UNDERTAKING J5.5

Undertaking

To provide the source of the Bruce Power data used by Board staff to create the chart in interrogatory L-1-34 and Exhibit K4.2.

Response

In J4.9, OPG stated:

> "Note: Bruce data is as provided by OEB staff in Exhibit K4.2. OPG was unable to validate these numbers. Further, OPG notes that these numbers differ significantly from those presented by Board staff in interrogatory L-1-34."

J4.9 also notes "The source for the Bruce data was not identified".

For ease of reference, the chart in L-1-34 was also provided in Exhibit K4.2. The unit costs OPG referred to that differ for Bruce Power are found on pages 7 and 8 of K4.2.

As noted in L-1-34 and K4.2, all of the data was taken from Bruce Power's Annual Reports. The following attempts to explain the differences.

L-1-34 focused on 2006. For 2006:

- *Page 8 (K4.2):* Involved a comparison of Production Unit Energy Costs (PUEC). Bruce Power refers to this as the "All-in Cost ($/MWh)". This figure was $38/MWh. Bruce Power's "All-in Cost" includes: *Fuel, Operating and Maintenance, Supplemental Rent, and Amortization.* The "All-in-Cost" is actually higher than the four costs identified above divided by their generation output which is $35.95/MWh. This is likely due to the "weighting" issue raised by OPG in making the corrections to their 2006 PUEC figure in A1-T4-S3 (p.17) from a "simple" average (Transcripts, v.4, p.54).

- *Page 7 (K4.2):* It differs for the following reason. Board staff was striving to get as close as possible to an appropriate comparison of OPG to Bruce Power and, thus, focused strictly on the O&M/OM&A line items in the Annual Reports of OPG and Bruce Power. As such, for Bruce Power, the following costs were excluded from the calculation: *Fuel expense, Supplemental Rent, and Amortization*. This is why the unit cost is significantly lower on page 7.

> As was done with Bruce Power, the data for OPG on page 7 of K4.2 focuses solely on the "Operating, Maintenance & Administration" line of $1,967M for 2006 and excludes items such as: *Fuel expense, Taxes, Depreciation, etc.*

Given the discussion above about the "weighting" issue, Board staff cannot be 100% certain what factors drive the Bruce Power "All-in-Cost" to be about $2/MWh higher than the four O&M costs identified in their Annual Report divided by the generation output. Similarly, Board staff are unable to arrive at the Nuclear PUEC reported by OPG in their Annual Reports based on the OM&A costs and output identified in their Annual Reports. As a result, given the rigorous review process that underlies the production of an Annual Report, Board staff relied upon the "All-in-Cost" and "PUEC" figures as published in the Annual Reports by OPG and Bruce Power to prepare the chart on page 8 of K4.2.

Board staff concluded that labour-related and Outage OM&A costs account for a substantial portion of the line items reflected in the Annual Reports used to prepare the chart on Page 7 (K4.2) and L-1-34 for a number of reasons. First, many operating costs, such as depreciation, taxes, nuclear fuel, etc., were already excluded as explained above. In addition, OPG stated in L-14-15 that direct labour costs account for 73% of Base OM&A (and 68% of EUCG members).

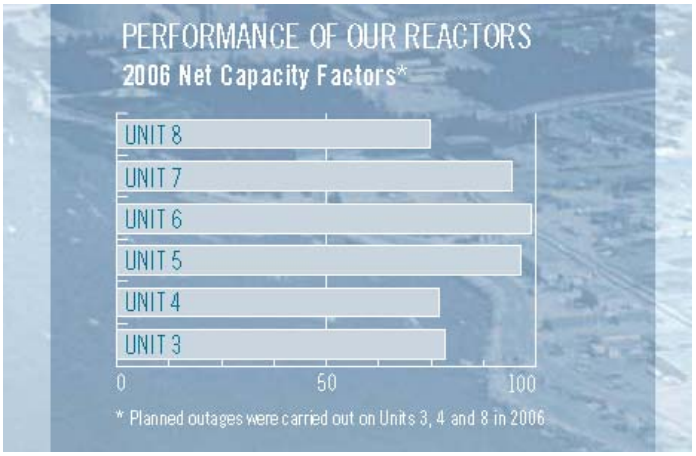
F2-T2-S1 has a further breakdown of OPG's Base OM&A which explains Staff Augmentation accounts for almost another 1% (p.23) and Staff Overtime has recently accounted for a further 5% (p.22). When combined, all labour-related costs account for about 80% of OPG's Base OM&A. Assuming OPG excluded Overtime and Staff Augmentation from the 68% for EUCG members, labour-related costs should similarly account for a significant portion of Base OM&A costs for other nuclear generators including Bruce Power. The remaining 20% also includes the common Outage OM&A costs. One difference between the companies is 100% of Bruce Power's corporate costs (e.g., HR, IT, Finance, etc.) would be included while OPG's prescribed business is allocated a portion (70%), with the remainder (30%) allocated to the unregulated side of OPG's business.

The reason for going back further to 2002 was because, like OPG, Bruce Power has refurbished and restarted a nuclear unit. Bruce A Unit 4 was restarted in 2003 and Bruce A Unit 3 in 2004.

The charts were prepared on a fleet-wide basis for OPG and Bruce Power because Bruce Power's Annual Reports do not provide information such as the "All-in-Cost" or O&M by unit and it would not be appropriate to compare OPG's individual units vs Bruce Power's fleet-wide results; it would not be comparable.

The following from page 6 of Bruce Power's 2006 Annual Report may explain Bruce Power's relatively low unit costs in 2006: *"In 2006, Bruce B was the best-performing multi-unit site in Canada, led by Unit 6 which recorded a capacity factor of 99 per cent,*

making it Canada's top-ranked reactor." The following chart from the same page of that Bruce Power Annual Report also illustrates the significant impact of outages on a unit's Capacity Factor, as OPG has explained in this proceeding.



Attached are the applicable pages from Bruce Power's "2006 YEAR IN REVIEW", with the relevant figures highlighted in yellow. Also highlighted is the Capacity Factor of 88% for 2006 used in the second chart of J4.9 (as taken from K4.2).

Similarly, applicable pages from OPG's 2006 Annual Report are also attached with relevant figures highlighted.

Note: It is uncertain why the PUEC figure of $42.87/MWh for 2006 (from OPG's 2006 Annual Report and reconfirmed in OPG's 2007 Annual Report) differs from both the $48/MWh in A1-T4-S3 (p.17) and the corrected value of $39/MWh (Transcripts, v.4, p. 54), once OPG identified the "weighting" issue. Board staff notes, in OPG's response to L-1-34, OPG stated that the average unit size for Bruce Power is *"around 840 MWs"*. According to Bruce Power (see final attachment), the rated output of their units is as follows:

- Bruce B has 2 units at 795 MW and 2 units at 822 MW
- Bruce A has 2 operating units at 750 MW

(Source: A Reporter's Guide to Bruce Power, Station Profiles).

Bruce Power

GENERATIONS

2006 YEAR IN REVIEW

Combined Financial Highlights

IN MILLIONS OF CANADIAN DOLLARS		QUARTERLY RESULTS				ANNUAL RESULTS	
BALANCE SHEET	QUARTER END:	MAR 31, 2006	JUN 30, 2006	SEP 30, 2006	DEC 31, 2006	DEC 31, 2006	DEC 31, 2005
Cash and Cash Equivalents		$89	$88	$83	$67	$67	$165
Accounts Receivable		180	160	167	221	221	188
Nuclear Fuel Inventory		65	81	87	74	74	47
Materials and Supplies Inventory		107	107	106	109	109	104
Other Assets		2,744	2,930	3,094	3,415	3,415	2,627
Total Assets		**3,185**	**3,366**	**3,537**	**3,886**	**3,886**	**3,131**
Accounts Payable and Accrued Liabilities		(245)	(263)	(319)	(484)	(484)	(367)
Credit Facility		(30)	(30)	0	0	0	0
Term Loan		(226)	(226)	(226)	(226)	(226)	(226)
Other Liabilities		(917)	(919)	(924)	(928)	(928)	(916)
PARTNERS' CAPITAL		**$1,767**	**$1,928**	**$2,068**	**$2,248**	**$2,248**	**$1,622**

STATEMENT OF OPERATIONS	QUARTER END:	MAR 31, 2006	JUN 30, 2006	SEP 30, 2006	DEC 31, 2006	2006	2005
Revenue		$496	$450	$494	$493	$1,933	$1,942
Expenses - Fuel		(20)	(22)	(26)	(27)	(95)	(77)
- Operating and Maintenance		(221)	(226)	(210)	(255)	(912)	(871)
- Supplemental Rent		(42)	(43)	(42)	(43)	(170)	(164)
- Amortization		(31)	(33)	(35)	(35)	(134)	(198)
Profit before Finance Costs		182	126	181	133	622	632
Finance Costs		(17)	(16)	(17)	(18)	(68)	(69)
Profit before Tax*		**$165**	**$110**	**$164**	**$115**	**$554**	**$563**

OPERATING HIGHLIGHTS	QUARTER END:	MAR 31, 2006	JUN 30, 2006	SEP 30, 2006	DEC 31, 2006	2006	2005
Generation (TWh)		9.14	8.70	9.39	9.24	36.47	32.90
Capacity Factor		90%	84%	90%	89%	88%	80%
Realized Selling Price ($/MWh)		$52	$51	$51	$50	$51	$58
All-in Cost ($/MWh)		$36	$39	$35	$41	$38	$42
Cash from Operations		$127	$144	$243	$156	$670	$818
Capital Expenditures (accrual basis)		$177	$213	$213	$344	$947	$528
Contributions*		$125	$211	$141	$210	$687	$185
Distributions*		$145	$160	$165	$145	$615	$400
Staff at period end (FTEs - Full time equivalents)		3,556	3,627	3,588	3,630	3,630	3,543

* excludes capital calls, distributions and loss on disposition related to the reorganization of the partnership during 2005

IN MILLIONS OF CANADIAN DOLLARS	QUARTERLY RESULTS				ANNUAL RESULTS	
BALANCE SHEET QUARTER END:	MAR 31, 2005	JUN 30, 2005	SEP 30, 2005	DEC 31, 2005	DEC 31, 2005	DEC 31, 2004
Cash and Cash Equivalents	$63	$7	$52	$165	$165	$10
Accounts Receivable	161	174	246	188	188	172
Nuclear Fuel Inventory	61	49	43	47	47	62
Materials and Supplies Inventory	108	106	107	104	104	108
Other Assets	2,432	2,490	2,530	2,627	2,627	2,443
Total Assets	**2,825**	**2,826**	**2,978**	**3,131**	**3,131**	**2,795**
Accounts Payable and Accrued Liabilities	(169)	(172)	(192)	(367)	(367)	(218)
Credit Facility	0	(10)	0	0	0	(10)
Term Loan	(226)	(226)	(226)	(226)	(226)	(226)
Other Liabilities	(919)	(917)	(917)	(916)	(916)	(918)
PARTNERS' CAPITAL	**$1,511**	**$1,501**	**$1,643**	**$1,622**	**$1,622**	**$1,423**

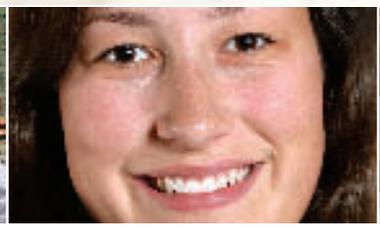
STATEMENT OF OPERATIONS QUARTER END:	MAR 31, 2005	JUN 30, 2005	SEP 30, 2005	DEC 31, 2005	2005	2004
Revenue	$418	$393	$642	$489	$1,942	$1,583
Expenses - Fuel	(19)	(18)	(21)	(19)	(77)	(68)
- Operating and Maintenance	(205)	(228)	(207)	(231)	(871)	(793)
- Supplemental Rent	(41)	(41)	(41)	(41)	(164)	(156)
- Amortization	(48)	(49)	(48)	(53)	(198)	(161)
Profit before Finance Costs	105	57	325	145	632	405
Finance Costs	(18)	(17)	(18)	(17)	(69)	(67)
Profit before Tax*	**$88**	**$40**	**$307**	**$128**	**$563**	**$338**

OPERATING HIGHLIGHTS QUARTER END:	MAR 31, 2004	JUN 30, 2004	SEP 30, 2004	DEC 31, 2004	2004	2003
Generation (TWh)	8.2	7.3	9.1	8.3	32.9	33.6
Capacity Factor	81%	71%	88%	79%	80%	82%
Realized Selling Price ($/MWh)	$50	$53	$70	$57	$58	$47
All-in Cost ($/MWh)	$40	$48	$37	$43	$42	$37
Cash from Operations	$121	$88	$299	$310	$818	$439
Capital Expenditures (accrual basis)	$53	$100	$87	$288	$528	$366
Contributions*	$0	$0	$0	$185	$185	$0
Distributions*	$0	$50	$165	$185	$400	$0
Staff at period end (FTEs - Full time equivalents)	3,607	3,584	3,548	3,543	3,543	3,576

* excludes capital call, distributions and loss on disposition related to the reorganization of the partnership

2006 ANNUAL REPORT

It's All About Performance



ONTARIO POWER GENERATION

Regulated – Nuclear Segment

(millions of dollars)	2006	2005
Revenue net of Market Power Mitigation Agreement rebate	**2,665**	2,447
Fuel expense	**122**	115
Gross margin	**2,543**	2,332
Operations, maintenance and administration	**1,967**	1,804
Depreciation and amortization	**343**	359
Accretion on fixed asset removal and nuclear waste management liabilities	**490**	467
Earnings on nuclear fixed asset removal and nuclear waste management funds	**(371)**	(381)
Property and capital taxes	**44**	30
Income before impairment of long-lived assets	**70**	53
Impairment of long-lived assets	**–**	63
Income (loss) before interest and income taxes	**70**	(10)

Revenue

(millions of dollars)	2006	2005
Regulated generation sales	**2,312**	1,621
Spot market sales, net of hedging instruments	**–**	662
Market Power Mitigation Agreement rebate	**–**	(160)
Variance account	**1**	(1)
Other	**352**	325
Total revenue	**2,665**	2,447

Regulated – Nuclear revenue was $2,665 million for the year ended December 31, 2006 compared to $2,447 million in 2005. The increase in revenue was primarily due to higher electricity generation of 1.9 TWh in 2006 compared to 2005, and higher sales prices related to the introduction of regulated prices effective April 1, 2005.

Electricity Prices

Electricity generation from stations in the Regulated – Nuclear segment have received a fixed price of 4.95¢/kWh since the introduction of rate regulation effective April 1, 2005. For the year ended December 31, 2005, OPG's Regulated – Nuclear sales price was 4.7¢/kWh, after taking into account the regulated price for the last three quarters of 2005, and the spot market sales price, net of the Market Power Mitigation Agreement rebate for the first quarter of 2005.

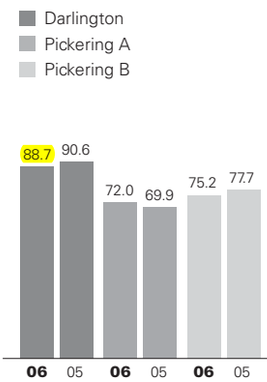
Volume

Electricity generation from stations in the Regulated – Nuclear segment for the year ended December 31, 2006 was 46.9 TWh compared to 45.0 TWh in 2005. The increase in volume was mainly due to the return to service of Unit 1 at the Pickering A nuclear generating station in the fourth quarter of 2005. Also, in the second quarter of 2005, Unit 4 at the Pickering A nuclear generating station was shut down for the duration of the quarter due to the inspection and repair of feeder pipes. Electricity generation from the Darlington and Pickering B nuclear generating stations decreased in 2006 compared to 2005 due to an increase in unplanned outage days.

The Darlington nuclear generating station's unit capability factor for the year ended December 31, 2006 was 88.7 per cent compared to 90.6 per cent in 2005. The decrease was a result of higher unplanned outage days in 2006.

Years Ended December 31

Nuclear Unit Capability Factor
(%)

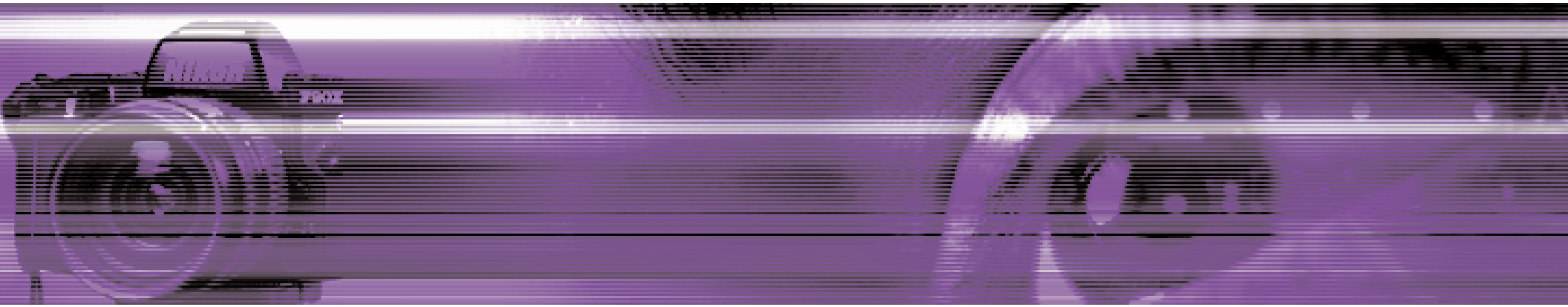


Nuclear PUEC
($/MWh)

The following table provides a summary of revenue, earnings and key generation and financial performance indicators by business segment:

(millions of dollars)	**2006**	2005
Revenue, net of revenue limit and Market Power Mitigation Agreement rebates		
Regulated – Nuclear	**2,665**	2,447
Regulated – Hydroelectric	**685**	792
Unregulated – Hydroelectric	**736**	732
Unregulated – Fossil-Fuelled	**1,313**	1,741
Other	**165**	86
	5,564	5,798
Income (loss) before interest, income taxes and extraordinary item		
Regulated – Nuclear	**70**	(10)
Regulated – Hydroelectric	**264**	375
Unregulated – Hydroelectric	**375**	423
Unregulated – Fossil-Fuelled	**(37)**	(17)
Other	**97**	(16)
	769	755
Electricity Generation (TWh)		
Regulated – Nuclear	**46.9**	45.0
Regulated – Hydroelectric	**18.3**	18.5
Unregulated – Hydroelectric	**15.0**	14.1
Unregulated – Fossil-Fuelled	**25.0**	30.9
Total electricity generation	**105.2**	108.5
Nuclear unit capability factor (per cent)		
Darlington	**88.7**	90.6
Pickering A	**72.0**	69.9
Pickering B	**75.2**	77.7
Equivalent forced outage rate (per cent)		
Regulated – Hydroelectric	**1.5**	1.2
Unregulated – Hydroelectric	**1.9**	1.4
Unregulated – Fossil-Fuelled	**14.1**	15.9
Availability (per cent)		
Regulated – Hydroelectric	**94.2**	92.7
Unregulated – Hydroelectric	**92.4**	92.2
Nuclear PUEC ($/MWh)	**42.87**	40.24
Regulated – Hydroelectric OM&A expense per MWh ($/MWh)	**5.01**	4.23
Unregulated – Hydroelectric OM&A expense per MWh ($/MWh)	**12.63**	10.55
Unregulated – Fossil-Fuelled OM&A expense per MW ($000/MW)	**61.1**	53.0

Bruce Power™



a reporter's guide
to Bruce Power

CS•7755 R004 Aug 07

Filed: 2008-05-06
EB-2007-0905
J5.5
Attachments

Bruce A station profile

Number of Reactors	Four
Net Rated output	Unit 1 – 750 MW* Unit 2 – 750 MW* Unit 3 – 750 MW Unit 4 – 750 MW

* When restarted

Fuel	Natural uranium dioxide (UO_2)
Moderator	Deuterium oxide– heavy water
Coolant	Pressurized heavy water

In Service	Lay-up	Restart dates
Unit 2 – 1977/09/01	1995/10/08	
Unit 1 – 1977/01/14	1997/10/16	
Unit 3 – 1978/02/01	1998/04/01	2004/01/08
Unit 4 – 1979/01/18	1998/03/16	2003/10/07

Building and structures

Reactor building

Material	Reinforced concrete
Width	92 ft (28.04 m)
Length	104 ft (31.7 m)
Height	162.5 ft (49.53 m)

Reactor vault

Length	104 ft (31.7 m)
Height	46.5 ft (14.18 m)
Width	92 ft (28.04 m)
Wall thickness	6 ft (1.83 m)

Reactor auxiliary bay

Length of bay	1,426 ft (434.7 m)
Width	150 ft (45.7 m)
Height	48 ft (14.6 m)

Powerhouse

Turbine hall

Length	1,460 ft (445 m)
Width	180 ft (54.86 m)
Height	180 ft (54.86 m)

Vacuum building

Inside diameter	160 ft 6 in (49 m)
Inside height	149 ft (45.4 m)
Wall thickness	3 ft 9 in (1.14 m)
Water storage	2.2 million gallons (10,000 m^3)

Reactor vessels

Calandria

Material	Austenitic stainless steel
Main shell inside diameter	27 ft 9 in (8.46 m)
Main shell thickness	1.25 in (3.17 cm)
Total length	19 ft 6 in (5.95 m)

Calandria tubes

Quantity	480
Material	Zircaloy – 2 seam welded
Inside diameter	5.077 in (12.9 cm)
Wall thickness	0.054 in (0.137 cm)

Reactor

Number of fuel channels	480
Number of fuel bundles	6,240

The Bruce A turbine hall.

Fuel facts

Type	37-element bundles
Length	19.5 in (49.5 cm)
Number per channel	13
Total weight of bundle	52.1 lb (23.65 kg)

Turbine generator

Turbine	One turbine set per reactor
Number of high-pressure cylinders	1
Number of low-pressure cylinders	3
Speed	1,800 rpm
Generator	One per turbine 18,500 volts

Filed: 2008-05-06
EB-2007-0905
J5.5
Attachments

Bruce B station profile

Number of Reactors	Four
Net Rated output*	Unit 5 795 MW Unit 6 822 MW Unit 7 822 MW Unit 8 795 MW
Fuel	Natural uranium dioxide (UO_2) ** New Fuel
Moderator	Deuterium oxide – heavy water
Coolant	Pressurized heavy water
Construction schedule	Start of construction late 1977 In-service dates: · Unit 6 – 1984/06/26 · Unit 5 – 1985/03/01 · Unit 7 – 1986/02/22 · Unit 8 – 1987/05/22

Building and structures

Reactor building

Material	Reinforced concrete
Width	92 ft (28.04 m)
Length	104 ft (31.7 m)
Height	162.5 ft (49.53 m)

Reactor vault

Length	104 ft (31.7 m)
Height	46.5 ft (14.18 m)
Width	92 ft (28.04 m)
Wall thickness	6 ft (1.83 m)

Reactor auxiliary bay

Length of bay	1426 ft (434.7 m)
Width	150 ft (45.7 m)
Height	48 ft (14.6 m)

Powerhouse

Turbine hall

Length	1460 ft (445 m)
Width	180 ft (54.86 m)
Height	134 ft (40.8 m)

Vacuum building

Inside diameter	160 ft 6 in (49 m)
Inside height	149 ft (45.4 m)
Wall thickness	3 ft 9 in (1.14 m)
Water storage	2.2 million gallons (10,000 m^3)

Reactor vessels

Calandria

Material	Austenitic stainless steel
Main shell inside diameter	27 ft 9 in (8.46 m)
Main shell thickness	1.25 in (3.17 cm)
Total length	19 ft 6 in (5.95 m)

Calandria tubes

Quantity	480
Material	Zircaloy – 2 seam welded
Inside diameter	5.077 in (12.9 cm)
Wall thickness	0.054 in (0.137 cm)

Reactor physics

Number of fuel channels	480
Number of fuel bundles	6,240

Fuel facts

Type	37 element bundles
Length	19.5 in (49.5 cm)
Number per channel	13
Total weight of bundle	52.1 lb (23.65 kg)

Turbine generator

Turbine	One turbine set per reactor
Number of high-pressure cylinders	1
Number of low-pressure cylinders	3
Speed	1,800 rpm

Steam lines in the Bruce B turbine hall.

Generator	One per turbine 24,000 volts

* Output on the Bruce B units varies due to ongoing efforts to improve output through fuelling changes and new turbine rotors.

** In an effort to enhance safety and reliability of its Bruce B reactors, Bruce Power has loaded six New Fuel bundles on Unit 7 which will remain in the reactor for approximately a year to test the fuel bundle design. New Fuel consists of a newly designed fuel bundle containing a neutron absorber and slightly enriched uranium.