



**Oral Presentation**

**Exposé oral**

**Submission from  
Strategic Policy Economics**

**Mémoire de  
Strategic Policy Economics**

In the Matter of

À l'égard de

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

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

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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

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

**Commission Public Hearing – Part 2**

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

**May 28-31, 2018**

**28-31 mai 2018**



# Bruce Power License Renewal

*2018-H-02 Supporting Arguments*

March 12, 2018



# Outline

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## Strategic Policy Economics

- In depth understanding of the nuclear contribution to Canada

## Ontario depends on Bruce Power's low cost clean power

- To sustain its economy and achieve climate mitigation

## The strong safety culture at Bruce Power permeates its entire workforce

- And is visible in industry benchmarks

## The community around Bruce Power supports the facility

## Conclusion

- No reason to consider not renewing Bruce Power's license

# Strategic Policy Economics

## In depth understanding of nuclear's contribution to Canada

Involved in many of the strategic issues facing Canada's nuclear sector over the last 10 years including:

- Unexpected shutdowns of AECL's NRU
- Canada's medical isotope crisis and the world's supply shortage risks
- Restructuring of AECL
- Role of nuclear in Ontario's long-term energy planning and the implications for interprovincial transmission interties
- Role of Canada's nuclear science and technology infrastructure<sup>(1)</sup>, including Canada's universities, in contributing to:
  - Canada's compliance to the international convention on nuclear safety
  - Canada's innovation ecosystem
- Many economic assessments of Canada's nuclear power generating stations, such as the life extension of Pickering

Strategic Policy Economics strongly supports the license renewal of Bruce Power

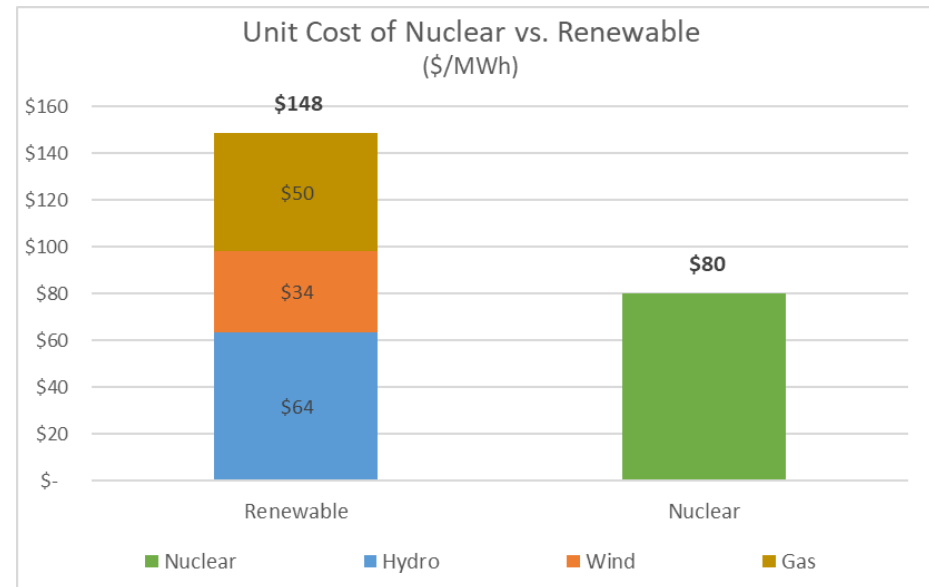
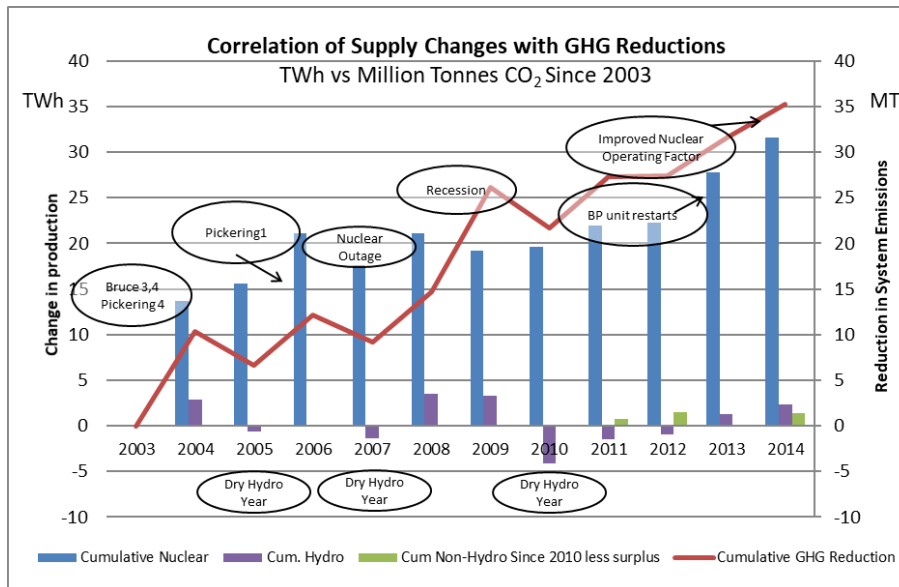
Sources: (1) <http://cins.ca/docs/Nuclear%20ST%20Innovation.pdf>

# Ontario depends on Bruce Power's low cost clean power

To sustain its economy and achieve climate mitigation

**Nuclear is responsible for eliminating coal**

**Refurbished nuclear is half the cost of a renewables/Quebec imports solution for baseload supply**



Sources:

- [https://strapolec.ca/uploads/Impact\\_of\\_Extending\\_PNGS\\_Operations\\_Final\\_Report\\_November\\_16\\_2015.pdf](https://strapolec.ca/uploads/Impact_of_Extending_PNGS_Operations_Final_Report_November_16_2015.pdf)
- [https://strapolec.ca/uploads/Expanding\\_Ontario\\_and\\_Quebec\\_Tx\\_Interties\\_-\\_Final\\_Report\\_June\\_16\\_2016.pdf](https://strapolec.ca/uploads/Expanding_Ontario_and_Quebec_Tx_Interties_-_Final_Report_June_16_2016.pdf)

# Nuclear in Ontario's supply mix lowers emission reduction cost

## Reliable nuclear output is less costly for emission reduction than intermittent renewables

Strategic Policy Economics studies show cost effective nuclear options **halve** costs to combat climate change

Study on *Emissions and the LTEP* shows a nuclear centric solution can:

1. Reduce the total future system energy cost of Ontario's electricity **by half**, and
2. Eliminate the economic cost of combatting climate change

Current study on *Jurisdictional Implications for Renewables DER* are suggesting:

1. Nuclear coupled with distributed storage to enact demand side management is **Half** the total system energy cost of
2. Renewables coupled with storage that also mitigates renewables intermittency

### Scenario "S" Benefits vs. OPO D1

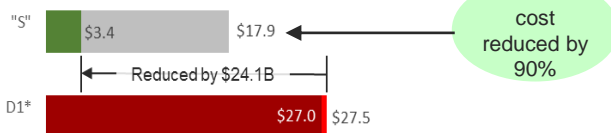
Incremental Unit Cost  
(\$/MWh)



Carbon Price  
(\$/t)



Cost of Emissions Reduction  
(\$B/year)



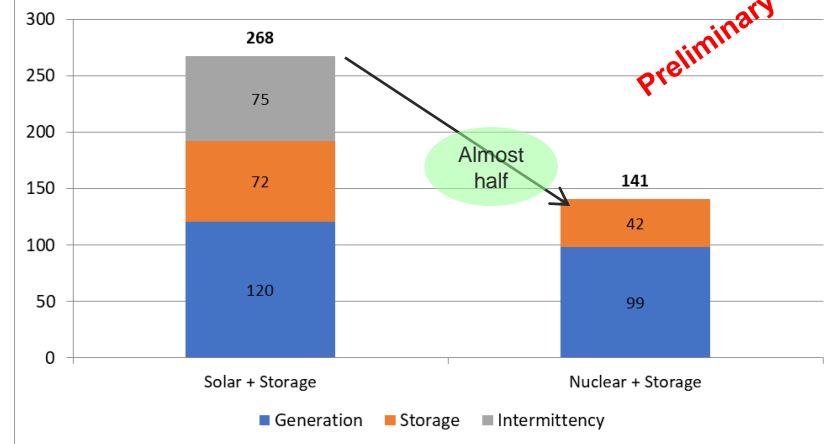
■ Benefit of Enhanced Economic Activity  
■ Additional Trade Loss

\* Capacity scaled to achieve emission targets

Scenario "S" is Strapolec developed scenario based on leveraging nuclear within four power system planning paradigm shifts

### Ontario LCOE Solar DER vs Nuclear + Storage

\$/MWh, 2030



- Costs built from U.S. 2030 projection for community based solar (\$73/MWh USD for community, which is higher than the \$47/MWh USD projected for grid) with solar capacity factor of 21%, converted to an Ontario 15% CF
- Ontario solar cost reflect capital, excess generation, and losses due to capacity factor in Ontario, and 15% exchange rate on 60% of the cost
- Storage reflect 2030 cost projections adjusted for capacity factor in Ontario
- Intermittency includes solar/storage waste, backup generation, and seasonal storage implications (illustrative)

Sources: [https://strapolec.ca/uploads/Ontarios\\_Emissions\\_and\\_the\\_LTEP\\_-\\_Ph\\_2\\_Report\\_Final\\_December\\_2016.pdf](https://strapolec.ca/uploads/Ontarios_Emissions_and_the_LTEP_-_Ph_2_Report_Final_December_2016.pdf), Strapolec Analysis

# Strong safety culture at Bruce permeates its entire workforce

And is visible in industry benchmarks

**Bruce Power has received the highest rating in at least 7 categories**

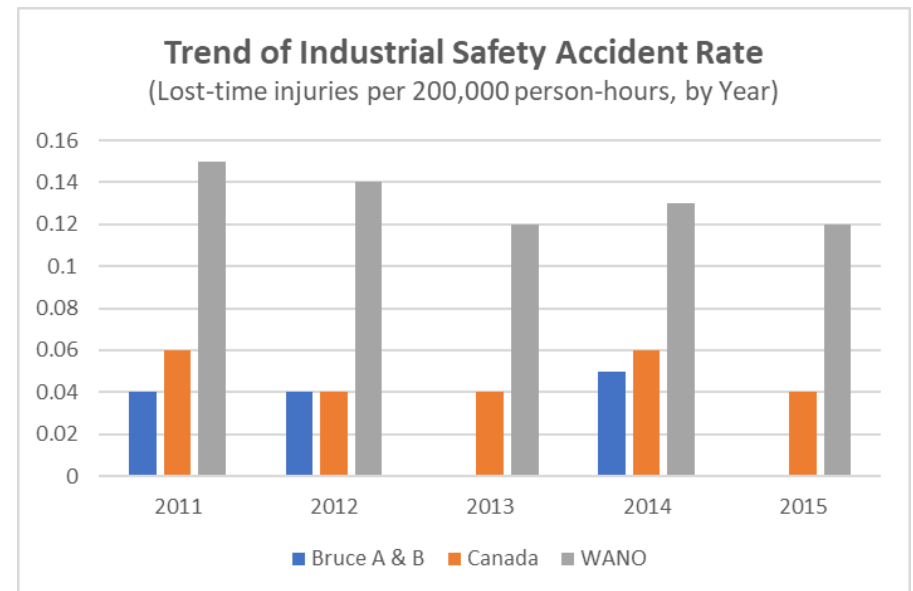
Safety and control area	Bruce A		Bruce B	
	2015	2016	2015	2016
Management system	SA	SA	SA	SA
Human performance management	SA	SA	SA	SA
Operating performance	1 FS	FS	FS	FS
Safety analysis	2 SA	FS	SA	FS
Physical design	SA	SA	SA	SA
Fitness for service	SA	SA	SA	SA
Radiation protection	3 SA	FS	SA	FS
Conventional health and safety	4 FS	FS	FS	SA
Environmental protection	SA	SA	SA	SA
Emergency management and fire protection	SA	SA	SA	SA
Waste management	5 FS	FS	FS	FS
Security	6 FS	SA	FS	SA
Safeguards and non-proliferation	SA	SA	SA	SA
Packaging and transport	SA	SA	SA	SA
Integrated plant rating	7 FS	FS	FS	SA

SA = Satisfactory      FS = Fully Satisfactory

Source: CNSC Regulatory Oversight Report for Canadian Nuclear Power Plants: 2015 & 2016

**Industrial Safety Accident Rate (ISAR) measures number of lost-time injuries per 200,000 person-hours**

■ Bruce Power had none in 2013 and 2015



Source: CNSC Regulatory Oversight Report for Canadian Nuclear Power Plants: 2015



# The community around Bruce Power supports nuclear

- **Support for the Bruce facility is high among local residents (85%)** – an increase from 79% in 2014.
- **Job creation** is the primary reason that local people support the refurbishment of the Bruce nuclear station. Reasons for opposing the refurbishment included concerns about safety, costs and the potential for other, better energy options.
- **Local residents are generally familiar with Bruce Power** — over three quarters of residents (76%) said they were very or somewhat familiar with Bruce Power. This is on par with findings from 2014, however there was a significant increase in those who said they were “very familiar” with Bruce Power in 2017, compared with 2014 (21% and 15% respectively).

85%

of residents polled continue to support the life extension of the Bruce nuclear facility

# Conclusion

## No reason to consider not renewing Bruce Power's license

Subject to the CNSC's assessment of the technical aspects of Bruce Power's license application, I support renewing the license of Bruce Power:

- Bruce Power's low cost clean power is important to the future of Ontario's economy and achieving the province's climate targets;
- Bruce Power's strong safety culture permeates its entire workforce and is visible in the results of independent industry safety benchmarks; and
- The strong community support Bruce Power enjoys for its operations and continued investments at the site.

March 12, 2018

Office of the Secretariat  
Canadian Nuclear Safety Commission  
280 Slater Street  
Ottawa, Ontario  
K1P 5S9

Re: 2018-H-02, Bruce Power License Renewal

To CNSC Commissioners:

I am the Principal Consultant at Strategic Policy Economics. I have been involved in many of the strategic issues facing Canada's nuclear sector over the last 10 years. These included: options for managing Canada's medical isotope crisis and the world's supply shortage risks; the restructuring of AECL; the role that nuclear plays in Ontario's long-term energy planning; and, the implications hydropower imports could have on interprovincial transmission interties. In addition, I undertook a comprehensive analysis of Canada's nuclear science and technology infrastructure, including the participation of Canada's universities, and the role it plays in helping Canada comply with the International Convention on Nuclear Safety and in stimulating Canada's innovation ecosystem.<sup>1</sup> Lastly, I have led many economic assessments related to Canada's nuclear power generating stations, such as the proposed four-year life extension of the Pickering Nuclear Stations. Currently, I am not performing any work directly for Bruce Power.

I strongly support renewing the operating license for the Bruce Power Nuclear Complex.

My studies have examined the economic impacts of Ontario's electricity supply choices as the province pursues its climate policies<sup>2,3</sup> and established that Ontario's nuclear fleet is a critical element of the province's low carbon, affordable baseload electricity supply mix<sup>4</sup>. In fact, my studies have repeatedly shown that nuclear, in particular refurbished nuclear, is half the cost of identified alternatives and can be expected to keep electricity costs low for Ontario consumers.

The low cost domestically supplied energy is an economic advantage that underpins Ontario's economic competitiveness and enables an energy trade balance that contributes positively to the province's GDP. Within the next 7 years, the Bruce Power reactors will represent 60% of Ontario's nuclear generating capacity and be a significant contributor to the province's future economic prosperity. The province will be challenged to economically prosper without Bruce Power.

Securing the identified economic benefits is dependent upon the safety performance of these nuclear facilities, including the robust regulatory oversight provided by the Canadian Nuclear Safety Commission (CNSC). Bruce Power has established a strong safety track record for its operations. Between 2015 and 2016, Bruce Power received the highest available rating at least once in each of

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<sup>1</sup> <http://cins.ca/docs/Nuclear%20ST%20Innovation.pdf>

<sup>2</sup> [https://strapolec.ca/uploads/Ontarios\\_Emissions\\_and\\_the\\_LTEP\\_-\\_Ph\\_2\\_Report\\_Final\\_December\\_2016.pdf](https://strapolec.ca/uploads/Ontarios_Emissions_and_the_LTEP_-_Ph_2_Report_Final_December_2016.pdf)

<sup>3</sup> [https://strapolec.ca/uploads/Expanding\\_Ontario\\_and\\_Quebec\\_Tx\\_Interties\\_-\\_Final\\_Report\\_June\\_16\\_2016.pdf](https://strapolec.ca/uploads/Expanding_Ontario_and_Quebec_Tx_Interties_-_Final_Report_June_16_2016.pdf)

<sup>4</sup> [https://strapolec.ca/uploads/Impact\\_of\\_Extending\\_PNGS\\_Operations\\_Final\\_Report\\_November\\_16\\_2015.pdf](https://strapolec.ca/uploads/Impact_of_Extending_PNGS_Operations_Final_Report_November_16_2015.pdf)

seven (7) of the CNSC's fifteen (15) safety performance rating categories<sup>5</sup>, the most among Canadian nuclear power plants. In the CNSC 2015 report<sup>6</sup>, the only quantitative safety related measure reported is the Industrial Safety Accident Rate (ISAR). The CNSC report shows two things for the 2011 to 2015 timeframe: (1) Bruce Power realized a lower ISAR than the industry average in Canada; and (2) the Canadian nuclear industry average ISAR is less than half the WANO average.

Based on my personal experience gained through undertaking audits of Bruce Power's operations and time spent at other nuclear facilities in Canada, I can attest to the strong safety culture the company has fostered among its entire workforce. This is a necessary prerequisite for achieving high safety ratings from the CNSC.

Bruce Power's strong safety performance is also reflected in the extensive support the company receives from residents in the communities surrounding its operations. In fact, 85% of these residents support the extension of nuclear operations at Bruce Power.<sup>7</sup> Communities that host Ontario's nuclear facilities support the local nuclear operations.<sup>8</sup>

In conclusion, subject to the CNSC's assessment of the technical aspects of Bruce Power's license application, I see no reasons to not support the renewal of Bruce Power's operating license. I strongly support renewing the operating license for the Bruce Power Nuclear Complex for the following reasons:

- The importance of Bruce Power's low cost clean power to the future of Ontario's economy and achieving the province's climate targets;
- Bruce Power's strong safety culture that permeates its entire workforce and is visible in the results of independent industry safety benchmarks; and
- The strong community support Bruce Power enjoys for its operations and continued investments at the site.

Best regards,



Marc Brouillette  
Principal Consultant  
Strategic Policy Economics

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<sup>5</sup> <http://nuclearsafety.gc.ca/eng/reactors/power-plants/regulatory-oversight-report-npp/2016-NPP-ROR-Executive-Summary.cfm>

<sup>6</sup> CNSC Regulatory Oversight Report for Canadian Nuclear Power Plants: 2015, retrieved from <http://nuclearsafety.gc.ca/eng/reactors/power-plants/regulatory-oversight-report-npp/2016-NPP-ROR-Executive-Summary.cfm>

<sup>7</sup> [http://www.brucepower.com/wp-content/uploads/2018/01/180017B\\_FactSheets\\_SocioEconomicR001.pdf](http://www.brucepower.com/wp-content/uploads/2018/01/180017B_FactSheets_SocioEconomicR001.pdf)

<sup>8</sup> <https://www.clarington.net/en/Modules/News/index.aspx?feedId=ac30fa3f-e893-4e40-ad58-310a0626345f&newsId=ce74789d-afde-44c7-8cea-561d2090556e>