate the biological effects of low-dose radiation
- Bruce Power's environmental program and the various regulatory approvals required require an ongoing element of re-evaluation of baseline conditions

# Actively engaging on licence renewal

- Process began in late 2015 starting with Indigenous communities
- Publications on licensing process released: first in August 2016; second in September 2017
- Online & social media engagement.
- Stakeholder meetings and workshops
- Community information mailings and open houses
- Active dialogue with county and municipal governments
- Independent public opinion polling



# Indigenous relations

- Recognize our site is located on the traditional territories of Indigenous Peoples
- Active and ongoing dialogue to further understanding of First Nations and Métis rights and way of life
- Formal Protocol Agreements in place covering regulatory engagement, capacity and community development
- Ongoing work with employment, education, training, business opportunities and economic development, environmental stewardship and community investment
- Bruce Power has invested significantly in capacity funding and other initiatives in our local Indigenous communities



# Part of the community

- Following Part 1, research into the attitudes & opinions Bruce, Grey & Huron county residents have of Bruce Power was released
- Results show:
  - 93% are confident Bruce Power operates safely
  - 90% feel we are a good community citizen
  - 89% feel Bruce Power is positively involved in the local community
  - 84% support refurbishment plans
  - 81% feel we update the community regularly



#### About the survey:

Telephone interviews of 850 local residents. Data weighted by region, gender & age to reflect the population of all three counties. Margin of error was  $\pm 3.4\%$  (19 times out of 20).

# In conclusion

- Bruce Power will continue to make adequate provision for the environment, health and safety of persons, and maintenance of national security and measures required to implement international agreements to which Canada has agreed, as described in the Nuclear Safety and Control Act, Section 24(4)(b)

## Bruce Power requests:

- Renewal of Power Reactor Operating Licence PROL 18.00/2020 for a period of 10 years from September 1, 2018
- Acceptance of the Integrated Implementation Plan
- Approval of the regulatory scope of the MCR outages in Units 3–8
- Incorporation of activities currently authorized by licences 13152-1-20.4 (nuclear substances and radiation devices), 131 52-2-21.1 (operation of a Class II nuclear facility), and 13152-3-20.2 (conduct of radiography), into PROL 18.00/2020 upon renewal