SCOTTMADDEN PHASE 1 NUCLEAR BENCHMARKING REPORT

1.0 INTRODUCTION

In 2009, OPG undertook a major new nuclear benchmarking initiative in conjunction with the development of its 2010-2014 nuclear business plan. This initiative was undertaken by OPG Nuclear, with the assistance of ScottMadden Inc. ("ScottMadden"), a general management consulting firm specializing in the provision of benchmarking and business planning consulting services to nuclear utilities.

Given the importance of this initiative, OPG sought to have incorporated into the reports the best comparative data available. As a result, the ScottMadden Phase 1 and Phase 2 reports rely extensively upon data extracted from leading industry association databases.

Data provided by the World Association of Nuclear Operators (WANO) was the primary source of benchmarking data for operational performance indicators. For financial performance comparisons, data was compiled from the database of the Electric Utility Cost Group (EUCG). Data was also obtained from the Canadian Electricity Association (CEA) for the all-injury rate metric and from a workgroup of the Institute for Nuclear Power Operations (INPO) for maintenance backlog comparisons. OPG, as a member of these industry associations, is bound by the confidentiality provisions that these associations have with respect to the use of their data.

OPG sought and obtained permission to file EUCG, WANO, and INPO comparisons on the condition that it not identify any company names, other than OPG, associated with the data. With the agreement of ScottMadden, OPG produced the report filed at Ex. F5-T1-S1 with company names from EUCG, WANO, and INPO removed from the charts and graphs showing OPG's relative performance. For EUCG charts, markings indicating CANDU reactors have also been removed as they would allow identification of Bruce Power data, by inference. The CEA also requires that OPG not disclose the first quartile performance for the all-injury metric and this has been removed from the report filed at Ex. F5-T1-S1.

The report is marked "Confidential" because when it was originally produced it included confidential information. The report as filed, with the names of the companies associated with the comparative data removed, is no longer confidential.

SCOTTMADDEN
Management Consultants

July 2, 2009

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Reference: **OPG Nuclear 2009 Benchmarking Report**

Dear Sirs:

By means of this transmittal letter, we are submitting to Ontario Power Generation (OPG) the final version of the *OPG Nuclear 2009 Benchmarking Report*. This report presents a comparison of OPG Nuclear's financial and non-financial performance to that of nuclear industry peer groups both in Canada and the Unites States. The report was prepared as part of OPG's commitment to "performance informed" business management and responds to the Ontario Energy Board's desire for a clear and consistent approach to industry benchmarking.

In preparing this report ScottMadden personnel, assisted by OPG, (a) identified the key performance metrics which would be benchmarked, (b) identified the most appropriate peer groups for comparison, and (c) prepared supporting analyses, charts and the report document. OPG personnel supplied the OPG data used for comparison and provided insight regarding key factors believed to contribute to specific performance gaps.

Effective benchmarking requires the selection of appropriate performance indicators and appropriate peer groups. A total of 19 performance indicators were chosen for comparison. They cover three of the four OPG cornerstone value areas (safety, reliability and value for money)[1]. Each performance indicator is a standard nuclear industry metric, with standard definitions and comparable year-over-year data. In

[1] Robust, consistent benchmark metrics are currently not available for OPG's cornerstone value of human performance.

preparing this report, we used five different peer groups which varied depending upon the performance indicator in question. The data for these peer groups was provided by recognized industry sources[2] and represent comparative data that have stood the test of time within the industry.

In our opinion, the comparisons provided in this report present a fair and balanced view of OPG operating and financial performance compared to other operators in the nuclear generation industry. However, it would be inappropriate to generalize regarding OPG's absolute performance based solely upon comparisons to industry averages. Differences in design technology, the number of reactors on site, the geographic size of the site, reactor age, operational condition and other factors all influence OPG's operational and financial performance. Benchmark data can be useful for highlighting performance gaps relative to other nuclear generation operators but prescriptive conclusions regarding OPG's ability to narrow such performance gaps will require further analysis.

Finally, it was our intent in developing this report to foster OPG's internal ability to undertake comprehensive performance benchmarking on a recurring basis. Accordingly, we worked with OPG personnel to prepare a formal OPG Nuclear "Benchmarking Report Procedure" and trained OPG personnel in how to access data and compile the report in the future. This procedure, and the accompanying training, should allow OPG to update the *Nuclear Benchmarking Report* on an annual basis as part of its revised business planning process.

Yours very truly,

John H. Sequeira, Ph.D.
Partner

[2] Data sources included the World Association of Nuclear Operators (WANO), the CANDU Owners Group (COG), the Canadian Electricity Association (CEA) and the Electric Utility Cost Group (EUCG).

July 2, 2009

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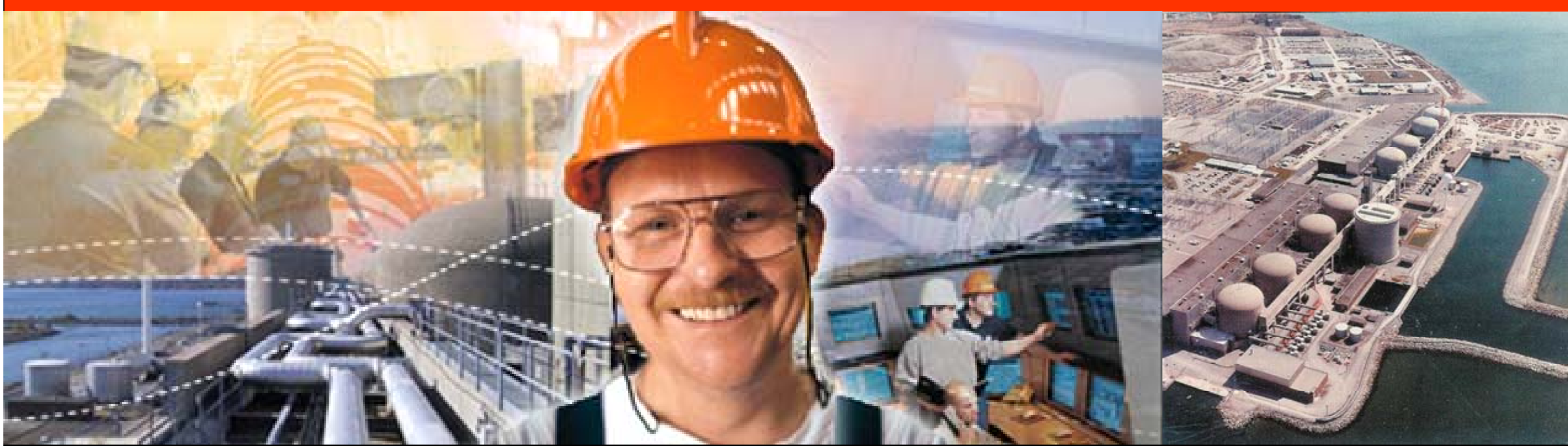
OPG Nuclear

2009 Benchmarking Report



ONTARIO POWER GENERATION

SCOTTMADDEN
Management Consultants

1.0 EXECUTIVE SUMMARY

Background

This report presents a comparison of Ontario Power Generation (OPG) Nuclear's financial and non-financial performance to that of nuclear industry peer groups both in Canada and the United States. The report was prepared as part of OPG's commitment to "performance informed" business management and to the requests of the Ontario Energy Board for a clear and consistent approach to industry benchmarking. The results of this report will be used during the 2010-2014 business planning cycle to help drive a "gap-based" approach to business improvement.

ScottMadden, Inc. (ScottMadden) is an external consulting company with recognized leadership in nuclear business planning and benchmarking. ScottMadden personnel worked side-by-side with OPG personnel during the period March 24 through May 22, 2009 to prepare this report. ScottMadden, assisted by OPG, (a) identified key performance metrics which would be benchmarked, (b) identified the most appropriate peer groups for comparison, and (c) prepared supporting analyses, charts and the final report. OPG personnel responsible for the designated performance metrics assisted the effort by supplying the OPG data used for benchmarking and providing insight into the factors contributing to current operational performance so that gap analysis could be performed.

In addition to this report, ScottMadden worked with OPG personnel to develop a *Benchmarking Report Procedure* which will be incorporated into OPG's standard business planning procedures. This procedure will enable OPG to prepare annual updates to this report. OPG personnel will be trained in this procedure and will independently update the benchmarking effort on an ongoing basis.

Industry Peer Groups

Effective comparison of performance requires both the selection of appropriate performance indicators and the selection of appropriate peer groups for comparison. ScottMadden recommended that OPG use different peer groups depending upon the performance measure to be compared. ScottMadden also recommended that OPG utilize standard data sources that have stood the test of time and are widely utilized within the nuclear industry. In all, five different peer groups were used as illustrated in Table 1.

Table 1: Benchmarking Indicators

	All COG CANDUs (WANO)	All North American PWR and PHWRs (WANO)	INPO AP928 Workgroup	CEA Tier 1	All Plants in EUCG
Safety					
All Injury Rate				X	
2-Year Industrial Safety Accident Rate*		X			
Fuel Reliability*	X	X			
2-Year Reactor Trip Rate*	X	X			
3-Year Auxiliary Feedwater System Unavailability*	X	X			
3-Year Emergency AC Power Unavailability*	X	X			
3-Year High Pressure Safety Injection Unavailability*	X	X			
2-Year Collective Radiation Exposure*	X	X			
Airborne Tritium Emissions per Unit	X				
Reliability					
WANO NPI	X	X			
2-Year Forced Loss Rate*	X	X			
2-Year Unit Capability Factor*	X	X			
2-Year Chemistry Performance Indicator*	X	X			
1-Year On-line Elective Maintenance Backlog (OEMB)			X		
1-Year On-line Corrective Maintenance Backlog (OCMB)			X		
Value for Money					
3-Year Total Generating Costs / MWh					X
3-Year Non-Fuel Operating Costs (OM&A) / MWh					X
3-Year Fuel Costs (OM&A) / MWh					X
3-Year Capital Costs / MW DER					X

* Subindicator of WANO NPI

Data provided by the World Association of Nuclear Operators (WANO, see Section 6.0, Table 10 for membership) was the primary source of benchmarking data for operational performance indicators. Three peer groups were established using WANO data: (a) CANDU Owners Group (COG) CANDUs (Section 6.0, Table 12), (b) All North American Pressurized Water Reactors (PWRs) and Pressurized Heavy Water Reactors (PHWRs) which includes CANDU plants as PHWRs, and (c) All North American plants which includes all those above plus Boiling Water Reactors (BWRs). Some WANO performance indicators are measured at the unit level while others are measured at the plant level.

For a few of the specialized operating metrics different peer groups were used since WANO data is not available for these metrics. For comparing maintenance backlog, ScottMadden recommended using a peer group consisting of all plants participating in the INPO AP928 workgroup (participants are listed within the review of the metrics, Section 3.0). For injury rate comparison, ScottMadden recommended using data available from the Canadian Electricity Association (CEA) with the members listed in Section 6.0, Table 13.

For financial performance comparisons, ScottMadden recommended using data compiled by the Electric Utility Cost Group (EUCG). EUCG is a nuclear industry operating group covering 69 nuclear plants (Section 6.0, Table 11), of which 63 provided 2008 data in time for the production of this report. EUCG cost indicators are available at the plant level only and were compared on a net MWh generated basis (will be referred to as just MWh for the remainder of the document) and a per MW design electrical rating (DER) basis.

The only CANDU operators reporting EUCG data (available as of March 2009) were OPG and Bruce Power. ScottMadden does not consider this to be a sufficiently large panel to provide a basis for comparison. Should more CANDU operators choose to join EUCG in the future, comparisons to this panel should be reconsidered. Specific one-on-one comparisons to Bruce Power are still useful and may be undertaken as appropriate during the development of business planning targets.

Performance Indicators

Good benchmarked performance indicators are defined by ScottMadden as metrics with standard definitions, reliable data sources, and utilization across a good portion of the industry. Good indicators allow for benchmarking to be repeated year after year in order to track performance and improvement. Additionally, when selecting an appropriate and relevant set of metrics, ScottMadden believes in a balanced approach with metrics covering all key areas of the business, as possible.

ScottMadden recommended the comparison of 19 key performance indicators to provide a balanced view of performance and for which consistent, comparable data is available. These indicators are listed in Table 1. In this report, they are divided into three categories which align with three of OPG's four cornerstone values. OPG's four cornerstone values are safety, human performance, reliability, and value for money. The three cornerstone areas included in the report are safety, reliability, and value for money.

Robust, consistent benchmark metrics are currently not available for OPG's cornerstone value of human performance. Internal metrics for this cornerstone value will continue to be used by OPG but cannot be compared to reliable industry standards at this time. Additionally, the effects of good or poor human performance manifest within many of the safety and reliability cornerstone metrics. Results in areas like 2-Year Industrial Safety Accident Rate, 2-Year Forced Loss Rate and 2-Year Unit Capability Factor can be directly impacted by human performance events.

Report Structure

The report is structured to first focus on the three cornerstone value areas, with detailed comparisons at the plant, and where applicable, unit level (Sections 2.0-4.0). Within each section, each of the metrics and corresponding peer groups have a specific format. First, each indicator is displayed graphically from best to worst (in bar chart format) for the most recent year for which data is available; in this case 2008. Next, the historical trend is graphed (in line chart format) using data for the last three to five years (depending upon availability and metric). Each graph also includes median and best quartile results, and for some WANO operating metrics, the graph also shows the values required to achieve full WANO NPI points. Following the graphical representation of performance are observations regarding the data as well as insights into the key factors driving performance at OPG.

The last section of the report is designed to provide an operator level summary across a few high-level metrics (Section 5.0). The operator level analysis looks at fleet operators across North America, utilizing a simple average of the results (mean) from each of their units/plants. WANO (operations related) results are averaged at the unit level and EUCG (cost related) results are averaged at the plant level. Included are a few key operational metrics and total generating costs.

Section 6.0 provides an appendix of supporting information, including common acronyms, definitions and panel composition details. Zero values are excluded from all calculations except where zero is a valid result. Missing data was imputed by averaging the prior and subsequent year if possible. If this was not possible, the average of the two most recent years was used.

Benchmarking Results – Plant Level Summary

Table 2 provides a summary of OPG's performance compared to the benchmark panel. For the WANO metrics with two panels (i.e. all COG CANDU; all North American PWR and PHWR), the all COG CANDU panel was used. Calculations in the table are at the plant level.

For reference, green shaded boxes indicate that performance is above best quartile or maximum NPI points are achieved if applicable, white shaded boxes indicate between best quartile and median, yellow shaded boxes indicate that performance is between median and the worst quartile, and red shaded boxes indicate that performance is within the worst quartile. Each metric represented here is analyzed in this report.

Table 2: Plant Level Performance Summary

Metric	Best Quartile*	Median*	Pickering A	Pickering B	Darlington
Safety					
All Injury Rate			0.73 ⇧	0.96 ⇧	1.04 ⇧
2-Year Industrial Safety Accident Rate	0.05	0.09	0.14 ⇩	0.07 ⇧	0.04 ⇧
2-Year Collective Radiation Exposure (man-rem per unit)	62.15	81.84	44.2 ⇧	95.81 ⇧	72.83 ⇧
Airborne Tritium (TBq) Emissions per Unit	48.0	101.0	101.0 ⇧	50.7 ⇧	40.0 ⇩
Fuel Reliability (microcuries per gram)	0.000001	0.000165	0.00059 ⇧	0.00159 ⇩	0.00025 ⇧
2-Year Reactor Trip Rate (# per 7,000 hrs)	0.00	0.33	1.22 ⇩	0.26 ⇔	0.00 ⇔
3-Year Auxiliary Feedwater System Unavailability	0.0014	0.0020	0.0119 ⇧	0.0040 ⇧	0.0017 ⇧
3-Year Emergency AC Power Unavailability	0.0024	0.0076	0.0081 ⇩	0.0091 ⇧	0.0020 ⇔
3-Year High Pressure Safety Injection Unavailability	0.0001	0.0037	0.0012 ⇧	0.0001 ⇧	0.0001 ⇧
Reliability					
WANO NPI (Index)	96.19	62.46	60.84 ⇧	60.93 ⇔	95.67 ⇔
2-Year Forced Loss Rate (%)	0.68	3.79	37.90 ⇩	18.19 ⇩	0.93 ⇧
2-Year Unit Capability Factor (%)	90.97	84.31	56.6 ⇩	73.17 ⇔	91.99 ⇔
2-Year Chemistry Performance Indicator (Index)	1.00	1.01	1.13 ⇧	1.25 ⇩	1.00 ⇔
1-Year Online Elective Maintenance (work orders/unit)	218	278	425 ⇧	695 ⇧	311 ⇧
1-Year Online Corrective Maintenance (work orders/unit)	4	7	14 ⇧	28 ⇧	11 ⇧
Value for Money					
3-Year Total Generating Costs per MWh ($/Net MWh)	28.66	32.31	92.27 ⇧	58.68 ⇔	30.08 ⇔
3-Year Non-Fuel Operating Costs per MWh ($/Net MWh)	18.06	21.28	82.62 ⇧	50.95 ⇔	25.10 ⇔
3-Year Fuel Costs per MWh ($/Net MWh)	5.02	5.37	2.64 ⇔	2.68 ⇔	2.62 ⇔
3-Year Capital Costs per MW DER	32.79	46.22	32.07 ⇩	32.44 ⇧	18.79 ⇔

*Panel used for WANO quartile and median data was All COG CANDU

⇧ = overall upward trend during reporting period

⇩ = overall declining trend during reporting period

⇔ = consistent performance during the reporting period

Green = best quartile performance/max NPI points achieved if applicable
White = 2nd quartile performance
Yellow = 3rd quartile performance
Red = lowest quartile performance

Benchmarking Results – Operator Summary

Operator level summary results for a specific metric are the average (mean) of the results across all plants managed by the given nuclear operator, providing a comprehensive overview of a nuclear operator's financial and operating performance. While the operator level summary results presented in Section 5.0 include a calculation for Unit Capability Factor (UCF) as well as WANO Nuclear Performance Index (WANO NPI) and Total Generating Costs per MWh, this executive summary only addresses WANO NPI and Total Generating Costs per MWh. This is because UCF is a subcomponent of WANO NPI. Full details of the operator summary results can be found in Section 5.0.

i) WANO Nuclear Performance Index (NPI): WANO NPI is designed to provide a comprehensive overview of a nuclear operator's overall operating performance. OPG's results for this indicator (at the operator level) are highlighted in Table 3 below. Rankings were calculated using the average (mean) results for the units in operation during the given year. The WANO data set is comprised of 20 major operators. A listing of the operators and plants can be found in the appendix (Table 10). The results are not weighted averages in any way.

OPG's WANO NPI ranking is low in comparison to other operators within the group. OPG ranked 17 out of a list of 20 fleet operators. Low unit capability factor (UCF) and high forced loss rate (FLR) are the primary contributors to this relative ranking.

Table 3: Average WANO NPI Rankings

	2006	2007	2008
	9	8	1
	4	5	2
	2	1	3
	7	3	4
	19	17	5
	12	13	6
	5	9	7
	3	4	8
	6	10	9
	11	6	10
	8	11	11
	10	7	12
	1	2	13
	13	12	14
	14	14	15
	15	15	16
OPG	17	16	17
	20	19	18
	16	20	19
	18	18	20

It should be pointed out that operator level data masks the wide disparity in plant performance found at OPG. Darlington consistently performed better than Pickering A and Pickering B, typically by a wide margin, for key operating indicators. The plant level detail contained in Section 2.0 and Section 3.0 provides a more detailed look into these differences. Clearly the challenges faced by each of the OPG stations are not consistent.

Additionally, the WANO NPI results of all CANDU operators are concentrated at the bottom of the peer group for the period 2006-2008.

ii) Total Generating Cost per MWh: Total Generating Cost per MWh is the highest indicator of an operator's overall financial performance. This metric is the sum of non-fuel operating costs per MWh, fuel costs per MWh, and capital costs per MWh, and represents the "all in" cost of producing each MWh of power.

The EUCG data set is comprised of 16 major operators. A listing of the operators and plants can be found in the appendix (Table 11). OPG's standing among these 16 North American fleet operators is highlighted in Table 4 below.

Table 4: Three-Year Total Generating Costs per MWh Rankings

	2005	2006	2007	2008
	2	1	3	1
	6	3	2	2
	1	9	9	3
	3	5	4	4
	10	14	10	5
	14	7	8	6
	4	6	5	7
	7	4	1	8
	9	11	6	9
	8	2	12	10
	13	8	11	11
	11	10	7	12
	12	12	15	13
	5	13	14	14
	15	15	13	15
OPG	16	16	16	16

It should be noted that OPG's financial performance is reported on a "per MWh" basis and is influenced by low capability factors at both Pickering A and Pickering B.

Consistent with the WANO NPI, the operator level data masks the wide disparity in plant performance found at OPG. Darlington consistently performed better than Pickering A and Pickering B, typically by a wide margin, for key cost indicators.

Section 4.0, Value for Money, of this report examines the components of Total Generating Cost that contribute to the above observations.

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2.0 SAFETY

Methodology and Sources of Data

The majority of safety metrics were calculated using the data from the WANO website. Any data labeled as invalid by WANO was ignored and excluded from all calculations. Indicator values of zero are not plotted or included in calculations except in cases where zero is a valid result. Complete data for the period 2001-2008 was obtained and averages are as provided by WANO.

The all-injury rate was calculated using data from the Canadian Electricity Association (CEA). Median information and individual company information was not available for this metric, therefore only trend and best quartile information is presented. The peer group for this metric is limited to members of CEA (Section 6.0, Table 13).

Airborne Tritium Exposure per Unit data was collected from COG. Data from 2003 to 2007 was collected. The peer group for this metric is all CANDUs which are members of COG (Section 6.0, Table 12).

Discussion

Nine metrics are included in this benchmarking report to reflect safety performance, including seven of the ten metrics which comprise the WANO NPI index: industrial safety accident rate, fuel reliability, unplanned automatic reactor trips, auxiliary feedwater safety system, emergency AC power safety system, high pressure safety injection and collective radiation exposure. The remaining WANO NPI metrics are included in the Reliability section. Additionally, the safety metrics include the CEA all-injury rate and airborne tritium emissions per unit.

Overall, OPG's performance in the WANO NPI safety metrics is strong, achieving full NPI points for many of the metrics. However, collective radiation exposure (CRE) performance is mixed among OPG plants.

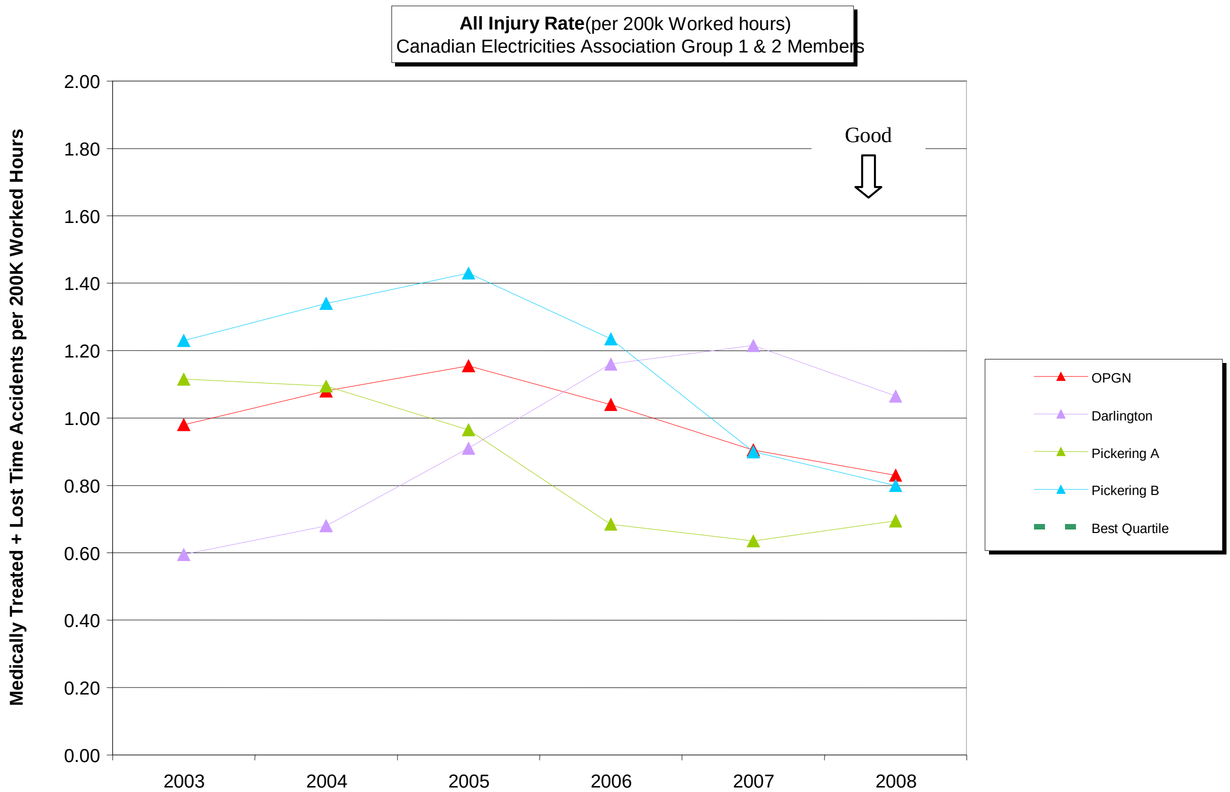
Key drivers for OPG performance for CRE are outage duration and scope, plant design, radiation source term and use of technology to reduce radiation source term, and human performance. Darlington has historically performed near the median but fell below median in 2007 primarily due to two planned outages and three forced outages. It is anticipated that Darlington can achieve best quartile against the CANDU panel, but significant work would be required to achieve best quartile among North American plants.

Pickering A's performance is expected to drop below median as a result of a change in exposure reporting. Until 2007, Pickering A's CRE performance was reported on a four-unit basis, although P2 and P3 were in safe storage. Beginning in 2008, Pickering A is be reported on a two unit basis. In addition, Pickering A's performance is negatively impacted by plant age, high radiation source term, and outage work and scope.

Pickering B's performance is below median. This performance is attributed to extensive planned outages in 2007 and 2008, a forced outage in 2007, and high radiation source term. Future performance of Pickering B will be determined by decisions on scope of continued operations maintenance activities.

Relative to the non WANO NPI safety metrics, OPG's performance for the all-injury rate is strong, performing in the best quartile since 2003. Performance in the airborne tritium emissions per unit has also been fairly strong, with Darlington performing in the best quartile and Pickering B finishing one position outside of the best quartile. Pickering A is performing worse than median by one position.

All-Injury Rate



Observations – All-Injury Rate

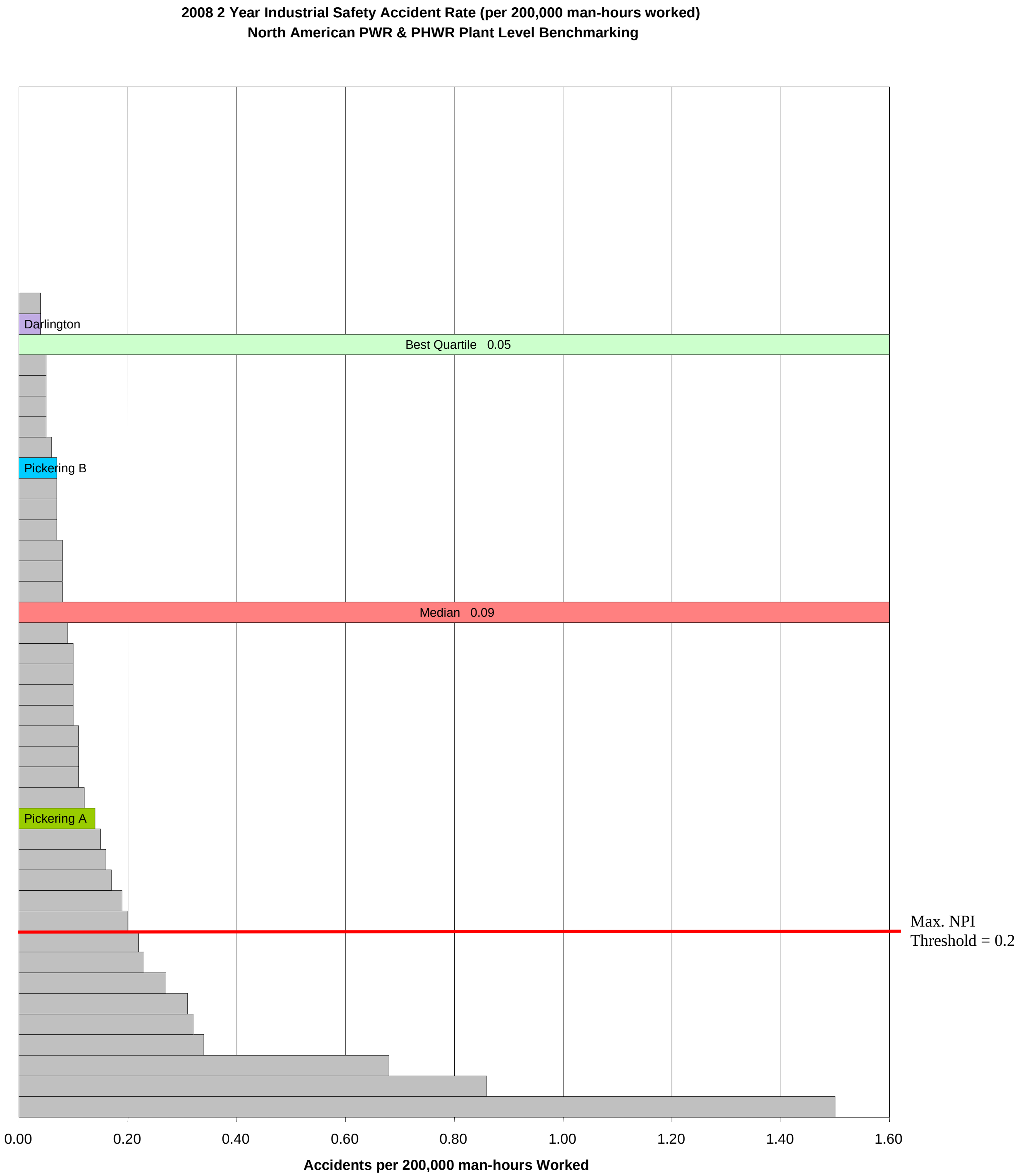
Trend

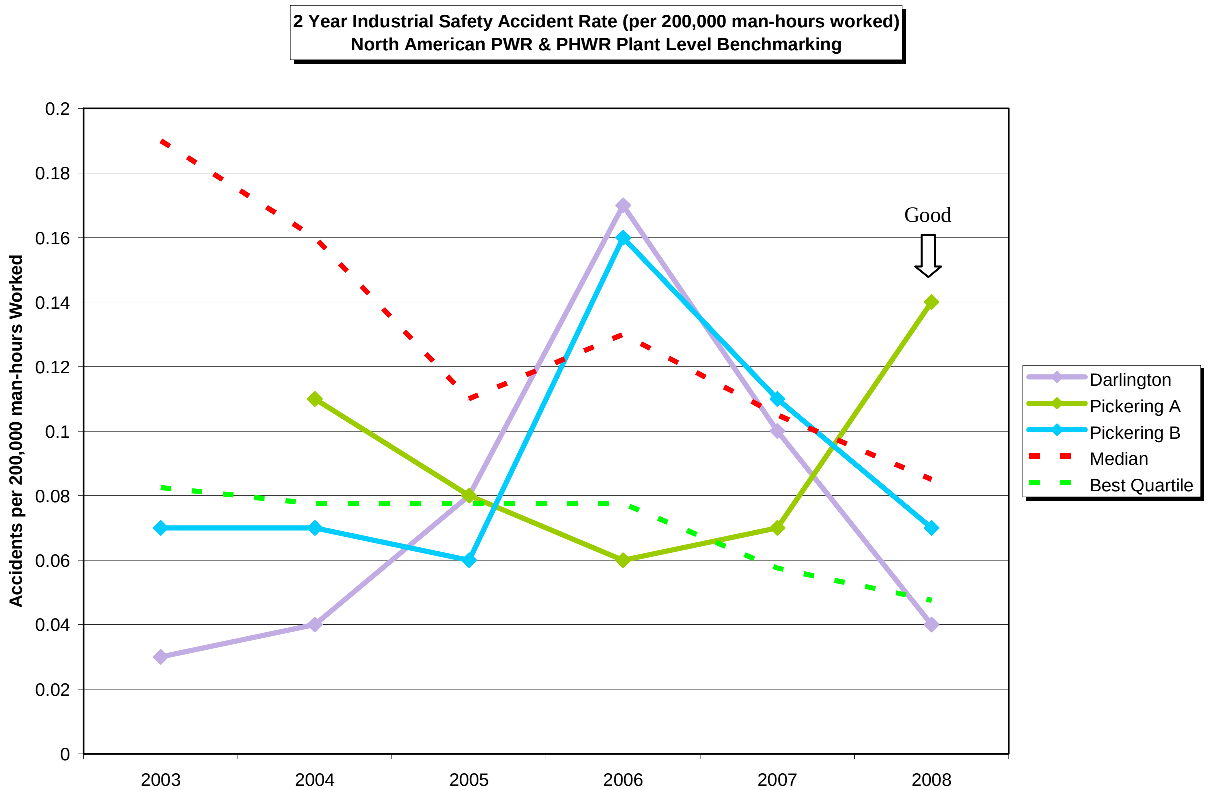
- All OPG plants are above best quartile in terms of all-injury rate and have been since 2003
- OPG has shown improvement in the number of medically treated and lost time accidents since 2004
- Darlington experienced increasing injuries from 2003-2006, but has steadily improved since 2006

Factors Contributing to Performance

- Providing more rapid medical services on-site and with preferred service providers in the community, as other Canadian Electricity Association (CEA) member utilities have done, would reduce the number of lost time accidents and help to maintain best quartile performance
- Targeted programs and initiatives addressing common injuries, such as musculoskeletal disorders, reduce the frequency of these type of injuries and lost time
- OPG has a very robust reporting culture for all injuries, including minor, repetitive, and chronic injuries that exceed other utilities in the benchmarking panel
- This metric is more integrated than the Industrial Safety Accident Rate (ISAR) and includes transmission and distribution personnel

2-Year Industrial Safety Accident Rate




2 Year Industrial Safety Accident Rate (per 200,000 man-hours worked)
North American PWR & PHWR Plant Level Benchmarking
Accidents per 200,000 man-hours Worked
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
2003
2004
2005
2006
2007
2008
Good
Darlington
Pickering A
Pickering B
Median
Best Quartile

Observations – 2-Year Industrial Safety Accident Rate

- The performance of OPG's units has been shown relative to best quartile, median, and the threshold established by WANO to achieve full WANO NPI points. Since achievement of full WANO NPI points is recognized within the industry as a measure of desirable performance, performance gaps are assessed against full WANO NPI points in addition to median and best quartile

2008 (2-Year Rolling Average)
- Best quartile for 2008 was 0.05
- Darlington ISAR performance is in the best quartile for 2008 at .04
- Pickering A is below the median of 0.09 for 2008
- Pickering B is above median of 0.09 for 2008

Trend
- Darlington fell to below best quartile in 2005 and continued sliding in 2006, but returned to best quartile in 2008
- Pickering A performance remained close to best quartile for 2004-2007, but declined in 2008
- Pickering B performance was within best quartile for 2003-2005, declining in 2006, but returning to better than the median in 2008

Factors Contributing to Performance

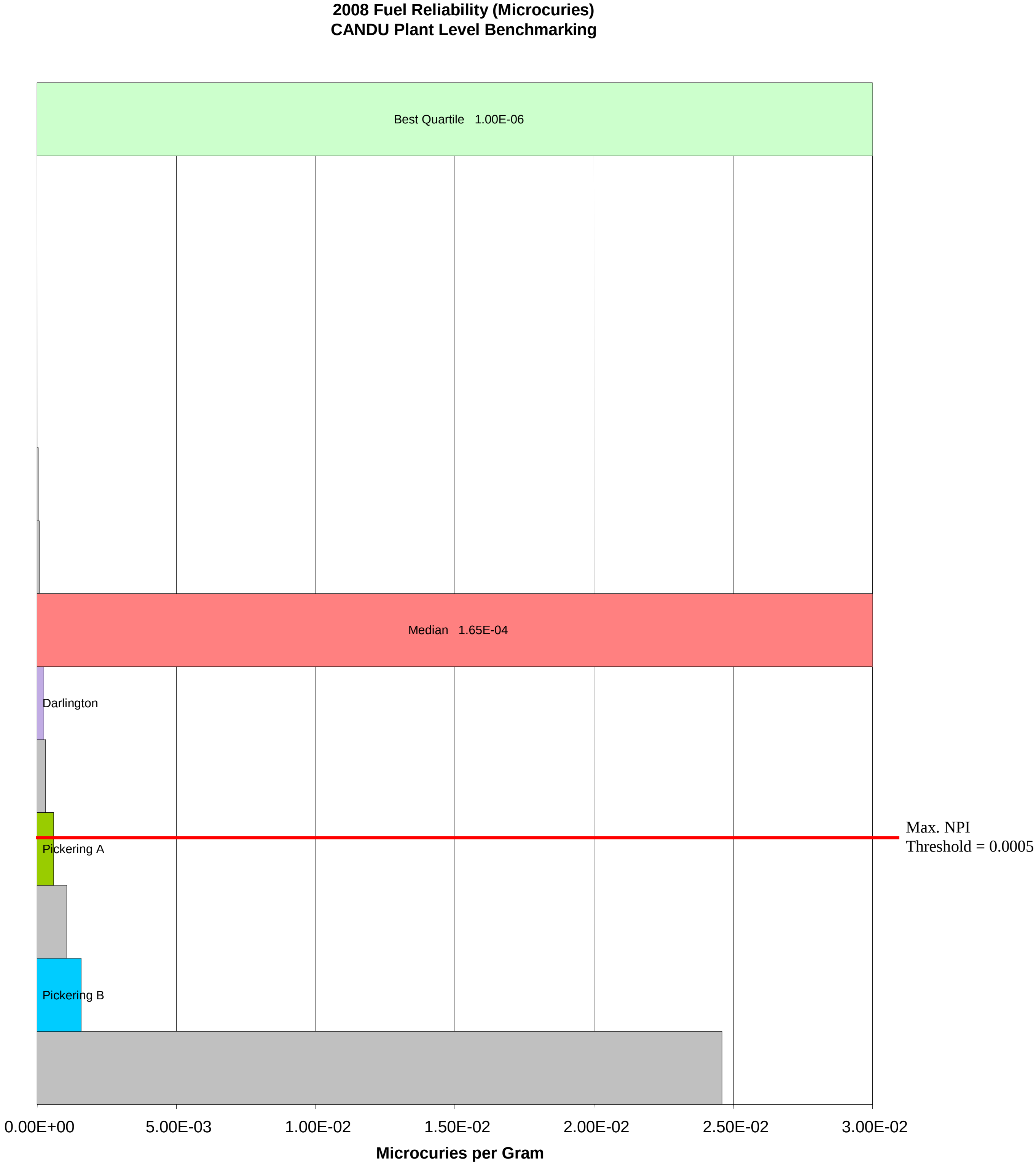
- Greater focus on lost time accident prevention through targeted initiatives on sources of lost time accidents, such as musculoskeletal injury prevention, will improve OPG performance
- Reviewing hazard control programs of other utilities in the benchmarking panel for possible implementation at OPG may be beneficial and lead to reduced injuries
- ISAR is a measure of "permanent utility personnel" and does not include contractors. Many of the utilities in the benchmarking panel utilize contractors to a greater extent than OPG for higher risk work activities (e.g. outages)

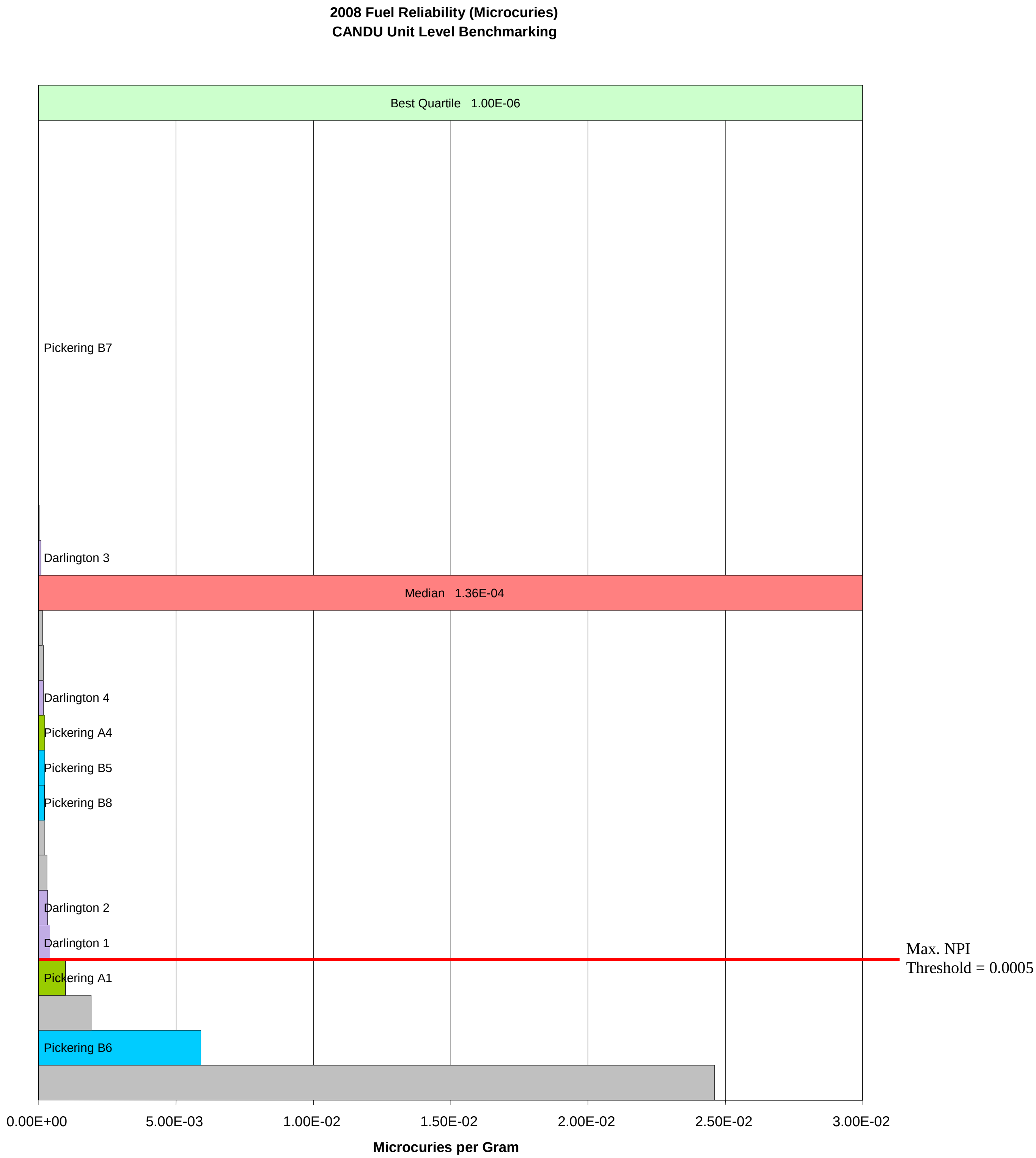
Darlington
- Darlington has no performance gap

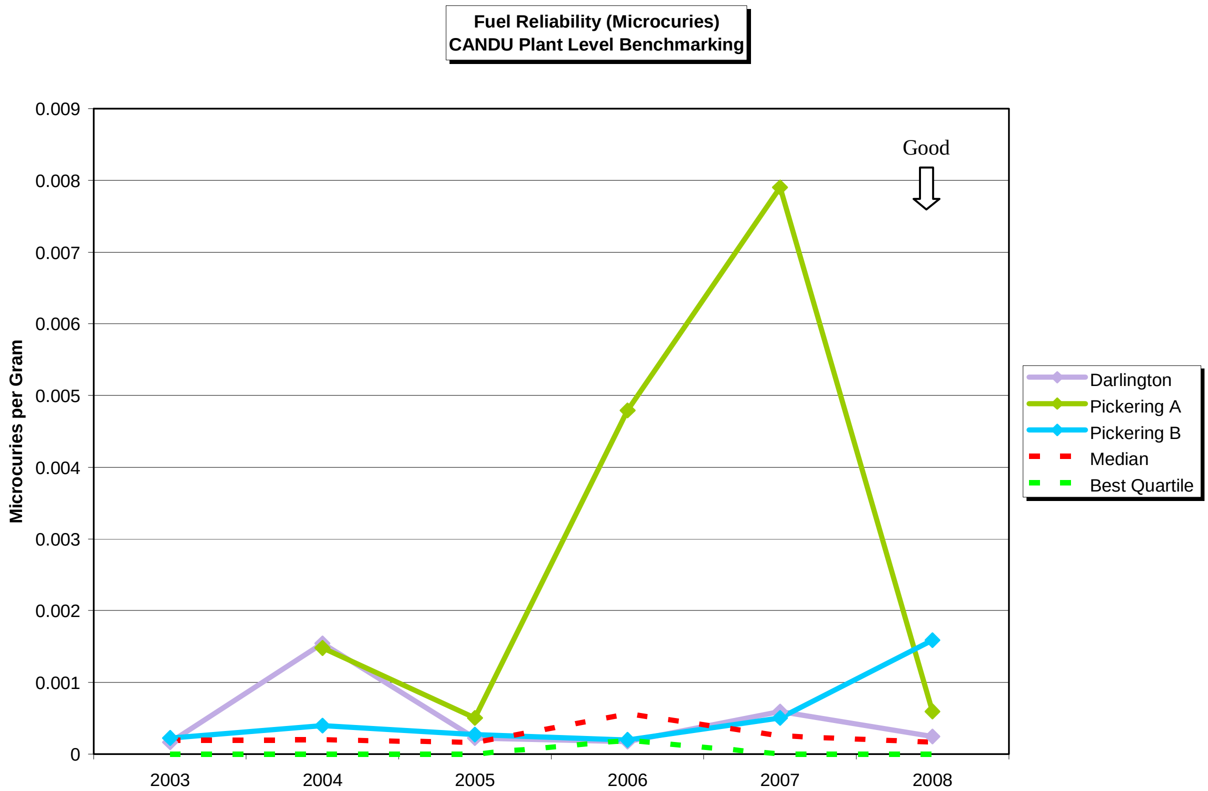
Pickering A
- Pickering A must have zero lost-time injuries to achieve best quartile
- Pickering A experienced two lost-time accidents in 2008, which put Pickering A ISAR significantly worse than median

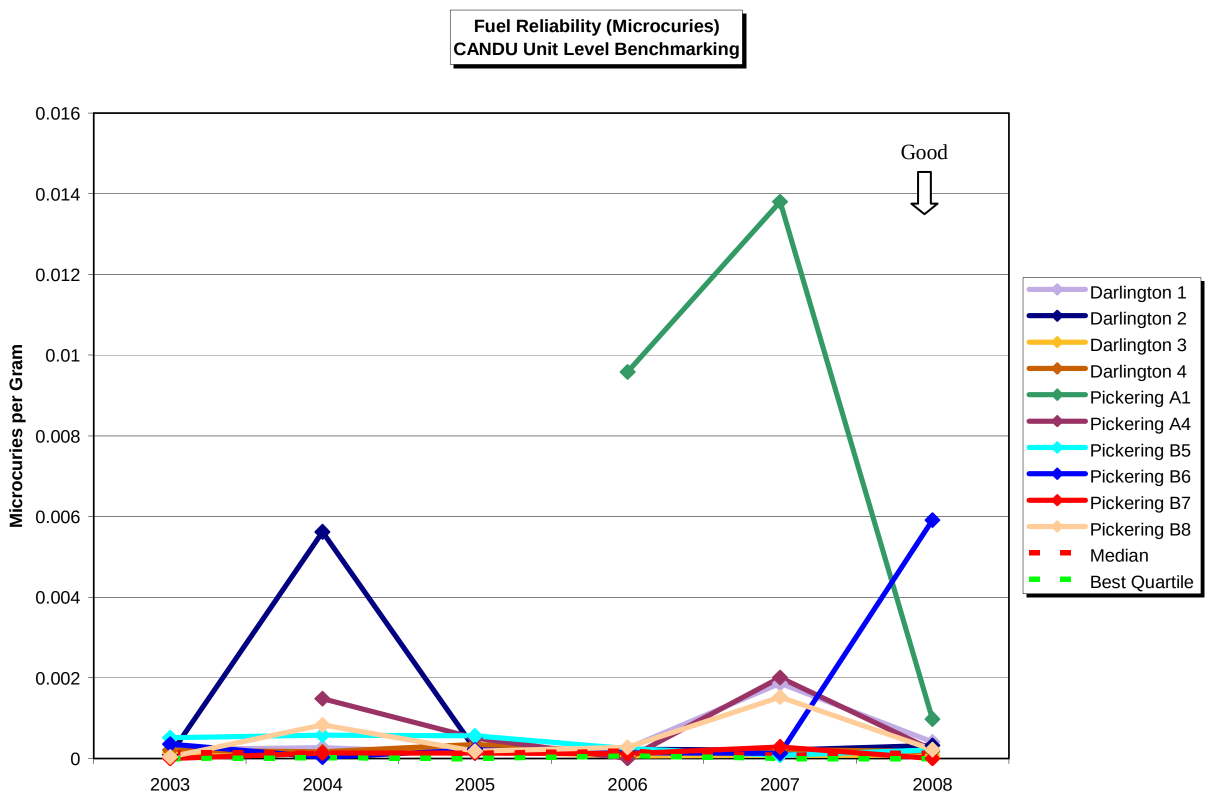
Pickering B
- Pickering B must have no more than one lost time injury to achieve best quartile
- Pickering B experienced two ISAR recordable events in 2008, which put Pickering B ISAR between best quartile and median

Fuel Reliability




2008 Fuel Reliability (Microcuries)
CANDU Unit Level Benchmarking
Best Quartile 1.00E-06
Pickering B7
Darlington 3
Median 1.36E-04
Darlington 4
Pickering A4
Pickering B5
Pickering B8
Darlington 2
Darlington 1
Pickering A1
Pickering B6
Max. NPI
Threshold = 0.0005
0.00E+00
5.00E-03
1.00E-02
1.50E-02
2.00E-02
2.50E-02
3.00E-02
Microcuries per Gram


Fuel Reliability (Microcuries)
CANDU Plant Level Benchmarking
Microcuries per Gram
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
2003
2004
2005
2006
2007
2008
Good
Darlington
Pickering A
Pickering B
Median
Best Quartile


Fuel Reliability (Microcuries)
CANDU Unit Level Benchmarking
Microcuries per Gram
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
2003
2004
2005
2006
2007
2008
Good
Darlington 1
Darlington 2
Darlington 3
Darlington 4
Pickering A1
Pickering A4
Pickering B5
Pickering B6
Pickering B7
Pickering B8
Median
Best Quartile

Observations – Fuel Reliability (CANDU)

- The performance of OPG's units has been shown relative to best quartile, median, and the threshold established by WANO to achieve full WANO NPI points. Since achievement of full WANO NPI points is recognized within the industry as a measure of desirable performance, performance gaps are assessed against full WANO NPI points in addition to median and best quartile. In the case of Fuel Reliability, there is essentially no mathematical difference between achieving best quartile and median performance

2008

- Fuel reliability at best quartile worldwide CANDU plants was 0.000001 for plant and equally negligible for units
- All units at Darlington performed well, although not all are at best quartile. Darlington did receive full WANO NPI points
- Pickering A showed significant improvement in 2008 and looks to be moving back toward median or best quartile performance
- Pickering B, and specifically unit 6, showed a negative trend upward to worse than median in 2008

Trend

- Best quartile results were consistently low
- Darlington performance was consistently strong for the review period
- Pickering A performance spiked negatively in 2007 but improved in 2008
- Pickering B performance was overall strong for the review period but showed a negative trend in 2008

Factors Contributing to Performance

Darlington

- Darlington received full WANO NPI points for fuel reliability

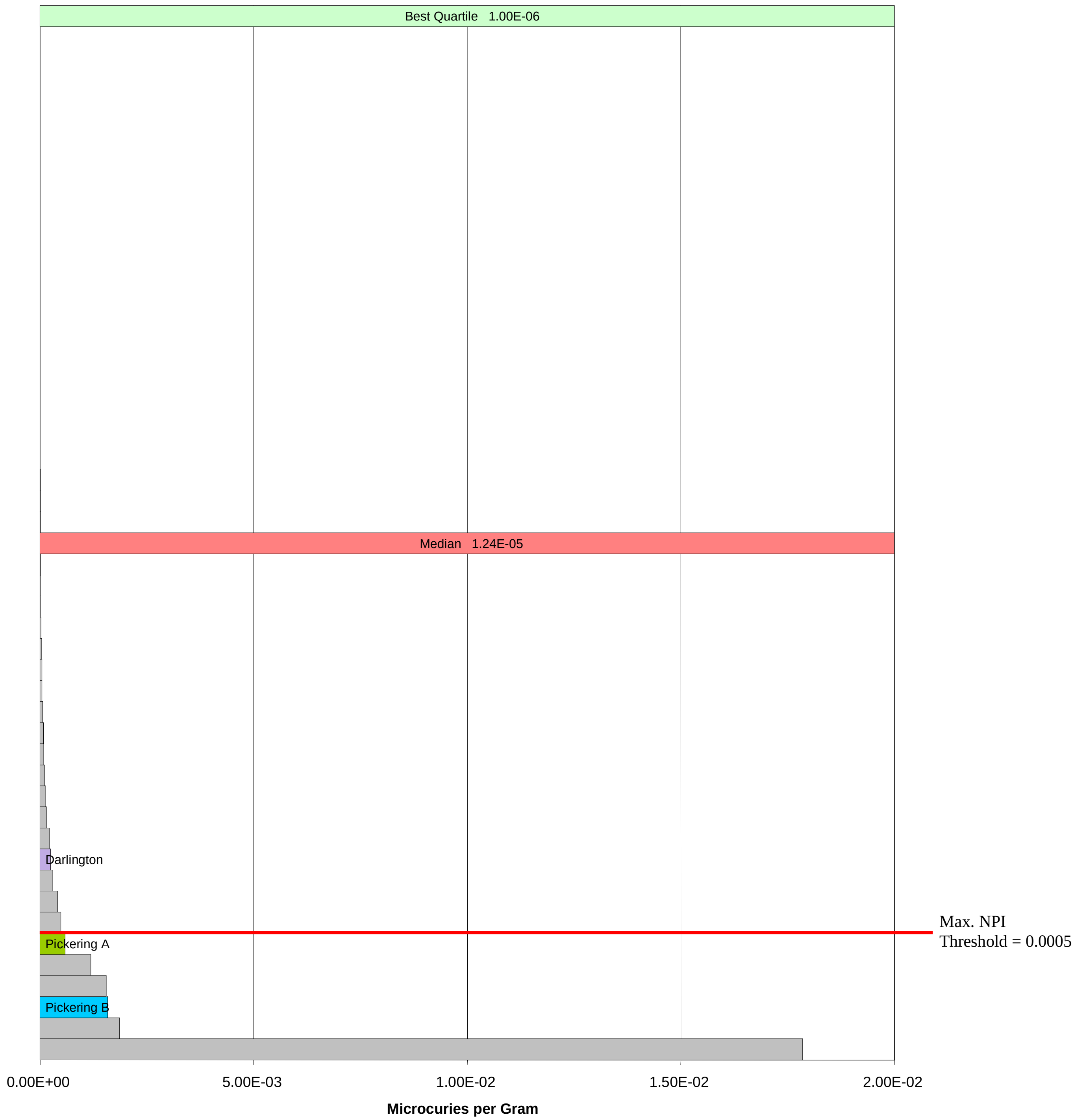
Pickering A

- Pickering A received 9.5 of 10 WANO NPI points
- Performance has significantly improved recently due to Foreign Material Exclusion improvements

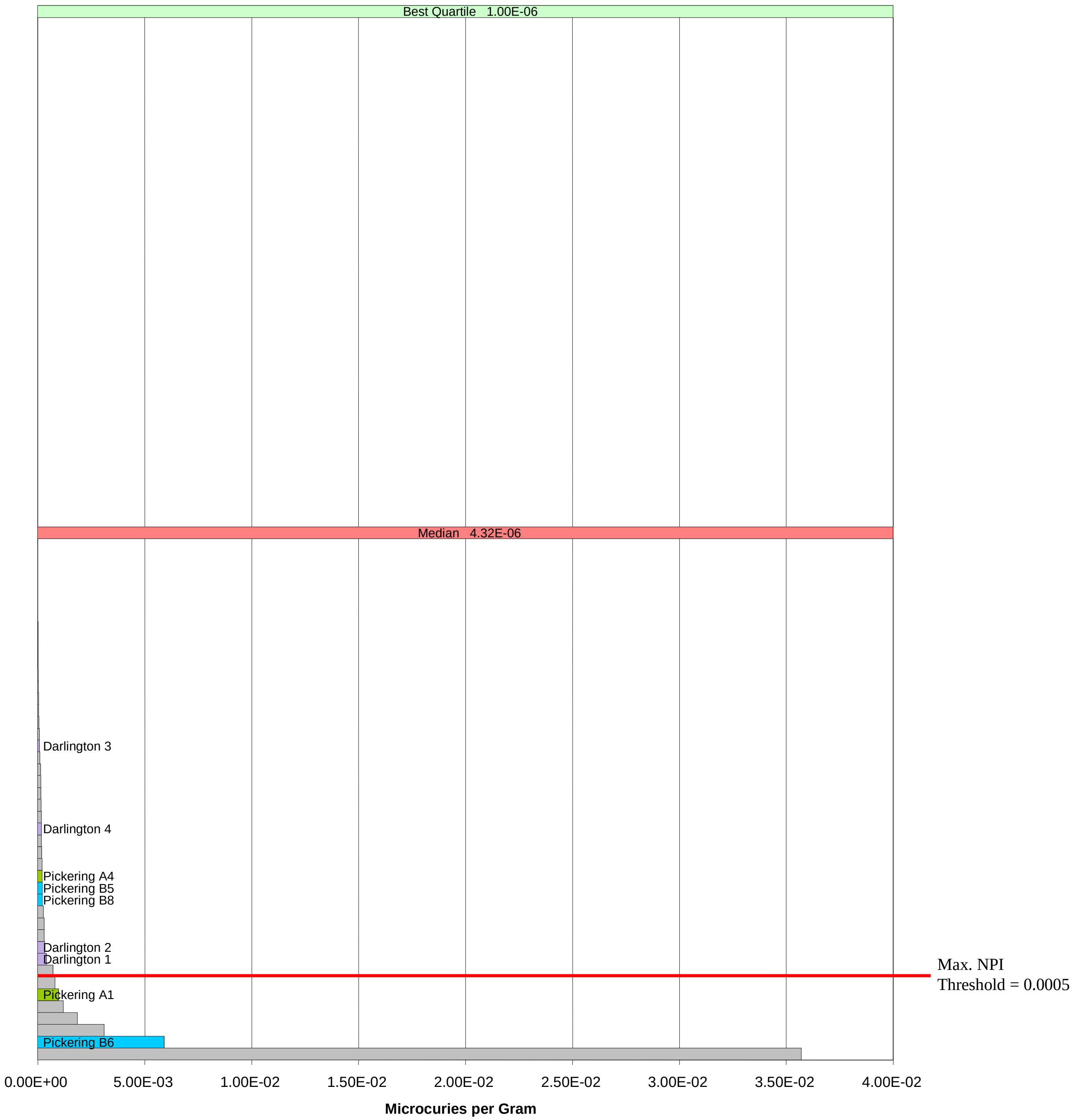
Pickering B

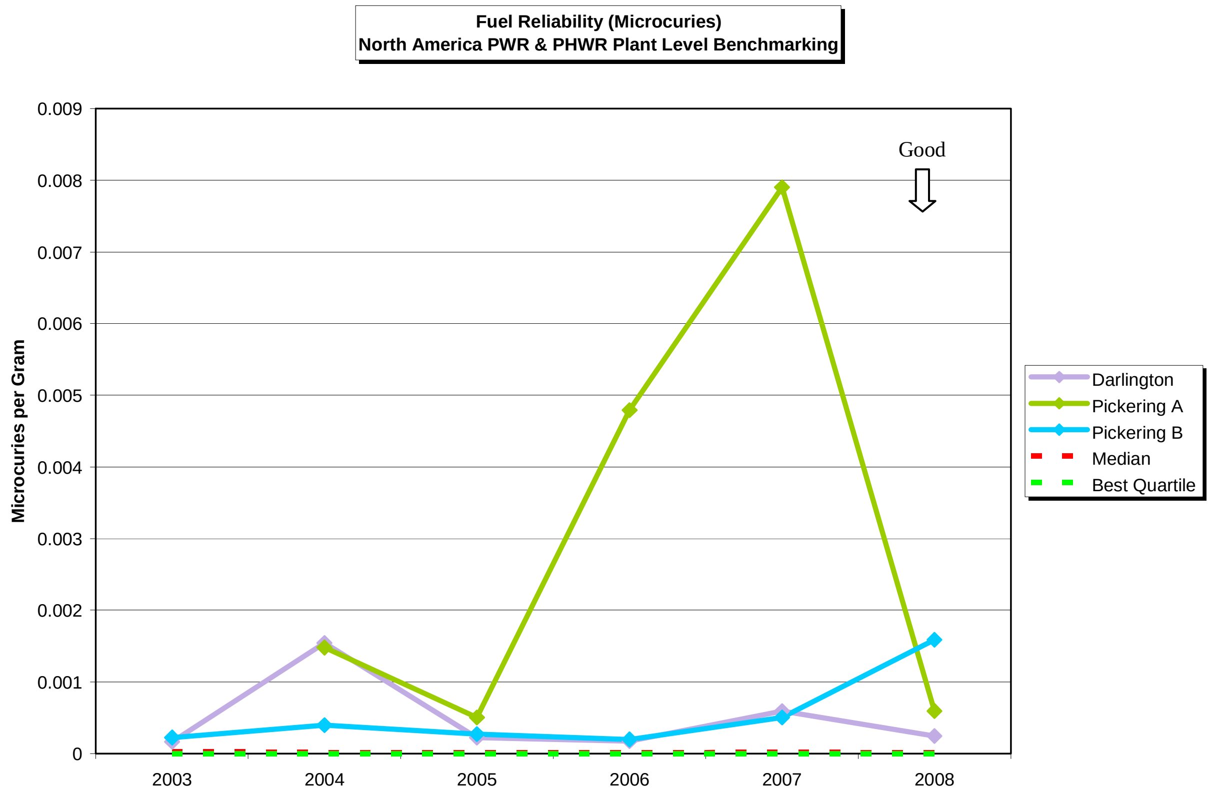
- Pickering B received 7.5 of 10 WANO NPI points
- The performance is expected to improve due to actions taken to improve Foreign Material Exclusion, but results are still pending

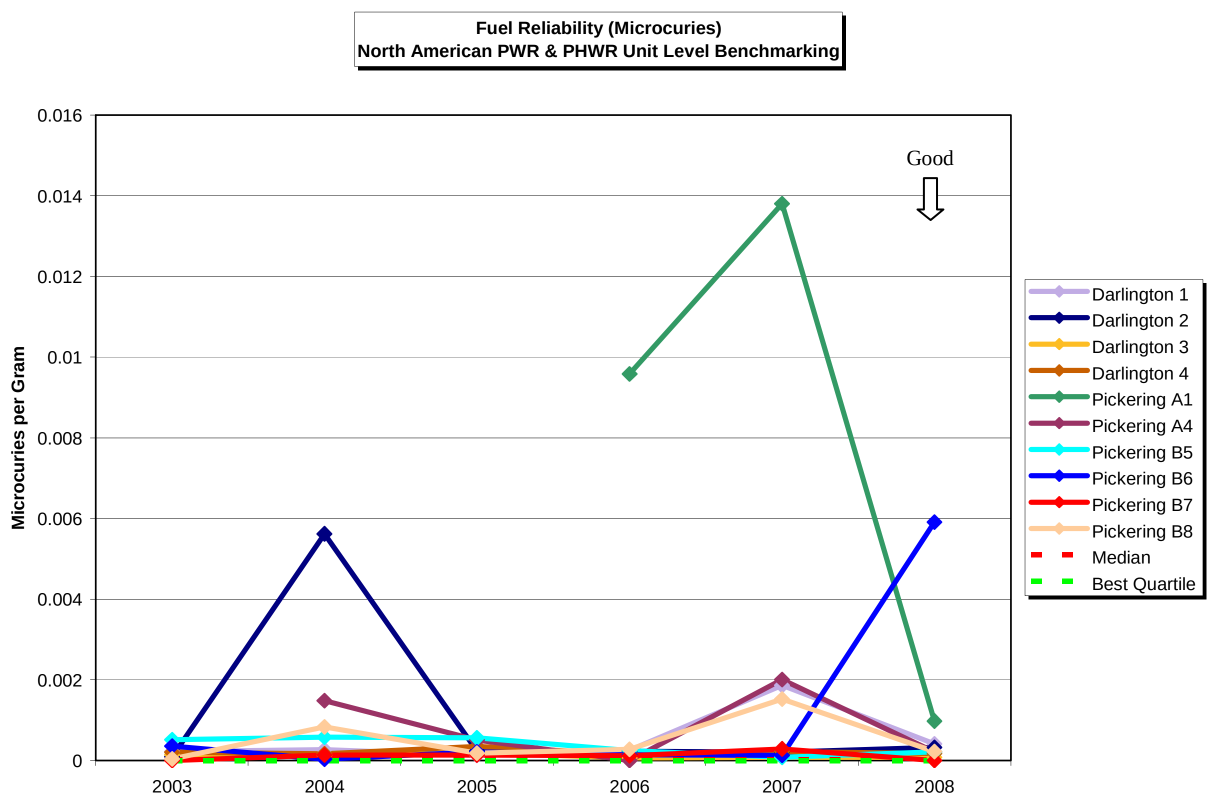
2008 Fuel Reliability (Microcuries)
North American PWR & PHWR Plant Level Benchmarking



2008 Fuel Reliability (Microcuries)
North America PWR & PHWR Unit Level Benchmarking




Fuel Reliability (Microcuries)
North America PWR & PHWR Plant Level Benchmarking
Microcuries per Gram
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
2003
2004
2005
2006
2007
2008
Good
Darlington
Pickering A
Pickering B
Median
Best Quartile


Fuel Reliability (Microcuries)
North American PWR & PHWR Unit Level Benchmarking
Microcuries per Gram
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
2003
2004
2005
2006
2007
2008
Good
Darlington 1
Darlington 2
Darlington 3
Darlington 4
Pickering A1
Pickering A4
Pickering B5
Pickering B6
Pickering B7
Pickering B8
Median
Best Quartile

Observations – Fuel Reliability (North American PWR and PHWR)

- The performance of OPG's units has been shown relative to best quartile, median, and the threshold established by WANO to achieve full WANO NPI points. Since achievement of full WANO NPI points is recognized within the industry as a measure of desirable performance, performance gaps are assessed against full WANO NPI points in addition to median and best quartile. In the case of Fuel Reliability, there is essentially no mathematical difference between achieving best quartile and median performance

2008

- Fuel reliability at best quartile for all North American PWR/PHWRs plants was 0.000001 for plant and equally negligible for units
- All OPG units at Darlington performed well, although not all best quartile but received full WANO NPI points
- Pickering A showed significant improvement in 2008 and looks to be moving back toward median or best quartile performance
- Pickering B, specifically unit B6, showed a negative trend upward to worse than median in 2008

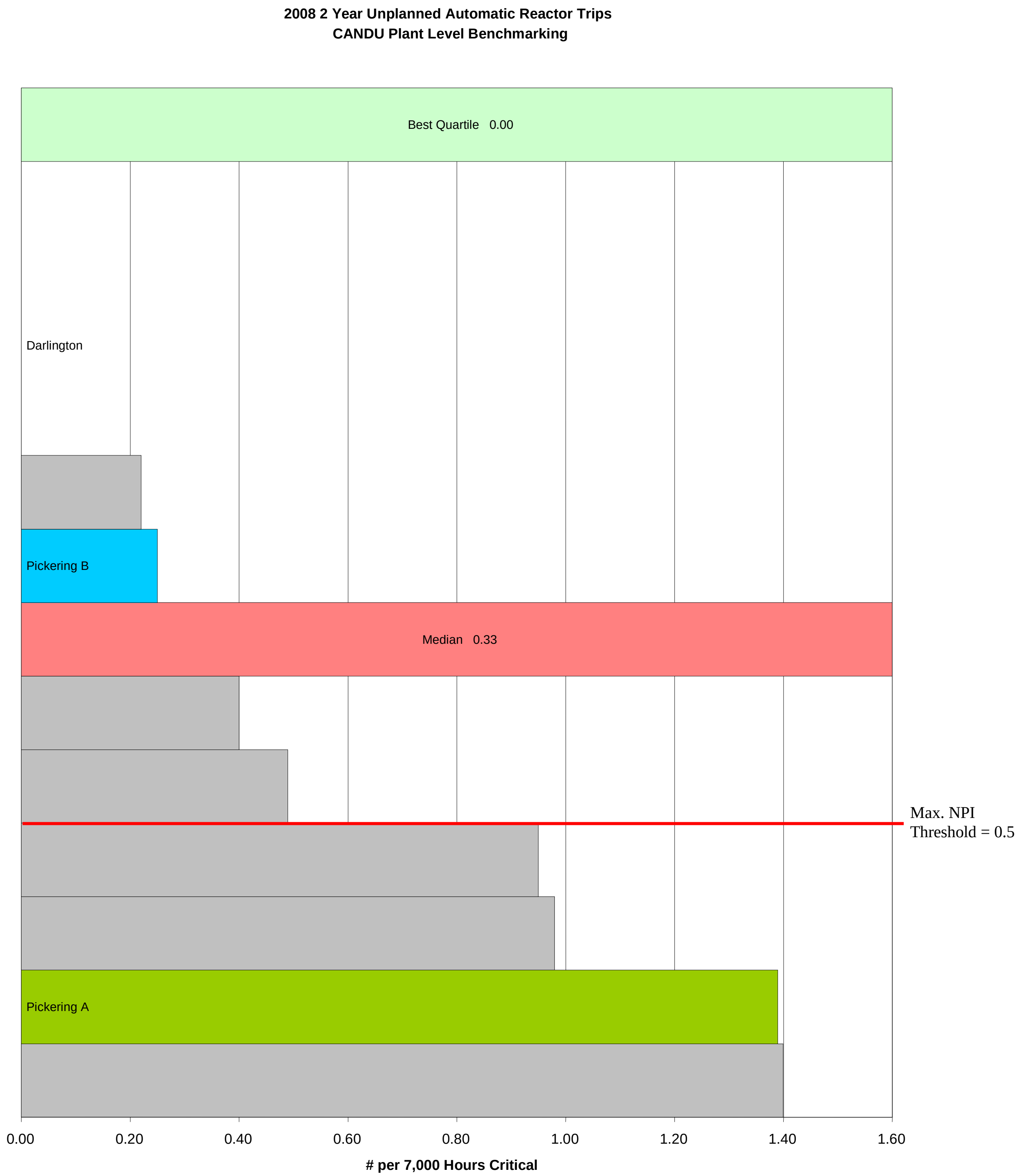
Trend

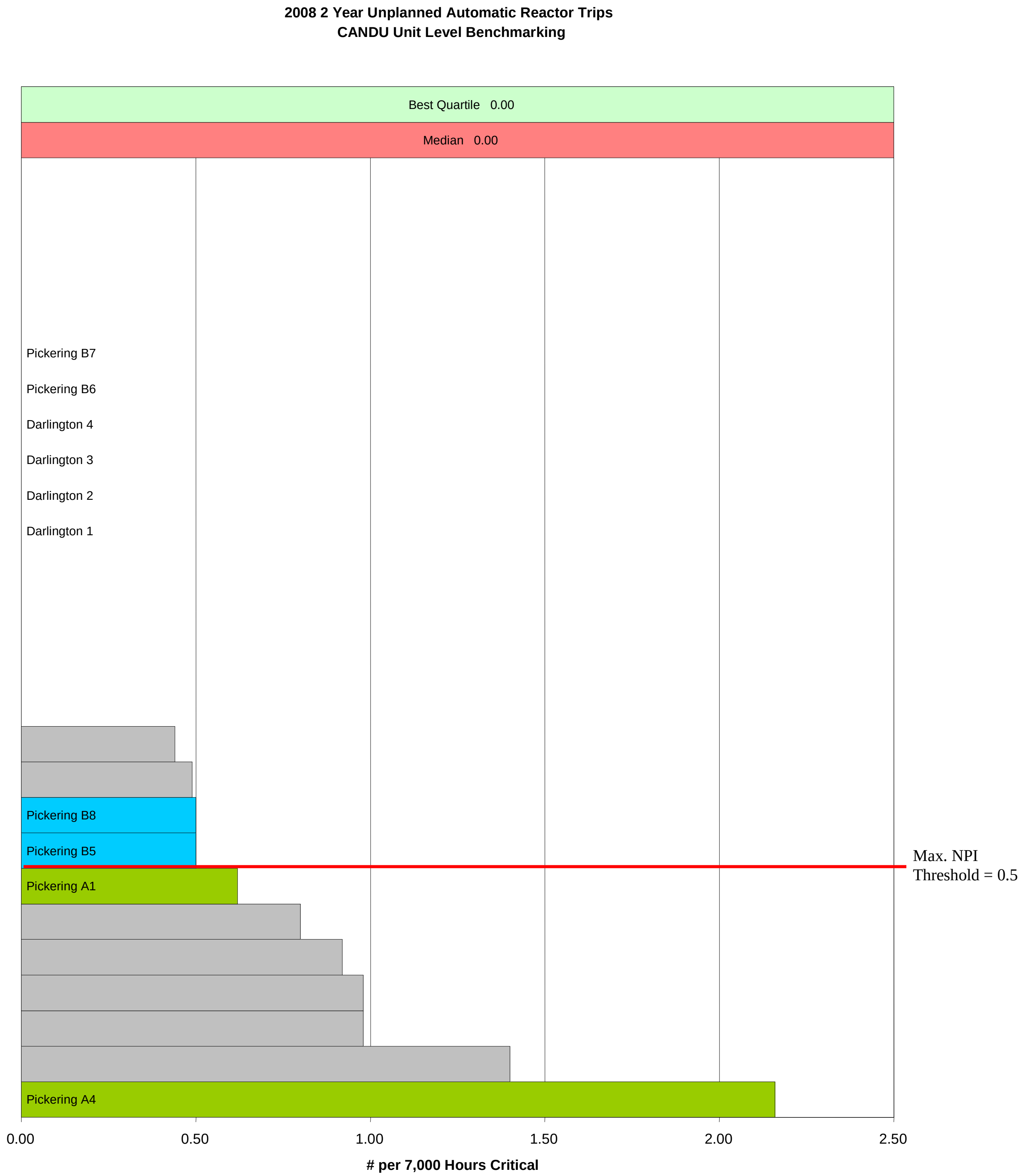
- Best quartile results were consistently low
- Darlington performance was consistently strong for the review period
- Pickering A performance spiked negatively in 2007 but improved significantly in 2008
- Pickering B performance was overall strong for the review period but showed a negative trend in 2008

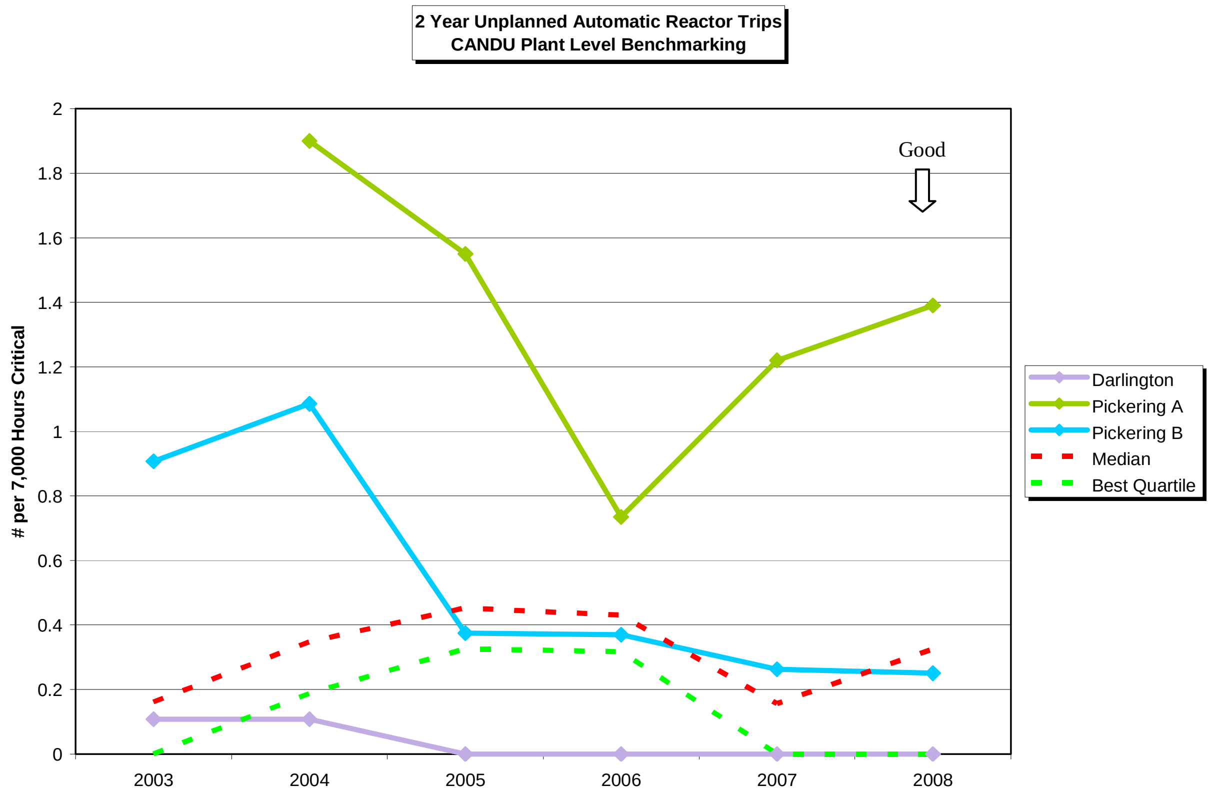
Factors Contributing to Performance

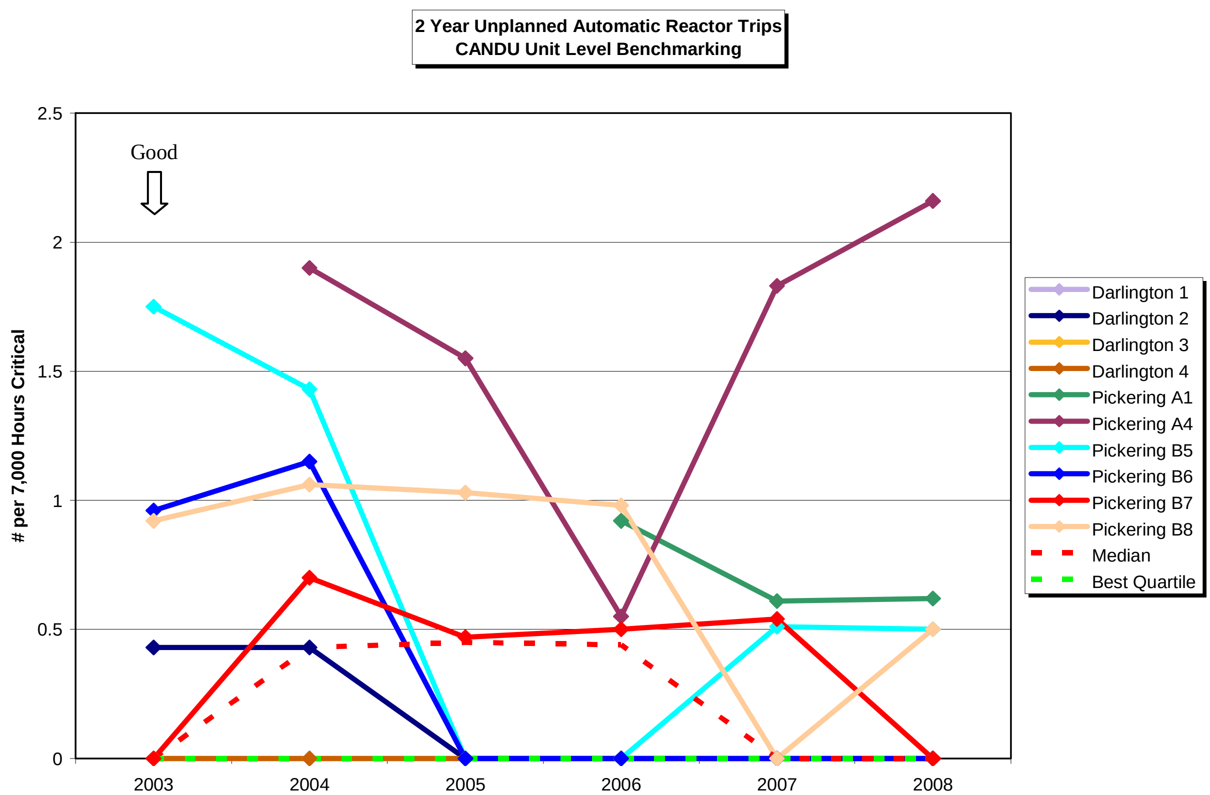
- All analysis is as included in CANDU benchmarking panel section

2-Year Unplanned Automatic Reactor Trips




2008 2 Year Unplanned Automatic Reactor Trips
CANDU Unit Level Benchmarking
Best Quartile 0.00
Median 0.00
Pickering B7
Pickering B6
Darlington 4
Darlington 3
Darlington 2
Darlington 1
Pickering B8
Pickering B5
Pickering A1
Pickering A4
Max. NPI Threshold = 0.5
0.00
0.50
1.00
1.50
2.00
2.50
per 7,000 Hours Critical


2 Year Unplanned Automatic Reactor Trips
CANDU Plant Level Benchmarking
per 7,000 Hours Critical
Good
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
2003
2004
2005
2006
2007
2008
Darlington
Pickering A
Pickering B
Median
Best Quartile


2 Year Unplanned Automatic Reactor Trips
CANDU Unit Level Benchmarking
per 7,000 Hours Critical
Good
2.5
2
1.5
1
0.5
0
2003
2004
2005
2006
2007
2008
Darlington 1
Darlington 2
Darlington 3
Darlington 4
Pickering A1
Pickering A4
Pickering B5
Pickering B6
Pickering B7
Pickering B8
Median
Best Quartile

Observations – 2-Year Unplanned Automatic Reactor Trips (CANDU)

- The performance of OPG's units has been shown relative to best quartile, median, and the threshold established by WANO to achieve full WANO NPI points. Since achievement of full WANO NPI points is recognized within the industry as a measure of desirable performance, performance gaps are assessed against full WANO NPI points in addition to median and best quartile. In the case of Unplanned Automatic Reactor Trips, there is essentially no mathematical difference between achieving best quartile and median performance

2008 (2-Year Rolling Average)

- Unplanned automatic reactor trips at best quartile worldwide CANDU plants was 0.40 for the plant average and 0 for individual units
- Darlington performed better than best quartile as a station and all units performed at zero reactor trips
- Pickering A performed worse than median as a plant and all units were worse than median for the most recent data point
- Pickering B performed at best quartile for plant average and two of four units were at zero for the most recent period with two units performing worse than median for units with 0.50 trips

Trend

- Best quartile for the panel started and ended the review period at consistent levels with a decline in performance in the middle of the period
- Darlington performance overall improved from better than median at the beginning of the review period to achieve best quartile for the last five data points consecutively
- Pickering A had a limited time period compared to the other stations due to the restart of unit 4 in September 2003 and unit 1 in November 2005
- Pickering A performance improved from just under 2.0 trips at the beginning of the time period to under 0.8 trips by 2006 but then worsened to 1.4 trips
- Pickering B performance improved over the review period from worse than median at 0.9 trips, to better than median for the most recent time period

Factors Contributing to Performance

- Key performance drivers for this metric include: general equipment reliability, material condition, and human performance as defined in Forced Loss Rate and Unit Capability Factor

Darlington

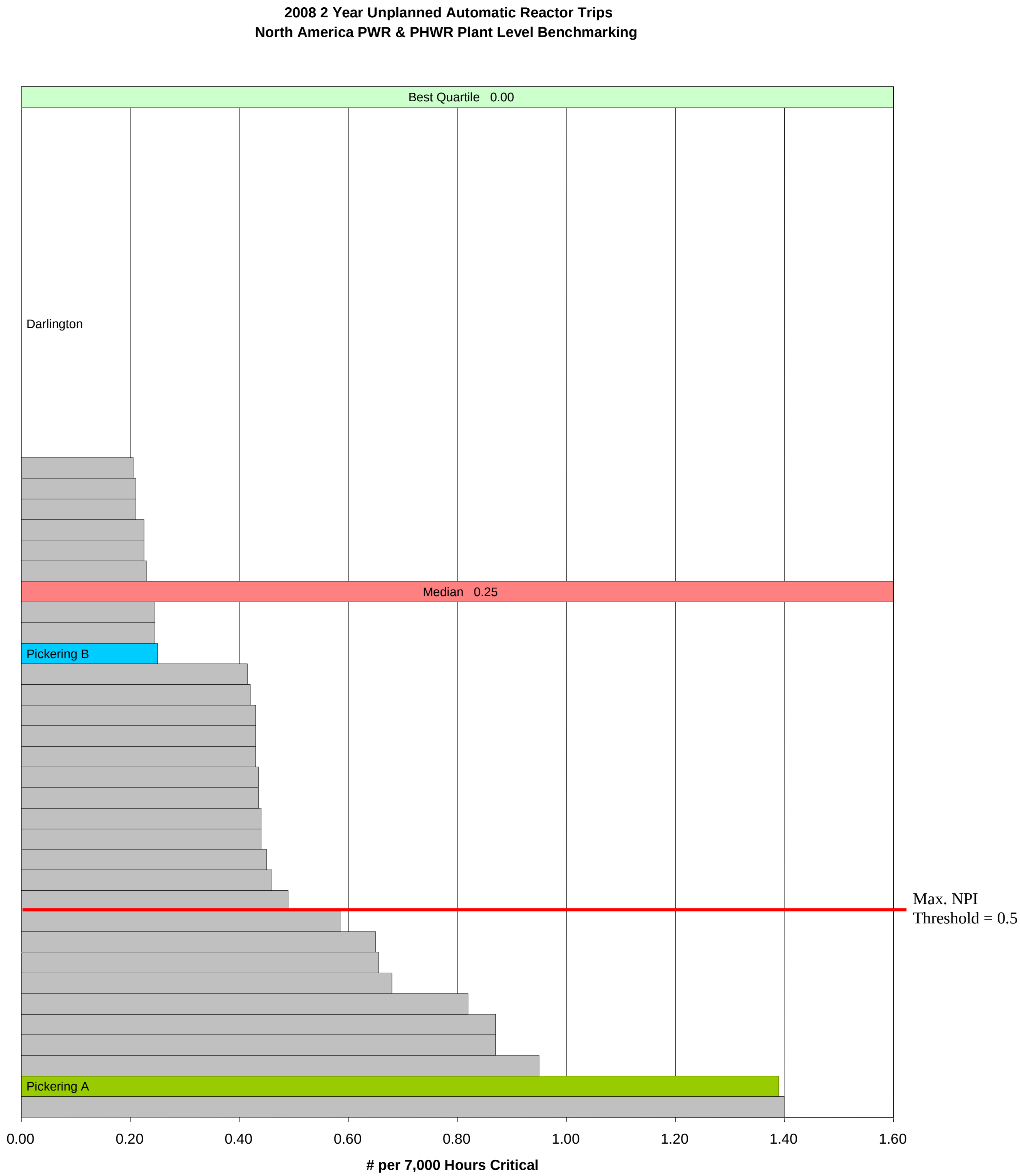
- Darlington achieved best quartile performance in unplanned automatic reactor trips against the panel and received full WANO NPI points

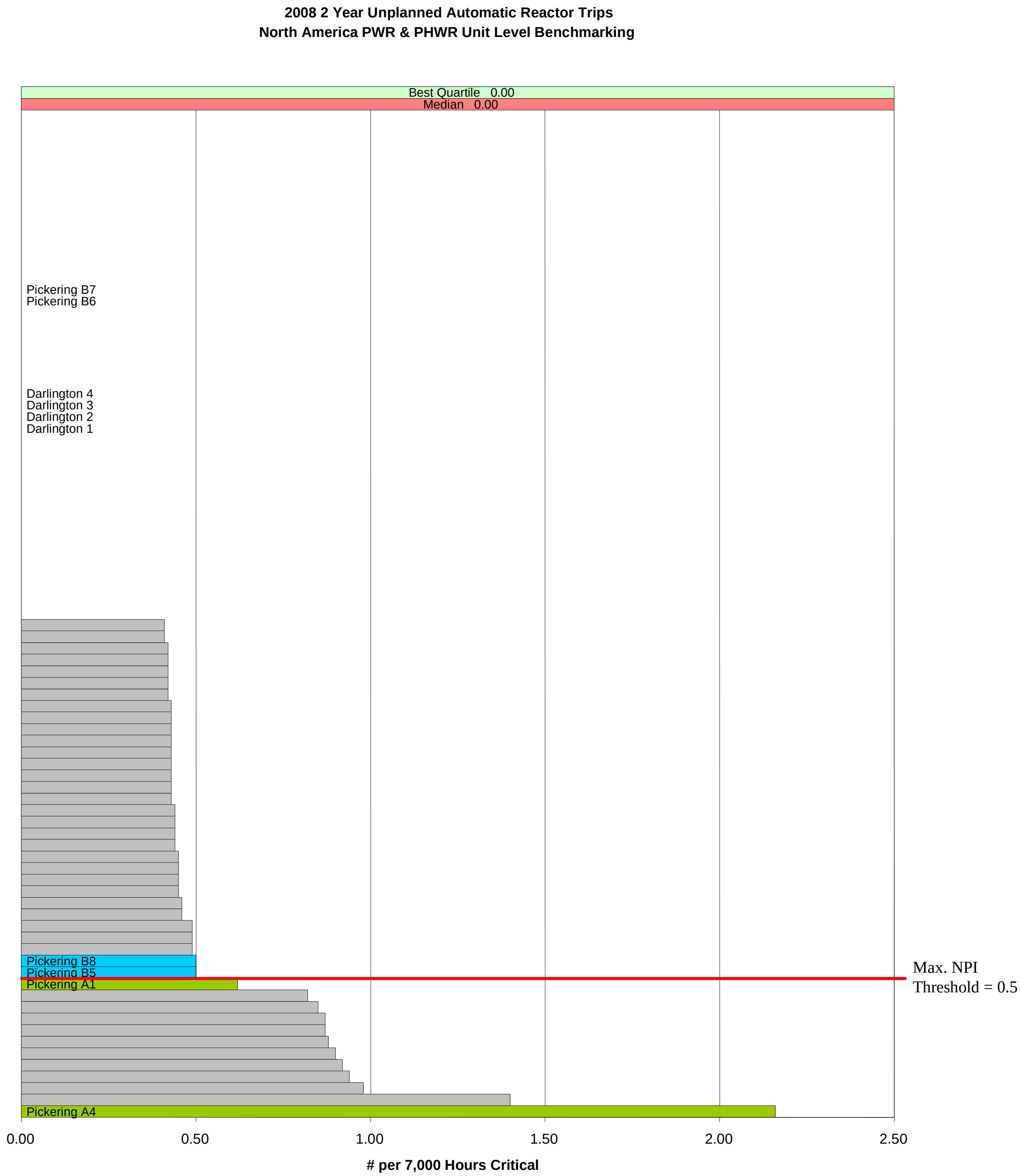
Pickering A

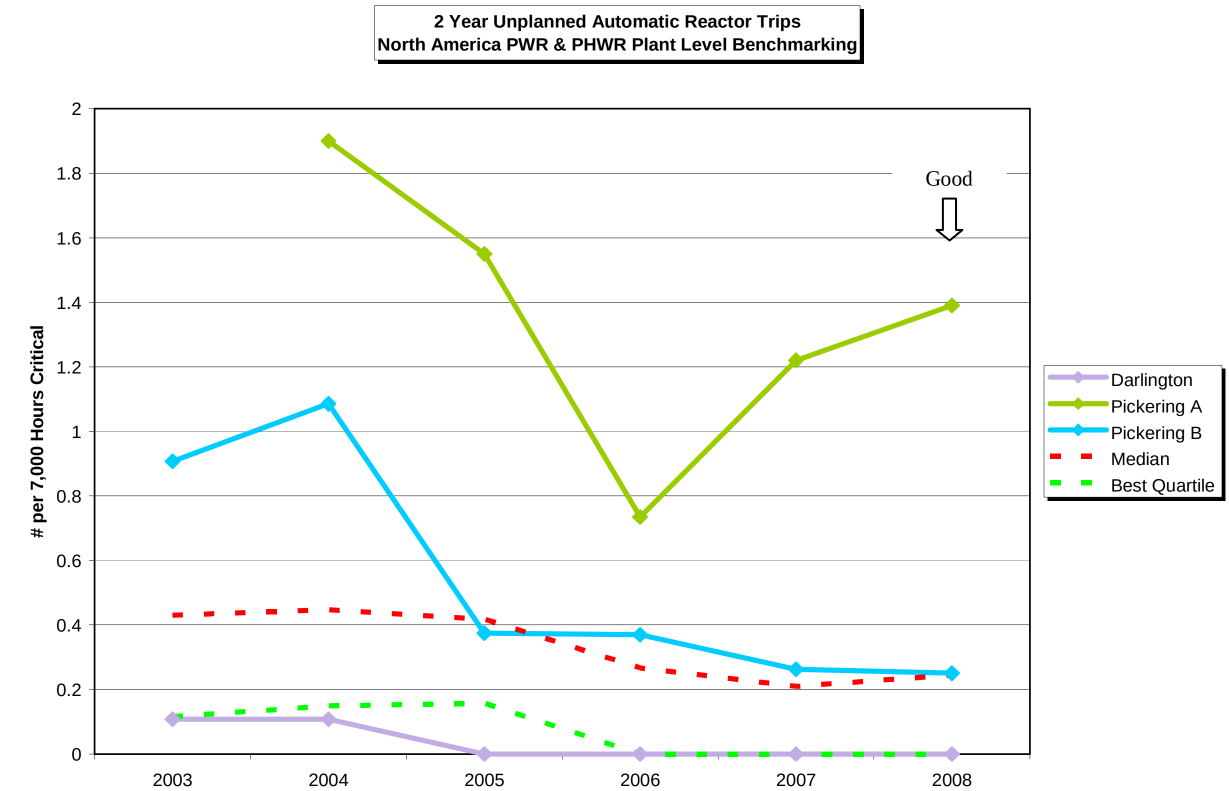
- Pickering A received 4.4 of 10 WANO NPI points for unplanned automatic reactor trips
- Six reactor trips have occurred at Pickering A since 2005. Causes are four due to equipment reliability problems and two due to human performance

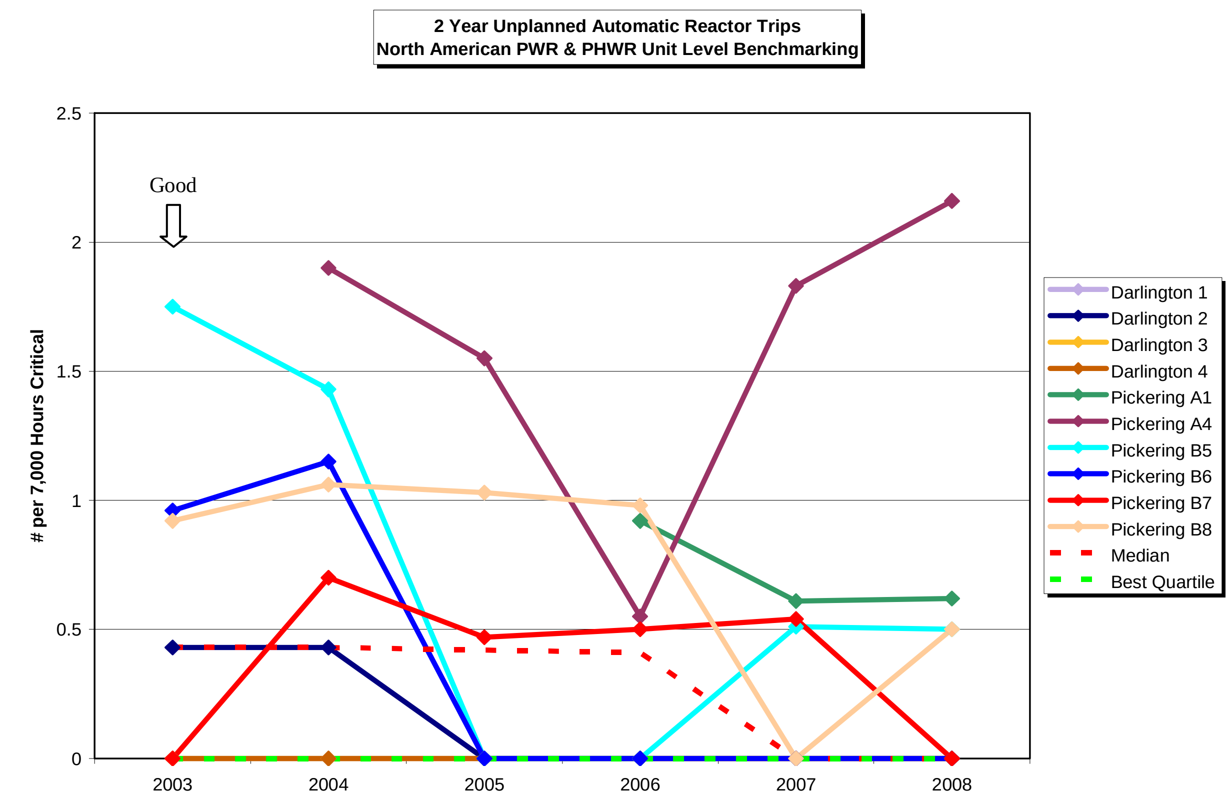
Pickering B

- Pickering B received full WANO NPI points for unplanned automatic reactor trips


2008 2 Year Unplanned Automatic Reactor Trips
North America PWR & PHWR Plant Level Benchmarking
Best Quartile 0.00
Darlington
Median 0.25
Pickering B
Max. NPI
Threshold = 0.5
Pickering A
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
per 7,000 Hours Critical


2008 2 Year Unplanned Automatic Reactor Trips
North America PWR & PHWR Unit Level Benchmarking
Best Quartile 0.00
Median 0.00
Pickering B7
Pickering B6
Darlington 4
Darlington 3
Darlington 2
Darlington 1
Pickering B8
Pickering B5
Pickering A1
Pickering A4
Max. NPI
Threshold = 0.5
0.00
0.50
1.00
1.50
2.00
2.50
per 7,000 Hours Critical


2 Year Unplanned Automatic Reactor Trips
North America PWR & PHWR Plant Level Benchmarking
per 7,000 Hours Critical
Good
Darlington
Pickering A
Pickering B
Median
Best Quartile
2003
2004
2005
2006
2007
2008


2 Year Unplanned Automatic Reactor Trips
North American PWR & PHWR Unit Level Benchmarking
per 7,000 Hours Critical
Good
Darlington 1
Darlington 2
Darlington 3
Darlington 4
Pickering A1
Pickering A4
Pickering B5
Pickering B6
Pickering B7
Pickering B8
Median
Best Quartile
2003
2004
2005
2006
2007
2008

Observations – 2-Year Unplanned Automatic Reactor Trips (North American PWR and PHWR)

- The performance of OPG's units has been shown relative to best quartile, median, and the threshold established by WANO to achieve full WANO NPI points. Since achievement of full WANO NPI points is recognized within the industry as a measure of desirable performance, performance gaps are assessed against full WANO NPI points in addition to median and best quartile. In the case of Unplanned Automatic Reactor Trips, there is essentially no mathematical difference between achieving best quartile and median performance

2008 (2-Year Rolling Average)

- Unplanned automatic reactor trips at best quartile for the North American PWR and PHWR panel was zero for the plant average and zero for individual units
- Darlington performed better than best quartile as a station and all units performed at zero unplanned automatic reactor trips
- Pickering A performed worse than median as a plant and all units were worse than median for the most recent data point
- Pickering B performed worse than median as a plant and all units were worse than median for the most recent data point

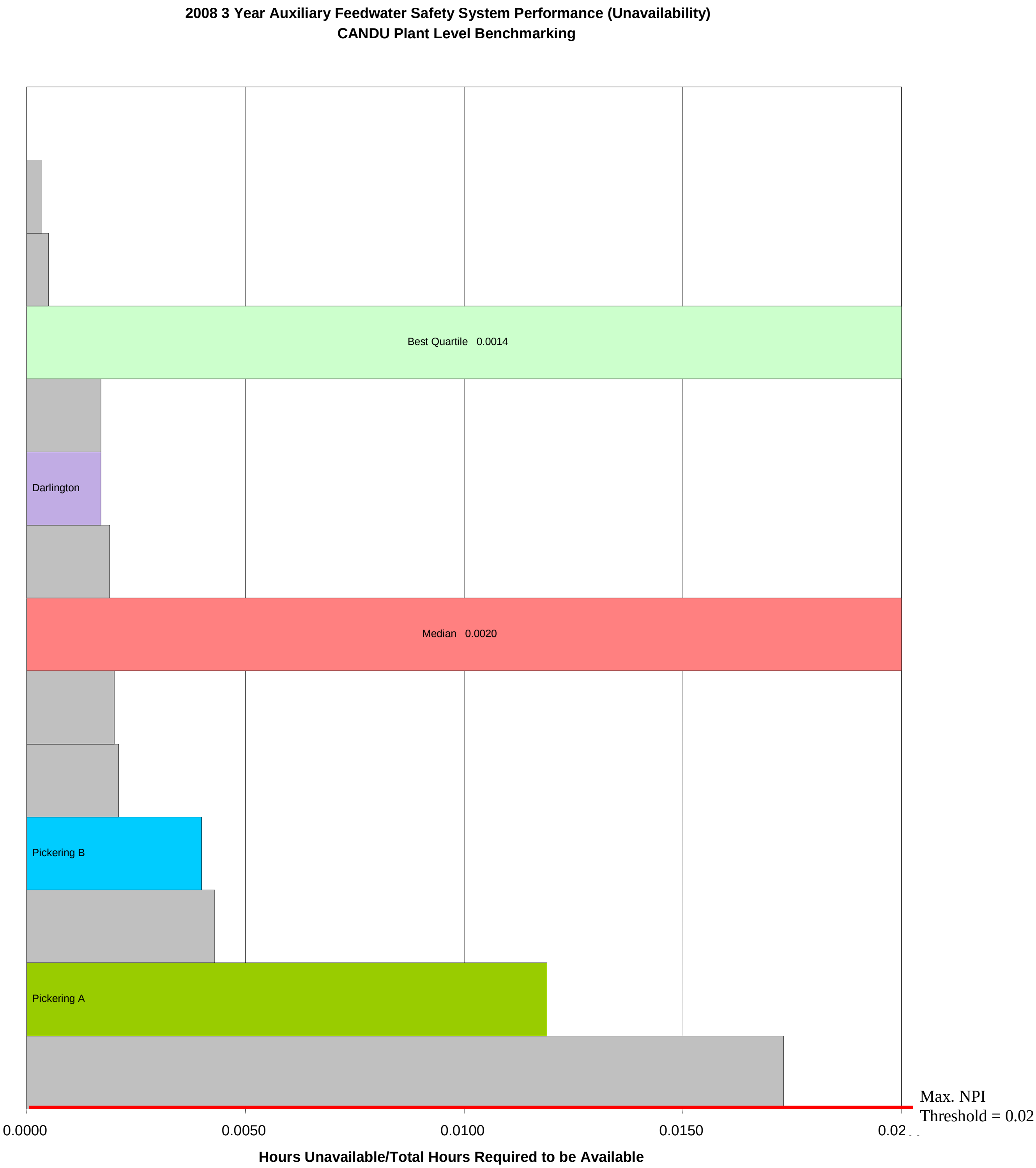
Trend

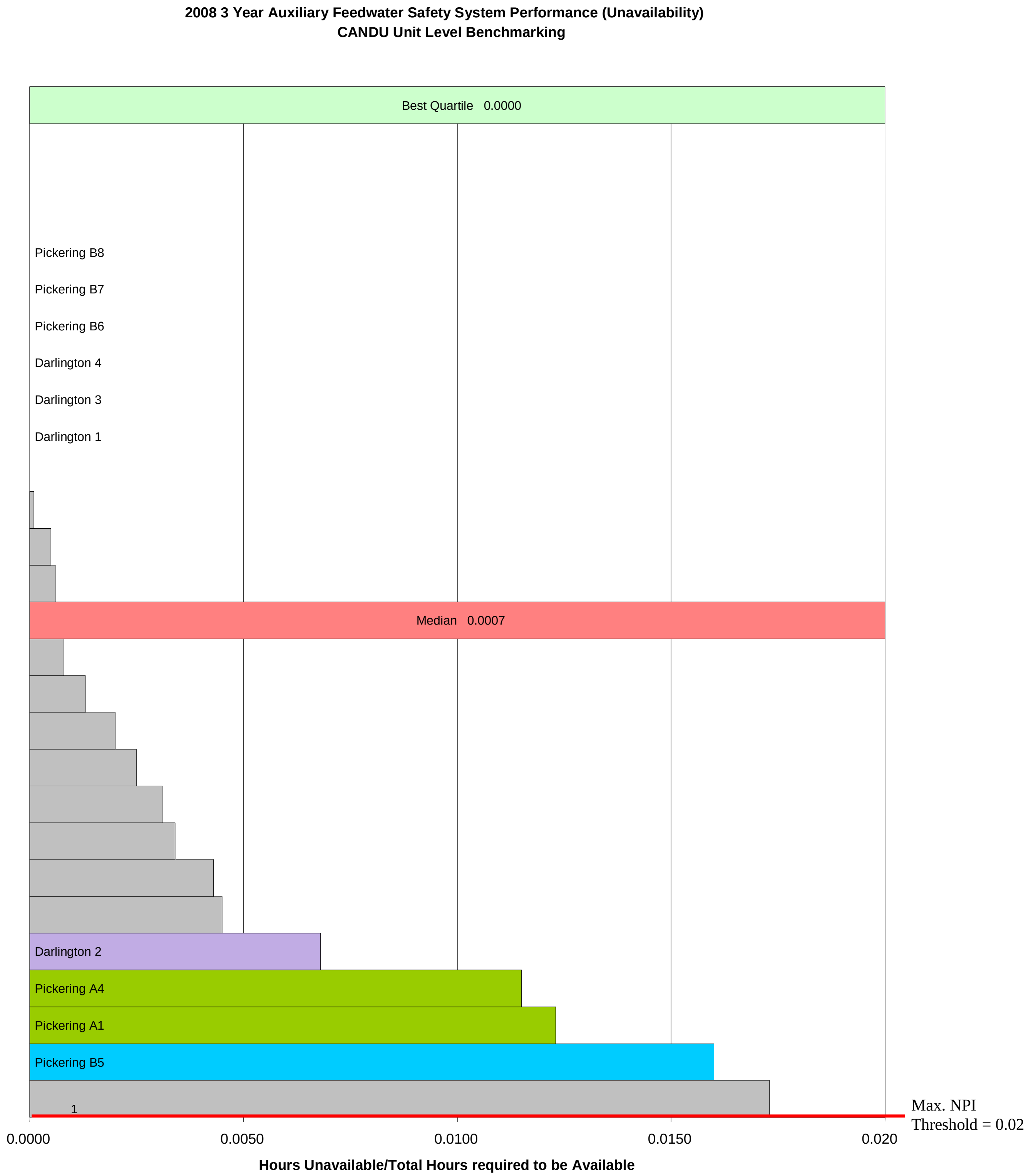
- Best quartile for the panel improved from 0.1 to 0.0 trips for the time period
- Darlington performance overall improved for the review period but remained best quartile for the duration
- Pickering A had a limited time period compared to the other stations due to the restart of unit 4 in September 2003 and unit 1 in November 2005
- Pickering A performance improved from just under 2.0 trips at the beginning of the time period to under 0.8 trips by 2006 but then worsened to 1.4 trips
- Pickering B performance improved over the review period from 0.9 trips to better than 0.3 trips but remained worse than median against the panel

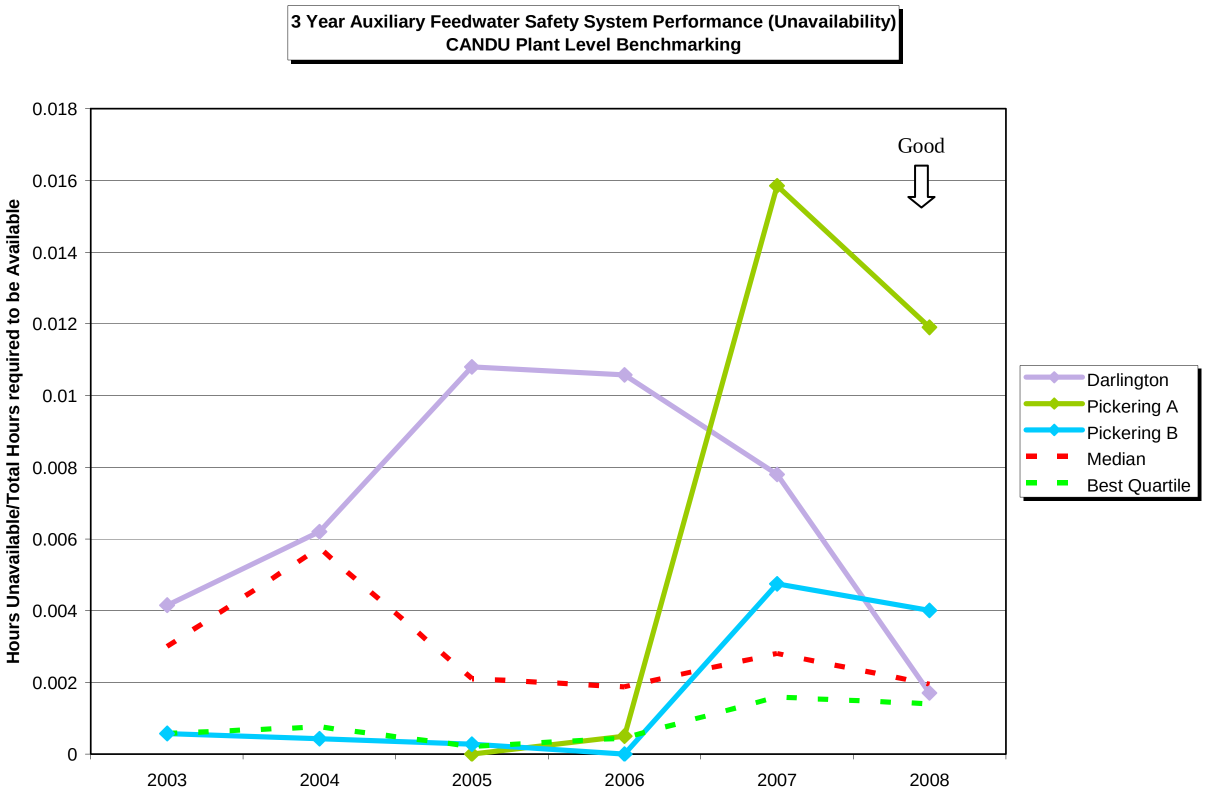
Factors Contributing to Performance

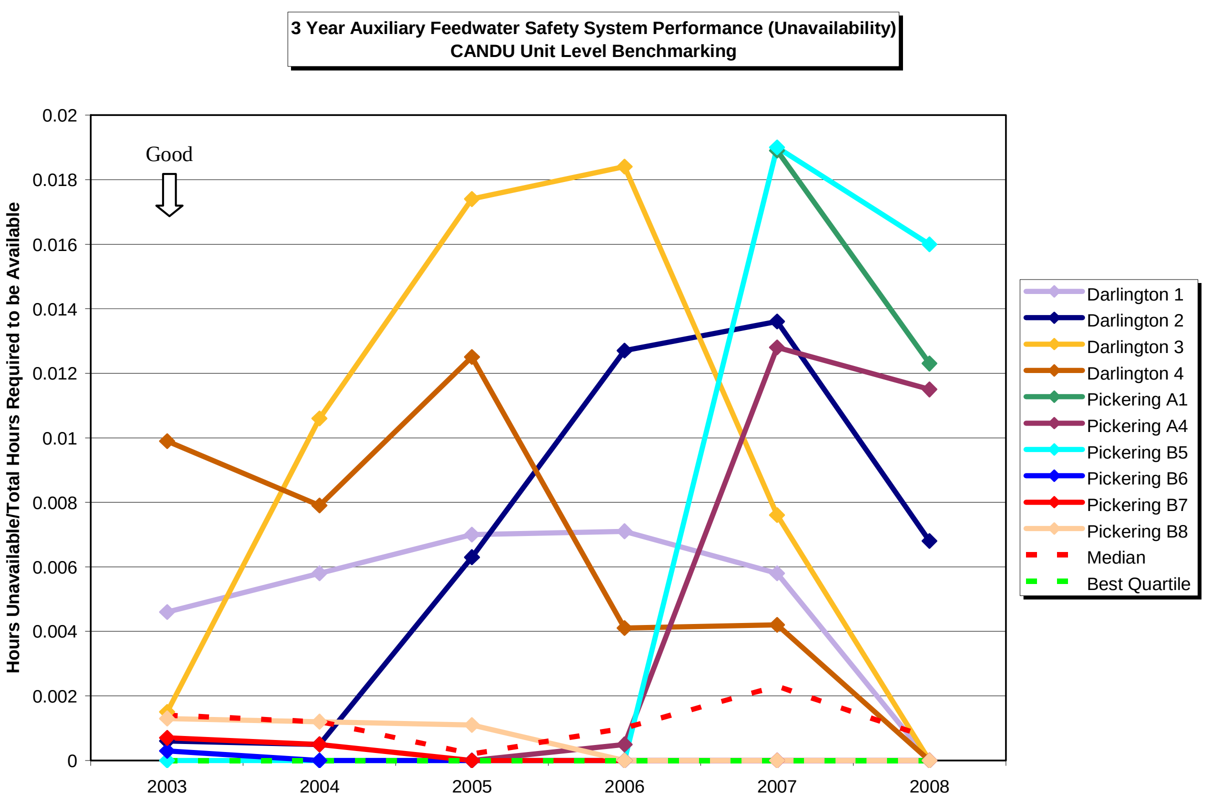
- Technology difference between PWR and CANDU should not impact unplanned automatic reactor trips
- All analysis of gap and WANO NPI points lost for the OPG plants documented in the worldwide CANDU benchmark panel section

3-Year Auxiliary Feedwater Safety System Unavailability




2008 3 Year Auxiliary Feedwater Safety System Performance (Unavailability)
CANDU Unit Level Benchmarking
Best Quartile 0.0000
Pickering B8
Pickering B7
Pickering B6
Darlington 4
Darlington 3
Darlington 1
Median 0.0007
Darlington 2
Pickering A4
Pickering A1
Pickering B5
1
Max. NPI
Threshold = 0.02
0.0000
0.0050
0.0100
0.0150
0.020
Hours Unavailable/Total Hours required to be Available


3 Year Auxiliary Feedwater Safety System Performance (Unavailability)
CANDU Plant Level Benchmarking
Hours Unavailable/Total Hours required to be Available
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
2003
2004
2005
2006
2007
2008
Good
Darlington
Pickering A
Pickering B
Median
Best Quartile


3 Year Auxiliary Feedwater Safety System Performance (Unavailability)
CANDU Unit Level Benchmarking
Hours Unavailable/Total Hours Required to be Available
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
2003
2004
2005
2006
2007
2008
Good
Darlington 1
Darlington 2
Darlington 3
Darlington 4
Pickering A1
Pickering A4
Pickering B5
Pickering B6
Pickering B7
Pickering B8
Median
Best Quartile

Observations – 3-Year Auxiliary Feedwater System (CANDU)

- The performance of OPG's units has been shown relative to best quartile, median, and the threshold established by WANO to achieve full WANO NPI points. Since achievement of full WANO NPI points is recognized within the industry as a measure of desirable performance, performance gaps are assessed against full WANO NPI points in addition to median and best quartile. In the case of Auxiliary Feedwater System, there is essentially no mathematical difference between achieving best quartile and median performance

2008 (3-Year Rolling Average)

- Auxiliary feedwater safety system performance at best quartile worldwide CANDU plants was 0.0014 for plant level and 0.0000 for units
- Darlington performed better than median
- Pickering A and Pickering B both performed worse than median

Trend

- Best quartile was consistently mathematically low, variation in line not displaying any trend
- Darlington performance showed consistent improvement to reach better than median performance by 2008
- Pickering A was well worse than median for 2007 and 2008
- Pickering B performance worsened over the last two years of the review period

Factors Contributing to Performance

Darlington

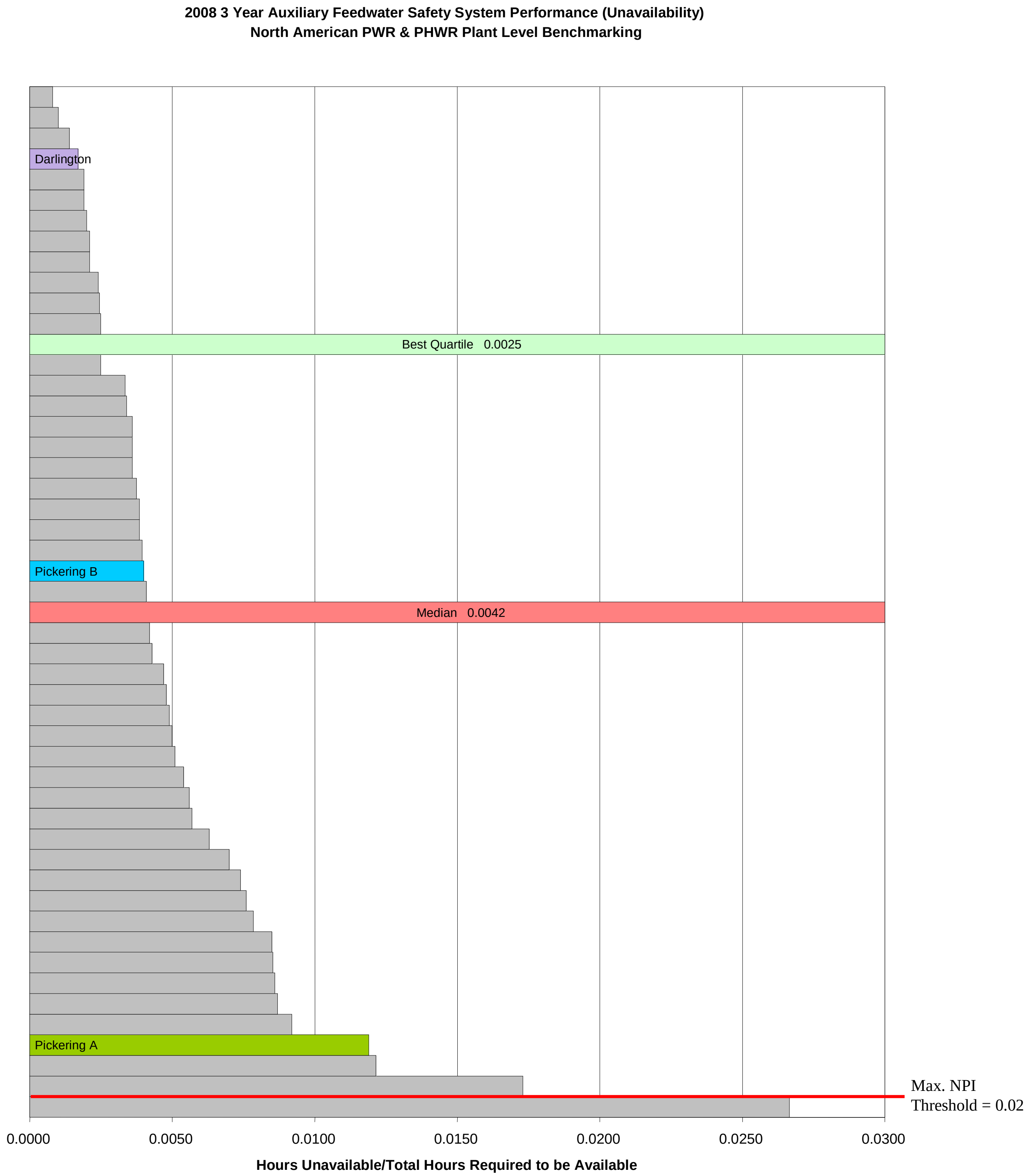
- Darlington received full WANO NPI points for auxiliary feedwater safety system performance therefore no performance gap exists

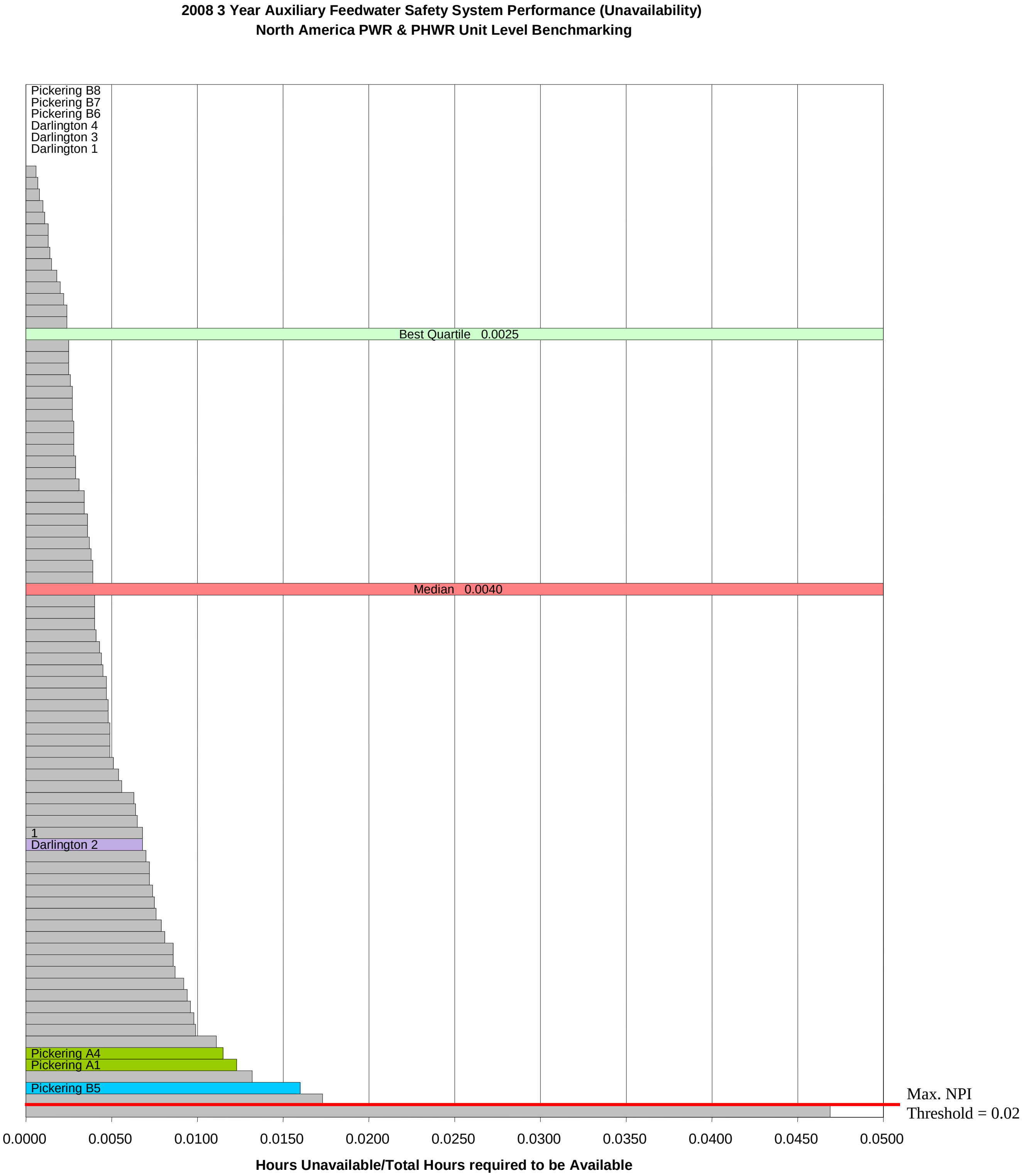
Pickering A

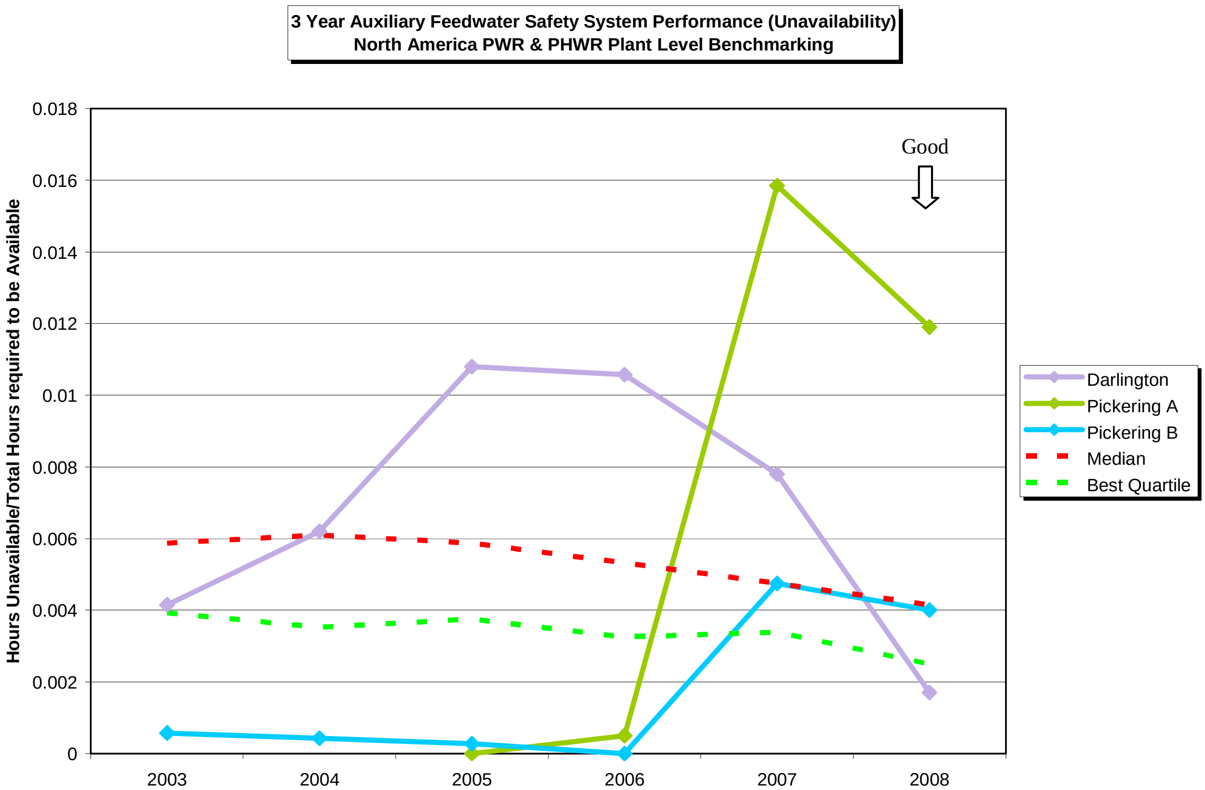
- Pickering A received full WANO NPI points for auxiliary feedwater safety system performance

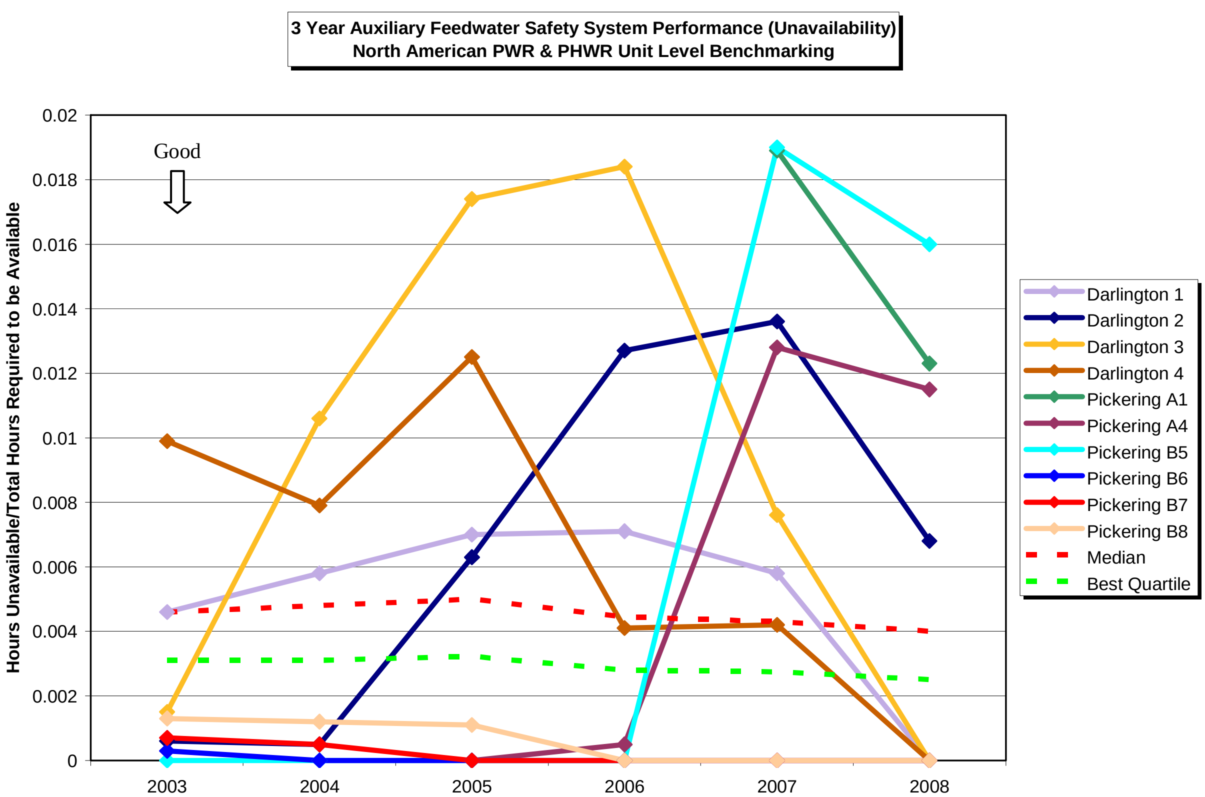
Pickering B

- Pickering B received full WANO NPI points for auxiliary feedwater safety system performance


2008 3 Year Auxiliary Feedwater Safety System Performance (Unavailability)
North American PWR & PHWR Plant Level Benchmarking
Darlington
Best Quartile 0.0025
Pickering B
Median 0.0042
Pickering A
Max. NPI
Threshold = 0.02
0.0000
0.0050
0.0100
0.0150
0.0200
0.0250
0.0300
Hours Unavailable/Total Hours Required to be Available


2008 3 Year Auxiliary Feedwater Safety System Performance (Unavailability)
North America PWR & PHWR Unit Level Benchmarking
Pickering B8
Pickering B7
Pickering B6
Darlington 4
Darlington 3
Darlington 1
Best Quartile 0.0025
Median 0.0040
1
Darlington 2
Pickering A4
Pickering A1
Pickering B5
Max. NPI
Threshold = 0.02
0.0000
0.0050
0.0100
0.0150
0.0200
0.0250
0.0300
0.0350
0.0400
0.0450
0.0500
Hours Unavailable/Total Hours required to be Available


3 Year Auxiliary Feedwater Safety System Performance (Unavailability)
North America PWR & PHWR Plant Level Benchmarking
Hours Unavailable/Total Hours required to be Available
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
2003
2004
2005
2006
2007
2008
Good
Darlington
Pickering A
Pickering B
Median
Best Quartile


3 Year Auxiliary Feedwater Safety System Performance (Unavailability)
North American PWR & PHWR Unit Level Benchmarking
Hours Unavailable/Total Hours Required to be Available
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
2003
2004
2005
2006
2007
2008
Good
Darlington 1
Darlington 2
Darlington 3
Darlington 4
Pickering A1
Pickering A4
Pickering B5
Pickering B6
Pickering B7
Pickering B8
Median
Best Quartile

Observations – 3-Year Auxiliary Feedwater System (North American PWR and PHWR)

- The performance of OPG's units has been shown relative to best quartile, median, and the threshold established by WANO to achieve full WANO NPI points. Since achievement of full WANO NPI points is recognized within the industry as a measure of desirable performance, performance gaps are assessed against full WANO NPI points in addition to median and best quartile. In the case of Auxiliary Feedwater System, there is essentially no mathematical difference between achieving best quartile and median performance

2008 (3-Year Rolling Average)

- Auxiliary feedwater safety system performance at best quartile North American PWR/PHWRs was 0.0025 for plant level and 0.0025 for units
- Darlington performed at best quartile
- Pickering A performed worse than median
- Pickering B performed better than median

Trend

- Best quartile was consistently mathematically low, showed downward trend in recent years
- Darlington performance showed consistent improvement to reach better than median performance by 2008
- Pickering A was well worse than median for 2007 and 2008
- Pickering B performance worsened over the last two years of the review period

Factors Contributing to Performance

Darlington

- Darlington received full WANO NPI points for auxiliary feedwater safety system performance therefore no performance gap exists

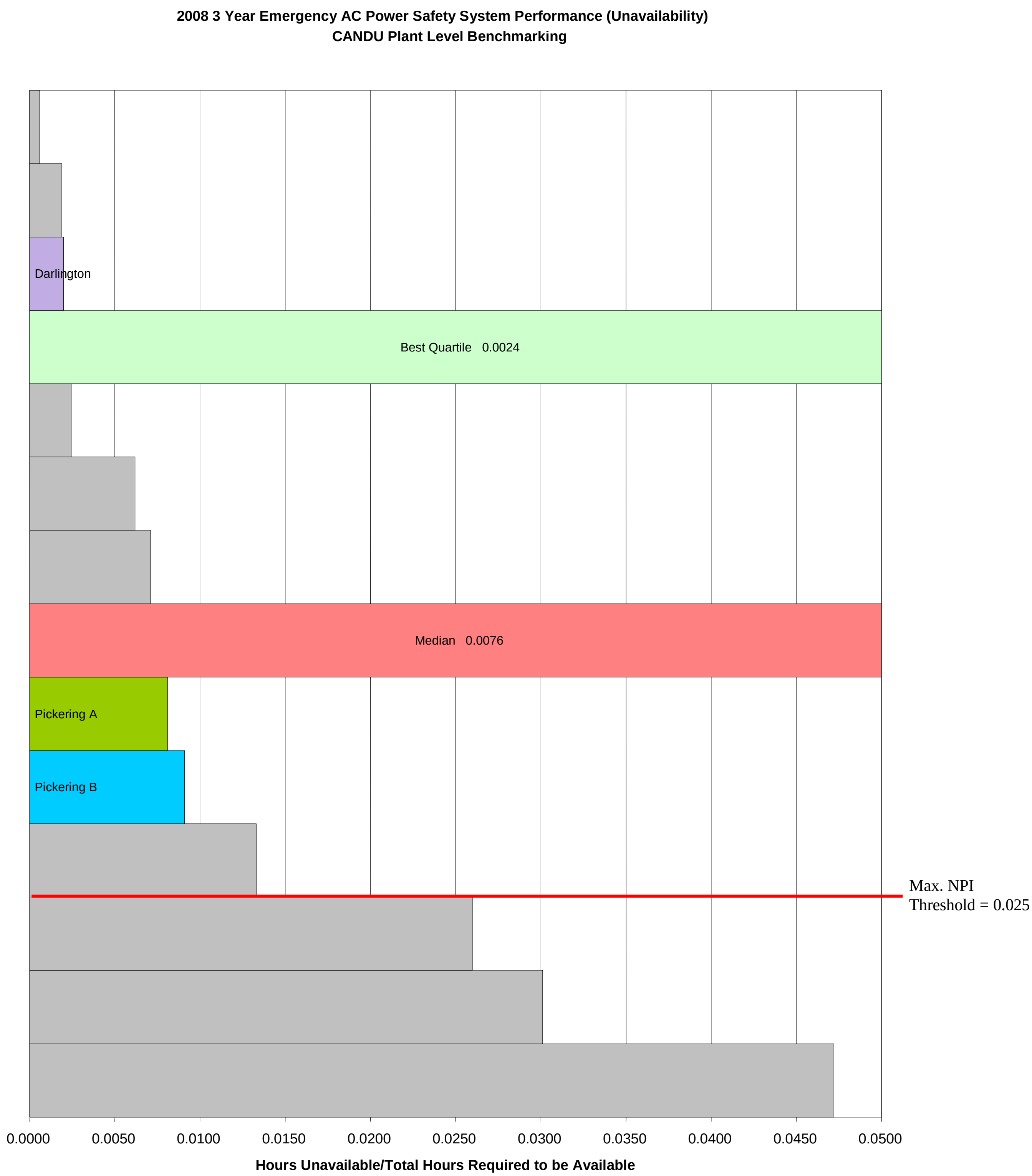
Pickering A

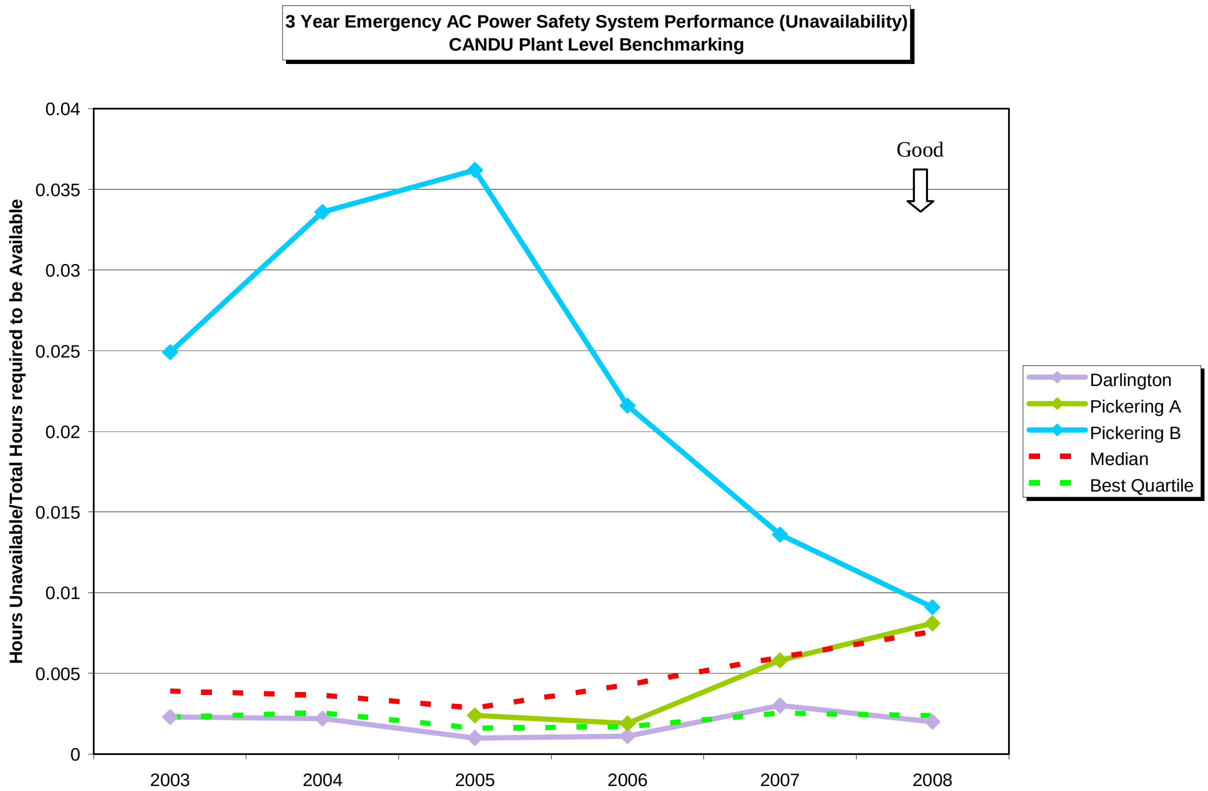
- Pickering A received full WANO NPI points for auxiliary feedwater safety system performance

Pickering B

- Pickering B received full WANO NPI points for auxiliary feedwater safety system performance

3-Year Emergency AC Power Safety Unavailability




3 Year Emergency AC Power Safety System Performance (Unavailability)
CANDU Plant Level Benchmarking
Hours Unavailable/Total Hours required to be Available
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
2003
2004
2005
2006
2007
2008
Good
Darlington
Pickering A
Pickering B
Median
Best Quartile

Observations – 3-Year Emergency AC Power Safety System (CANDU)

- The performance of OPG's units has been shown relative to best quartile, median, and the threshold established by WANO to achieve full WANO NPI points. Since achievement of full WANO NPI points is recognized within the industry as a measure of desirable performance, performance gaps are assessed against full WANO NPI points in addition to median and best quartile. In the case of Emergency AC Power Safety System, there is essentially no mathematical difference between achieving best quartile and median performance

2008 (3-Year Rolling Average)

- Emergency AC power system safety performance at best quartile worldwide CANDU was 0.0024
- Darlington performed at best quartile
- Pickering A performed worse than median
- Pickering B performed worse than median

Trend

- Best quartile was consistently mathematically low, showed downward trend in recent years
- Darlington performed consistently at best quartile
- Pickering A trended worse in 2007 and 2008
- Pickering B improved performance consistently from 2005 to 2008

Factors Contributing to Performance

Darlington

- Darlington received full WANO NPI points for emergency AC power system safety performance therefore no performance gap exists

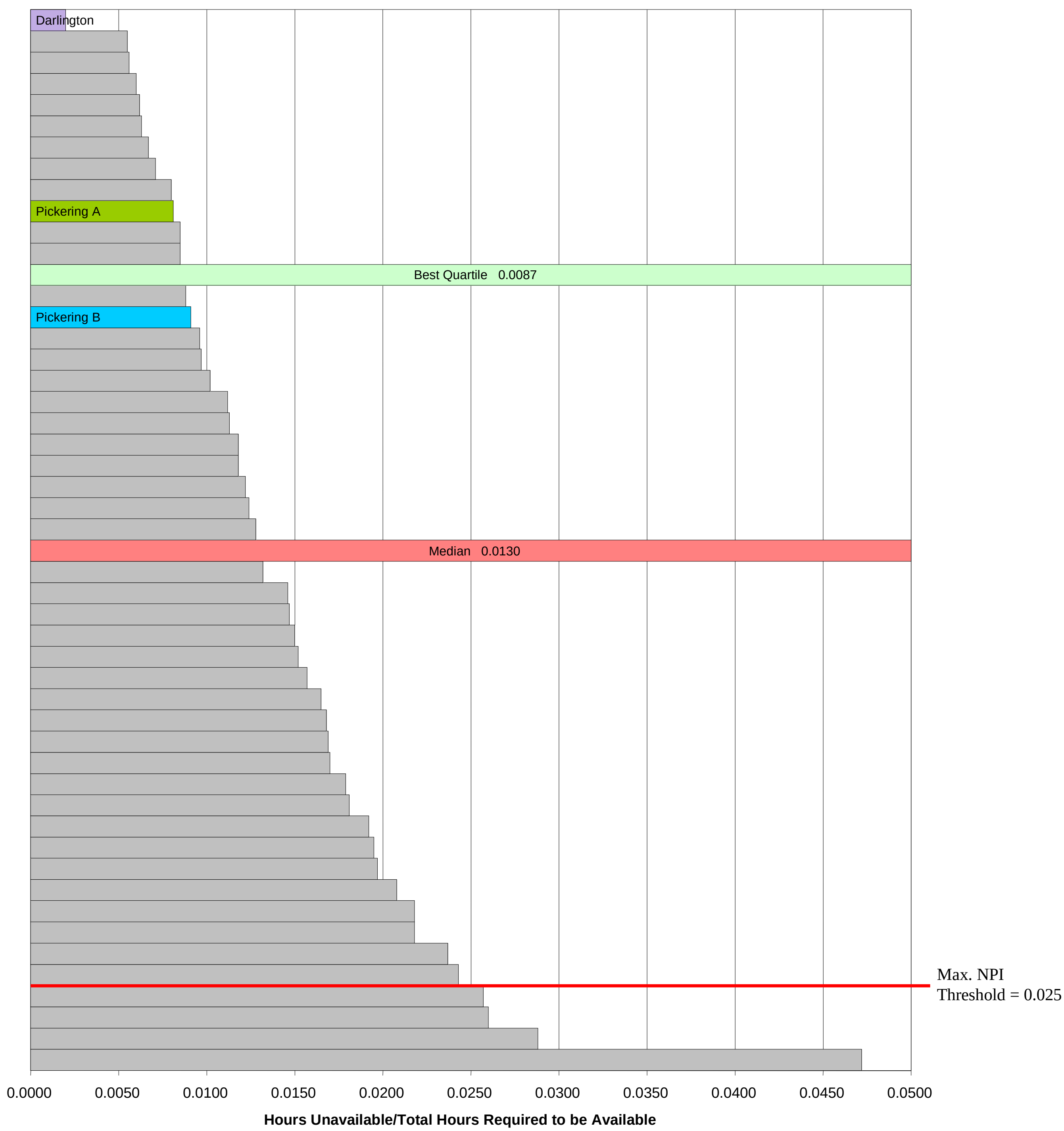
Pickering A

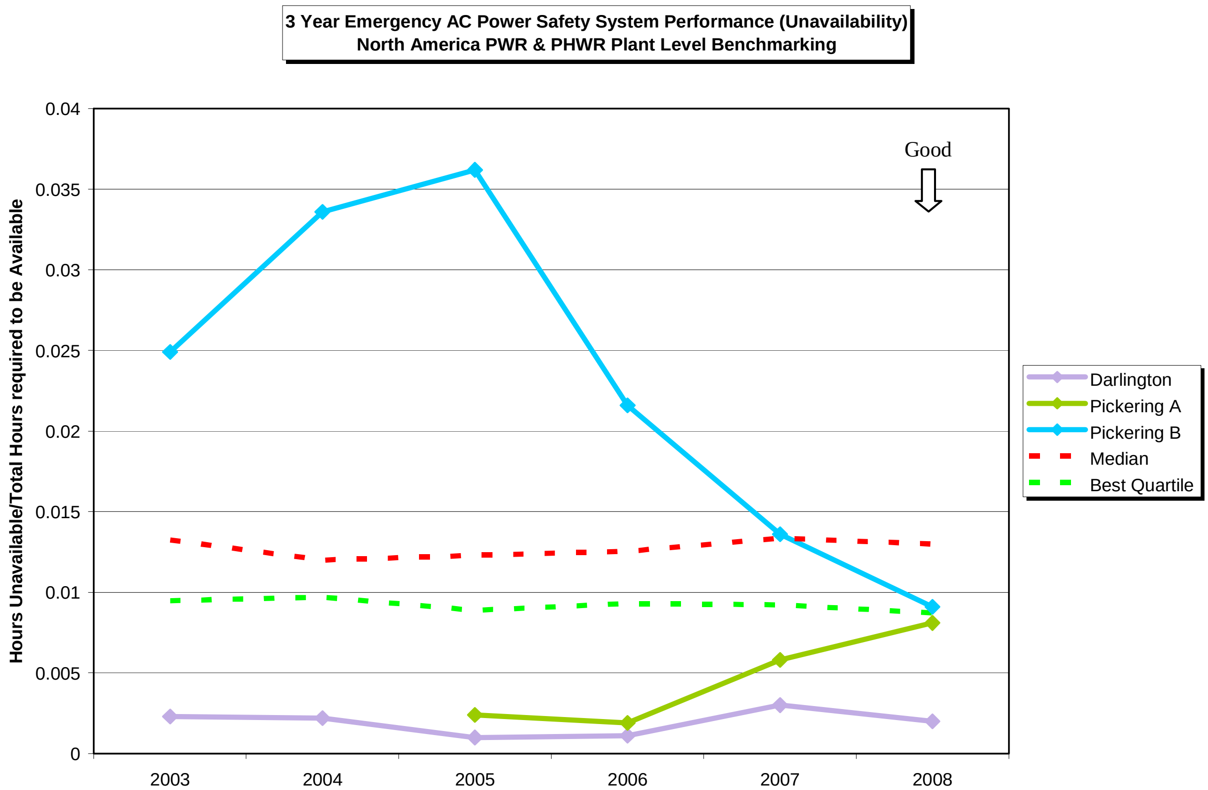
- Pickering A received full WANO NPI points for emergency AC power system safety performance

Pickering B

- Pickering B received full WANO NPI points for emergency AC power system safety performance

2008 3 Year Emergency AC Power Safety System Performance (Unavailability)
North American PWR & PHWR Plant Level Benchmarking




3 Year Emergency AC Power Safety System Performance (Unavailability)
North America PWR & PHWR Plant Level Benchmarking
Hours Unavailable/Total Hours required to be Available
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
2003
2004
2005
2006
2007
2008
Good
Darlington
Pickering A
Pickering B
Median
Best Quartile

Observations – 3-Year Emergency AC Power Safety System (North American PWR/PHWR)

- The performance of OPG's units has been shown relative to best quartile, median, and the threshold established by WANO to achieve full WANO NPI points. Since achievement of full WANO NPI points is recognized within the industry as a measure of desirable performance, performance gaps are assessed against full WANO NPI points in addition to median and best quartile. In the case of Emergency AC Power Safety System, there is essentially no mathematical difference between achieving best quartile and median performance

2008 (3-Year Rolling Average)

- Emergency AC power system safety performance at best quartile North America PWR and PHWR was 0.0087
- Darlington performed at best quartile
- Pickering A performed at best quartile
- Pickering B performed worse than median

Trend

- Best quartile was consistently mathematically low
- Darlington performed consistently at best quartile
- Pickering A trended worse in 2007 and 2008
- Pickering B improved performance consistently from 2005 to 2008

Factors Contributing to Performance

Darlington

- Darlington received full WANO NPI points for emergency AC power system safety performance therefore no performance gap exists

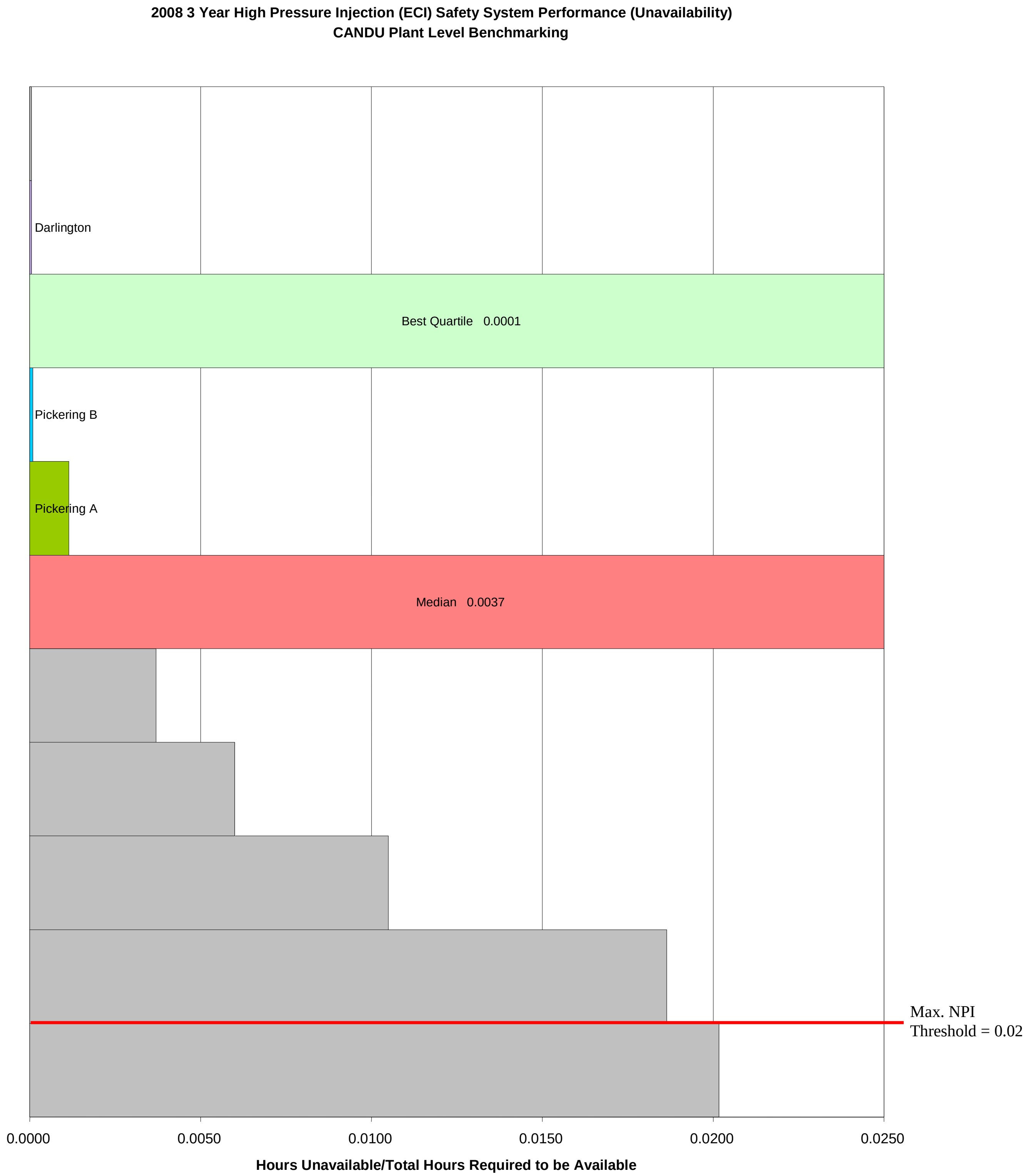
Pickering A

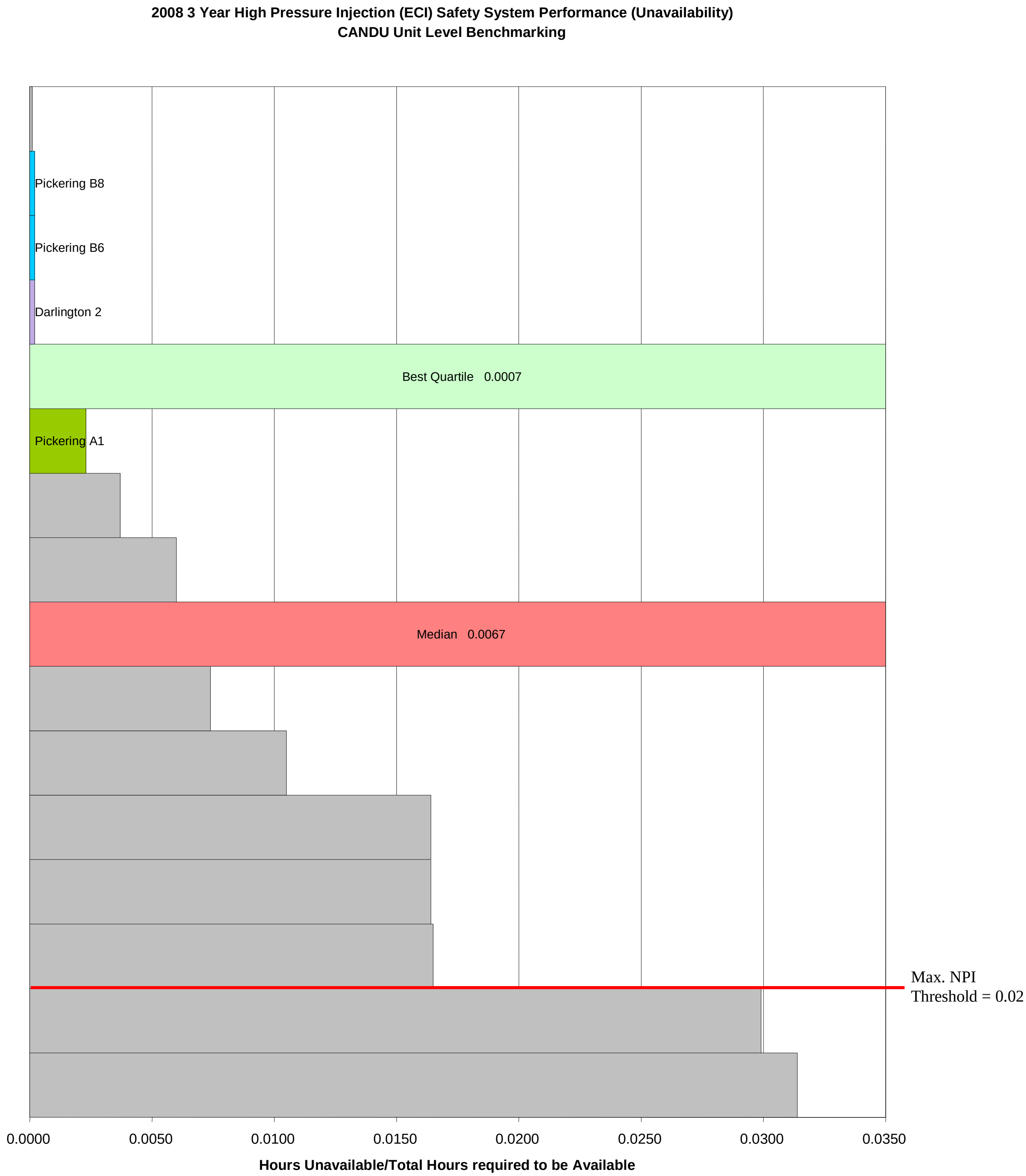
- Pickering A received full WANO NPI points for emergency AC power system safety performance

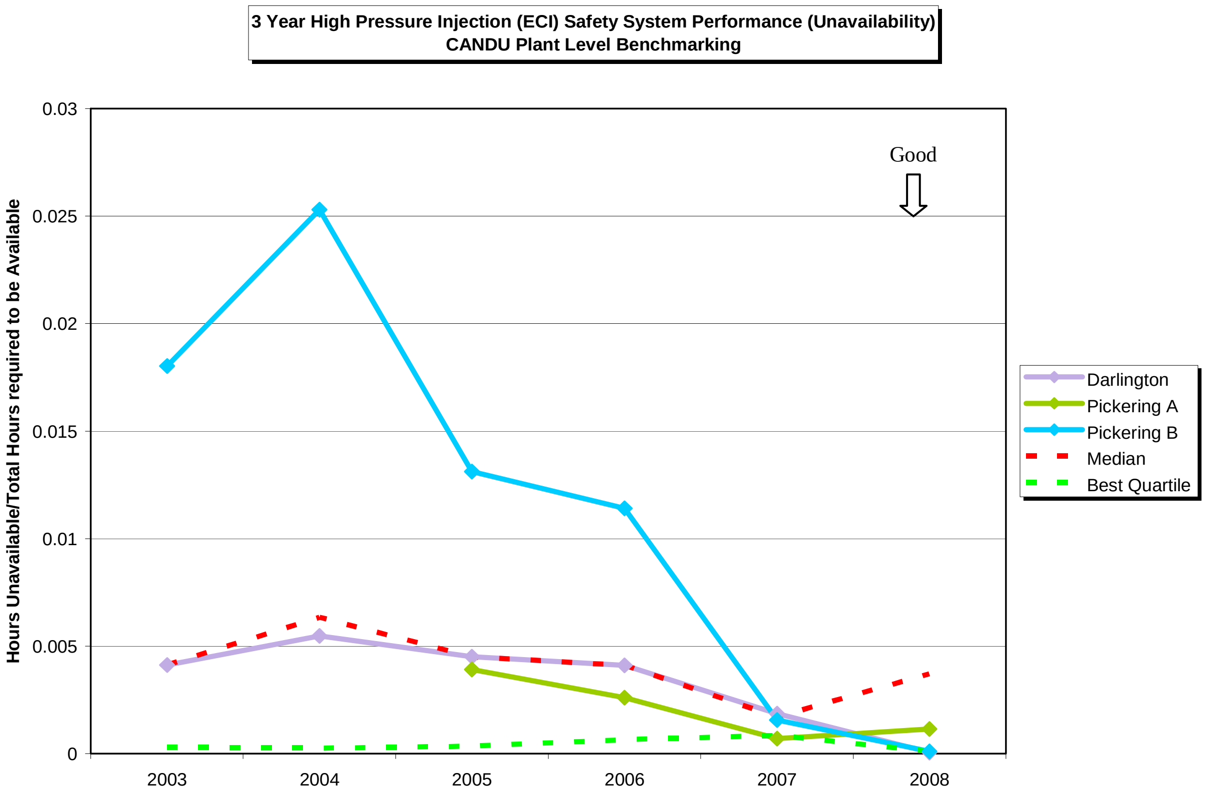
Pickering B

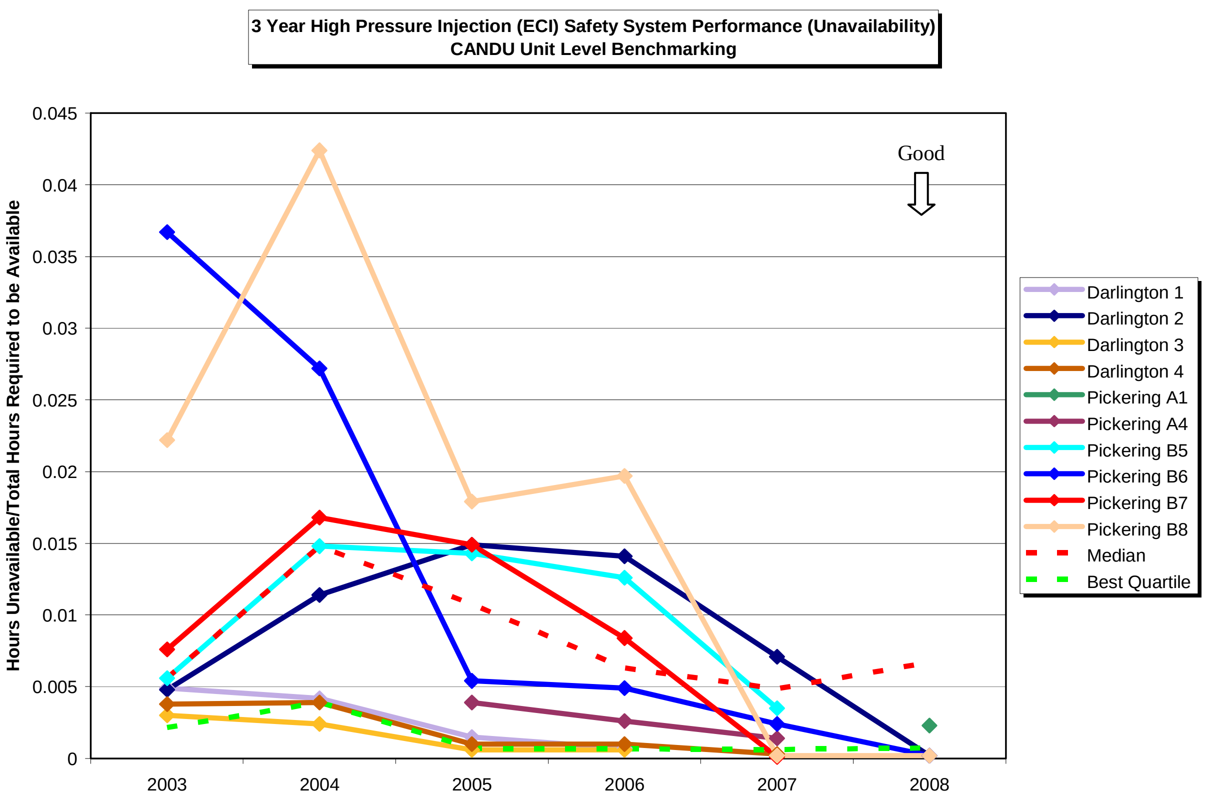
- Pickering B received full WANO NPI points for emergency AC power system safety performance

3-Year High Pressure Safety Injection




2008 3 Year High Pressure Injection (ECI) Safety System Performance (Unavailability)
CANDU Unit Level Benchmarking
Pickering B8
Pickering B6
Darlington 2
Best Quartile 0.0007
Pickering A1
Median 0.0067
Max. NPI
Threshold = 0.02
0.0000
0.0050
0.0100
0.0150
0.0200
0.0250
0.0300
0.0350
Hours Unavailable/Total Hours required to be Available


3 Year High Pressure Injection (ECI) Safety System Performance (Unavailability)
CANDU Plant Level Benchmarking
Hours Unavailable/Total Hours required to be Available
0.03
0.025
0.02
0.015
0.01
0.005
0
2003
2004
2005
2006
2007
2008
Good
Darlington
Pickering A
Pickering B
Median
Best Quartile


3 Year High Pressure Injection (ECI) Safety System Performance (Unavailability)
CANDU Unit Level Benchmarking
Hours Unavailable/Total Hours Required to be Available
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
2003
2004
2005
2006
2007
2008
Good
Darlington 1
Darlington 2
Darlington 3
Darlington 4
Pickering A1
Pickering A4
Pickering B5
Pickering B6
Pickering B7
Pickering B8
Median
Best Quartile

Observations – 3-Year High Pressure Safety Injection Unavailability (CANDU)

- The performance of OPG's units has been shown relative to best quartile, median, and the threshold established by WANO to achieve full WANO NPI points. Since achievement of full WANO NPI points is recognized within the industry as a measure of desirable performance, performance gaps are assessed against full WANO NPI points in addition to median and best quartile. In the case of High Pressure Safety Injection Unavailability, there is essentially no mathematical difference between achieving best quartile and median performance

2008 (3-Year Rolling Average)

- High pressure safety injection system performance at best quartile worldwide CANDU was 0.0001 for plant and .0007 for unit
- Darlington performed at best quartile
- Pickering A performed better than median
- Pickering B performed better than median

Trend

- Best quartile was consistently mathematically low
- Darlington performance trended better over the review period
- Pickering A performance trended better over the review period
- Pickering B performance trended better over the review period

Factors Contributing to Performance

Darlington

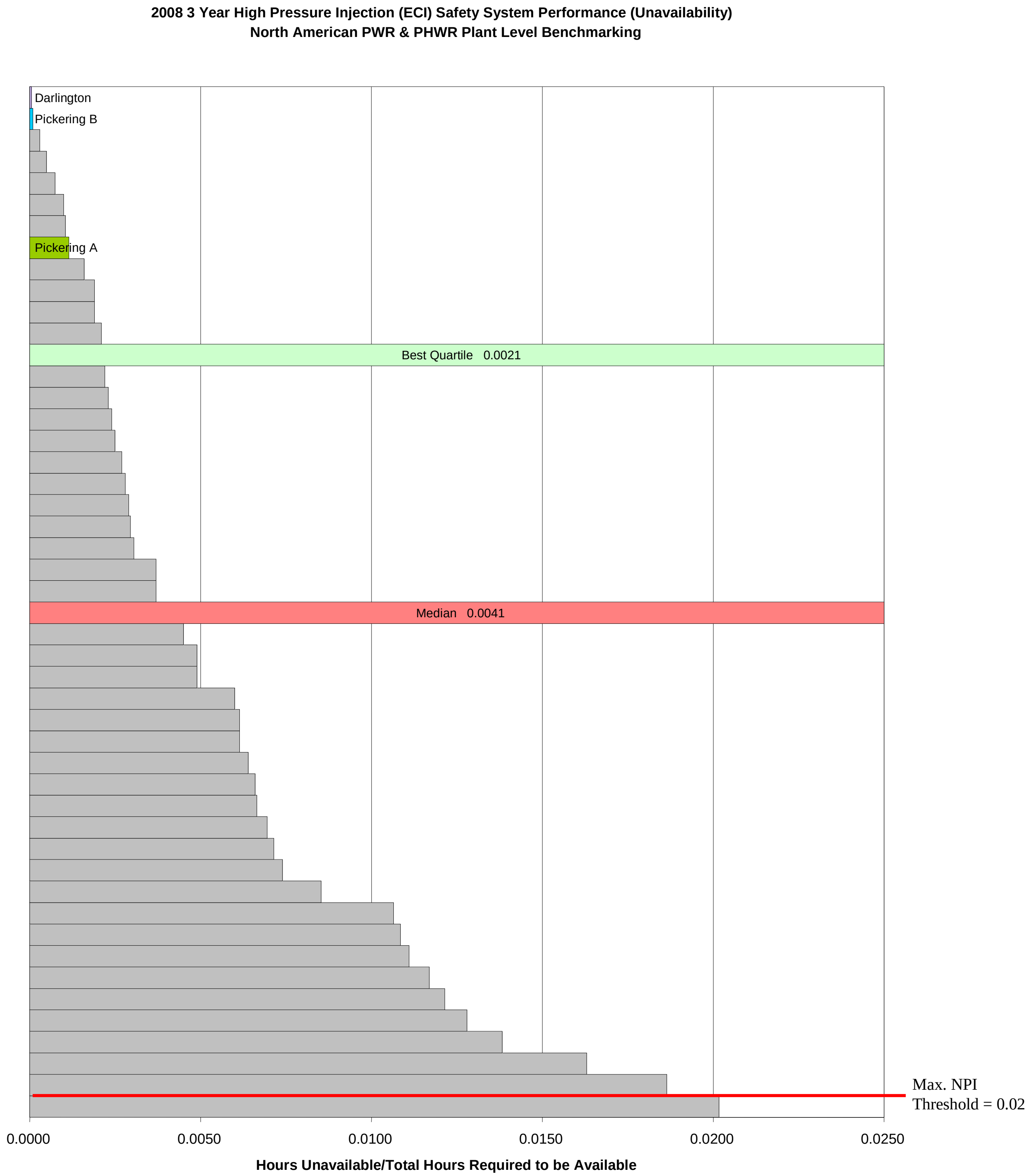
- Darlington received full WANO NPI points for high pressure safety injection system performance therefore no performance gap exists

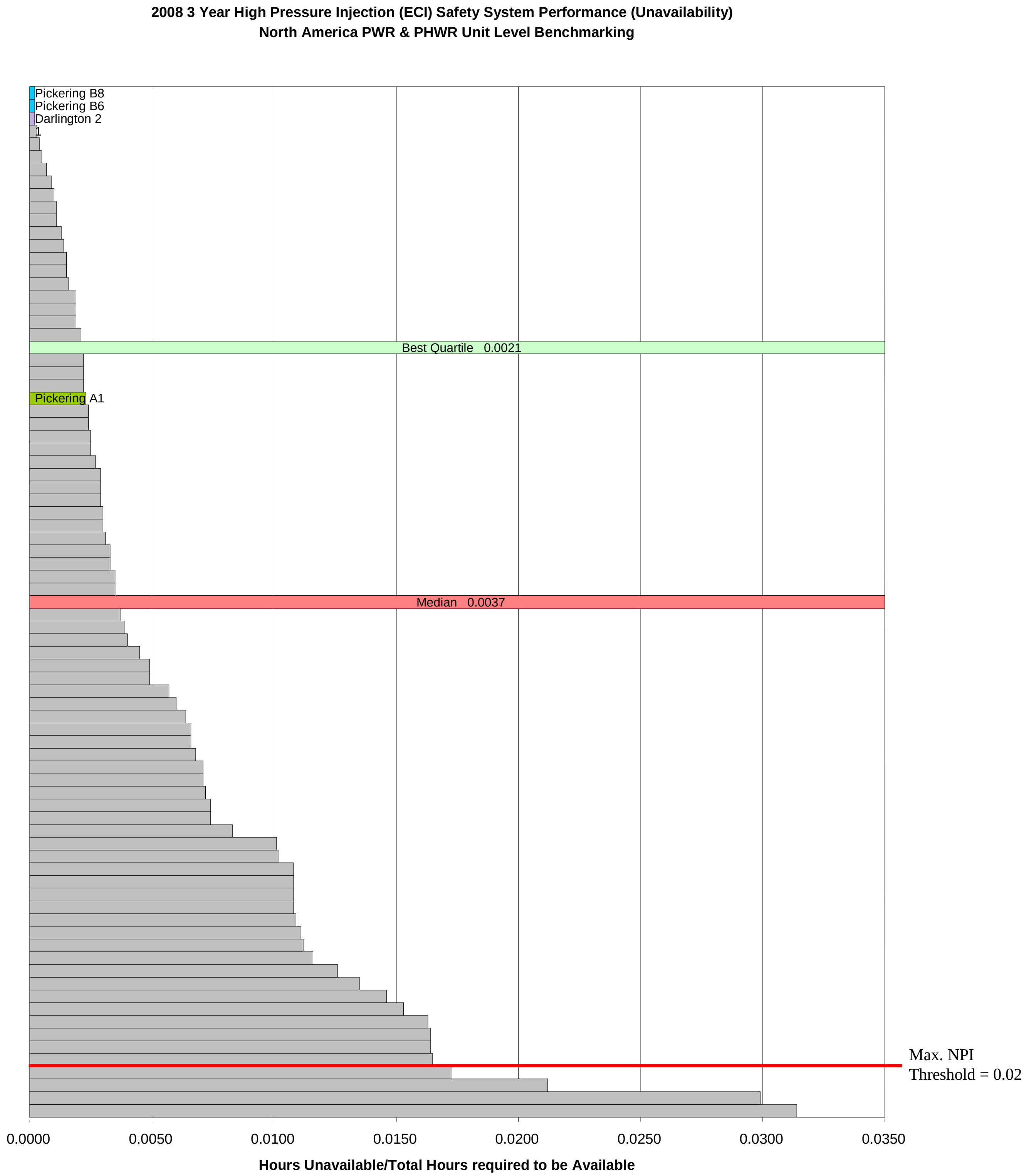
Pickering A

- Pickering A received full WANO NPI points for high pressure safety injection system performance

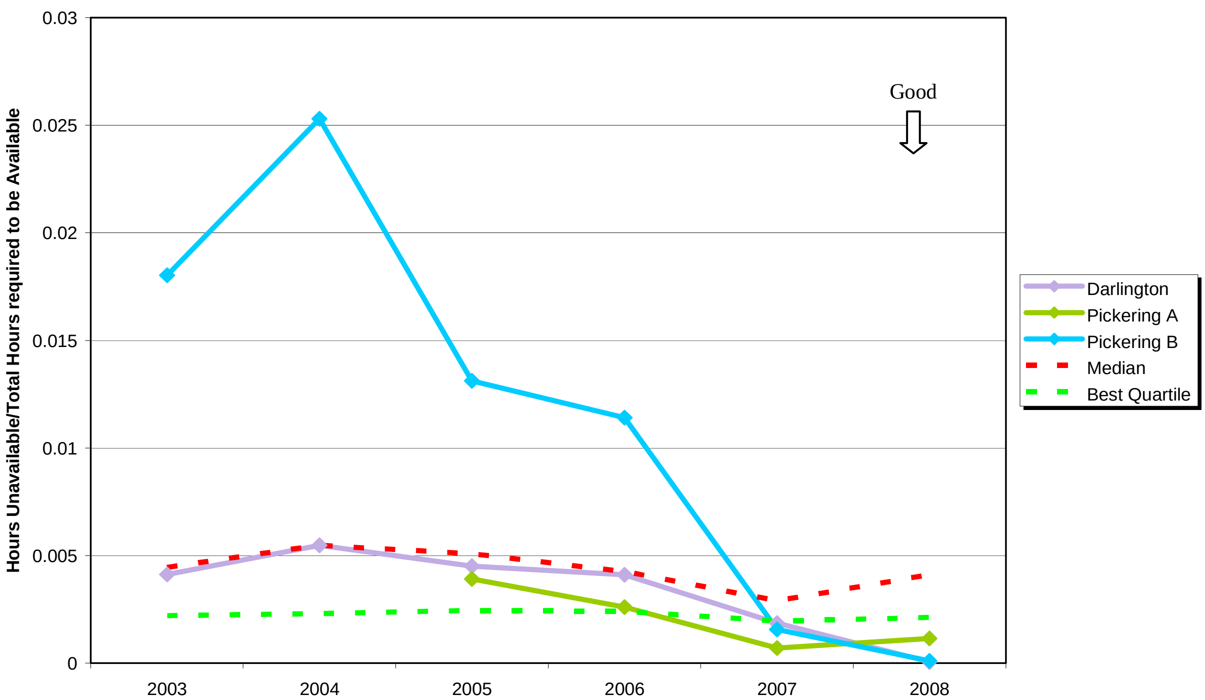
Pickering B

- Pickering B received full WANO NPI points for high pressure safety injection system performance

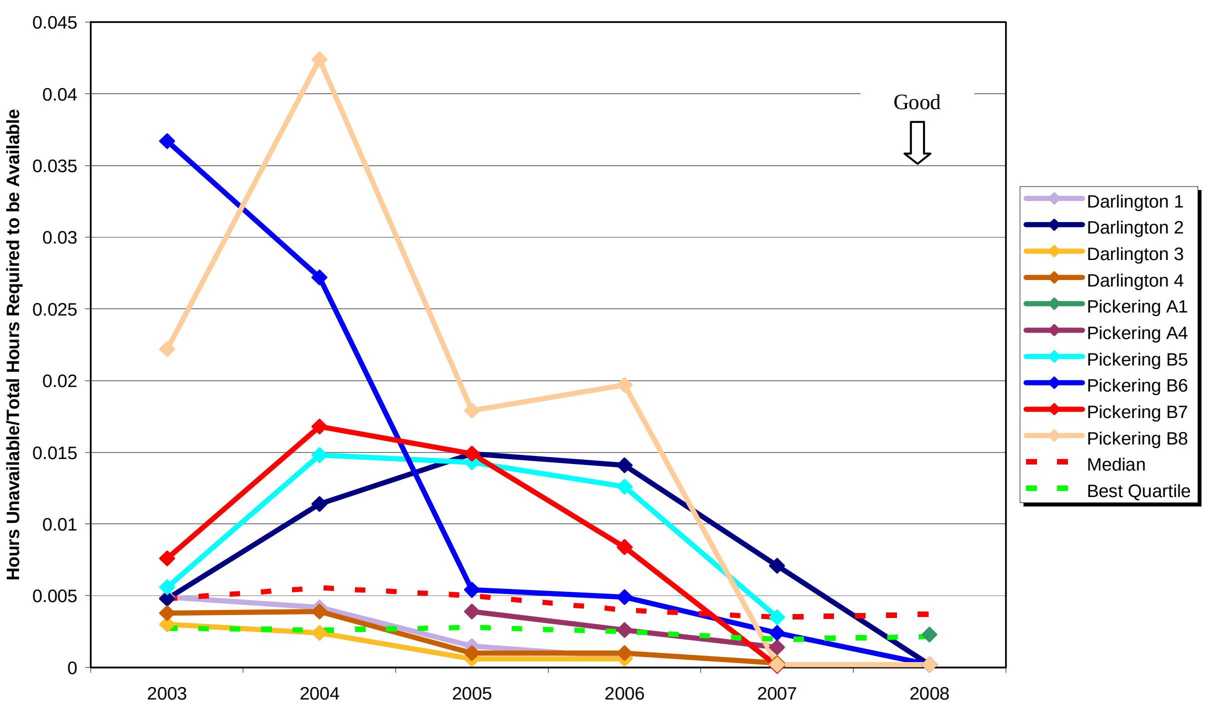

2008 3 Year High Pressure Injection (ECI) Safety System Performance (Unavailability)
North American PWR & PHWR Plant Level Benchmarking
Darlington
Pickering B
Pickering A
Best Quartile 0.0021
Median 0.0041
Max. NPI
Threshold = 0.02
0.0000
0.0050
0.0100
0.0150
0.0200
0.0250
Hours Unavailable/Total Hours Required to be Available


2008 3 Year High Pressure Injection (ECI) Safety System Performance (Unavailability)
North America PWR & PHWR Unit Level Benchmarking
Pickering B8
Pickering B6
Darlington 2
1
Best Quartile 0.0021
Pickering A1
Median 0.0037
Max. NPI
Threshold = 0.02
0.0000
0.0050
0.0100
0.0150
0.0200
0.0250
0.0300
0.0350
Hours Unavailable/Total Hours required to be Available

3 Year High Pressure Injection (ECI) Safety System Performance (Unavailability)
North America PWR & PHWR Plant Level Benchmarking



3 Year High Pressure Injection (ECI) Safety System Performance (Unavailability)
North American PWR & PHWR Unit Level Benchmarking



Observations – 3-Year High Pressure Safety Injection Unavailability (North American PWR/PHWR)

- The performance of OPG's units has been shown relative to best quartile, median, and the threshold established by WANO to achieve full WANO NPI points. Since achievement of full WANO NPI points is recognized within the industry as a measure of desirable performance, performance gaps are assessed against full WANO NPI points in addition to median and best quartile. In the case of High Pressure Safety Injection Unavailability, there is essentially no mathematical difference between achieving best quartile and median performance

2008 (3-Year Rolling Average)

- High pressure injection system safety performance at best quartile North American PWR and PHWR was 0.0021 for plant and .0021 for unit
- Darlington performed at best quartile
- Pickering A performed at best quartile
- Pickering B performed at best quartile

Trend

- Best quartile was consistently mathematically low
- Darlington performance trended better over the review period
- Pickering A performance trended better over the review period
- Pickering B performance trended better over the review period

Factors Contributing to Performance

Darlington

- Darlington received full WANO NPI points for high pressure injection system safety performance and therefore no performance gap exists

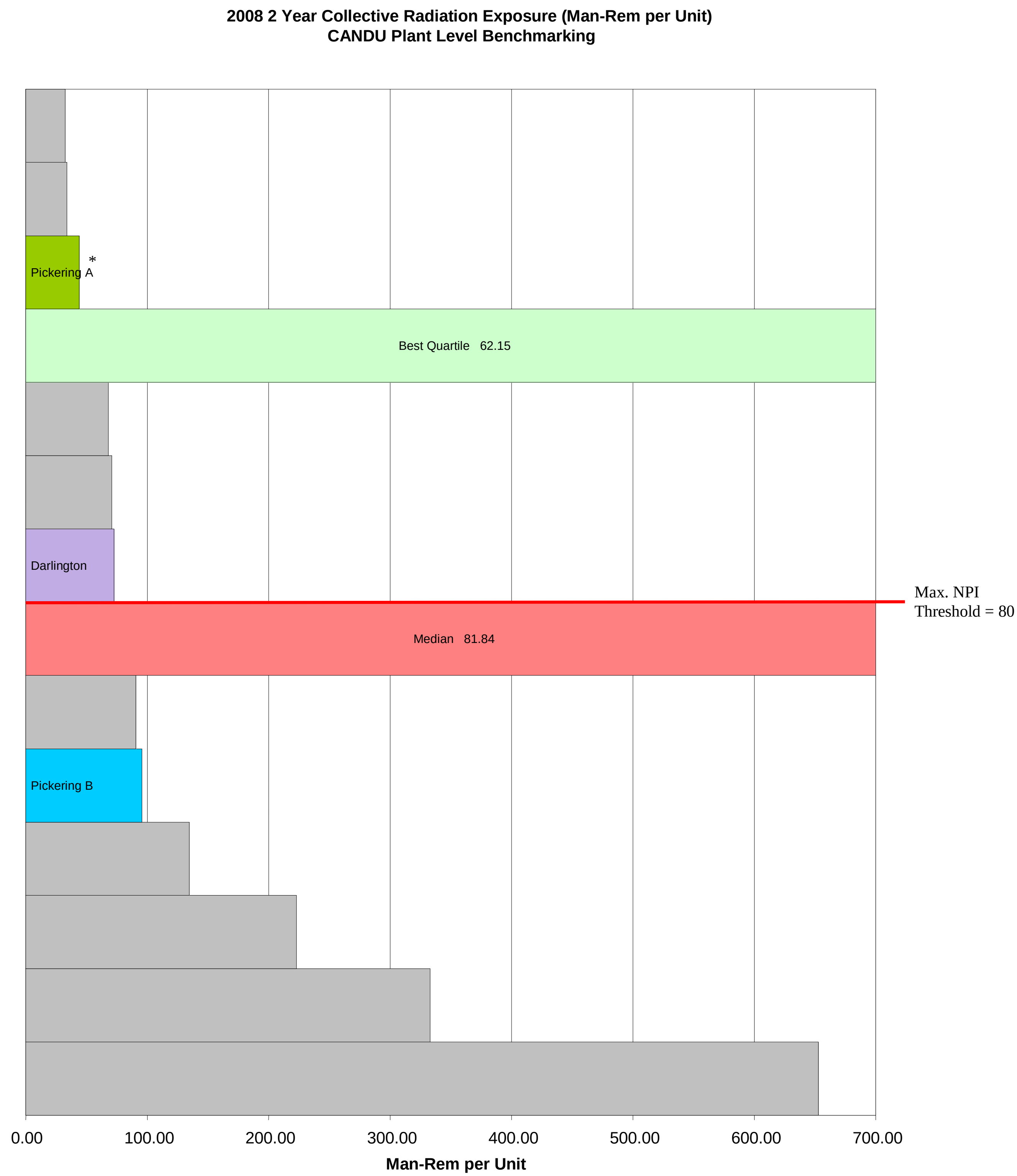
Pickering A

- Pickering A received full WANO NPI points for high pressure injection system safety performance

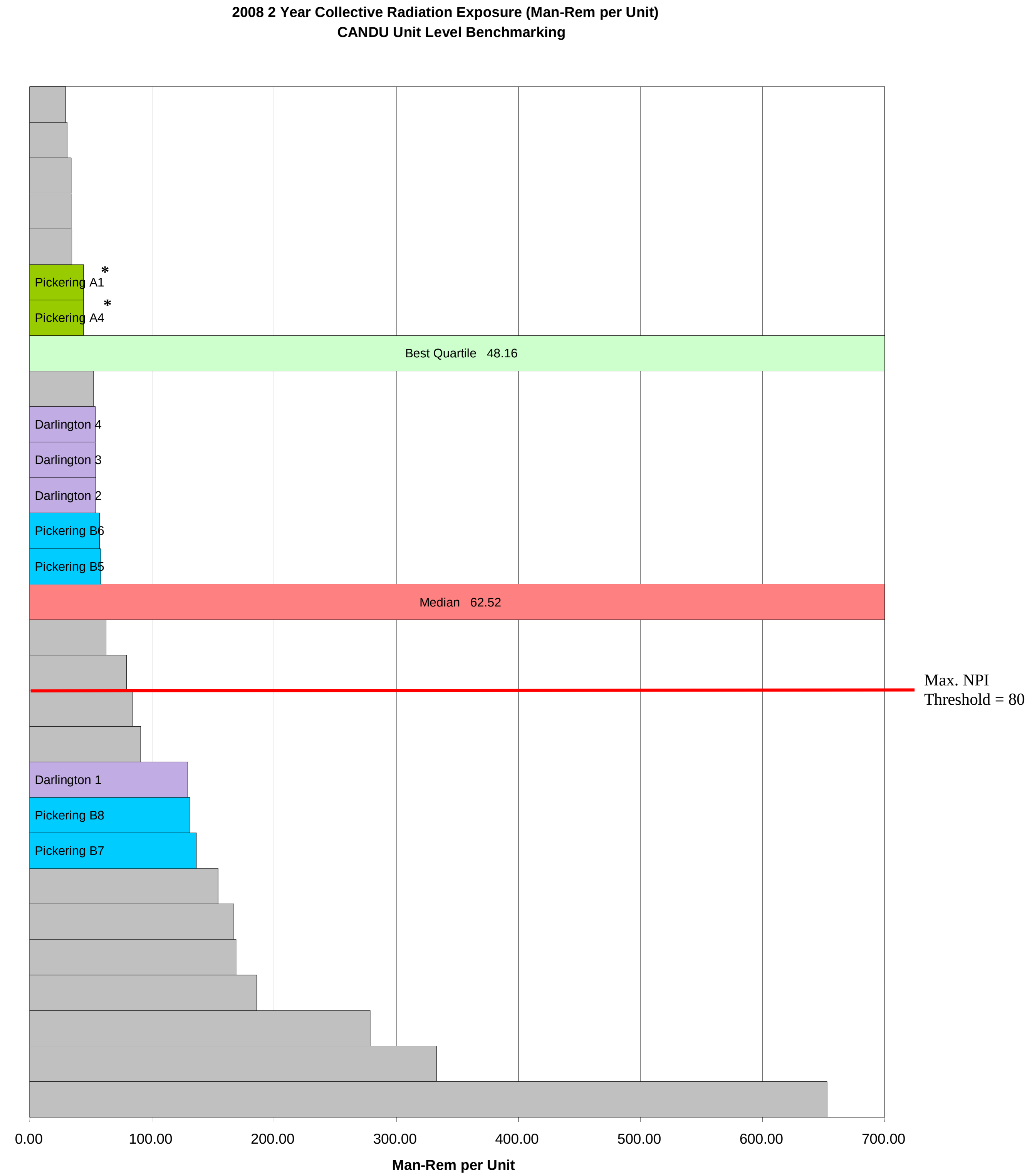
Pickering B

- Pickering B received full WANO NPI points for high pressure injection system safety performance

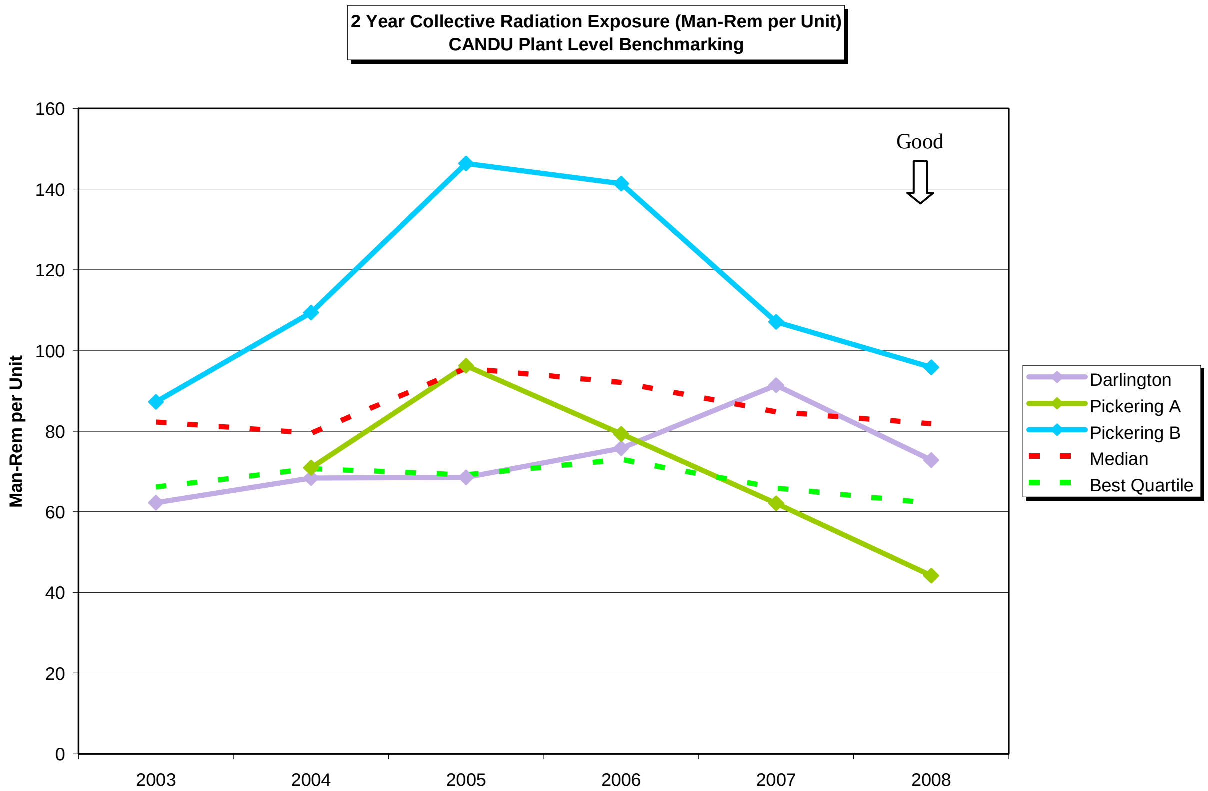
2-Year Collective Radiation Exposure

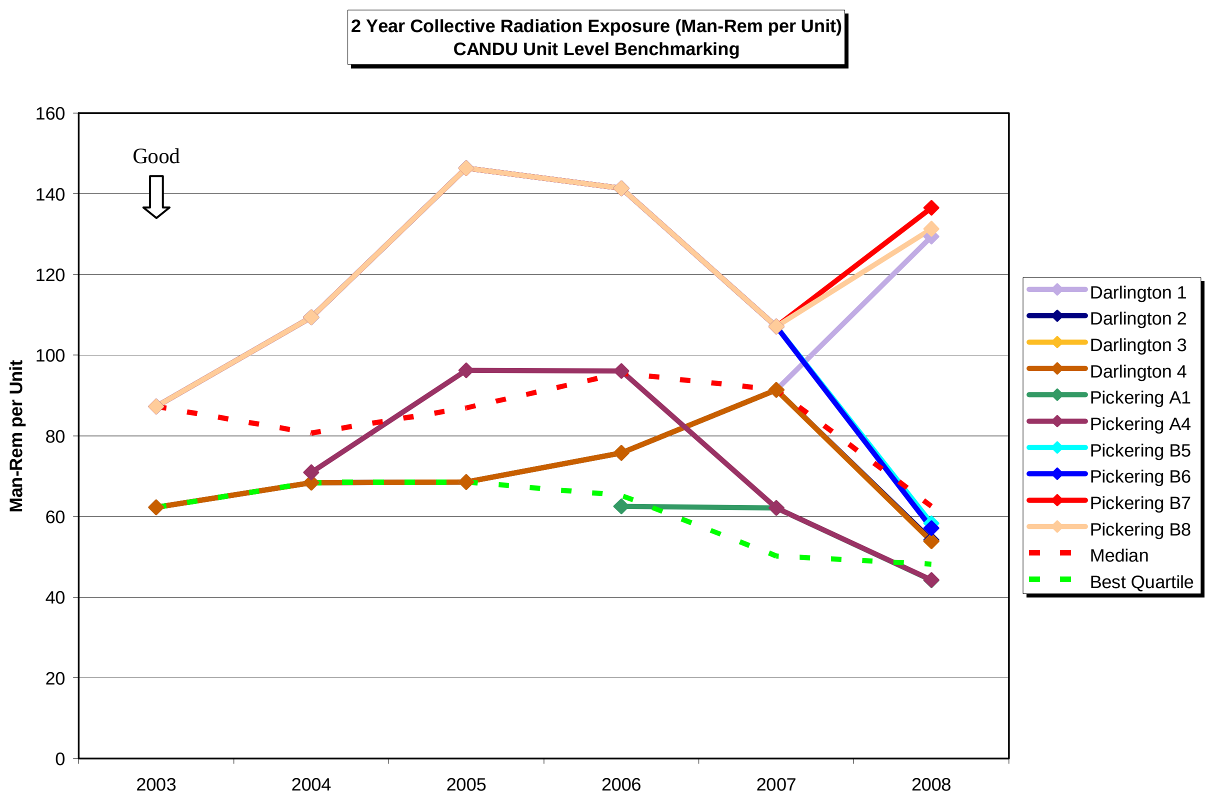


* See Observations and Analysis for information on Pickering A performance



*** See Observations and Analysis for information on Pickering A performance**


2 Year Collective Radiation Exposure (Man-Rem per Unit)
CANDU Plant Level Benchmarking
Good
Man-Rem per Unit
160
140
120
100
80
60
40
20
0
2003
2004
2005
2006
2007
2008
Darlington
Pickering A
Pickering B
Median
Best Quartile


2 Year Collective Radiation Exposure (Man-Rem per Unit)
CANDU Unit Level Benchmarking
Good
Man-Rem per Unit
160
140
120
100
80
60
40
20
0
2003
2004
2005
2006
2007
2008
Darlington 1
Darlington 2
Darlington 3
Darlington 4
Pickering A1
Pickering A4
Pickering B5
Pickering B6
Pickering B7
Pickering B8
Median
Best Quartile

Observations – 2-Year Collective Radiation Exposure (CANDU)

- The performance of OPG's units has been shown relative to best quartile, median, and the threshold established by WANO to achieve full WANO NPI points. Since achievement of full WANO NPI points is recognized within the industry as a measure of desirable performance, performance gaps are assessed against full WANO NPI points in addition to median and best quartile

2008 (2-Year Rolling Average)

- Darlington is currently better than median (81.8.) but worse than the best quartile (62.2)
- Pickering A appears in the best quartile (see below for change in reporting)
- Pickering B is currently worse than the median

Trend

- In 2007, Darlington had two planned outages, D721 and D741, and three forced outages. Collective Radiation Exposure (CRE) performance was 102.7 man-rem/unit vs a target of 94
- In 2008, Darlington had one planned outage, D811 and one forced outage D821 resulting in a CRE performance of 43.4 man-rem/unit vs. a target of 75 due to some significant ALARA improvements in shielding and reducing vault tritium during outages. Even with the extensive amount of work being performed during the planned outage, Darlington scored full NPI points in 2008
- The 2-year CRE CANDU unit level benchmarking graph provided shows an increasing trend in CRE since 2003. However, the radiation levels within the vault and associated systems have been decreasing since 2004. This is attributed to the change in pH level from 10.8 to 10.2, and the introduction of submicron filtration in the primary heat transport (PHT). The reason for the increasing trend in CRE is increased workload associated with outages, i.e. single fuel channel replacement (SFCR), horizontal flux detector (HFD) cable replacement, and feeder inspections and replacement
- In 2009, WANO accepted Darlington's request to use a three-year rolling average for determining NPI. This change does not impact the WANO NPI analysis in this report but will impact future benchmarking comparisons
- In 2007, Pickering A CRE was measured by dividing total plant dose by four units. This is different from how other plants measure CRE – based only on operating units. Two of the units had been laid up for about a decade. Since 2007, they had been undergoing a process called safe storage which required some dose expenditure, but significantly less than for an operating unit. If only two units were accounted for, CRE would have changed from 53.7 (full NPI points) to 107 man-rem/unit
- In 2008, the CRE measure was changed to align with industry standard and to reflect two operating units, however, CRE performance benefited short term when the planned outage for Unit 4 (P841) was deferred from 2008 until Q1 2009. As a result, Pickering A once again received full NPI points based on a CRE performance of 35 man-rem/unit. Additionally, human performance is also a factor both in direct worker radiation protection performance and in cases where human performance events triggered forced outages (also impacting forced loss rate) and resulting in increased radioactive work requirements

- Factoring in a 2-unit CRE in 2007, combined with 2008 CRE, would drop Pickering A to second quartile vs CANDUs, and third quartile vs North American PWRs and PHWRs
- Beginning in 2008, CRE performance began to be reported individually by unit
- The 2009 CRE performance in Q1 is 99.2 man-rem/unit and is expected to reach about 129.5 by year-end, reflecting the impact of a unit maintenance outage
- Pickering A plant age (oldest OPG units) and design (including more stellite components and poor dryer performance) results in higher radiation source term and dose rates
- Pickering B had one planned outage in 2007, P761, and one forced outage, P751 that resulted in a year end CRE performance of 93.1 man-rem/unit vs. a target of 110.8. Included in P761 was an Single Fuel Channel Replacement which resulted in a dose of 26 rem
- In 2008, Pickering B had two planned outages, P871 and P881, which resulted in a year-end CRE performance of 98.8 man-rem/unit vs a target of 98.8. Included in P871 was a Single Fuel Channel Replacement which resulted in a dose of 37 rem
- The 2-year CRE CANDU unit level benchmarking graph provided shows a decreasing trend in CRE since 2005 for Pickering B. This is believed to be attributed to the change in pH from 10.8 to 10.2 and the introduction of submicron filtration in the PHT system. Like Darlington, Pickering B has been seeing a decreasing trend in radiation levels inside their reactor buildings and associated systems since 2005

Factors Contributing to Performance

- The number of outages are a significant driver of CRE due to extended exposure during specific maintenance activities performed only during outages. Other key performance drivers for this metric include: source term, outage duration, human performance, and technology

Darlington

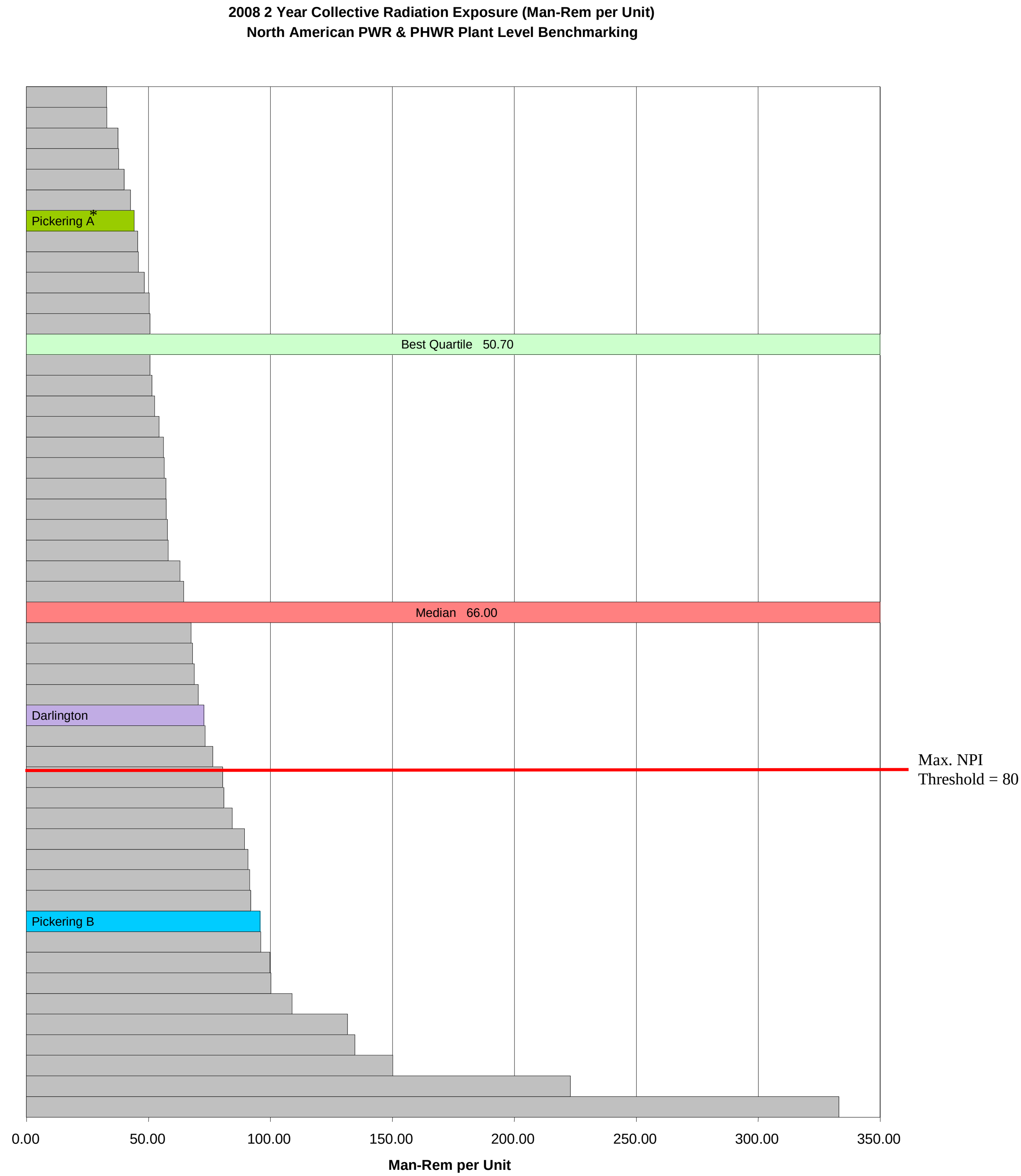
- Darlington may be able to reach best quartile vs CANDUs with relatively small reduction in dose. For example, reduction of vault tritium levels would enable less restrictive protective equipment which, in turn, enables shorter work times within the vault and less radiation exposure

Pickering A

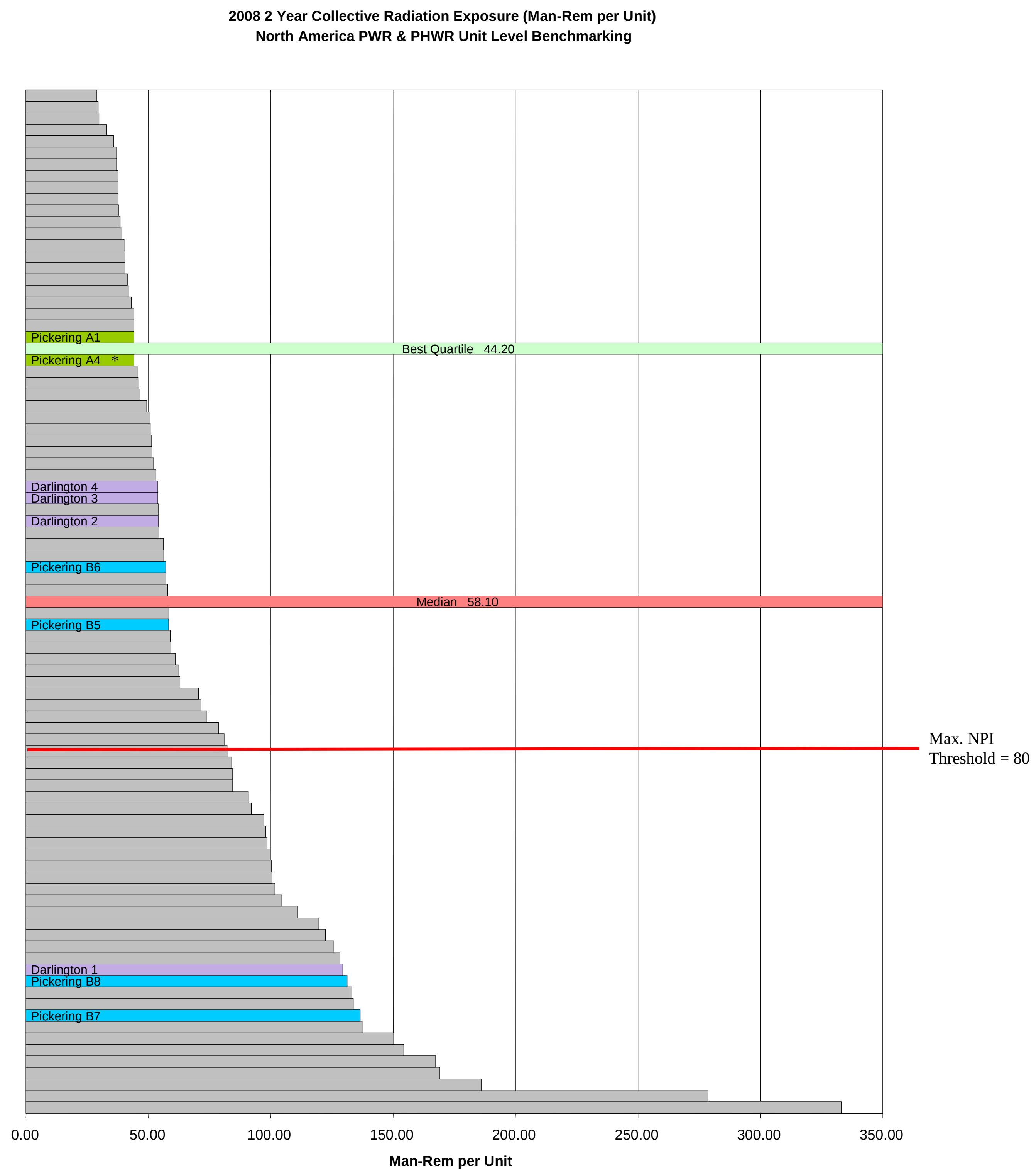
- Reviewing Pickering A outage plans for 2010 through 2012, we should expect few NPI points for CRE to be achieved due to outage scope combined with high source term (probably third quartile vs CANDUs and fourth quartile vs North American PWRs and PHWRs)

Pickering B

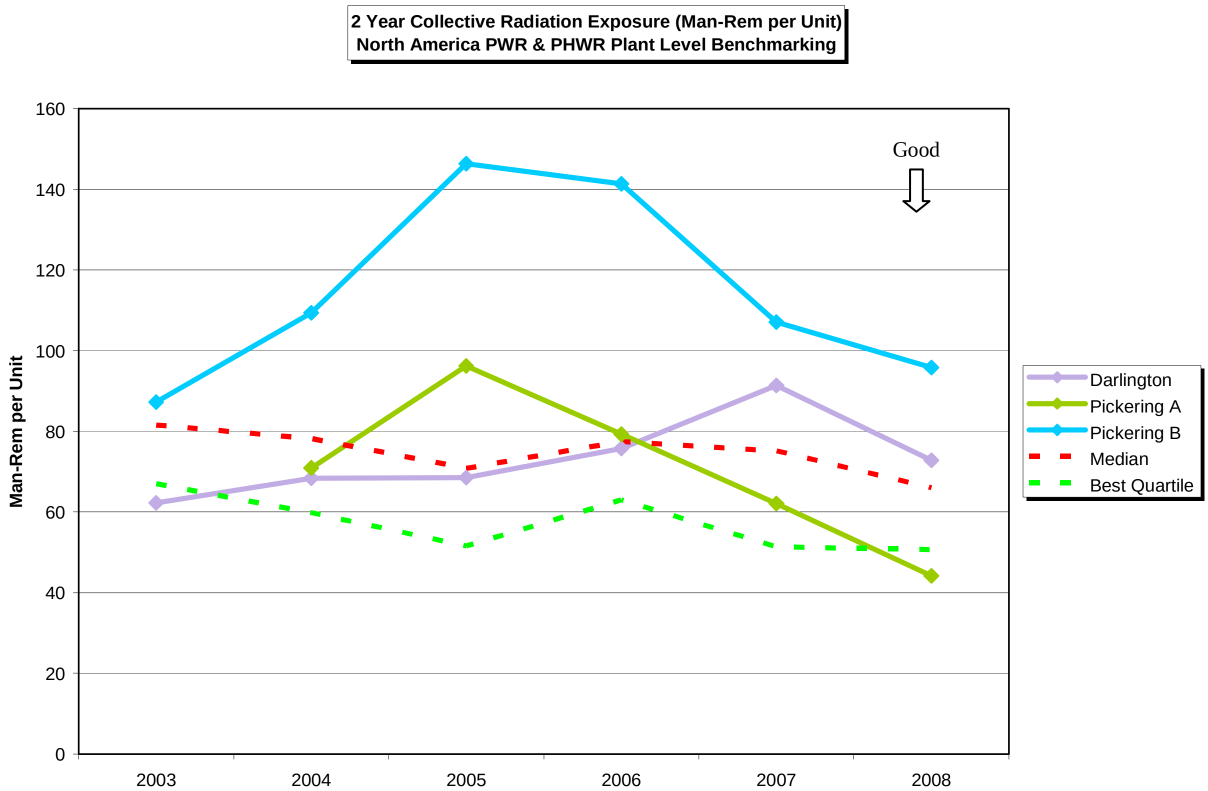
- Proceeding with continued operations may require increased maintenance outage activities, negatively impacting CRE performance
- Implementation of dose reduction technologies can mitigate to some extent, however the overall plant age and design works against it. No technology improvements have been identified which would enable reduction of radiation source term sufficient to reach top quartile, due to long Cobalt 60 decay time combined with limited number of years of operation under life extension

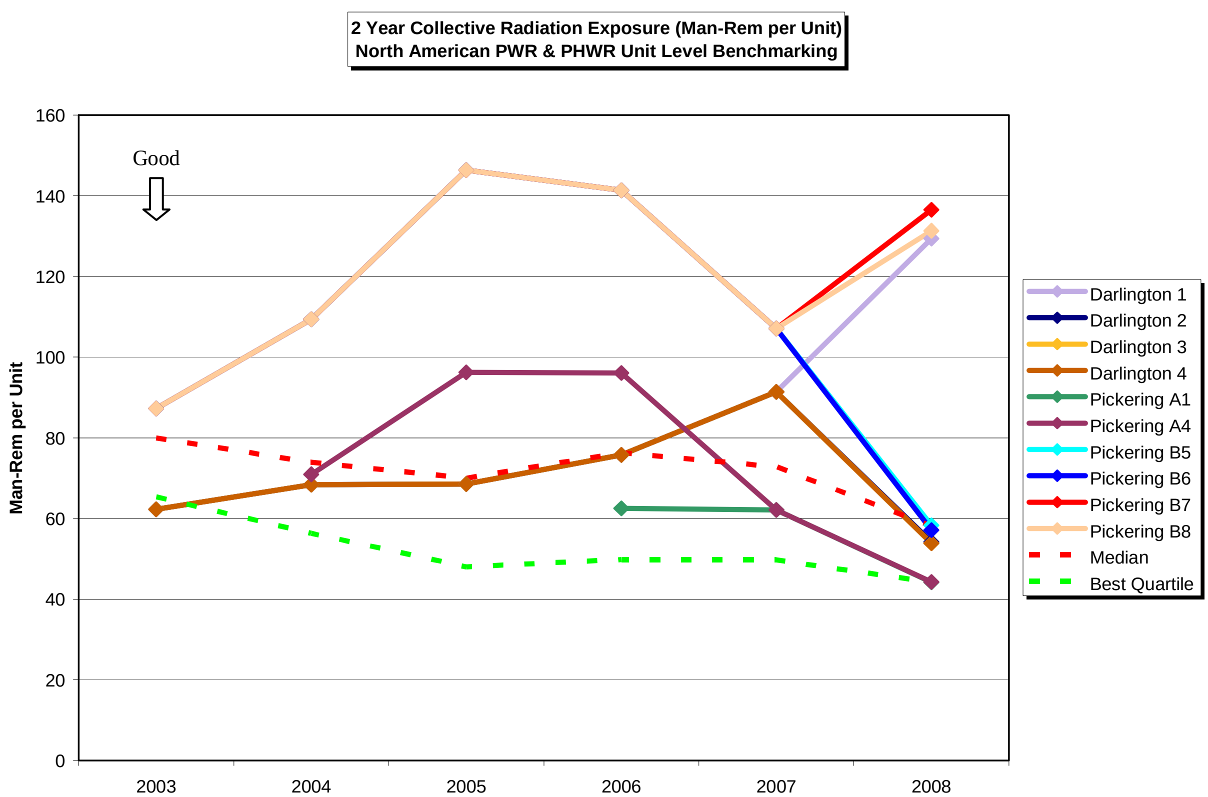


* See Observations and Analysis for information on Pickering A performance



* See Observations and Analysis for information on Pickering A performance


2 Year Collective Radiation Exposure (Man-Rem per Unit)
North America PWR & PHWR Plant Level Benchmarking
Man-Rem per Unit
0
20
40
60
80
100
120
140
160
2003
2004
2005
2006
2007
2008
Good
Darlington
Pickering A
Pickering B
Median
Best Quartile


2 Year Collective Radiation Exposure (Man-Rem per Unit)
North American PWR & PHWR Unit Level Benchmarking
Man-Rem per Unit
0
20
40
60
80
100
120
140
160
2003
2004
2005
2006
2007
2008
Good
Darlington 1
Darlington 2
Darlington 3
Darlington 4
Pickering A1
Pickering A4
Pickering B5
Pickering B6
Pickering B7
Pickering B8
Median
Best Quartile

Observations – 2-Year Collective Radiation Exposure (North American PWR and PHWR)

- The performance of OPG's units has been shown relative to best quartile, median, and the threshold established by WANO to achieve full WANO NPI points. Since achievement of full WANO NPI points is recognized within the industry as a measure of desirable performance, performance gaps are assessed against full WANO NPI points in addition to median and best quartile

2008 (2-Year Rolling Average)

- Best quartile for all North American PWR and PHWRs was 50.7, with a median of 66 man-rem/unit
- Darlington is below median at the plant level; however units 2, 3, and 4 performed above median at the unit level. Unit 1 performed below median
- Pickering A is in the best quartile (see CANDU panel for information regarding performance measuring)
- Pickering B performed below median at the plant level. Unit 6 performed above the median and unit 5, 7, and 8 performed below the median at the unit level

Trend

- See trend analysis section of CANDU panel

Factors Contributing to Performance

- Key performance drivers for this metric include: source term, outage duration, human performance, and technology

Darlington

- Darlington will not be able to reach top quartile vs North American PWRs and PHWRs without substantially reducing the Cobalt 60 source term. This will require either major gains from use of new macroporous resins (untested in CANDUs), replacement of stellite FM ram balls with another material (not yet tested or qualified) along with time for radioactive decay of existing Cobalt 60, or installation of new FM filtration and IX combined with time for decay, or some other improvement technology or initiative

Pickering A

- Reviewing Pickering A outage plans for 2010 through 2012, we should expect few NPI points for CRE to be achieved due to outage scope combined with high source term (probably third quartile vs CANDUs and fourth quartile vs North American PWRs and PHWRs)

Pickering B

- Proceeding with continued operations may increase maintenance outage activities negatively impacting CRE. Implementation of dose reduction technologies can mitigate to some extent, however the overall plant age and design works against it. Currently, no technology improvements have been identified which would enable reduction of radiation source term sufficient to reach best quartile vs PWRs and PHWRs plants, due to long Cobalt 60 decay time

General Comments Regarding Technology

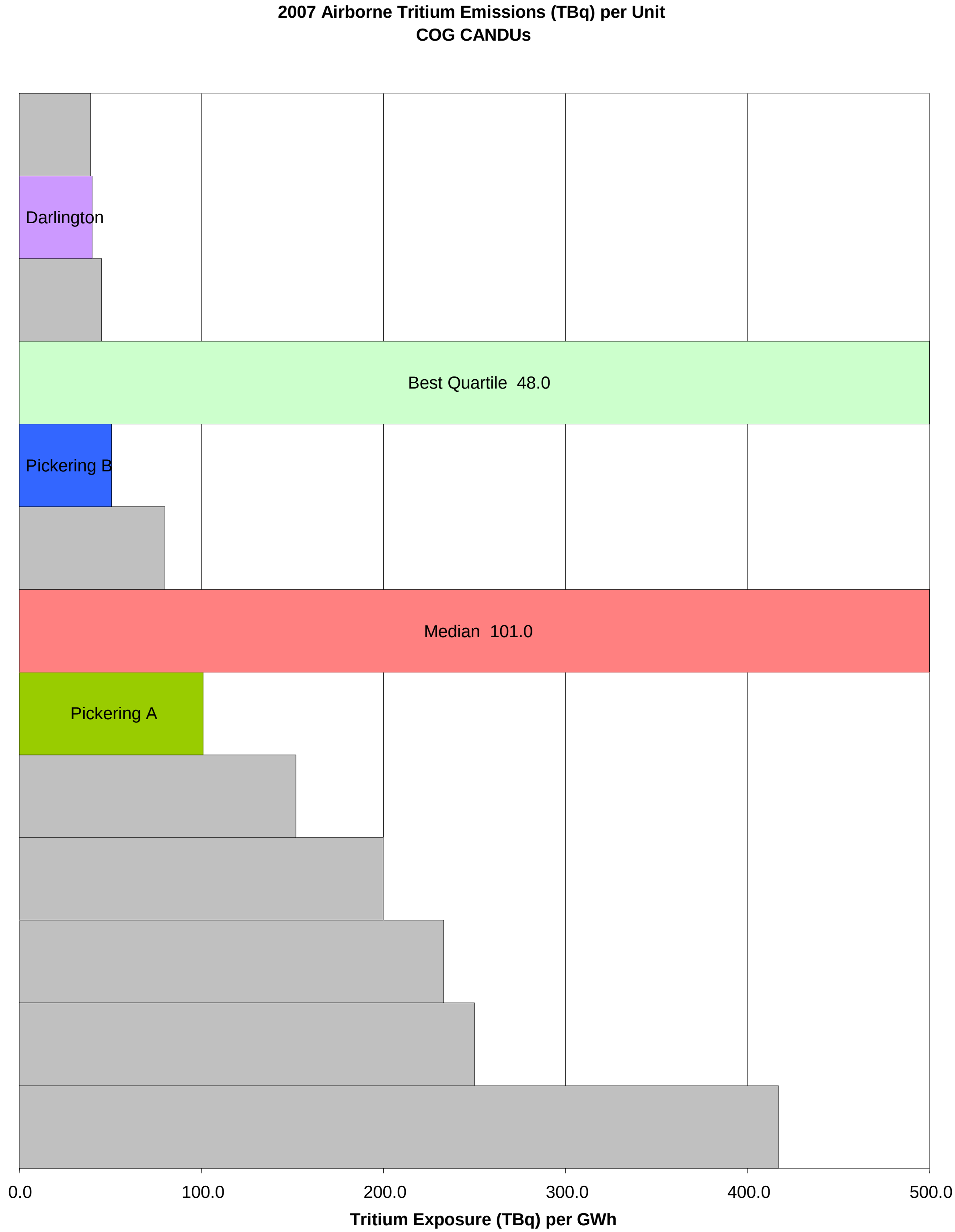
PWRs

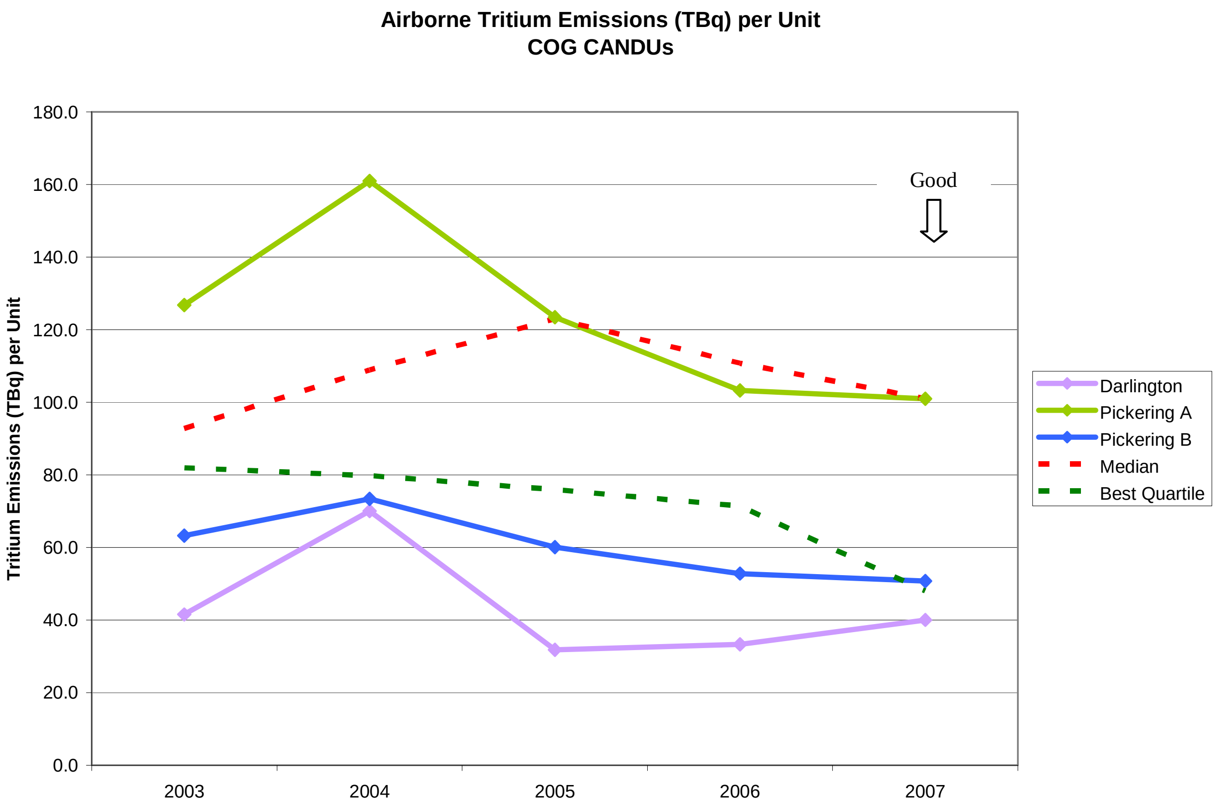
- Over the last 20 years, industry groups along with PWR station chemistry and RP groups have worked together to find the best methods for reducing source term to reduce worker dose ALARA (as noted below, a similar concerted historical effort did not occur for CANDUs)
- PWRs have less tritium exposure hazard for employees
- PWRs do not have online fueling machines, thereby reducing radiation exposure to employees
- Outages for PWRs have been historically shorter than CANDUs, thereby reducing radiation exposure to employees

CANDU Reactors (Note: a CANDU is a type of PHWR)

- PWR-approved technologies for dose control including zinc or hydrogen peroxide addition have not been approved for use at OPG or other CANDUs due to chemistry department concerns that these are either not applicable to CANDU metallurgy and/or chemistry regimes, may cause plant damage, or at least would require an extensive qualification program. OPG has learned through operating experience to be very cautious with large-scale programs that inject chemicals into heat transport systems
- Due to small purification flow rates in CANDU plants (typically operating even less than original design), even if steps are taken to improve flow, there are long lead-times (years) required to reduce radiation source term
- At OPG, Radiation Protection (RP) ALARA sections were first formed in 2000. RP and chemistry departments have generally not been well integrated historically. As a result, source term initiatives have only been in place for the last seven to eight years. Some of these initiatives include:
  - Submicron filtration, (starting about 2002 at one plant; work continues to reach best industry standards)
  - pH change from 10.8 to 10.2 (driven by feeder thinning teams)

Airborne Tritium Emissions per Unit




Airborne Tritium Emissions (TBq) per Unit
COG CANDUs
Tritium Emissions (TBq) per Unit
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
2003
2004
2005
2006
2007
Good
Darlington
Pickering A
Pickering B
Median
Best Quartile

Observations – Airborne Tritium Emissions (TBq) per Unit

2007 Performance

- TBq/Unit at best quartile worldwide CANDU plants was 48 or lower
- Darlington performed better than best quartile as a site
- Pickering B nuclear was nearly best quartile
- Pickering A was virtually at median

Trend

- Darlington and Pickering B sites have demonstrated consistent performance over the last five years. As such with modest improvements Darlington can continue as best quartile and Pickering B can reach best quartile if it addresses its minor performance gaps
- The industry trend shows the best plants continuing to improve while median performance is near static. Median performance is likely reflective of both aging and higher tritium source terms in facilities without access to detritiation capability

Factors Contributing to Performance

- Facilities with access to a tritium removal facility (Darlington, Pickering, Bruce Power) fare better in this measure having the benefit of a reduced source term
- Darlington being attached to a tritium removal facility would be expected to benefit the most but this effect will be mitigated somewhat by the emissions from the tritium removal facility itself which is also processing tritiated water from other sites
- Sites having units that are in the process of being placed in a long-term "safe state" (Pickering A) are hindered by emissions from those units

Darlington

- Darlington is better than best quartile and there is no gap in that sense. Performance could still be improved by initiatives to operate the associated Tritium Removal Facility with fewer unplanned outages and the resultant transient emission

Pickering A

- In 2007, Pickering A emitted as much tritium as Pickering B but operated half as many units indicating performance gaps are more significant with Pickering A
- A comparison of the emission events at Pickering A to those at Pickering B suggests a focus on tracking and aggressively repairing leaks, and keeping dryers in service or even augmenting them would reduce the site gap to best quartile
- The tritium source term in Pickering Units 2 and 3 produces emissions without generation and its removal is essential for Pickering sites to move toward best quartile.
- Consistently executing moderator swaps, thereby taking full advantage of access to detritiation capabilities, would also reduce Pickering's gap to best quartile

Pickering B

- Pickering B units are virtually best quartile and as such performance gaps are small
- Reducing source term through moderator swaps during outages offers the biggest single potential for emissions reduction

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3.0 RELIABILITY

Methodology and Sources of Data

The majority of reliability metrics were calculated using the data from the WANO website. Any data labeled as invalid by WANO was excluded from all calculations. Indicator values of zero are not plotted or included in calculations except in cases where zero is a valid result. Complete data for the period 2001-2008 was obtained and averages are as provided by WANO.

The two backlog metrics, elective and corrective maintenance, are also included within this section and the data comes from an industry sponsored INPO AP-928 subcommittee rather than from a more formal third-party source. The years included are 2006 to 2008 because the data is most reliable over that period. Data points benchmarked are a single point in time, not a rolling average. All of the data is self-reported.

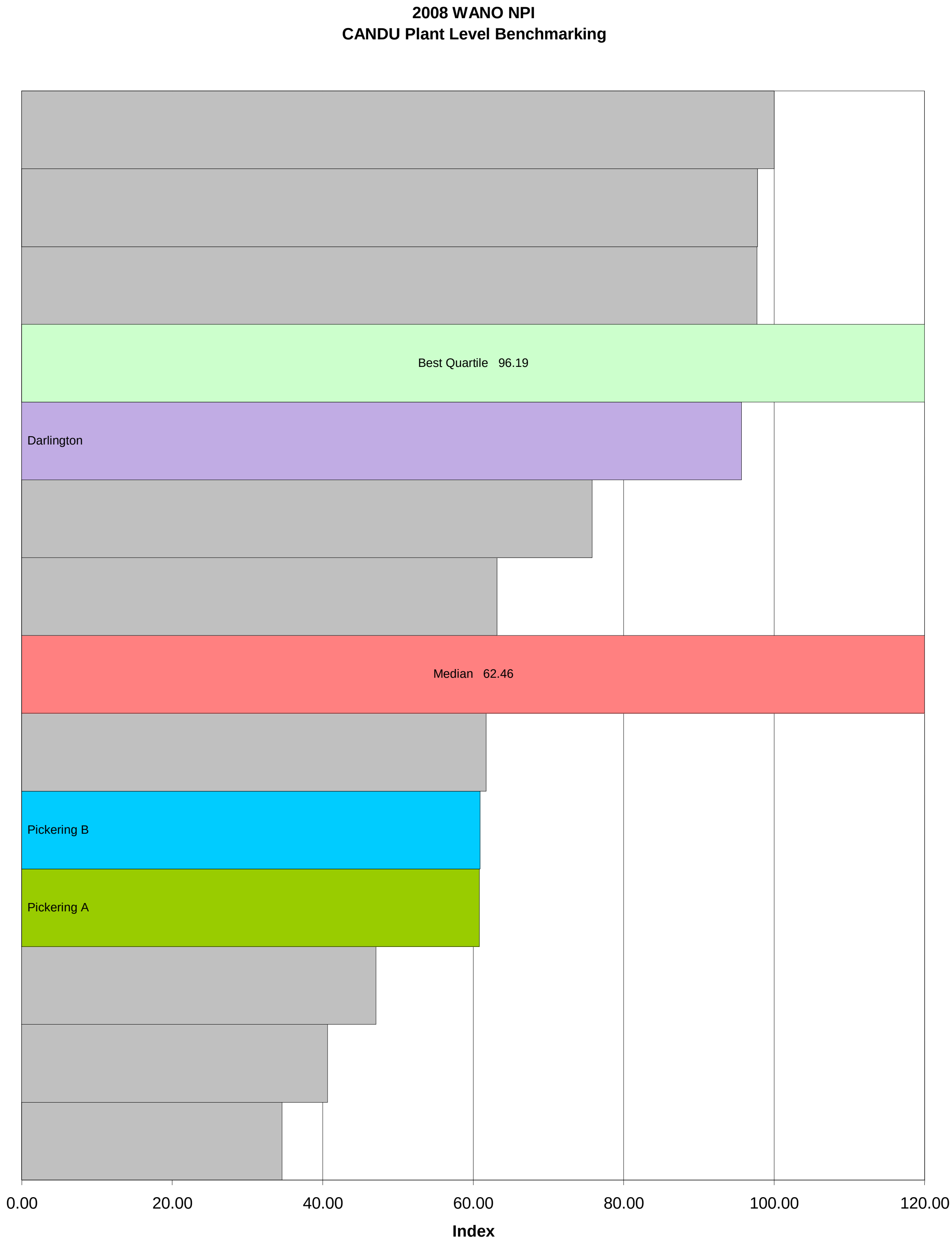
Discussion

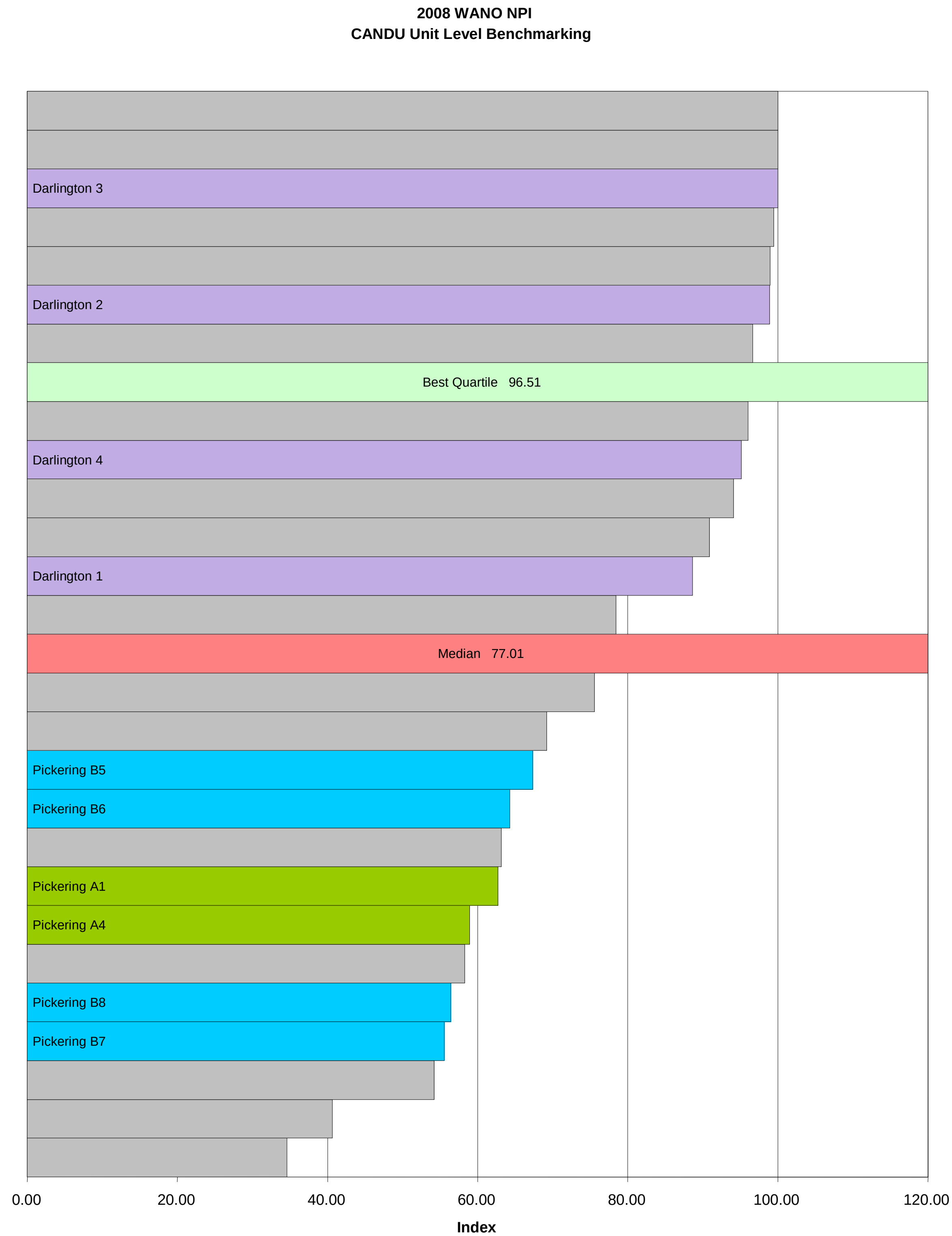
The primary metric within the reliability section is the WANO NPI. The WANO NPI is an operational performance indicator comprised of 10 metrics, three of which are also analyzed in this section: forced loss rate, unit capability factor, and chemistry performance indicator. The remainder of the WANO NPI components are analyzed in the Safety section (Section 2.0).

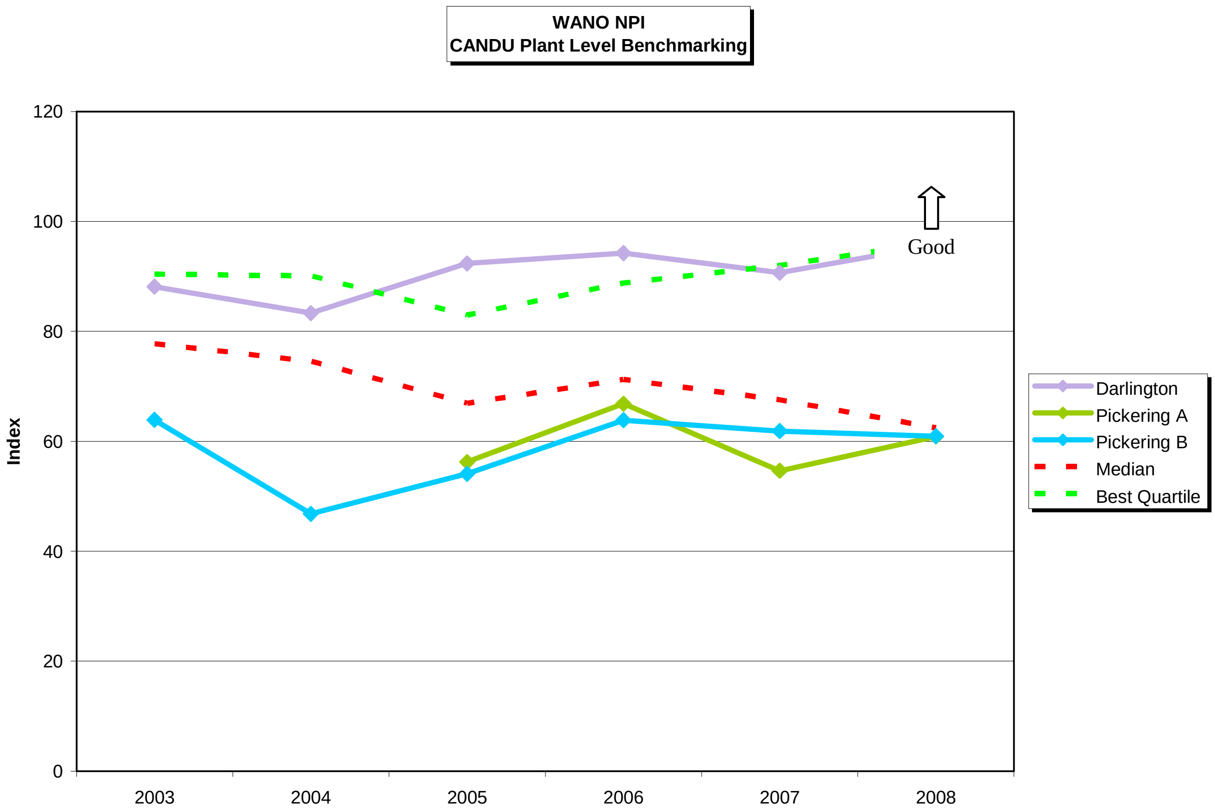
For WANO NPI, Darlington performed well against both the CANDU worldwide panel and the North American PWR and PHWR panel, achieving best quartiles for part of the review period and falling just outside of best quartile for the most recent data point. Pickering A and Pickering B both need to improve performance significantly to achieve best quartile. The areas in which the Pickering stations have performed the poorest are capability factor and forced loss rate. Both areas require attention in order to improve their WANO NPI metric.

All of the plants have shown consistent improvement for the elective and corrective backlog metrics, but because of simultaneous industry level improvement, best quartile has not yet been achieved by Darlington, Pickering A, or Pickering B.

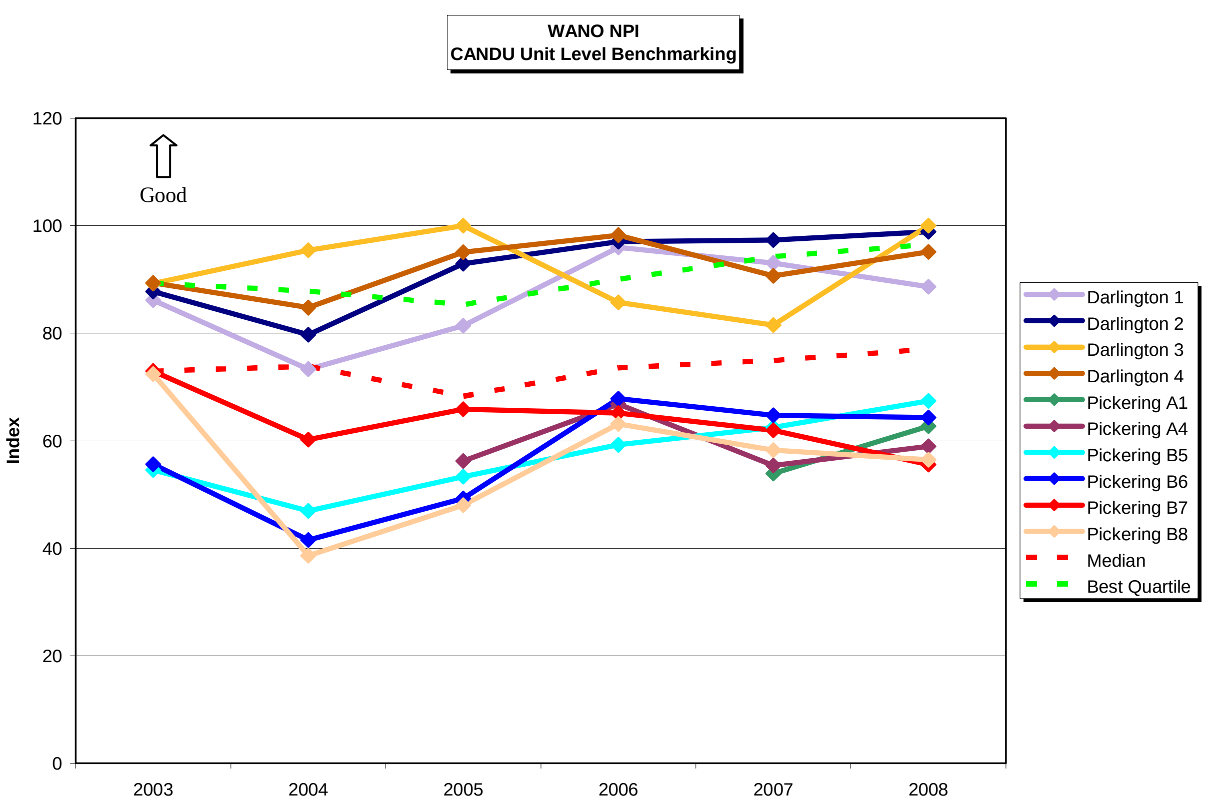
WANO NPI


2008 WANO NPI
CANDU Plant Level Benchmarking
Best Quartile 96.19
Darlington
Median 62.46
Pickering B
Pickering A
0.00
20.00
40.00
60.00
80.00
100.00
120.00
Index


2008 WANO NPI
CANDU Unit Level Benchmarking
Darlington 3
Darlington 2
Best Quartile 96.51
Darlington 4
Darlington 1
Median 77.01
Pickering B5
Pickering B6
Pickering A1
Pickering A4
Pickering B8
Pickering B7
0.00
20.00
40.00
60.00
80.00
100.00
120.00
Index



Note: Only Pickering A Unit 4 received a WANO NPI score in 2005 and 2006



Observations – WANO NPI (CANDU)

2008
- The current best quartile level for WANO NPI is 95.67 and has consistently risen within the CANDU comparison panel since 2005
- It is also worth noting that the performance of Pickering Units B5 and B6 are noticeably better than that of Pickering Units B7 and B8

Trend
- The median value for the panel has actually decreased slightly since 2005. This indicates that the performers outside of best quartile are performing worse
- Darlington is the strongest OPG performer achieving best quartile over most of the review period
- Both Pickering A and Pickering B have performed consistently below median over the review period
- The recent move closer to median is a result of the scores for the comparison panel moving lower rather than Pickering A and Pickering B moving higher
- Pickering A has shown the most improvement since 2005 achieving Pickering B levels by 2008
- Pickering B performance demonstrated considerable improvement from 2004 through 2006, but then has declined slightly since then

Factors Contributing to Performance

- The WANO NPI is a composite index reflecting the weighted sum of the scores of 10 separate performance measures. A maximum score of 100 is possible. All of the sub-indicators in this index are reviewed separately in this benchmarking report
- The method to analyze the gap to top quartile for the composite index is to specifically indicate points gained or lost for each sub-indicator for each station during the most recent period (2008)

Darlington
- For 2008, Darlington received maximum scores for 7 out of 10 NPI sub-indicators
- For the key safety system related metrics, high pressure injection, auxiliary feedwater, and emergency AC power, Darlington received 10 of 10 points for each
- Darlington also received perfect scores for fuel reliability (10 of 10), chemistry performance (5 of 5) and industrial safety accident rate (5 of 5)
- Darlington received 13.3 of a possible 15 points for unit capability factor; 14.4 of a possible 15 points for forced loss rate; and 7.9 of a possible 10 points for collective radiation exposure. Refer to unit capability factor, forced loss rate, and collective radiation sections for detailed information regarding performance on these indicators

Factors Contributing to Performance (Cont'd)

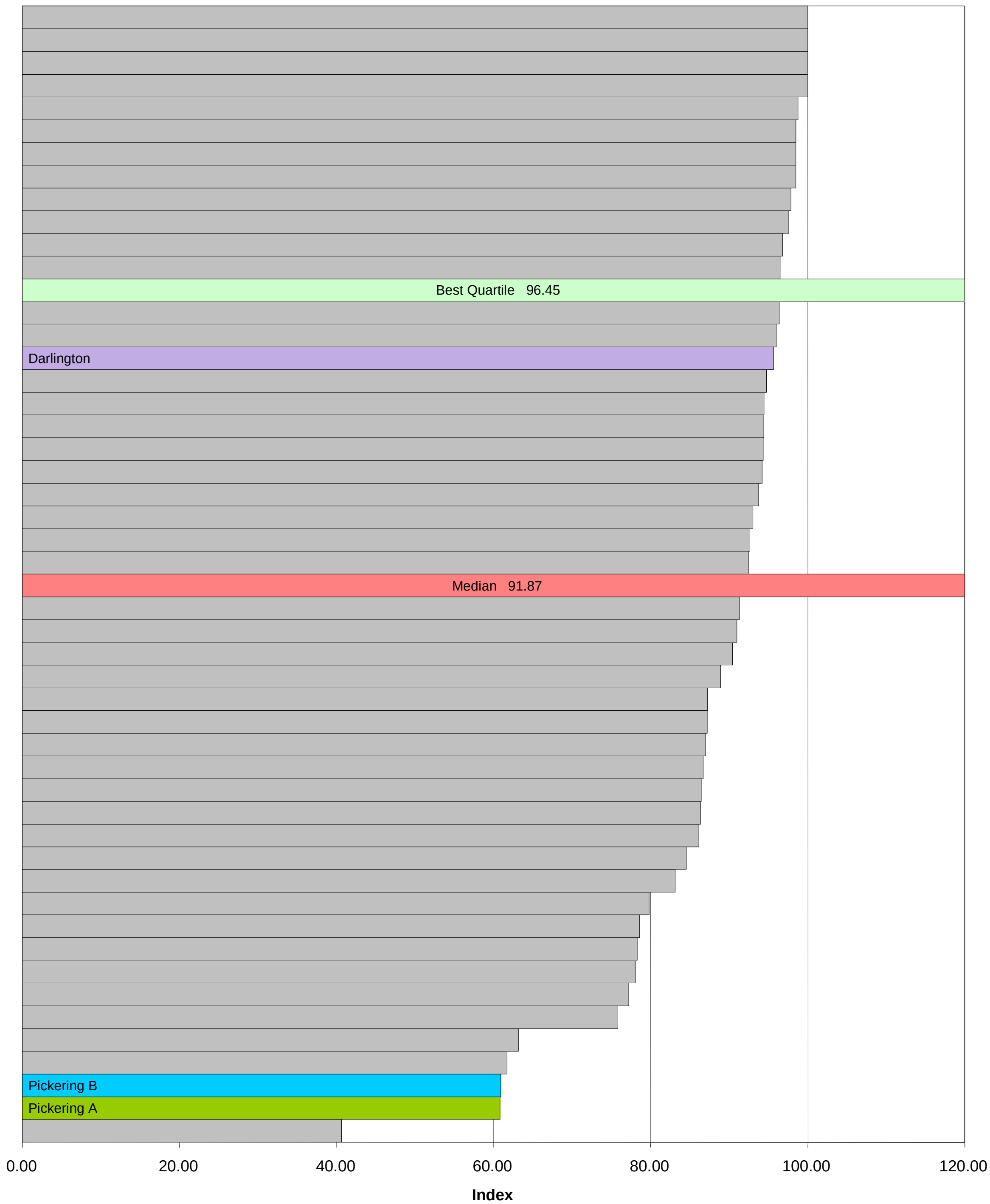
Pickering A

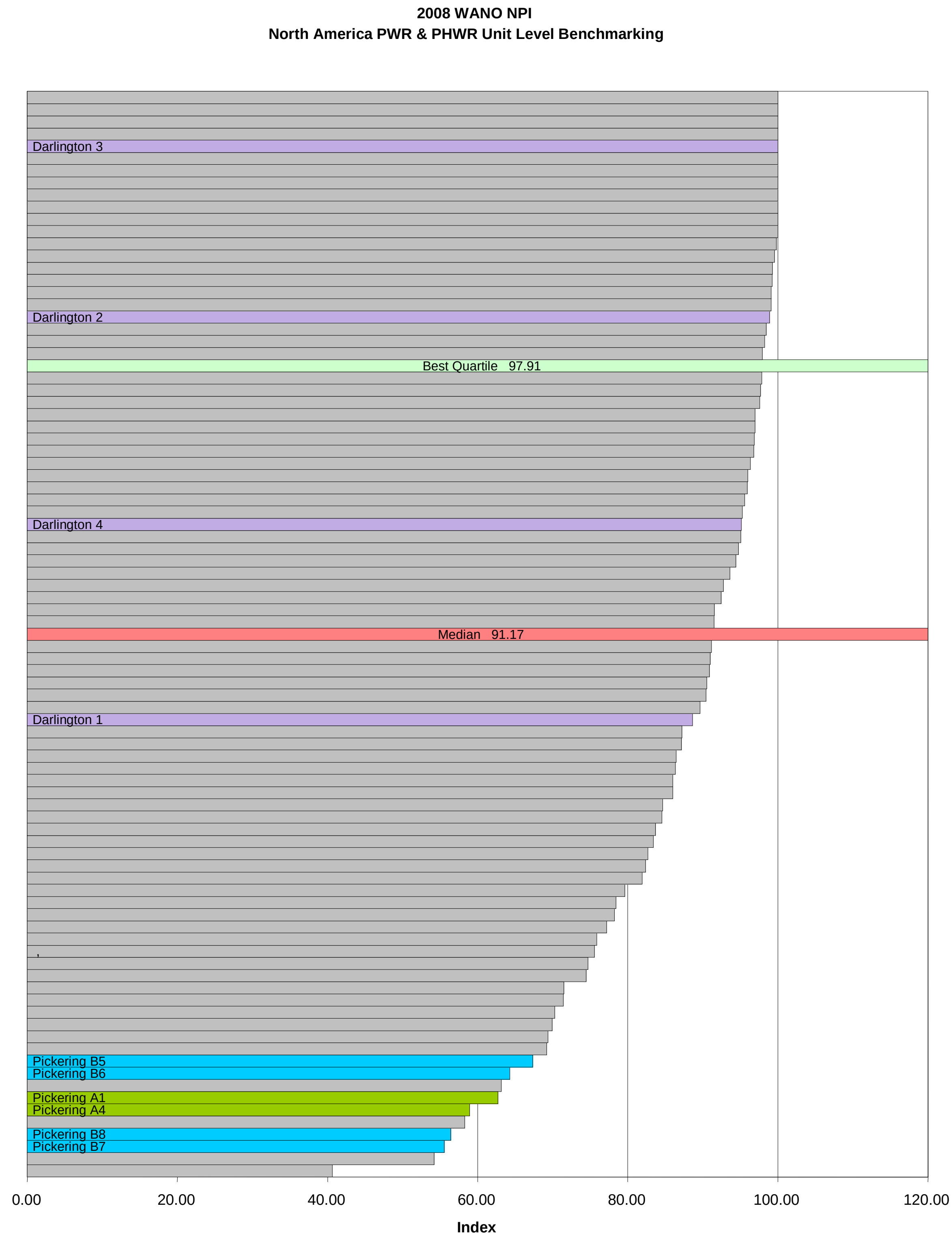
- For 2008, Pickering A received maximum scores for 5 out of 10 NPI sub-indicators
- For the key safety system related metrics, high pressure injection, auxiliary feedwater, and emergency AC power, Pickering A received 10 of 10 points for each
- Pickering A gained 5 of 5 points for industrial safety accident rate and 10 of a possible 10 points for collective radiation exposure
- Pickering A earned 4.4 of 10 points for reactor trips; fuel reliability yielded 9.5 of 10 points, and chemistry performance yielded 2 of 5 points. Refer to reactor trips, fuel reliability, and chemistry performance for detailed information regarding performance on these indicators
- Due to challenges with generation, Pickering A received 0 of 15 possible points for both unit capability factor and forced loss rate. Refer to unit capability factor and forced loss rate sections for detailed information regarding performance on these indicators

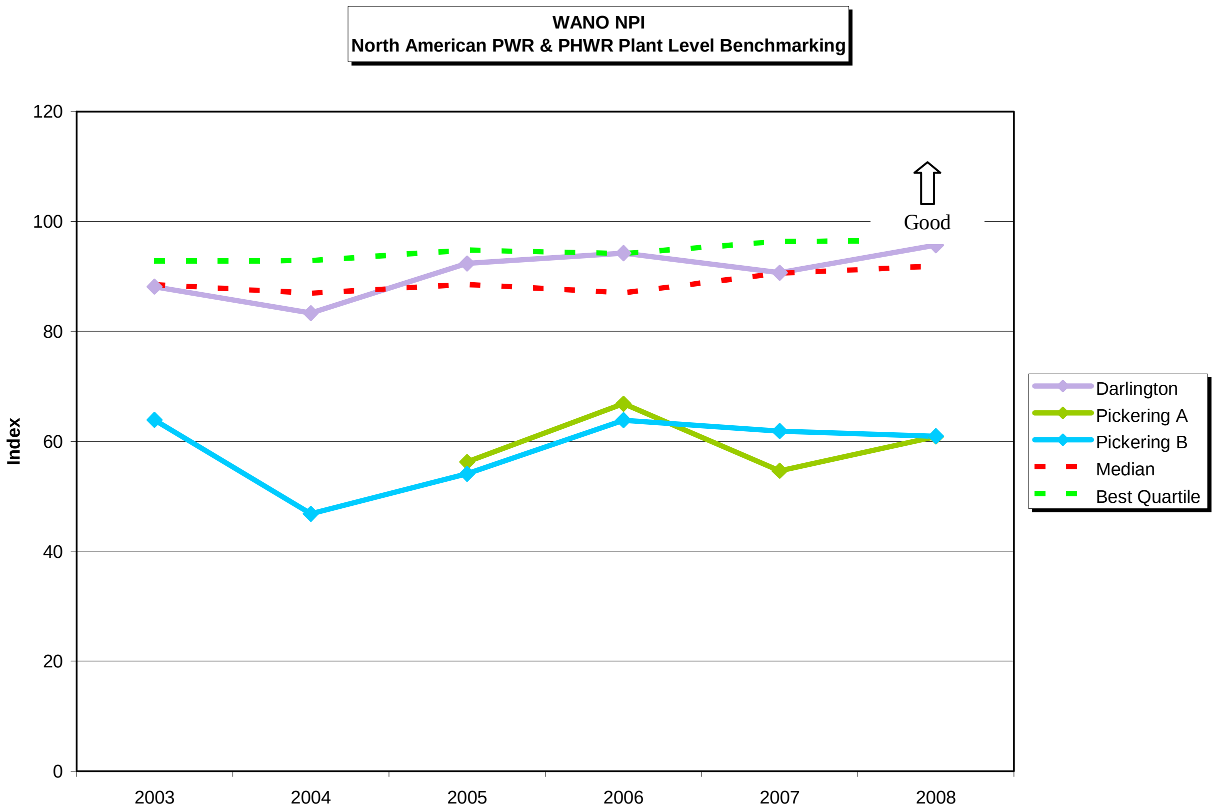
Pickering B

- For 2008, Pickering B received maximum scores for 5 out of 10 NPI sub-indicators
- For the key safety system related metrics, high pressure injection, auxiliary feedwater, and emergency AC power, Pickering B received 10 of 10 points for each
- Pickering B earned 5 of 5 points for industrial safety accident rate
- Pickering B earned 10 of 10 points for reactor trips
- Due to challenges with generation, Pickering B received 1.2 of 15 possible points for both unit capability factor and forced loss rate. Refer to unit capability factor and forced loss rate sections for detailed information regarding performance on these indicators
- Pickering B achieved scores of 7.5 of 10 points for fuel reliability, 0.6 of 5 points for chemistry performance, and 5.5 of a possible 10 points for collective radiation exposure. Refer to fuel reliability, chemistry performance, and collective radiation exposure sections for detailed information regarding performance on these indicators

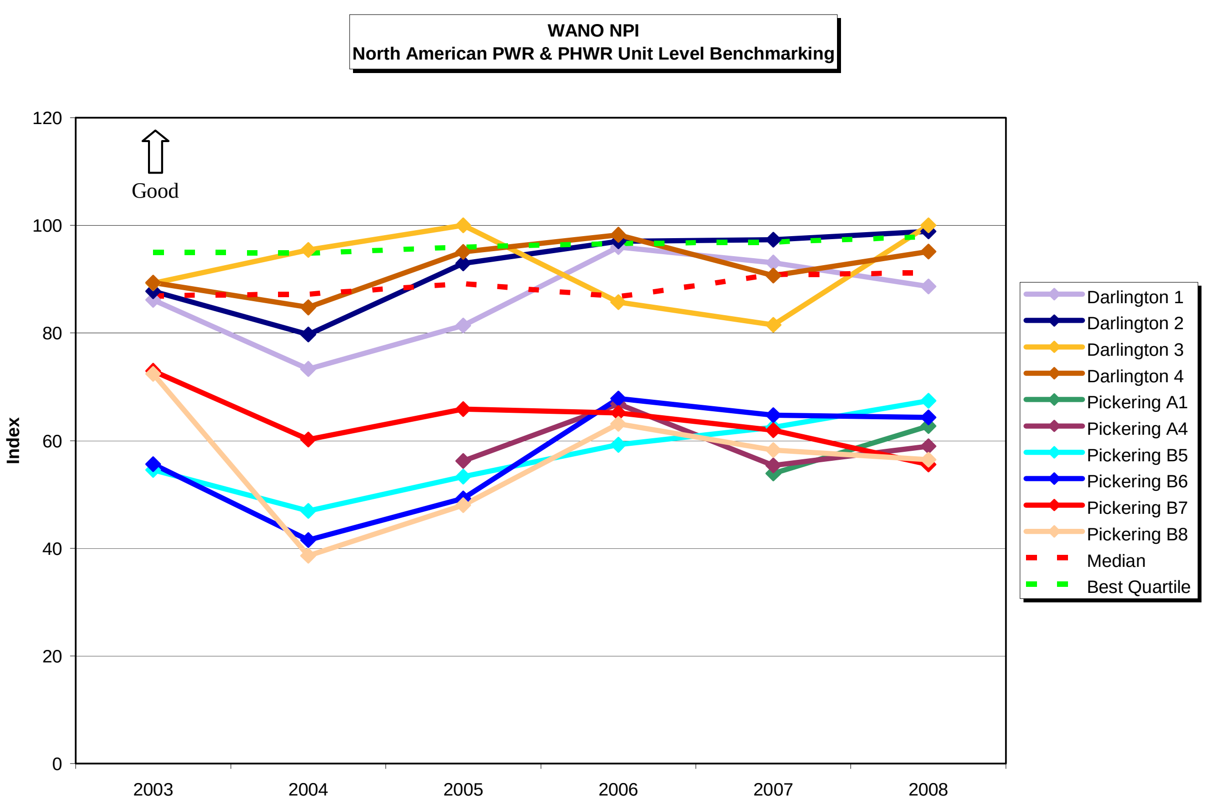
2008 WANO NPI
North American PWR & PHWR Plant Level Benchmarking




2008 WANO NPI
North America PWR & PHWR Unit Level Benchmarking
Darlington 3
Darlington 2
Best Quartile 97.91
Darlington 4
Median 91.17
Darlington 1
Pickering B5
Pickering B6
Pickering A1
Pickering A4
Pickering B8
Pickering B7
0.00
20.00
40.00
60.00
80.00
100.00
120.00
Index



Note: Only Pickering A Unit 4 received a WANO NPI score in 2005 and 2006



Observations – WANO NPI (N. American PWR and PHWR)

2008

- Both the best quartile level and the median values for the North American PWR comparison panel have risen slightly for WANO NPI since 2006 indicating steady improvement in the North American reactor fleet
- Darlington is the strongest OPG performer and achieved scores higher than the peer group median value in four of the six years reviewed. Two of the Darlington units (units 2 and 3) achieved NPI scores above best quartile levels

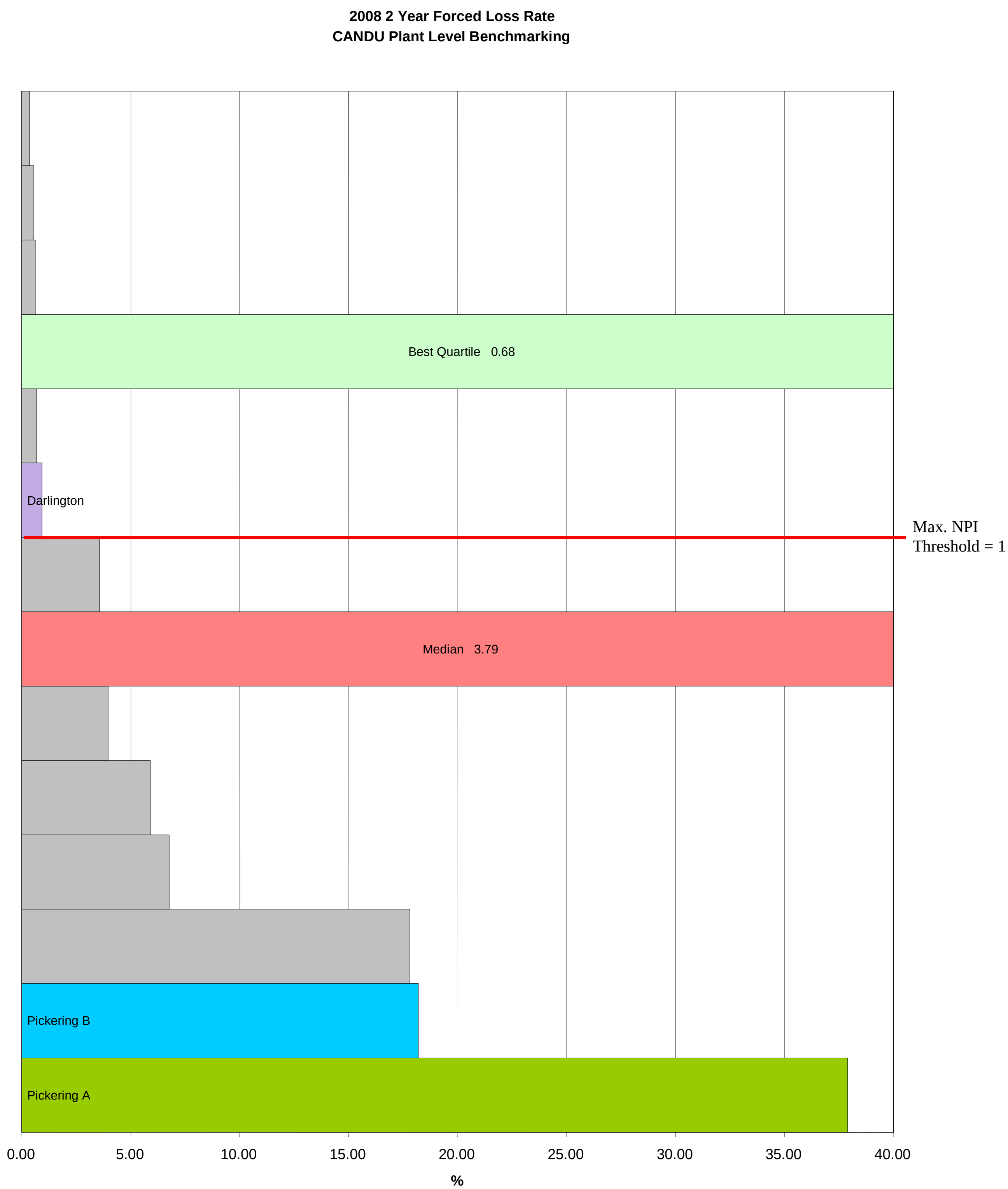
Trend

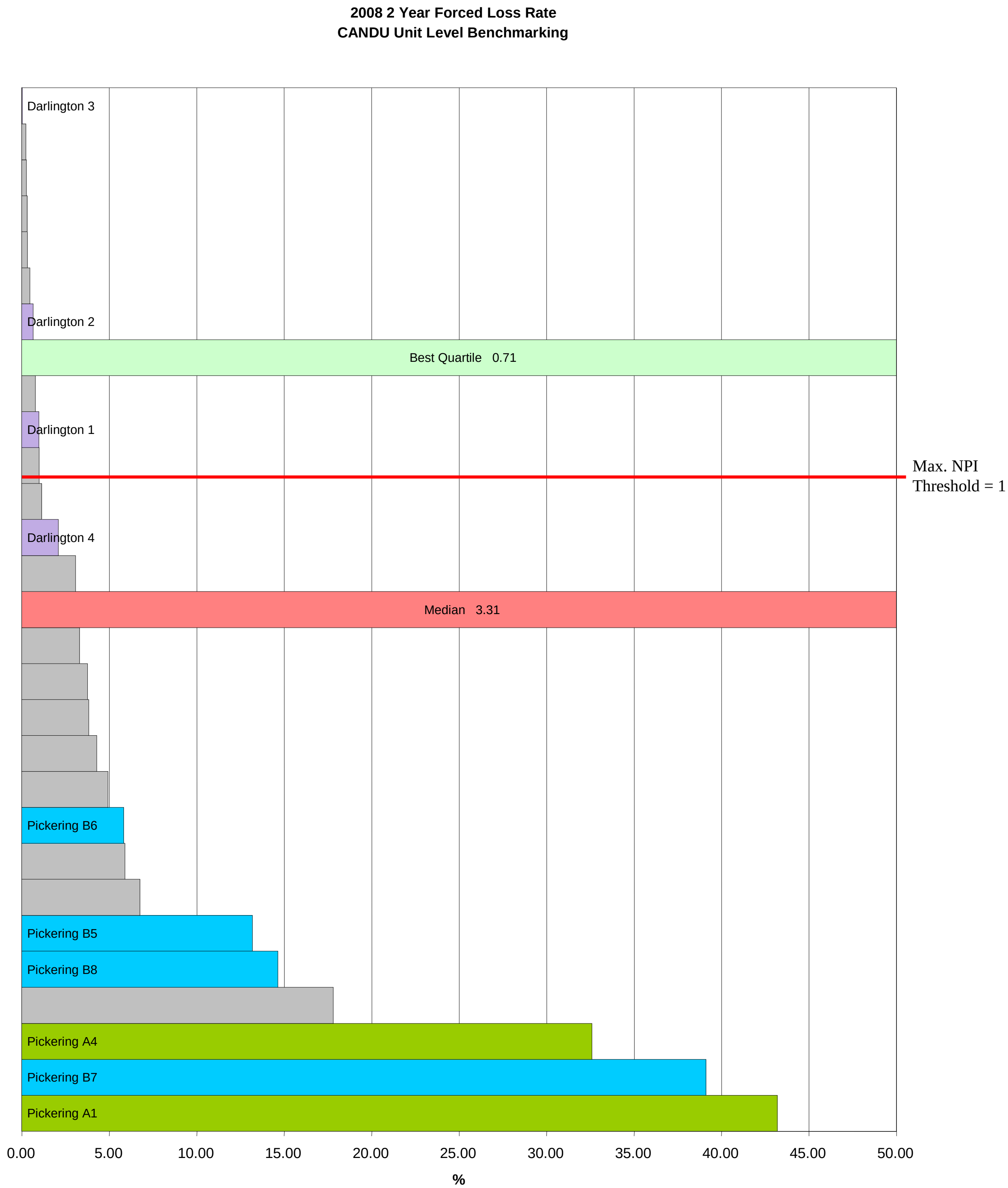
- All of the units at Pickering A and Pickering B have performed consistently below median over the review period. The six Pickering units were among the lowest 10 units surveyed in North America

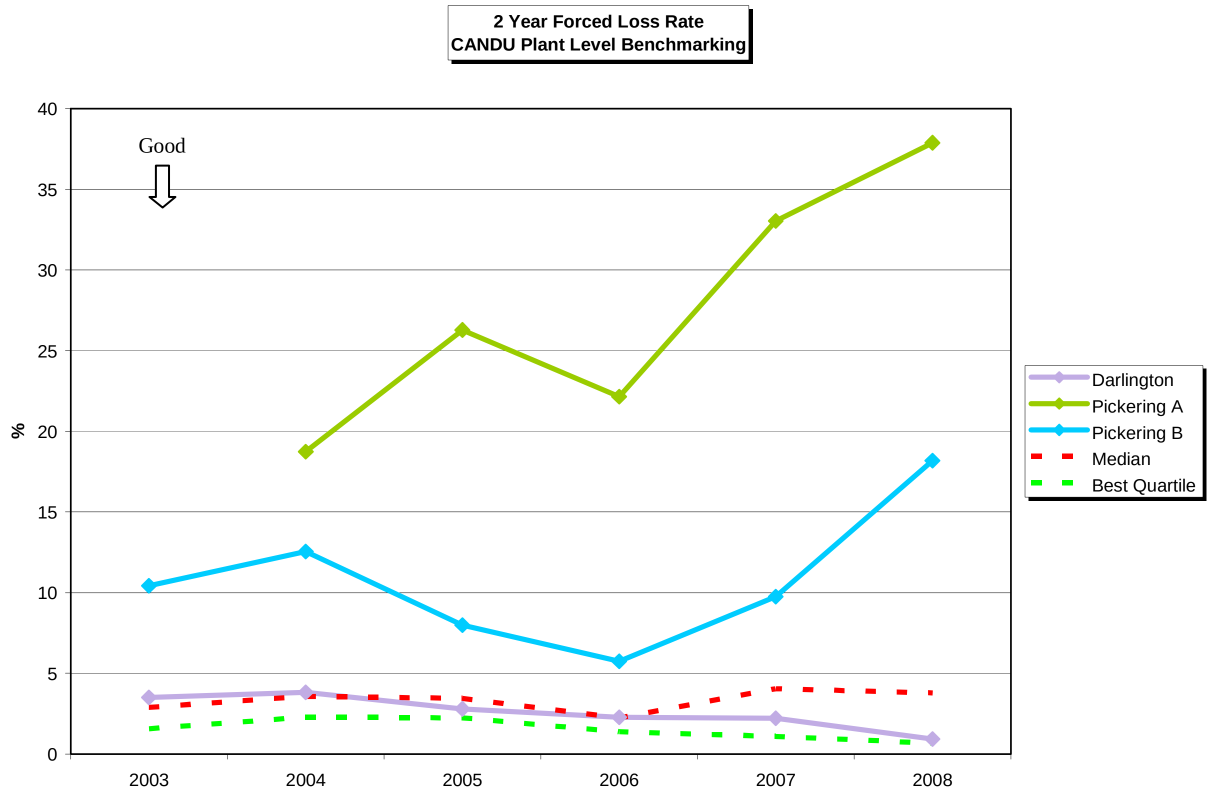
Factors Contributing to Performance

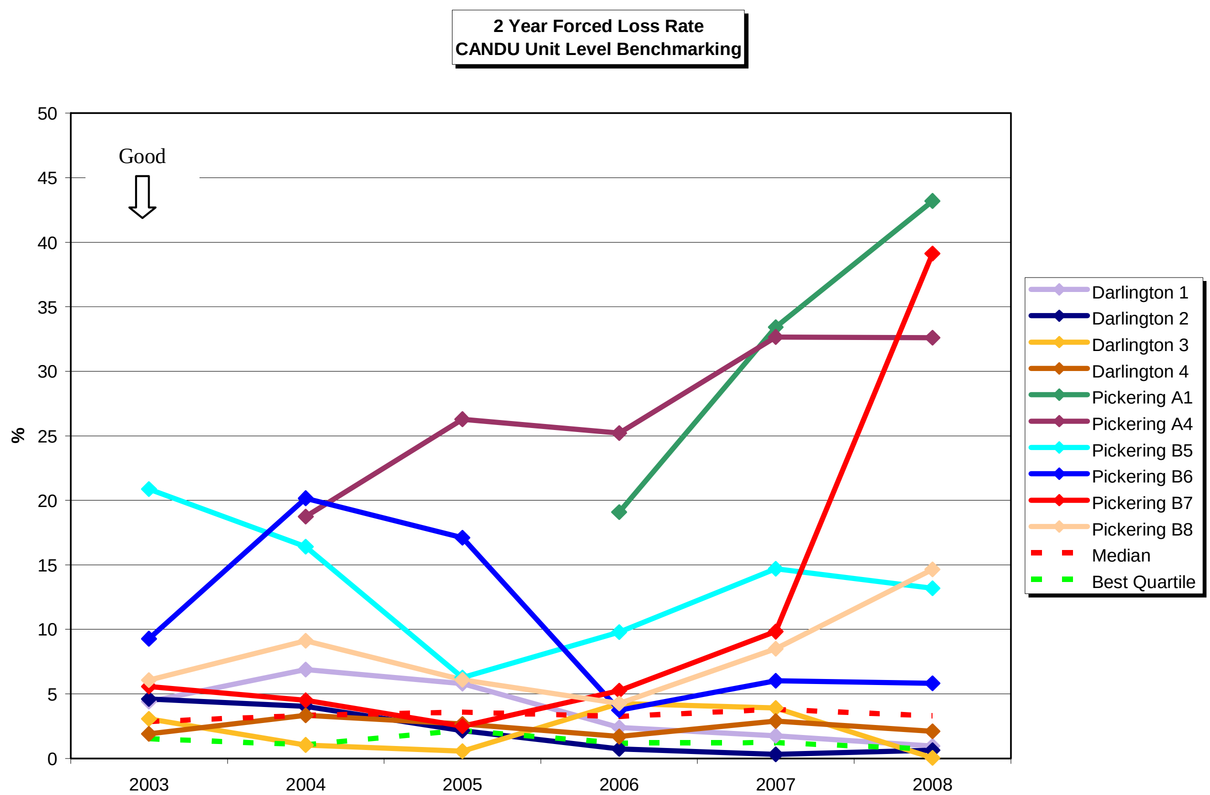
- The method to analyze the gap to top quartile for the composite index is to specifically indicate points gained or lost for each sub-indicator for each station during the most recent period (2008). This comparison was provided above in the section describing the CANDU benchmarking panel

2-Year Forced Loss Rate




2008 2 Year Forced Loss Rate
CANDU Unit Level Benchmarking
Darlington 3
Darlington 2
Best Quartile 0.71
Darlington 1
Max. NPI Threshold = 1
Darlington 4
Median 3.31
Pickering B6
Pickering B5
Pickering B8
Pickering A4
Pickering B7
Pickering A1
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
50.00
%


2 Year Forced Loss Rate
CANDU Plant Level Benchmarking
Good
%
40
35
30
25
20
15
10
5
0
2003
2004
2005
2006
2007
2008
Darlington
Pickering A
Pickering B
Median
Best Quartile


2 Year Forced Loss Rate
CANDU Unit Level Benchmarking
Good
%
50
45
40
35
30
25
20
15
10
5
0
2003
2004
2005
2006
2007
2008
Darlington 1
Darlington 2
Darlington 3
Darlington 4
Pickering A1
Pickering A4
Pickering B5
Pickering B6
Pickering B7
Pickering B8
Median
Best Quartile

Observations – 2-Year Forced Loss Rate (CANDU)

- The performance of OPG's units has been shown relative to best quartile, median, and the threshold established by WANO to achieve full WANO NPI points. Since achievement of full WANO NPI points is recognized within the industry as a measure of desirable performance, performance gaps are assessed against full WANO NPI points in addition to median and best quartile

2008 (2-Year Rolling Average)

- Forced loss rate (FLR) at best quartile worldwide CANDU plants was 0.68% for the plant average and 0.71% for individual units
- Darlington performed better than median but worse than best quartile as a station and all units performed better than median individually with two units performing better than best quartile
- Both Pickering A and B were below median as a plant, and each unit performed below median individually

Trend

- Best quartile improved slightly for the review period for both unit and plant level while median became slightly worse for both unit and plant over the review period
- Darlington performance overall improved from just worse than median performance at the start of the review period to just worse than top quartile for the most recent time period
- Pickering A had a limited time period compared to the other stations due to the restart of unit 4 in September 2003 and unit 1 in November 2005
- Pickering A's FLR performance worsened significantly, almost doubling from a FLR just under 20% to 37.90%
- Pickering B FLR performance over the review period also worsened, almost doubling from a FLR just under 10% to 18.19%

Factors Contributing to Performance

- FLR is defined as the ratio of all unplanned forced energy losses during a given period of time to the reference energy generation minus energy generation losses corresponding to planned outages and any unplanned outage extensions of planned outages
- To analyze performance for capability factor and forced loss rate, for 2005 to 2008 all incidents causing of loss of generation were assigned to categories (defined below) so primary drivers of performance could be identified
- <u>Equipment Reliability</u>: Failure of component or equipment which directly forced or extended an outage (includes material condition problems)
- <u>Design Basis</u>: Equipment operated as per design. Inadequate design margin directly forced or extended an outage
- <u>Human Performance (HP)</u>: Event caused by HP issues which directly forced or extended an outage, but HP event had to be in recent past (i.e. no HP on design basis errors in the past). This included contractors inside or outside plant (i.e. Water Treatment) that directly impacted plant operations

Factors Contributing to Performance (Cont'd)

Darlington

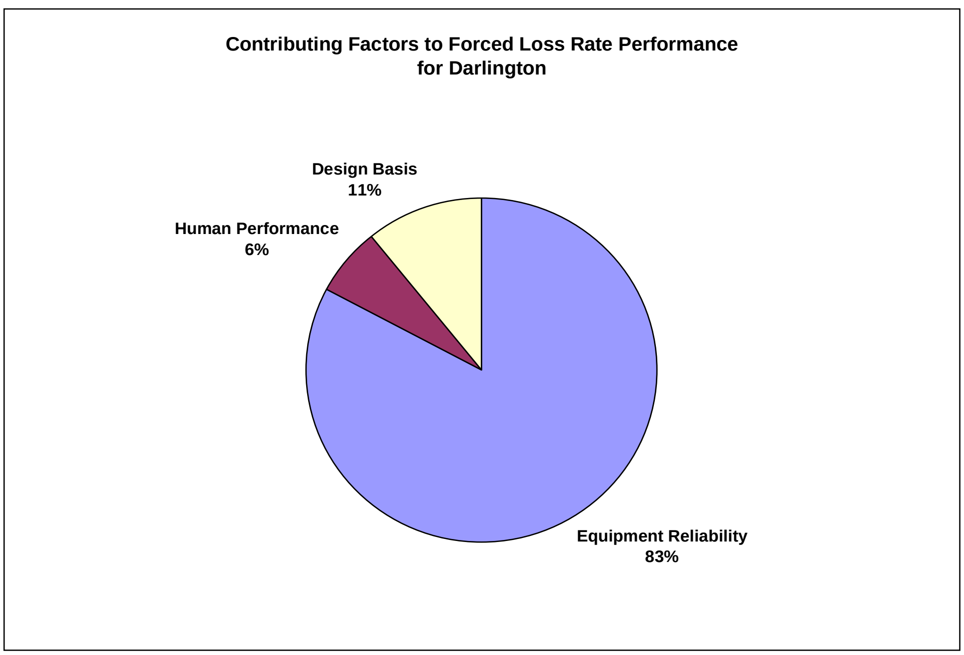
- Darlington gap to best quartile against the worldwide CANDU panel for 2008 was 0.25%
- The contributing factors to Darlington FLR on a percentage basis over the review period were 83% equipment reliability, 11% material condition, and 6% human performance

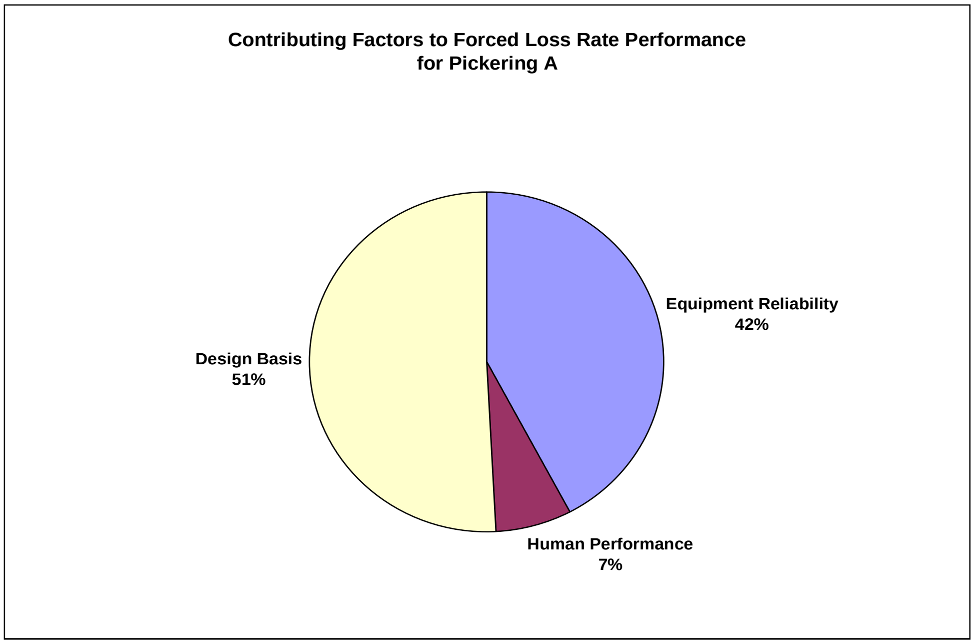
Pickering A

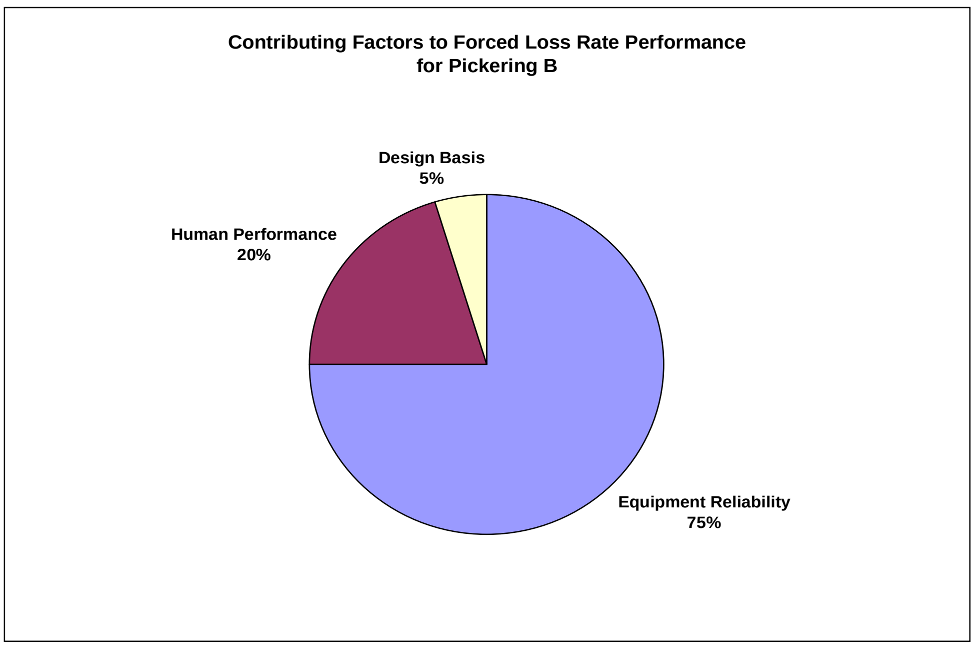
- Pickering A gap to best quartile was 37.22% against the worldwide CANDU panel for 2008.
- For the review period, approximately 7% of the Pickering A FLR was attributable to human performance, 42% to equipment reliability, and 51% percent to design basis

Pickering B

- Pickering B gap to best quartile was 17.51% against the worldwide CANDU panel for 2008
- For the review period, approximately 20% of the Pickering FLR was attributable to human performance, 75% to equipment reliability, and 5% percent to design basis



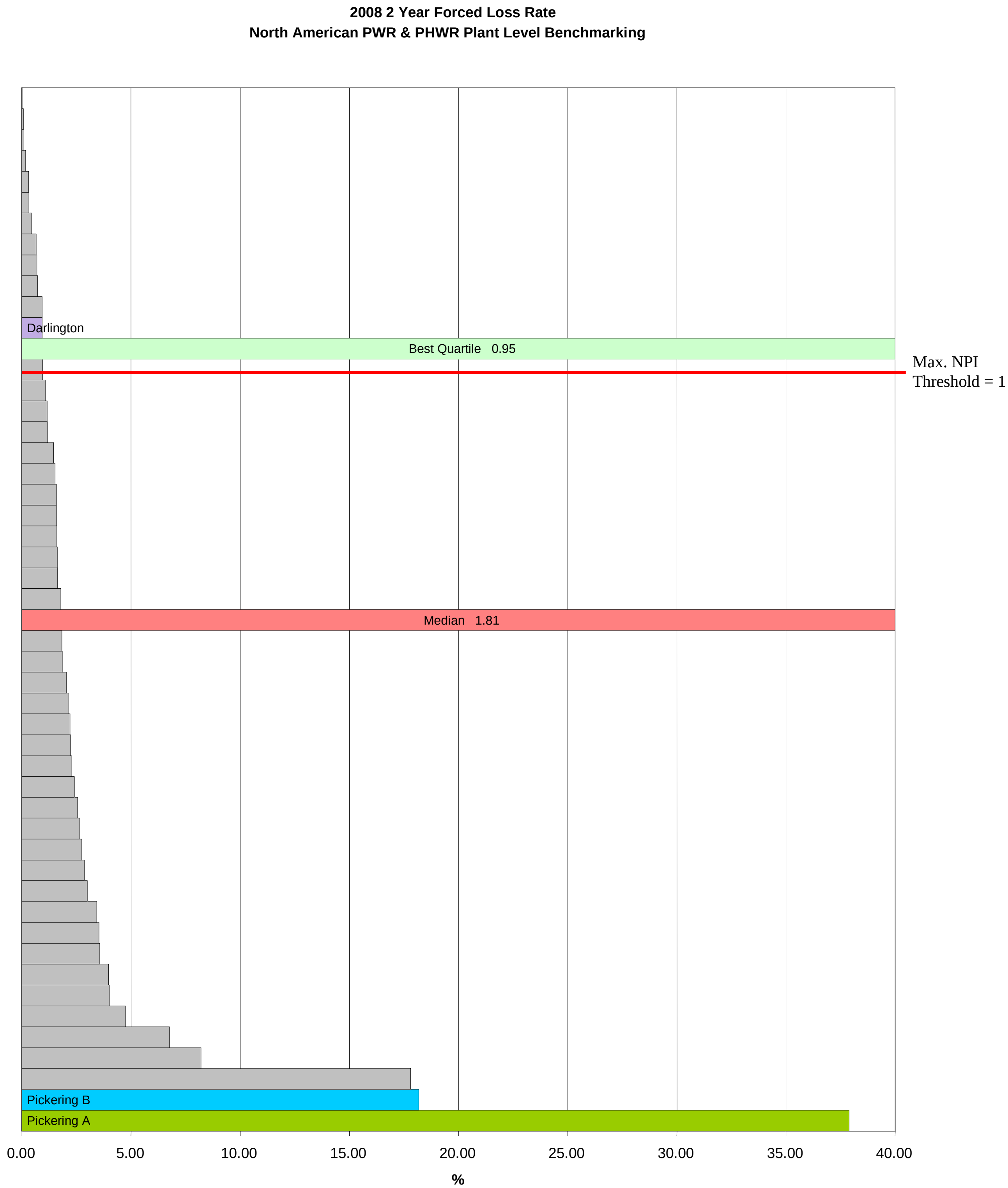


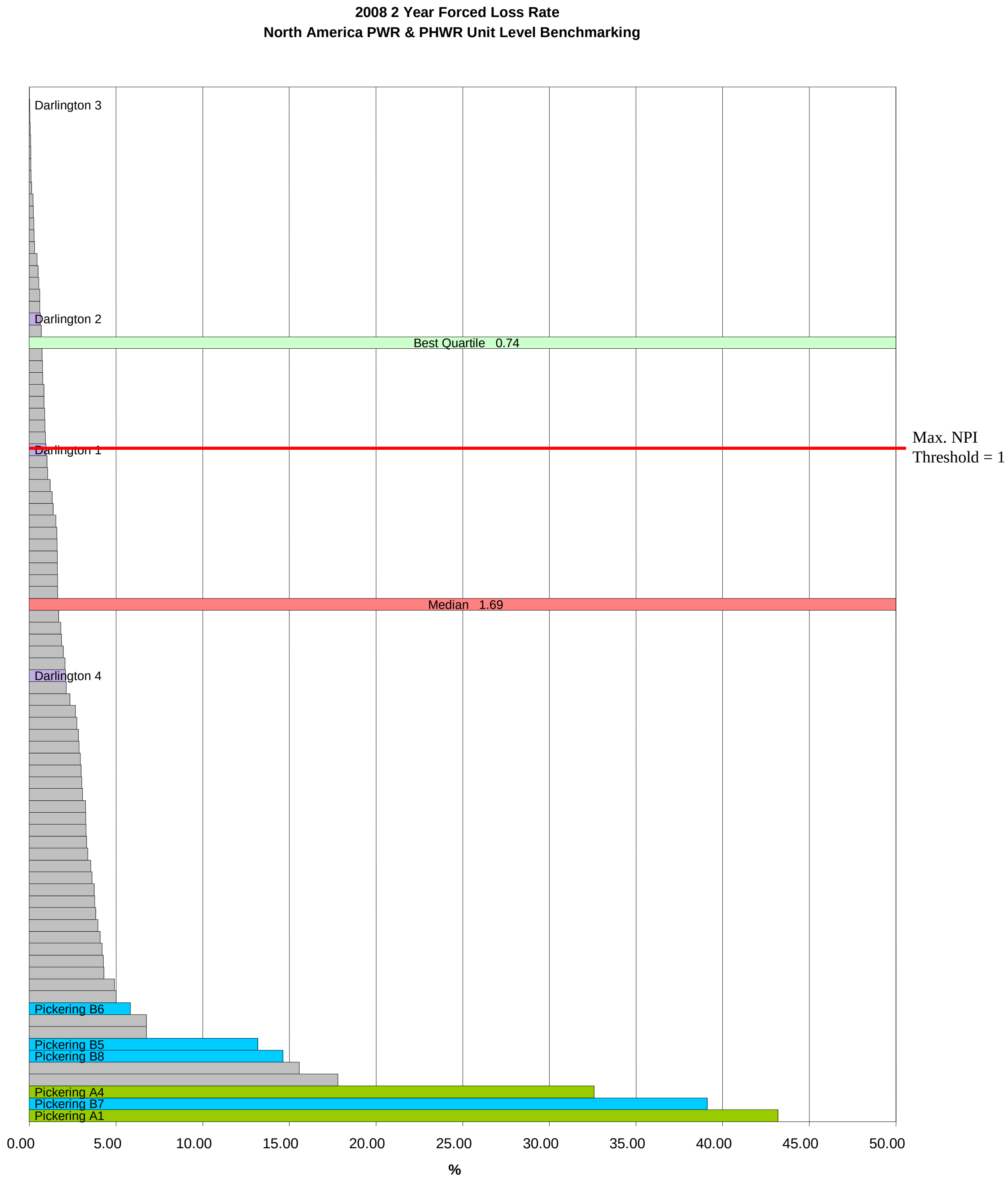


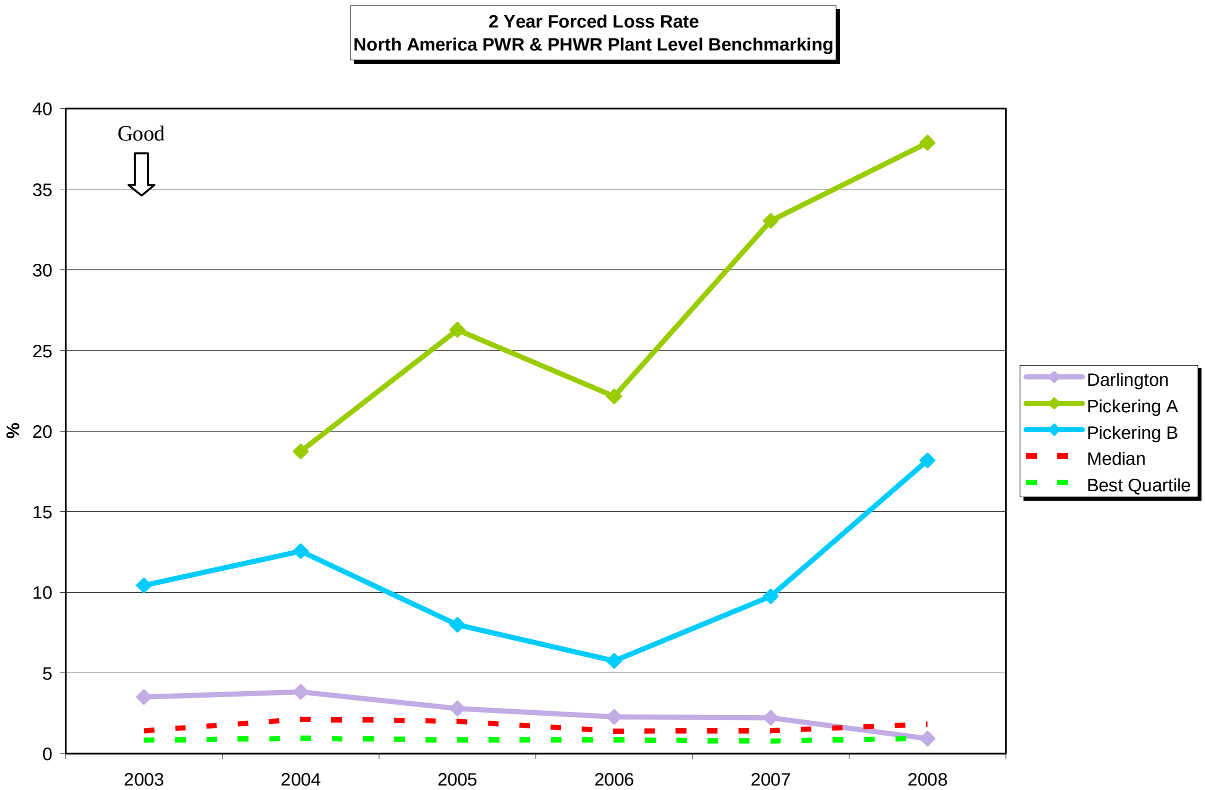
Factors Contributing to Performance (Cont'd)

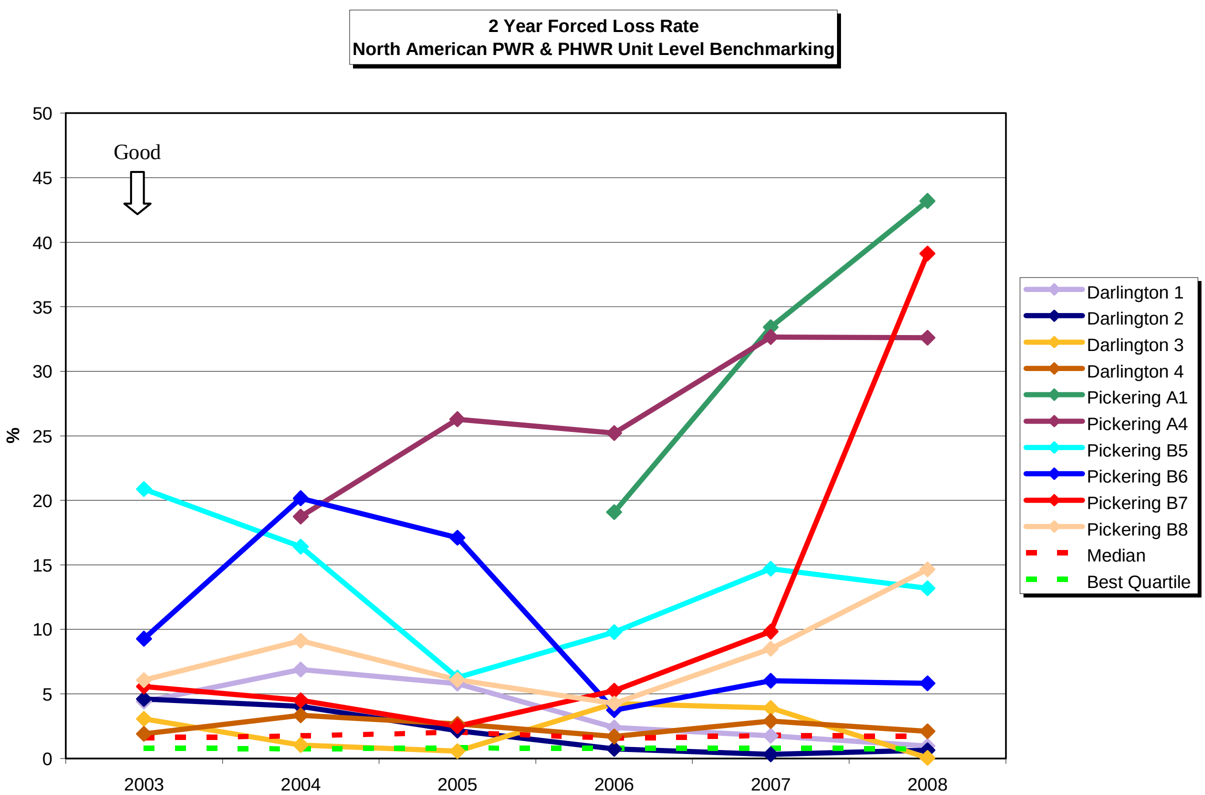
Examples of Contributing Incidents

- Equipment Reliability incidents contributing to FLR included a Calandria Tube failure, a heat transport system leak, a faulty feeder cabinet door latch, and pipe elbow inspections due to new information on feeder thinning rates
- Design Basis incidents contributing to FLR included an inter-station transfer bus (ISTB) problem, inadequate pipe seal design, and a system configuration problem
- Human Performance incidents contributing to FLR included resin ingress to the system caused by a contractor error, a voltage transient caused during the execution of routine steps, and a troubleshooting error while resolving a leakage problem


2008 2 Year Forced Loss Rate
North American PWR & PHWR Plant Level Benchmarking
Darlington
Best Quartile 0.95
Max. NPI Threshold = 1
Median 1.81
Pickering B
Pickering A
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
%


2008 2 Year Forced Loss Rate
North America PWR & PHWR Unit Level Benchmarking
Darlington 3
Darlington 2
Best Quartile 0.74
Darlington 1
Max. NPI
Threshold = 1
Median 1.69
Darlington 4
Pickering B6
Pickering B5
Pickering B8
Pickering A4
Pickering B7
Pickering A1
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
50.00
%


2 Year Forced Loss Rate
North America PWR & PHWR Plant Level Benchmarking
Good
%
40
35
30
25
20
15
10
5
0
2003
2004
2005
2006
2007
2008
Darlington
Pickering A
Pickering B
Median
Best Quartile


2 Year Forced Loss Rate
North American PWR & PHWR Unit Level Benchmarking
Good
%
50
45
40
35
30
25
20
15
10
5
0
2003
2004
2005
2006
2007
2008
Darlington 1
Darlington 2
Darlington 3
Darlington 4
Pickering A1
Pickering A4
Pickering B5
Pickering B6
Pickering B7
Pickering B8
Median
Best Quartile

Observations – 2-Year Forced Loss Rate (North American PWR and PHWR)

- The performance of OPG's units has been shown relative to best quartile, median, and the threshold established by WANO to achieve full WANO NPI points. Since achievement of full WANO NPI points is recognized within the industry as a measure of desirable performance, performance gaps are assessed against full WANO NPI points in addition to median and best quartile

2008 (2-Year Rolling Average)

- FLR at best quartile for the North American PWR/PHWR panel was 0.95% for the plant average and 0.74% for individual units
- Darlington performed within than best quartile as a station with two units performing in best quartile, one unit performing better than median, and one unit performing worse than median
- Both Pickering A and B were below median as a plant, and each unit performed below median individually

Trend

- Best quartile and median for the panel remained relatively stable for the review period under review with a slight decline in performance during the middle of the period
- Darlington performance improved from worse than median performance at the start of the review period best quartile for the most recent data point
- Pickering A had a limited time period compared to the other stations due to the restart of unit 4 in September 2003 and unit 1 in November 2005
- Pickering A FLR performance worsened significantly, almost doubling from a FLR just under 20% to 37.90%
- Pickering B FLR performance also worsened, almost doubling from a FLR just under 10% to 18.19%

Factors Contributing to Performance

Darlington

- Darlington performed within the best quartile for the panel

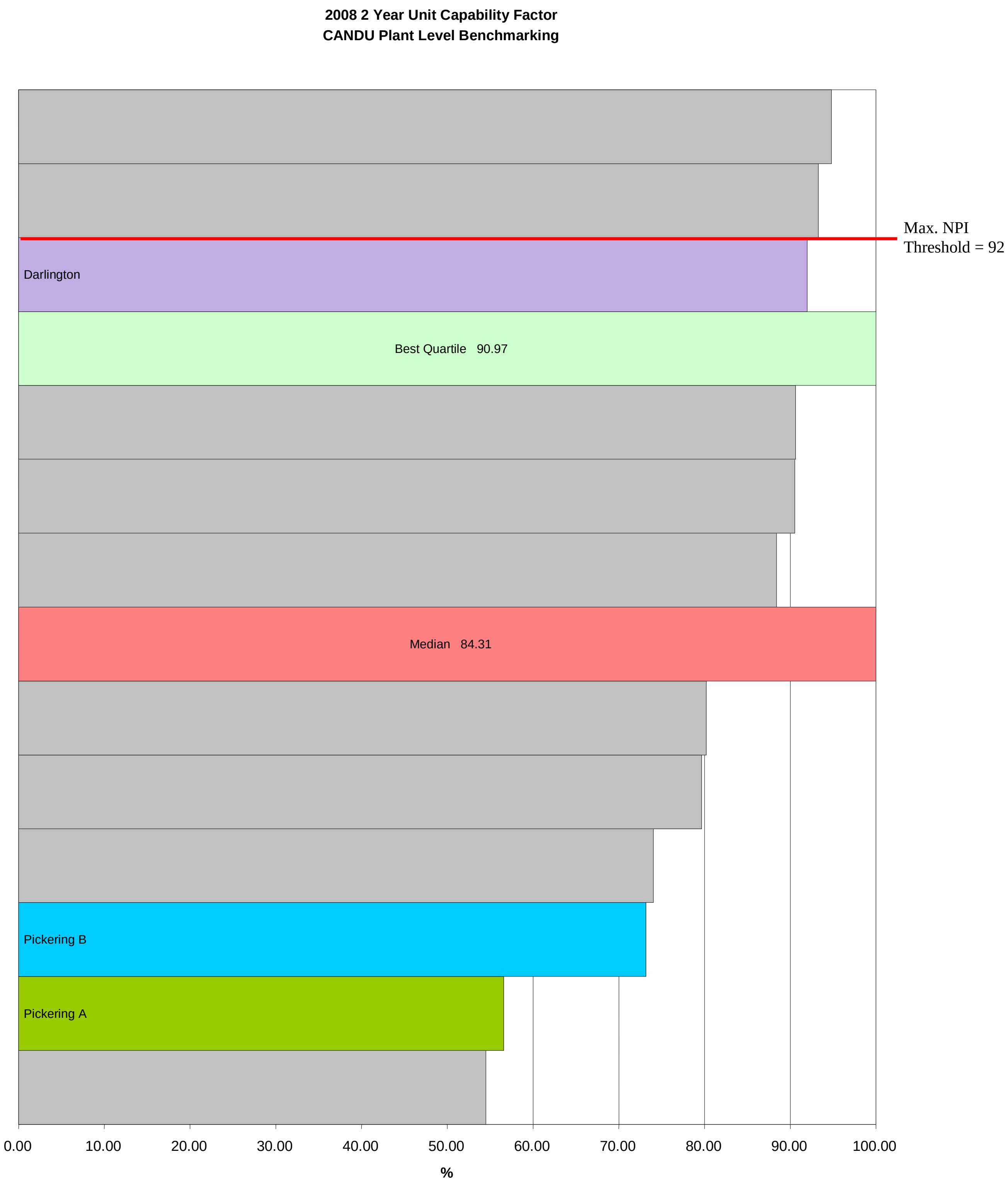
Pickering A

- Pickering A gap to best quartile was 36.95% for the most recent time period under review
- The contributing factors for Pickering A FLR were listed within the analysis of the worldwide CANDU panel results

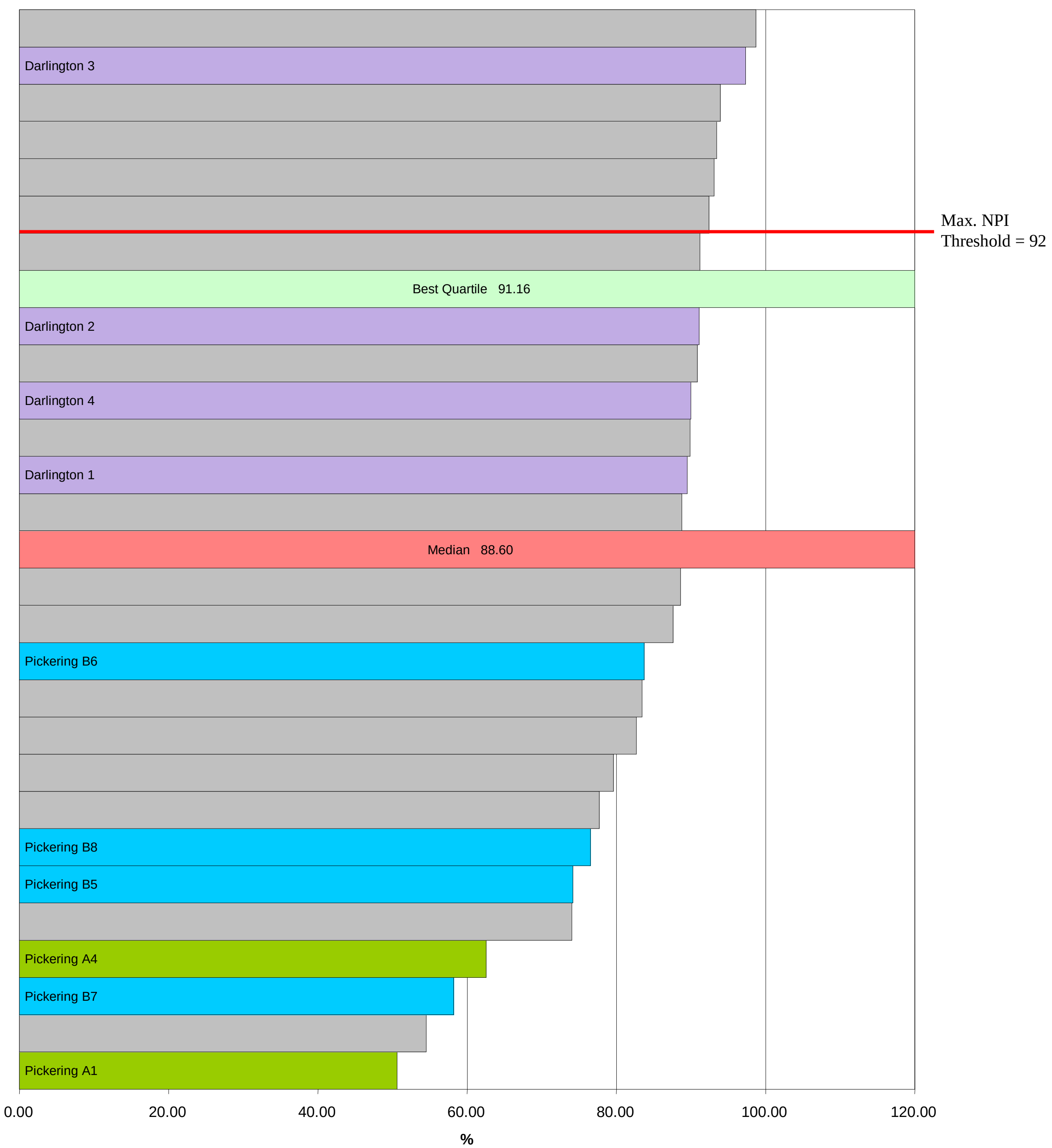
Pickering B

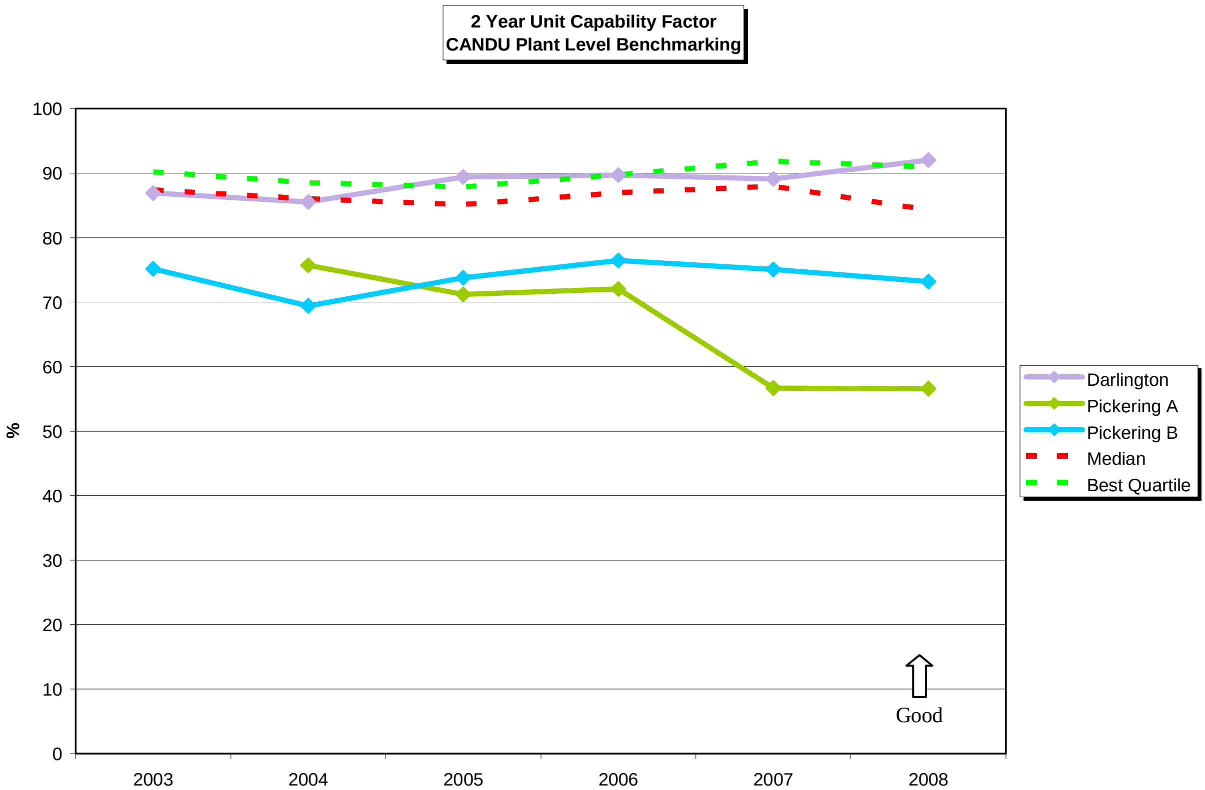
- Pickering B gap to best quartile was 17.24% for the most recent time period under review
- The contributing factors for Pickering B FLR were listed within the analysis of the worldwide CANDU panel results

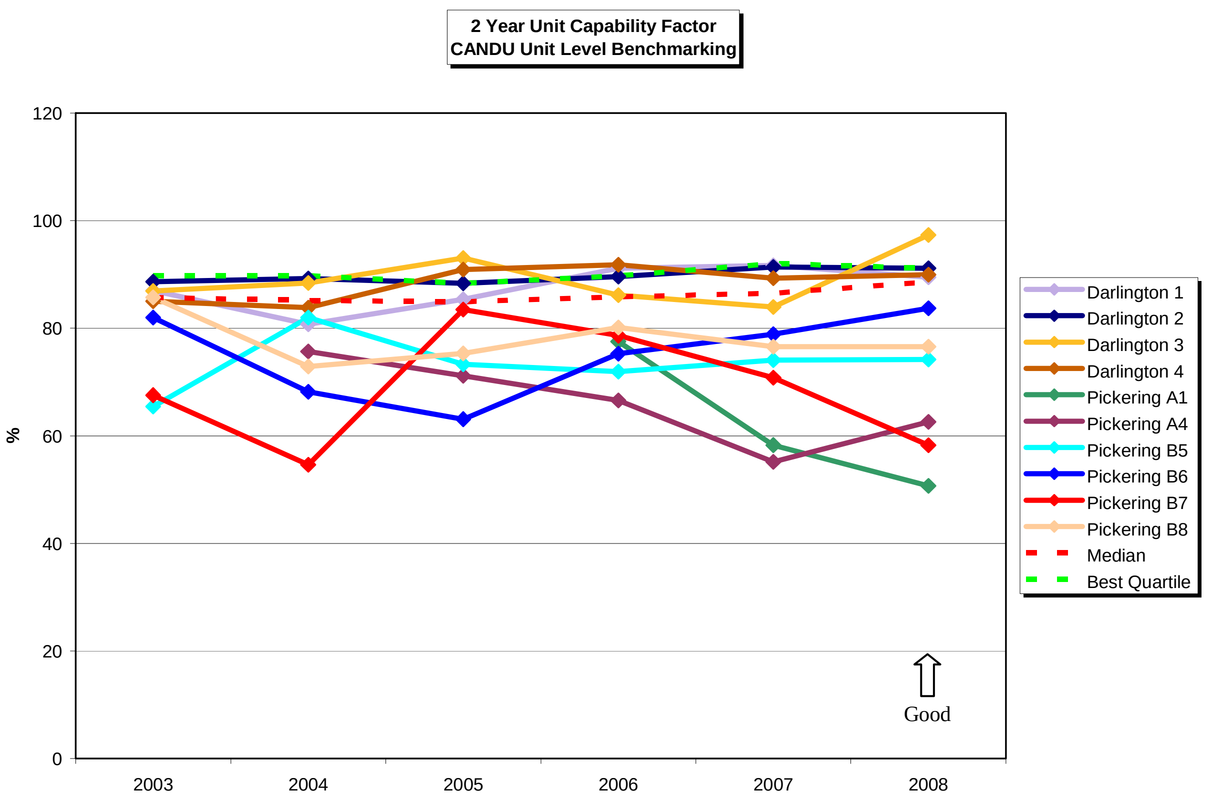
2-Year Unit Capability Factor



2008 2 Year Unit Capability Factor
CANDU Unit Level Benchmarking




2 Year Unit Capability Factor
CANDU Plant Level Benchmarking
100
90
80
70
60
50
40
30
20
10
0
%
2003
2004
2005
2006
2007
2008
Good
Darlington
Pickering A
Pickering B
Median
Best Quartile


2 Year Unit Capability Factor
CANDU Unit Level Benchmarking
120
100
80
60
40
20
0
%
2003
2004
2005
2006
2007
2008
Good
Darlington 1
Darlington 2
Darlington 3
Darlington 4
Pickering A1
Pickering A4
Pickering B5
Pickering B6
Pickering B7
Pickering B8
Median
Best Quartile

Observations – 2-Year Unit Capability Factor (CANDU)

- The performance of OPG's units has been shown relative to best quartile, median, and the threshold established by WANO to achieve full WANO NPI points. Since achievement of full WANO NPI points is recognized within the industry as a measure of desirable performance, performance gaps are assessed against full WANO NPI points in addition to median and best quartile

2008 (2-Year Rolling Average)

- UCF at best quartile worldwide CANDU plants was 90.97% for the plant average and 91.16% for individual units
- Darlington performed better than best quartile as a station and all units performed better than median individually
- Both Pickering A and B were below median as a plant and each unit performed below median individually

Trend

- Best quartile and median for both plant average and unit performance have remained relatively flat over the review period
- Darlington performance overall has remained above median for the review period with at least three of the last four periods performing above best quartile
- Pickering A had a limited time period compared to the other stations due to the restart of unit 4 in September 2003 and unit 1 in November 2005
- Pickering A performance declined significantly over the most recent two data points for the review period with no individual or plant average data points at median level for the review period
- Pickering B performance remained relatively stable over the review period but all data points for unit level and plant level results are below the median level

Factors Contributing to Performance

- To analyze performance for capability factor and forced loss rate, for 2005 to 2008 all incidents causing of loss of generation were assigned to categories (defined below) so primary drivers of performance could be identified
- Planned Outage: The specific scope and timeframe for an outage designated in advance and not including forced extensions of planned outages planned outages and extensions of planned outages reduce Unit Capability Factor. Outage extensions are further defined by the root cause categories of Equipment Reliability, Design Basis and Human Performance as defined below
- Equipment Reliability: Failure of component or equipment which directly forced or extended an outage (includes material condition problems)
- Design Basis: Equipment operated as per design. Inadequate design margin directly forced or extended an outage
- Human Performance (HP): Event caused by HP issues which directly forced or extended an outage, but HP event had to be in recent past (i.e. no HP on design basis errors in the past). This included contractors inside or outside plant (i.e. Water Treatment) that directly impacted plant operations

Factors Contributing to Performance (Cont'd)

Darlington

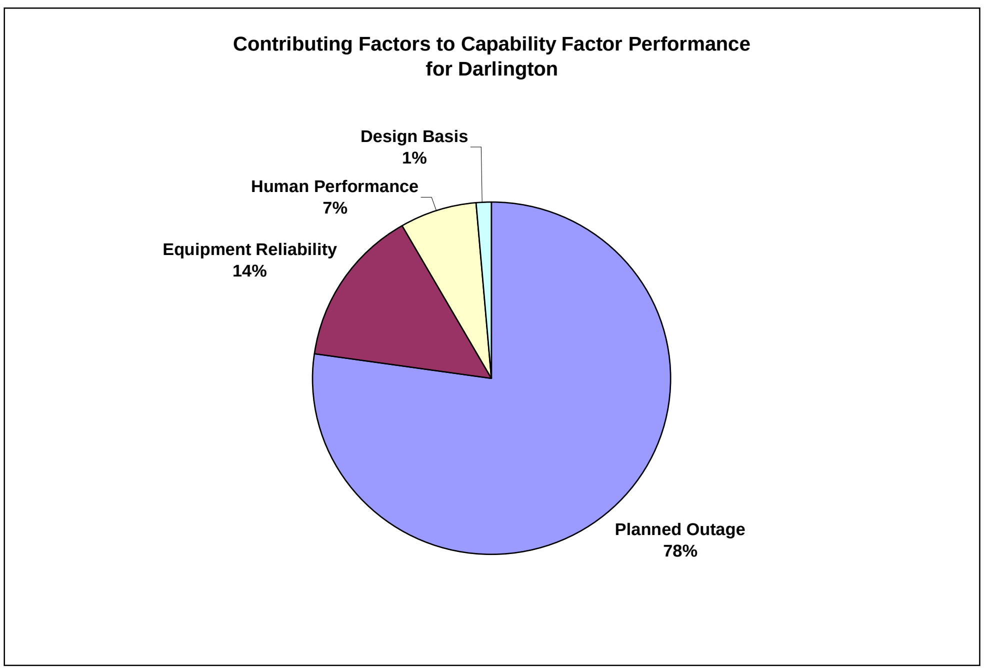
- Darlington achieved best quartile performance in UCF against the panel

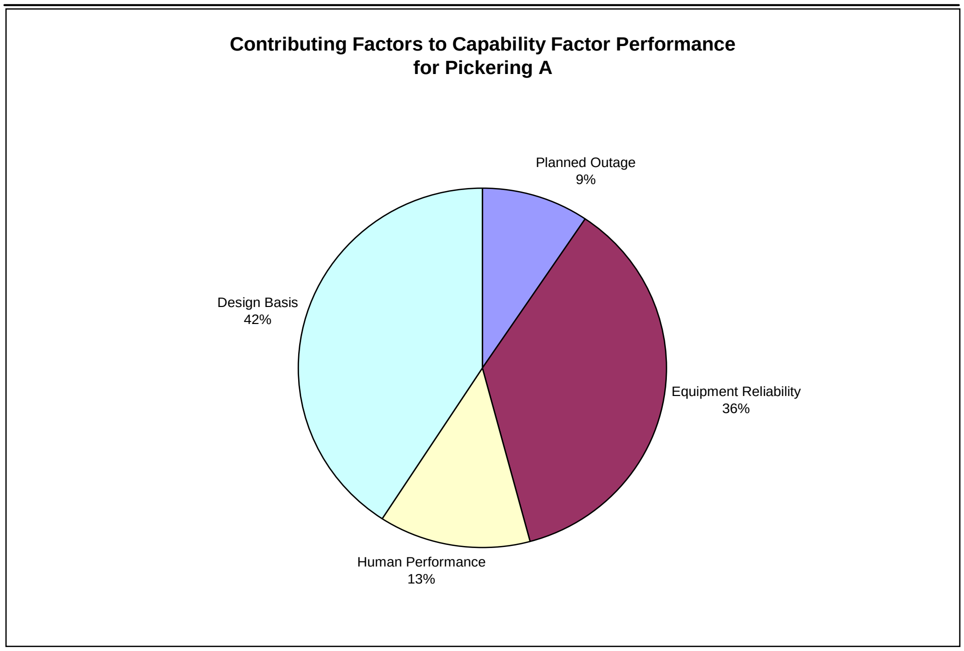
Pickering A

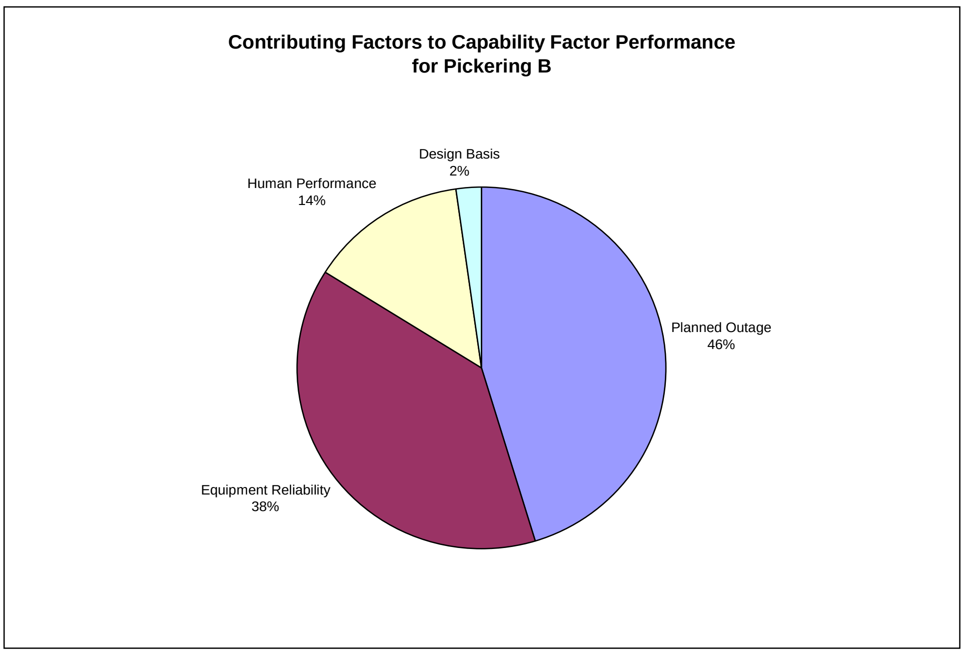
- Pickering A gap to best quartile was over 30% for 2008
- For the review period (2005-2008), approximately 13% of the Pickering gap to best quartile was attributable to human performance, approximately 36% to equipment reliability, 9% to planned outages, and 42% percent to design basis
- Pickering A had one short, planned outage of 14 days within the time period but the other two outages averaged 62 days in length
- Every planned outage during the review period had an associated forced extension

Pickering B

- Pickering B gap to best quartile was over 15% for 2008
- For the review period (2005-2008), approximately 46% of the Pickering gap to best quartile was attributable to planned outages, approximately 14% to human performance, 38% to equipment reliability, and 2% percent to design basis of the facility
- Pickering B planned outage length averaged over 64 days per outage for the review period and the data included two short, planned outages of 6.5 and 1.7 days
- Each of the eight planned outage during the review period had an associated forced extension



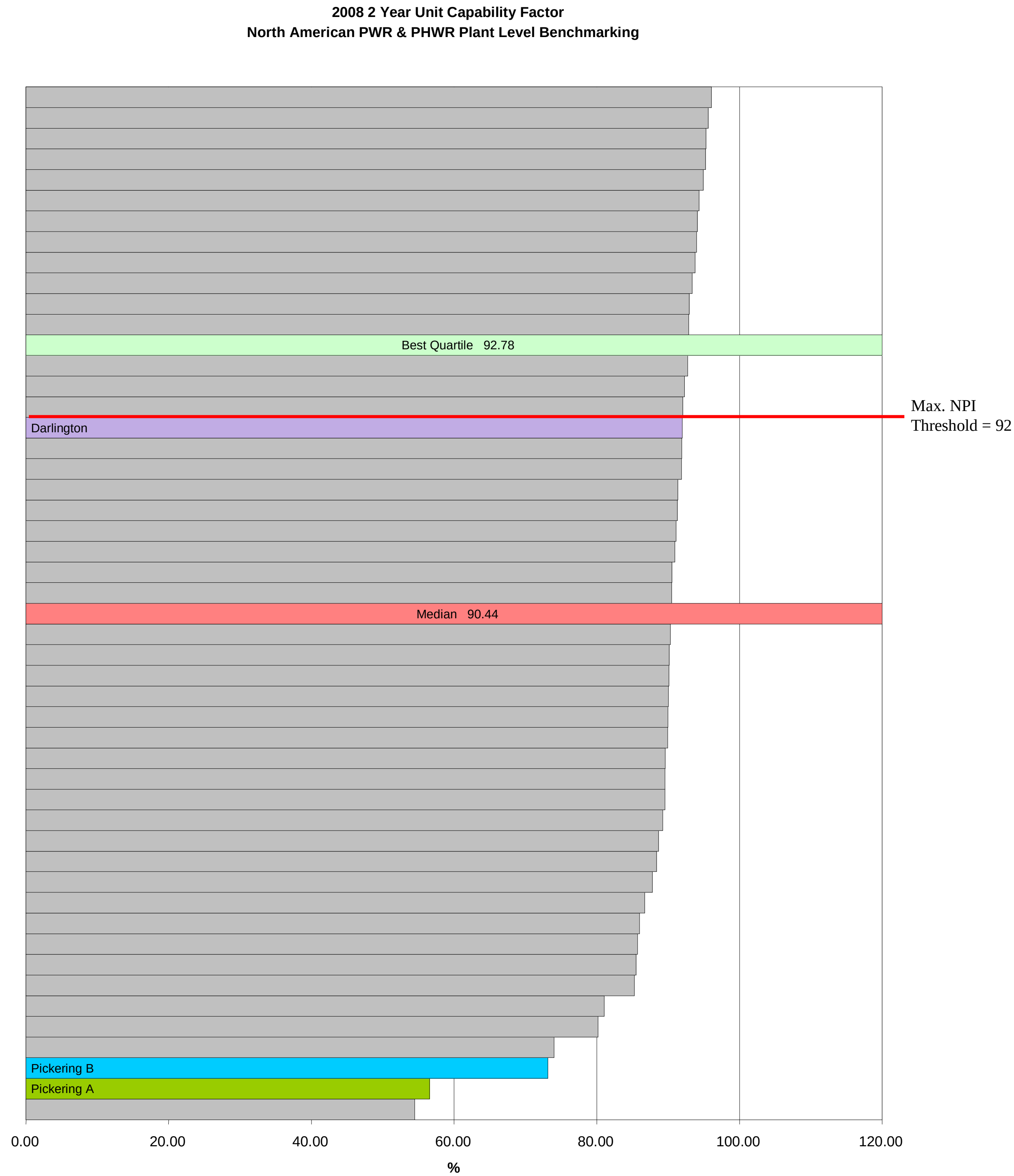




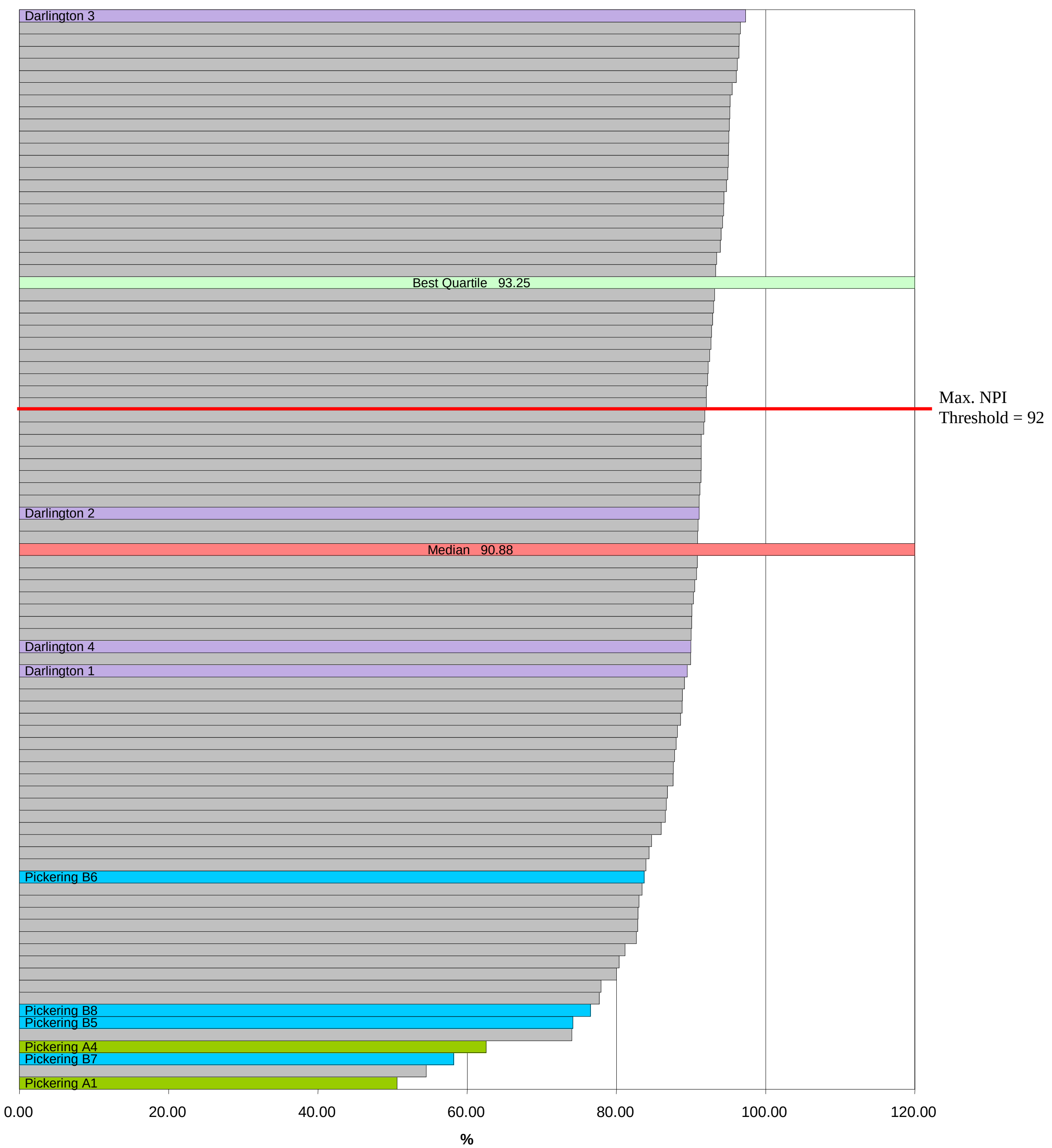
Factors Contributing to Performance (Cont'd)

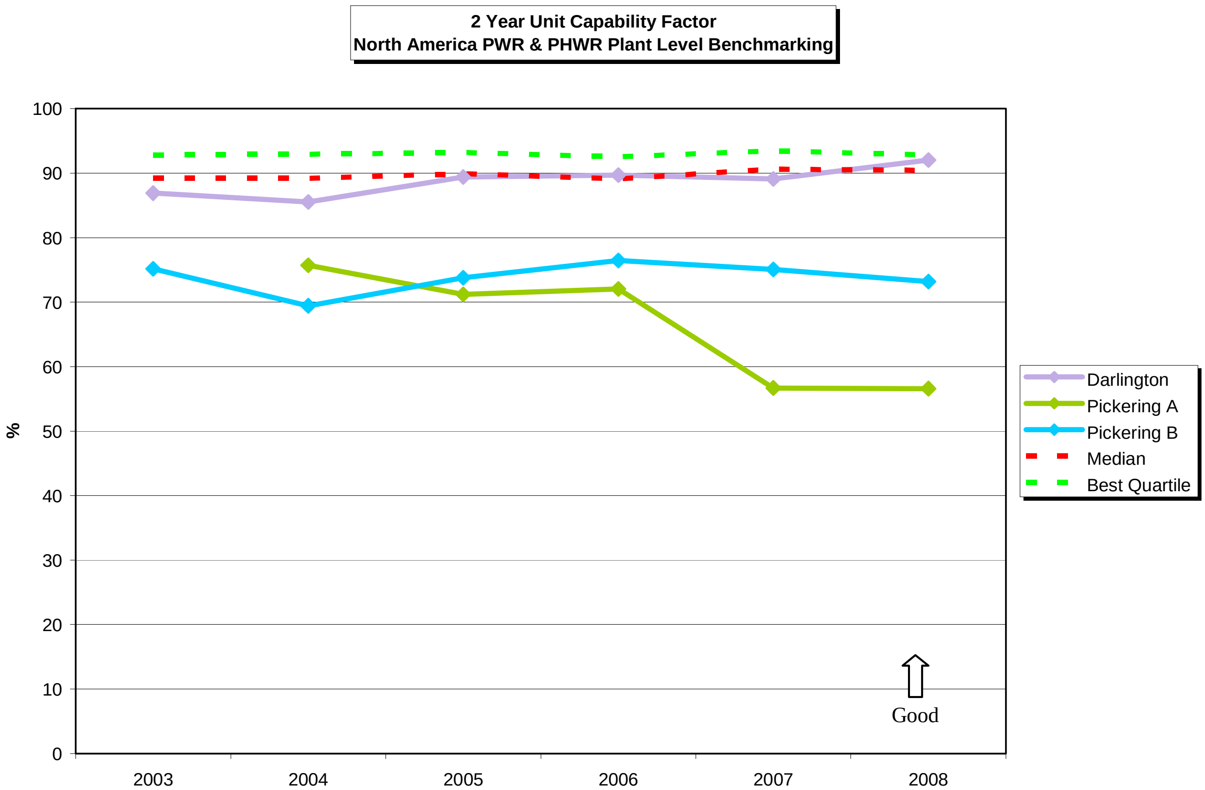
Examples of Contributing Incidents

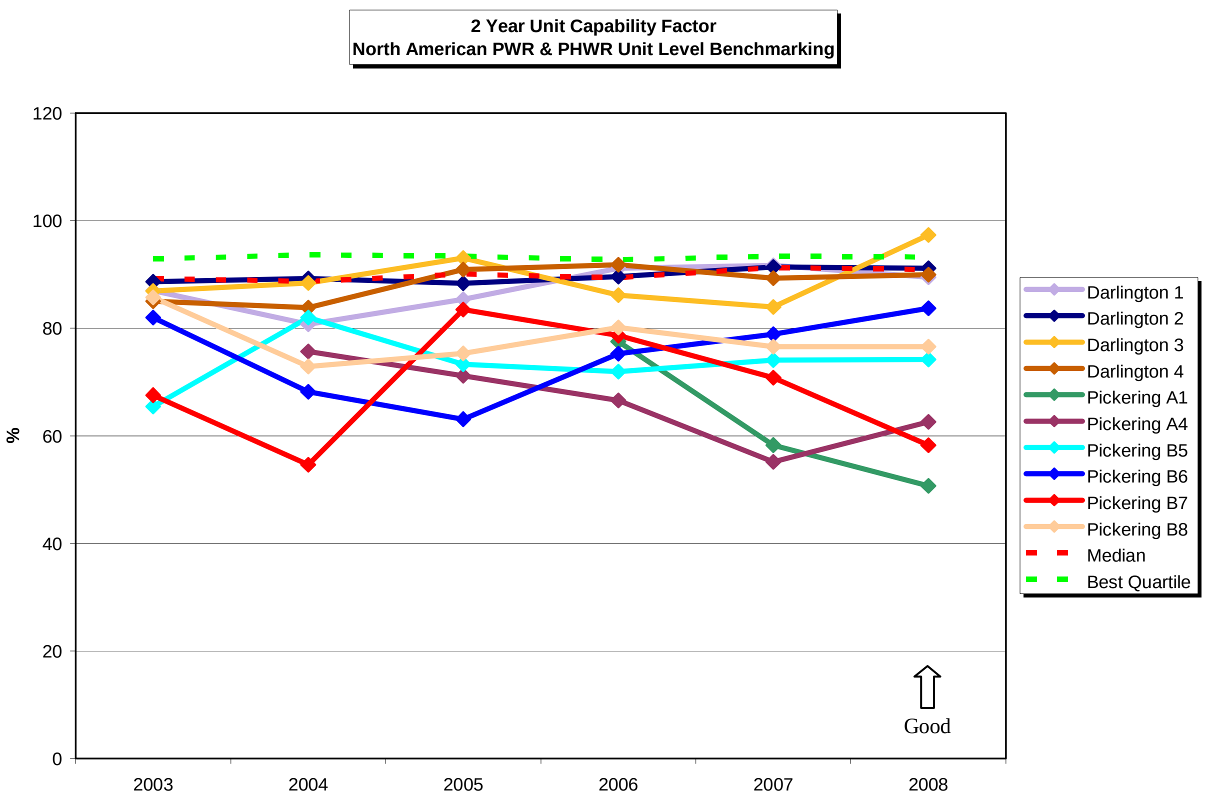
- Equipment Reliability, Design Basis and Human Performance contributors to UCF are consistent with Forced Loss Rate and are discussed under that metric
- Planned outage critical scope items driving outage length included boiler tube inspections, feeder inspections, feeder replacements, CIGAR inspections, and turbine work


2008 2 Year Unit Capability Factor
North American PWR & PHWR Plant Level Benchmarking
Best Quartile 92.78
Max. NPI
Threshold = 92
Darlington
Median 90.44
Pickering B
Pickering A
0.00
20.00
40.00
60.00
80.00
100.00
120.00
%

2008 2 Year Unit Capability Factor
North America PWR & PHWR Unit Level Benchmarking




2 Year Unit Capability Factor
North America PWR & PHWR Plant Level Benchmarking
100
90
80
70
60
50
40
30
20
10
0
%
2003
2004
2005
2006
2007
2008
Good
Darlington
Pickering A
Pickering B
Median
Best Quartile


2 Year Unit Capability Factor
North American PWR & PHWR Unit Level Benchmarking
120
100
80
60
40
20
0
%
2003
2004
2005
2006
2007
2008
Good
Darlington 1
Darlington 2
Darlington 3
Darlington 4
Pickering A1
Pickering A4
Pickering B5
Pickering B6
Pickering B7
Pickering B8
Median
Best Quartile

Observations – 2-Year Unit Capability Factor (North American PWR and PHWR)

- The performance of OPG's units has been shown relative to best quartile, median, and the threshold established by WANO to achieve full WANO NPI points. Since achievement of full WANO NPI points is recognized within the industry as a measure of desirable performance, performance gaps are assessed against full WANO NPI points in addition to median and best quartile

2008 (2-Year Rolling Average)

- UCF at best quartile North American PWR and PHWR plants was 92.78% for the plant average and 93.25% for individual units
- The overall standard for best quartile is higher for the North American PWR and PHWR panel than the worldwide CANDU panel
- Darlington performed better than median as a station but not at best quartile level
- One Darlington unit individually was the best overall for the unit panel, with one unit better than median and the remaining two units below median
- Both Pickering A and B were below median as a plant and each unit performed below median individually

Trend

- Best quartile and median for both plant average and unit performance remained relatively flat over the review period
- Darlington performance improved over the review period, moving from below median to within a relatively small margin of best quartile
- Pickering A had a limited time period compared to the other stations due to the restart of unit 4 in September 2003 and unit 1 in November 2005
- Consistent with Pickering A performance against the worldwide CANDU panel, Pickering A performance declined significantly over the most recent two data points for the review period with no individual or plant average data points at median level for the review period
- Consistent with Pickering B performance against the worldwide CANDU panel, Pickering B performance remained relatively stable over the review period but all data points for unit level and plant level results are below the median level

Factors Contributing to Performance

Darlington

- Darlington achieved gap to best quartile was approximately 1% for the most recent time period under review
- Approximately 78% of the Darlington gap to best quartile was due to planned outages, with 7% related to human performance, 14% related to equipment reliability of the plant, and 1% to design basis
- For the review period, Darlington averaged 57 days for six longer outages and averaged 18 days for three shorter outages
- Five of the nine planned outages during the review period required forced extensions

Factors Contributing to Performance (Cont'd)

Darlington (Cont'd)

- The PWR members of the panel (all but four CANDU plants) typically experience shorter planned outages for several reasons including technological differences, outage scope, and radiological challenges of fuel remaining in the core for CANDU. As a result, although variation occurs, average planned outage length for PWRs typically runs 30-35 days with some plants achieving even shorter outages
- PWRs function on a 18- to 24-month outage cycle and Darlington operated on a 24-month outage cycle for the review period

Pickering A

- Pickering A gap to best quartile was over 30% for the most recent time period under review
- The factors driving Pickering A outages were described in the previous section comparing Pickering A to the worldwide CANDU panel
- The difference in planned outage length for PWRs as compared to CANDUs also applies to Pickering A
- PWRs function on a 18- to 24-month outage cycle and Pickering A operated on a 24-month outage cycle for the review period

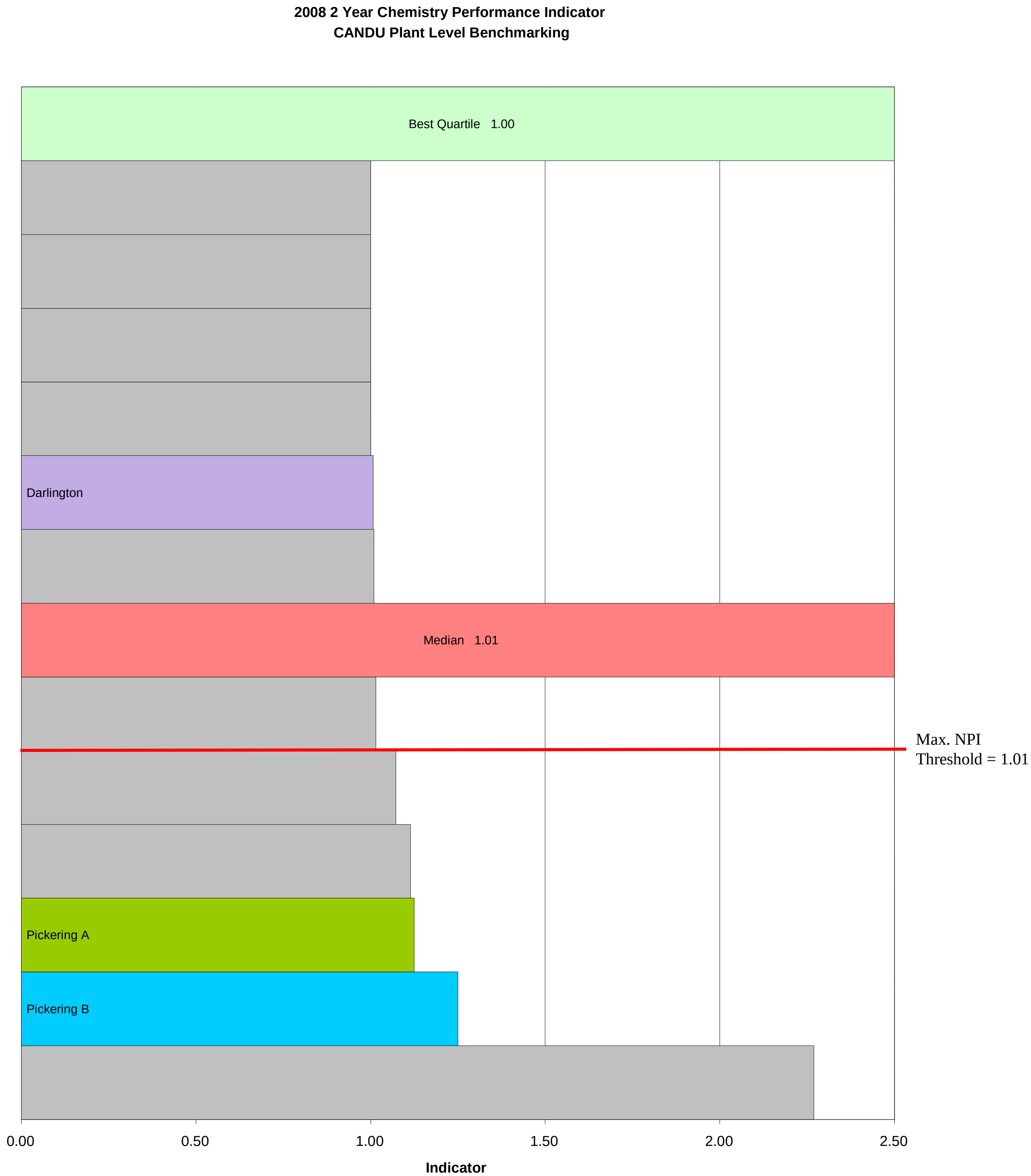
Pickering B

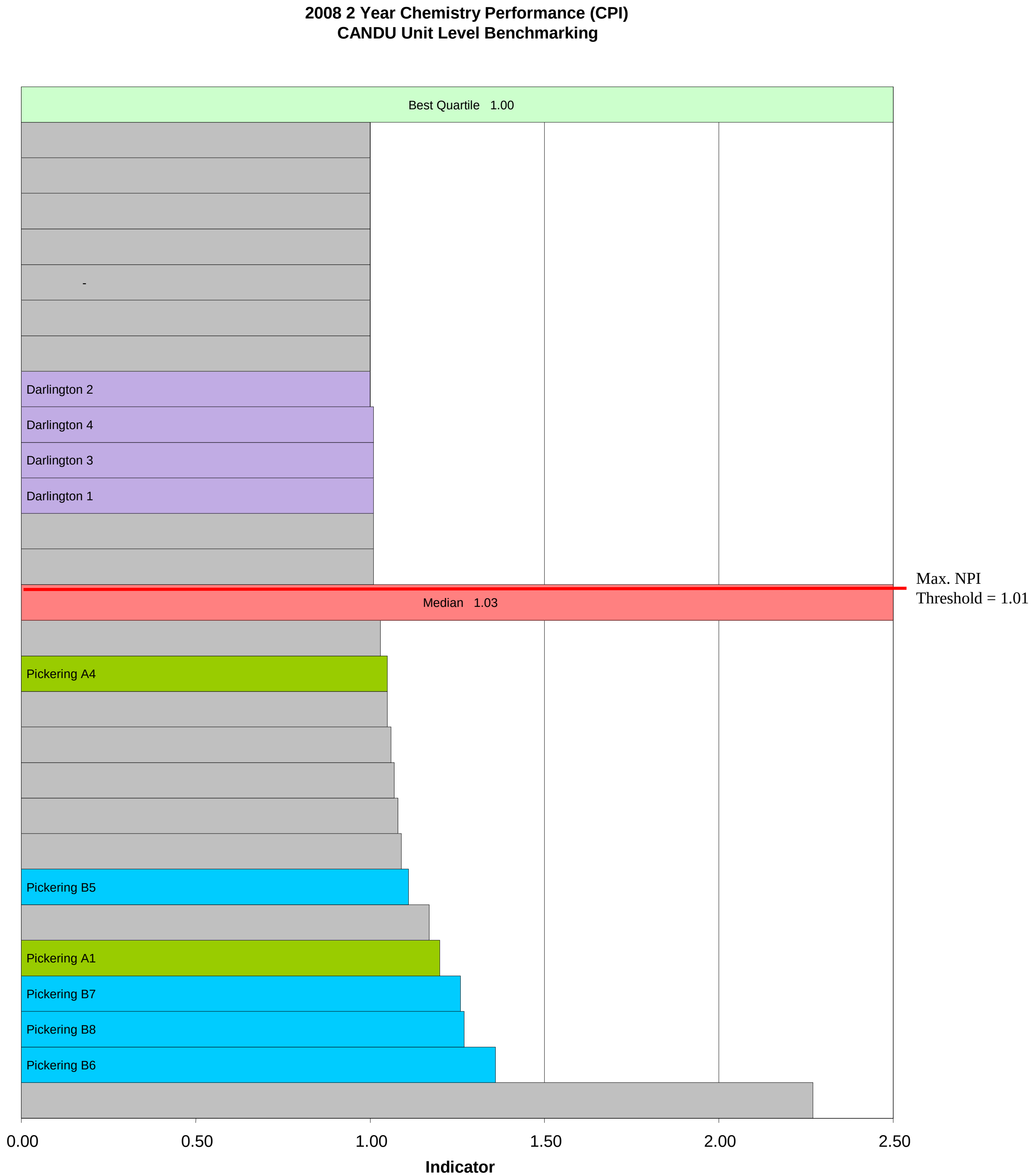
- Pickering B gap to best quartile was just under 20% for the most recent time period under review
- The factors driving Pickering B outages were described in the previous section comparing Pickering B to the worldwide CANDU panel
- The difference in planned outage length for PWRs as compared to CANDUs also applies to Pickering B
- PWRs function on a 18- to 24-month outage cycle and Pickering B operated on a 24-month outage cycle for the review period

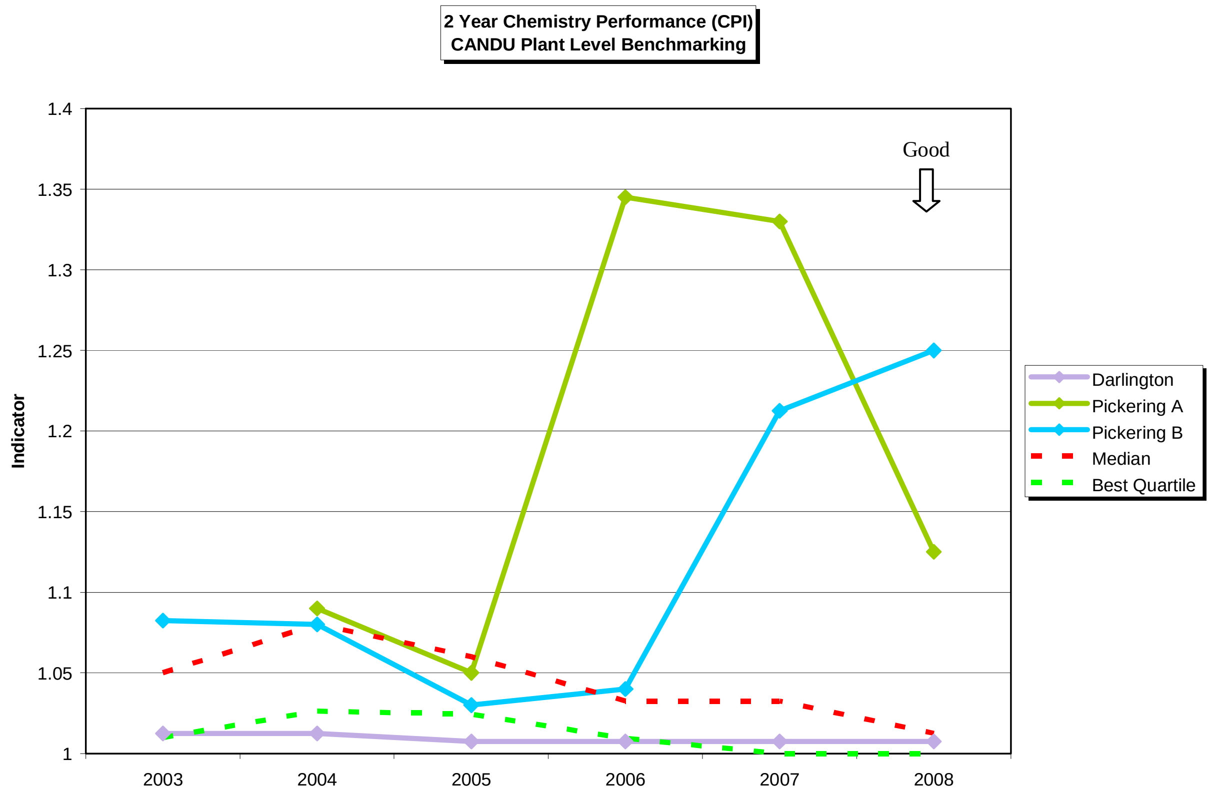
General Comments on selection of Unit Capability Factor versus Capacity Factor

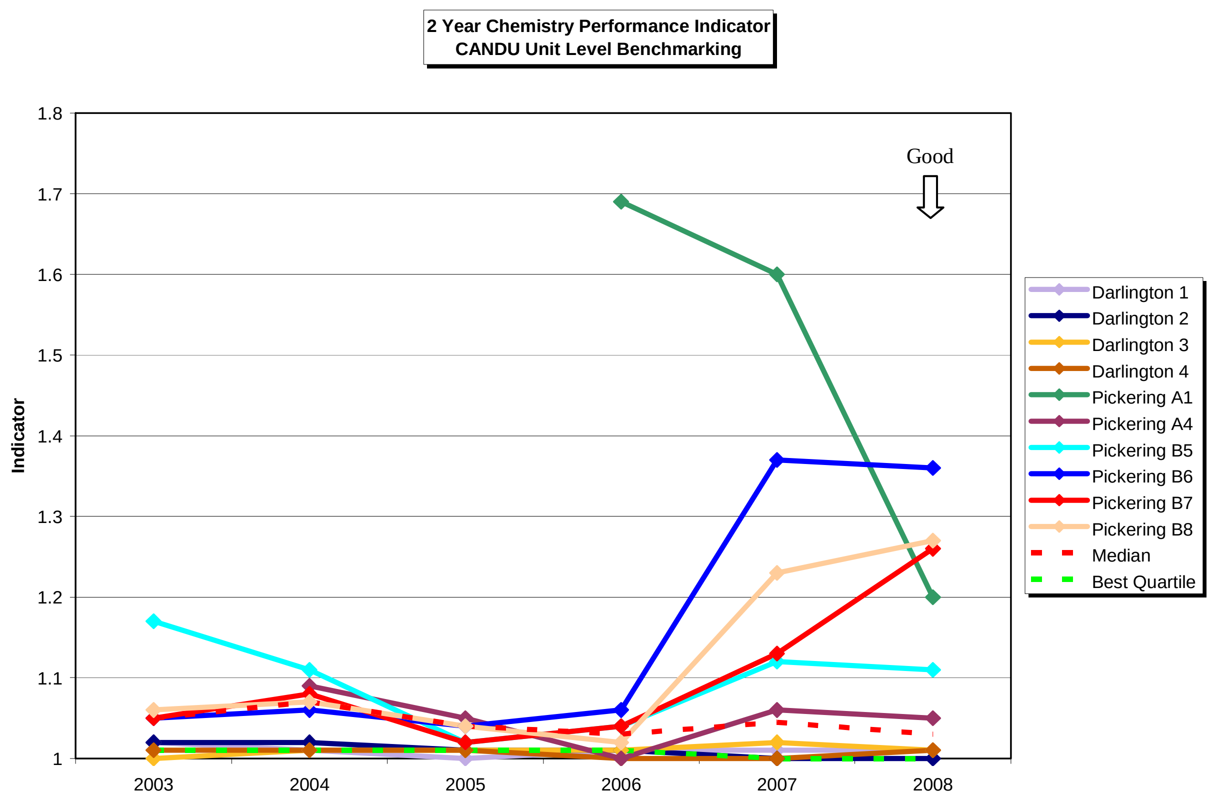
- UCF and CF are metrics used in the nuclear industry to measure generation performance. UCF was selected for benchmarking reliability in preference to capacity factor, due to the similarity of metrics (only one metric was preferred) and the availability and reliability of data. The calculation of the metrics is similar, the primary difference between UCF and CF is that CF reflects grid losses (which is not a reflection of plant performance). UCF 2008 data is also available now whereas CF 2008 from EUCG will be published in the summer of 2008. Additionally, the submission guidance and data reliability is better for WANO's Unit Capability Factor compared to EUCG's Capacity Factor

2-Year Chemistry Performance Indicator (CPI)




2008 2 Year Chemistry Performance (CPI)
CANDU Unit Level Benchmarking
Best Quartile 1.00
-
Darlington 2
Darlington 4
Darlington 3
Darlington 1
Median 1.03
Max. NPI
Threshold = 1.01
Pickering A4
Pickering B5
Pickering A1
Pickering B7
Pickering B8
Pickering B6
0.00
0.50
1.00
1.50
2.00
2.50
Indicator


2 Year Chemistry Performance (CPI)
CANDU Plant Level Benchmarking
Good
Indicator
1.4
1.35
1.3
1.25
1.2
1.15
1.1
1.05
1
2003
2004
2005
2006
2007
2008
Darlington
Pickering A
Pickering B
Median
Best Quartile


2 Year Chemistry Performance Indicator
CANDU Unit Level Benchmarking
Good
Indicator
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
2003
2004
2005
2006
2007
2008
Darlington 1
Darlington 2
Darlington 3
Darlington 4
Pickering A1
Pickering A4
Pickering B5
Pickering B6
Pickering B7
Pickering B8
Median
Best Quartile

Observations – 2-Year Chemistry Performance Indicator (CANDU)

- The performance of OPG's units has been shown relative to best quartile, median, and the threshold established by WANO to achieve full WANO NPI points. Since achievement of full WANO NPI points is recognized within the industry as a measure of desirable performance, performance gaps are assessed against full WANO NPI points in addition to median and best quartile. In the case of Chemistry Performance Indicator, there is essentially no mathematical difference between achieving best quartile and median performance

2008 (2-Year Rolling Average)
- The plant level best quartile of the CANDU panel is 1.01
- Darlington units are in the best quartile
- Pickering A units are below the median, with unit 4 nearing the median
- Pickering B units are below the median

Trend
- Darlington has shown improvement toward the maximum score since 2003
- Pickering A units have shown improvement since 2006
- Pickering B units were close to median prior to 2006, but declined in 2007
- CANDU best quartile performance is the maximum score (1.00), while median for individual units is just 1.04, showing little differentiation among units
- Since 2003, the top quartile and median scores, already close to the maximum, have converged even closer to 1.00
- Relative ranking may be dramatically changed by just a few tenths of a part per billion (ppb) for a single chemical species. For example, for a Pickering unit an additional 1 ppb sulphate (2.7 ppb vs. 1.7 ppb) could move performance from top quartile (1.00) to bottom quartile (1.10). Similarly an additional 0.2 ppb sodium could move performance from top quartile to median (1.04)

Factors Contributing to Performance

- Unit start-ups negatively impact the indicator, therefore, sustained periods of continuous operation will assist in maximizing the indicator score
- There have been examples of defective blowdown valves requiring blowdown of individual boilers to be taken out of service. This causes boiler impurity concentrations to temporarily rise and can negatively impact the indicator score

Darlington
- Darlington has no performance gap

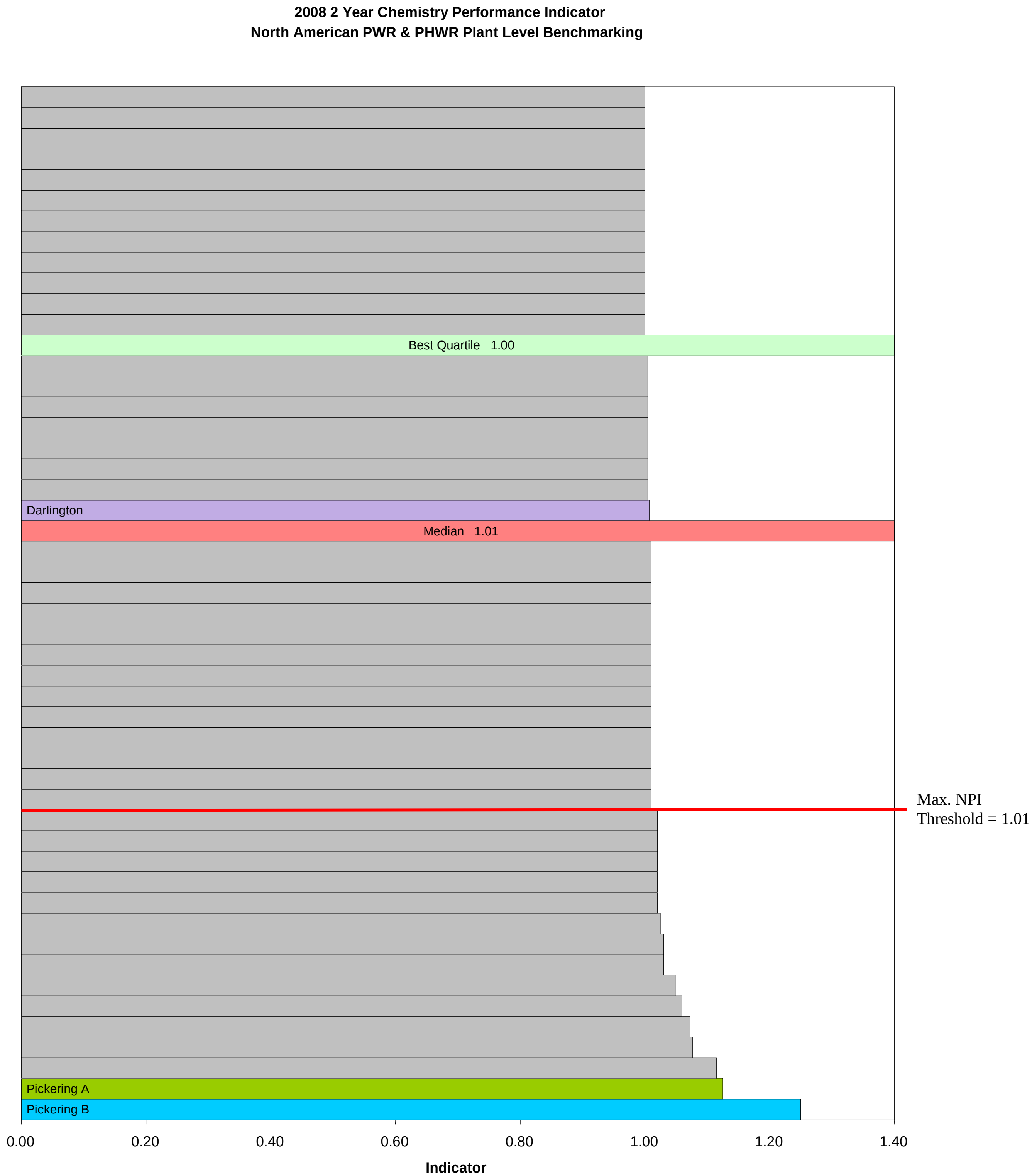
Factors Contributing to Performance (Cont'd)

Pickering A

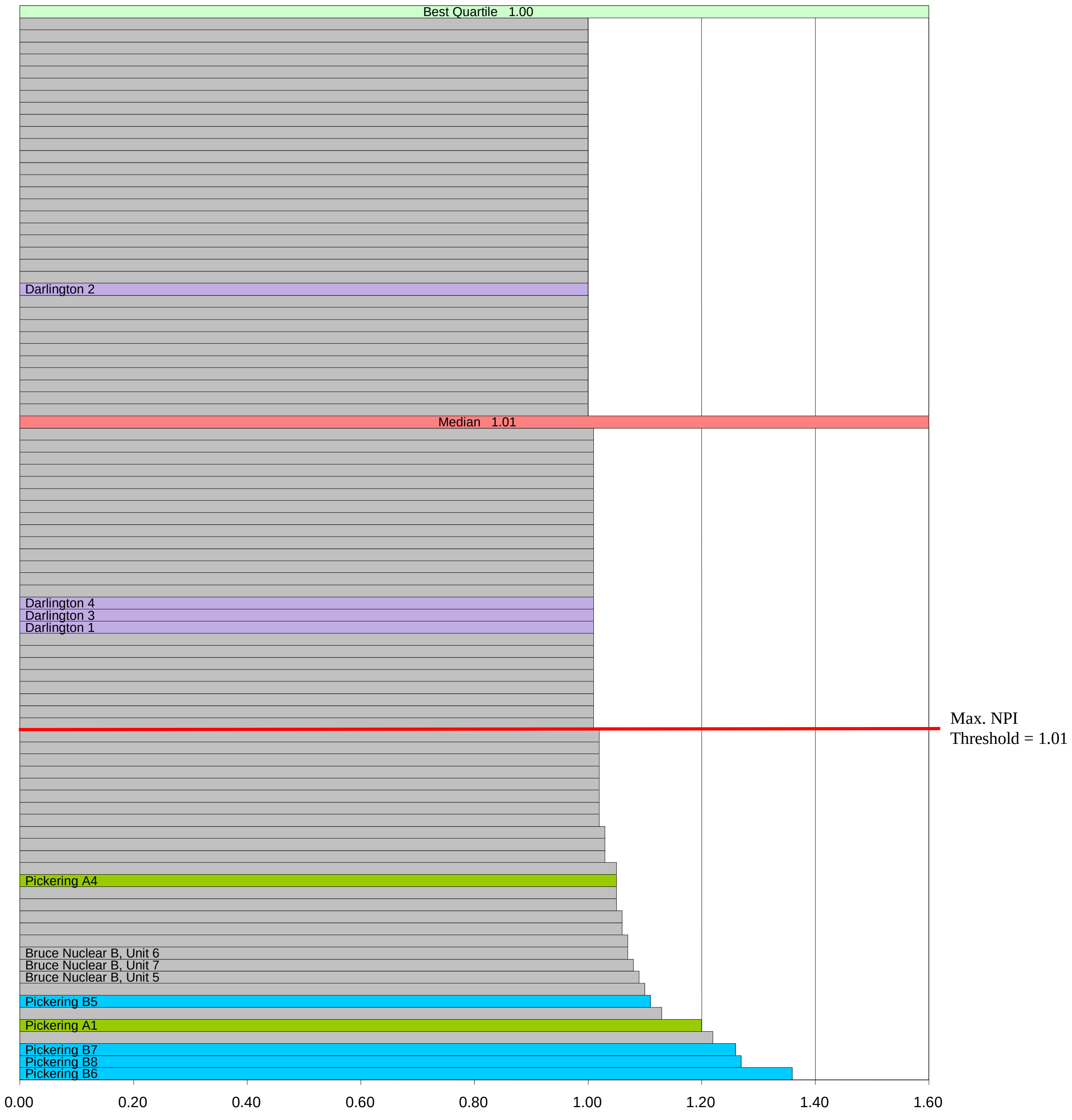
- Pickering A performance has been impacted by two major causes:
  - Unit re-start following a long period out of service negatively impacts the indicator. P4 was relatively stable during the reporting period, the return to service of P1 negatively impacted the overall Pickering A score
  - Pickering A units were affected by the December 2006 water treatment plant resin intrusion event. This indicator is a two-year rolling average, so the effects of this event remain in the calculation for 2008.

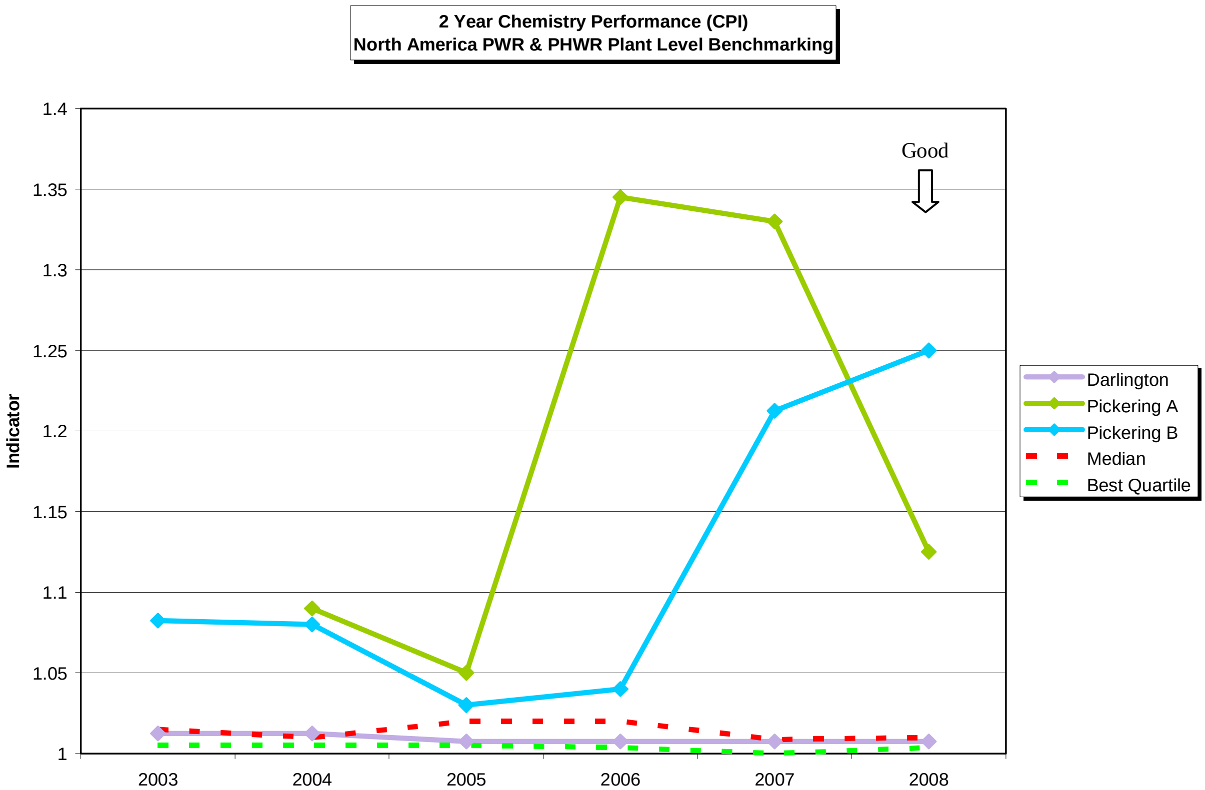
Pickering B

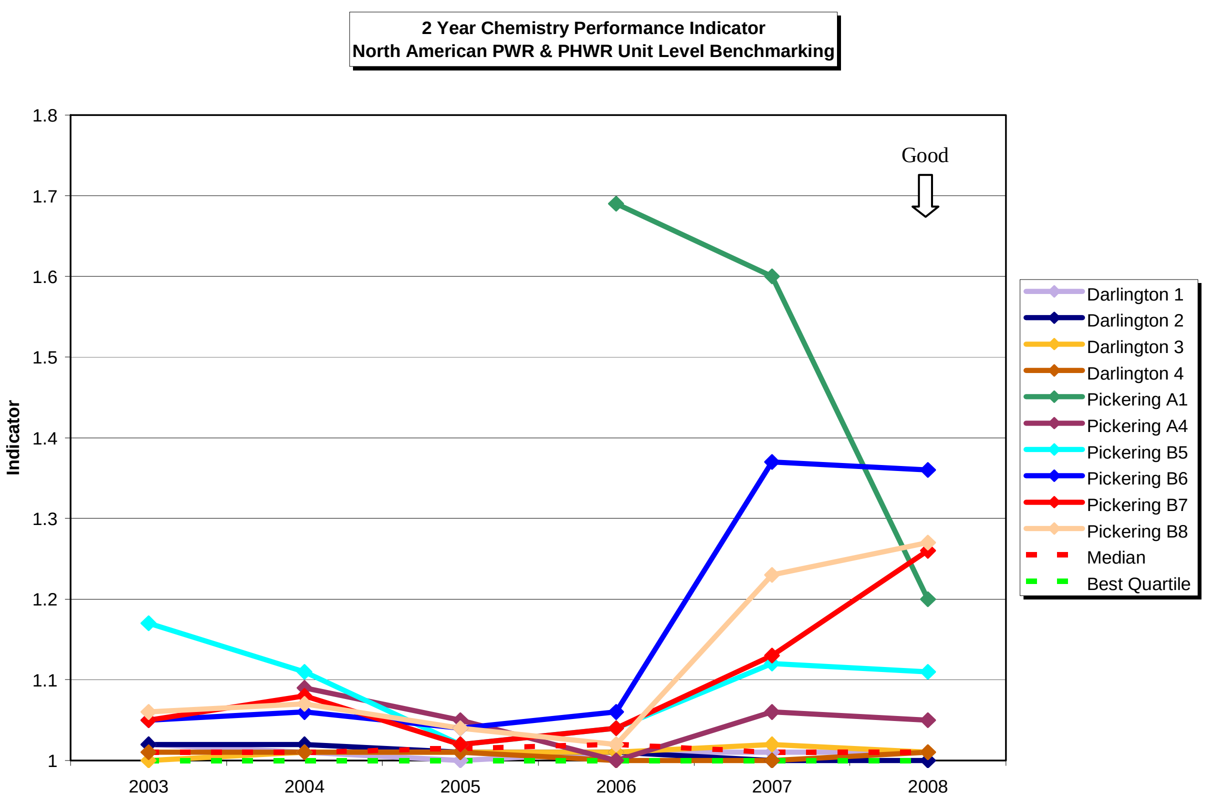
- Pickering B units were moving toward median and best quartile prior to 2006. In December 2006 significant quantities of cation form resin entered the feedwater and boilers from the water treatment plant, releasing sulphate (one of the chemical species that makes up the indicator). The worst affected units were P6 and P8 . Despite much improved performance recently, the effect is still reflected in the two-year rolling average period


2008 2 Year Chemistry Performance Indicator
North American PWR & PHWR Plant Level Benchmarking
Best Quartile 1.00
Darlington
Median 1.01
Max. NPI
Threshold = 1.01
Pickering A
Pickering B
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
Indicator

2008 2 Year Chemistry Performance (CPI)
North America PWR & PHWR Unit Level Benchmarking




2 Year Chemistry Performance (CPI)
North America PWR & PHWR Plant Level Benchmarking
Good
Indicator
1.4
1.35
1.3
1.25
1.2
1.15
1.1
1.05
1
2003
2004
2005
2006
2007
2008
Darlington
Pickering A
Pickering B
Median
Best Quartile


2 Year Chemistry Performance Indicator
North American PWR & PHWR Unit Level Benchmarking
Good
Indicator
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
2003
2004
2005
2006
2007
2008
Darlington 1
Darlington 2
Darlington 3
Darlington 4
Pickering A1
Pickering A4
Pickering B5
Pickering B6
Pickering B7
Pickering B8
Median
Best Quartile

Observations – 2-Year Chemistry Performance Indicator (North American PWR/PHWR)

- The performance of OPG's units has been shown relative to best quartile, median, and the threshold established by WANO to achieve full WANO NPI points. Since achievement of full WANO NPI points is recognized within the industry as a measure of desirable performance, performance gaps are assessed against full WANO NPI points in addition to median and best quartile. In the case of Chemistry Performance Indicator, there is essentially no mathematical difference between achieving best quartile and median performance

2008 (2-Year Rolling Average)

- Darlington unit performance is in top quartile or median of the North American PWR/PHWR panel
- Pickering A (units 1 and 4) is in the bottom quartile
- Pickering B units are all at the bottom of the performance chart

Trend

- Darlington performance has remained consistent during the review period
- Pickering A performance decreased from 2005-2006, but has started to improve
- Pickering B performance remained just under median until 2006 at which point performance began to drop
- Top-performing units have little differentiation, with top performance being maximum score (1.00) and median 1.01
- U.S. PWRs and BWRs have been reporting the INPO Chemistry Effectiveness Indicator (CEI), in addition to the WANO CPI for a year and one quarter
- The intent of the CEI is to allow more direct benchmarking of performance between different reactor designs (PWR and BWR), provide an indicator of performance for more than one system (i.e. not just the steam generators as is the case for the CPI) and to allow more meaningful differentiation among plants
- OPG and Bruce Power have done some preliminary internal reporting of a metric similar to CEI and are currently working to produce a CANDU CEI to present to the COG CANDU community as a possible replacement for CPI

Factors Contributing to Performance

In general, for all OPG units CPI performance is maximized by:

- Ensuring high-quality, make-up water is delivered at all times by the facility water treatment plant
- Ensuring condenser in-leakage is minimized, and in particular, reacting quickly to condenser tube leaks
- Ensuring steam generator blowdown is available at all times to remove accumulating impurities
- Minimizing the number of unit start-ups and reviewing start-up documentation to ensure best practices for chemistry control are in place. Items such as options for condensate/filtration should be evaluated

Factors Contributing to Performance (Cont'd)

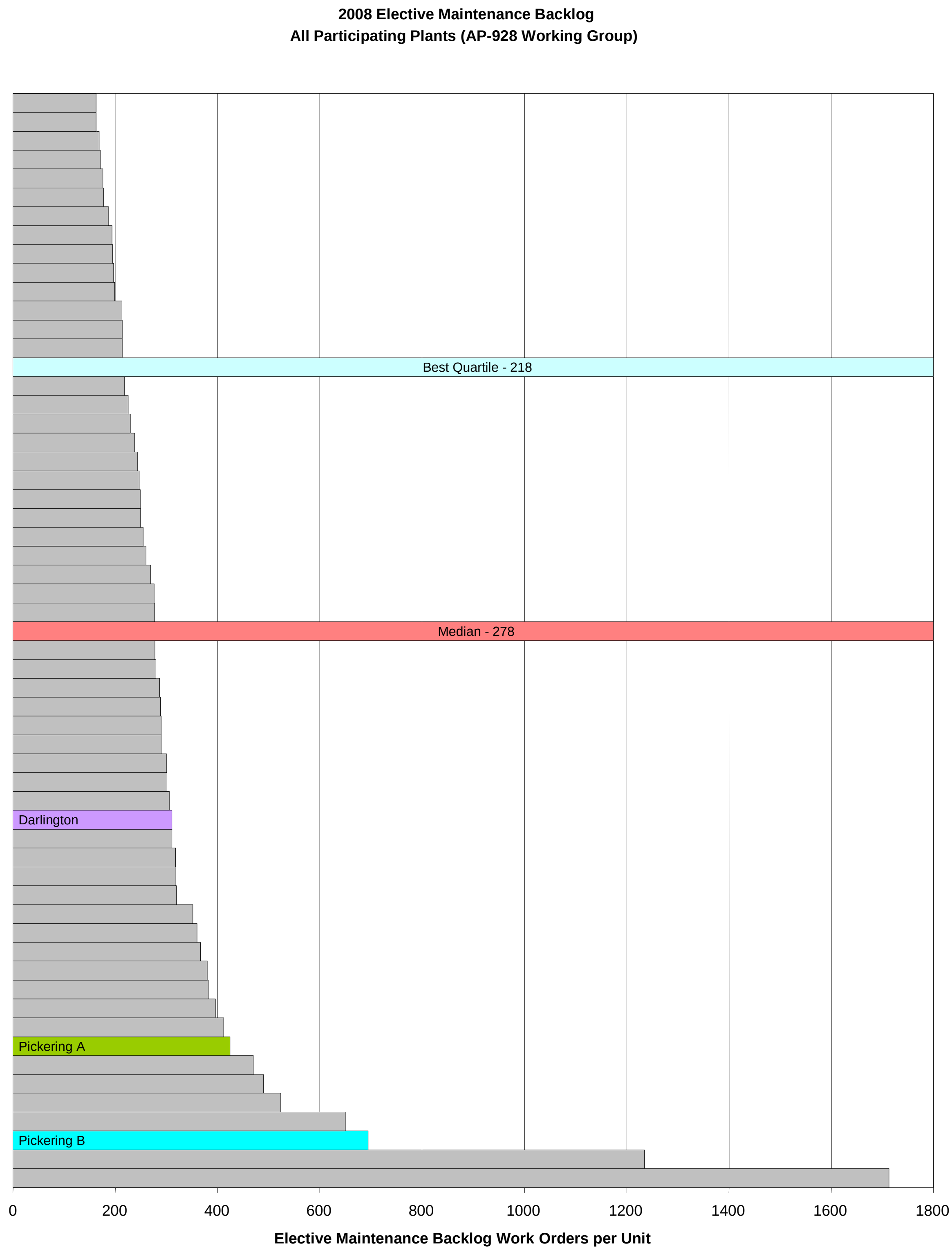
Pickering A

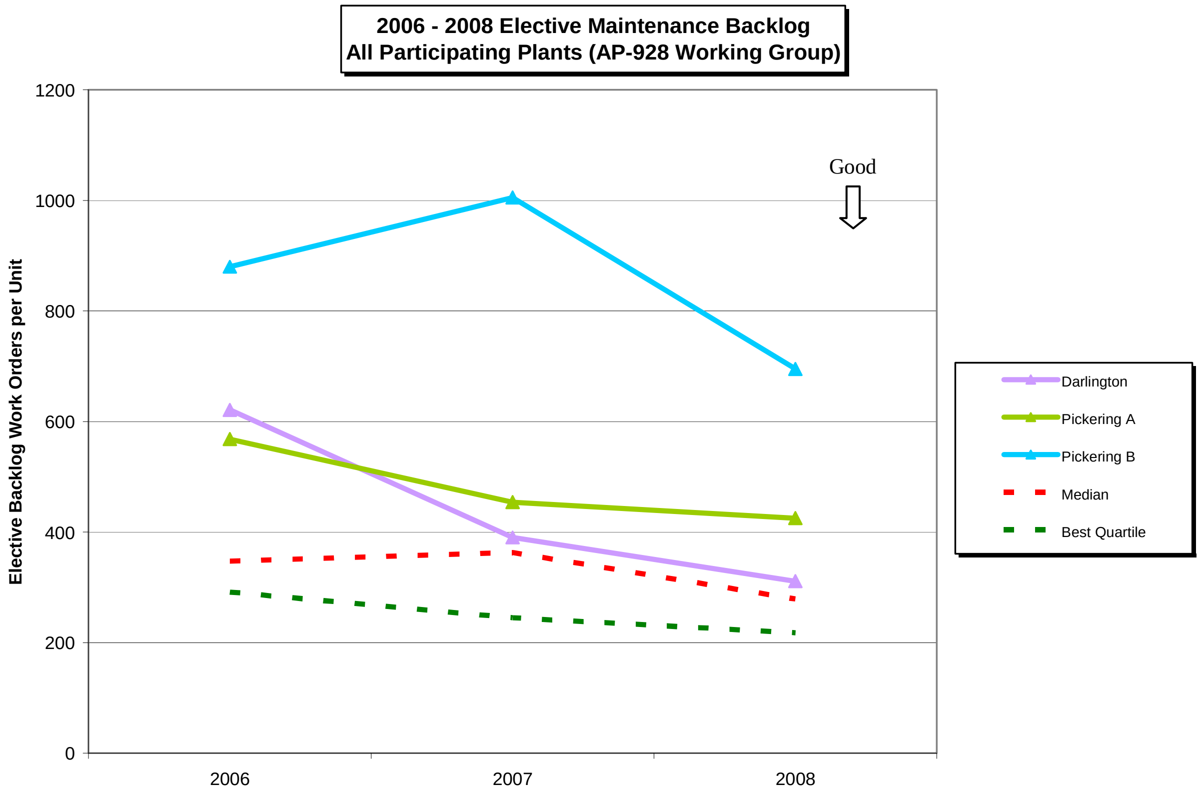
- Pickering A performance is difficult to assess due to the impact of the resin event of 2006 and the minimal differentiation in performance between top and bottom performing plants. Nevertheless, allowing for the impact of the resin event, performance would be expected in the 1.00 to 1.05 range, though performance at the bottom end of this very narrow range would still place the units well toward the bottom of the performance chart
- In any case, start-up transients would likely have impact the ability of these units to consistently produce top quartile performance

Pickering B

- Pickering B performance is difficult to assess due to the impact of the resin event of 2006 and the minimal differentiation in performance between top and bottom performing plants
- Allowing for the impact of the resin event, performance would be expected in the 1.00 to 1.05 range, though performance at the bottom end of this very narrow range would still place the units well toward the bottom of the performance chart
- It is expected that start-up would similarly impact the ability of these units to consistently produce top quartile performance

1-Year On-line Elective Maintenance Backlog




2006 - 2008 Elective Maintenance Backlog
All Participating Plants (AP-928 Working Group)
Elective Backlog Work Orders per Unit
1200
1000
800
600
400
200
0
2006
2007
2008
Good
Darlington
Pickering A
Pickering B
Median
Best Quartile

Observations – Elective Maintenance Backlog (INPO AP-928 Workgroup)

- Although all common services backlogs at Pickering are ascribed to Pickering A for purposes of internal reporting, when reporting externally, such backlogs are divided up between Pickering A and B based on operating units. Therefore 33% of common services backlogs reside at Pickering A, the remaining with Pickering B. This adjustment is reflected in the Pickering A and B backlog numbers presented below

2008

- The data in this panel is gathered by an independent industry group of peers through an INPO AIP-928 group
- Best quartile for the panel is 218 elective work orders
- All three plants are currently performing worse than median

Trend

- The overall industry best quartile has improved steadily for the review period
- Darlington is the closest station in the OPG fleet to reach median performance as indicated in industry performance metrics. Darlington has been focused on its elective maintenance backlogs for some time, however, efforts made in 2006 allowed them to drive their backlogs down with an entire site focus. Considerable work still remains to reach top quartile, but the infrastructure is in place
- Pickering B was an outlier with the industry in 2004 and 2005, far above the nearest reporting utility. Significant gains have been made but they remain with the fourth quartile group, with a significant gap to top quartile remaining

Factors Contributing to Performance

- Key performance drivers for this metric include: parts obsolescence, bottle necks, and engineering holds

Darlington

- Darlington recently broke the 300 plane putting them within reach of median status. In order to bridge the gap in attaining top quartile, a 30% further reduction in backlogs is required. An additional challenge Darlington faces is related to the speed in which the industry is advancing in this area. It is projected that actual gap they are facing is closer to a 40% reduction. Issues challenging Darlington include timely engineering holds resolution and parts obsolescence

Pickering A

- Pickering A elective maintenance backlog has held in the 500 range (unadjusted, 475 adjusted) as they fight through a planned as well as two forced outages this year. A reduction of approximately 60% of their backlog is required to attain top quartile. Challenges affecting Pickering A include forced loss rate, work assessment, and parts obsolescence

Factors Contributing to Performance (Cont'd)

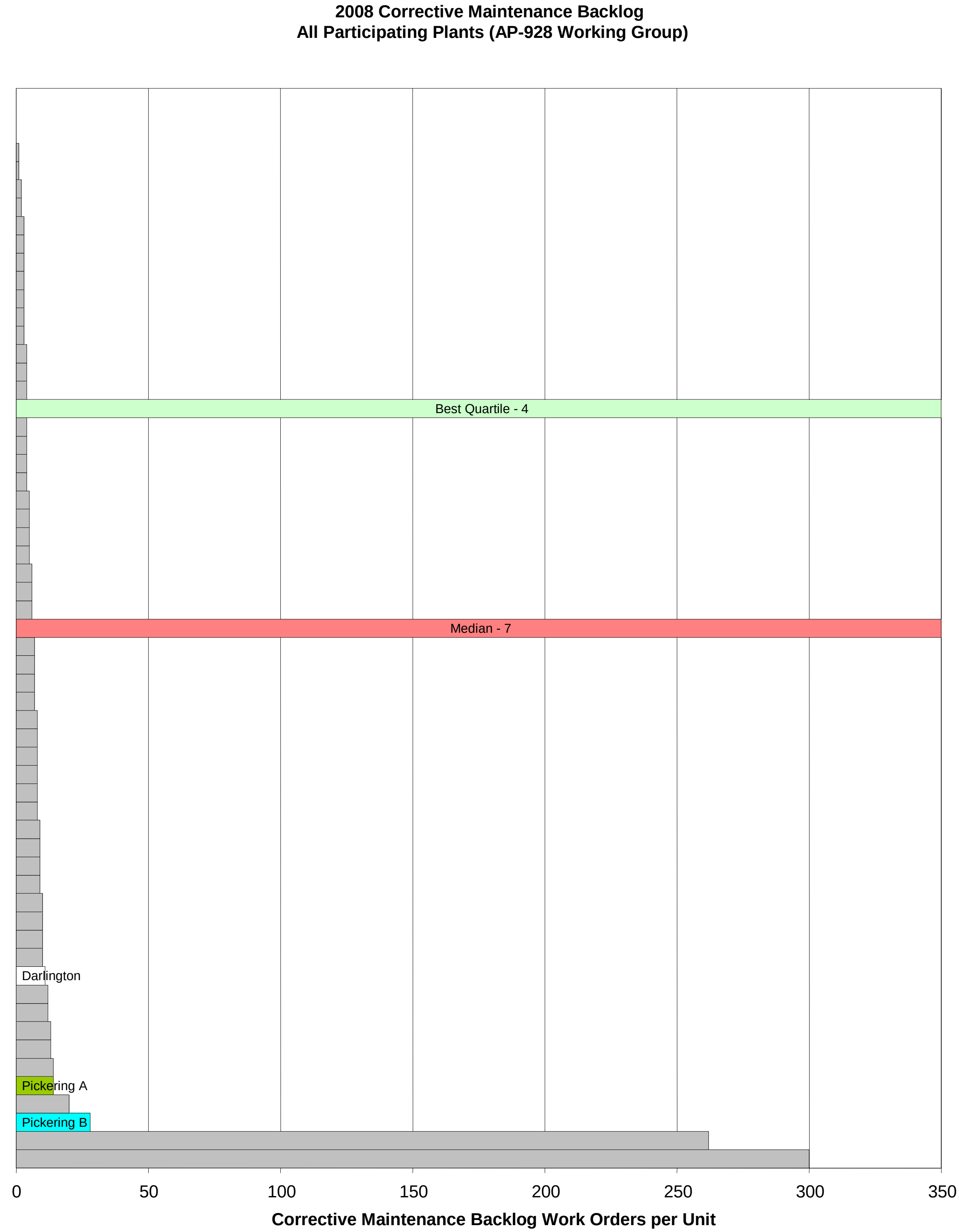
Pickering B

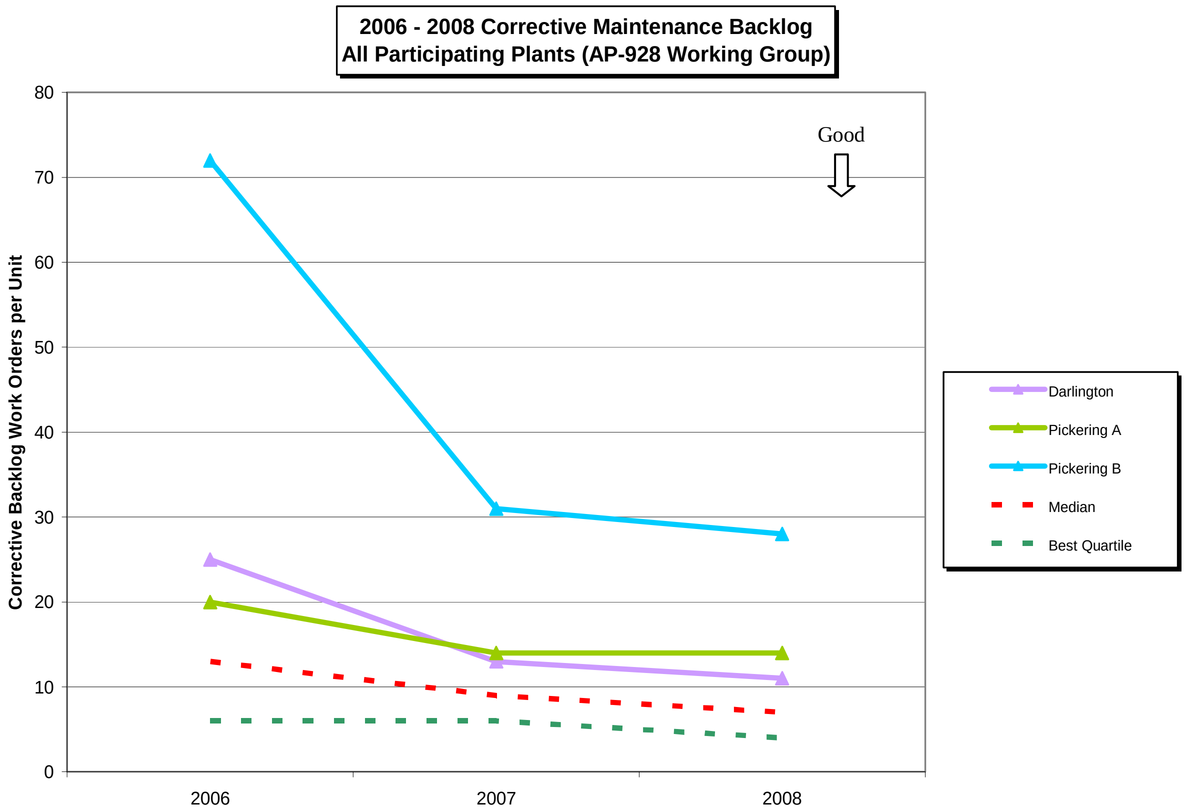
- Pickering B elective maintenance backlog is currently at 685 (unadjusted, 698 adjusted). They have to reduce their backlog by 70% to attain top quartile. Performance for the year has been flat with one unit in a planned outage. Challenges affecting Pickering B include extended planned outages resulting in resource availability issues for operating units backlogs; assessing work**,** engineering holds resolution, and parts obsolescence

General Comments

- Recognition should be given to the challenges a four-unit CANDU site has that is not present with PWR and BWR technology. On-line fueling, heavy water management and a common vacuum building that connects all units' containment structures raise the complexity of accomplishing scheduled work.
- Having four-unit stations increases impacts of plant perturbations on the other units. In terms of comparison, there are no four-unit PWR or BWR sites in existence. The closest comparison would be three-unit sites with only three in existence (the remaining sites are single- and dual-unit stations)
- While this additional complexity cannot be quantified into a factor when comparing backlog performance, it should be a consideration when understanding the effort required to maintain backlogs at a four-unit CANDU station

1-Year Corrective Maintenance Backlog




2006 - 2008 Corrective Maintenance Backlog
All Participating Plants (AP-928 Working Group)
Corrective Backlog Work Orders per Unit
80
70
60
50
40
30
20
10
0
2006
2007
2008
Good
Darlington
Pickering A
Pickering B
Median
Best Quartile

Observations – Corrective Maintenance Backlog (INPO AP928 Workgroup)

2008

- Best quartile for the panel is four work orders
- Currently all OPG sites are performing worse than median
- Darlington is at 11, Pickering A is at 14 and Pickering B is at 28. A 50% reduction by Pickering A corrective maintenance backlog and a 70% by Pickering B corrective maintenance backlog are required to bring them into alignment with top performance in the industry

Trend

- Best quartile has remained fairly constant and a low number for the review period, while median has improved, revealing an overall trend in the industry to single-digit corrective maintenance backlog results
- All OPG sites have shown consistent improvement over the review period but remain worse than median for the duration of the review period. All stations were in excess of single-digit corrective maintenance values over the review period

Factors Contributing to Performance

- Both best quartile and median are single-digit values. Achieving single-digit corrective maintenance backlog (i.e. nine or lower) is considered desirable indicator performance. Further reductions may not be prudent from a cost/benefit perspective, i.e. it is not apparent that there is additional value for OPG to seek performance levels at best quartile/median.

Darlington

- Darlington has maintained current performance level for the better part of the last year. Their program and process rigor are able to maintain corrective maintenance backlogs at this level

Pickering A

- Pickering A has remained flat with the same challenges mentioned in the elective maintenance analysis

Pickering B

- Pickering B has also remained flat with parts obsolescence and subsequent engineering issues with corrective maintenance backlogs

General Comments

- The general comments on elective maintenance backlog (previous section) are also applicable for this section

4.0 VALUE FOR MONEY

Methodology and Sources of Data

Costs indicators were retrieved from the EUCG website in April of 2008. Data was collected for three-year rolling averages for all financial metrics covering the review period from 2005-2008. Zero values for cost indicators are excluded from all calculations. For two-year averages where only one year of data is available, the most recent year's value is used. All data pulled from the EUCG website by OPG is automatically converted by EUCG to Canadian dollars. Therefore, all values included within this benchmarking report are in Canadian dollars.

Effective January 2009 (but applied retroactively to EUCG historical data), EUCG automatically applies a purchasing power parity (PPP) value to adjust for all values across national borders. The primary function of the PPP value is to adjust for currency exchange rate fluctuations but it will also take into account additional cross-border factors which may impact purchasing power of companies in different jurisdictions. As a result, cost variation between plants is limited, as much as possible, to real differences and not advantages of utilizing one currency over another.

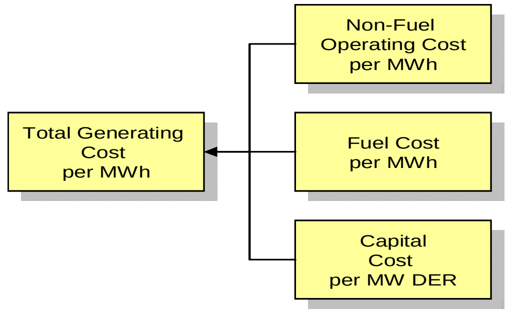
The benchmarking panel utilized for value for money metrics is made up of all North American plants reporting to EUCG. Within that panel, there is only one other CANDU technology plant reporting, Bruce Power. The remaining plants are BWRs or PWRs. For that reason, some of the gaps in performance are likely associated with technology differences rather than comparable performance. However, some of a plant's performance is not directly tied to technology differences and can be compared across technologies, allowing this panel to be used for benchmarking purposes.

All metrics include cost information normalized by some factor (MWh or MW DER) to allow for more accurate comparison across plants of different sizes and numbers of units.

Discussion

Four "value for money" metrics are benchmarked in this report. They are total generating costs per MWh, non-fuel operating costs per MWh, fuel cost per MWh and capital costs per MW DER. The metrics themselves roll up as shown in the illustration below. Total generating cost is the sum of non-fuel operating cost, fuel cost, and capital cost. Given differences between OPG and most North American plant with respect to both fuel costs and capital costs, the best overall financial comparison metric for OPG facilities is total generating cost per MWh.

Diagram of Summary Relationship of Value for Money Metrics



Capital cost is reported on a capital cost per MW DER basis individually; because that is the most appropriate benchmarking metric (output or MWh are not appropriate values to normalize for capital investment). When totaled to calculated total generating cost per MWh, the denominator for capital cost is changed to MWh to maintain consistency of units.

Capital costs per MW DER: The benchmark data indicates that OPG per unit capital spending is the lowest in North America with Darlington, Pickering A and Pickering B all performing within the best quartile for the panel. Lower capital costs could be in part due to the application of the capitalization policy at OPG for purposes of classifying projects as capital or OM&A or due to the use of higher capitalization threshold at OPG than at most other plants in the panel. When OPG OM&A projects are added to capital expenditures, the resulting total is more consistent with the per unit capital spending of other plants in the EUCG panel.

As a result, the benchmark data suggests that the lower capital costs results in higher non-fuel operating cost per MWh. In other words, the impact of low capital project costs offset by high OM&A projects costs results in OM&A expenses appearing slightly higher against benchmark plants and capital expenditures appearing lower against benchmark plants.

The best way to address this difference is to utilize total generating cost per MWh (i.e. the sum of non-fuel operating cost, fuel cost, and capital cost) as the primary financial benchmark to eliminate any unintended impact of the capitalization policy on total operating cost per MWh.

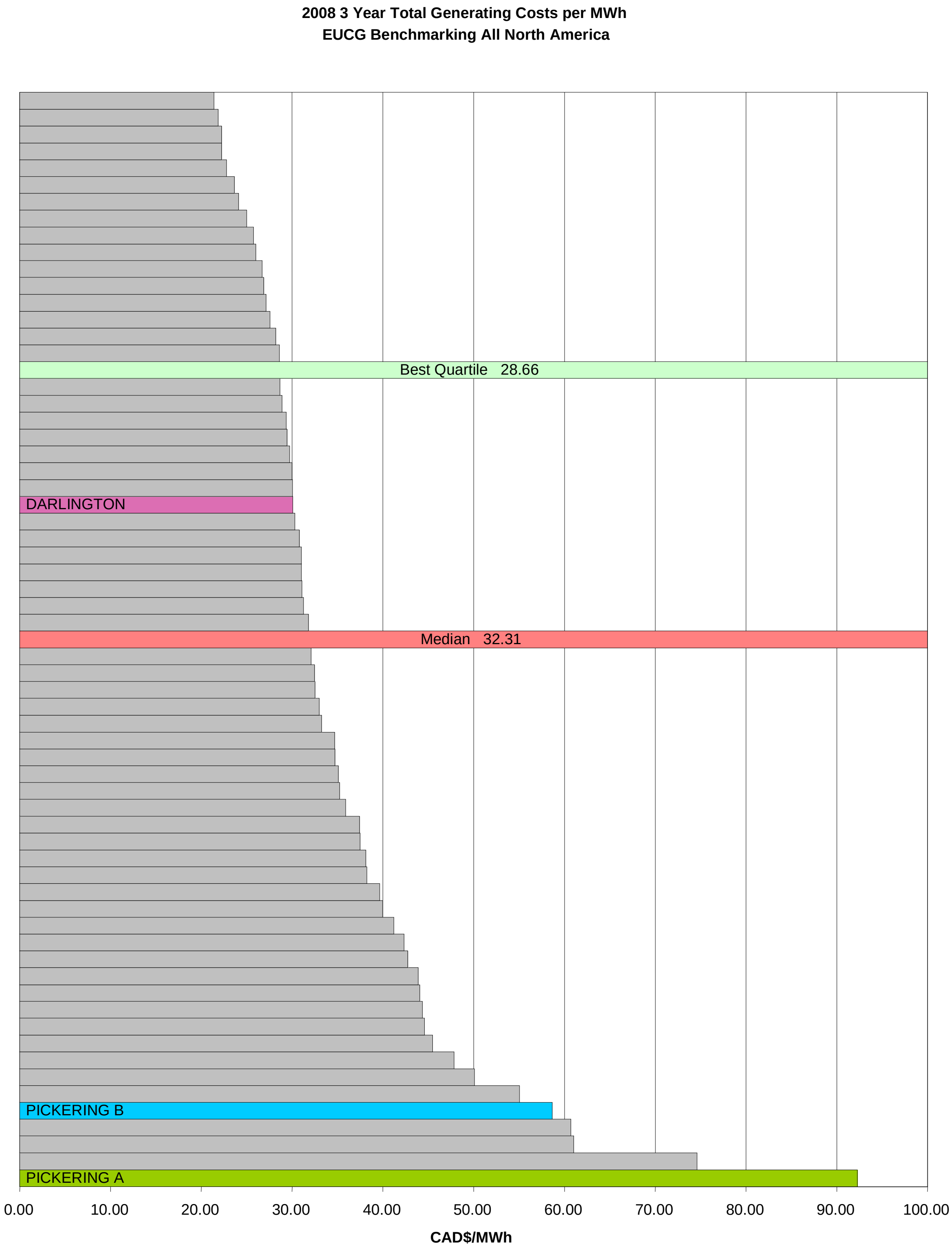
Fuel costs per MWh: Fuel cost, primarily driven by the technological differences in CANDU technology, are lower for OPG than for most North American PWR/BWR reactors. CANDUs do not require enriched uranium like BWRs and PWRs and, as a result, experience lower fuel costs. This provides a significant advantage for OPG in this cost category. Fuel cost per MWh for Darlington, Pickering A, and Pickering B are each approximately $2.30/MWh better than the best quartile value for this metric.

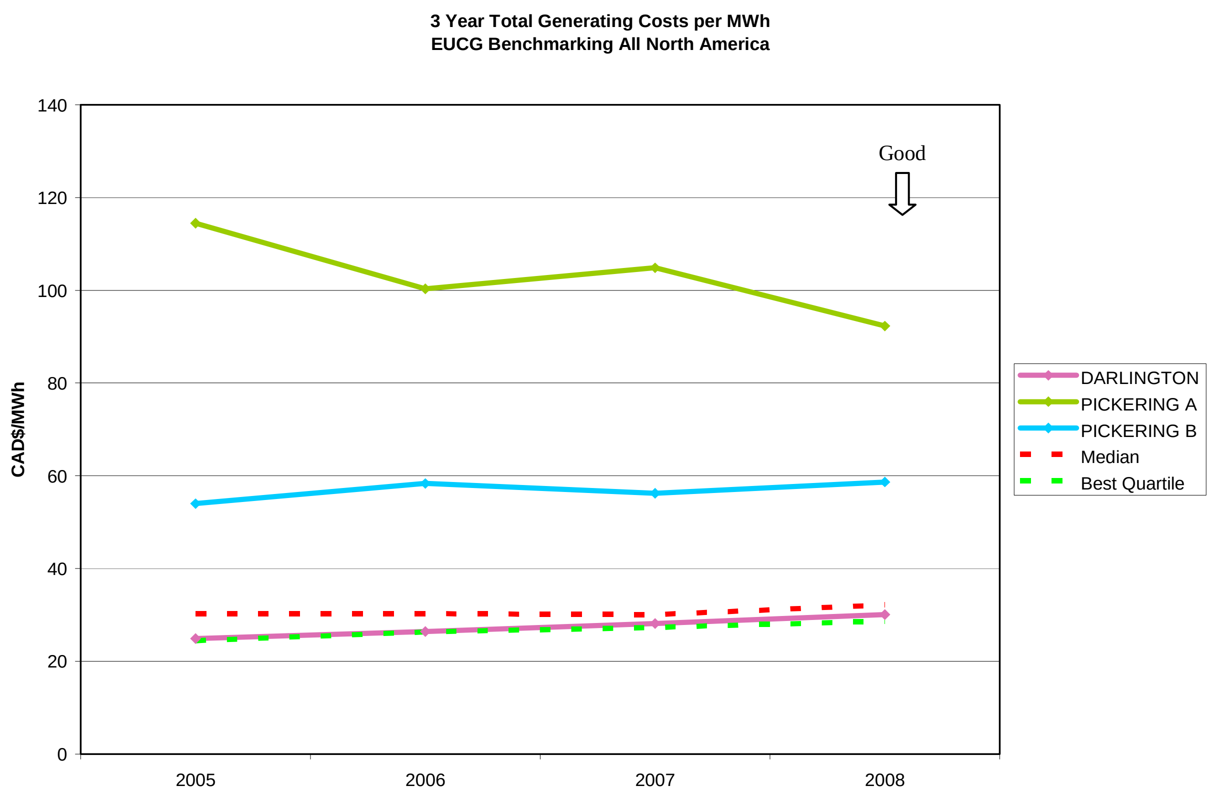
Non-fuel operating costs per MWh: Performance in non-fuel operating cost per MWh drives the majority of OPG financial performance. Removing OPG's advantages in fuel costs and capital costs reveals relatively poor financial performance at all three OPG facilities with respect to non-fuel operating cost per MWh. Specific drivers of performance vary from station to station and will be discussed in more detail later in the report, but overall the biggest drivers are; capability factor, station size, CANDU technology, corporate cost allocation and potential controllable costs. In more detail:

- The 'capability factor' driver is related specifically to generation performance of the station in relation to the overall potential for the station (results are discussed within the Reliability section within the 2-Year Unit Capability Factor metric).
- The 'station size' driver is the combined effect of number of units and size of units. The number of units and size of those units can have significant impacts on plant cost performance and review of the benchmarking data reveals a link between the two.

- The 'CANDU technology' driver relates specifically to the concept that CANDU technology results in some specific cost disadvantages related to the overall engineering and maintenance costs. In addition, this factor is influenced by the fact that CANDU plants have less well-developed user groups to share and adopt competitive advantage information, than do longer-established user groups for PWRs and BWRs. Quantification of CANDU technology impact to cost remains most difficult of all drivers.
- The 'corporate cost allocations' driver relates directly to the allocated corporate support costs charged to the nuclear group.
- The 'potential controllable costs' driver relate to the remaining costs which are not attributable to other specific cost drivers – and provide a potential improvement opportunity for further analysis.

3-Year Total Generating Costs per MWh




3 Year Total Generating Costs per MWh
EUCG Benchmarking All North America
140
120
100
80
60
40
20
0
CAD$/MWh
Good
2005
2006
2007
2008
DARLINGTON
PICKERING A
PICKERING B
Median
Best Quartile

Observations – 3-Year Total Generating Cost per MWh (All North American)

2008 (3-Year Rolling Average)

- The best quartile level for total generating costs per MWh among North American EUCG participants was $28.66/MWh while the median level was $32.31/MWh
- Darlington achieve total costs better than the industry median but they did not achieve best quartile
- Pickering A's total generating cost was $92.27/MWh, well worse than the median of $32.31/MWh
- Pickering B's total generating cost was $58.68/MWh, also well worse than the median of $32.31/MWh

Trend

- Both best quartile and median total generating costs per MWh have increased slightly over the 2005 to 2008 period – in effect, lowering the bar. The best quartile costs rose by $4/MWh while the median cost rose by $1.8/MWh
- Darlington's costs trended upward over the review period. In 2005, they were at best quartile level but by 2008 they were between best quartile and median levels. The growth during this period was $1.4/MWh
- Pickering A's total generation cost per MWh was the highest cost of any station reporting and was $60/MWh above the 2008 median, although costs have decreased over the period by $22.2/MWh
- Pickering B's costs have consistently trended above the median

Factors Contributing to Performance

- Total generating cost per MWh is the sum of non-fuel operating cost per MWh, fuel cost per MWh and capital cost per MWh. The benchmark metric is capital cost per MW DER. To include capital cost impact in total generating cost, station capital costs are divided by net MWh produced – same as for fuel/ non-fuel operating costs
- For technological reasons, fuel per MWh is an advantage for all CANDUs and the OPG plants performed within the best quartile
- Non-fuel operating cost per MWh for all OPG plants yielded results of worse than median for the most recent data point compared to the North American EUCG panel

Factors Contributing to Performance – 3-Year Total Generating Cost per MWh (Cont'd)

Darlington

- As stated above, fuel cost per MWh and capital cost per MW DER performed within the best quartile for Darlington while the non-fuel operating cost per MWh performed worse than median
- The largest drivers of performance gap for Darlington are CANDU technology, corporate allocations and potential controllable costs
- Due to strong generation performance at Darlington, capability factor does not contribute negatively to performance.
- Station size actually provides an overall advantage for Darlington (due to 4 relatively large units), it does not contribute negatively to performance

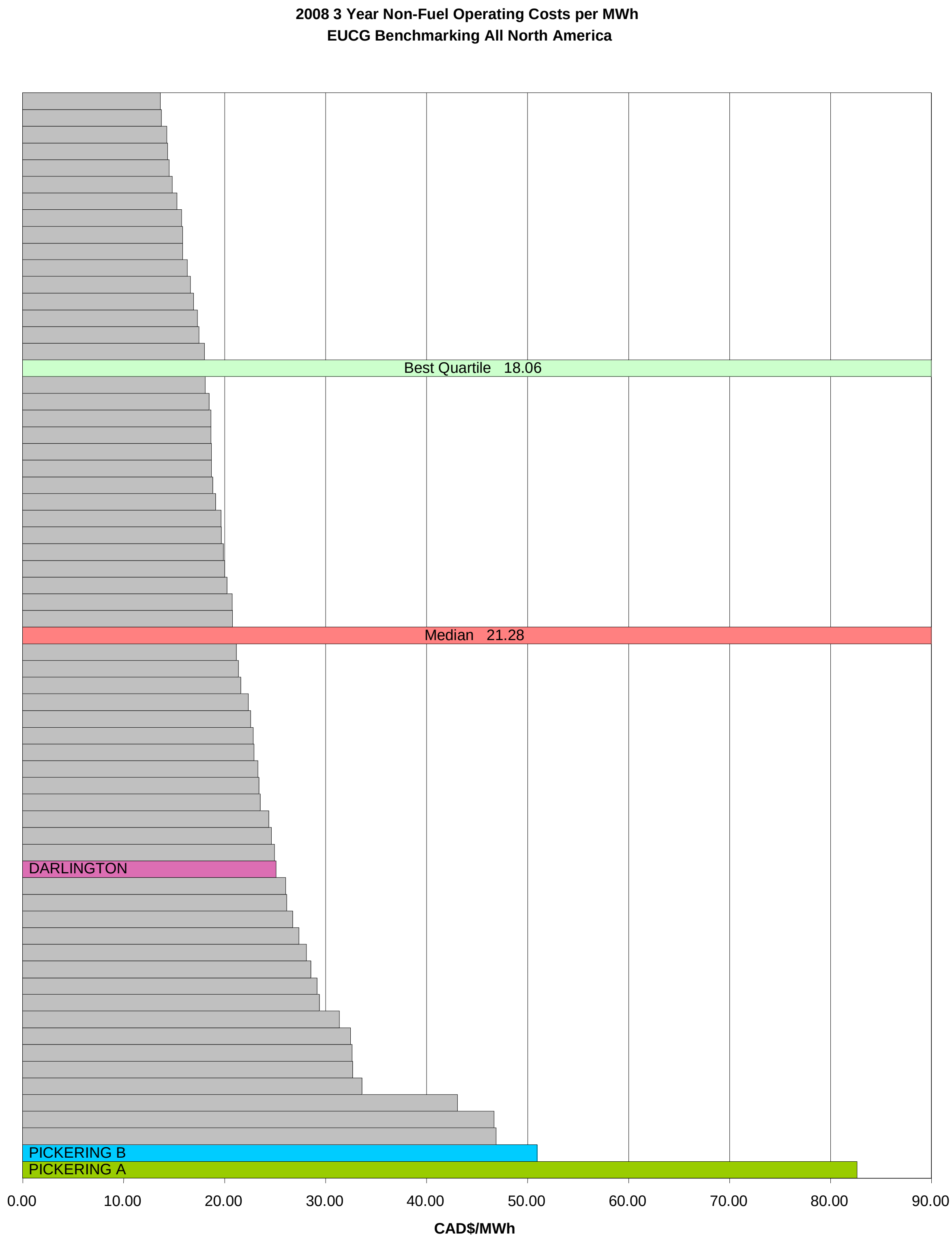
Pickering A

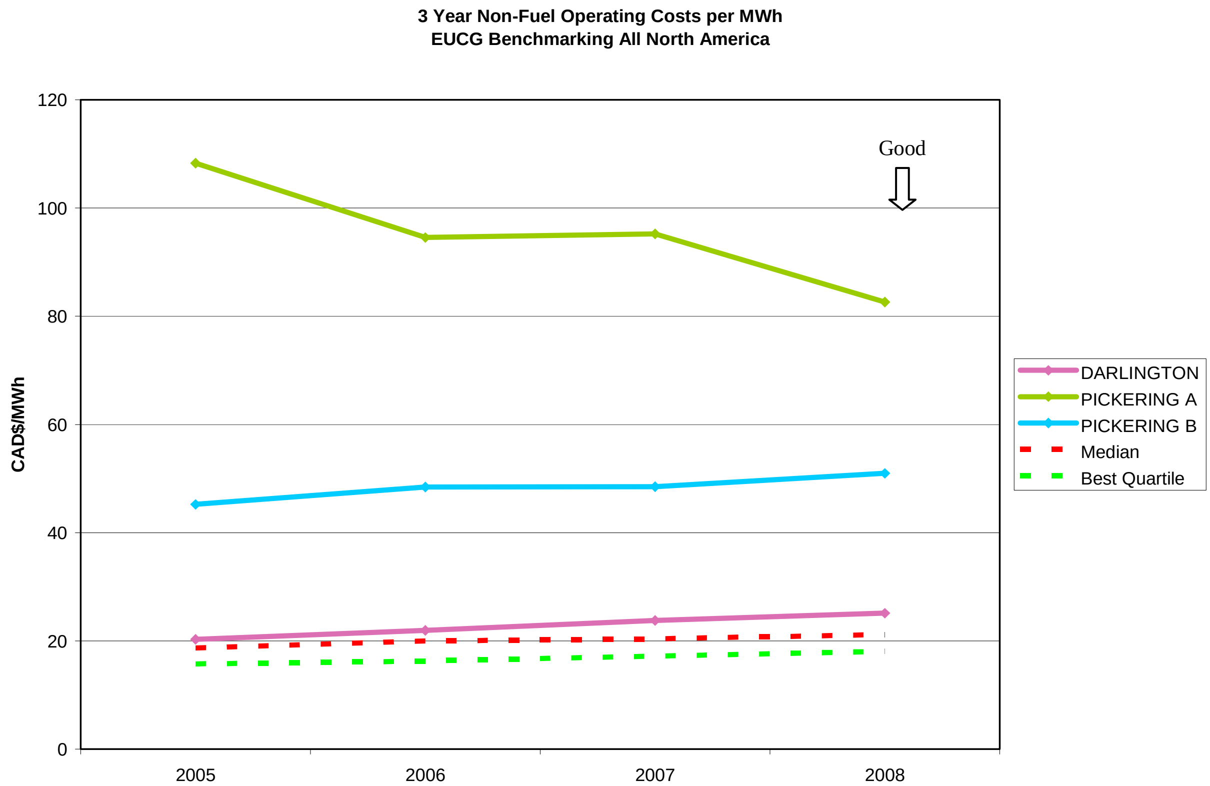
- As stated above, fuel cost per MWh and capital cost per MW DER performed within the best quartile for Pickering A while the non-fuel operating cost per MWh performed worse than median
- The overall largest driver of cost per MWh for Pickering A during the review period is capability factor
- Station size also negatively impacts cost per MWh for Pickering A (primarily driven by relatively small units)
- The remaining large drivers of cost performance at Pickering A include CANDU technology, corporate cost allocations, and potential controllable costs

Pickering B

- As stated above, fuel cost per MWh and capital cost per MW DER performed within the best quartile for Pickering B while the non-fuel operating cost per MWh performed worse than median
- Like Pickering A, the overall largest driver of cost per MWh for Pickering B over the review period is capability factor
- Station size also negatively impacts cost per MWh for Pickering (primarily driven by relatively small units)
- The remaining large drivers of cost performance at Pickering B include CANDU technology, corporate cost allocations, and potential controllable costs

3-Year Non-Fuel Operating Costs per MWh




3 Year Non-Fuel Operating Costs per MWh
EUCG Benchmarking All North America
120
100
80
60
40
20
0
CAD$/MWh
Good
2005
2006
2007
2008
DARLINGTON
PICKERING A
PICKERING B
Median
Best Quartile

Observations – 3-Year Non-Fuel Operating Costs per MWh (All North American)

2008 (3-Year Rolling Average)

- A total of 64 North American plants were included in this peer panel and four are CANDUs compared to 60 PWR or BWR plants
- Best quartile Plants had non-fuel operating costs of better than $18.06/MWh
- Median Plants were better than $21.28/MWh

- Darlington's costs, at $25.10/MWh, were $7.04/MWh higher than best quartile and $3.82/MWh higher than the median
- Pickering B, at $50.95/MWh, was $32.89/MWh higher than best quartile and $ 29.67/ MWh higher than median
- Pickering A, at $82.62/MWh, was $64.56/MWh above best quartile and $61.34/MWh higher than the median

Trend

- Both best quartile and median levels increased over the review period with annual percentages increases between 4% and 5% thus lowering the bar
- Darlington non-fuel operating costs per MWh trended upward at a rate of increase nearly double that of the industry as a whole thus lowering their overall standing on this metric
- Pickering A non-fuel operating costs per MWh showed a dramatic decrease since 2005 – a significant improvement
- Pickering B non-fuel operating costs per MWh rose slowly since 2005 and were approximately three times higher than best quartile for the North American EUCG panel

Factors Contributing to Performance

Darlington

- The major contributing factors for Darlington performance for non-fuel operating cost per MWh were reviewed within the total generating cost per MWh section
- The only additional contributing factor which appears within non-fuel operating cost is capitalization policy
- The impact of differing capitalization policies is removed when looking at total generating cost per MWh (i.e. the sum of non-fuel operating cost, fuel cost, and capital cost)

Pickering A

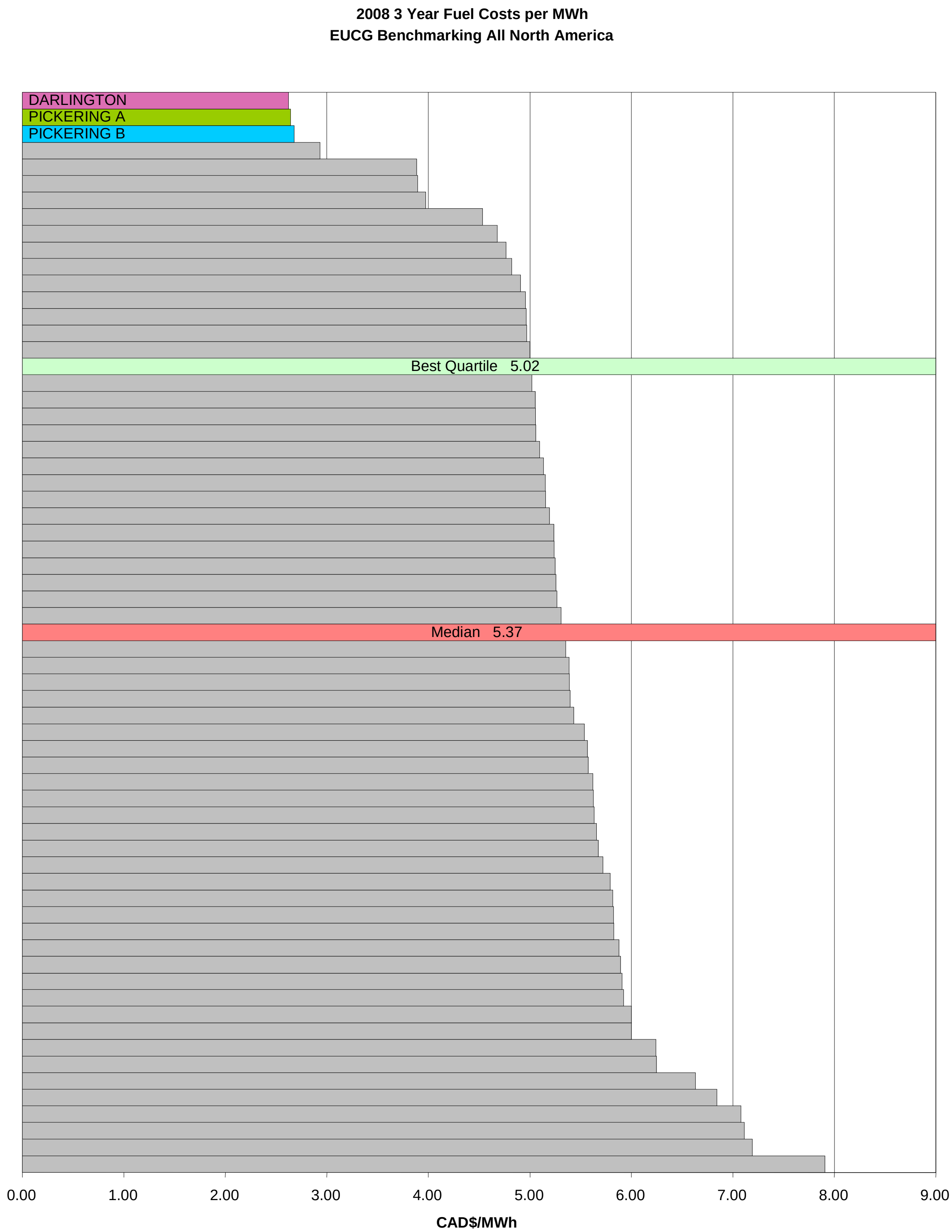
- The major contributing factors for Pickering A performance for non-fuel operating cost per MWh were reviewed within the total generating cost per MWh section
- The only additional contributing factor which appears within non-fuel operating cost is capitalization policy
- The impact of differing capitalization policies is removed when looking at total generating cost per MWh (i.e. the sum of non-fuel operating cost, fuel cost, and capital cost)

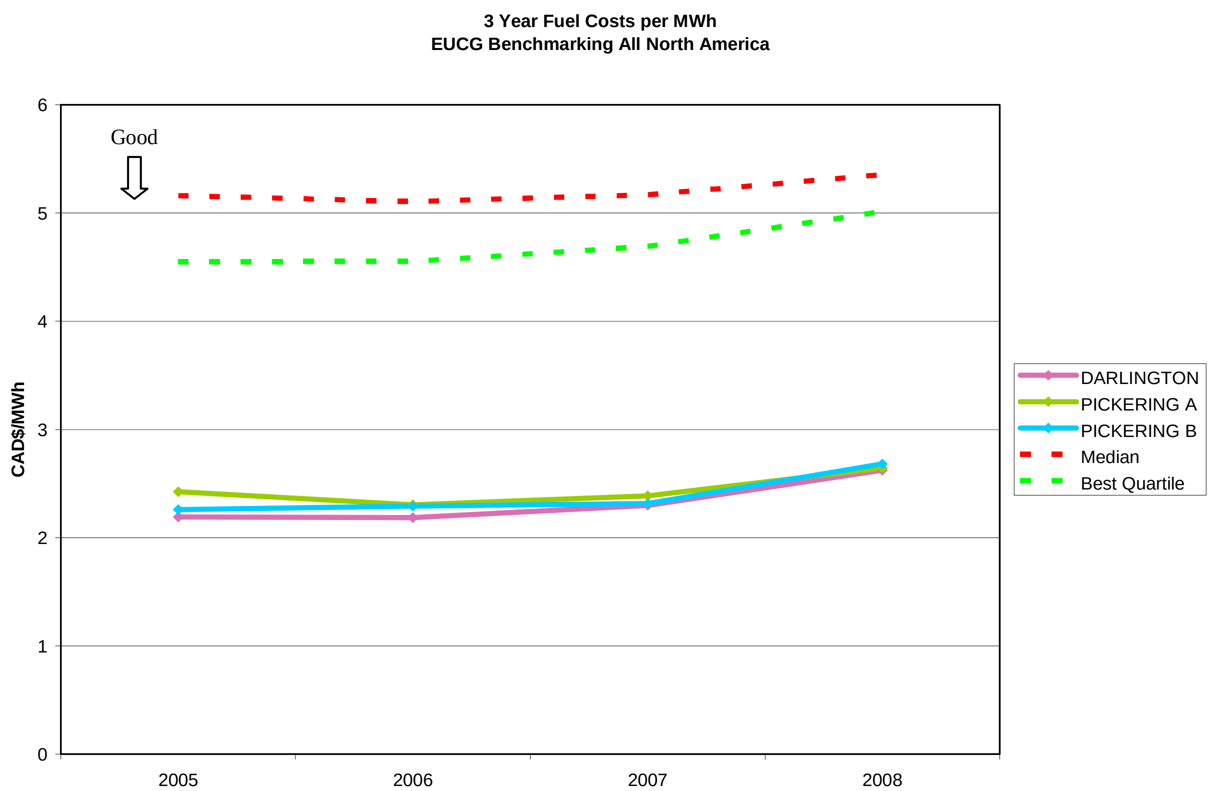
Factors Contributing to Performance – 3-Year Non-Fuel Operating Costs per MWh (Cont'd)

Pickering B

- The major contributing factors for Pickering B performance for non-fuel operating cost per MWh were reviewed within the total generating cost per MWh section
- The only additional contributing factor which appears within non-fuel operating cost is capitalization policy
- The impact of differing capitalization policies is removed when looking at total generating cost per MWh (i.e. the sum of non-fuel operating cost, fuel cost, and capital cost).

3-Year Fuel Costs per MWh




3 Year Fuel Costs per MWh
EUCG Benchmarking All North America
Good
CAD$/MWh
0
1
2
3
4
5
6
2005
2006
2007
2008
DARLINGTON
PICKERING A
PICKERING B
Median
Best Quartile

Observations – 3-Year Fuel Costs per MWh (All North American)

2008 (3-Year Rolling Average)

Trend

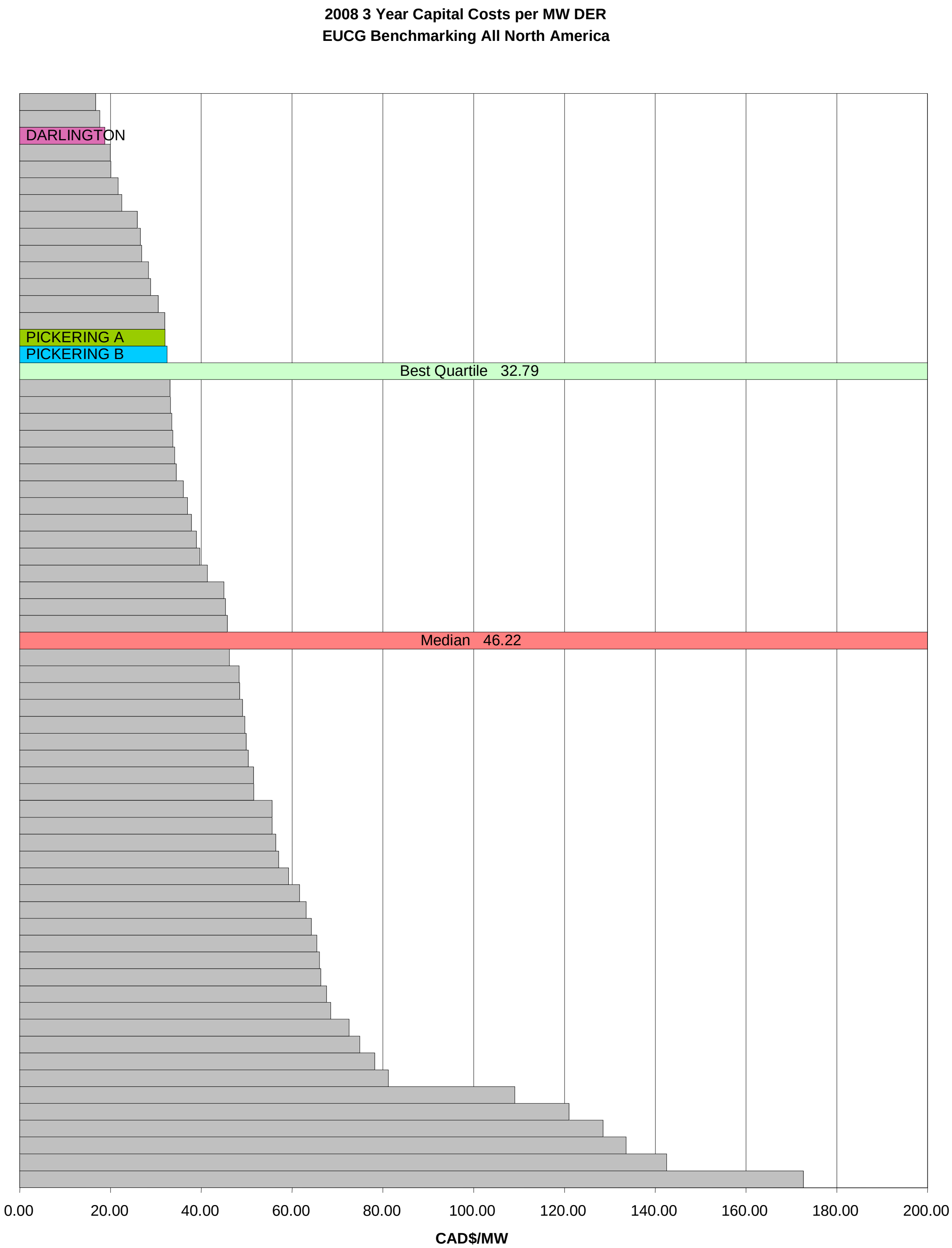
- The best quartile 3-year fuel costs per MWh have been slowing rising since 2005 with the greatest increase in 2008
- Since 2006 fuel costs per MWh for all three OPG plants have been rising with the greatest increase in 2008
- Fuel costs per MWh at the three OPG plants have been converging and currently are very similar to one another

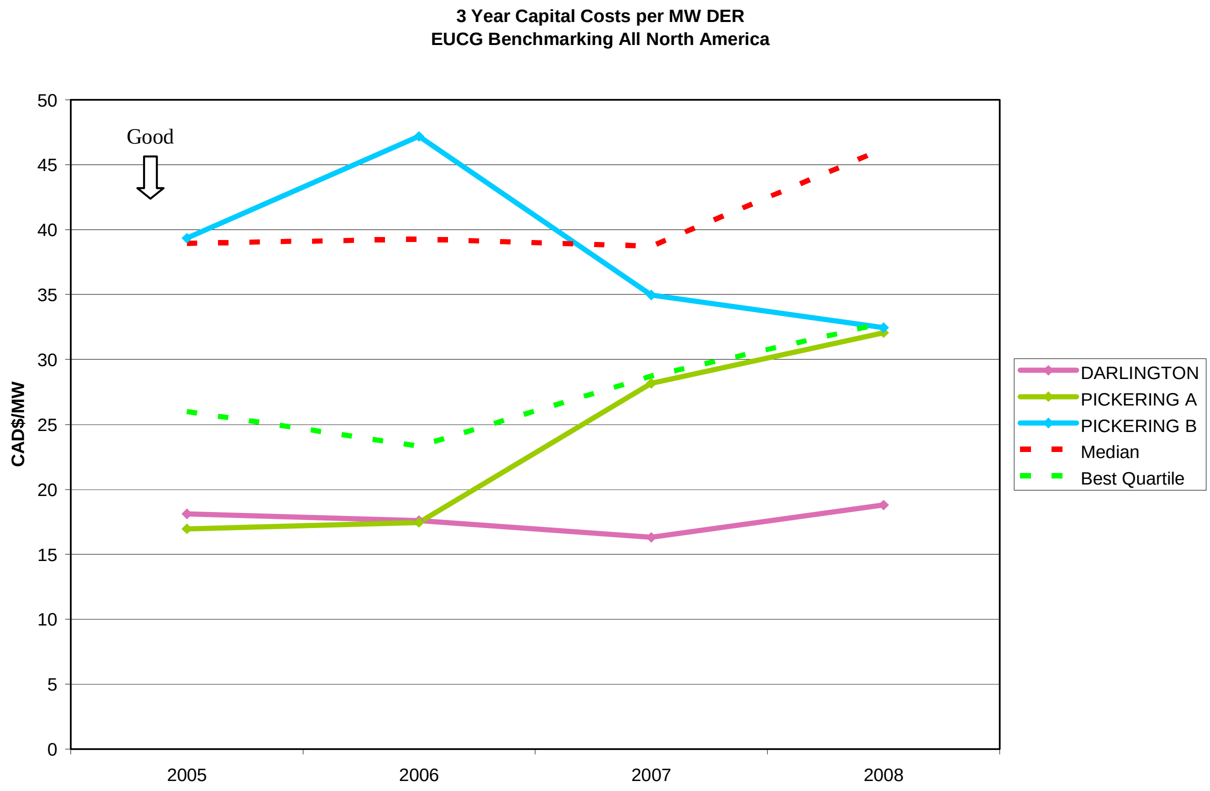
Factors Contributing to Performance

Best quartile fuel cost performance noted above is due to three significant factors:

- Uranium fuel costs: Raw uranium is processed directly into uranium dioxide to make fuel pellets, without the cost and process complexity of enriching the fuel as required in light water reactors. The advantage due to fuel costs also includes transportation, handling and shipping costs
- Reactor core efficiency: CANDU is the most efficient of all reactors in using uranium, requiring about 15% less uranium than a pressurized water reactor for each megawatt of electricity produced
- Fuel assembly manufacturing costs: Manufacturing costs for light water reactor fuel assemblies are significantly higher than CANDU fuel bundles, due to physical design complexity and increased amount of materials

3-Year Capital Costs per MW DER




3 Year Capital Costs per MW DER
EUCG Benchmarking All North America
Good
CAD$/MW
50
45
40
35
30
25
20
15
10
5
0
2005
2006
2007
2008
DARLINGTON
PICKERING A
PICKERING B
Median
Best Quartile

Observations – 3-Year Capital Costs per MW DER (All North American)

2008 (3-Year Rolling Average)

- Best quartile threshold for capital costs per MW DER across the North American EUCG peer panel plants was $32.79/MW DER
- Median cost for the panel was $46.22/MW DER
- Darlington had the third lowest capital costs/MW DER of any plant in the peer group
- Pickering A and B were both in the best quartile

Trend

- Best quartile capital costs per MW DER have increased since 2006
- Median levels for capital costs held steady from 2005 to 2007 and then escalated for 2008
- Darlington's capital cost per MW DER decreased moderately between 2005 and 2007 and escalated for 2008
- Pickering A's capital costs per MW DER rose from 2005 to 2008 but have maintained best quartile level
- Pickering B's capital costs per MW DER rose from 2005 to 2006 and have decreased through 2008

Factors Contributing to Performance

- Darlington, Pickering A, and Pickering B are all performing within the best quartile for the panel
- One contributing factor for OPG appears to be the capitalization threshold. The minimum expenditure threshold for capitalization at OPG for generating assets is $200k per unit whereas the majority of the companies in the industry have adopted minimum capitalization thresholds that are significantly lower
- A second contributing factor for OPG may be due in part to the application of the capitalization policy at OPG for purposes of classifying projects as capital or OM&A

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5.0 MAJOR OPERATOR SUMMARY

Purpose

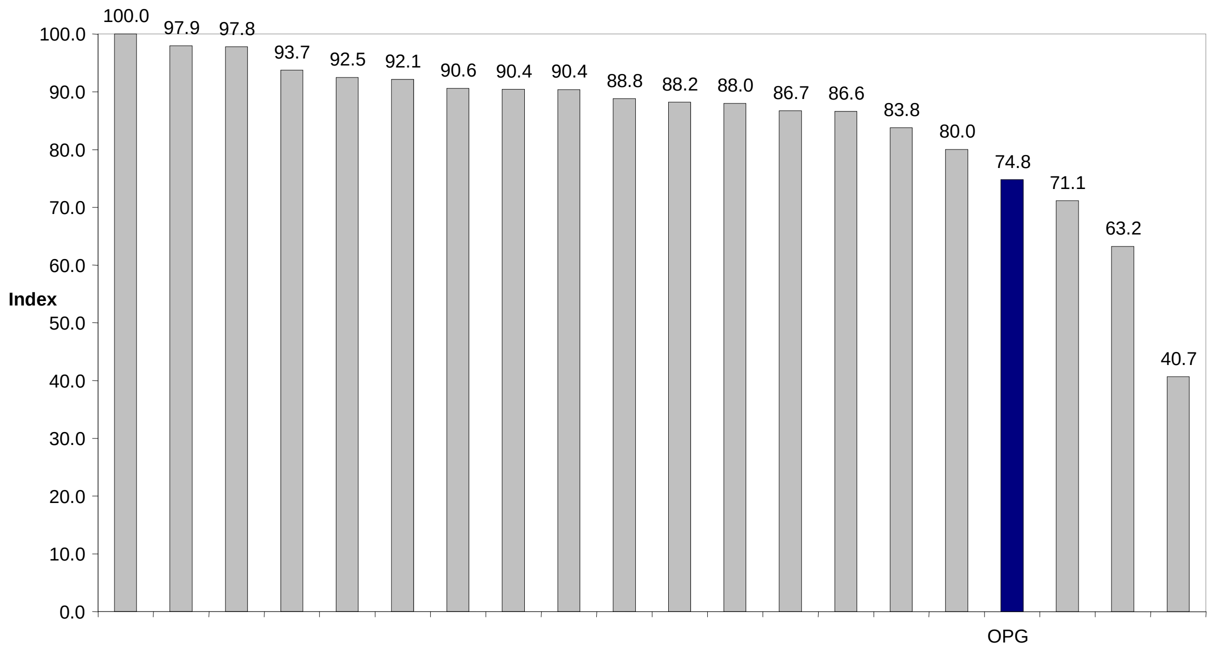
This section supplements the Executive Summary, providing more detailed comparison of the major operators of nuclear plants for three key metrics: WANO NPI, Unit Capacity Factor (UCF) and Total Generating Costs (TGC). Operator level summary results are the average (mean) of the results across all plants managed by the given operator. These comparisons provide additional context but all of the detail data in the previous sections provide the more complete picture of plant by plant performance. WANO NPI and UCF are calculated as the mean of all unit performance for a specific operator. TGC is the mean of plant level data because costs are not allocated to specific units within EUCG.

A table of plants and their operators for WANO NPI and for UCF is provided in Table 10 of the appendix and for TGC see Table 11 in the appendix.

WANO NPI Analysis

The WANO NPI results for the operators in 2008 are illustrated in the graph below. WANO method four was used for these calculations.

2008 WANO NPI for Major Operators*



*See Table 10 in the appendix for listing of operators and plants
**OPG unit values averaging to a WANO NPI of 74.8 in 2008 shown below:

Unit	2008 WANO NPI
Darlington 1	88.64
Darlington 2	98.90
Darlington 3	100.00
Darlington 4	95.13
Pickering A1	62.74
Pickering A4	58.95
Pickering B5	67.37
Pickering B6	64.31
Pickering B7	55.57
Pickering B8	56.45

In 2008, led all the operators in this data set with an NPI of 100. OPG ranked 17th, with an NPI of 74.8. Darlington performed significantly better overall than Pickering A and Pickering B, achieving best quartile for most of the review period. Refer to Section 3 for further information.

The NPI rankings of the major operators from 2006 to 2008 are listed in Table 5.

Table 5: Average WANO NPI Rankings

	2006	2007	2008
	9	8	1
	4	5	2
	2	1	3
	7	3	4
	19	17	5
	12	13	6
	5	9	7
	3	4	8
	6	10	9
	11	6	10
	8	11	11
	10	7	12
	1	2	13
	13	12	14
	14	14	15
	15	15	16
OPG	17	16	17
	20	19	18
	16	20	19
	18	18	20

Table 6 below provides a comparison of the ten sub-indicators that comprise the WANO NPI index.

Table 6: WANO Performance Indicator Results Summary (Operator Level)

		All North American PWR and PHWRs (WANO)		All COG CANDUs (WANO)		
	OPG Average	Median	Best Quartile	Median	Best Quartile	Units
Safety						
2-Year Industrial Safety Accident Rate	0.07	0.12	0.07	-	-	# per 200,000 man-hours worked
Fuel Reliability	8.51E-04	5.63E-05	1.94E-05	5.63E-05	1.00E-06	Microcuries per gram
2-Year Reactor Trip Rate	0.38	0.32	0.18	0.38	0.21	# per 7,000 hours critical
3-Year Auxiliary Feedwater System Unavailability	0.0047	0.0044	0.0035	0.0020	0.0010	Unavailability/Required Availability
3-Year Emergency AC Power Unavailability	0.0061	0.0132	0.0105	0.0062	0.0040	Unavailability/Required Availability
3-Year High Pressure Safety Injection Unavailability	0.0003	0.0048	0.0027	0.0003	0.0000	Unavailability/Required Availability
2-Year Collective Radiation Exposure	76.30	71.97	57.64	76.30	51.78	man-rem per Unit
Reliability						
WANO NPI	74.81	88.50	92.20	71.12	86.28	Index
2-Year Forced Loss Rate	15.23	2.07	1.46	3.86	0.64	%
2-Year Unit Capability Factor	77.38	90.04	90.77	85.68	91.27	%
2-Year Chemistry Performance Indicator	1.13	1.01	1.01	1.01	1.00	Indicator

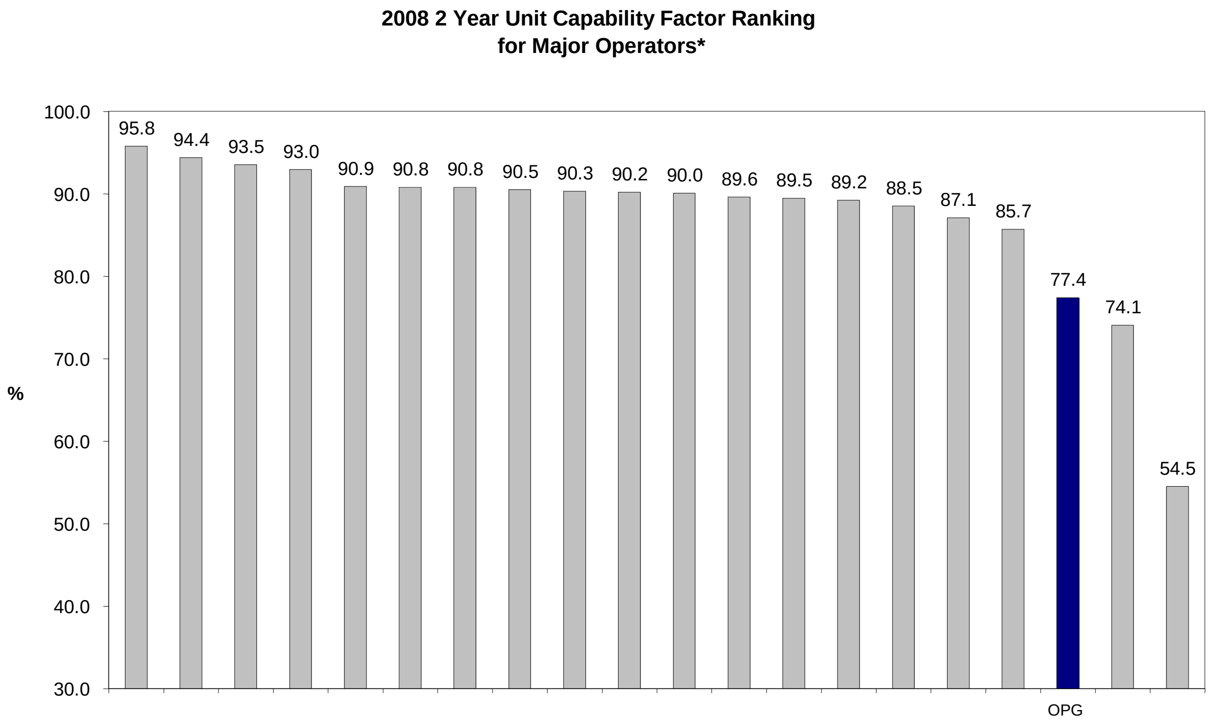
Note: This table contains the average of all unit results per operator

Unit Capability Factor (UCF) Analysis

Unit Capability Factor is the ratio of available energy generation over a give time period to the reference energy generation of the same time period. Reference energy generation is the energy that could be produced if the unit were operating continuously at full power under normal conditions. Since nuclear generation plants are large fixed assets, the extent to which these assets generate reliable power is the key to both their operating and financial performance. For this reason, we examine this NPI indicator more closely below.

A comparison of UCF values for major nuclear operators is presented in the graph below. UCF is expressed as a two-year average. OPG achieved a two-year average unit capacity factor of 77.4% and ranked 18 out of 20 major operators in the WANO data set.

The range of values reported for these operators, however, varies greatly.



*OPG unit values averaging to a 2 Year UCF in 2008 of 77.4 shown below:

Unit	2008 2-Year UCF
Darlington 1	89.50
Darlington 2	91.12
Darlington 3	97.35
Darlington 4	89.97
Pickering A1	50.65
Pickering A4	62.55
Pickering B5	74.20
Pickering B6	83.73
Pickering B7	58.22
Pickering B8	76.54

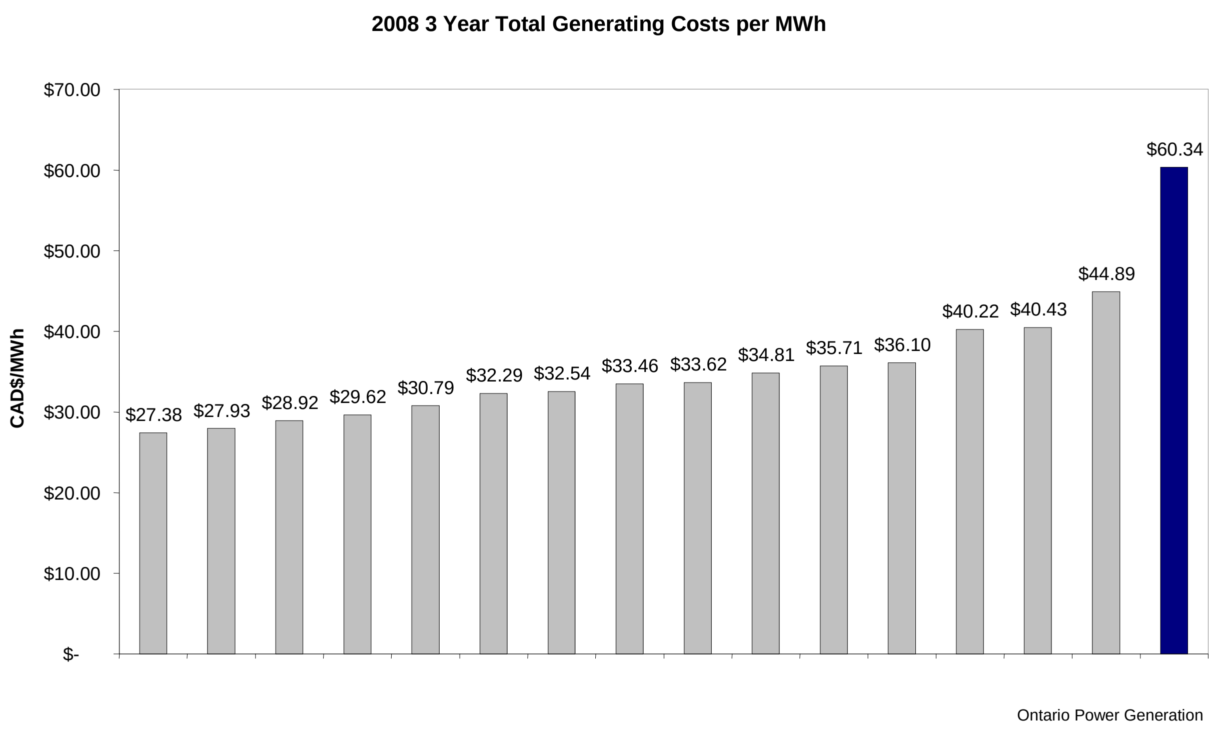
Based on reviewing individual unit results, Darlington performed the best overall, followed by Pickering A and then Pickering B. Rankings for the major operators for UCF over the past four years are provided in Table 7 below.

Table 7: Two-Year Unit Capability Factor Rankings

Operator	2005	2006	2007	2008
	1	2	4	1
	2	1	2	2
	6	10	9	3
	4	5	3	4
	13	19	19	5
	12	8	11	6
	10	9	6	7
	5	4	5	8
	3	20	17	9
	15	3	1	10
	8	12	12	11
	7	6	8	12
	9	7	10	13
	14	13	7	14
	17	14	13	15
	11	17	14	16
	19	16	15	17
OPG	20	18	20	18
	16	15	18	19
	18	11	16	20

Total Generating Costs/MWh Analysis

The 3-year total generating costs results for the major operators in 2008 are displayed in the graph below. Total generating costs are defined as total operating costs plus capital costs. This value is divided by the total net generation for the year and provided as a three-year average. The top performer for 2008 was OPG ranked 16th, with a 3-year total generation cost of $60.34 per MWh.



*OPG plant values averaging to 3 Year TGC of $60.34/MWh shown below:

Unit	2008 3 Year TGC
Darlington	$30.08/MWh
Pickering A	$92.27/MWh
Pickering B	$58.68/MWh

Table 8: Three-Year Total Generating Costs per MWh Rankings

	2005	2006	2007	2008
	1	1	1	1
	4	4	2	2
	6	5	3	3
	3	2	4	4
	2	3	5	5
	15	14	11	6
	13	7	6	7
	5	6	7	8
	8	8	8	9
	9	11	10	10
	10	10	9	11
	11	9	12	12
	7	12	13	13
	12	13	14	14
	14	15	15	15
Ontario Power Generation	16	16	16	16

Total Generating Cost is comprised of: (a) Non-Fuel Operating Costs, plus (b) Fuel Costs, plus (c) Capital Costs. Table 9 below shows the relative contribution of these cost components to Total Generating Cost and compares OPG's costs to those of all EUCG operators. As stated in Section 4, OPG's advantages in Fuel Costs and Capital Costs is offset by relatively poor financial performance at all three OPG facilities with respect to Non-Fuel Operating Cost. Low fuel costs are attributable to the use of CANDU technology while low capital costs may reflect OPG's policies regarding capitalization. Additionally, by reviewing individual plant results, Darlington performed by far the best overall, followed by Pickering B and then by Pickering A.

Table 9: EUCG Indicator Results Summary (Operator Level)

EUCG Indicator Results Summary	OPG Average	All EUCG Operators*		Units
		Median	Best Quartile	
Value for Money Performance				
3-Yr. Non-Fuel Operating Costs per MWh	$ 52.89	$ 21.09	$ 19.82	CAD$/MWh
3-Yr. Fuel Costs per MWh	$ 2.65	$ 5.40	$ 5.02	CAD$/MWh
3-Yr. Capital Costs per MW DER	$ 27.76	$ 49.63	$ 42.76	CAD$/MW
3-Yr. Total Generating Costs per MWh	$ 60.34	$ 33.54	$ 30.50	CAD$/MWh

*See Table 11 in the appendix for list of operators included
Note: This summary contains the average of all plant results per operator

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6.0 APPENDIX

Acronyms

Acronym	Meaning
ALARA	As Low As Reasonably Achievable
BWR	Boiling Water Reactor
CANDU	Canada Deuterium Uranium (type of PHWR)
CEA	Canadian Electricity Association
COG	CANDU Owners Group
DER	Design Electrical Rating
EUCG	Electric Utility Cost Group
INPO	Institute of Nuclear Power Operators
OPG	Ontario Power Generation
PHWR	Pressurized Heavy Water Reactor
PWR	Pressurized Water Reactor
WANO	World Association of Nuclear Operators

Safety and Reliability Definitions

The following definitions are summaries extracted from the *November 2003 WANO PERFORMANCE INDICATOR PROGRAMME REFERENCE MANUAL.*

The **chemistry performance indicator** compares the concentration of selected impurities and corrosion products to corresponding limiting values. Each parameter is divided by its limiting value, and the sum of these ratios is normalized to 1.0. For BWRs and most PWRs, these limiting values are the medians for each parameter, based on data collected in 1993, thereby reflecting recent actual performance levels. For other plants, they reflect challenging targets. If an impurity concentration is equal to or better than the limiting value, the limiting value is used as the concentration. This prevents increased concentrations of one parameter from being masked by better performance in another. As a result, if a plant is at or below the limiting value for all parameters, its indicator value would be 1.0, the lowest chemistry indicator value attainable under the indicator definition.

- PWRs with recirculating steam generators and VVERs
  - Steam generator blowdown chloride
  - Steam generator blowdown cation conductivity (only applicable to vver and pwrs with i-800 sg tubes)
  - Steam generator blowdown sulfate
  - Steam generator blowdown sodium
  - Final feedwater iron

   - Final feedwater copper (not applicable to PWRs with I-800 steam generator tubes)
   - Condensate dissolved oxygen (only applicable to pwrs with I-800 steam generator tubes)
   - Steam generator molar ratio target range (by reporting the upper and lower range limits (as "from" and "to" values when using molar ratio control)
   - Steam generator actual molar ratio (if reporting molar ratio control data)

- PWRs with once through steam generators
   - Final feedwater chloride
   - Final feedwater sulfate
   - Final feedwater sodium
   - Final feedwater iron
   - Final feedwater copper

- Pressurized heavy water reactors (PHWRs)
   - *Inconel-600 or Monel tubes
      - Steam generator blowdown chloride
      - Steam generator blowdown sulfate
      - Steam generator blowdown sodium
      - Final feedwater iron
      - Final feedwater copper
      - Final feedwater dissolved oxygen

   - Incoloy-800 tubes
      - Steam generator blowdown chloride
      - Steam generator blowdown sulfate
      - Steam generator blowdown sodium
      - Final feedwater iron
      - Final feedwater dissolved oxygen

- PHWRs on molar ratio control
   - Steam generator blowdown chloride
   - Steam generator blowdown sulfate
   - Final feedwater iron
   - Final feedwater copper
   - Feedwater dissolved oxygen
   - Steam generator molar ratio target range (by reporting the upper and lower range limits (as "from" and "to" values)
   - Steam generator actual molar ratio

Collective radiation exposure, for purposes of this indicator, is the total external and internal whole body exposure determined by primary dosimeter (thermoluminescent dosimeter (TLD) or film badge), and internal exposure calculations. All measured exposure should be reported for station personnel, contractors, and those personnel visiting the site or station on official utility business.

Visitors, for purposes of this indicator, include only those monitored visitors who are visiting the site or station on official utility business.

The **forced loss rate (FLR)** is defined as the ratio of all unplanned forced energy losses during a given period of time to the reference energy generation minus energy generation losses corresponding to planned outages and any unplanned outage extensions of planned outages, during the same period, expressed as a percentage.

Unplanned energy losses are either unplanned forced energy losses (unplanned energy generation losses not resulting from an outage extension) or unplanned outage extension of planned outage energy losses.

Unplanned forced energy loss is energy that was not produced because of unplanned shutdowns or unplanned load reductions due to causes under plant management control when the unit is considered to be at the disposal of the grid dispatcher. Causes of forced energy losses are considered to be unplanned if they are not scheduled at least four weeks in advance. Causes considered to be under plant management control are further defined in the clarifying notes.

Unplanned outage extension energy loss is energy that was not produced because of an extension of a planned outage beyond the original planned end date due to originally scheduled work not being completed, or because newly scheduled work was added (planned and scheduled) to the outage less than four weeks before the scheduled end of the planned outage.

Planned energy losses are those corresponding to outages or power reductions which were planned and scheduled at least four weeks in advance (see clarifying notes for exceptions).

Reference energy generation is the energy that could be produced if the unit were operated continuously at full power under reference ambient conditions throughout the given period. Reference ambient conditions are environmental conditions representative of the annual mean (or typical) ambient conditions for the unit.

Fuel reliability is inferred from fission product activities present in the reactor coolant. Due to design differences, this indicator is calculated differently for different reactor types. The indicator is defined as the steady-state primary coolant iodine-131 activity (Becquerels/gram or microcuries/gram), corrected for the tramp uranium contribution and power level, and normalized to a common purification rate.

Industrial safety accident rate is defined as the number of accidents for all utility personnel (permanently or temporarily) assigned to the station, that result in one or more days away from work (excluding the day of the accident) or one or more days of restricted work (excluding the day of the accident), or fatalities, per 200,000 or per 1,000,000 man-hours worked. The selection of 200,000 man-hours worked or 1,000,000 man-hours worked for the indicator will be made by the country collecting the data, and international data will be displayed using both scales. Contractor personnel are not included for this indicator.

Plant capacity factor is defined as the ratio of the net electricity generated, for the time considered, to the energy that could have been generated at continuous full-power operation during the same period. (Note: this is a generic definition as no definition was provided by EUCG).

The **safety system performance indicator** is defined for the many different types of nuclear reactors within the WANO membership. To facilitate better understanding of the indicator and applicable system scope for these different type reactors a separate section has been developed for each reactor type.

Also, because some members have chosen to report all data on a system train basis versus the "standard" overall system approach, special sections have also been developed for those reactor types where train reporting has been chosen. (The resulting indicator vales resulting from these methods are essentially the same.)

Each section is written specifically for that reactor type and reporting method. If a member desires to understand how a different member is reporting or wishes to better understand that member's indicator, it should consult the applicable section.

The safety systems monitored by this indicator are the following:

PHWRs

Although the PHWR safety philosophy considers other special safety systems to be paramount to public safety, the following PHWR safety and safety-related systems were chosen to be monitored in order to maintain a consistent international application of the safety system performance indicators.

- High pressure emergency coolant injection system
- Auxiliary boiler feedwater system
- Emergency AC power

These systems were selected for the safety system performance indicator based on their importance in preventing reactor core damage or extended plant outage. Not every risk important system is monitored. Rather, those that are generally important across the broad nuclear industry are included within the scope of this indicator. They include the principal systems needed for maintaining reactor coolant inventory following a loss of coolant, for decay heat removal following a reactor trip or loss of main feedwater, and for providing emergency AC power following a loss of plant off-site power. (Gas cooled reactors have an additional decay heat removal system instead of the coolant inventory maintenance system.)

Except as specifically stated in the definition and reporting guidance, no attempt is made to monitor or give credit in the indicator results for the presence of other systems at a given plant that add diversity to the mitigation or prevention of accidents. For example, no credit is given for additional power sources that add to the reliability of the electrical grid supplying a plant because the purpose of the indicator is to monitor the effectiveness of the plant's response once the grid is lost.

Unit capability factor is defined as the ratio of the available energy generation over a given time period to the reference energy generation over the same time period, expressed as a percentage. Both of these energy generation terms are determined relative to reference ambient conditions.

Available energy generation is the energy that could have been produced under reference ambient conditions considering only limitations within control of plant management, i.e., plant equipment and personnel performance, and work control.

Reference energy generation is the energy that could be produced if the unit were operated continuously at full power under reference ambient conditions.

Reference ambient conditions are environmental conditions representative of the annual mean (or typical) ambient conditions for the unit.

Unplanned automatic reactor trips (SCRAMS) is defined as the number of unplanned automatic reactor trips (reactor protection system logic actuations) that occur per 7,000 hours of critical operation. The indicator is further defined as follows:

- Unplanned means that the trip was not an anticipated part of a planned test
- Trip means the automatic shutdown of the reactor by a rapid insertion of negative reactivity (e.g., by control rods, liquid injection shutdown system, etc.) that is caused by actuation of the reactor protection system. The trip signal may have resulted from exceeding a setpoint or may have been spurious
- Automatic means that the initial signal that caused actuation of the reactor protection system logic was provided from one of the sensors monitoring plant parameters and conditions, rather than the manual trip switches or, in certain cases described in the clarifying notes, manual turbine trip switches (or pushbuttons) provided in the main control room
- Critical means that during the steady-state condition of the reactor prior to the trip, the effective multiplication factor (keff) was essentially equal to one
- The value of 7,000 hours is representative of the critical hours of operation during a year for most plants, and provides an indicator value that typically approximates the actual number of scrams occurring during the year

The following definitions are taken from the AP-928 Rev 2 issued November 2007.

Corrective maintenance is any work on a **power block** system, structure, or component (SSC) that has failed or is significantly degraded such that failure is imminent (within its operating cycle/preventive maintenance interval) and the SSC no longer conforms to or perform its design function. An SSC should be considered failed or significantly degraded if the deficiency is similar to any of the following:

- Is removed from service because of actual or incipient failure

- Significant component degradation that affects system operability – The SSC may be determined operable by engineering assessment, but the degradation is significant and requires immediate corrective action. This normally includes any deficiency that requires a basis for continued operation as defined in NRC Regulatory Issue Summary (RIS) 2005-20, *NRC Inspection Manual*, Part 9900, Technical Guidance.
- Creates the potential for rapidly increasing component degradation (for example, borated water leaks, steam leaks where cutting degradation is possible)
- Releases fluids that create significant exposure or contamination concerns (or has the potential to under postulated accident conditions) – Minor leaks that can be controlled and managed by simple drip catch containments would not be included here
- Adversely affects controls or process indications that impair operator ability to operate the plant or that reduce the redundancy of important equipment
- Significant component degradation identified from the conduct of predictive, periodic, or preventive maintenance which, if not resolved, could result in equipment failure or significant additional damage prior to its next scheduled preventive maintenance period

Elective maintenance is any work on **power block equipment** for which identified potential or actual degradation is minor and does not threaten the component's design function or performance criteria. This category of maintenance is intended to be performed in the future, but the nature of the degradation is such that scheduling flexibility exists. Examples are as follows:

- Minor leaks that are simply controlled and that do not justify immediate action to repair
- Minor degradation, identified by predictive, periodic, or planned preventive maintenance activities, that warrants attention to maintain the long-term reliability of the equipment but that is not expected to result in failure prior to its next scheduled preventive maintenance period
- Other minor plant equipment deficiencies that do not impede plant operation, nuclear or plant reliability, or operator ability to properly respond to normal, off-normal, or accident transients or conditions. Examples are as follows:
  - Damaged or broken local indication gauges that are informational only and that are not required for operator control of systems for normal or emergency response
  - Indications of internal valve leakage that do not hinder system operation or the ability to provide maintenance isolation

On-line maintenance is maintenance that will be performed with the main generator connected to the grid.

Power block equipment includes all SSCs required for the safe and reliable operation of the station. It will include all safety-related and balance-of-plant systems and components required for operation, including radioactive waste processing and storage and switchyard equipment maintained by the station. Systems, structures, or components required to maintain federal or state regulatory compliance should be included in this grouping. It will not include buildings or structures that support station staff, such as offices or storage structures, or the HVAC and support systems focused only on habitability of those structures. This distinction may vary among stations.

Value for Money Definitions

The following definition summaries are taken from the *January 2006 EUCG Nuclear Committee Nuclear Database Instructions*.

Capital Costs ($)
All costs associated with improvements and modifications made during the reporting year. These costs should include design and installation costs in addition to equipment costs. Other miscellaneous capital additions such as facilities, computer equipment, moveable equipment, and vehicles should also be included. These costs should be fully burdened with indirect costs. Exclude AFUDC.

Fuel ($)
The total cost associated with a load of fuel in the reactor which is burned up in a given year.

Generation (Gigawatt Hours)
Per NRC monthly operating report definition for net electrical energy: The gross electrical output of the unit measured at the output terminals of the turbine-generator minus the normal station service loads during the gross hours of the reporting period, expressed in Gigawatt hours (GWh). Negative quantities should not be used.

Design Electrical Rating (DER)
Per Energy Information Administration, the definition for design electrical rating: The nominal net electrical output of a unit, specified by the utility and used for plant design.

Operating Costs ($)
The data provided should reflect the full cost for operating and maintaining the nuclear plant. This should include all costs from the senior nuclear corporate officer down. These costs should reflect the share of payroll taxes & benefits and corporate administrative & general costs applicable to the nuclear plant. Costs that would be applicable if the plant were considered a business unit should be included.

Total Generating Costs ($)
The sum of total operating costs and capital costs as above.

Total Operating Costs ($)
The sum of operating costs and fuel costs as above.

Note: Capital costs, fuel costs, operating costs and total generating costs are divided by net generation as above to obtain per MWh results. Non-fuel operating costs and capital costs are also divided by MW DER to obtain MW results.

Table 10: WANO Panel

Operator	Plant	Operator	Plant
Bruce Power	BRUCE NUCLEAR A	STARS	CALLAWAY
	BRUCE NUCLEAR B		COMANCHE PEAK
Constellation	CALVERT CLIFFS		DIABLO CANYON
	GINNA		PALO VERDE
Dominion	KEWAUNEE		SOUTH TEXAS
	MILLSTONE	TVA	WATTS BAR
	NORTH ANNA	USA	COOK
	SURRY		FORT CALHOUN
Duke Power	CATAWBA		
	MCGUIRE		
	OCONEE		
Entergy	ANO		
	INDIAN POINT		
	WATERFORD		
Exelon	BRAIDWOOD		
	BYRON		
	THREE MILE ISLAND		
FirstEnergy	BEAVER VALLEY		
	DAVIS-BESSE		
FPL	POINT BEACH		
	SEABROOK		
	ST. LUCIE		
	TURKEY POINT		
Hydro Quebec	GENTILLY		
Independents	SAN ONOFRE		
	SEQUOYAH		
	SUMMER		
	WOLF CREEK		
Int'l CANDU	CERNAVODA		
	EMBALSE		
	QINSHAN 3		
	WOLSONG A		
	WOLSONG B		
NB Power	POINT LEPREAU		
NMC	PALISADES		
	PRAIRIE ISLAND		
OPG	DARLINGTON		
	PICKERING A		
	PICKERING B		
Progress Energy	CRYSTAL RIVER		
	HARRIS		
	ROBINSON		
PSEG	SALEM UNIT		
Southern Energy	FARLEY		
	VOGTLE		

Table 11: EUCG Panel

Operator	Plant	Operator	Plant
Bruce	BRUCE	STARS	CALLAWAY
Constellation	CALVERT CLIFFS		COMANCHE PEAK
	NINE MILE		DIABLO CANYON
	R.E. GINNA		PALO VERDE
Dominion Resources	KEWAUNEE		SOUTH TEXAS
	MILLSTONE	TVA	BROWNS FERRY
	NORTH ANNA		SEQUOYAH
	SURRY		WATTS BAR
Duke	CATAWBA	USA	COLUMBIA
	MCGUIRE		COOK
	OCONEE		COOPER
Entergy	ARKANSAS ONE		FERMI
	FITZPATRICK		FORT CALHOUN
	GRAND GULF		SAN ONOFRE
	PALISADES		SUSQUEHANNA
	PILGRIM		WOLF CREEK
	RIVER BEND	Xcel	MONTICELLO
	VERMONT YANK		PRAIRIE ISLAND
	WATERFORD		
Exelon	BRAIDWOOD		
	BYRON		
	CLINTON		
	DRESDEN		
	LASALLE		
	LIMERICK		
	OYSTER CREEK		
	PEACH BOTTOM		
	QUAD CITIES		
	THREE MILE ISLAND		
First Energy	BEAVER VALLEY		
	DAVIS-BESSE		
	PERRY		
OPG	DARLINGTON		
	PICKERING A		
	PICKERING B		
Progress Energy	BRUNSWICK		
	CRYSTAL RIVER		
	HARRIS		
	ROBINSON		
PSEG	HOPE CREEK		
	SALEM		
SC Power and Gas	SUMMER		
Southern	FARLEY		
	HATCH		
	VOGTLE		

Table 12: COG CANDUs

Operator	Plant
Bruce Power	BRUCE NUCLEAR A BRUCE NUCLEAR B
China	QINSHAN 3
CNEA	EMBALSE
Hydro Quebec	GENTILLY
Korea	WOLSONG A WOLSONG B
NB Power	POINT LEPREAU
OPG	DARLINGTON PICKERING A PICKERING B
Romania	CERNAVODA

Table 13: CEA Members

Companies
AltaLink
ATCO Electric
ATCO Power
BC Hydro
Brookfield Renewable Power
ENMAX
EPCOR
FortisAlberta
FortisBC
Horizon Utilities Corp
Hydro One
Hydro Ottawa
HydroQuebec Distribution
Hydro Quebec TransEnergie
Manitoba Hydro
New Brunswick Power
Newfoundland Power
Nova Scotia Power
OPG
SaskPower
The Hydro Group (Newfoundland)
Toronto Hydro
TransAlta

WANO NPI Calculations

In the benchmarking report, the NPI index is calculated using the method four based on WANO data according to the following guidelines published by WANO. The "new" method is also referred to as "method four."

Table 14. WANO NPI Calculations

Indicator	Previous Ranges and Weights: Range Minimum	Previous: Range Maximum	Previous: Weight	**New Ranges and Weights: Range Minimum**	**New: Range Maximum**	**New: Weight**	Time Period (Months)
Unit Capability Factor	80	92	15	**80**	**92**	**15**	18 or 24*
Forced Loss Rate	8	1	15	**8**	**1**	**15**	18 or 24*
Unplanned Automatic Scrams	1.5	0.5	10	**1.5**	**0.5**	**10**	24
Safety System Unavailability (%)							
BWR High Pressure Injection	3	2	10	**3**	**2**	**10**	36
BWR Residual Heat Removal	3	2	10	**3**	**2**	**10**	36
PWR High Pressure Injection	3	2	10	**3**	**2**	**10**	36
PWR Auxiliary Feedwater	3	2	10	**3**	**2**	**10**	36
Emergency AC Power	3.5	2.5	10	**3.5**	**2.5**	**10**	36
Fuel Reliability (BWR)	3000	300	10	**3000**	**300**	**10**	3
Fuel Reliability (PWR)	$5x10^{-3}$	$5x10^{-4}$	10	**$5x10^{-3}$**	**$5x10^{-4}$**	**10**	3
Chemistry Performance	1.2	1.01	5	**1.2**	**1.01**	**5**	18 or 24*
Collective Radiation Exposure (BWR)	220	120	10	**220**	**120**	**10**	18 or 24*
Collective Radiation Exposure (PHWR)	120	60	10	**140**	**80**	**10**	18 or 24*
Collective Radiation Exposure (PWR)	120	60	10	**120**	**60**	**10**	18 or 24*
Industrial Safety Accident Rate	1.0	0.2	5	**1.0**	**0.2**	**5**	18 or 24*
	Total		100	**Total**		**100**	

*PHWR units will use 24 month time period
Note: Beginning in 2009, Darlington will use a 3-year NPI cycle.

SCOTTMADDEN PHASE 2 NUCLEAR BENCHMARKING REPORT

1.0 INTRODUCTION

In 2009, OPG undertook a major new nuclear benchmarking initiative in conjunction with the development of its 2010-2014 nuclear business plan. This initiative was undertaken by OPG Nuclear, with the assistance of ScottMadden Inc. ("ScottMadden"), a general management consulting firm specializing in the provision of benchmarking and business planning consulting services to nuclear utilities.

Given the importance of this initiative, OPG sought to have incorporated into the reports the best comparative data available. As a result, the ScottMadden Phase 1 and Phase 2 reports rely extensively upon data extracted from leading industry association databases.

Data provided by the World Association of Nuclear Operators (WANO) was the primary source of benchmarking data for operational performance indicators. For financial performance comparisons, data was compiled from the database of the Electric Utility Cost Group (EUCG). Data was also obtained from the Canadian Electricity Association (CEA) for the all-injury rate metric and from a workgroup of the Institute for Nuclear Power Operations (INPO) for maintenance backlog comparisons. OPG, as a member of these industry associations, is bound by the confidentiality provisions that these associations have with respect to the use of their data.

The report filed at Ex. F5-T1-S2 has redacted company names from the EUCG comparator charts and the first quartile value for the CEA all-injury performance metric. OPG sought and obtained permission to file EUCG comparisons on the condition that it not identify any company names, other than OPG, associated with the data. The CEA also requires that OPG not disclose the first quartile performance for the all-injury metric. In addition, OPG has redacted references to individual company performance that appear in the text of the ScottMadden Phase 2 report.

Finally, information on number of security staff at OPG and comparator companies has been redacted for security purposes.

The report is marked "Confidential" because when it was originally produced it included confidential information. The redacted report as filed is no longer confidential.

SCOTTMADDEN
Management Consultants

September 11, 2009

Mr. Randy Leavitt
Vice President, Nuclear Finance

Mr. Pierre Tremblay
Senior Vice President, Nuclear Programs and Training
Ontario Power Generation
889 Brock Road
Pickering, Ontario L1W 3J2

Reference: OPG Nuclear 2009 Benchmarking Project – Phase 2 Final Report

Dear Sirs:

By means of this transmittal letter, we are submitting to Ontario Power Generation (OPG) our final report related to completion of Phase 2 of the OPG Nuclear (OPGN) Benchmarking Project. The purpose of this report as outlined in our proposal of May 19, 2009 is to:

> *"document the activities undertaken during this phase and to assess the degree to which OPG has successfully piloted a gap-based business planning process and used this process to identify and drive meaningful improvement opportunities capable of addressing current performance gaps."*

It is our opinion that OPGN has undertaken the actions necessary to successfully pilot a gap-based business planning process as originally envisioned. These actions include: (a) fairly benchmarking the company's operational and financial performance to external peers, (b) using the benchmarking results to establish performance improvement targets that will achieve, or significantly drive the company closer to, top quartile industry performance, and (c) developing and implementing a gap-based business planning process that identified the improvement initiatives best able to close the identified performance gaps.

Improvements in the OPGN planning process include the following: (a) establishment of top-down quantitative operational and financial targets for each year and each business unit, (b) identification of site, business unit, and functional improvement initiatives that are tied to specific operational and financial targets, (c) designation of accountability points for the delivery of all improvement initiatives, (d) linkage of improvement initiatives to closure of documented performance gaps, and (e) incorporation of improvement initiatives into the site and support unit business plans and budgets.

It should be noted that the gap-based business planning process outlined above represents a significant change in the manner in which business plans have been traditionally prepared at OPGN. Implementing these changes has not been easy and OPGN management is to be commended on the degree to which they provided executive sponsorship to the internal teams that worked to complete this effort.

ScottMadden believes that OPGN's challenge ahead will be to implement the improvement initiatives identified during the planning process. In our view, several key improvement initiatives cannot be implemented under "business as usual" conditions. They will require changes in the company's governance, performance tracking, and accountability practices that may be as equally challenging as those involved in modifying the business planning process.

Should you have any questions or concerns regarding the attached report, we stand ready to discuss them with you at your earliest convenience.

Yours very truly,

John H. Sequeira, Ph.D.
Partner

ScottMadden
Management Consultants

✓ Ontario Power Generation Inc.

Nuclear 2009 Benchmarking Project
Phase 2 – Final Report

September 11, 2009

[redacted]

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Table of Contents

1.0 Introduction

1.1 About ScottMadden, Inc.

Founded in 1983, ScottMadden, Inc. (ScottMadden) is a general management consulting firm providing independent and objective counsel to more than 300 clients worldwide. We specialize in serving the utility sector and have assisted more than 200 public and private utilities in implementing their strategies, planning their businesses, improving their processes, restructuring their organizations, and improving their operating results. We have successfully completed business advisory projects for 65% of the commercial nuclear generation stations in North America. We have extensive experience assisting executive management in planning and managing the performance of nuclear generation fleets. In 2007-2009, we conducted engagements with five of the top six North American nuclear fleet operators.

We trace the source of our success to our size, culture, and values and our deep understanding of the energy industry gained from more than a quarter century of providing management counsel to our energy clients. Our expertise in energy consulting covers a range of relevant competencies and skills, including:

- Business Management
- Organization Design and Development
- Asset Management
- Benchmarking
- Business Process Improvement
- Operations Management
- Nuclear Operations Turnaround
- Fleet Operating Models
- Nuclear New Build Support

1.2 Project Background

In recent years, OPG has been under increasing scrutiny from the Ontario Energy Board (OEB), as well as third-party interveners, to demonstrate that its operating costs are in line with those of other nuclear stations in Canada and the United States. Benchmarking evidence filed in OPG's last rate application indicated that OPG's operating costs substantially exceeded others in the industry based upon production unit energy costs (PUEC) during the years 2005 through 2007.[1] In its last Decision, the OEB expressed concern as to whether OPG management has adequately engaged in external benchmarking on an ongoing basis and whether such benchmarking has been appropriately used to drive business planning and operational improvement.[2]

In addition, a Memorandum of Agreement between the Province of Ontario and OPG set an expectation that "OPG will seek continuous improvement in its nuclear generation business and internal services. OPG will benchmark its performance in these areas against CANDU nuclear plants worldwide as well as against the top quartile of private and publicly owned nuclear

[1] OEB Decision EB-2007-0905 Re: Productivity and Benchmarking
[2] Ibid.

electricity generators in North America. OPG's top operational priority will be to improve the operation of its existing nuclear fleet."[3]

The OEB directed OPG management in its last Decision to: (1) produce further benchmarking studies, (2) use these studies to determine what level of cost and operational performance improvement is justified, and (3) develop an improvement plan for execution.[4]

1.3 Project Objectives

OPG has been involved in operational and financial benchmarking for many years. Multiple sources of comparative data have been, and continue to be, used. These include EUCG cost and production data, WANO non-cost performance data, and special third-party studies. However, formal external studies by OPGN have not been undertaken since late 2006. To address the OEB's Decision and to update its benchmarking baseline, OPG management retained ScottMadden to undertake further benchmarking studies to compare its nuclear financial and non-financial performance with industry peers. The objective of these studies is to clarify and confirm performance gaps and to identify potential cost and performance improvement areas for inclusion in OPG's 2010-2014 Nuclear Business Plan.

1.4 Project Approach

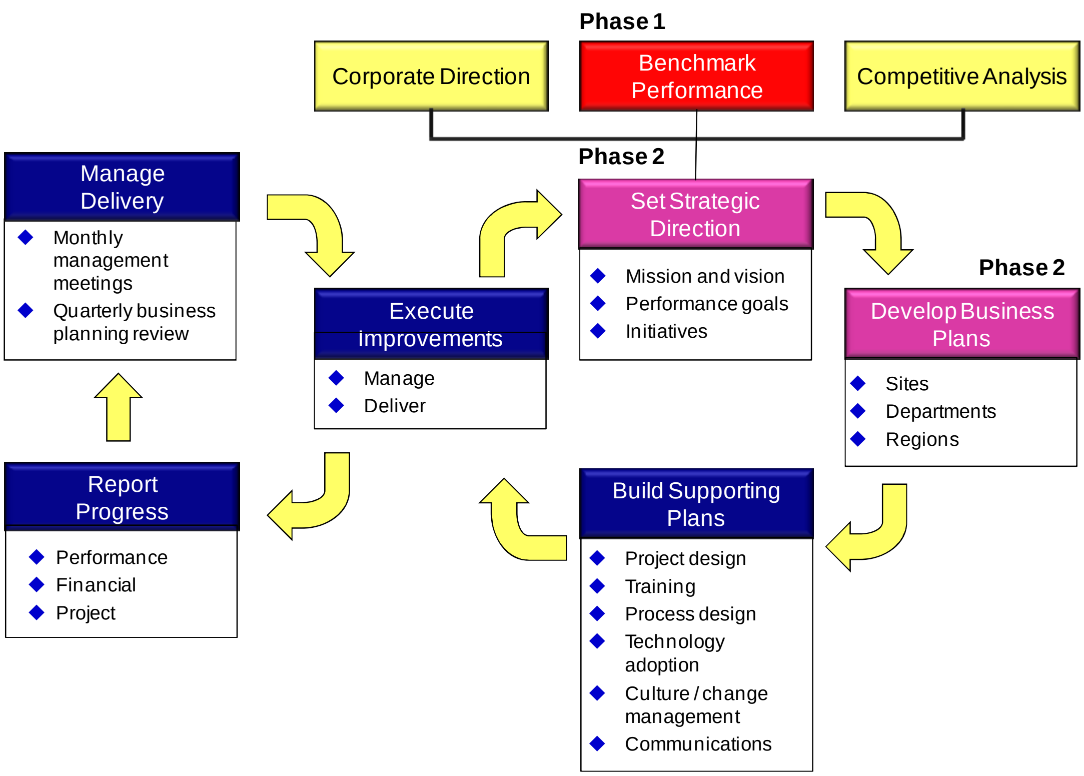
ScottMadden's approach to gap-based business planning is implemented in seven steps as listed below and illustrated in Figure 1.

1. *Benchmark Performance* – Compare the company to industry peers to determine relative standing on key operational and financial performance indicators
2. *Set Strategic Direction* – Use the benchmarks to help set fair and balanced performance targets and identify improvement initiatives that will move the company toward a desired level of performance compared to industry peers
3. *Develop Business Plans* – Prepare site and business unit plans that incorporate the improvement initiatives and ensure that the desired performance targets are achieved
4. *Build Supporting Plans* – Prepare implementation plans for the various improvement initiatives that will help drive the desired changes
5. *Execute Improvements* – Implement the improvement initiatives that will drive improved performance
6. *Report Progress* – Design and implement a reporting process that will effectively track the implementation of improvement initiatives and the delivery of performance improvement
7. *Manage Delivery* – Design and implement a process to ensure that those responsible for implementing the improvement initiatives are held accountable for successful implementation of the initiative and for the delivery of the associated business benefits

[3] 2008 Memorandum of Understanding between the Province of Ontario and Ontario Power Generation
[4] OEB Decision EB-2007-0905 Re: Productivity and Benchmarking

The OPG Nuclear 2009 Benchmarking Project, undertaken in response to the OEB Decision, was designed to address the first three of these steps. Phase 1 addressed *Step 1 – Benchmark Performance*, while Phase 2 addressed *Step 2 – Set Strategic Direction* and *Step 3 – Develop Business Plans*. Phase 1 was performed from March 24 through May 22, 2009, and consisted of a comparative analysis designed to establish current performance gaps at each OPG nuclear station against relevant top-performing peers. The purpose was to enhance understanding of "how much to improve." Phase 2 was performed from May 23 through September 11, 2009 and consisted of using the comparative analysis from Phase 1 to (a) identify where cost and operational improvements are warranted and (b) to formulate targets and action plans for achieving these improvements.

Figure 1 – ScottMadden's Approach to Gap-based Business Planning



2.0 Project Overview

The OPG Nuclear 2009 Benchmarking Project was undertaken in two phases. Each is discussed below.

2.1 Phase 1 Overview

During Phase 1 ScottMadden personnel, assisted by OPG, (a) identified the key performance metrics which would be benchmarked, (b) identified the most appropriate peer groups for comparison, and (c) prepared supporting analyses, charts, and a formal benchmarking report. OPG personnel supplied the OPG data used for comparison and provided insight regarding key factors believed to contribute to specific performance gaps. The results were documented in the *OPG Nuclear 2009 Benchmarking Report* delivered to OPG management on July 2, 2009.

Figure 2 provides a summary of OPG's plant-level performance as of 2008 compared to the benchmark panel for each of the 19 key performance metrics benchmarked during the study.

Figure 2 – Summary Comparison of 2008 OPGN Performance to Industry Benchmarks

Metric	Best Quartile	Median	Pickering A	Pickering B	Darlington
Safety					
All Injury Rate	[redacted]	[redacted]	0.73	0.96	1.04
2-Year Industrial Safety Accident Rate	0.05	0.09	0.14	0.07	0.04
2-Year Collective Radiation Exposure (man-rem per unit)	62.15	81.84	44.2	95.81	72.83
Airborne Tritium (TBq) Emissions per Unit	48.0	101.0	101.0	50.7	40.0
Fuel Reliability (microcuries per gram)	0.000001	0.000165	0.00059	0.00159	0.00025
2-Year Reactor Trip Rate (# per 7,000 hrs)	0.00	0.33	1.22	0.26	0.00
3-Year Auxiliary Feedwater System Unavailability	0.0014	0.0020	0.0119	0.0040	0.0017
3-Year Emergency AC Power Unavailability	0.0024	0.0076	0.0081	0.0091	0.0020
3-Year High Pressure Safety Injection Unavailability	0.0001	0.0037	0.0012	0.0001	0.0001
Reliability					
WANO NPI (Index)	96.19	62.46	60.84	60.93	95.67
2-Year Forced Loss Rate (%)	0.68	3.79	37.90	18.19	0.93
2-Year Unit Capability Factor (%)	90.97	84.31	56.6	73.17	91.99
2-Year Chemistry Performance Indicator (Index)	1.00	1.01	1.13	1.25	1.00
1-Year Online Elective Maintenance (work orders/unit)	218	278	425	695	311
1-Year Online Corrective Maintenance (work orders/unit)	4	7	14	28	11
Value for Money					
3-Year Total Generating Costs per MWh ($/Net MWh)	28.66	32.31	92.27	58.68	30.08
3-Year Non-Fuel Operating Costs per MWh ($/Net MWh)	18.06	21.28	82.62	50.95	25.10
3-Year Fuel Costs per MWh ($/Net MWh)	5.02	5.37	2.64	2.68	2.62
3-Year Capital Costs per MW DER	32.79	46.22	32.07	32.44	18.79

KEY: Green = best quartile performance/max NPI points achieved if applicable
White = 2nd quartile performance
Yellow = 3rd quartile performance
Red = lowest quartile performance

In our opinion, the *OPG Nuclear 2009 Benchmarking Report* presents a fair and balanced view of OPG's operating and financial performance compared to other operators in the nuclear generation industry. The results indicate that OPGN performs well across a broad range of industry operational measures, that the Darlington station is within first or second quartile on a majority of measures, but OPG is clearly challenged with respect to reliability and cost at the two Pickering stations.

Comparatively poor operational and cost performance of the Pickering stations lowers OPG's overall performance compared to other nuclear fleet operators. The impact is shown in the company's relative standing on two key operator level comparisons. The first is the WANO nuclear performance index (NPI) and the second is total generating costs per MWh.

The WANO NPI is designed to provide a comprehensive overview of a nuclear operator's overall operating performance. OPG's results for this indicator are highlighted in Figure 3. The rankings were calculated using the average (mean) results for the units in operation during the given year. The WANO data set is comprised of 20 major operators. A listing of the operators and plants can be found in the appendix of the *OPG Nuclear 2009 Benchmarking Report*. The results are not weighted in any way.

Figure 3 – Average WANO NPI Rankings, 2006–2008[5] per WANO Data

	2006	2007	2008
[redacted]	9	8	1
	4	5	2
	2	1	3
	7	3	4
	19	17	5
	12	13	6
	5	9	7
	3	4	8
	6	10	9
	11	6	10
	8	11	11
	10	7	12
	1	2	13
	13	12	14
	14	14	15
	15	15	16
OPG	17	16	17
[redacted]	20	19	18
	16	20	19
	18	18	20

OPG's WANO NPI ranking is low in comparison to other operators within the group. [redacted] OPG

[5] Nuclear Performance Index (NPI), prepared by the World Association of Nuclear Operators (WANO)

ranked 17 out of a list of 20 fleet operators. Low unit capability factor (UCF) and high forced loss rate (FLR) are the primary contributors to OPG's relative ranking.

A second key operator-level performance indicator is total generating costs per MWh. Total generating costs per MWh is the highest indicator of an operator's overall financial performance. This metric incorporates non-fuel operating costs, fuel costs, and capital costs, and represents the "all in" cost of producing each MWh of power.

The EUCG data set is comprised of 16 major operators. A listing of the operators and plants can be found in the Appendix A. OPG's standing among these 16 North American fleet operators is highlighted in Figure 4 below.

Figure 4 – Three-Year Total Generating Costs per MWh Rankings, 2005–2008 per EUCG Data

	2005	2006	2007	2008
[redacted]	2	1	3	1
[redacted]	6	3	2	2
[redacted]	1	9	9	3
[redacted]	3	5	4	4
[redacted]	10	14	10	5
[redacted]	14	7	8	6
[redacted]	4	6	5	7
[redacted]	7	4	1	8
[redacted]	9	11	6	9
[redacted]	8	2	12	10
[redacted]	13	8	11	11
[redacted]	11	10	7	12
[redacted]	12	12	15	13
[redacted]	5	13	14	14
[redacted]	15	15	13	15
OPG	16	16	16	16

It should be noted that OPG's financial and operational performance relative to its peers is impacted by differences in design technology, the number of reactors onsite, the geographic size of the site, reactor age, and operational condition in addition to low capability factors at both the Pickering A and Pickering B sites. It should also be noted that OPG and Bruce Power are the only CANDU operators that reported comparable EUCG data.

At the conclusion of Phase 1, ScottMadden worked with OPG personnel to develop a *Benchmarking Report Procedure* which will be incorporated into OPG's standard business planning procedures. OPG personnel were trained in this procedure and should be capable of independently updating the benchmarking report in support of future business planning cycles.

2.2 Phase 2 Overview

During Phase 2, ScottMadden personnel worked with OPGN Finance to incorporate gap-based business planning practices into the company's existing business planning process. Phase 2 was divided into the following four tasks:

- Task 1 – Develop Gap-Based Business Plans (Site and Support Units). This task consisted of two primary sub tasks: (1) working with OPGN project core team and Nuclear executives to convert the industry benchmarks from Phase 1 into specific performance targets to be used during the gap-based planning cycle, and (2) working with the three nuclear sites and the six nuclear support units to identify specific improvement initiatives capable of achieving the established targets for their sites or units.

- Task 2 – Identify Functional Area Improvement Strategies. In addition to working with the nuclear sites and support units, ScottMadden also worked with 16 functional/peer teams to identify a broad range of fleet-wide improvement initiatives that will also help contribute to achieving the targets set by OPGN management. These were designed to supplement the business unit specific initiatives discussed under Task 1.

- Task 3 – Develop Staffing and Organization Plan. This task was also divided into two subtasks. The first involved comparing OPGN staffing levels to industry peers in North America. These comparisons were provided to the site, support unit, and functional teams to highlight staffing discrepancies and to encourage investigation of best practices associated with reduced staffing levels. The second subtask involved preparing a detailed staffing work program analysis for the Radiation Protection function. This was performed as a pilot to demonstrate the approach used by ScottMadden with other nuclear fleet operators to determine appropriate staffing levels for specific nuclear functions.

- Task 4 – Prepare Final Assessment Report. The final task during Phase 2 involved preparing the present report. This report includes: (a) documentation of the activities undertaken during Phase 2, and (b) an assessment of the degree to which OPG has successfully piloted a gap-based business planning process and used this process to identify and drive meaningful improvements capable of addressing its current performance gaps.

In Section 3.0 of this report, we examine in more detail the activities and deliverables associated with Tasks 1 through 3 of the Phase 2 workplan. In Section 4.0, we provide our assessment of the degree to which OPG has successfully piloted a gap-based business planning process and used this process to identify and drive meaningful improvements capable of addressing current performance gaps.

3.0 Phase 2 Activities and Key Deliverables

3.1 Develop Gap-based Business Plans (Phase 2, Task 1)

Task 1 consisted of assisting OPGN management establish meaningful performance targets and then develop site and support unit plans to achieve these targets. This task has two subtasks, each of which is discussed below.

3.1.1 Target Setting

ScottMadden worked with OPGN management to identify and establish performance targets for a total of 48 performance metrics. This was accomplished in three steps as described below.

<u>Step 1 – Identify Performance Metrics</u>

The first step in target setting was to identify and agree upon the performance metrics for which targets would be set. To prepare for this, ScottMadden assembled a list of key performance measures used by OPGN at the time the *OPG Nuclear 2009 Benchmarking Report* was prepared (May 2009). These metrics are listed in Appendix B which also shows the OPGN reports in which the metrics were used.
The planning team then reviewed these metrics and agreed upon the key metrics which should be used for target setting and business planning.

Figures 5 and 6 present the final list of selected metrics grouped according to OPGN's four cornerstone values (Safety, Reliability, Human Performance, and Value for Money). Figure 5 presents the final performance metrics used to address <u>station</u> performance, while Figure 6 presents the final performance metrics used to address <u>business support unit</u> performance. The list of metrics shown in Figures 5 and 6 vary slightly from those shown in Appendix B. A few metrics were omitted as being of lower value and PUEC was replaced with Total Generating Cost since this is a better comparator of financial performance. No other additions were made since OPGN performance metrics are in line with those typically used by leading nuclear fleet operators.

<u>Step 2 – Conduct Target-Setting Sessions</u>

The next step in target setting was to prepare for, and conduct, a series of target setting meetings with the OPGN Nuclear Executive Committee (NEC). Two target-setting sessions were held. The first, held on June 8, 2009, focused on setting operational performance targets. The second, held on June 15, 2009, focused on setting financial performance targets. The purpose of both sessions was to assist the executive team in reaching consensus on the performance targets that OPGN would commit to for the next five-year business plan (2010-2014).

For the first target-setting session, the executive team set operational performance targets only for the year 2014. Each NEC member committed to their respective 2014 targets based upon their specific situations and their understanding of the factors contributing to the current performance gaps, as challenged by the CNO and the rest of the executive team. The sites and support units were then instructed to fill in the interim years in their final business plans following the meeting. This allowed the sites and support units to determine the pace in which the operational targets would be achieved based upon the specifics of their site and support unit action plans. For the second target-setting session, the executive team set financial performance targets for the interim planning years as well as for 2014. The additional direction provided in terms of financial targets was required in order to ensure that each site and support unit met the financial obligations of OPGN as a whole.

Figure 5 – Performance Metrics – Nuclear Stations

Safety 1. All Injury Rate 2. Collective Radiation Exposure 3. Fuel Reliability 4. Environment Index 5. Accident Severity Rate 6. Industrial Safety Accident Rate 7. SS – Auxiliary Feedwater System Unavailability 8. SS – Emergency AC Power Unavailability 9. SS – High Pressure Safety Injection Unavailability 10. Reactor Trip Rate (WANO) 11. Airborne Tritium Emissions	**Human Performance** **1. Event Free Day Resets** 2. Corrective Action Program Quality 3. Corrective Action Program Root Cause Effectiveness 4. Corrective Action Program Timeliness 5. Training Index
Reliability 1. Nuclear Performance Index 2. Unit Capability Factor 3. Forced Loss Rate 4. Net Electrical Production 5. Chemistry Performance Indicator (WANO) 6. Plant Condition Index 7. OCMB – On-line Corrective Maintenance Backlog 8. OEMB – On-line Elective Maintenance Backlog 9. ERI – Equipment Reliability Index 10. Plant Reliability List 11. BP Planned Outage Performance 12. System Health Improvement Effectiveness (%) 13. Criticality 1 Deferral of PMs (Average # of PMs/unit)	**Value for Money** 1. OM&A – Base & Outage 2. Non-Fuel Operating Cost per MWh 3. Total Generating Cost per MWh 4. Projects Available for Service

To assist in setting both operational and financial performance targets, the executive team was provided with a targeting worksheet for each cornerstone area showing the following data for each performance metric:

- 2008 actual values
- 2009 projected values
- Existing targets from the prior business plan (2009-2013)
- North American PWR/PHWR best quartile and median values (for benchmarked metrics)
- CANDU best quartile and median values (for benchmarked metrics)

Other material provided included graphs showing 2003-2008 trend lines for each operational metric as well as projections out to 2013 based upon prior business plan targets. These graphs also showed the change in "best quartile" thresholds over time and highlighted the degree to which prior plans would (or would not) close the performance gap.[6] It should be noted that, prior to ScottMadden's involvement, the NEC executive team had been made aware of the CNO's expectations for the 2010 Nuclear business plan, including a minimum $40M per year reduction in OM&A costs.

Figure 6 – Performance Metrics – Support Units

Safety

1. No Additional Safety Non-Plant Metrics

Human Performance

No Additional Human Performance Non-Plant Metrics

Reliability

1. Incinerate Liquid Waste
2. Western Used Fuel Dry Storage Facility Capability Factor
3. Inventory Accuracy
4. Stock Out Materials
5. Transportation Package Maintenance Compliance
6. Meet BP and OPG needs for Accepting Low Level Waste Volumes
7. Raditation Material Transportation Preventable Collision Rate
8. OPG Outage Scope Delivered on Schedule
9. IM&CS Equipment Condition Index

Value for Money

1. Nuclear Waste Liabilities – Internal
2. NWMD Capital/MFA
3. Inventory Creep
4. Material Requested Not Issued
5. Total Process Costs

In preparation for the second target-setting session (focused on financial targets), ScottMadden prepared five hypothetical scenarios for each site and support unit. The scenarios showed "Total Non-Fuel Operating Costs" and "Non-Fuel Operating Costs per MWh" under various cost reduction assumptions. The scenarios do not reflect ScottMadden's presumption of what is appropriate or achievable for OPGN. Rather, they are indicative of the financial impact of attaining relative degrees of cost reduction. The purpose was to assist the executive team understand the degree of cost reduction required to achieve median or best quartile performance as well as other hypothetical, but more moderate, cost reduction options.

The five scenarios were as follows:

- Scenario 1 – Base Case (prior 2009-2013 Business Plan with additional $40M reduction in each year beginning in 2010; 2014 trended)
- Scenario 2 – Base Case Less 2% (beginning in 2011)

[6] For operational metrics (Safety, Reliability and Human Performance), the "best quartile" benchmarks for 2008 were assumed to remain constant through the end of 2014. For the financial metrics (Value for Money), the "best quartile" and median benchmarks were adjusted for anticipated cost inflation.

- Scenario 3 – Base Case Less 4% (beginning in 2011)
- Scenario 4 – Cost Reductions Required to Achieve Median Performance (by 2014)
- Scenario 5 – Cost Reductions Required to Achieve Best Quartile Performance (by 2014)

It was not expected that the sites or support units would adopt any particular scenario and, in fact, they did not. In the end the business unit executives used the scenarios as guidance and, consistent with operational performance target setting, committed to their respective 2014 targets based upon their specific situations (e.g. the need for incremental expenditures and increased outage days to implement Pickering B Continued Operations) and their understanding of the drivers to the current performance gaps, as challenged by the CNO and the rest of the executive team. Appendix C presents the cost analysis scenarios prepared for the three generation stations (based upon Total Non-Fuel Operating Costs). Appendix D presents the cost analysis scenarios prepared for the three generation stations and business support units (based upon OM&A Costs).

Using the cost analysis scenarios as guidance, the business unit executives worked with their business unit directors to calculate their respective interim year targets. The resulting financial targets for OPGN as a whole are summarized in Figure 7 below with and without the assumption regarding implementation of the Continued Operations program at Pickering B (COOP). They represent what the business unit executives believe are difficult but achievable targets and were developed with encouragement from the CNO to challenge their teams and exceed previous commitments.

Figure 7 – Projected Cost Savings Resulting From Gap-based Business Planning ($000s)

Total Cost Savings (w/ COOP)	2010	2011	2012	2013	2014	CUM TOTAL
Total 2009-13 Plan OM&A [1]	$1,558,749	$1,482,286	$1,516,763	$1,663,731	$1,676,002	$7,897,531
Total 2010-14 Plan OM&A Targets	$1,519,577	$1,454,490	$1,476,432	$1,605,877	$1,596,216	$7,652,591
Total $ Savings Over Prior Plan	$39,172	$27,796	$40,332	$57,854	$79,786	$244,940
Total OM&A % Change	-2.51%	-1.88%	-2.66%	-3.48%	-4.76%	-3.10%

Total Cost Savings (w/o COOP)	2010	2011	2012	2013	2014	CUM TOTAL
Total 2009-13 Plan OM&A [1]	$1,542,949	$1,482,286	$1,516,763	$1,663,731	$1,676,002	$7,881,731
Total 2010-14 Plan OM&A Targets	$1,503,777	$1,429,390	$1,455,632	$1,576,877	$1,564,616	$7,530,291
Total $ Savings Over Prior Plan	$39,172	$52,896	$61,132	$86,854	$111,386	$351,440
Total OM&A % Change	-2.54%	-3.57%	-4.03%	-5.22%	-6.65%	-4.46%

[1] 2014 amounts were not included in 2009 business plan. Values shown for 2014 amounts were derived by ScottMadden by reference to the 2009-2013 trend.

The tables show that the revised planning process facilitated management's ability to set financial targets which are expected to result in cumulative cost savings ranging between 3.1% and 4.5% over what would have been expected under OPGN's prior five-year business plan (2009-2013). The cumulative cost savings over the period 2010 through 2014 total between $244.9M and $351.4M depending upon whether or not the cost of Pickering B Continued Operations is included. While the cost savings are not adequate to achieve best quartile financial performance, they do represent a significant commitment to future cost reduction and an improvement over both the current situation and that previously planned.

Step 3 – Finalize and Distribute Targets

Once the sites and support units had set their operational and financial targets, they were subsequently distributed by the CNO in a formal planning memorandum to the NEC members dated June 30, 2009. These targets then served as financial guidance to both business units and the functional/peer teams as they considered the actions and improvement plans that would be required to achieve them. The specific targets distributed are presented in Appendix E.

To illustrate the impact that achieving the proposed targets will have on OPGN's performance relative to other nuclear fleet operators, ScottMadden prepared a hypothetical benchmarking comparison showing OPGN's "future performance" (assuming all targets are achieved) to today's industry performance levels. This comparison is presented in Figure 8 below.

Figure 8 – Hypothetical Comparison of OPGN Performance to Industry Benchmarks Assuming Achievement of all Operating and Financial Performance Targets by 2014

Metric	Best Quartile	Median	Pickering A	Pickering B	Darlington
Safety					
All Injury Rate	[redacted]	[redacted]	1.2	1.2	1.2
2-Year Industrial Safety Accident Rate	0.05	0.09	0.15	0.15	0.15
2-Year Collective Radiation Exposure (man-rem per unit)	62.15	81.84	125	82	66
Airborne Tritium (TBq) Emissions per Unit	48.0	101.0	81.1	36.5	27.0
Fuel Reliability (microcuries per gram)	0.000001	0.000165	0.0005	0.0005	0.0005
2-Year Reactor Trip Rate (# per 7,000 hrs)	0.00	0.33	0.50	0.50	0.50
3-Year Auxiliary Feedwater System Unavailability	0.0014	0.0020	0.0200	0.0200	0.0200
3-Year Emergency AC Power Unavailability	0.0024	0.0076	0.0250	0.0250	0.0250
3-Year High Pressure Safety Injection Unavailability	0.0001	0.0037	0.0200	0.0200	0.0200
Reliability					
WANO NPI (Index)	96.19	62.46	70.9	81.3	98.6
2-Year Forced Loss Rate (%)	0.68	3.79	4.00	4.00	1.25
2-Year Unit Capability Factor (%)	90.97	84.31	84.3	81	93.3
2-Year Chemistry Performance Indicator (Index)	1.00	1.01	1.04	1.04	1.01
1-Year Online Elective Maintenance (work orders/unit)	218	278	278	300	218
1-Year Online Corrective Maintenance (work orders/unit)	4	7	9	15	5
Value for Money					
3-Year Total Generating Costs per MWh ($/Net MWh)**	37.97	42.60	70.81	64.80	36.75
3-Year Non-Fuel Operating Costs per MWh ($/Net MWh)*	25.53	29.08	60.07	52.47	28.82
3-Year Fuel Costs per MWh ($/Net MWh)	7.62	8.15	7.45	6.01	5.43
3-Year Capital Costs per MW DER	35.49	50.03	34.73	34.67	20.37

*OPG's 2014 Total Generating Costs per MWh target is inclusive of OPEB. To ensure accurate comparison, best quartile and median values were similarly adjusted upward to account for OPEB

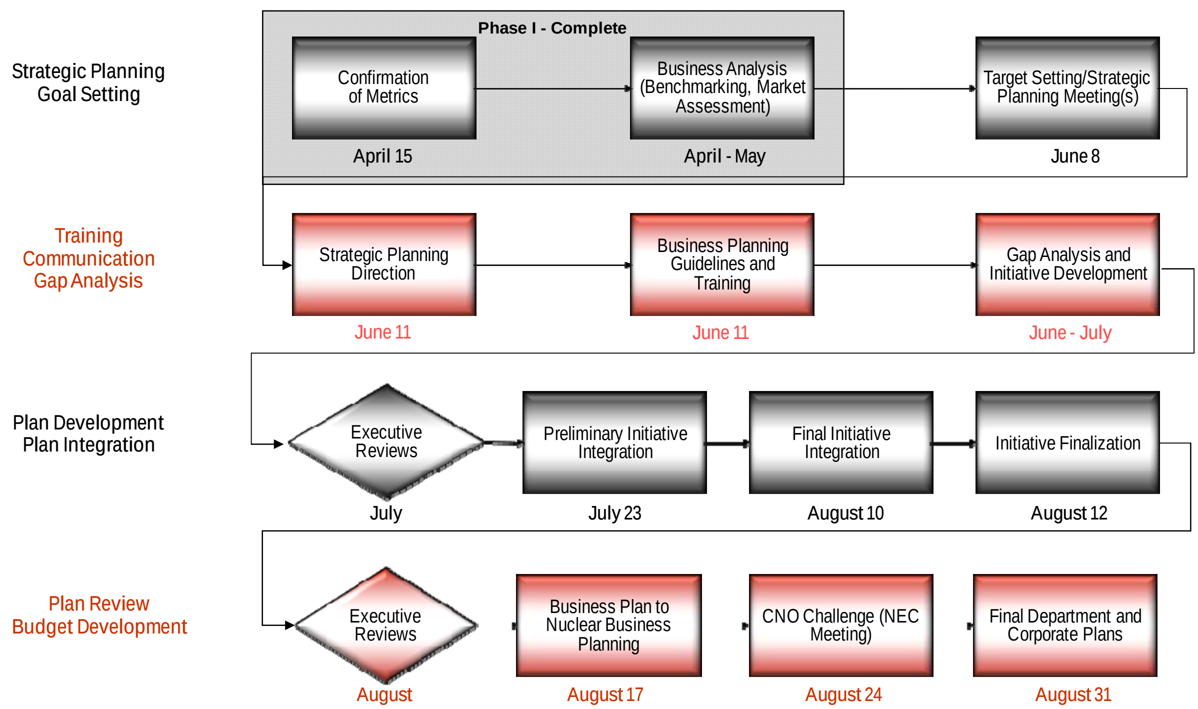
KEY: Green = best quartile performance/max NPI points achieved if applicable
White = 2nd quartile performance
Yellow = 3rd quartile performance
Red = lowest quartile performance

By comparing Figure 2 with Figure 8 the reader can assess the degree of improvement that will result should OPGN achieve its desired targets over the next five years. The reader is advised to remember that industry performance levels may change over this same time period so the comparison is directional only.

3.1.2 Business Plan Development

In parallel with the target setting process, ScottMadden and the project core team began working with the site and support unit business managers to develop the process and templates required to implement gap-based business plans for each site and support unit. These site and support unit plans were then consolidated for subsequent CFO, CEO, and OPG Board of Director review, which was outside the scope of ScottMadden's Phase 2 involvement. The overall process used to develop these plans is illustrated in Figure 9. This process was overlaid upon OPGN's traditional business planning cycle which was already underway (including a memorandum dated March 12, 2009 setting out CNO expectations for 2010 Business Plan) consistent with OPG's corporate business planning process. This resulted in a good deal of additional planning effort for all involved during the summer months of June, July, and August of 2009.

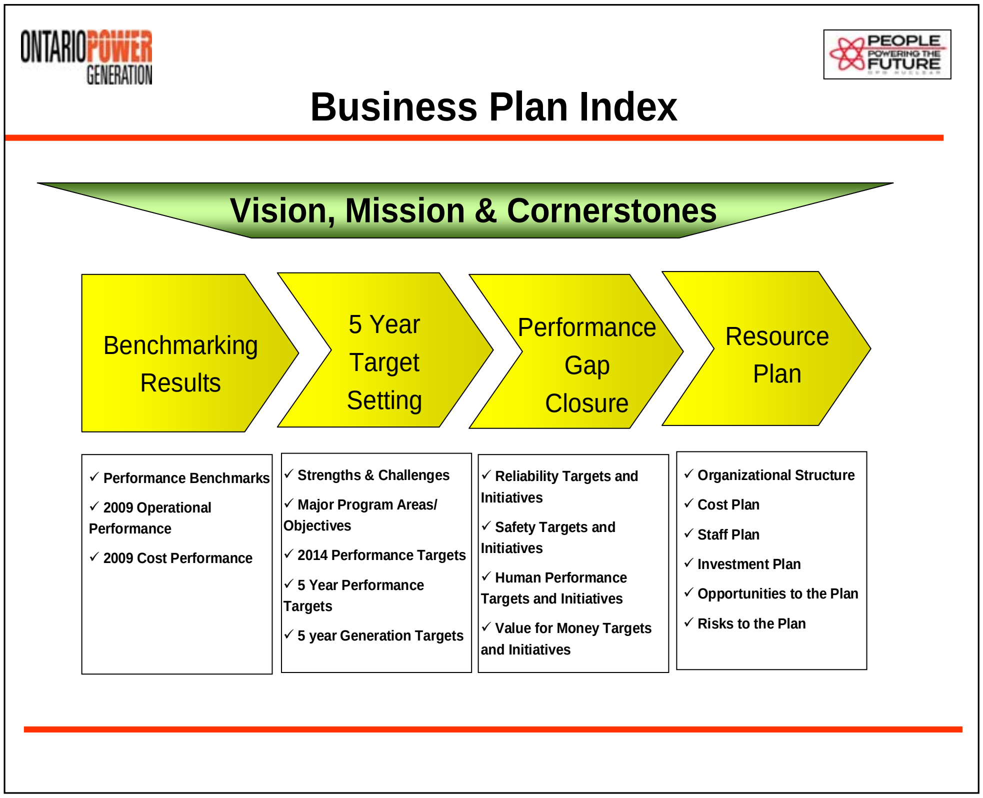
Figure 9 – Overview of 2009 OPG Gap-based Business Planning Process



ScottMadden's role in assisting the development of the site and support unit business plans consisted of conducting initial meetings with the site and business unit business managers, explaining the gap-based business process to be followed, providing initiative improvement templates and providing guidance throughout the process. During this process, ScottMadden and the OPGN Finance team played a coordinating and support role. The sites/support units had primary responsibility for identifying and documenting the changes they desired to implement to help achieve their committed performance targets.

Once the fleet-wide initiatives were developed by the functional/peer teams (see Section 3.2 below), these initiatives were consolidated with the site/support unit initiatives to develop an integrated business plan for each site/business unit. The business plan for each site/support unit followed a standard template, the contents of which are outlined in Figure 10.

Figure 10 – Standard Outline for Site/Support Unit Business Plan

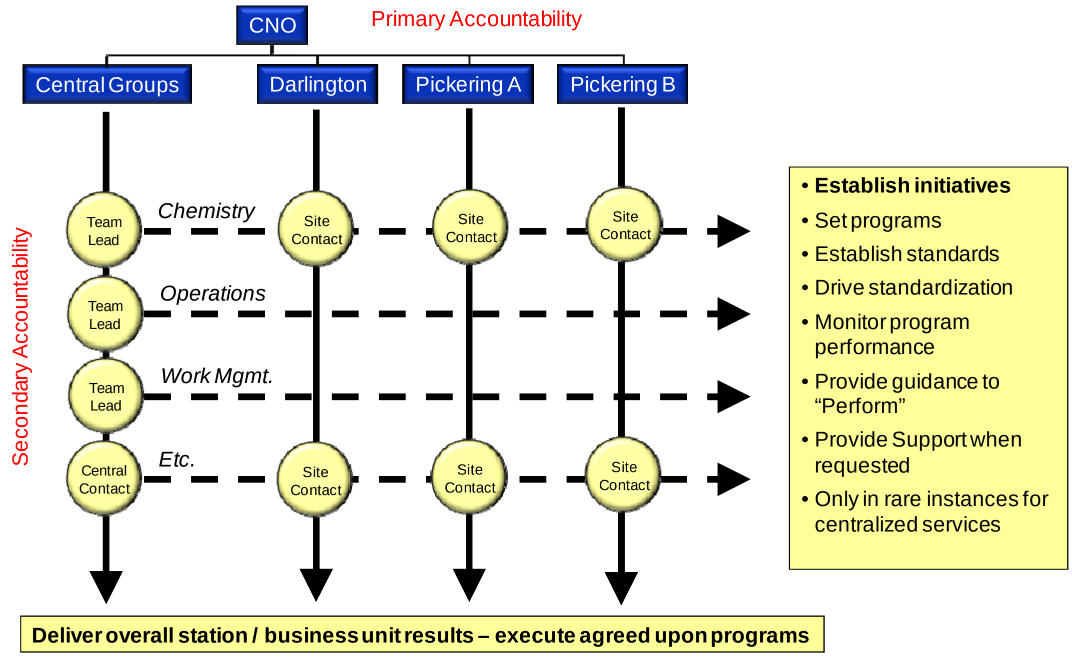


3.2 Identify Functional Area Improvement Initiatives (Phase 2, Task 2)

Under Task 2, ScottMadden assisted OPG in leveraging their internal functional/peer teams for the purpose of identifying fleet-wide improvement initiatives that will contribute toward achieving the company's five-year planning targets. The overlay of fleet-wide improvement initiatives on top of those identified and developed by the sites and support units provides an additional layer of focus and accountability and brings a "fleet-wide" perspective to the business unit plans.

While each generation site is accountable for all activities conducted on that site, the functional/peer teams are responsible for identifying critical fleet-wide initiatives that should be adopted to narrow/ close performance gaps relative to OPGN's peer group. Since each initiative is eventually executed at a particular site or business unit there is, in effect, both site and functional accountability for progress. This approach to primary and secondary accountability is illustrated in Figure 11.

Figure 11 – Primary and Secondary Planning and Execution Accountability



Once the process of agreeing upon the fleet-wide initiatives that would be adopted was completed, these initiatives were consolidated with the site/support unit initiatives to develop an integrated business plan for each site/business unit.

The identification of functional improvement initiatives was accomplished in three steps as described below.

Step 1 – Identify the Functional Teams

The first step was to identify the existing functional teams and their internal leadership. During this step, a total of 16 different functional teams were identified. Four of the teams participating in this effort were formally established "peer teams" while the remainder were functional business units or service teams. A list of the functional/peer teams that were charged with identification of fleet-wide improvement initiatives is presented in Figure 12.

Each functional/peer team was assigned someone from the core team to provide process and administrative support. A representative from Nuclear Finance was also assigned to each team to support the team in developing the business case supporting the initiative. Finally, selected teams (maintenance, outage, engineering, equipment reliability, and materials and services) were provided additional consulting support by representatives from ScottMadden and Model Performance LLC.

Figure 12 – OPG Functional/Peer Teams Participating in the 2009 Planning Cycle

Functional Area	Supporting Organization	Central Contact	Site Contact Darlington	Site Contact Pickering A	Site Contact Pickering B
Operations	NP&T	Dave Walsh [Mgr. Operations Programs]	Peter King	Ken Gilbert	Shane Ryder
Fuel Handling	NP&T	Dave Walsh [Mgr. Operations Programs]	J.R. Pinnegar	John Lennarduzzi/Mike Kramberger	Dana Kimpel
Maintenance	NP&T	Doug Radford [Mgr. Maint. Programs]	Jim Whyte	Chris Johnston	Bill Owens
Work Management	NP&T	Larry Upson	Arthur Despres	Mike Topolnisky	Vince Smyth
Outage	NP&T	Jim Woodcroft [Mgr. Outage Programs]	1 of Ross McCord/Dan Norrad	1 of Dana Letts/Tim Cullen	1 of Walt Arnsby/Ajay Upadhyaya/Chris MacKenzie
Engineering	Engineering	Fred Dermarkar [Dir. Eng. Services]	Steve Woods	Robert Black	Keith Howard
Equipment Reliability / Plant Condition	Engineering	Paul Vonhatten [No sanctioned peer team yet]	Jim Whyte	Jennifer Noronha	Chris Mackenzie
Chemistry	Engineering	Michael Brett [Mgr. Chem., Metal.& Weldg] (Elio Fracalanza effect. 25JUN)	Liette Lemieux	Elio Fracalanza (Mike Brett effect 25JUN)	Elio Fracalanza (Mike Brett effect 25JUN)
Industrial Safety	Corp. HR	Greg Jackson [Mgr. Safety Strategy]	Paul Hurley	Jay Dellandrea (PN)	
Radiation Protection	NP&T	Robin Manley [Mgr. Health Physics]	Peter Burnham	Nick Pistilli	Scott Cameron
Fire Safety	NP&T	Don Trylinski [Mgr. Fire Protection Programs & Training]	Kelly Serson	Richard Hadden	Richard Hadden
Environment	NP&T	Frank Bajurny [Mgr. Environment Programs]	Liette Lemieux	Elio Fracalanza/ Tom Van Horne	Elio Fracalanza/ Tom Van Horne
Training	NP&T	Greg Cornett [Mgr., Training Programs]	Frank Howie	Ron Moore	Jamie Chevers
Financial Performance	Finance	Carla Carmichael [Dir., Nuclear Bus. Planning]	Sabine Parks	Louie Shoukas	John Blazanin
Performance Improvement / HP	PINO	Tom Smart [Mgr., Perf. Improvement]	Jeff Lehman	Ron Maruska	Ian Lake
Materials and Services	NSC	Staff are all from NSC. Planning Contacts: Stephanie Powers, Warren Williams, Ann Sharp, Stuart Harris			

The consulting support provided to these teams included facilitated meetings during which the following material was covered:

- A review of current practices
- An inventory of all existing change initiatives currently underway
- Identification of key "game changing" practices in use at leading nuclear fleet operators and assistance in understanding how these practices are used and their potential impact

Step 2 – Identify and Document Improvement Initiatives

The functional teams were then requested to identify fleet-wide initiatives which could contribute to achieving OPGN's performance targets. They participated in a formal kick-off training session and then were given approximately eight weeks to identify and document improvement opportunities.

All teams were provided a standard "Fleet Initiative Planning Template" to complete for each improvement initiative they identified. The content of each template included the following:

- The name of the initiative
- A short description of the initiative
- The cornerstone metric that the initiative improves
- The name of the owner of the initiatives
- The results expected from the initiative (by location and by year)
- The business or implementation risks associated with the initiative
- The additional resources required to achieve the initiative by category and location (if above base "level of effort")
- An assessment of the technical difficulty associated with implementing the initiative
- An assessment of the "people/culture change" difficulty associated with the initiative
- The start and end date of the initiative
- A Level 1 action plan for implementing the initiative

A sample initiative template can be found in Appendix F to this report.

Step 3 – Review and Consolidate Initiatives

The preliminary initiatives identified by the functional/peer teams were subject to a quality control and testing process that consisted of the following actions:

- Review by a Cross-Functional Review Team (COT Team). An ad-hoc Cross-Functional Review Team was established to identify initiatives that would require two, or more, functional organizations to address. This team consisted of several senior OPGN managers with cross-functional knowledge together with key members of the project core team. Members of the COT team included:

    - Director of Nuclear Programs
    - Director of Nuclear Protection Programs and Training
    - Director of Business Planning – Nuclear
    - Engagement Partner from ScottMadden, Inc.
    - Engagement Director from ScottMadden, Inc.
    - Representative of Model Performance LLC

  The COT team played a key role in identifying and consolidating complex cross-functional improvement initiatives. This team met on three occasions during the planning cycle.

- Review by the Site Directors. The preliminary initiatives were also reviewed by the Site Directors who met on three occasions to review and comment on the preliminary improvement initiatives. The Site Directors included:

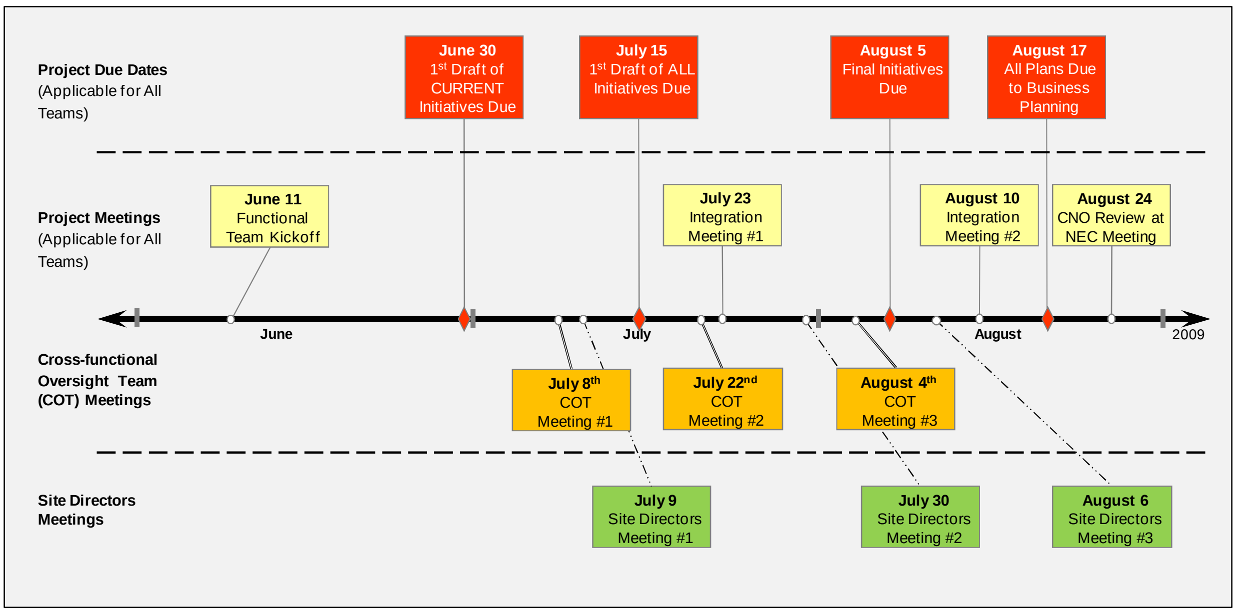
    - Director of Operations & Maintenance (DOM) from all three sites
    - Director Work Management (DWM) from all three sites
    - Director of Engineering (DOE) from all three sites

  The Site Directors played a critical role in ensuring that the most important performance issues were addressed and that the assumptions regarding site resources were adequately dealt with.

- Initiative Integration Meetings. In addition to the COT and Site Director meetings, the gap-based business planning process included two formal "integration and review" meetings designed to allow each functional/peer team to hear what improvement ideas were being proposed by the other functional/peer teams. Given the interconnected nature of work performed at nuclear plants, an improvement initiative proposed by one function may directly or indirectly result in changes in the performance of another function's activities and related performance metrics. It is important that these impacts be adequately identified and explored during the planning process.

The sequencing of these review meetings is highlighted in Figure 13. They concluded with the functional/peer teams presenting to the NEC on August 24, 2009. By this time, the initial 150 fleet improvement initiatives had been consolidated down to 46 key initiatives. Consolidation primarily resulted from the grouping related initiatives, the elimination of lower priority initiatives, and the balancing of workloads.

Figure 13 – Sequencing of Fleet Initiative Development and Review Meetings



During the subsequent week, a second NEC meeting was held to resolve questions that were raised at the August 24th meeting and the COT team met again to review and prioritize the initiatives. Factors considered during prioritization included: (a) the business benefit or impact, (b) the required investment of financial and human resources, (c) the logical sequencing of work, (d) the balance of workload over the planning horizon, and (e) the degree of culture change required. In the end, a total of 33 fleet-wide improvement initiatives were approved for incorporation into the site and support unit business plans. These initiatives are listed in Figure 14.

Figure 14 – Fleet-wide Improvement Initiatives Accepted for the 2010–2014 Business Plan

Top Priority Initiatives – New initiatives that require support outside of the normal course of business and identified as high priority by the functional teams

- EN-01 – Work Order Readiness
- EN-02 – Engineering Value for Money
- ER-01 – Standard Equipment Reliability Program
- OP-05 – Human Performance Improvement Program
- OU-02 – Outage Improvement Strategy
- MA-08 – Day Based Maintenance
- ER-02 – Improve PM Program

"Just do it" – New initiatives that will be completed as part of the normal course of business

- ER-03 – Critical Spares/Obsolescence
- MA-04 – Centralized Measurement and Test Equipment
- MA-06 – Maintenance "Helpers"
- MA-07 – Leverage DN OEMB Process
- MA-09 – Single Source Laundry
- FS-03 – Offer Fire Training
- IS-02 – Safety Behaviors Assessment
- IS-03 – Review Incident Counting Practices
- IS-04 – Constrain Training Qualifications
- FP-02 – Labour Cost Reduction
- PI-01 – CAP Improvement Program
- PI-03 – CAP is Core
- WM-01 – Backlog Reclassification
- RP-05 – Optimize Reactor Face Shielding
- RP-09 – Improve Fuel Machine Filtration
- TR-02 – Computer Based Training Increase
- TR-04 – Initial Authorization Training Program

"Ongoing" – Initiatives that are currently in process and will continue until completed

- MS-02 – Inventory Management
- MS-03 – Strategic Sourcing
- IS-01 – Musculoskeletal Disorder Prevention
- OP-02 – Work Management Performance Improvement Plan
- MA-01 – Improve FIN Effectiveness
- RP-26 – Area Mapping
- EN-03 – Improve Fuel Reliability Index
- RP-10 - Detritiation of Reactor PHT
- PI-02 – Implement Human Performance Rapid Response

The operational improvement and cost savings benefits associated with the functional improvement initiatives were specifically identified and then tied to one or more operational and/or financial performance gap that needed to be closed. When aggregated, these benefits were sufficient to close the gaps between current performance and targeted performance. Should the initiatives be implemented and should they achieve the benefits associated with them, they will significantly improve both OPGN's operational and financial performance.

In the opinion of ScottMadden, many of these improvement ideas would not have been identified using OPG's prior business unit planning process. Accordingly, we believe that the new approach was a significant factor contributing to OPGN's ability to produce a 2010-2014 Business Plan geared to achieve its organization-wide performance targets.

3.3 Develop Staffing and Organization Analyses (Phase 2, Task 3)

As part of the gap-based business planning process, ScottMadden worked with the OPGN core planning team to benchmark staffing levels and review the company's organization model. The purpose was not to develop formal staffing targets but to provide guidance and insight to the functional/peer teams and the business units in their development of improvement initiatives that would contribute to the achievement of OPGN's financial performance targets[7]. This effort consisted to three sub-tasks: (1) assembly and review of high-level industry staffing benchmarks by function, (2) completion of a detailed top-down staffing analysis for a single OPGN function, and (3) a review of OPGN overall organizational structure.

3.3.1 High-Level Staff Benchmarking by Function

To support the 2010-2014 business planning cycle, ScottMadden compared OPGN staff levels to those of other nuclear fleet operators in North America. This information was then provided to the sites/support unit business managers as well as to the functional/peer team leaders. The purpose in distributing this information was to assist these business planners identify areas/functions where staffing levels were inconsistent with those of leading companies (OPGN staffing is generally higher) so as to encourage the functional/peer teams to consider improvement ideas that might help improve the alignment in staffing levels.

<u>Step 1 – EUCG Staffing Data Comparison</u>

The first step was to use EUCG staffing data to prepare function-by-function staffing comparisons.[8] The EUCG data was normalized (for the number of reactor units) and a function-by-function comparison was prepared. EUCG data is subdivided into functions using a series of Work Program Structure (WPS) codes which largely reflect the NEI Standard Nuclear Process Model.[9]

A series of four comparisons were made to different sets (peer panels) of nuclear plants. Each of these comparisons is described below.

<u>Panel 1 – All EUCG Companies.</u> The first peer panel consisted of all EUCG companies. To summarize this panel, the best quartile (lowest staffing) and group median levels were identified. These values are presented in columns [redacted] and [redacted] in each of the four tables presented in Appendix G.

<u>Panel 2 – Large Nuclear Stations</u>. The second peer panel was a group of large nuclear stations. Those selected for comparison were Browns Ferry (TVA), Bruce Power, and Oconee (Duke Energy). Browns Ferry and Oconee were selected since they roughly compare to Darlington and Pickering B in terms of the number of reactor units per station. Bruce Power was selected since

[7] ScottMadden believes that setting staffing targets requires consideration of work tasks and outputs which would have required more time than was available during the current planning cycle. We did, however, conduct a pilot project demonstrating how this work is typically done. The pilot was prepared for the Radiation Protection function and is discussed in Section 3.3.2 of this report.
[8] EUCG, Nuclear Staffing Database, year-end values for 2008
[9] Nuclear Energy Institute, <u>Nuclear Asset Management Process Description and Guideline</u>, NEI AP-940. (NEI, May 2005)

it has both a large number of units and represents the application of CANDU technology. These comparisons are presented in columns [redacted] through [redacted] of Appendix G.

Panel 3 – Smaller Nuclear Stations. The third panel was a group of smaller stations consisting of Prairie Island (Xcel Energy), Nine Mile Point (Constellation), and Surry (Dominion). This group was compared to Pickering A. Although the technology deployed is different (PWR versus CANDU), the number of units at each station is the same (two) and the relative MW size of each unit is similar (500MW to 850 MW). These comparisons are shown in columns [redacted] through [redacted] of Appendix G.

Four separate data views were developed for each of these three panels. These views are listed below. Each view is documented in the separate table in Appendix G.

- Total Staff Summary (onsite employees + offsite employees + baseline contractors)
- Onsite Staff Summary (employees located at the generation site)
- Offsite Staff Summary (employees supporting the generation site, but not located at the site)
- Baseline Contractors Summary[10]

Panel 4 – Operator Level Data for Offsite Staff. The fourth peer panel consisted of comparisons of "offsite staffing" levels summarized at the operator level (e.g., all OPG sites combined) rather than at the station level per Appendix G. All staffing numbers in this comparison are on an absolute basis (not normalized by reactor unit). Only nuclear operating companies with two or more stations were included (11 companies plus OPG). No quartile or median metrics were calculated for this group. The results are shown in Appendix H.

The companies were presented in rank order (from left to right) based upon their total staffing. This comparison highlighted considerable differences between companies with respect to the number of offsite employees supporting nuclear stations. The number of such employees may reflect the total number of nuclear support personnel as well as the approach to where such personnel are located (i.e. onsite versus offsite). [redacted], reported 697 offsite employees supporting 10 stations and 17 units whereas OPGN reported 3,414 offsite employees supporting three stations and 10 units. The study team did not have adequate time to delve into the business drivers behind these variances or to ascertain which approach (i.e., support staff location) is more effective or efficient.

Step 2 – Bruce Power Functional Comparison

In addition to the staffing comparison using EUCG data, ScottMadden was able to prepare a second comparison of OPG staffing to Bruce Power based upon a functional analysis more closely attuned to the way in which Bruce Power organizes its staff to conduct work. This second comparison was prepared in cooperation with Bruce Power allowing both companies to share sensitive and confidential staffing information.

[10] Baseline contractors are non-employees who perform routine, ongoing functions as opposed to project-based contractors

The results of both the EUCG and the Bruce Power functional comparison showed that overall OPGN staff levels per unit exceed both the industry median and Bruce Power levels. OPGN staffing levels are higher than the peer groups for some functional areas and lower for others. For the most part, however, OPGN staff levels are generally higher than the comparison panels. It should be noted that, however, that staffing levels can be influenced by a company's approach to staffing project-based outage functions. Certain North American operators rely extensively on third-party contractors for such services, whereas others, including OPGN, largely rely on in-house resources.

When comparing staff levels one must be careful to consider the underlying work allocation which requires in-depth, top-down staffing analysis. The results of both the EUCG and Bruce Power functional comparison confirmed general assumptions regarding OPGN staffing levels and provided guidance and insight to the sites, functional/peer teams and the business support units in their development of improvement initiatives. The generally lower staffing levels found at other plants encouraged all of these teams to explore ways to deliver current service levels more productively and with fewer employees.

3.3.2 In-Depth, Top-Down Staffing Analysis Pilot

In order to demonstrate how detailed top-down staffing analysis can be used to identify and drive staffing reduction, ScottMadden piloted a top-down staffing analysis using the OPGN Radiation Protection (RP) function as an example. This effort involved: (a) identifying initial top-down benchmark targets based upon EUCG and Bruce Power staff levels for RP, (b) defining current OPGN activities for RP by position, (c) identifying the FTEs associated with each RP activity, (d) benchmarking these activities against peer companies (Bruce Power and Duke Energy), and (e) developing estimates of potential OPGN future staff levels. ScottMadden provided the methodology and templates used and facilitated the process.

The RP Pilot resulted in a number of recommended changes for future consideration by OPG, including: (a) the development of a standard organization structure for the RP function at each site, (b) a revised organization structure for RP services and training, (c) various process improvement recommendations, and (d) a potential reduction of 53 FTEs in the RP function (28%). These reductions would result from:

- Consolidation of resources performing similar job functions at Pickering A and Pickering B
- Elimination of positions dedicated to the new build initiative which has been postponed
- Reduction in the number of instructors required through utilization of computer-based training for courses and evaluations and right-sizing to fit the reduced number of RP staff

Of the potential 48 FTEs reduced, 35 would potentially be reassigned to other functional organization through improved resource alignment while 13 would be eliminated altogether. These changes were still being considered by OPGN at the time this report was prepared. A presentation of the standard site RP organization chart, the revised Health Physics organization chart, and a summary of the staffing analysis results are presented in Appendix I.

3.3.3 OPGN Organization Structure Review

In addition to completing a high-level staff benchmarking analysis, ScottMadden also examined the overall structure of the OPG Nuclear organization. The objective was to evaluate the OPG Nuclear organization structure (nuclear support group and top station level) for consistency with selected "design principles" employed at leading nuclear fleet operators. The following design principles were considered:

- Clear Accountability – Leading fleet operators organize to provide clear accountability for results. In nearly all cases, there is a single point of ownership for performing a particular function. Leading fleet operators do not dilute this focus with multiple/competing responsibilities (e.g., assigning a support responsibility such as training to those with operate responsibility such as plant managers).

- Station-based Accountability – Leading operators have established the nuclear station as the primary point of accountability for results. Site VPs are generally officer-level employees and have full accountability for the delivery of station operating results.
  - Business plans and performance reporting are organized around the station (supporting organizations are shown on station organization chart and costs roll to stations). Headcount is "assigned" to the stations.

- A Strong Plant Manager Focus – Leading fleet operators typically designate a single Plant Manager with responsibility for delivering all core site functions including Operations, Maintenance, Work Control, Chemistry, and Radiation Protection. (This role is separate from the site VP.) In addition, there is typically a single Operations Manager (often aided by the Shift Manager) who is separate from the Plant Manager and to whom the operating shifts report. This avoids having multiple Shift Managers report directly to Plant Manager.
  - The Plant Manager is the next in line to succeed the Site VP

- Adoption of the GOSP (Govern, Oversee, Support, and Perform) Framework – Several governance frameworks are in use by leading nuclear fleet operators to help clarify accountabilities when they are divided across a nuclear fleet. One of these frameworks is the "GOSP framework" which derives its name from the four key accountabilities which are identified under the framework.

  The GOSP framework, as well as other accountability frameworks, is used to ensure role clarity between different organizational units. Using this model calls for clearly distinguishing between the following responsibilities:

- Govern
  - Establish standards and associated accountabilities
  - Define and implement programs
  - Ensure a common definition of "best performance" and plans to achieve this
  - Drive standardization
- Oversee
  - Monitor performance
  - Provide guidance to those with *perform* role
  - Escalate and resolve issues
- Support
  - Provide support to Governance, Oversight, and Perform functions as needed
- Perform
  - Deliver results
  - Execute agreed-upon programs

Key GOSP principles include:

- All employees should understand their respective governance roles, i.e., governance, oversight, support or perform
- *Govern* and *oversee* responsibilities should be separated from *perform* responsibilities as much as possible
- Day-to-day operational (*perform*) responsibilities/functions generally report to the Plant Manager while longer-term strategic (*oversee*) responsibilities/functions report to the Site VP. Similarly, Operations, Maintenance, and Work Control (*perform*) should be under the Plant Manager whereas Training (*support*) is typically a nuclear corporate support unit

- Organization is Structured Around Business Needs not Incumbent Capabilities – The organizational structure should reflect key business functions and their respective requirements rather than the availability of certain personnel or their personal skills sets. The rule is "find people to fit the organization" – not "fit the organization to the person." While a balance must always be reached, the exceptions to this rule should be few.

- Standardized Fleet Organizational Structure and Staffing – Organization structures and staffing levels found at one nuclear station should be equal to, or similar, to those employed at another "sister" or similar station.
  - This facilitates policy and process documentation, fosters quicker sharing of leading practices between sites and increases the effectiveness of personnel when they are transferred between sites

— Improvements in organization structures at one station should be adopted at the remaining stations when management agrees that they represent the fleet's "best" practice. There should be an established process for identifying such practices, gaining agreement as to their benefits and then rolling them out to the other sites

— Spans of control and management layers should be standardized between sites and should be in line with industry standards

By comparing these design principles to OPGN's organization structure, ScottMadden developed the observations and recommendations presented in Figure 15 for the future consideration of OPG.

Figure 15 – Organization Structure Review – Observations and Recommendations

Observations	Recommendations
Clear Accountability for Results ▪ OPGN has established clear accountability for operational and financial results with the CNO which cascades to each of the three Station Site VPs ▪ Accountability for certain nuclear oversight and support functions is less clear at this time	▪ OPG demonstrates alignment with principle of the clear responsibility ▪ Accountability for certain nuclear oversight functions should be clarified and documented using the GOSP framework
Station-Based Accountability ▪ OPG organization has a clear and strong focus on accountability at the nuclear station level ▪ The stations are responsible for business planning, headcount management, and on-site support function delivery	▪ OPG demonstrates alignment with principle of the "station-based accountability"
A Strong Plant Manager Focus ▪ OPGN does not have a designated Plant Manager responsible for core *perform* functions at each station ▪ Instead, the Plant Manager function is performed by two separate Directors: the Director of Operations and Maintenance (DOM), and the Director of Work Management (DWM) ▪ There are also additional Directors of Engineering which is standard industry practice	▪ Consider adopting a single Plant Manager model in lieu of the current dual DOM/DWM roles ▪ In light of the change required by the 33 fleet improvement initiatives, it might be best to postpone implementation of this recommendation until 2012 or beyond
Adoption of the GOSP Model ▪ There is no evidence that the GOSP model has been adopted and consistently applied across the fleet	▪ Adopt the GOSP model and clearly identify all plant functions in their appropriate designation (*govern, oversee, support, perform*)

Observations	Recommendations
	▪ Ensure that managers, supervisors and employees are training in the GOSP concept and appreciate the respective roles and responsibilities
Organization Structured Around Business Needs not Employee Capabilities ▪ ScottMadden did not have adequate time to determine if this principle is being applied or not	▪ n/a
Fleet Standardization ▪ There is no evidence of an attempt to develop or apply a standard station organization and staffing model — Darlington has a Deputy Site VP whereas, the other sites do not — There are different spans of control between sites, especially at the Director level — There are different names for identical or similar functions at different sites ▪ Overall spans of control, on average, reflect those found at leading nuclear operators (4-6 for VPs and Directors and Managers in the 4-6, 6-8 range)	▪ Develop a “best practice” station organization and staffing model and then apply this model consistently across the fleet ▪ Examine and address the overly high spans of control in Engineering ▪ Standardize the organizational nomenclature used at the different sites ▪ Establish a process for identifying “best practices” across OPGN fleet and then rolling these out to all the stations

4.0 Phase 2 Observations and Conclusions

ScottMadden was asked by OPG management to assess the degree to which OPG has successfully piloted a gap-based business planning process and used this process to identify and drive meaningful improvements capable of addressing current performance gaps. This section summarizes our observations and conclusions in response to this request. Our observations and conclusions address each of the key actions required to successfully implement gap-based business planning.

4.1 Benchmarking

The first step in implementing gap-based business planning is accurately benchmarking OPGN's performance to the rest of the industry. This step was completed by OPGN with the support of ScottMadden between March and June 2009.

Benchmarking	
Observations	**Conclusions**
▪ OPG/ScottMadden identified a set of performance metrics covering all four cornerstone values ▪ OPG /ScottMadden identified peer panels and industry comparable data for 19 key benchmarks ▪ OPG/ScottMadden compared OPGN performance to industry best quartile levels across all 19 benchmarked metrics ▪ As Phase 2 progressed, the core team discovered a number of inconsistencies in the reporting of OPG data to EUCG. These did not materially impact the benchmark comparisons and will be corrected in next year's submission ▪ ScottMadden, assisted by OPG, prepared and issued the *OPG Nuclear 2009 Benchmarking Report*	▪ OPG's key performance metrics are in line with those commonly used by leading nuclear fleet operators ▪ OPG successfully compared its current and recent past performance to industry peer groups across a standard set of key performance measures ▪ The comparison, as documented in the *OPG Nuclear 2009 Benchmarking Report*, presents a fair and accurate view of OPG's performance against the North American and Canadian nuclear generation industry

Related Recommendations:

1. Update the OPG Nuclear Benchmarking Report in 2010 using the procedure prepared by the joint ScottMadden/OPG team.

2. Begin this process as early as possible so that the results of the benchmarking analysis are available to the planning team for target setting early in the 2010 business planning cycle

3. Assign a single point of accountability for reporting OPG data to EUCG, WANO and other outside organizations. This will help improve data quality and consistency of presentation.

4.2 Target Setting

The next step in gap-based business planning is to use the results of the benchmarking effort to establish meaningful targets that will help drive future performance. This step was completed by OPG during June and July 2009.

Target Setting	
Observations	**Conclusions**
▪ OPG used the 2009 Benchmarking Report to educate managers and raise performance expectations ▪ OPG conducted two formal target setting workshops and established desired performance levels for the year 2014 across common performance metrics ▪ Specific 2014 targets were set for each site and support unit ▪ The process of setting top-down performance targets based upon where OPG wants to be by 2014 represented a significant departure from past OPGN business planning practices. Adopting this practice represented a major cultural change within the organization at multiple levels ▪ The targets were agreed to by all of the site and support unit executives and were distributed to the site and support unit business managers for adoption in their 2010-2014 five-year business plan	▪ OPG executive leadership demonstrated a firm commitment to top-down business planning throughout the planning process ▪ While the targets set for 2014 will not achieve “best quartile” performance in all performance categories for all sites, they represent a significant improvement over current performance ▪ In our opinion, the targets established by OPG management are fair and reasonable given OPGN’s baseline position ▪ Without downplaying the success achieved during the current planning cycle, we believe that opportunities remain for continuous improvement beyond the current business planning horizon

Related Recommendations:

1. When the OPG Nuclear Benchmarking Report is updated in 2010, analyze the new benchmarks and use them to establish operational and financial performance targets for 2015.

2. Through a process of continuous improvement, continue closing the gap to “best quartile” industry performance for all metrics and at all sites as additional years are added to the rolling five-year plan.

4.3 Fleet-Wide Improvement Initiatives

The third step in implementing gap-based business planning was identifying the improvement initiatives needed to achieve the established business targets. These initiatives were both "site specific" (i.e., applicable to a specific site or support unit) or "fleet wide" (i.e.., applicable to all OPGN sites). In the table below, we summarize our observations and conclusions regarding the development of fleet-wide improvement initiatives at OPG.

Fleet-Wide Improvement Initiatives	
Observations	**Conclusions**
▪ Sixteen functional/peer teams were designated to develop fleet-wide initiatives in their individual functional areas ▪ Four of these teams were standing "peer teams," while the rest were corporate functional teams or business units ▪ The teams worked for approximately nine weeks and initially completed 150 improvement initiative templates. These were subsequently consolidated, prioritized and pared down to 33 fleet-wide improvement initiatives scheduled over the years 2010-2014 ▪ The quality of the documentation supporting the improvement initiatives varied significantly between teams and within teams between specific initiatives ▪ In the end, the teams were able to identify a set of fleet-wide initiatives that will significantly contribute to achievement of both the operational and financial planning targets ▪ Throughout the process, there was growing support for the top-down planning process. Several teams stated that they welcomed greater executive direction ▪ Most of the teams struggled with quantifying cost and benefit estimates. There was a new level of healthy discussion regarding the need to identify opportunities for cost reduction coupled with performance improvement	▪ Leveraging functional/peer teams to identify fleet-wide improvement opportunities for inclusion in the planning process was a new endeavor for the OPGN functional teams. As such, the process experienced many of the difficulties associated with "first time" efforts ▪ The performance of the functional/peer teams was challenging due to: (a) the immaturity of the peer team process at OPG, (b) the limited scope of the standing peer teams, (c) the novelty of the process, e.g., the functional teams were asked to deliver improvements and cost reduction at the same time, and (d) differences in the capabilities of the team leaders and their speed in embracing the process ▪ In spite of the start-up issues described above, OPGN successfully leveraged their functional teams to identify a broad range of fleet-wide improvement initiatives designed to achieve the company's performance and financial targets

Related Recommendations:

1. Encourage the functional/peer teams to refine and improve their initiatives throughout the remainder of the planning cycle and into implementation.

2. Re-examine the current functional/peer team structure and governance. Expand the number of formal peer teams to cover additional functions. Revise the program to strengthen the ability of the peer teams to identify and drive meaningful change.

3. As part of continuous improvement to operational and financial excellence, challenge the teams next year to identify further improvements within their respective functional areas.

4.4 Site and Support Business Unit Plans

At the same time the functional/peer teams were developing their fleet-wide improvement initiatives, the sites and business support units were identifying improvement opportunities specific to their individual sites or units. When the fleet-wide initiatives were finalized and agreed to, they were subsequently incorporated into the site and support unit plans for execution. The fleet-wide initiatives supplemented the site and support unit initiatives and became part of their respective business plans. The site and support unit business plans were then submitted to the NEC on September 11th. In the table below, we summarize our observations and conclusions regarding the development of the site and support business unit plans.

Site and Support Unit Plans	
Observations	**Conclusions**
▪ A total of nine business unit plans were prepared – one for each of the three nuclear stations (Pickering A, Pickering B and Darlington), and one for each of the six nuclear support units ▪ The business managers for each of the nine business units were well versed in the development of annual business plans and required minimal support from ScottMadden during this project ▪ Initially, there was some resistance to embracing top-down planning. In time, this was resolved and the business managers prepared solid business plans designed to achieve the targets they committed to ▪ At the time of ScottMadden's departure from the project, some issues remained open with respect to the financial targets in selected business unit plans	▪ There was extensive culture change involved in moving to the new gap-based, top-down business planning process ▪ In the end, the executives, business managers, and functional teams achieved alignment and the process resulted in the creation of business unit plans designed to achieve the desired targets. In ScottMadden's opinion, this is a major step forward in the development of gap-based business planning at OPGN

Related Recommendations:

1. Incorporate gap-based business planning into the business planning processes for all subsequent years.

2. Begin the process early enough so that fleet-wide and site/support unit improvement initiatives are identified prior to the beginning of the summer vacation period.

4.5 Adoption of Gap-Based Business Planning

2009 was the first year in which gap-based business planning was rolled out at OPGN. Future success in adopting this planning model will require the current planning organization to modify its practices and "bake in" the new philosophy, process, schedule and templates. Below we summarize our observations and conclusions with regard to the challenges OPG will face in the future in adopting gap based business planning.

Adoption of Gap-based Business Planning	
Observations	**Conclusions**
▪ OPGN has made a commitment to adopt gap-based business planning in future years ▪ The standard business planning cycle has been modified to incorporate (a) annual updating of the benchmarking report, (b) top-down target setting, (c) development of fleet-wide improvement initiatives, (d) integration of the fleet wide improvement initiatives with the site and support unit improvement initiatives, and (e) the final reconciliation of all initiative results to target achievement ▪ A standard Improvement Initiative Template (Appendix F) has been adopted as the standard template for use in future years	▪ We believe that the current OPGN business planning team under Nuclear Finance has the leadership skills and capability to successfully manage a gap-based business planning process in subsequent years ▪ With adequate oversight, the site and support unit business managers and their teams also have the leadership skills and capability to manage a gap-based business planning process in their respective units in subsequent years ▪ Success in future years will largely depend upon the commitment of the OPG CEO and the OPGN leadership team to the continued pursuit of operational and financial excellence

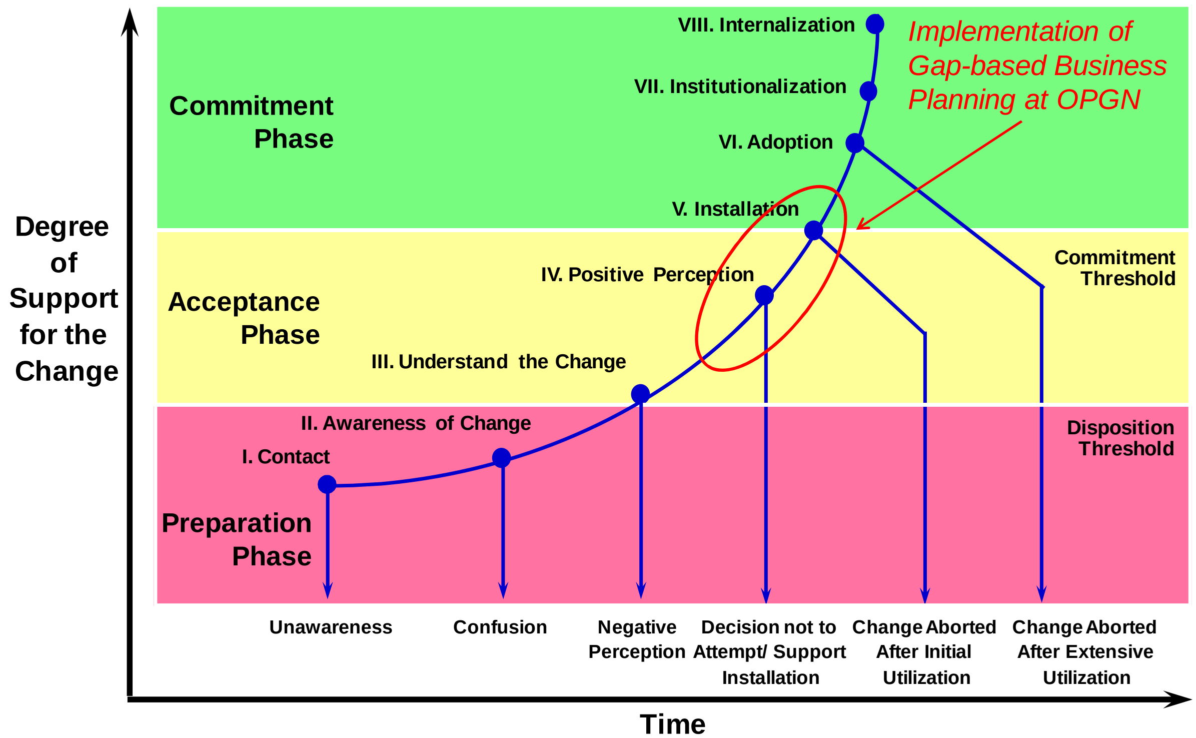
Based upon the above observations and conclusions, we believe that OPGN is well on the way to successfully adopting gap-based business planning. While acceptance varies by business unit and individual, we believe the extent of implementation (as depicted in Figure 16) represents significant progress for the first year of a new program of this nature.

Related Recommendations:

1. As noted earlier, incorporate gap-based business planning into the business planning process for all subsequent years.

2. Ensure ongoing reinforcement of senior management commitment through active communication and participation.

Figure 16 – Implementation of Gap-Based Business Planning at OPGN



4.6 Plan Execution and Monitoring

Establishing the five-year gap-based business plan is only part of adopting a full gap-based accountability model. It is equally important to ensure that adequate monitoring and follow-up practices are in place to ensure that the improvement initiatives are executed on time and that the results are, in fact, achieved. The table below summarizes our observations and conclusions in regard.

Plan Execution and Monitoring	
Observations	**Conclusions**
▪ OPGN managers noted that complex, cross-functional initiatives generally "die on the vine" when assigned to the line organization for implementation. The reasons cited include: — *The Tyranny of Daily Events:* Team members who have full-time responsibility for daily work are unable to dedicate adequate time and focus on the change initiative — *Diffuse Accountability:* Too many "participants" but no clear leadership and single point of accountability	▪ Without adopting a revised approach to implementing and monitoring change initiatives, OPGN is at risk of not successfully implementing the improvement initiatives that have been agreed upon and incorporated into its business unit plans ▪ Due to time limitations, ScottMadden was unable to perform an analysis as to whether OPGN has the structure, process, and methodologies in place to manage transformational change initiatives of the scope envisioned

<table>
<tr><th colspan="2">Plan Execution and Monitoring</th></tr>
<tr><th>Observations</th><th>Conclusions</th></tr>
<tr><td>

— Inadequate Authority: Inability of accountable owner to get other functions or line organizations to fully cooperate in the resolution of the problem
— Disagreement: Disagreement across the fleet on what is the best approach to problem resolution. No consistent approach
— Musical Chairs: Priorities and decisions change as people in key roles change positions in the organization. People tend to “wait out” the problem knowing they will soon be elsewhere

Similarly, <u>when central (non-line) organizations are assigned responsibility</u> for implementing complex changes, these initiatives also experience problems due to:

— Lack of Line Ownership: The line organization is not adequately involved in creating the solution, and do not understand or appreciate the changes needed. As a result, the changes are not implemented when rolled out
— Absence of Implementation Accountability: There is too little accountability or consequences if initiatives are not implemented successfully and on time
— Weak Performance Management. The linkage between implementation success and individual performance and incentive programs is insufficient

At the time this report was prepared OPGN had incorporated the 33 initiatives into the business plans but had not yet established a formal implementation strategy

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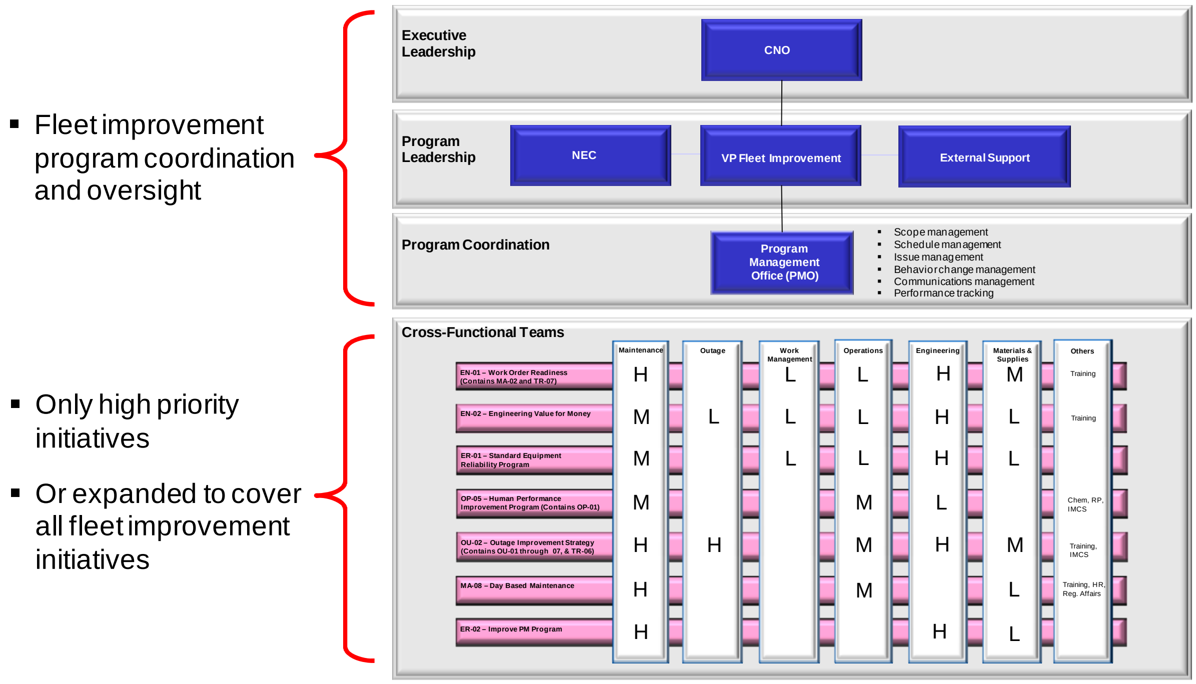
Related Recommendations:

1. At the program level, establish a formal organization structure to oversee and coordinate the high impact, most difficult improvement initiatives identified during the planning process. An example of how this might look is presented in Figure 17. This organization would provide additional program oversight and support while the sites and business units maintain "govern" and "perform" responsibilities under the GOSP model. This model has proved effective in driving transformational change in large organizations.

Figure 17 – Recommended Approach to Managing the Planned Fleet Improvement Program



L, M, H (Low, Medium, High) refer to the anticipated level of involvement that each function will have in each "high priority" initiative

2. Assign a full-time senior executive to lead this organization. This executive should have a broad range of experience both at the plant and nuclear corporate level, be highly intelligent, and be "action oriented" and able to drive change in the face of considerable resistance.

3. Establish a Program Management Office (PMO) to support this executive. The PMO should be responsible for supporting the fleet improvement program by providing the following services:

   a. Performance tracking and monitoring

   b. Initiative scope management

   c. Integrated schedule management

   d. Issue management and resolution

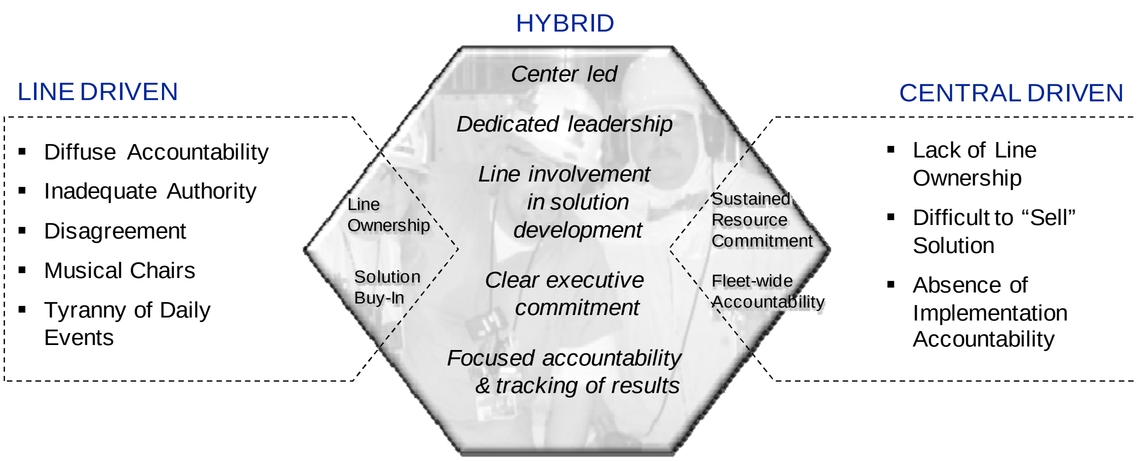
e. Behavior change management

f. Communication management

The PMO may also provide a central pool of individuals skilled in process documentation, process redesign, the application of TQM/Six Sigma/Lean tools and techniques that can be "loaned" out to the various initiative teams as needed.

4. At the initiative level, adopt a "hybrid" project structure capable of leveraging the best elements of central guidance and support combined with significant line participation and decision making. This approach is summarized in Figure 18. Under this structure, the central organization (typically 1 to 2 individuals) would provide project leadership that would work full (or nearly full-time) on the initiative, while the line organization would provide team members (typically 3 to 6 individuals) who would participate part-time through planned meetings. The team member responsibilities would include data collection, information review and the development of recommendations for change. The central leadership maintains the project momentum, analyzes data, and does the "heavy lifting" required to enable progress.

Figure 18 – Hybrid Organization Proposed for Initiative-Level Teams



5. Identify and utilize resources (internal and/or external) experienced in managing large organization transformation initiatives to help launch and provide initial support to the fleet improvement executive, the PMO organization, and the initiative teams.

Appendix A – EUCG 2008 Benchmarking Participants

The table below lists the nuclear operators and the plants which are part of the 2008 EUCG database.

Operator	Plant
Bruce	BRUCE
Constellation	CALVERT CLIFFS
	NINE MILE
	R.E. GINNA
Dominion Resources	KEWAUNEE
	MILLSTONE
	NORTH ANNA
	SURRY
Duke	CATAWBA
	MCGUIRE
	OCONEE
Entergy	ARKANSAS ONE
	FITZPATRICK
	GRAND GULF
	PALISADES
	PILGRIM
	RIVER BEND
	VERMONT YANK
	WATERFORD
Exelon	BRAIDWOOD
	BYRON
	CLINTON
	DRESDEN
	LASALLE
	LIMERICK
	OYSTER CREEK
	PEACH BOTTOM
	QUAD CITIES
	THREE MILE ISLAND
First Energy	BEAVER VALLEY
	DAVIS-BESSE
	PERRY
OPG	DARLINGTON
	PICKERING A
	PICKERING B
Progress Energy	BRUNSWICK
	CRYSTAL RIVER
	HARRIS
	ROBINSON
PSEG	HOPE CREEK
	SALEM
SC Power and Gas	SUMMER
Southern	FARLEY
	HATCH
	VOGTLE

Operator	Plant
STARS	CALLAWAY
	COMANCHE PEAK
	DIABLO CANYON
	PALO VERDE
	SOUTH TEXAS
TVA	BROWNS FERRY
	SEQUOYAH
	WATTS BAR
USA	COLUMBIA
	COOK
	COOPER
	FERMI
	FORT CALHOUN
	SAN ONOFRE
	SUSQUEHANNA
	WOLF CREEK
Xcel	MONTICELLO
	PRAIRIE ISLAND

Appendix B – OPGN Key Performance Measures

The tables below list all of the performance measures in use by OPG Nuclear at the time the Phase 1 benchmarking report was prepared (May 2009). The tables also show which metrics were subject to benchmarking by ScottMadden and which were used in various OPGN internal reports and plans. A separate table is presented for each OPGN Cornerstone Value. The initial list of metrics presented below was revised slightly and resulted in the final list used during target setting and business planning (See Figures 5 and 6 earlier in this report).

Safety

Cornerstone	Tier	Performance Measure	Benchmarked	Report Card Measure (2009)	Station Report Card Measure (2009)	AIP (2009)	Plant Business Plans	Support Group Business Plans
Safety	1	All Injury Rate	✓	✓	✓	✓	✓	
Safety	1	Collective Radiation Exposure	✓	✓	✓		✓	
Safety	1	Fuel Reliability		✓	✓		✓	
Safety	1	Environment Index		✓	✓	✓	✓	
Safety	1	Accident Severity Rate		✓	✓	✓	✓	✓
Safety	2	Industrial Safety Accident Rate	✓	✓	✓		✓	
Safety	2	SS - Auxiliary Feedwater System Unavailability	✓				✓	
Safety	2	SS - Emergency AC Power Unavailability	✓				✓	
Safety	2	SS - High Pressure Safety Injection Unavailability	✓				✓	
Safety	2	Reactor Trip Rate (WANO)	✓				✓	
Safety	2	Airborne Tritium Emissions	✓	✓	✓		✓	
Safety	2	Contractor Accident Severity Rate		✓				✓
Safety	2	ALARA Dose Savings		✓				✓

Reliability

Cornerstone	Tier	Performance Measure	Benchmarked	Report Card Measure (2009)	Station Report Card Measure (2009)	AIP (2009)	Plant Business Plans	Support Group Business Plans
Reliability	1	Nuclear Performance Index	✓	✓	✓		✓	
Reliability	1	Unit Capability Factor	✓	✓	✓		✓	
Reliability	1	Forced Loss Rate	✓	✓	✓		✓	
Reliability	1	Net Electrical Production		✓	✓	✓	✓	
Reliability	2	Chemistry Performance Indicator (WANO)	✓				✓	
Reliability	2	Plant Condition Index		✓	✓		✓	
Reliability	2	OCMB - On-line Corrective Maintenance Backlog	✓	✓	✓	✓	✓	
Reliability	2	OEMB - On-line Elective Maintenance Backlog	✓	✓	✓	✓	✓	
Reliability	2	ERI - Equipment Reliability Index		✓	✓		✓	
Reliability	2	Plant Reliability List		✓	✓		✓	
Reliability	2	Dry Storage Containers		✓		✓	✓	✓
Reliability	2	Incinerate Liquid Waste		✓		✓		✓
Reliability	2	Western Used Fuel Dry Storage Facility Capability Factor		✓		✓		✓
Reliability	2	Inventory Accuracy		✓		✓		✓
Reliability	2	Stock Out Materials		✓		✓		✓
Reliability	2	Transportation Package Maintenance Compliance		✓		✓		✓
Reliability	2	Customer Satisfaction Index		✓		✓		✓
Reliability	2	Meet BP & OPG needs for Accepting Low Level Waste Volumes		✓		✓		✓
Reliability	2	Rad Material Transportation Preventable Collision Rate		✓		✓		✓
Reliability	2	BP Planned Outage Performance		✓	✓	✓	✓	
Reliability	2	OPG Outage Scope Delivered on Schedule		✓				✓
Reliability	2	IM&CS Equipment Condition Index		✓				✓
Reliability	2	System Health Improvement Effectiveness (%)					✓	
Reliability	2	Criticality 1 Deferral of PMs (Avg # of PMs/unit)					✓	

Human Performance

Cornerstone	Tier	Performance Measure	Benchmarked	Report Card Measure (2009)	Station Report Card Measure (2009)	AIP (2009)	Plant Business Plans	Support Group Business Plans
Human Performance	1	Event Free Day Resets		✓	✓	✓	✓	
Human Performance	2	Corrective Action Program Quality		✓	✓		✓	✓
Human Performance	2	Corrective Action Program Root Cause Effectiveness		✓	✓		✓	✓
Human Performance	2	Corrective Action Program Timeliness		✓	✓		✓	✓
Human Performance	2	Training Index		✓	✓		✓	

Value for Money

Cornerstone	Tier	Performance Measure	Benchmarked	Report Card Measure (2009)	Station Report Card Measure (2009)	AIP (2009)	Plant Business Plans	Support Group Business Plans
Value for Money	1	OM&A - Base & Outage		✓	✓		✓	✓
Value for Money	1	Non-Fuel Operating Cost per MWh	✓				✓	
Value for Money	1	Total Generating Cost per MWh	✓				✓	
Value for Money	2	Nuclear Projects Available for Service (AFS)		✓	✓	✓	✓	✓
Value for Money	2	Annual Projects Started		✓	✓	✓	✓	
Value for Money	2	Blended Unit Cost of Loaded DSC at all UFDS Facilities		✓		✓		✓
Value for Money	2	IMS Utilization Rate		✓				✓
Value for Money	2	Nuclear Waste Liabilities - Internal		✓				✓
Value for Money	2	Nuclear Waste Liabilities - ONFA		✓				✓
Value for Money	2	NWMD Capital / MFA		✓				✓
Value for Money	2	Inventory Creep		✓		✓		✓
Value for Money	2	Material Requested Not Issued		✓				✓
Value for Money	2	Total Process Costs		✓				✓

Appendix C – Cost Analysis Scenarios (Total Non- Fuel Operating Costs) Used for Target Setting – Station Projections

The tables below present the "high-level" cost scenarios used during target setting for the three nuclear stations. Two different scenarios were developed for Pickering B – one under the assumption of continuing operations and one without continuing operations. Each of these summaries was supported by detailed tables showing the cost build up but which are not presented here.

Darlington							
Scenario	Metric	2009 Projection	2010	2011	2012	2013	2014
Scenario 1	Total Non-Fuel Operating Costs	805,952.6	812,771.7	766,811.3	796,329.1	919,434.2	849,776.1
	Generation (TWh)	26.5	27.7	28.9	29.0	26.8	28.4
	Total Non-Fuel Operating Cost per MWh ($/MWh)	$ 30.39	$ 29.30	$ 26.57	$ 27.48	$ 34.26	$ 29.95
Scenario 2	Total Non-Fuel Operating Costs	805,952.6	812,771.7	751,475.1	764,157.4	863,157.4	779,727.2
	Generation (TWh)	26.5	27.7	28.9	29.0	26.8	28.4
	Total Non-Fuel Operating Cost per MWh ($/MWh)	$ 30.39	$ 29.30	$ 26.04	$ 26.37	$ 32.16	$ 27.48
Scenario 3	Total Non-Fuel Operating Costs	805,952.6	812,771.7	736,138.8	731,348.7	804,629.9	705,434.3
	Generation (TWh)	26.5	27.7	28.9	29.0	26.8	28.4
	Total Non-Fuel Operating Cost per MWh ($/MWh)	$ 30.39	$ 29.30	$ 25.51	$ 25.24	$ 29.98	$ 24.87
Scenario 4	Total Non-Fuel Operating Costs	805,952.6	812,771.7	761,282.0	784,803.5	899,401.0	824,999.6
	Generation (TWh)	26.5	27.7	28.9	29.0	26.8	28.4
	Total Non-Fuel Operating Cost per MWh ($/MWh)	$ 30.39	$ 29.30	$ 26.38	$ 27.08	$ 33.51	$ 29.08
Scenario 5	Total Non-Fuel Operating Costs	805,952.6	812,771.7	739,946.8	739,554.4	819,374.5	724,286.1
	Generation (TWh)	26.5	27.7	28.9	29.0	26.8	28.4
	Total Non-Fuel Operating Cost per MWh ($/MWh)	$ 30.39	$ 29.30	$ 25.64	$ 25.52	$ 30.53	$ 25.53
Best Quartile Costs/MWh		$ 20.56	$ 21.42	$ 22.12	$ 23.28	$ 24.45	$ 25.53
Median Costs/MWh		$ 23.84	$ 24.76	$ 25.51	$ 26.72	$ 27.95	$ 29.08

Pickering A							
Scenario	Metric	2009 Projection	2010	2011	2012	2013	2014
Scenario 1	Total Non-Fuel Operating Costs	463,994.8	481,914.3	470,147.1	470,382.6	485,238.1	494,193.2
	Generation (TWh)	6.4	6.4	7.4	7.7	7.6	7.6
	Total Non-Fuel Operating Cost per MWh ($/MWh)	$ 72.68	$ 74.83	$ 63.36	$ 61.25	$ 63.68	$ 65.28
Scenario 2	Total Non-Fuel Operating Costs	463,994.8	481,914.3	460,744.2	451,379.1	455,537.6	453,455.8
	Generation (TWh)	6.4	6.4	7.4	7.7	7.6	7.6
	Total Non-Fuel Operating Cost per MWh ($/MWh)	$ 72.68	$ 74.83	$ 62.09	$ 58.77	$ 59.78	$ 59.90
Scenario 3	Total Non-Fuel Operating Costs	463,994.8	481,914.3	451,341.3	431,999.3	424,649.3	410,250.3
	Generation (TWh)	6.4	6.4	7.4	7.7	7.6	7.6
	Total Non-Fuel Operating Cost per MWh ($/MWh)	$ 72.68	$ 74.83	$ 60.83	$ 56.25	$ 55.73	$ 54.19
Scenario 4	Total Non-Fuel Operating Costs	463,994.8	481,914.3	415,323.2	354,283.6	294,922.9	220,135.6
	Generation (TWh)	6.4	6.4	7.4	7.7	7.6	7.6
	Total Non-Fuel Operating Cost per MWh ($/MWh)	$ 72.68	$ 74.83	$ 55.97	$ 46.13	$ 38.70	$ 29.08
Scenario 5	Total Non-Fuel Operating Costs	463,994.8	481,914.3	410,791.4	344,114.2	277,276.1	193,262.1
	Generation (TWh)	6.4	6.4	7.4	7.7	7.6	7.6
	Total Non-Fuel Operating Cost per MWh ($/MWh)	$ 72.68	$ 74.83	$ 55.36	$ 44.81	$ 36.39	$ 25.53
Best Quartile Costs/MWh		$ 20.56	$ 21.42	$ 22.12	$ 23.28	$ 24.45	$ 25.53
Median Costs/MWh		$ 23.84	$ 24.76	$ 25.51	$ 26.72	$ 27.95	$ 29.08

Pickering B - No Continuous Operations							
Scenario	**Metric**	**2009 Projection**	**2010**	**2011**	**2012**	**2013**	**2014**
Scenario 1	Total Non-Fuel Operating Costs	711,471.6	724,082.7	710,885.3	723,583.1	747,423.2	747,423.2
	Generation (TWh)	15.8	14.2	15.8	16.0	15.9	15.9
	Total Non-Fuel Operating Cost per MWh ($/MWh)	$ 45.03	$ 50.99	$ 44.99	$ 45.20	$ 47.07	$ 47.01
Scenario 2	Total Non-Fuel Operating Costs	711,471.6	724,082.7	696,667.6	694,350.4	701,674.9	685,811.5
	Generation (TWh)	15.8	14.2	15.8	16.0	15.9	15.9
	Total Non-Fuel Operating Cost per MWh ($/MWh)	$ 45.03	$ 50.99	$ 44.09	$ 43.37	$ 44.19	$ 43.13
Scenario 3	Total Non-Fuel Operating Costs	711,471.6	724,082.7	682,449.9	664,538.7	654,096.9	620,467.0
	Generation (TWh)	15.8	14.2	15.8	16.0	15.9	15.9
	Total Non-Fuel Operating Cost per MWh ($/MWh)	$ 45.03	$ 50.99	$ 43.19	$ 41.51	$ 41.19	$ 39.02
Scenario 4	Total Non-Fuel Operating Costs	711,471.6	724,082.7	651,084.2	596,724.1	542,486.5	462,372.0
	Generation (TWh)	15.8	14.2	15.8	16.0	15.9	15.9
	Total Non-Fuel Operating Cost per MWh ($/MWh)	$ 45.03	$ 50.99	$ 41.21	$ 37.27	$ 34.16	$ 29.08
Scenario 5	Total Non-Fuel Operating Costs	711,471.6	724,082.7	640,760.2	573,786.7	503,698.5	405,927.0
	Generation (TWh)	15.8	14.2	15.8	16.0	15.9	15.9
	Total Non-Fuel Operating Cost per MWh ($/MWh)	$ 45.03	$ 50.99	$ 40.55	$ 35.84	$ 31.72	$ 25.53
Best Quartile Costs/MWh		$ 20.56	$ 21.42	$ 22.12	$ 23.28	$ 24.45	$ 25.53
Median Costs/MWh		$ 23.84	$ 24.76	$ 25.51	$ 26.72	$ 27.95	$ 29.08

Pickering B - With Continued Operations							
Scenario	**Metric**	**Projection**	**2010**	**2011**	**2012**	**2013**	**2014**
Scenario 1	Total Non-Fuel Operating Costs	721,271.6	746,382.7	757,885.3	765,683.1	783,623.2	838,118.2
	Generation (TWh)	15.8	13.9	14.3	15.2	14.9	14.7
	Total Non-Fuel Operating Cost per MWh ($/MWh)	$ 45.65	$ 53.70	$ 53.00	$ 50.24	$ 52.56	$ 57.09
Scenario 2	Total Non-Fuel Operating Costs	721,271.6	746,382.7	742,727.6	734,749.5	735,659.2	769,030.3
	Generation (TWh)	15.8	13.9	14.3	15.2	14.9	14.7
	Total Non-Fuel Operating Cost per MWh ($/MWh)	$ 45.65	$ 53.70	$ 51.94	$ 48.21	$ 49.34	$ 52.39
Scenario 3	Total Non-Fuel Operating Costs	721,271.6	746,382.7	727,569.9	703,203.4	685,776.9	695,756.6
	Generation (TWh)	15.8	13.9	14.3	15.2	14.9	14.7
	Total Non-Fuel Operating Cost per MWh ($/MWh)	$ 45.65	$ 53.70	$ 50.88	$ 46.14	$ 45.99	$ 47.39
Scenario 4	Total Non-Fuel Operating Costs	721,271.6	746,382.7	678,342.6	596,526.6	510,089.8	426,894.4
	Generation (TWh)	15.8	13.9	14.3	15.2	14.9	14.7
	Total Non-Fuel Operating Cost per MWh ($/MWh)	$ 45.65	$ 53.70	$ 47.44	$ 39.14	$ 34.21	$ 29.08
Scenario 5	Total Non-Fuel Operating Costs	721,271.6	746,382.7	669,743.0	577,228.3	477,186.3	374,780.4
	Generation (TWh)	15.8	13.9	14.3	15.2	14.9	14.7
	Total Non-Fuel Operating Cost per MWh ($/MWh)	$ 45.65	$ 53.70	$ 46.84	$ 37.88	$ 32.00	$ 25.53
Best Quartile Costs/MWh		$ 20.56	$ 21.42	$ 22.12	$ 23.28	$ 24.45	$ 25.53
Median Costs/MWh		$ 23.84	$ 24.76	$ 25.51	$ 26.72	$ 27.95	$ 29.08

Appendix D – Cost Analysis Scenarios (OM&A) Used for Target Setting – Support Unit Projections

The tables below present the "high-level" cost summaries used during target setting for the seven support units. They also present the base and outage OM&A costs for the stations for reference purposes.

Scenario 1 – Base Case

Scenario 1 - Base Case								
Metric	Site / Business Unit		2009	Existing Targets				2014
				2010	2011	2012	2013	
OM&A	Pickering A	Base	204,000.0	198,000.0	189,800.0	192,500.0	197,200.0	197,200.0
		Outage	46,900.0	73,400.0	58,800.0	52,400.0	63,500.0	72,455.1
		Total	250,900.0	271,400.0	248,600.0	244,900.0	260,700.0	269,655.1
	Pickering B (No Continuous Ops)	Base	267,800.0	257,500.0	261,500.0	273,000.0	277,642.0	277,642.0
		Outage	77,000.0	103,600.0	87,000.0	79,600.0	87,300.0	87,300.0
		Total	344,800.0	361,100.0	348,500.0	352,600.0	364,942.0	364,942.0
	Pickering B (With Continuous Ops)	Base	277,600.0	271,900.0	279,100.0	290,300.0	298,942.0	286,042.0
		Outage	77,000.0	107,700.0	94,500.0	83,100.0	95,000.0	159,695.0
		Total	354,600.0	379,600.0	373,600.0	373,400.0	393,942.0	445,737.0
	Darlington	Base	300,700.0	289,100.0	301,300.0	320,300.0	333,200.0	333,200.0
		Outage	102,400.0	117,700.0	75,500.0	71,300.0	168,700.0	99,041.9
		Total	403,100.0	406,800.0	376,800.0	391,600.0	501,900.0	432,241.9
	NP&T	Base	238,642.5	253,741.0	257,609.0	268,148.3	269,631.2	269,631.2
		Outage	1,820.6	841.9	595.9	628.2	838.7	838.7
		Total	240,463.1	254,582.9	258,204.8	268,776.5	270,469.9	270,469.9
	E&M	Base	72,170.0	69,667.0	70,566.0	73,008.0	73,398.0	73,398.0
		Outage	7,323.0	7,912.0	5,809.0	5,093.0	8,304.0	8,304.0
		Total	79,493.0	77,579.0	76,375.0	78,101.0	81,702.0	81,702.0
OM&A	PINO	Base	9,613.0	9,540.0	9,618.0	9,948.0	10,149.0	10,149.0
		Outage	0.0	0.0	0.0	0.0	0.0	0.0
		Total	9,613.0	9,540.0	9,618.0	9,948.0	10,149.0	10,149.0
	NSC	Base	69,915.0	69,744.0	69,837.0	71,024.0	72,081.0	72,081.0
		Outage	6,971.0	1,636.0	1,412.0	1,447.0	1,963.0	1,963.0
		Total	76,886.0	71,380.0	71,249.0	72,471.0	74,044.0	74,044.0
	IM&CS	Base	40,772.0	38,027.0	39,769.0	41,945.0	43,575.0	43,575.0
		Outage	0.0	0.0	0.0	0.0	0.0	0.0
		Total	40,772.0	38,027.0	39,769.0	41,945.0	43,575.0	43,575.0
	CNO	Base	8,345.8	3,754.8	4,187.9	7,170.4	5,637.5	5,637.5
		Labour Price Varience	4,386.0	4,474.0	4,400.0	4,576.0	4,700.0	4,700.0
		Total	12,731.8	8,228.8	8,587.9	11,746.4	10,337.5	10,337.5
	NWM	Base	4,651.0	4,452.0	4,592.0	4,918.0	5,875.0	5,875.0
		Outage	0.0	0.0	0.0	0.0	0.0	0.0
		Total	4,651.0	4,452.0	4,592.0	4,918.0	5,875.0	5,875.0

Scenario 2 – Base Case and 2% Reduction

Scenario 2 - Base Case and 2% Reduction								
Metric	**Site / Business Unit**		**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
OM&A	Pickering A	Base	204,000.0	198,000.0	186,004.0	184,723.0	185,129.8	180,944.4
		Outage	46,900.0	73,400.0	57,624.0	50,283.0	59,613.3	66,482.5
		Total	250,900.0	271,400.0	243,628.0	235,006.0	244,743.1	247,426.9
	Pickering B (No Continuous Ops)	Base	267,800.0	257,500.0	256,270.0	261,970.8	260,648.1	254,755.4
		Outage	77,000.0	103,600.0	85,260.0	76,384.2	81,956.5	80,103.7
		Total	344,800.0	361,100.0	341,530.0	338,355.0	342,604.6	334,859.0
	Pickering B (With Continuous Ops)	Base	277,600.0	271,900.0	273,518.0	278,571.9	280,644.4	262,462.9
		Outage	77,000.0	107,700.0	92,610.0	79,742.8	89,185.2	146,531.0
		Total	354,600.0	379,600.0	366,128.0	358,314.6	369,829.6	408,993.9
	Darlington	Base	300,700.0	289,100.0	295,274.0	307,359.9	312,805.5	305,733.6
		Outage	102,400.0	117,700.0	73,990.0	68,419.5	158,374.2	90,877.7
		Total	403,100.0	406,800.0	369,264.0	375,779.4	471,179.7	396,611.3
	NP&T	Base	238,642.5	253,741.0	252,456.8	257,315.1	253,127.6	247,404.9
		Outage	1,820.6	841.9	583.9	602.8	787.4	769.6
		Total	240,463.1	254,582.9	253,040.8	257,917.9	253,915.0	248,174.5
	E&M	Base	72,170.0	69,667.0	69,154.7	70,058.5	68,905.5	67,350.0
		Outage	7,323.0	7,912.0	5,692.8	4,887.2	7,795.7	7,619.8
		Total	79,493.0	79,579.0	74,847.5	74,945.7	76,701.2	74,969.8
OM&A	PINO	Base	9,613.0	9,540.0	9,425.6	9,546.1	9,527.8	9,312.4
		Outage	0.0	0.0	0.0	0.0	0.0	0.0
		Total	9,613.0	9,540.0	9,425.6	9,546.1	9,527.8	9,312.4
	NSC	Base	69,915.0	69,744.0	68,440.3	68,154.6	67,669.1	66,141.5
		Outage	6,971.0	1,636.0	1,383.8	1,388.5	1,842.8	1,801.2
		Total	76,886.0	71,880.0	69,824.0	69,543.2	69,511.9	67,942.8
	IM&CS	Base	40,772.0	38,027.0	38,973.6	40,250.4	40,907.9	39,984.4
		Outage	0.0	0.0	0.0	0.0	0.0	0.0
		Total	40,772.0	40,127.0	38,973.6	40,250.4	40,907.9	39,984.4
	CNO	Base	8,345.8	3,754.8	4,104.1	6,880.7	5,292.4	5,172.8
		Labour Price Varience	4,386.0	4,474.0	4,312.0	4,391.1	4,412.3	4,312.6
		Total	12,731.8	8,228.8	8,416.1	11,271.8	9,704.8	9,485.4
	NWM	Base	4,651.0	4,392.0	4,500.2	4,719.3	5,515.4	5,390.7
		Outage	0.0	0.0	0.0	0.0	0.0	0.0
		Total	4,651.0	4,392.0	4,500.2	4,719.3	5,515.4	5,390.7

Scenario 3 – Base Case and 4% Reduction

Scenario 3 - Base Case and 4% Reduction								
Metric	Site / Business Unit		2009	2010	2011	2012	2013	2014
OM&A	Pickering A	Base	204,000.0	198,000.0	182,208.0	176,792.0	172,576.8	163,703.9
		Outage	46,900.0	73,400.0	56,448.0	48,124.2	55,571.1	60,148.0
		Total	250,900.0	271,400.0	238,656.0	224,916.2	228,148.0	223,851.9
	Pickering B (No Continuous Ops)	Base	267,800.0	257,500.0	251,040.0	250,723.2	242,974.5	230,482.1
		Outage	77,000.0	103,600.0	83,520.0	73,104.6	76,399.4	72,471.3
		Total	344,800.0	361,100.0	334,560.0	323,827.8	319,373.9	302,953.5
	Pickering B (With Continuous Ops)	Base	277,600.0	271,900.0	267,936.0	266,611.5	261,614.9	237,455.3
		Outage	77,000.0	107,700.0	90,720.0	76,319.0	83,137.9	132,569.4
		Total	354,600.0	379,600.0	358,656.0	342,930.6	344,752.8	370,024.8
	Darlington	Base	300,700.0	289,100.0	289,248.0	294,163.5	291,595.3	276,603.1
		Outage	102,400.0	117,700.0	72,480.0	65,481.9	147,635.4	82,218.8
		Total	403,100.0	406,800.0	361,728.0	359,645.4	439,230.8	358,821.9
	NP&T	Base	238,642.5	253,741.0	247,304.6	246,267.4	235,964.0	223,832.0
		Outage	1,820.6	841.9	572.0	576.9	734.0	696.3
		Total	240,463.1	254,582.9	247,876.7	246,844.3	236,698.0	224,528.3
	E&M	Base	72,170.0	69,667.0	67,743.4	67,050.5	64,233.2	60,927.7
		Outage	7,323.0	7,912.0	5,576.6	4,677.4	7,267.1	6,893.2
		Total	79,493.0	79,579.0	73,320.0	71,728.0	71,500.4	67,820.8
OM&A	PINO	Base	9,613.0	9,540.0	9,233.3	9,136.2	8,881.8	8,425.1
		Outage	0.0	0.0	0.0	0.0	0.0	0.0
		Total	9,613.0	9,540.0	9,233.3	9,136.2	8,881.8	8,425.1
	NSC	Base	69,915.0	69,744.0	67,043.5	65,228.4	63,080.7	59,834.4
		Outage	6,971.0	1,636.0	1,355.5	1,328.9	1,717.9	1,629.5
		Total	76,886.0	71,880.0	68,399.0	66,557.4	64,798.6	61,463.9
	IM&CS	Base	40,772.0	38,027.0	38,178.2	38,522.3	38,134.1	36,171.6
		Outage	0.0	0.0	0.0	0.0	0.0	0.0
		Total	40,772.0	40,127.0	38,178.2	38,522.3	38,134.1	36,171.6
	CNO	Base	8,345.8	3,754.8	4,020.4	6,585.3	4,933.6	4,679.9
		Labour Price Varience	4,386.0	4,474.0	4,224.0	4,202.6	4,113.1	3,901.7
		Total	12,731.8	8,228.8	8,244.4	10,787.9	9,046.7	8,581.6
	NWM	Base	4,651.0	4,392.0	4,408.3	4,516.7	5,141.4	4,876.8
		Outage	0.0	0.0	0.0	0.0	0.0	0.0
		Total	4,651.0	4,392.0	4,408.3	4,516.7	5,141.4	4,876.8

Scenario 4 – Performance Required to Achieve Benchmark Median

Metric	Site / Business Unit		2009	2010	2011	2012	2013	2014
OM&A	Pickering A	Base	204,000.0	198,000.0	167,667.4	144,987.5	119,856.2	87,841.6
		Outage	46,900.0	73,400.0	51,943.3	39,466.7	38,594.7	32,274.7
		Total	250,900.0	271,400.0	219,610.7	184,454.2	158,450.9	120,116.4
	Pickering B (No Continuous Ops)	Base	267,800.0	257,500.0	239,502.1	225,137.5	201,515.1	171,755.3
		Outage	77,000.0	103,600.0	79,681.4	65,644.5	63,363.1	54,005.7
		Total	344,800.0	361,100.0	319,183.5	290,781.9	264,878.2	225,760.9
	Pickering B (With Continuous Ops)	Base	277,600.0	271,900.0	249,807.5	226,166.3	194,592.6	145,695.1
		Outage	77,000.0	107,700.0	84,581.9	64,741.4	61,839.1	81,340.4
		Total	354,600.0	379,600.0	334,389.4	290,907.6	256,431.6	227,035.6
	Darlington	Base	300,700.0	289,100.0	299,127.4	315,664.1	325,940.0	323,485.1
		Outage	102,400.0	117,700.0	74,955.6	70,268.0	165,024.3	96,154.2
		Total	403,100.0	406,800.0	374,083.0	385,932.2	490,964.3	419,639.3
	NP&T	Base	238,642.5	253,741.0	242,410.1	234,897.9	217,053.1	198,178.9
		Outage	1,820.6	841.9	560.7	550.3	675.2	616.5
		Total	240,463.1	254,582.9	242,970.8	235,448.2	217,728.3	198,795.4
	E&M	Base	72,170.0	69,667.0	66,402.6	63,955.0	59,085.4	53,947.5
		Outage	7,323.0	7,912.0	5,466.3	4,461.5	6,684.7	6,103.4
		Total	79,493.0	77,579.0	71,868.9	68,416.5	65,770.1	60,051.0
OM&A	PINO	Base	9,613.0	9,540.0	9,050.5	8,714.4	8,169.9	7,459.5
		Outage	0.0	0.0	0.0	0.0	0.0	0.0
		Total	9,613.0	9,540.0	9,050.5	8,714.4	8,169.9	7,459.5
	NSC	Base	69,915.0	69,744.0	65,716.6	62,217.0	58,025.2	52,979.5
		Outage	6,971.0	1,636.0	1,328.7	1,267.6	1,580.2	1,442.8
		Total	76,886.0	71,380.0	67,045.3	63,484.6	59,605.4	54,422.3
	IM&CS	Base	40,772.0	38,027.0	37,422.6	36,743.8	35,077.9	32,027.6
		Outage	0.0	0.0	0.0	0.0	0.0	0.0
		Total	40,772.0	38,027.0	37,422.6	36,743.8	35,077.9	32,027.6
	CNO	Base - CNO Office	8,345.8	3,754.8	3,940.8	6,281.2	4,538.2	4,143.6
		Base - Labour Price Variance	4,386.0	4,474.0	4,140.4	4,008.6	3,783.5	3,454.5
		Total	12,731.8	8,228.8	8,081.2	10,289.8	8,321.7	7,598.1
	NWM	Base	4,651.0	4,452.0	4,321.1	4,308.2	4,729.4	4,318.1
		Outage	0.0	0.0	0.0	0.0	0.0	0.0
		Total	4,651.0	4,452.0	4,321.1	4,308.2	4,729.4	4,318.1

Scenario 5 – Performance Required to Achieve Benchmark Best Quartile

Scenario 5 - Performance Necessary to Achieve Benchmark Best Quartile

Metric	Site / Business Unit		2009	2010	2011	2012	2013	2014
OM&A	Pickering A	Base	204,000.0	198,000.0	165,837.9	140,825.7	112,684.6	77,118.2
		Outage	46,900.0	73,400.0	51,376.5	38,333.9	36,285.4	28,334.7
		Total	250,900.0	271,400.0	217,214.4	179,159.6	148,969.9	105,452.9
	Pickering B (No Continuous Ops)	Base	267,800.0	257,500.0	235,704.4	216,483.5	187,106.7	150,787.9
		Outage	77,000.0	103,600.0	78,417.9	63,121.2	58,832.6	47,412.8
		Total	344,800.0	361,100.0	314,122.3	279,604.6	245,939.3	198,200.7
	Pickering B (With Continuous Ops)	Base	277,600.0	271,900.0	246,640.6	218,849.5	182,040.3	127,909.1
		Outage	77,000.0	107,700.0	83,509.6	62,646.9	57,850.1	71,410.6
		Total	354,600.0	379,600.0	330,150.2	281,496.4	239,890.4	199,319.7
	Darlington	Base	300,700.0	289,100.0	290,744.2	297,464.0	296,938.7	283,995.0
		Outage	102,400.0	117,700.0	72,854.9	66,216.6	150,340.8	84,416.0
		Total	403,100.0	406,800.0	363,599.2	363,680.7	447,279.5	368,410.9
	NP&T	Base	238,642.5	253,741.0	237,515.5	224,172.0	200,336.0	174,451.4
		Outage	1,820.6	841.9	549.4	525.2	623.2	542.7
		Total	240,463.1	254,582.9	238,064.9	224,697.1	200,959.2	174,994.1
	E&M	Base	72,170.0	69,667.0	65,061.9	61,034.7	54,534.7	47,488.5
		Outage	7,323.0	7,912.0	5,355.9	4,257.7	6,169.9	5,372.7
		Total	79,493.0	77,579.0	70,417.8	65,292.4	60,704.6	52,861.2
OM&A	PINO	Total	9,613.0	9,540.0	8,867.8	8,316.5	7,540.7	6,566.4
		Outage	0.0	0.0	0.0	0.0	0.0	0.0
		Total	9,613.0	9,540.0	8,867.8	8,316.5	7,540.7	6,566.4
	NSC	Base	69,915.0	69,744.0	64,389.7	59,376.1	53,556.2	46,636.4
		Outage	6,971.0	1,636.0	1,301.9	1,209.7	1,458.5	1,270.1
		Total	76,886.0	71,380.0	65,691.6	60,585.8	55,014.7	47,906.5
	IM&CS	Base	40,772.0	38,027.0	36,667.0	35,066.0	32,376.2	28,193.0
		Outage	0.0	0.0	0.0	0.0	0.0	0.0
		Total	40,772.0	38,027.0	36,667.0	35,066.0	32,376.2	28,193.0
	CNO	Base - CNO Office	8,345.8	3,754.8	3,861.2	5,994.4	4,188.7	3,647.5
		Base - Labour Price Variance	4,386.0	4,474.0	4,056.8	3,825.5	3,492.1	3,040.9
		Total	12,731.8	8,228.8	7,918.0	9,820.0	7,680.8	6,688.4
	NWM	Base	4,651.0	4,452.0	4,233.8	4,111.4	4,365.1	3,801.1
		Outage	0.0	0.0	0.0	0.0	0.0	0.0
		Total	4,651.0	4,452.0	4,233.8	4,111.4	4,365.1	3,801.1

Appendix E – Final Business Planning Targets Established for 2014

The tables below present the final operational and financial planning targets agreed to by the OPG Nuclear Executive Committee (NEC) for inclusion in the 2010-2014 Business Plan. **Bold** type is used to indicate the maximum NPI point threshold established by WANO. These thresholds represent guidance as to what is considered superior industry performance.

Safety Cornerstone Targets

Metric	Site / Business Unit	2009 Projection	2014	NA PWR/PHWR Best Quartile	NA PWR/PHWR Median	CANDU Best Quartile	CANDU Median
Tier 1							
All Injury Rate	Darlington	1.3	1.2	n/a	n/a	[redacted]	[redacted]
	Pickering A	1.3	1.2	n/a	n/a	[redacted]	[redacted]
	Pickering B	1.3	1.2	n/a	n/a	[redacted]	[redacted]
	IM&CS	2.36	1.2				
Collective Radiation Exposure* (man-rem)	Darlington	84.66	***66***	50.70	66.00	62.15	81.84
	Pickering A	129.53	125	50.70	66.00	62.15	81.84
	Pickering B	86.04	82	50.70	66.00	62.15	81.84
Fuel Reliability* (microcuries per gram)	Darlington	***0.00050***	***0.00050***	0.000001	0.000012	0.000001	0.000165
	Pickering A	0.00280	***0.00050***	0.000001	0.000012	0.000001	0.000165
	Pickering B	0.00120	***0.00050***	0.000001	0.000012	0.000001	0.000165
Environmental Index (%)	Darlington	85	80	n/a	n/a	n/a	n/a
	Pickering A	80	80	n/a	n/a	n/a	n/a
	Pickering B	80	80	n/a	n/a	n/a	n/a
Accident Severity Rate	Darlington	2.81	3.30	n/a	n/a	n/a	n/a
	Pickering A	4.18	3.30	n/a	n/a	n/a	n/a
	Pickering B	2.41	3.30	n/a	n/a	n/a	n/a
	NP&T	3.34	3.30	n/a	n/a	n/a	n/a
	E&M	2.30	3.30	n/a	n/a	n/a	n/a
	PINO	2.84	3.30	n/a	n/a	n/a	n/a
	NSC	2.42	3.30	n/a	n/a	n/a	n/a
	IM&CS	2.36	3.30	n/a	n/a	n/a	n/a
	NWM	7.34	3.30	n/a	n/a	n/a	n/a

Safety Cornerstone Targets (Cont'd)

Metric	Site / Business Unit	2009 Projection	2014	NA PWR/PHWR		CANDU	
				Best Quartile	Median	Best Quartile	Median
Tier 2							
Industrial Safety Accident Rate* (# per 200,000 man-hours worked)	Darlington	***0.15***	***0.15***	0.05	0.09	n/a	n/a
	Pickering A	***0.15***	***0.15***	0.05	0.09	n/a	n/a
	Pickering B	***0.15***	***0.15***	0.05	0.09	n/a	n/a
SS - Auxiliary Feedwater System Unavailability* (unavailability/ required availability)	Darlington	***0.0200***	***0.0200***	0.0025	0.0042	0.0014	0.0020
	Pickering A	***0.0200***	***0.0200***	0.0025	0.0042	0.0014	0.0020
	Pickering B	***0.0200***	***0.0200***	0.0025	0.0042	0.0014	0.0020
SS - Emergency AC Power Unavailability* (unavailability/ required availability)	Darlington	***0.0250***	***0.0250***	0.0087	0.0130	0.0024	0.0076
	Pickering A	***0.0250***	***0.0250***	0.0087	0.0130	0.0024	0.0076
	Pickering B	***0.0250***	***0.0250***	0.0087	0.0130	0.0024	0.0076
SS - High Pressure Safety Injection Unavailability* (unavailability/ required availability)	Darlington	***0.0200***	***0.0200***	0.0021	0.0041	0.0001	0.0037
	Pickering A	***0.0200***	***0.0200***	0.0021	0.0041	0.0001	0.0037
	Pickering B	***0.0200***	***0.0200***	0.0021	0.0041	0.0001	0.0037
Reactor Trip Rate* (# per 7,000 hours critical)	Darlington	***0.50***	***0.50***	0.00	0.25	0.00	0.33
	Pickering A	***0.40***	***0.50***	0.00	0.25	0.00	0.33
	Pickering B	***0.50***	***0.50***	0.00	0.25	0.00	0.33
Airborne Tritium Emissions (Curies)	Darlington	4000	4000	n/a	n/a	n/a	n/a
	Pickering A	12000	6000	n/a	n/a	n/a	n/a
	Pickering B	7000	5400	n/a	n/a	n/a	n/a

Reliability Cornerstone Targets

Metric	Site / Business Unit	2009 Projection**	2014	NA PWR/PHWR Best Quartile	NA PWR/PHWR Median	CANDU Best Quartile	CANDU Median
Tier 1							
WANO NPI (INPO)	Darlington	94.9	*98.6*	96.45	91.87	96.19	62.50
	Pickering A	57.4	*70.9*	96.45	91.87	96.19	62.50
	Pickering B	68.1	*81.3*	96.45	91.87	96.19	62.50
Unit Capability Factor* (%)	Darlington	86.5	***93.3***	92.78	90.44	90.97	84.31
	Pickering A	79.5	84.3	92.78	90.44	90.97	84.31
	Pickering B	87.3	81	92.78	90.44	90.97	84.31
Forced Loss Rate* (%)	Darlington	2.00	1.25	0.95	1.81	0.68	3.79
	Pickering A	11.50	4	0.95	1.81	0.68	3.79
	Pickering B	6.20	4	0.95	1.81	0.68	3.79
Net Electrical Production (TWh)***	Darlington	26.52	28.67	n/a	n/a	n/a	n/a
	Pickering A	6.37	7.57	n/a	n/a	n/a	n/a
	Pickering B	15.54	14.66	n/a	n/a	n/a	n/a
Tier 2							
Chemistry Performance Indicator*	Darlington	***1.01***	1.01	1.00	1.01	1.00	1.01
	Pickering A	1.08	1.04	1.00	1.01	1.00	1.01
	Pickering B	1.10	1.04	1.00	1.01	1.00	1.01
Online Elective Maintenance Backlog (# of workorders)	Darlington	300	215	218	278	n/a	n/a
	Pickering A	375	278	218	278	n/a	n/a
	Pickering B	575	300	218	278	n/a	n/a
Online Corrective Maintenance Backlog (# of workorders	Darlington	10	5	4	7	n/a	n/a
	Pickering A	15	9	4	7	n/a	n/a
	Pickering B	25	15	4	7	n/a	n/a

Reliability Cornerstone Targets (Cont'd)

Metric	Site / Business Unit	2009 Projection	2014	NA PWR/PHWR		CANDU	
				Best Quartile	Median	Best Quartile	Median
Plant Condition Index	Darlington	73.70	Internally generated, needs review with site plan	n/a	n/a	n/a	n/a
	Pickering A	56.00		n/a	n/a	n/a	n/a
	Pickering B	65.30		n/a	n/a	n/a	n/a
Equipment Reliability Index	Darlington	67.0	89	n/a	n/a	n/a	n/a
	Pickering A	45.0	82	n/a	n/a	n/a	n/a
	Pickering B	52.0	72	n/a	n/a	n/a	n/a
Planned Outage Performance (days)	Darlington	171.7	80.8	n/a	n/a	n/a	n/a
	Pickering A	106.5	89	n/a	n/a	n/a	n/a
	Pickering B	135.3	225	n/a	n/a	n/a	n/a
Plant Reliability List (# workorders completed)	Darlington	200	200	n/a	n/a	n/a	n/a
	Pickering A	600	200	n/a	n/a	n/a	n/a
	Pickering B	291	TBD	n/a	n/a	n/a	n/a
System Health (%)	Darlington	85.00	95.0%	n/a	n/a	n/a	n/a
	Pickering A	85.00	98.0%	n/a	n/a	n/a	n/a
	Pickering B	85.00	85.0%	n/a	n/a	n/a	n/a
PM Deferrals (#)	Darlington	7	2	n/a	n/a	n/a	n/a
	Pickering A	20	9	n/a	n/a	n/a	n/a
	Pickering B	15	4	n/a	n/a	n/a	n/a

Human Performance Cornerstone Targets

Metric	Site / Business Unit	2009 Projection	2014	No Benchmark Available	
				Best Quartile	Median
Tier 1					
Event Free Day Resets (#)	Darlington	8	4	n/a	n/a
	Pickering A	4	2	n/a	n/a
	Pickering B	8	4	n/a	n/a
Metric	**Site / Business Unit**	**2009 Projection**	**2014**	**NA PWR/PHWR**	
				Best Quartile	**Median**
Tier 2					
Corrective Action Program (CAP) - Quality of Level 1&2 Eval. (%) (Replaces Corrective Action Program Quality %)	Darlington	80.0	90	n/a	n/a
	Pickering A	80.0	90	n/a	n/a
	Pickering B	80.0	90	n/a	n/a
	NP&T	80.0	90	n/a	n/a
	E&M	80.0	90	n/a	n/a
	NSC	80.0	90	n/a	n/a
	IM&CS	80.0	90	n/a	n/a
Corrective Action Program (CAP) - Effect. of Level 1&2 SCRs (%) (Replaces Corrective Action Program Root Cause Effectivenss %)	Darlington	80.0	90	n/a	n/a
	Pickering A	80.0	90	n/a	n/a
	Pickering B	80.0	90	n/a	n/a
	NP&T	80.0	90	n/a	n/a
	E&M	80.0	90	n/a	n/a
	NSC	80.0	90	n/a	n/a
	IM&CS	80.0	90	n/a	n/a
Corrective Action Program (CAP)- Timeliness of Level 1&2 SCRs (%) (Replaces Corrective Action Program Timeliness %)	Darlington	80.0	95	n/a	n/a
	Pickering A	80.0	95	n/a	n/a
	Pickering B	80.0	95	n/a	n/a
	NP&T	80.0	95	n/a	n/a
	E&M	80.0	95	n/a	n/a
	NSC	80.0	95	n/a	n/a
	IM&CS	80.0	95	n/a	n/a
Training Index	Darlington	70	90	n/a	n/a
	Pickering A	70	90	n/a	n/a
	Pickering B	75	90	n/a	n/a

Value for Money Cornerstone Targets

Metric	Site / Business Unit	2009 Projection	2014	Projected 2014 Values	
				Best Quartile	Median
Tier 1					
OM&A Base & Outage ($MM)	Darlington	403.20	444.80	n/a	n/a
	Pickering A	260.30	272.86	n/a	n/a
	Pickering B	352.70	399.90	n/a	n/a
	NP&T	240.50	257.33	n/a	n/a
	E&M	81.00	77.76	n/a	n/a
	PINO	9.60	10.56	n/a	n/a
	NSC	71.90	73.91	n/a	n/a
	IM&CS	41.50	43.10	n/a	n/a
	NWM	4.60	4.39	n/a	n/a
Non-Fuel Operating Cost per MWh ($/MWh)	Darlington	30.13	28.82	25.53	29.08
	Pickering A	74.88	60.07	25.53	29.08
	Pickering B	46.01	52.47	25.53	29.08
Total Generating Cost per MWh** ($/MWh)	Darlington	36.48	36.75	33.98	37.90
	Pickering A	84.47	70.81	33.98	37.90
	Pickering B	54.17	64.80	33.98	37.90
Metric	**Site / Business Unit**	**2009 Projection**	**2014**	**NA PWR/PHWR**	
				Best Quartile	**Median**
Tier 2					
Nuclear Projects Available for Service (#)	Darlington	32	100%	n/a	n/a
	Pickering A	8	100%	n/a	n/a
	Pickering B	18	100%	n/a	n/a
	NP&T	7	100%	n/a	n/a

NOTE: OM&A Base and Outage ($MM) excludes approximately $11.6M in OM&A cost associated with the Office of the CNO.

Appendix F – Sample Fleet Improvement Initiative

Provided below is one of the fleet improvement initiatives recommended by the Radiological Protection Team. It is provided as an example of how the standard template was used during the process.

Initiative Action Plan

Initiative Number: RP-05

ONTARIOPOWER GENERATION

NOTE: Hover mouse over section titles for additional details

Initiative Title:	Reduce collective radiation exposures (CRE) during reactorface work through optimization of reactor face shielding using combination of alternatives appropriate to the tasks being performed and units pltatform geometries and layout.
Initiative Number:	**RP-05** { This a consoildated project for **DN (DA04 & DA07)**, **Pick-A(PA-SA1-)** & **Pick-B** }
Description:	In recent years, increased work activities at the reactor face associated with feeder and fuel channel work in all units have contributed to a steadily increasing dose trend and challenged the station's ability to meet industry standard. This consolidated project encompasses shielding options to the reactor face and overhead radiation fields through combination of Tungsten shielding blocks, overhead shielding structures and shielding cabinets. The implementation of this shielding strategy will provide much needed protection to workers and reduce the risks of unplanned exposures. Impact is expected to save up to 40% of Feeder Thinning inspection dose exposures per outage (i.e. 12 R / outage). This will in turn result in fewer contract workers being required since they are limited by dose (saving real money).
Cornerstone/ Metric(s) Targeted:	Cornerstone safety metrics: Collective Radiation Exposure (CRE), WANO NPI
Initiative Owner:	DA: (Tom Wong) ; IM&CS(Perry Bowles)

Expected Results: (Repeat table below for additional metrics)

Quantitative for Metric Impact:

Metric Name	Year	Darlington	Pickering A	Pickering B
CRE	2010	-3.8 rem/unit	0	0
CRE	2011	-5.6 rem/unit	-7.5 rem/unit	-2.0 rem/unit
CRE	2012	-5.2 rem/unit	-16.5 rem/unit	-4.7 rem/unit
CRE	2013	-10.8 rem/unit	-10.5 rem/unit	-3.8 rem/unit
CRE	2014	-7.2 rem/unit	-21 rem/unit	-7 rem/unit

Financial and Qualitative:

List any other benefits of metric by station/by year - include financial or other. Describe benefit

Metric Name	Year	Darlington	Pickering A	Pickering B
WANO NPI	2010	0.6	0	0
WANO NPI	2011	0.9	1.3	0.4
WANO NPI	2012	0.9	2.7	0.8
WANO NPI	2013	1.8	1.8	0.6
WANO NPI	2014	1.2	3.5	1.2

Additional comments for qualitative benefits

WANO NPI is a calculation of 10 sub-indicators, CRE contributes 10% to this index.

Metric Name	Year	Darlington	Pickering A	Pickering B
value for money	2010	0	0	0
value for money	2011	325,000	120,000	245,000
value for money	2012	325,000	120,000	120,000
value for money	2013	650,000	120,000	370,000
value for money	2014	325,000	0	185,000

ONTARIOPOWER GENERATION

Initiative Action Plan

Initiative Number: RP-05

For operational costs saved, by reducing the outage dose exposure by 40%, we would require 40% fewer inspectors. Based on a reduction of 12R per outage, this equates to 20 fewer inspectors for up to 6 weeks per outage. Again assuming a maximum of 60 hours per week per person, the savings per Pickering A or Darlington outage would be around $600K per outage or $1.2M for 2 outages per year. Pickering B outages are less dose-intensive in this area thus the savings in people costs are smaller. The numbers quoted above are for the IMCS feeder inspection and SCRAPE campaign savings. Detailed Feeder replacement savings, believed to represent about 50% of the potential savings, are not available as of this Aug 26 revision.

Risks

Describe below any safety, technical or business risks associated with this initiative

> Field limitations (platform weight carrying capacity, overhead clearance etc) may affect equipment installation in the field. Project cost is highly dependent on the design which is not yet defined. Insufficient station resources and long lead items may affect the project schedule and delay the project deliverables.
> @ DN Shielding blocks may slow down feeder inspections as these blocks need to be removed one by one as the inspection progresses (Not expected to have a major impact). Impact on critical path is expected to be small (2 additional hours)

Resources:

List financial and personnel resources required – indicate any associated capital/O&M project ID numbers and if the project is currently budgeted for – include any budget implications by year and by specific type of budget impacted
NOTE: Although no additional resources are currently budgeted, it is important to note cost and work effort required for the initiative for prioritization purposes

Site/ Department	Year	O&M*	Capital*	Comments (include any numbers of FTEs corresponding to $ or other assumptions)
Darlington	2010		1035k$	302k$ will be needed in 2009 to cover the cost of engineering design, 733 will cover the cost of construction and commissioning in 2010. AISC development release has been approved, to develop AISC Part B
		500k$		Procurement of 480 shield blocks
Darlington	2011	500k$		Procurement of 480 shield blocks
Darlington	2012	LOE		
Darlington	2013	LOE		
Darlington	2014	LOE		
Pickering A	2010		1035k$	302k$ will be needed in 2009 to cover the cost of engineering design, 733k$ will cover the cost of construction and commissioning in 2010.
Pickering A	2011			
Pickering A	2012			
Pickering A	2013			
Pickering A	2014			
Pickering B	2010		1035k$	302k$ will be needed in 2009 to cover the cost of engineering design, 733k$ will cover the cost of construction and commissioning in 2010.
Pickering B	2011			
Pickering B	2012			
Pickering B	2013			
Pickering B	2014			
Corp. (specify dept.)	2010			
Corp. (specify dept.)	2011			
Corp. (specify dept.)	2012			
Corp. (specify dept.)	2013			
Corp. (specify dept.)	2014			

* Note: Initiatives seeking Capital or IT investments must obtain approval through the Asset Investment Screening Committee (AISC). All initiatives requiring budget will require approval and must show clear benefit.

ONTARIOPOWER GENERATION

Initiative Action Plan

Initiative Number: RP-05

Technical Difficulty: Rate technical difficulty to implement (Easy, Medium, or Hard) — Hard

Explain rating

The shielding cabinet/ overhead shielding structure must be able to be adaptable for a variety of work activities at the reactor face (feeder inspection, SFCR, damp scrape, etc.) and within the load bearing capacity of the reactor bridge platform and compactible with station system.

People Change Difficulty: Rate difficulty in terms of people changes (Easy, Medium, or Hard) — Easy

Explain rating

People working in the shielding cabinet or under the shielding structure are passive users and should not be significantly impacted by it.

List any other measures or metrics used to track the success of initiatives – any success that can be measured near-term

Effectiveness Measures: An average WANO RP NPI increase of up to 4.5 DN (shielding blocks & overhead shielding), 2.7 at PA and PB (shielding cabinets)is estimated.

Initiative Start/End Dates: Start Date: 6/11/2009 End Date: 8/5/2011

Initiative Revision Date: 8/26/2009

Action Plan: Shielding cabinets and overhead shielding structures

Action	Description	Owner	Start Date	Completion Date	Comments
1	Submit Partial Release BCS/AISC Part B	IMCS	6/11/2009	7/7/2009	The partial release BCS approval that we proposed was not accepted. Utilizing a person-Rem savings cost justification was also scrutinized. The AISC Committee wanted to see a direct link to FTE savings. They also wanted incorporation of dose savings related to feeder weld overlay replacing feeder replacement at Darlington. The BCS has been re-worked as a developmental release and is headed back through the AISC.
1.1	Partial Release BCS Dispositioned	IMCS	6/11/2009	7/7/2009	
2	Conceptual Design Complete	IMCS	8/17/2009	9/4/2009	
2.1	Interface Agreement Complete	IMCS	8/17/2009	8/21/2009	
2.2	Conceptual Design Plan Approved and Issued	IMCS	8/21/2009	8/28/2009	
2.3	Issue Project Execution Plan (PEP)	IMCS	8/28/2009	9/4/2009	
3	Issue Full Release BCS	IMCS	9/4/2009	10/13/2009	
3.1	Full Release BSC Dispostitioned	IMCS	10/6/2009	10/13/2009	
4	Vendor Delivery	IMCS	10/20/2009	5/21/2010	
4.1	Issue Vendor PO	IMCS	10/20/2009	5/21/2010	
5	Overhead Shielding Structure AFS	IMCS	6/17/2009	8/27/2010	
5.1	Equipment Commissioning & Testing	IMCS	5/21/2010	6/17/2010	
5.2	Issue Operating Instructions	IMCS	6/17/2010	7/13/2010	

Appendix G – Staffing Benchmark Analysis – EUCG Data (Plant Level)

This appendix presents plant-level staffing comparisons prepared using EUCG data.

Table 1: Total Staff Summary

Account		(a) DARLINGTON	(b) PICKERING B	(c) [redacted]	(d) [redacted]	(e) [redacted]	(f) PICKERING A	(g) [redacted]	(h) [redacted]	(i) [redacted]	(j) Mean of Lowest Quartile	(k) Mean of Median
CM0A	Design/Mods/Technical Engineering	44.4	50.9	22.2	18.7	29.3	60.1	16.0	0.0	33.9	18.2	31.3
CM0B	Plant Computer Engineering	8.0	8.0	3.5	0.0	3.7	8.0	5.0	0.0	0.0	1.4	1.2
CMADM	CM Administrative Support	0.0	0.0	0.3	0.2	0.7	0.0	0.5	0.0	2.0	0.9	1.1
CMMGMT	CM Management	2.7	3.0	0.3	1.3	1.7	4.2	0.5	21.5	6.6	3.2	2.9
CMTOT	***Total - Configuration Management***	***55.1***	***61.8***	***26.3***	***20.2***	***35.3***	***72.3***	***22.0***	***21.5***	***42.5***	***23.7***	***36.6***
ER0A	Plant Engineering	45.6	40.9	21.5	27.0	29.0	74.1	37.3	0.0	37.0	22.9	33.6
ER0B	Non-destructive Exams - NDE	24.3	24.3	0.0	2.2	0.7	24.3	0.0	0.0	4.0	0.6	2.6
ERADM	ER Administrative Support	1.2	1.2	1.2	0.5	0.7	0.9	0.0	0.0	1.5	0.8	1.0
ERMGMT	ER Management	3.1	2.9	1.5	3.0	1.7	2.6	2.0	37.9	5.0	5.4	3.3
ERTOT	***Total - Equipment Reliability***	***74.2***	***69.2***	***24.2***	***32.7***	***32.0***	***101.9***	***39.3***	***37.9***	***47.5***	***29.7***	***40.5***
LP02	QA	4.3	4.3	5.3	3.3	7.7	4.3	5.3	8.5	0.0	5.3	6.9
LP03	Quality Control	0.5	0.5	1.0	0.0	3.7	0.5	1.5	1.5	7.3	1.1	3.0
LP04	Corrective Action Program and OE	3.6	3.9	1.0	2.2	4.7	7.1	3.0	2.0	2.5	2.1	4.9
LP05	Safety/Health	3.7	3.0	2.8	11.0	1.3	5.7	2.5	2.0	4.5	1.5	3.4
LP06	Licensing	2.0	3.3	3.5	1.3	4.3	0.5	11.8	4.3	2.8	5.1	3.6
LP07	Emergency Preparedness	1.8	1.8	3.0	3.5	1.7	1.8	3.5	2.5	2.3	2.6	2.9
LP08	Dedicated Fire Responders	14.1	14.4	9.7	18.2	0.0	0.6	0.5	0.0	0.0	2.4	1.6
LPADM	LP Administrative Support	0.4	0.4	0.5	1.3	2.0	0.4	0.0	0.5	3.9	1.2	2.2
LPMGMT	LP Management	3.1	3.1	0.7	2.8	8.0	3.3	1.3	0.5	10.9	2.3	3.8
LPTOT	***Total - Loss Prevention***	***33.5***	***34.5***	***27.5***	***43.7***	***33.3***	***24.2***	***29.3***	***21.8***	***34.0***	***23.5***	***32.1***
MS01	Materials Mgmt/Warehousing	14.3	14.3	9.3	10.0	4.7	14.3	5.5	8.0	12.5	7.1	11.4
MS02	Contracts/Purchasing	17.7	18.2	2.3	5.3	4.7	18.4	2.3	11.5	0.0	4.2	4.6
MS03	Procurement Engineering	5.9	5.9	1.3	5.7	7.7	5.9	3.8	5.5	0.0	2.7	4.2
MSADM	MS Administrative Support	0.4	0.4	0.0	0.5	0.3	0.4	0.0	2.5	0.0	0.5	0.7
MSMGMT	MS Management	1.9	2.4	0.4	1.0	1.3	1.9	0.3	0.5	0.0	1.1	0.8
MSTOT	***Total - Materials & Services***	***40.2***	***41.2***	***13.4***	***22.5***	***18.7***	***40.9***	***11.8***	***28.0***	***12.5***	***15.6***	***21.7***
NF00	Nuclear Fuels/Reactor Engrg	9.3	11.3	5.5	13.3	14.0	11.0	2.8	7.0	15.4	4.2	7.5
NFADM	NF Administrative Support	0.3	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.3	0.1	0.2
NFMGMT	NF Management	0.5	0.8	0.5	0.8	3.3	1.5	0.5	0.0	2.1	0.5	0.9
NFTOT	***Total - Nuclear Fuel***	***10.0***	***12.0***	***6.0***	***14.2***	***18.0***	***12.5***	***3.3***	***7.0***	***17.9***	***4.9***	***8.5***
OP01A	Operations	115.8	92.3	47.3	96.5	61.7	186.3	53.0	70.5	65.0	55.4	63.7
OP01B	Operations Support	21.1	16.8	42.3	20.2	18.3	19.8	12.0	24.5	10.6	18.5	19.1
OP02	Environmental	3.1	3.8	2.0	0.0	1.3	1.8	0.5	1.0	0.5	1.4	1.5
OP03	Chemistry	14.2	19.5	9.5	8.5	16.0	0.2	10.0	16.0	9.5	12.8	13.3
OP04	Radiation Protection	20.8	20.8	25.3	12.3	23.0	20.8	12.0	26.0	25.5	20.8	23.2
OP05	Radwaste	23.1	23.4	5.0	2.2	3.7	23.1	1.5	0.5	0.5	2.2	2.1
OPADM	OP Administrative Support	2.1	1.3	1.0	0.5	3.7	2.8	0.0	3.5	4.1	2.0	2.7
OPMGMT	OP Management	5.8	4.6	1.2	4.8	9.3	7.8	1.8	2.5	15.8	5.4	7.7
OPTOT	***Total - Operate Plant***	***205.9***	***182.4***	***133.7***	***145.0***	***137.0***	***262.6***	***90.8***	***144.5***	***131.5***	***118.6***	***133.4***
SS01	Information Technology	1.5	1.0	2.7	11.0	10.3	1.7	10.0	15.5	0.0	6.0	9.5
SS02	Business Services	12.4	11.4	4.3	9.0	7.0	16.6	6.0	7.7	3.3	3.7	8.2
SS03	Records Management and Procedures	41.2	40.5	4.8	23.3	3.3	41.2	12.0	4.0	8.4	5.8	8.4
SS04	Human Resources	3.8	4.1	1.8	4.8	2.3	5.3	2.5	6.1	2.3	2.2	2.7
SS05	Housekeeping and Facilities Management	47.6	47.1	15.7	21.2	19.3	55.8	10.5	10.5	21.0	10.5	14.2
SS06	Communications and Community Relations	2.1	1.9	0.3	2.3	1.0	2.6	1.0	0.5	0.4	0.6	1.0
SS07	Management Assistance and Industry Assoc	0.3	0.3	0.7	11.8	0.0	0.3	0.8	2.5	2.4	1.1	1.9
SS08	Nuclear Officers and Executives	1.2	1.2	3.5	5.5	4.0	1.2	7.3	3.4	2.0	3.5	4.1
SSADM	SS Administrative Support	2.9	2.7	0.7	4.2	0.3	1.9	14.3	1.0	1.0	1.9	2.8
SSMGMT	SS Management	4.7	4.2	1.0	4.3	0.7	4.7	0.8	0.5	5.9	2.4	3.7
SSTOT	***Total - Management & Support Services***	***117.6***	***114.1***	***35.5***	***97.5***	***48.3***	***131.3***	***65.0***	***51.6***	***46.5***	***37.7***	***56.5***
TR00	Training - Develop and Conduct	24.9	24.6	24.3	21.8	19.3	24.6	21.5	25.5	28.6	18.9	26.2
TRADM	Training Administrative Support	0.4	0.4	0.5	1.2	2.0	0.4	0.0	2.5	1.8	1.2	3.5
TRMGMT	Training Management	0.9	0.9	0.7	1.3	2.0	0.9	1.8	0.5	2.9	2.1	2.0
TRTOT	***Total - Training***	***26.2***	***25.9***	***25.5***	***24.3***	***23.3***	***25.9***	***23.3***	***28.5***	***33.3***	***22.2***	***31.7***
WM01A	Planning	7.1	3.1	18.7	36.0	9.3	10.6	14.0	11.0	13.5	14.4	13.7
WM01B	Maintenance/Construction Support	29.3	23.8	10.3	4.3	69.3	35.3	7.0	0.0	0.0	7.4	11.3
WM01C	Scheduling	12.8	16.0	4.3	9.5	4.7	21.0	8.0	6.5	0.0	7.5	5.0
WM01D	Outage Management	9.0	10.5	6.7	0.0	2.7	25.7	3.5	3.0	5.4	3.2	3.8
WM01E	Project Management	0.0	0.0	2.2	0.8	14.0	0.0	0.0	3.0	0.0	4.0	1.8
WM02J	Electrical Maintenance	40.7	37.7	28.7	42.5	4.3	54.8	13.5	17.0	17.0	20.4	19.1
WM02K	I&C Maintenance	40.7	37.7	33.7	0.0	23.0	54.8	11.5	32.0	19.0	24.7	25.2
WM02L	Mechanical Maintenance	62.4	62.7	35.0	39.0	48.7	82.9	33.0	31.0	27.5	37.1	49.0
WM02M	Other Craft/Toolroom/Calibration	0.1	1.6	2.0	18.3	6.0	0.1	0.0	3.5	16.0	0.9	7.6
WMADM	WM Administrative Support	0.9	0.6	1.0	0.8	3.7	0.6	0.0	2.0	3.5	2.9	2.7
WMMGMT	WM Management	3.1	4.4	2.5	8.2	8.7	4.6	2.3	10.0	19.1	5.1	8.1
WMTOT	***Total - Work Management***	***205.9***	***197.9***	***145.0***	***159.5***	***194.3***	***290.4***	***92.8***	***119.0***	***121.0***	***127.6***	***147.2***
	Sub-Total Total Staff	768.3	738.8	437.1	559.5	540.3	962.0	377.3	459.8	486.6	403.5	508.3
CAPTOT	Total - Capital Staffing	0.0	0.0	1.3	44.3	9.3	0.0	30.3	17.5	0.0	6.6	15.7
LP01	Security (Note 1)	0.0	0.0	[redacted]	[redacted]	[redacted]	0.0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
ALLSTAFFTOT	Total Staffing with Capital and Security	768.3	738.8	[redacted]	[redacted]	[redacted]	962.0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Note 1: OPG Security Data excluded for confidentiality reasons.

Table 2: Onsite Staff Summary

Account	Account Description	(a) DARLINGTON (Median)	(b) PICKERING B (Median)	(c) [redacted]	(d) [redacted]	(e) [redacted]	(f) PICKERING A	(g) [redacted]	(h) [redacted]	(i) [redacted]	(j) Mean of Lowest Quartile	(k) Mean of Median
CM0A	Design/Mods/Technical Engineering	8.8	15.3	16.0	14.0	20.7	24.5	10.5	0.0	18.0	15.3	20.5
CM0B	Plant Computer Engineering	0.0	0.0	0.0	0.0	3.7	0.0	5.0	0.0	0.0	0.3	0.5
CMADM	CM Administrative Support	0.0	0.0	0.3	0.2	0.7	0.0	0.5	0.0	1.5	0.8	0.6
CMMGMT	CM Management	0.5	0.8	0.3	1.3	1.7	2.0	0.5	20.0	3.5	1.2	3.4
CMTOT	***Total - Configuration Management***	***9.3***	***16.0***	***16.7***	***15.5***	26.7	***26.5***	***16.5***	***20.0***	***23.0***	***17.6***	***25.0***
ER0A	Plant Engineering	31.5	26.8	19.0	25.2	24.7	60.0	31.5	0.0	37.0	23.9	31.5
ER0B	Non-destructive Exams - NDE	0.0	0.0	0.0	2.2	0.0	0.0	0.0	0.0	4.0	0.5	1.8
ERADM	ER Administrative Support	0.3	0.3	1.0	0.5	0.7	0.0	0.0	0.0	1.5	0.8	0.7
ERMGMT	ER Management	1.0	0.8	1.0	3.0	1.7	0.5	1.0	29.5	5.0	2.0	4.5
ERTOT	***Total - Equipment Reliability***	***32.8***	***27.8***	***21.0***	***30.8***	27.0	***60.5***	***32.5***	***29.5***	***47.5***	***27.2***	***38.4***
LP02	QA	0.0	0.0	2.7	3.0	0.0	0.0	3.5	7.0	0.0	3.9	4.9
LP03	Quality Control	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	5.5	0.8	2.0
LP04	Corrective Action Program and OE	2.5	2.8	1.0	2.0	2.7	6.0	2.5	2.0	2.5	2.3	3.9
LP05	Safety/Health	0.0	0.0	0.7	10.8	1.3	0.0	2.5	2.0	4.5	0.9	1.7
LP06	Licensing	1.5	2.8	2.3	1.3	3.0	0.0	6.0	4.0	2.0	3.2	2.7
LP07	Emergency Preparedness	0.0	0.0	0.7	3.5	1.7	0.0	3.5	2.5	1.5	1.5	2.4
LP08	Dedicated Fire Responders	13.5	13.8	9.7	18.2	0.0	0.0	0.5	0.0	0.0	1.4	3.3
LPADM	LP Administrative Support	0.0	0.0	0.0	1.3	2.0	0.0	0.0	0.5	3.0	0.9	1.2
LPMGMT	LP Management	1.0	1.0	0.0	2.8	5.3	1.5	0.0	0.5	9.5	1.5	3.0
LPTOT	***Total - Loss Prevention (w/o Security)***	***18.5***	***20.3***	***17.0***	***43.0***	16.0	***7.5***	***20.0***	***18.5***	***28.5***	***16.5***	***25.0***
MS01	Materials Mgmt/Warehousing	0.0	0.0	9.3	10.0	4.0	0.0	5.5	6.5	12.5	7.7	8.2
MS02	Contracts/Purchasing	0.8	1.3	0.0	5.3	0.0	1.5	1.5	5.5	0.0	2.4	1.8
MS03	Procurement Engineering	0.0	0.0	1.3	5.5	0.0	0.0	3.0	4.5	0.0	2.0	3.0
MSADM	MS Administrative Support	0.0	0.0	0.0	0.5	0.0	0.0	0.0	2.5	0.0	0.5	0.4
MSMGMT	MS Management	0.0	0.5	0.3	1.0	0.0	0.0	0.0	0.5	0.0	0.8	0.4
MSTOT	***Total - Materials & Services***	***0.8***	***1.8***	***11.0***	***22.3***	4.0	***1.5***	***10.0***	***19.5***	***12.5***	***13.4***	***13.8***
NF00	Nuclear Fuels/Reactor Engrg	9.3	11.3	3.0	13.0	6.0	11.0	0.0	1.5	0.0	1.6	3.1
NFADM	NF Administrative Support	0.3	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.1
NFMGMT	NF Management	0.5	0.8	0.0	0.8	1.7	1.5	0.0	0.0	0.0	0.3	0.2
NFTOT	***Total - Nuclear Fuel***	***10.0***	***12.0***	***3.0***	***13.8***	8.3	***12.5***	***0.0***	***1.5***	***0.0***	***1.8***	***3.4***
OP01A	Operations	114.0	90.5	47.3	96.5	61.7	184.5	53.0	70.5	65.0	52.2	69.5
OP01B	Operations Support	20.3	16.0	36.7	18.5	18.3	19.0	10.5	24.5	9.0	17.4	18.6
OP02	Environmental	1.3	2.0	2.0	0.0	1.3	0.0	0.5	1.0	0.5	1.2	1.2
OP03	Chemistry	14.0	19.3	8.7	8.3	15.0	0.0	10.0	16.0	9.5	12.3	14.1
OP04	Radiation Protection	9.5	9.5	19.7	12.3	15.3	9.5	12.0	26.0	25.5	19.8	20.8
OP05	Radwaste	0.0	0.3	5.0	2.2	3.0	0.0	1.5	0.5	0.5	1.8	2.0
OPADM	OP Administrative Support	0.8	0.3	1.0	0.5	3.7	2.0	0.0	3.5	4.0	2.1	2.1
OPMGMT	OP Management	2.3	1.3	1.0	4.8	7.7	5.5	1.5	2.5	15.5	5.8	6.5
OPTOT	***Total - Operate Plant***	***162.0***	***139.0***	***121.3***	***143.2***	126.0	***220.5***	***89.0***	***144.5***	***129.5***	***112.8***	***134.8***
SS01	Information Technology	0.3	0.0	2.0	10.8	3.3	0.0	3.0	14.5	0.0	3.2	3.0
SS02	Business Services	2.8	2.0	3.0	9.0	4.3	6.5	4.5	4.5	2.5	2.4	4.8
SS03	Records Management and Procedures	0.8	0.0	4.0	23.3	2.3	0.5	10.0	4.0	7.0	4.2	6.6
SS04	Human Resources	0.0	0.0	1.3	4.7	1.3	0.0	1.5	3.0	1.5	1.2	1.5
SS05	Housekeeping and Facilities Management	26.3	25.8	4.7	21.2	11.3	34.5	10.5	10.5	21.0	5.9	11.8
SS06	Communications and Community Relations	0.0	0.0	0.3	2.3	0.7	0.0	1.0	0.5	0.0	0.6	0.4
SS07	Management Assistance and Industry Assoc	0.0	0.0	0.3	11.7	0.0	0.0	0.5	2.5	1.0	0.4	1.2
SS08	Nuclear Officers and Executives	0.5	0.3	2.3	5.3	2.3	0.5	6.0	1.5	1.0	2.0	3.8
SSADM	SS Administrative Support	0.5	0.3	0.3	4.2	0.0	0.0	13.0	1.0	1.0	1.8	1.7
SSMGMT	SS Management	1.0	0.5	0.7	4.3	0.0	1.5	0.0	0.5	5.5	1.2	2.4
SSTOT	***Total - Management & Support Services***	***32.0***	***28.8***	***19.0***	***96.8***	25.7	***43.5***	***50.0***	***42.5***	***40.5***	***23.0***	***37.2***
TR00	Training - Develop and Conduct	0.3	0.0	17.7	15.3	18.3	0.0	21.5	24.5	26.5	18.4	22.3
TRADM	Training Administrative Support	0.0	0.0	0.3	1.2	2.0	0.0	0.0	2.5	1.5	1.3	2.9
TRMGMT	Training Management	0.0	0.0	0.7	1.3	2.0	0.0	1.5	0.5	2.5	1.6	1.8
TRTOT	***Total - Training***	***0.3***	***0.0***	***18.7***	***17.8***	22.3	***0.0***	***23.0***	***27.5***	***30.5***	***21.4***	***26.9***
WM01A	Planning	5.5	1.5	18.7	34.0	7.0	9.0	10.5	11.0	13.5	13.9	9.3
WM01B	Maintenance/Construction Support	11.0	5.5	4.0	4.3	11.0	17.0	7.0	0.0	0.0	4.0	6.0
WM01C	Scheduling	5.5	9.0	4.3	9.0	4.7	14.0	6.5	6.5	0.0	6.9	5.0
WM01D	Outage Management	8.8	10.3	6.7	0.0	2.3	25.5	3.5	3.0	5.0	2.3	4.6
WM01E	Project Management	0.0	0.0	1.3	0.8	6.0	0.0	0.0	2.5	0.0	1.8	0.9
WM02J	Electrical Maintenance	36.3	33.3	28.7	42.5	4.3	50.5	13.5	17.0	17.0	20.0	17.2
WM02K	I&C Maintenance	36.3	33.3	33.7	0.0	23.0	50.5	11.5	32.0	19.0	22.7	28.5
WM02L	Mechanical Maintenance	54.5	54.8	35.0	39.0	48.7	75.0	30.0	29.5	27.5	34.5	41.7
WM02M	Other Craft/Toolroom/Calibration	0.0	1.5	2.0	18.3	3.3	0.0	0.0	3.5	13.0	0.5	2.8
WMADM	WM Administrative Support	0.8	0.5	1.0	0.8	3.7	0.5	0.0	2.0	3.0	3.0	1.8
WMMGMT	WM Management	2.5	3.8	2.0	8.2	8.0	4.0	2.0	5.5	19.0	5.4	6.4
WMTOT	***Total - Work Management***	***161.0***	***153.3***	***137.3***	***157.0***	122.0	***246.0***	***84.5***	***112.5***	***117.0***	***115.1***	***124.1***
	Sub-Total On-Site	426.5	398.8	365.0	540.3	378.0	618.5	325.5	416.0	429.0	348.8	428.6
CAPTOT	Total - Capital Staffing	0.0	0.0	1.3	44.3	0.0	0.0	9.5	7.0	0.0	1.8	8.4
LP01	Security (Note 1)	0.0	0.0	[redacted]	[redacted]	[redacted]	0.0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
ALLSTAFFTOT	Total Staffing with Capital and Security	426.5	398.8	[redacted]	[redacted]	[redacted]	618.5	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Note 1: OPG Security Data excluded for confidentiality reasons.

Table 3: Offsite Staff Summary

		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Account	**Account Description**	DARLINGTON	PICKERING B	[redacted]	[redacted]	[redacted]	PICKERING A	[redacted]	[redacted]	[redacted]	Mean of Lowest Quartile	Mean of Median
CM0A	Design/Mods/Technical Engineering	35.6	35.6	6.2	0.0	0.0	35.6	0.0	0.0	15.9	0.0	2.9
CM0B	Plant Computer Engineering	8.0	8.0	3.5	0.0	0.0	8.0	0.0	0.0	0.0	0.0	0.7
CMADM	CM Administrative Support	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0
CMMGMT	CM Management	2.2	2.2	0.0	0.0	0.0	2.2	0.0	1.5	3.1	0.0	0.5
CMTOT	***Total - Configuration Management***	***45.8***	***45.8***	***9.7***	***0.0***	***0.0***	***45.8***	***0.0***	***1.5***	***19.5***	***0.0***	***4.2***
ER0A	Plant Engineering	14.1	14.1	2.5	0.0	3.0	14.1	2.8	0.0	0.0	0.0	1.4
ER0B	Non-destructive Exams - NDE	24.3	24.3	0.0	0.0	0.7	24.3	0.0	0.0	0.0	0.0	0.1
ERADM	ER Administrative Support	0.9	0.9	0.2	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0
ERMGMT	ER Management	2.1	2.1	0.5	0.0	0.0	2.1	1.0	8.4	0.0	0.0	0.9
ERTOT	***Total - Equipment Reliability***	***41.4***	***41.4***	***3.2***	***0.0***	***3.7***	***41.4***	***3.8***	***8.4***	***0.0***	***0.0***	***2.3***
LP02	QA	4.3	4.3	2.7	0.0	7.7	4.3	1.8	1.5	0.0	0.1	0.8
LP03	Quality Control	0.5	0.5	1.0	0.0	3.7	0.5	0.0	1.5	1.8	0.0	0.2
LP04	Corrective Action Program and OE	1.1	1.1	0.0	0.0	2.0	1.1	0.5	0.0	0.0	0.0	0.2
LP05	Safety/Health	3.7	3.0	2.2	0.0	0.0	5.7	0.0	0.0	0.0	0.0	0.3
LP06	Licensing	0.5	0.5	1.2	0.0	1.3	0.5	0.8	0.3	0.8	0.0	0.8
LP07	Emergency Preparedness	1.8	1.8	2.3	0.0	0.0	1.8	0.0	0.0	0.8	0.0	0.8
LP08	Dedicated Fire Responders	0.6	0.6	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0
LPADM	LP Administrative Support	0.4	0.4	0.5	0.0	0.0	0.4	0.0	0.0	0.9	0.0	0.3
LPMGMT	LP Management	2.1	2.1	0.7	0.0	2.7	1.8	1.3	0.0	1.4	0.0	0.6
LPTOT	***Total - Loss Prevention***	***15.0***	***14.3***	***10.5***	***0.0***	***17.3***	***16.7***	***4.3***	***3.3***	***5.5***	***0.1***	***4.0***
MS01	Materials Mgmt/Warehousing	14.3	14.3	0.0	0.0	0.7	14.3	0.0	1.5	0.0	0.2	0.2
MS02	Contracts/Purchasing	16.9	16.9	2.3	0.0	3.0	16.9	0.8	6.0	0.0	0.3	2.1
MS03	Procurement Engineering	5.9	5.9	0.0	0.0	7.7	5.9	0.3	1.0	0.0	0.1	0.2
MSADM	MS Administrative Support	0.4	0.4	0.0	0.0	0.3	0.4	0.0	0.0	0.0	0.0	0.1
MSMGMT	MS Management	1.9	1.9	0.1	0.0	1.3	1.9	0.3	0.0	0.0	0.2	0.1
MSTOT	***Total - Materials & Services***	***39.4***	***39.4***	***2.4***	***0.0***	***13.0***	***39.4***	***1.3***	***8.5***	***0.0***	***0.9***	***2.6***
NF00	Nuclear Fuels/Reactor Engrg	0.0	0.0	2.5	0.0	8.0	0.0	2.8	5.5	15.4	0.2	2.2
NFADM	NF Administrative Support	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.1
NFMGMT	NF Management	0.0	0.0	0.5	0.0	1.7	0.0	0.5	0.0	2.1	0.2	0.2
NFTOT	***Total - Nuclear Fuel***	***0.0***	***0.0***	***3.0***	***0.0***	***9.7***	***0.0***	***3.3***	***5.5***	***17.9***	***0.4***	***2.5***
OP01A	Operations	1.8	1.8	0.0	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.0
OP01B	Operations Support	0.8	0.8	0.0	0.0	0.0	0.8	0.0	0.0	1.6	0.0	0.1
OP02	Environmental	1.8	1.8	0.0	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.2
OP03	Chemistry	0.2	0.2	0.8	0.0	1.0	0.2	0.0	0.0	0.0	0.0	0.2
OP04	Radiation Protection	11.3	11.3	2.0	0.0	2.7	11.3	0.0	0.0	0.0	0.0	0.2
OP05	Radwaste	23.1	23.1	0.0	0.0	0.7	23.1	0.0	0.0	0.0	0.0	0.0
OPADM	OP Administrative Support	1.3	1.1	0.0	0.0	0.0	0.8	0.0	0.0	0.1	0.0	0.1
OPMGMT	OP Management	3.6	3.3	0.2	0.0	1.7	2.3	0.3	0.0	0.3	0.0	0.2
OPTOT	***Total - Operate Plant***	***43.9***	***43.4***	***3.0***	***0.0***	***6.0***	***42.1***	***0.3***	***0.0***	***2.0***	***0.0***	***0.9***
SS01	Information Technology	1.2	1.0	0.7	0.0	7.0	1.7	4.0	0.0	0.0	1.1	3.2
SS02	Business Services	9.6	9.4	1.3	0.0	1.3	10.1	1.5	3.2	0.8	0.1	1.1
SS03	Records Management and Procedures	40.5	40.5	0.8	0.0	0.0	40.7	0.5	0.0	1.4	0.0	0.4
SS04	Human Resources	3.8	4.1	0.5	0.0	1.0	5.3	1.0	2.6	0.8	0.1	1.2
SS05	Housekeeping and Facilities Management	21.3	21.3	0.0	0.0	0.0	21.3	0.0	0.0	0.0	0.0	0.4
SS06	Communications and Community Relations	2.1	1.9	0.0	0.0	0.3	2.6	0.0	0.0	0.4	0.0	0.2
SS07	Management Assistance and Industry Assoc	0.3	0.3	0.3	0.0	0.0	0.3	0.3	0.0	1.4	0.0	0.6
SS08	Nuclear Officers and Executives	0.7	1.0	1.2	0.0	1.7	0.7	1.3	1.9	1.0	0.0	1.1
SSADM	SS Administrative Support	2.4	2.4	0.3	0.0	0.3	1.9	1.3	0.0	0.0	0.0	0.2
SSMGMT	SS Management	3.7	3.7	0.3	0.0	0.7	3.2	0.8	0.0	0.4	0.0	0.5
SSTOT	***Total - Management & Support Services***	***85.6***	***85.3***	***5.5***	***0.0***	***12.3***	***87.8***	***10.5***	***7.6***	***6.0***	***1.3***	***8.9***
TR00	Training - Develop and Conduct	24.6	24.6	0.0	0.0	0.3	24.6	0.0	1.0	2.1	0.0	0.3
TRADM	Training Administrative Support	0.4	0.4	0.2	0.0	0.0	0.4	0.0	0.0	0.3	0.0	0.0
TRMGMT	Training Management	0.9	0.9	0.0	0.0	0.0	0.9	0.3	0.0	0.4	0.0	0.3
TRTOT	***Total - Training***	***25.9***	***25.9***	***0.2***	***0.0***	***0.3***	***25.9***	***0.3***	***1.0***	***2.8***	***0.0***	***0.7***
WM01A	Planning	1.6	1.6	0.0	0.0	0.7	1.6	0.0	0.0	0.0	0.0	0.1
WM01B	Maintenance/Construction Support	18.3	18.3	0.0	0.0	0.0	18.3	0.0	0.0	0.0	0.0	0.2
WM01C	Scheduling	7.3	7.0	0.0	0.0	0.0	7.0	0.0	0.0	0.0	0.0	0.1
WM01D	Outage Management	0.2	0.2	0.0	0.0	0.3	0.2	0.0	0.0	0.4	0.0	0.4
WM01E	Project Management	0.0	0.0	0.8	0.0	8.0	0.0	0.0	0.5	0.0	0.0	0.4
WM02J	Electrical Maintenance	4.4	4.4	0.0	0.0	0.0	4.3	0.0	0.0	0.0	0.0	0.2
WM02K	I&C Maintenance	4.4	4.4	0.0	0.0	0.0	4.3	0.0	0.0	0.0	0.0	0.0
WM02L	Mechanical Maintenance	7.9	7.9	0.0	0.0	0.0	7.9	0.0	1.5	0.0	0.0	0.3
WM02M	Other Craft/Toolroom/Calibration	0.1	0.1	0.0	0.0	2.7	0.1	0.0	0.0	0.0	0.0	0.0
WMADM	WM Administrative Support	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1
WMMGMT	WM Management	0.6	0.6	0.5	0.0	0.7	0.6	0.3	2.0	0.1	0.0	0.5
WMTOT	***Total - Work Management***	***44.9***	***44.7***	***1.3***	***0.0***	***12.3***	***44.4***	***0.3***	***4.0***	***0.5***	***0.0***	***2.2***
	Sub-Total Off-Site	341.8	340.1	38.8	0.0	74.7	343.5	23.8	39.8	54.1	2.7	28.3
CAPTOT	Total - Capital Staffing	0.0	0.0	0.0	0.0	9.3	0.0	1.3	0.0	0.0	0.0	0.1
LP01	Security (Note 1)	0.0	0.0	[redacted]	[redacted]	[redacted]	0.0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
ALLSTAFFTOT	Total Staffing with Capital and Security	341.8	340.1	[redacted]	[redacted]	[redacted]	343.5	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Note 1: OPG Security Data excluded for confidentiality reasons.

Table 4: Baseline Contractors Summary

Account	Account Description	(a) DARLINGTON (Lowest)	(b) PICKERING A (Lowest)	(c) [redacted]	(d) [redacted]	(e) [redacted]	(f) PICKERING A	(g) [redacted]	(h) [redacted]	(i) [redacted]	(j) Mean of Lowest Quartile	(k) Mean of Median
CM0A	Design/Mods/Technical Engineering	0.0	0.0	0.0	4.7	8.7	0.0	5.5	0.0	0.0	0.2	0.4
CM0B	Plant Computer Engineering	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CMADM	CM Administrative Support	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
CMMGMT	CM Management	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CMTOT	***Total - Configuration Management***	***0.0***	***0.0***	***0.0***	***4.7***	8.7	***0.0***	***5.5***	***0.0***	***0.0***	***0.3***	***0.4***
ER0A	Plant Engineering	0.0	0.0	0.0	1.8	1.3	0.0	3.0	0.0	0.0	0.0	0.2
ER0B	Non-destructive Exams - NDE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
ERADM	ER Administrative Support	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ERMGMT	ER Management	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ERTOT	***Total - Equipment Reliability***	***0.0***	***0.0***	***0.0***	***1.8***	1.3	***0.0***	***3.0***	***0.0***	***0.0***	***0.1***	***0.2***
LP02	QA	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.1
LP03	Quality Control	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LP04	Corrective Action Program and OE	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LP05	Safety/Health	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.6
LP06	Licensing	0.0	0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0
LP07	Emergency Preparedness	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LP08	Dedicated Fire Responders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LPADM	LP Administrative Support	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LPMGMT	LP Management	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LPTOT	***Total - Loss Prevention***	***0.0***	***0.0***	***0.0***	***0.7***	0.0	***0.0***	***5.0***	***0.0***	***0.0***	***0.1***	***0.7***
MS01	Materials Mgmt/Warehousing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
MS02	Contracts/Purchasing	0.0	0.0	0.0	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.1
MS03	Procurement Engineering	0.0	0.0	0.0	0.2	0.0	0.0	0.5	0.0	0.0	0.0	0.0
MSADM	MS Administrative Support	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MSMGMT	MS Management	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MSTOT	***Total - Materials & Services***	***0.0***	***0.0***	***0.0***	***0.2***	1.7	***0.0***	***0.5***	***0.0***	***0.0***	***0.0***	***0.4***
NF00	Nuclear Fuels/Reactor Engrg	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NFADM	NF Administrative Support	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NFMGMT	NF Management	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NFTOT	***Total - Nuclear Fuel***	***0.0***	***0.0***	***0.0***	***0.3***	0.0	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***
OP01A	Operations	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3
OP01B	Operations Support	0.0	0.0	5.7	1.7	0.0	0.0	1.5	0.0	0.0	0.0	0.3
OP02	Environmental	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2
OP03	Chemistry	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.0
OP04	Radiation Protection	0.0	0.0	3.7	0.0	5.0	0.0	0.0	0.0	0.0	0.2	0.2
OP05	Radwaste	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OPADM	OP Administrative Support	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
OPMGMT	OP Management	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OPTOT	***Total - Operate Plant***	***0.0***	***0.0***	***9.3***	***1.8***	5.0	***0.0***	***1.5***	***0.0***	***0.0***	***0.4***	***1.1***
SS01	Information Technology	0.0	0.0	0.0	0.2	0.0	0.0	3.0	1.0	0.0	0.3	0.8
SS02	Business Services	0.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0
SS03	Records Management and Procedures	0.0	0.0	0.0	0.0	1.0	0.0	1.5	0.0	0.0	0.0	0.3
SS04	Human Resources	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.5	0.0	0.0	0.0
SS05	Housekeeping and Facilities Management	0.0	0.0	11.0	0.0	8.0	0.0	0.0	0.0	0.0	0.8	3.3
SS06	Communications and Community Relations	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SS07	Management Assistance and Industry Assoc	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.1
SS08	Nuclear Officers and Executives	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SSADM	SS Administrative Support	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SSMGMT	SS Management	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SSTOT	***Total - Management & Support Services***	***0.0***	***0.0***	***11.0***	***0.7***	10.3	***0.0***	***4.5***	***1.5***	***0.0***	***1.1***	***4.5***
TR00	Training - Develop and Conduct	0.0	0.0	6.7	6.5	0.7	0.0	0.0	0.0	0.0	0.0	1.2
TRADM	Training Administrative Support	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TRMGMT	Training Management	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TRTOT	***Total - Training***	***0.0***	***0.0***	***6.7***	***6.5***	0.7	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***1.2***
WM01A	Planning	0.0	0.0	0.0	2.0	1.7	0.0	3.5	0.0	0.0	0.2	0.5
WM01B	Maintenance/Construction Support	0.0	0.0	6.3	0.0	58.3	0.0	0.0	0.0	0.0	0.8	2.2
WM01C	Scheduling	0.0	0.0	0.0	0.5	0.0	0.0	1.5	0.0	0.0	0.0	0.0
WM01D	Outage Management	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
WM01E	Project Management	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.9
WM02J	Electrical Maintenance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3
WM02K	I&C Maintenance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1
WM02L	Mechanical Maintenance	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.1	1.9
WM02M	Other Craft/Toolroom/Calibration	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.5	2.1
WMADM	WM Administrative Support	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.2
WMMGMT	WM Management	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	0.2	0.0
WMTOT	***Total - Work Management***	***0.0***	***0.0***	***6.3***	***2.5***	60.0	***0.0***	***8.0***	***2.5***	***3.5***	***2.8***	***8.3***
	Sub-Total Base-Line Contractors	0.0	0.0	33.3	19.2	87.7	0.0	28.0	4.0	3.5	4.9	16.9
CAPTOT	Total - Capital Staffing	0.0	0.0	0.0	0.0	0.0	0.0	19.5	10.5	0.0	0.7	1.9
LP01	Security (Note 1)	0.0	0.0	[redacted]	[redacted]	[redacted]	0.0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
ALLSTAFFTOT	Total Staffing with Capital and Security	0.0	0.0	[redacted]	[redacted]	[redacted]	0.0	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Note 1: OPG Security Data excluded for confidentiality reasons.

Appendix H – Staffing Benchmark Analysis – EUCG Data (Operator Level)

This appendix presents operator-level staffing comparisons prepared using EUCG data.

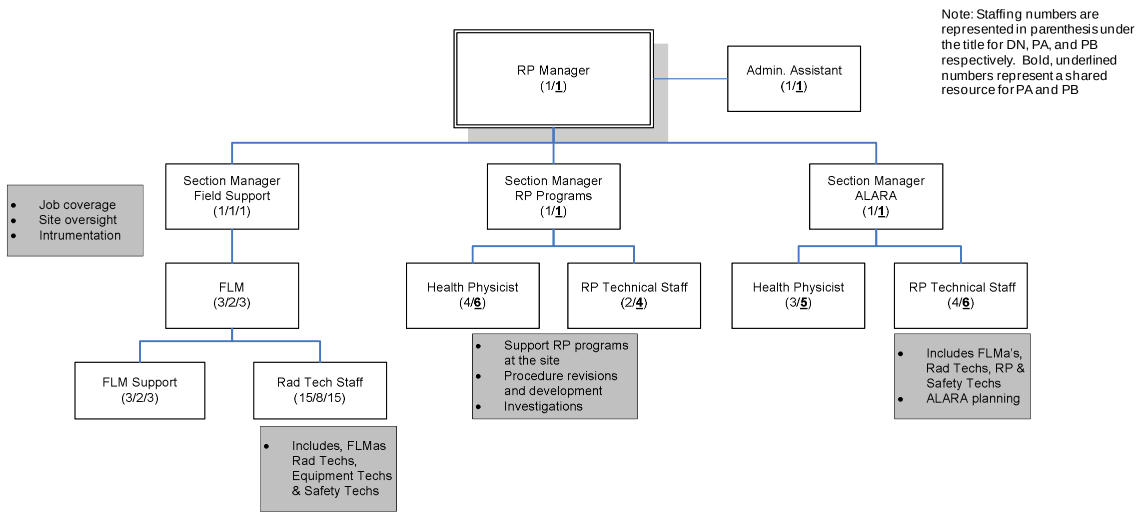
Offsite Operator Level Staffing Summary

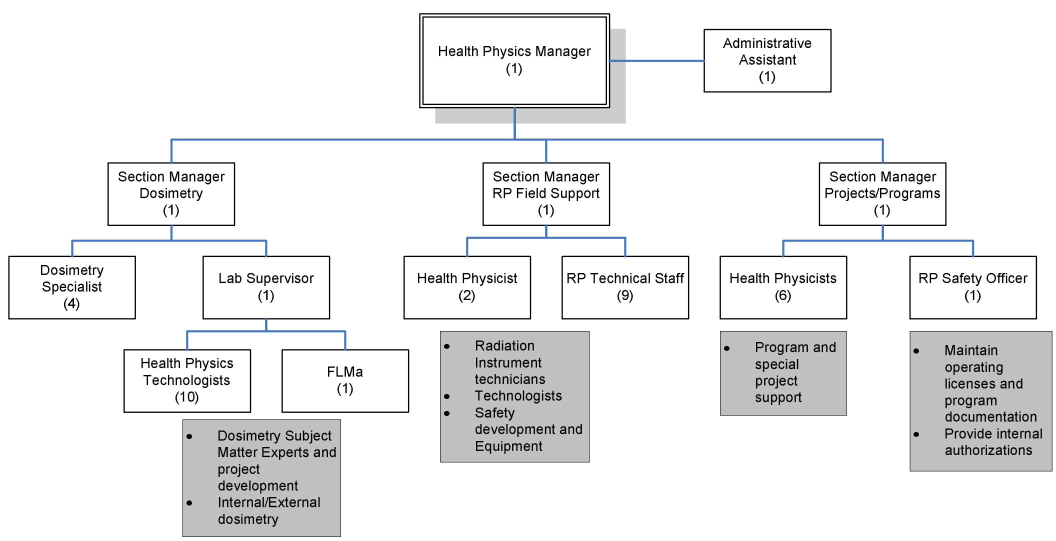
Account	Account Description	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	Ontario Power Generation
	Units	7.0	3.0	3.0	5.0	5.0	4.0	6.0	7.0	6.0	7.0	17.0	10.0
	Stations	5.0	2.0	2.0	3.0	4.0	3.0	3.0	4.0	3.0	3.0	10.0	3.0
CM0A	Design/Mods/Technical Engineering	0.0	0.0	0.0	3.0	31.0	9.0	37.0	126.5	112.9	0.0	77.0	356.0
CM0B	Plant Computer Engineering	0.0	0.0	0.0	0.0	0.0	0.0	21.0	0.0	0.0	0.0	26.0	80.0
CMADM	CM Administrative Support	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	5.0	0.0	1.0	0.0
CMMGMT	CM Management	0.0	0.0	0.0	4.0	0.0	0.0	0.0	25.0	6.0	0.0	25.0	22.0
CMTOT	***Total - Configuration Management***	***0.0***	***0.0***	***0.0***	***7.0***	***31.0***	***9.0***	***58.0***	***155.5***	***123.8***	***0.0***	***129.0***	***458.0***
ER0A	Plant Engineering	0.0	11.0	0.0	7.0	4.0	31.0	15.0	0.0	46.0	27.0	24.0	141.0
ER0B	Non-destructive Exams - NDE	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	9.0	6.0	5.2	243.0
ERADM	ER Administrative Support	0.0	0.0	0.0	0.0	0.0	0.2	1.0	0.0	2.0	0.0	0.0	9.0
ERMGMT	ER Management	1.0	4.0	19.0	31.8	5.0	0.2	3.0	0.0	2.0	0.0	4.2	21.0
ERTOT	***Total - Equipment Reliability***	***1.0***	***15.0***	***19.0***	***38.8***	***10.0***	***32.4***	***19.0***	***0.0***	***59.0***	***33.0***	***33.4***	***414.0***
LP02	QA	0.0	7.0	15.0	7.0	4.0	0.0	16.0	0.0	12.0	69.0	17.0	43.0
LP03	Quality Control	0.0	0.0	0.0	7.0	1.0	0.0	6.0	14.0	0.0	33.0	0.0	5.0
LP04	Corrective Action Program and OE	0.0	2.0	0.0	0.0	7.0	5.0	0.0	0.0	7.0	18.0	1.0	11.0
LP05	Safety/Health	0.0	0.0	0.0	0.0	1.0	4.0	14.0	0.0	9.0	0.0	0.9	38.0
LP06	Licensing	0.0	3.0	9.0	1.5	11.0	10.0	6.7	6.0	23.0	12.0	23.0	5.0
LP07	Emergency Preparedness	0.0	0.0	8.0	0.0	0.0	6.0	14.0	6.0	3.0	0.0	24.0	18.0
LP08	Dedicated Fire Responders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0
LPADM	LP Administrative Support	0.0	0.0	0.0	0.0	3.0	0.0	3.0	7.0	6.3	0.0	11.0	4.0
LPMGMT	LP Management	1.0	5.0	0.0	0.0	5.0	1.3	4.0	11.0	3.0	24.0	26.0	20.0
LPTOT	***Total - Loss Prevention***	***1.0***	***17.0***	***32.0***	***15.5***	***32.0***	***26.3***	***63.7***	***44.0***	***63.3***	***156.0***	***102.9***	***150.0***
MS01	Materials Mgmt/Warehousing	3.6	0.0	2.0	7.0	0.0	3.0	0.0	0.0	0.0	6.0	0.0	143.0
MS02	Contracts/Purchasing	6.5	3.0	2.0	29.0	4.0	44.0	17.0	0.0	30.0	25.0	6.2	169.0
MS03	Procurement Engineering	1.8	1.0	0.0	5.0	0.0	0.0	0.0	0.0	9.0	68.0	0.0	59.0
MSADM	MS Administrative Support	0.9	0.0	1.0	0.0	0.0	1.0	0.0	0.0	3.0	3.0	1.2	4.0
MSMGMT	MS Management	4.5	1.0	2.0	0.0	1.0	1.0	0.9	0.0	3.0	12.0	2.2	19.0
MSTOT	***Total - Materials & Services***	***17.3***	***5.0***	***7.0***	***41.0***	***5.0***	***49.0***	***17.9***	***0.0***	***45.0***	***114.0***	***9.6***	***394.0***
NF00	Nuclear Fuels/Reactor Engrg	0.0	11.0	16.0	25.0	29.0	15.0	15.0	108.0	23.0	74.0	38.0	0.0
NFADM	NF Administrative Support	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	6.0	0.0
NFMGMT	NF Management	0.0	2.0	0.0	0.0	2.0	1.0	2.3	15.0	3.0	15.0	8.0	0.0
NFTOT	***Total - Nuclear Fuel***	***0.0***	***13.0***	***16.0***	***25.0***	***31.0***	***16.0***	***17.3***	***125.0***	***28.0***	***89.0***	***52.0***	***0.0***
OP01A	Operations	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0
OP01B	Operations Support	0.0	0.0	0.0	0.0	0.0	0.7	0.0	13.0	0.0	0.0	5.0	8.0
OP02	Environmental	0.0	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	7.0	18.0
OP03	Chemistry	0.0	0.0	0.0	0.0	0.0	7.0	5.0	0.0	0.0	9.0	3.0	2.0
OP04	Radiation Protection	0.0	0.0	0.0	0.0	0.0	1.4	12.0	0.0	0.0	24.0	2.0	113.0
OP05	Radwaste	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	1.0	231.0
OPADM	OP Administrative Support	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	3.0	11.0
OPMGMT	OP Management	0.0	1.0	0.0	0.0	3.0	0.7	1.0	2.0	0.0	15.0	8.0	32.0
OPTOT	***Total - Operate Plant***	***0.0***	***1.0***	***0.0***	***1.0***	***3.0***	***12.0***	***18.0***	***16.0***	***0.0***	***54.0***	***29.0***	***433.0***
SS01	Information Technology	25.5	16.0	0.0	0.0	63.0	0.0	6.0	0.0	22.0	63.0	30.0	12.0
SS02	Business Services	0.0	6.0	0.0	15.0	7.0	1.7	10.0	6.0	68.0	12.0	19.0	96.0
SS03	Records Management and Procedures	0.0	2.0	0.0	0.0	0.0	10.0	5.0	11.0	2.3	0.0	15.0	405.0
SS04	Human Resources	0.6	4.0	0.0	12.0	2.5	8.0	4.0	6.0	11.0	9.0	11.0	42.0
SS05	Housekeeping and Facilities Management	0.0	0.0	52.0	0.5	0.0	2.7	0.0	0.0	0.0	0.0	2.4	213.0
SS06	Communications and Community Relations	0.0	0.0	0.0	0.0	0.0	0.7	0.0	3.0	6.0	3.0	4.0	21.0
SS07	Management Assistance and Industry Asso	0.0	1.0	0.0	0.0	3.0	8.0	2.0	11.0	1.0	0.0	25.0	3.0
SS08	Nuclear Officers and Executives	0.0	5.0	4.0	9.0	6.0	7.3	7.0	8.0	3.0	15.0	36.0	8.0
SSADM	SS Administrative Support	0.0	5.0	0.0	0.0	0.0	5.0	2.0	0.0	19.0	3.0	5.0	23.0
SSMGMT	SS Management	0.0	3.0	29.0	0.0	2.8	0.0	2.0	3.0	21.0	6.0	22.4	36.0
SSTOT	***Total - Management & Support Service***	***26.1***	***42.0***	***85.0***	***36.5***	***84.3***	***43.2***	***38.0***	***48.0***	***153.2***	***111.0***	***169.8***	***859.0***
TR00	Training - Develop and Conduct	0.0	0.0	0.0	4.0	0.3	0.0	0.0	17.0	3.0	3.0	12.0	246.0
TRADM	Training Administrative Support	0.0	0.0	0.0	0.0	0.0	0.0	1.0	2.0	0.0	0.0	1.0	4.0
TRMGMT	Training Management	0.0	1.0	0.0	1.0	0.8	1.0	0.0	3.0	0.0	0.0	16.0	9.0
TRTOT	***Total - Training***	***0.0***	***1.0***	***0.0***	***5.0***	***1.0***	***1.0***	***1.0***	***22.0***	***3.0***	***3.0***	***29.0***	***259.0***
WM01A	Planning	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	16.0
WM01B	Maintenance/Construction Support	0.0	0.0	0.0	1.0	1.0	2.0	0.0	0.0	0.0	0.0	8.0	183.0
WM01C	Scheduling	0.0	0.0	0.0	1.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	71.0
WM01D	Outage Management	0.0	0.0	16.0	1.0	0.0	1.0	0.0	3.0	0.0	3.0	24.0	2.0
WM01E	Project Management	1.0	0.0	0.0	2.0	0.0	4.0	5.0	0.0	0.0	59.0	12.0	0.0
WM02J	Electrical Maintenance	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0	44.0
WM02K	I&C Maintenance	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44.0
WM02L	Mechanical Maintenance	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	57.2	79.0
WM02M	Other Craft/Toolroom/Calibration	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.0	0.0	1.0
WMADM	WM Administrative Support	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	6.0	1.0
WMMGMT	WM Management	0.0	1.0	0.0	4.0	2.0	1.7	3.0	1.0	0.0	6.0	23.2	6.0
WMTOT	***Total - Work Management***	***1.0***	***1.0***	***16.0***	***19.0***	***3.0***	***12.6***	***8.0***	***4.0***	***0.0***	***98.0***	***142.4***	***447.0***
	Sub Total Off-Site	46.4	95.0	175.0	188.8	200.2	201.5	240.9	414.5	475.3	658.0	697.1	3414.0
CAPTOT	Total - Capital Staffing	0	5	0	0		0		0	42	80		
LP01	Security (Note 1)		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]		[redacted]	[redacted]	[redacted]
ALLSTAFFTOT	Total Staffing with Capital and Security	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Note 1: OPG Security Data excluded for confidentiality reasons.

Appendix I – RP Future State Organization and Staffing

The charts and table below summarize: (a) the future state standard site RP organization and staffing structure and (b) the future state Health Physics organization and staffing structure that resulted from the piloted top-down staffing analysis performed for this function.





Position	Current						Initial Proposal					
	DN	PA	PB	HP	RP S&T	Total	DN	PA	PB	HP	Total	Delta
Managers	4	4	4	4	3	19	4	1	4	4	**13**	**6**
Health Physicists	6	6	7	14	0	33	7	0	11	18	**36**	**-3**
Individual Contributors	29	16	29	28	32	134	28	12	32	17	**89**	**45**
Total Staff	**39**	**26**	**40**	**46**	**35**	**186**	**39**	**13**	**47**	**39**	**138**	**48**

Note: Delta includes reduction due to RP S&T realignment. Staff reduction is 13 excluding this adjustment

Report to

Ontario Power Generation Inc.

Regarding

Review of Centralized Support and Administrative Cost Allocation Methodology

March 5, 2010

TABLE OF CONTENTS

EXHIBITS

A. *Background and Purpose*

Black & Veatch Corporation ("Black & Veatch" or "we") is pleased to submit this Report to Ontario Power Generation Inc. ("OPG") on our Review of Centralized Support and Administrative Cost Allocation Methodology ("Review").

Previously ("2006 Review"), Black & Veatch was engaged by OPG to evaluate whether the methodology employed by OPG to distribute Centralized Support and Administrative ("CSA") costs separates the costs between regulated nuclear, regulated hydroelectric and unregulated operations in a manner that meets best practices and is consistent with precedents on cost allocation established by the Ontario Energy Board ("OEB"), and to make appropriate recommendations to OPG. Black & Veatch issued its Report on Cost Allocation Methodology Review dated April 30, 2006 ("2006 Report"), which was filed in EB-2007-0905 as Exhibit F4-T1-S1. In EB-2007-0905, the OEB concluded that "an appropriate cost allocation methodology and independent review can ensure there is no cross-subsidy between OPG's regulated and unregulated businesses," and directed that "the next independent review to include an evaluation of the cost allocation methodology and consideration of the Board's '3-prong test'".

In this Review, Black & Veatch was engaged by OPG to evaluate if its cost allocation methodology continues to meet best practices and OEB precedents, and additionally to evaluate if its cost allocation methodology meets the 3-prong test for affiliate transactions defined by the OEB in its Decision in EBRO 493/494. In this Report "regulated" and "unregulated" refer only to regulation by the OEB with respect to the payment amounts OPG receives with regard to its generating stations.

Black and Veatch's evaluation of the cost allocation methodology consisted of reviewing the allocators developed by OPG for ongoing consistency with the 2006 Review and, review of documentation and spreadsheets which detailed the method for cost allocations to nuclear business and between the regulated and unregulated hydroelectric businesses.

Black & Veatch was also asked to review OPG's methodology regarding allocation of revenues and costs to the Bruce Facilities and the Bruce Lease (described below).

B. *Organization of Ontario Power Generation*

Ontario Power Generation Inc. is wholly owned by the Province of Ontario. Its principal business is the generation and sale of electricity in Ontario and to interconnected markets.

OPG is primarily organized by generation technology, with the following Business Segments receiving CSA functions and services ("Service Recipients") listed in Table 1.

TABLE 1. BUSINESS SEGMENTS RECEIVING CSA FUNCTIONS AND SERVICES
Nuclear Generation- Regulated *(Nuclear Waste Management is a separate segment for financial reporting but included with Nuclear Generation in this Review)*
Hydroelectric Generation- Regulated
Hydroelectric Generation- Unregulated
Thermal (Fossil) Generation- Unregulated
Other Business Non-generation, including Energy Markets which supports generation businesses and performs other activities

The costs for regulated generating operations, including the CSA Costs distributed to them, may be considered in future proceedings before the OEB in determining payment amounts that OPG receives with regard to those regulated generating operations.

Many of the functions and services necessary to support the Business Segments are performed by centralized employee groups within OPG. The groups that provide the CSA functions and services ("Service Providers") are listed in Table 2. Table 2. Exhibit C presents the departmental budgets for 2010 for the CSA Service Providers.

TABLE 2. GROUPS PROVIDING CSA FUNCTIONS AND SERVICES

Group	2010 Budget ($ millions)	% Total
Information Technology	$163.6	40.7%
Finance	60.4	15.0%
Human Resources	54.0	13.5%
Real Estate and Business Services	41.7	10.4%
Corporate Affairs	33.8	8.4%
Corporate Center	26.2	6.5%
Energy Markets	22.0	5.5%
	401.7	**100.0%**
Hydroelectric Common / OSL Common	38.3	
Centrally Held Costs (not an employee group)	260.8	
	$**700.8**	

C. *Summary of Approach*

Our Review comprised the tasks listed in **Error! Reference source not found.**

TABLE 3. TASKS	
Task	**DESCRIPTION**
Task 1	Review OPG's business and organization, and the departments included in CSA Costs. Discuss changes from 2006.
Task 2	Review and evaluate the methodology used by OPG to distribute 2010 CSA costs, including overall design, use of direct assignment, selection of cost drivers and documentation.
Task 3	Plan approach to determine and document OPG's compliance with 3-Prong Test.
Task 4	Review and evaluate completed questionnaires for 3-Prong Test.
Task 5	Prepare Report on review of cost allocation methodology and 3-Prong Test, and Black & Veatch's conclusions and recommendations.

The reader is referred to the 2006 Report for information on how the costs for departments that support more than one Business Segment are distributed among those Business Segments, including direct assignment, time and cost estimates and allocation using cost drivers; a discussion of cost drivers; the criteria used by Black & Veatch to select appropriate cost drivers; and types of cost drivers including external, internal and blended. A cost driver is a formula for sharing costs among those who cause the costs to be incurred; the use of cost drivers to allocate costs of shared resources conforms to regulatory precedent and is widely accepted.

D. *Scope*

Consistent with standard practice for independent review consulting assignments, we relied on the genuineness and completeness of all documents (including spreadsheets) presented to us by OPG and we accepted factual statements made to us by OPG (e.g., budget dollars; specific time assignments), subject only to overall reasonableness considerations and actual contrary knowledge, but without independent confirmation.

The total CSA Costs for 2010 are estimated to be C$700.8 million (including Centrally Held costs and Hydroelectric / OSL Common). In making judgments based on materiality, and in developing statistics for this Report, we used a budget provided by OPG that OPG expects will be reasonably close to actual departmental costs for 2010.

Consistent with the 2006 review, Black and Veatch did not review the models used by OPG to implement the methodology.

H. *Cost Allocation Methodology*

This section includes a discussion of Task 1 and Task 2 identified in Table 3.

Task 1- Review OPG's business and organization, and the departments included in CSA Costs. Discuss changes from 2006.

The purpose of this task was to identify how OPG is organized. This information was obtained from OPG public and internal documents and discussions with OPG personnel.

OPG's business and organization are discussed in Section B. There were no organizational changes from 2006 that would indicate the methodology is not appropriate or should be revised.

The Service Recipients for the CSA functions and services are the Business Segments identified in Table 1. The Service Providers are the departments identified in Table 2.

Task 2- Review and evaluate the methodology used by OPG to distribute 2010 CSA Costs, including overall design, use of direct assignment, selection of cost drivers and documentation.

The purpose of OPG's cost distribution methodology is to distribute the CSA Costs among the Business Segments, and in the case of Hydroelectric, between the regulated and unregulated stations. The information in this Task was obtained by Black & Veatch in discussions with OPG personnel and review of the document "OPG Revenue and Cost Allocation Methodology" dated January 14, 2010, which documents OPG's CSA cost allocation methodology.

The reader is referred to the 2006 Report for information on how the costs of the Service Provider departments are distributed among the Service Recipient Business Segments. The costs are distributed based on the following relationships:

- Direct assignment to generating station
- Direct assignment to Business Segment
- Time and cost basis, using actual records or estimates
- Allocation using cost drivers; the primary cost driver types used by OPG are: OM&A and Capital Blend; Physical attributes; Headcount; Transactions

If the relationships identified above do not have sufficient detail to enable costs to be distributed to stations, a sub-distribution is needed. For example, certain Information Technology costs are distributed first among various IT applications, then sub-distributed to the Business Segments or stations based on the users of the applications.

"OPG Revenue and Cost Allocation Methodology" describes how costs are directly assigned or allocated from Service Providers, for example:

- "Direct assignment to a station is applied when the costs are either directly related to the operations of that station or directly support the operations of a station." (p. 3)

- "The allocation of costs incurred on information technology is based mainly on physical measurement of usage by the generating stations. These measurements include LAN ID's, number of computers, storage of data, software licenses, and users for specific applications, e.g. SAP and Passport" (p. 4)
- "Allocation is based on the number of transactions or invoice values processed on behalf of the organizational group (based on previous year results)" (p. 4)

"OPG Revenue and Cost Allocation Methodology" also describes the functions and services performed by each Service Provider, and on what basis the costs it incurs are directly assigned or allocated. For Service Recipients, it describes the nature of the business and on what basis CSA costs are directly assigned or allocated to it.

Design

In evaluating the design of OPG's methodology, we considered the following:

- Does the methodology reflect how the business is organized and operated?

<u>Evaluation</u>: OPG's methodology follows its organizational structure, in which the majority of the costs of the CSA functions and services are integral to running the Business Segments (e.g., engineering and human resources), and Business Segments receive many of their necessary support functions and services from CSA departments rather than decentralized resources residing in/reporting to the business units. This permits extensive use of direct assignment. In addition, the use of internal allocators for costs initially distributed to CSA groups is also appropriate given the centralized support structure.

- Are sufficient resources devoted to the cost allocation process? Do management and the users understand and support the process?

<u>Evaluation</u>: OPG's cost allocation process has the support of senior levels of management including the assignment of dedicated resources. The heads of the organizations that Black & Veatch interviewed are knowledgeable about the cost allocation methodology and understand how to work within it to meet the needs of their businesses.

- Is sufficient information gathered from reliable sources to support specific identification, time estimation and selection of appropriate cost drivers?

<u>Evaluation</u>: The methodology relies on the judgments of departmental managers and Business Segments to support specific identification of labor and non-labor costs, and time estimation. These are the people in the best position to determine how resources are used. Currently, results are reviewed by representatives of the Controller's department that support each Business Segment; OPG informed Black & Veatch that in 2010 the review will be expanded to include representatives of Business Segments.

The department heads that we interviewed believe the cost drivers selected are appropriate, and they have the opportunity to review them if they believe necessary. Obtaining input from the people closest to the resources improves the quality of decisions as to cost drivers.

Conclusion on Design: OPG's methodology reflects how OPG is organized and operated. OPG has devoted sufficient resources to the cost allocation process. The process is understood and supported by management and the users. Sufficient information is gathered from reliable sources to support specific identification, time estimation and selection of cost drivers.

Use of Direct Assignment

- Is the use of direct assignment appropriate?

Evaluation: Direct assignment is preferable to allocation because it is means there is a direct relationship between the costs incurred and the Business Segment or Station causing it to be incurred. 0shows that over 70% of CSA costs are directly assigned.

Conclusion on Direct Assignment: The OPG methodology uses direct assignment wherever possible.

Selection of Cost Drivers

- Are the cost drivers selected by OPG appropriate?

Evaluation: Exhibit D lists the cost drivers selected by OPG for those instances where less than all costs could be distributed by direct assignments. OPG's cost driver selections are appropriate based on the nature of the costs and are consistent with those identified in the 2006 Report, which reflected input from Black & Veatch. There has been significant standardization of allocators, as recommended in the 2006 Report. In addition, the allocators selected by OPG are consistent with the principles and the selection criteria stated in the 2006 Report, Section IV. D.

In our 2006 Report, Black & Veatch recommended that department budgets be broken into more detailed activities. OPG has established more detailed activities for the 2010 department budgets. Labor and non-labor costs are reviewed and assigned or allocated separately, which was a recommendation in Black & Veatch's 2006 report.

Conclusion on Selection of Cost Drivers: The cost drivers listed in Exhibit D are appropriate based on the principles and the selection criteria stated in the 2006 Report and the operation of OPG's business.

Documentation

Evaluation:

Methodology- The document OPG "OPG Revenue and Cost Allocation Methodology" is a reasonably complete and detailed description of OPG's cost allocation methodology. The document presents the information in a reasonably standardized format, which required some effort to achieve because of the diverse nature of CSA groups and

Business Segments. Because people with many perspectives participate in the CSA cost allocation process, this is an important achievement.

Models- OPG sent to Black & Veatch working copies of the models used in the cost allocation process, which were tested to validate that the models used are consistent with the documented methodology. The purpose of the models is to make calculations easier and to support compliance with OPG's CSA cost allocation methodology. The purpose of preparing documentation for the models is to make it easier and more efficient and reliable to update them, to obtain information from them and to check them. OPG has developed documentation for the models for systems administrators and IT personnel. Based on the draft that we reviewed, Black & Veatch recommends the documentation of the models be expanded to be more applicable to business users.

Conclusion on Documentation: OPG's documentation for its cost allocation methodology is substantially improved from that we reviewed in 2006. It now provides a reasonable explanation of the methodology to OPG personnel, the OEB and intervenors, promotes consistent application of principles and makes the methodology easier to adapt as the business changes. Black & Veatch also notes that documentation of the models for systems administrators and IT personnel is under development, and recommends that the documentation of the models be expanded to be more applicable to business users.

Overall Conclusion on CSA Cost Allocation Methodology

OPG's CSA cost allocation methodology reflects how OPG is organized and operated. The process is understood and supported by management and the users. Sufficient information is gathered from reliable sources to support specific identification, time estimation and selection of cost drivers. Direct assignment is used wherever possible. The cost drivers selected are appropriate based on the principles and the selection criteria stated in the 2006 Report and OPG's business. Documentation explains the methodology reasonably well, and promotes consistent application of principles and makes the methodology easier to adapt as the business changes. Black & Veatch recommends that documentation of the model for systems administrators and IT personnel continue, and be expanded to be more applicable to business users.

I. *3-Prong Test*

This section includes a discussion of Task 3 and Task 4 identified in Table 3.

Task 3- Plan approach to determine and document OPG's compliance with 3-Prong Test.

Background for evaluation of 3-prong test

In its Decision with Reasons for OPG's filing at Docket EB 2007-0905, the OEB wrote, "The Board expects the next independent review to include an evaluation of the cost allocation methodology and consideration of the Board's 3-prong test." The 3-prong test is summarized as follows:

1. Cost incurrence: Were the corporate centre charges prudently incurred by, or on behalf of, the utility for the provision of services required by Ontario ratepayers?

2. Cost allocation: Were the corporate centre charges allocated appropriately to the recipient companies based on the application of cost drivers/allocation factors supported by principles of cost causality?

3. Cost / benefit: Did the benefits to the Company's Ontario ratepayers equal or exceed the costs?

At OPG, many of the shared Centralized Support and Administrative functions and services are provided to the Service Recipient Business Segments by dedicated personnel; therefore the OPG methodology must capture the costs of specific personnel and activities so they can be assigned correctly. In many other utilities, it is only necessary to capture costs at the department level.

In addition, at OPG the majority of the costs of the CSA functions and services are integral to running the Business Segments (e.g., engineering and human resources). For many other companies, shared functions and services are not integral to running the business but are primarily administrative (e.g., financial accounting and invoice processing). Therefore, Service Providers and Service Recipients (Regulated Hydroelectric and Nuclear businesses) must work together closely to ensure the needs of the Service Recipients are met, the level of service is appropriate and the costs are correctly assigned or allocated.

Design of questionnaires

Black & Veatch and OPG determined that the company's compliance with the 3-prong test could be evaluated by asking Service Recipients and Service Providers to complete a questionnaire designed to provide sufficient, relevant information. Black & Veatch used as a starting point a questionnaire used by Meyers, Norris Penny LLP, an independent consultant engaged to review the corporate service charges between the parent company, Enbridge Inc. and its subsidiary, Enbridge Gas Distribution ("Enbridge") to support Enbridge's cost allocation method. Black & Veatch adapted the Enbridge questionnaire to reflect: a) the different corporate arrangement (i.e. OPG's costs are allocated within a single corporate entity, Enbridge's are allocated from a separate affiliated entity to operating subsidiaries in multiple provinces and countries), b) the unique aspects of OPG's business and c) its shared cost methodology.

In designing the OPG questionnaire, we identified how each question addresses one or more of the prongs, to ensure each was adequately addressed; we also believed this would lead to a more thorough review of the responses.

The questionnaire for Service Recipients is included as Exhibit A, and for Service Providers as Exhibit B.

Selection of Service Provider Respondents

Corporate support and administrative functions at OPG for which the allocation methodology has been developed include: Business Services and Information Technology (BS&IT including Real Estate and Corporate Supply Chain), Finance, Human Resources, Corporate Affairs (comprising Public Affairs, Energy Markets, Regulatory Affairs, Emergency Preparedness, and Sustainable Development), and Corporate Centre (Executive Office, Corporate Secretary, Corporate Generation Development and Law).

OPG requested that questionnaires be completed by the following Service Provider groups, representing approximately 85% of the allocated CSA costs for CSA functions and services: Information Technology, Real Estate Services, Finance, Human Resources and Public Affairs(a department within Corporate Affairs). This provided sufficient evidence for Black & Veatch to reach its conclusions.

Administration of questionnaires

After the questionnaires were designed we spoke with Robert Cappadocia of Elenchus Research Associates ("ERA"), who was selected by OPG to administer the questionnaires, and with other OPG personnel, to ensure that all of the questions were clearly written and their purposes understood, and to discuss the level of detail needed to provide adequate documentation.

The questionnaires were administered through in-person interviews to Service Recipients and Service Providers by Robert Cappadocia, who performed a similar role for Enbridge.

<u>Task 4- Review and evaluate completed questionnaires for 3-Prong Test.</u>

Black & Veatch reviewed the documented responses to the questionnaires discussed during the interviews with the following Service Recipients: Nuclear and Hydro, and by the following Service Providers: Information Technology, Finance, Real Estate, Public Affairs and Human Resources.

Each of the answers to the questionnaires that Black & Veatch reviewed is responsive to the questions asked, and provides sufficient detail to support statements made as to level and quality of service, responsiveness of Service Providers and cost effectiveness. The documented responses to the questionnaires, together with Black & Veatch's review of the cost allocation methodology, provide sufficient information to assess whether each of the 3 prongs is being met.

As a follow-up, Black & Veatch re-contacted the heads of Nuclear and Hydro (the largest Service Recipients) and BS&IT and Finance (the largest Service Providers, representing 57% of CSA costs). The purpose of these discussions was to validate their documented responses on the questionnaires, to confirm their familiarity with the allocation process and methodology as well as to obtain further information on specific items. In the follow-up interviews, Black and Veatch found that the Service Recipients and Service Providers understood the questions, and the answers on the questionnaires were based on their personal experience with the allocation process and with the services that their Business Segment received of their departments provided.

Black & Veatch also confirmed that the responses from Nuclear, Hydro and BS&IT, as well as information received regarding Real Estate, applied to costs that are charged through Asset Service Fees.[1]

1. Cost incurrence: *Were the corporate centre charges prudently incurred by, or on behalf of, the utility for the provision of services required by Ontario ratepayers?*

The completed Service Recipient questionnaires clearly indicated that the services they receive are necessary to running their Business Segments. The descriptions of services received are detailed and demonstrate familiarity with the nature of the services received, which was confirmed in the interviews with Nuclear and Hydro.

The Hydro response states that most of the services received are required to fulfill the Shareholder mandate/relationship, ensure compliance with typical Corporate governance and Ontario Business Corporation requirements, operate and comply with all external regulatory and other requirements, and ensure proper due diligence in the areas of safety, environment, and risk and asset management. Hydro also states that most shared services are essential for Hydro, and some are desirable. The only activity noted that would not be needed if Hydro were standalone company is the Federal Representative in Ottawa, which is the exception that proves the rule (i.e., this very small cost is the only exception, therefore the process works very well).

The Nuclear response, likewise, states that all the shared services that are provided, are needed. Nuclear also states that the level of services is tailored to its needs- the level of service received is adequate but not more than is needed. Nuclear also reports that the IT applications it uses are reviewed and it is seeking to eliminate nearly 1,000 which will improve efficiency and reduce costs.

Both Nuclear and Hydro understand the services provided and the purpose of each function, and confirmed for each service how it is used and why it is needed in their respective businesses.

As discussed in *Cost / benefit* (below), Hydro and Nuclear work with the Service Providers BS&IT and Real Estate to determine the services needed and the levels of service, and these decisions are based on collaborative cost / benefit analyses.

The Service Providers stated that the needs of the Service Recipients are the primary criteria in evaluating the usefulness of the activities they perform and the level of service they provide. BS&IT states that its budgeting process explicitly seeks to optimize service availability while reducing costs, and to align spending with the priorities of OPG and of

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[1] OPG allocates the costs of IT assets and Real Estate using Asset Service Fees ("ASFs"). ASFs Include depreciation expense, return on Net Book Value including income taxes, and operating costs not otherwise charged (e.g., property taxes). In the 2006 Report, Black & Veatch reviewed the methodology OPG uses to determine ASFs and to allocate them to the assets users, and found OPG's approach to be reasonable. OPG conforms that the same approach is used at present, and Black & Veatch believes OPG's approach remains reasonable.

the Business Segments, and its budgeting process includes measures of financial return. BS&IT states that this process includes applications and programming as well as assets.

OPG provided to Black & Veatch the results of benchmarking studies for its IT, Finance and Human Resources departments, as discussed in *Cost / benefit* (below).

Conclusion on Cost incurrence: The Service Providers tailor their offerings to meet the needs of the Service Recipients, and the levels of service they provide are adequate but not excessive. The CSA costs were prudently incurred for the benefit the Service Recipients, to enable them to meet the needs of the Ontario ratepayers they serve.

2. *Cost allocation*: *Were the corporate centre charges allocated appropriately to the recipient companies based on the application of cost drivers/allocation factors supported by principles of cost causality?*

Black & Veatch reviewed cost allocation as part of Task 1 and Task 2 in Table 3. In addition, Black & Veatch found that the Service Recipients are familiar with the cost allocation methodology, and understand that costs can be either directly assigned or allocated to their Business Segment. They reported that they have the opportunity to challenge both the level of services provided and the costs they are allocated. Hydro expects costs to be stable over the Business Planning horizon (2009-2012). Service Recipients are also familiar with how ASFs are determined and how costs incurred by Service Providers are allocated to their businesses.

Hydro has determined that 80% of the BS&IT costs it is allocated are for core services that are specifically needed by it, including WAN / LAN, Hydro business systems, Hydro connectivity projects, and SCADA upgrades. Hydro also reports that the current cost allocation methodology has been refined as business activities have changed, to use appropriate allocators.

Hydro also reports that its overall needs for Risk Management services are not as great as Nuclear's needs, and accordingly it is allocated a much smaller share of Risk Management costs.

Nuclear reports that they understand which Service Providers their costs are coming from and what they have to do to reduce costs. Both Nuclear and Hydro report that changes in usage for IT assets and real estate are appropriately reflected in ASFs they are charged. Black & Veatch considers a cost allocation methodology that responds to changes in levels of service to be very effective.

These findings are important peripheral indicators of the appropriateness of the cost allocation methodology. For example, the ability to produce reasonably stable costs is important for a cost allocation methodology, so that Service Recipients can forecast costs; and the ability of a methodology to reflect changes in the level is service received is very important.

Real Estate assets are in service for extended periods and costs incurred cannot be changed in the short term, however surplus space is leased to third parties, therefore the costs allocated to Service Recipients reflect actual needs and usage.

Conclusion on Cost allocation:Black & Veatch reviewed the cost allocation methodology separately, as reported in this Report. In addition, the Service Recipients are familiar with the cost allocation methodology, and believe the cost allocations are appropriate and reflect differences in levels of service.

3. *Cost / benefit: Did the benefits to the Company's Ontario ratepayers equal or exceed the costs?*

Hydro and Nuclear stated that in working with the Service Providers BS&IT and Real Estate, determining the nature and level of services provided is a collaborative process, and costs are considered in this process. For BS&IT and Real Estate, many activities and service offerings are discretionary or at least can be provided at varying levels of service, therefore a collaborative planning process is appropriate and provides the opportunity to weigh explicitly the benefits and costs for each potential activity service offering.

BS&IT states that its budgeting process explicitly seeks to optimize service availability while reducing costs, and to align spending with the priorities of OPG and of the Business Segments. BS&IT also states that its budgeting process includes measures of financial return.

Nuclear stated that the level of services is functional and flexible, and is tailored to its needs- the level of service received is adequate but not more than is needed.

Hydro and Nuclear also stated that they work collaboratively with the Service Providers Finance and Human Resources to determine the requirements of the Business Segments, but these Service Providers do not involve them in setting cost budgets. This is appropriate because to a large extent, the services provided by Finance and Human Resources are not discretionary, therefore it is not possible to compare benefits and costs.

Both Hydro and Nuclear stated that the Public Affairs group helps to build relationships with stakeholders including towns, cities, First Nations and community groups.

OPG provided to Black & Veatch the results of benchmarking studies for its IT, Finance and Human Resources departments. For IT, OPG's costs per GWh generated were 69% of the simple average of 11 companies (93% if a high-cost outlier is excluded). For Finance, OPG was ranked in the first quartile for both effectiveness and efficiency; staffing levels were below (i.e., more favorable than) the peer group; this advantage was somewhat offset by higher labor costs which may be due to OPG's location in downtown Toronto. For Human Resources, OPG's provides Human Resources support at average or lower cost than peer group companies.

The benchmarking studies, which cover 70% of CSA costs, show that these CSA functions and services are provided at favorable costs to comparable utilities.

Conclusion on Cost / benefit: Service Providers explicitly consider the needs of the Service Recipients in developing their budgets, and often weigh explicitly the benefits and costs of activities they ate considering. Benchmark studies indicate the major Service Providers are average or favorable to average performers.

Overall Conclusion on 3-Prong Test

The responses to the questionnaires, including the interviews conducted by Black & Veatch, as well as other information reviewed, provide sufficient, reliable evidence that OPG's allocated Centralized Support and Administrative functions and services costs meet the requirements of the OEB's 3 prong test.

J. Summary of Conclusions and Recommendations

The methodology used by OPG to distribute the cost of the Centralized Support and Administrative functions and services separates the costs between regulated and unregulated Business Segments in a manner that meets current best practices and is consistent with cost allocation precedents established by the OEB.

The responses provided by Service Recipients and Service Providers to the questionnaires, and the interviews conducted by Black & Veatch as well as other information reviewed, provide sufficient, reliable evidence that OPG's allocated Centralized Support and Administrative functions and services costs meet the requirements of the OEB's 3 prong test.

Black & Veatch reviewed the recommendations made to OPG in our 2006 Report, and found that they have been implemented, including improving documentation for the cost allocation methodology and process, and separately assigning or allocating labor and non-labor costs for each department. We recommend that the documentation for the cost allocation models, which OPG has drafted, be completed and expanded to be more applicable to business users.

K. *Summary of Cost Drivers*

0summarizes the types of costs drivers used to distribute CSA Costs (excluding Hydroelectric Common) to the Business Segments; the percentages are based on the estimated 2010 Budget amounts.

TABLE 4. DIRECT ASSIGNMENTS AND COST DRIVERS USED FOR DISTRIBUTION OF CSA COSTS TO BUSINESS SEGMENTS

Direct Assignment or Type of Cost Driver	Centralized Support & Administrative Functions	Centrally Held Costs	CSA Costs (A)
Direct Assignment	50.5%	92.5%	67.0%
Physical cost drivers	26.1%		15.8%
Financial cost drivers	0.1%	7.5%	3.0%
OMA / CapEx cost driver	10.2%		6.2%
Internal Cost Drivers	4.3%		2.6%
Other	8.8%		5.4%
Total	**100.0%**	**100.0%**	**100.0%**

(A) Excludes Hydroelectric Common which is 100% directly assigned to the Hydroelectric Business Segment.

L. *Summary of Direct Assignments and Cost Drivers Selected- Exhibit D*

This Section describes Exhibit D, which summarizes the Distributions of the CSA Costs, indicates costs that are distributed by direct assignment, and identifies the cost drivers selected by OPG for those instances where less than all costs could be distributed by direct assignments.

Column A lists each department that provides the CSA functions and services and the group to which the department belongs, and lists the activities within each department.

Column B shows each activity's percentage of the departmental budget for 2010. Each department sums to 100%.

Columns C-G show how departmental costs are distributed to the Business Segments, and in the case of the Hydroelectric Business Segment, among regulated and unregulated generating stations. If a portion of costs are Direct Assigned to one or more Business Segments, the Direct Assignment method is shown in Column C and the amount, shown as a percentage of the departmental budget for 2010, is shown in Column D. The Direct Assignment methods listed in Column C include Specific, Estimate and Historic.

For the portion of costs to be allocated to the Business Segments, Column E shows the cost driver and Column F shows the amount as a percentage of the departmental budget for 2010. For each activity, the percentages in Columns D and F total the percentage in Column B.

All of OPG's nuclear plants are in the Nuclear Business Segment, which is regulated, all of its fossil plants are in the Fossil Business Segment, which is unregulated, and all Other Business (which includes Energy Trading, Energy Contracts and other activities) is unregulated. Therefore costs that are distributed to Nuclear, Fossil or Other Business are already determined to be either regulated or unregulated.

However, some plants within the Hydroelectric Business Segment are regulated and some are unregulated. Therefore, Column G shows how the cost of each activity is distributed between Hydroelectric Regulated and Hydroelectric Unregulated. The entries in Column G apply to costs that are Direct Assigned. For Direct Assigned costs, Column G shows either:

- If it was possible to Direct Assign between Hydroelectric Regulated and Hydroelectric Unregulated, Column G shows "Specific to Stations"; "Estimates to Stations"; or "Historical to Stations"; depending on the type of Direct Assignment.
- If it was not possible to Direct Assign between Hydroelectric Regulated and Hydroelectric Unregulated, Column G shows the cost driver used to allocate between Hydroelectric Regulated and Hydroelectric Unregulated.
- If no costs were Direct Assigned to Hydroelectric, Column G shows "N/A".

For Allocated costs, there are no entries in Column G because all of the cost drivers in Column E separate costs between Hydroelectric Regulated and Hydroelectric Unregulated.

In addition to the sale of electric energy output, OPG's Business Units receive revenue from the sale of Ancillary Services. As part of this engagement, Rudden was also asked to review OPG's methodology regarding distributing the CSA Costs between energy output and Ancillary Services.

M. *Bruce Lease*

Background on Bruce Lease and Bruce Stations

The Nuclear Business Segment includes revenue and costs under the terms of a lease arrangement ("Bruce Lease") with Bruce Power L.P. ("Bruce Power") related to the Bruce nuclear generating stations ("Bruce Facilities"). Under the Bruce Lease, Bruce Power operates the plant and receives all of the revenue from sales of electric energy and capacity, and OPG receives lease revenue from Bruce Power.

OEB Decision Concerning Bruce Stations

The OEB found that "the appropriate method to calculate OPG's test period revenues and costs related to the Bruce stations is to use amounts calculated in accordance with

GAAP"[2]. The OEB provided the following direction[3] to OPG to determine the net of revenues and costs for the Bruce facilities:

- "costs" should exclude the return on equity and deemed interest expense.
- costs should include all items that would be recognized as expenses under GAAP, including accretion expense on the nuclear liabilities. Forecast earnings on the segregated funds related to the Bruce liabilities should be included as a reduction of costs.
- OPG should calculate Bruce lease revenue in accordance with GAAP for a non-regulated business.
- OPG should include an income tax (PILS) provision, calculated in accordance with GAAP, in its computation of Bruce costs

The OEB concluded that "any profit (or loss) in respect of OPG's Bruce lease, calculated in accordance with GAAP, will increase (or decrease) the payment amounts for the prescribed assets."[4]

The OEB also directed OPG to establish a variance account to capture the difference between forecast and actual Bruce lease net revenues, to ensure that the actual excess of Bruce Lease revenues over expenses is used to offset the payment amounts.

Analysis

Black and Veatch reviewed the attribution and allocation of revenues and costs to the Bruce Facilities to determine whether they are consistent with the OEB's Decision in EB-2007-0905.

The EB-2007-0905 Payment Amount Order, Appendix A, Table 7 lists the revenues and costs used to determine the Bruce Lease forecast net revenue amount that is used to reduce the nuclear payment amount and is also used as the basis for determining the Bruce Lease variance account balance. 0 Table 5 lists the Bruce Lease costs and revenues included in the Bruce Lease forecast net revenue, and identifies whether each item is directly assigned or allocated; and the allocation methodology if applicable.

[2] EB-2007-0905 Decision With Reasons, Page 109
[3] EB-2007-0905 Decision With Reasons, Page 110
[4] EB-2007-0905 Decision With Reasons, Page 111.

TABLE 5. BRUCE LEASE REVENUE AND COSTS			
Revenue / Cost Components		**Direct Assignment / Allocation**	**Method / Basis of Allocation**
Revenue:			
1	Lease Revenue – (Fixed Base, Supplemental & Amortization of Prepaid)	Assigned Directly	
2	Site services (OPG to Bruce Power)	Assigned Directly	
3	Low and Intermediate Level Waste Services	Assigned Directly	
4	Cobalt-60	Assigned Directly	
Cost s:			
5	Depreciation	Assigned Directly	
6	Property Tax	Assigned Directly	
7	Capital Tax	Allocated	Net Book Value (NBV)
8A	Used Fuel Storage (UFS) & Disposal (UFD)	UFS – Assigned Directly; USD – Allocated	
8B	Waste Management Variable expense	Assigned Directly	
9	Interest	Allocated	Average of NBV of Capital Assets
10	Income Tax (current and future)	Assigned Directly (based on stand-alone calculation of Bruce Facilities' revenues and costs)	
11	(Earning) Losses on Segregated Funds	Assigned Directly based on opening fund balances and fund activity during the period based on the Ontario Nuclear Funds Agreement (ONFA)	
12	Accretion	Assigned directly (calculated using accretion rate per GAAP applied to asset retirement obligation	N/A
13	Total Costs	Computed	

All of the Bruce Lease revenues and costs for 2009 are based on OPG's accounting records and are directly assigned, or allocated based on accounting Net Book Values or computed on another basis consistent with GAAP. Therefore the revenues and cost variances recorded in OPG's Bruce Lease variance account, and included in OPG's audited 2009 financial statements for its consolidated operations, are consistent with GAAP.

Black and Veatch notes that OPG's methodology treats CSA costs allocated to the Bruce Facilities as Other Nuclear Costs. Other Nuclear Costs are not allocated to the Bruce Lease and they are not reflected in the Bruce Lease variance account.

Black and Veatch notes that these CSA costs which could be allocated to the Bruce Lease are relatively small in amount, and are fairly stable from year to year, therefore expected differences from the forecast are minor. In addition, as OPG's treatment is consistent with the EB-2007-0905 Payment Amounts Order, Black and Veatch believes that OPG's treatment is reasonable.

Conclusion

Black & Veatch has reviewed OPG's methodology for assigning and allocating revenues and costs to the Bruce facilities and under the Bruce Lease. We believe that the methodology is appropriate and properly reflects the costs OPG incurs and the revenues it realizes, and complies with the OEB's Decision in EB-2007-0905.

OPG CENTRALIZED SUPPORT AND ADMINISTRATIVE COSTS

REVIEW OF CENTRALIZED SUPPORT AND ADMINISTRATIVE COST ALLOCATION METHODOLOGY

3-PRONG TEST QUESTIONNAIRE FOR SERVICE RECIPIENTS

Questions For Service Recipients	3-Prong Test	Comment
INTRODUCTION		
1. How long have you been in your current position? 2. How many people are in your department? 3. How many people within your department use this shared service?	General	Background
DESCRIPTION OF SHARED SERVICES RECEIVED		
4. Does the service description accurately reflect the service being provided in terms of completeness and technical specifications?	Incurrence	Validation of the service being provided
5. Is this service essential? Is it desirable? Explain how you use this shared service to perform your responsibilities.	Incurrence	Basic to determining if service is required
6. Is the level of service being provided at a level that is different than what is actually needed?	Incurrence / Cost-Benefit	Additional info on level of service received and cost-benefit
CORRELATION OF COSTS AND THE SHARED SERVICES RECEIVED		
7. What benefits are received by your department from this service? How do these benefits relate to your business (or go-to-market proposition)? What is value-added about this service?	Incurrence / Cost-Benefit	Confirms Incurrence; Qualitative Cost-Benefit assessment
8. Does the benefit of this service exceed the cost you are allocated for the service? How is this cost/benefit relationship measured? Is it documented?	Cost-Benefit	Qualitative Cost-Benefit assessment
THE BUDGETING PROCESS FOR SHARED SERVICES		
9. Please explain your budget process, including the approval processes?	Incurrence / Cost-Benefit	Ability to challenge budgeted costs confirms Incurrence and Cost-Benefit

OPG CENTRALIZED SUPPORT AND ADMINISTRATIVE COSTS

REVIEW OF CENTRALIZED SUPPORT AND ADMINISTRATIVE COST ALLOCATION METHODOLOGY

3-PRONG TEST QUESTIONNAIRE FOR SERVICE RECIPIENTS

Questions For Service Recipients	3-Prong Test	Comment
10. Describe any disagreements that you have had about amounts allocated to your department under Corporate Allocation Methodology. Was disagreement about level of service provided, amount, other? How was it resolved?	Incurrence / Cost-Benefit	Same as Q9
ALTERNATE SERVICE PROVISIONS		
11. What would it take to perform this shared service at the level of your department ("in-house)? Consider initial and going costs, and direct and indirect (e.g. supervision, training) costs. Would there be any difference in quality of service?	Allocation / Cost-Benefit	'Business Case' in brief; Fundamental to Allocation / Cost-Benefit
a. Is such an analysis performed? By whom, when, and how frequently?	Allocation / Cost-Benefit	Be prepared to discuss why not
12. If OPG Corporate could not provide this service, who would provide this service, or could it be eliminated? a. Have you considered outsourcing this service? Are you able to qualify it as an outsourced service?	Incurrence / Cost Benefit	Fundamental to Incurrence

OPG CENTRALIZED SUPPORT AND ADMINISTRATIVE COSTS

REVIEW OF CENTRALIZED SUPPORT AND ADMINISTRATIVE COST ALLOCATION METHODOLOGY

3-PRONG TEST QUESTIONNAIRE FOR SERVICE PROVIDERS

Questions For Service Providers	3-Prong Test	Comment
INTRODUCTION		
1. How long have you been in your current position? 2. How many people are in your department? 3. To whom do you report? 4. Do any business unit staff report directly to you? If so, who?	General	Background
DESCRIPTION OF DEPARTMENTAL SERVICES		
5. Please provide a brief summary of services provided by your department	General	Background
6. Are any of these services performed by external contractors or outsourced? a. If yes, please provide the costs, qualifications, etc. b. If no, has your department considered outsourcing?	Cost Benefit	Are there costs to manage contractors? Is there a mark-up to service recipients?
DESCRIPTION OF SHARED SERVICES PROVIDED		
7. How many people within your department provide, or support those providing, service to service recipients?	General	Background
8. How does your department support the service recipients?	Incurrence	Fundamental to Incurrence
9. How is the need for support determined?	Incurrence	Fundamental to Incurrence
THE BUDGETING PROCESS FOR SHARED SERVICES		
10. Please explain your budgeting process, including the approval processes	Incurrence	Fundamental prudence part of Incurrence

OPG CENTRALIZED SUPPORT AND ADMINISTRATIVE COSTS

REVIEW OF CENTRALIZED SUPPORT AND ADMINISTRATIVE COST ALLOCATION METHODOLOGY

3-PRONG TEST QUESTIONNAIRE FOR SERVICE PROVIDERS

Questions For Service Providers	3-Prong Test	Comment
11. What is the policy for cost variances – to be absorbed by the department or shared with the service recipient?	Allocation	Incidental to Allocation
TIME ESTIMATION OR OTHER ALLOCATION BASES		
12. Please describe how your department tracks time spent on providing service to service recipients. Are logs available?	Allocation	Fundamental to Allocation
13. Are there any anomalies that would affect the data (extended employee absences, extraordinary projects, cyclicality)	Allocation	Incidental to Allocation
14. If other allocation bases are used: a. Describe in concept b. Explain why this particular allocation basis is used	Allocation	Fundamental to Allocation

OPG CENTRALIZED SUPPORT AND ADMINISTRATIVE COSTS
REVIEW OF CENTRALIZED SUPPORT AND ADMINISTRATIVE COST ALLOCATION METHODOLOGY
DEPARTMENTAL BUDGETS FOR 2010

DEPARTMENT / Activities	2010 Budget C$000s	2010 Budget % of Total	Distribution to Business Units- Direct Assign %
Human Resources Group	54,000	8.1%	45.6%
Corporate Center Group			
Executive Office	5,563	0.8%	-
Law	11,094	1.7%	76.1%
Corporate Secretariat	4,280	0.6%	-
COO	5,281	0.8%	100.0%
	26,217	4.0%	52.3%
Finance Group			
Controllership	47,940	7.2%	38.0%
Treasury	3,457	0.5%	27.0%
Risk Services	3,602	0.5%	73.7%
Internal Audit	4,132	0.6%	87.8%
CFO Office	1,285	0.2%	-
	60,417	9.1%	42.1%
Corporate Affairs Group			
Sustainable Development	2,972	0.4%	80.0%
E8	750	0.1%	-
Emergency Preparedness	3,468	0.5%	85.0%
Public Affairs	16,615	2.5%	93.8%
Regulatory Affairs / Strategic Planning	8,739	1.3%	87.0%
SVP Office	1,291	0.2%	33.6%
	33,835	5.1%	85.6%
BS&IT Group	163,600	24.7%	38.7%
Energy Markets Group	22,000	3.3%	92.1%
Real Estate			
Real Estate Services	13,789	2.1%	96.0%
Business Services	18,017	2.7%	25.2%
Facilities Services	9,137	1.4%	95.1%
Fleet Services	306	0.0%	-
Vice President's Office	417	0.1%	-
	41,665	6.3%	63.5%
Total CSA Costs (excl. Hydroelectric Common)	**401,734**	**60.6%**	50.5%
Centrally Held Costs	260,849	39.4%	92.5%
Total (excl. Hydroelectric Common)	**662,583**	**100.0%**	**67.0%**
Hydroelectric Common Support Costs			
Hydroelectric Business Unit Common Support Costs	32,352	84.5%	100.0%
Ottawa-St. Lawrence Common Support Costs	5,937	15.5%	100.0%
Total	**38,289**	**100.0%**	**100.0%**
Total (including Hydroelectric Common)	**700,871**		

OPG CENTRALIZED SUPPORT AND ADMINISTRATIVE COSTS
REVIEW OF CENTRALIZED SUPPORT AND ADMINISTRATIVE COST ALLOCATION METHODOLOGY
SUMMARY OF COST DISTRIBUTIONS - 2010 BUDGET

		DISTRIBUTION TO BUSINESS UNITS				HYDROELECTRIC
		Direct Assignment		Allocation		Regulated / Unregulated
DEPARTMENT / Activities (A)	Activity % Dept. (B)	Method (C)	Direct Assign (D)	Cost Driver (E)	BU Allocation % (F)	Applies to Direct Assignment (G)
HUMAN RESOURCES GROUP						
Nuclear HR & Employee Safety	27.3%	Specific	27.3%			N/A
Hydro / Fossil HR & Employee Safety	16.8%	Specific/Estimates	16.8%			Specific to Stations
Corporate HR	17.4%			FTEs	17.4%	FTEs
HR Strategy & Reporting	0.5%			FTEs	0.5%	FTEs
Labour Relations	6.3%			FTEs	6.3%	FTEs
Corp. Safety. Wellness, Comp/Benefits	21.0%	Specific / Estimates	1.5%	FTEs	19.5%	FTEs
Executive Vice President's Office	10.7%			FTEs	10.7%	
	100.0%		45.6%		54.4%	
CORPORATE CENTER GROUP- EXECUTIVE OFFICE						
Executive Office	100.0%			Blend- OM&A / CapEx	100.0%	
	100.0%		0.0%		100.0%	
CORPORATE CENTER GROUP- LAW						
General Corp	11.0%	Estimates	8.0%	Blend OM&A/CapEx	3.0%	> Blend- OM&A / CapEx > Internal- Energy Markets Total > Est Hydro Reg / Hydro Unreg
SVP & Labour	3.4%	Estimates		Blend OM&A/CapEx	3.4%	
Admin	14.6%	Estimates	13.5%	Blend OM&A/CapEx	1.1%	
Labour/Employment	19.6%	Estimates	14.2%	Blend OM&A/CapEx	5.5%	
Hydro/Fossil Projects	16.6%	Estimates	11.6%	Blend OM&A/CapEx	5.0%	
Regulated/Environmental	21.8%	Estimates	17.0%	Blend OM&A/CapEx	4.8%	
Nuclear Projects	13.0%	Estimates	11.8%	Blend OM&A/CapEx	1.2%	> Blend- OM&A / CapEx > Internal- Energy Markets Total > Est Hydro Reg / Hydro Unreg
	100.0%		76.1%		23.9%	
CORPORATE CENTER GROUP- CORPORATE SECRETARIAT						
Corporate Secretariat	58.8%			Blend- OM&A / CapEx	58.8%	
Board of Directors	41.2%			Blend- OM&A / CapEx	41.2%	
	100.0%		0.0%		100.0%	
COO's OFFICE						
Corp Gen Dev - Other Bus	100.0%	Specific	100.0%			N/A
	100.0%		100.0%		0.0%	
FINANCE GROUP- CONTROLLERSHIP						
Controllership- Nuclear Accounting, Planning and Support	22.3%	Specific	22.3%			N/A
Controllership- Energy Markets	10.0%			Internal- Energy Markets Total	10.0%	
Controllership - Corp Functions	4.9%			Blend- OM&A / CapEx	4.9%	
Controllership- Fossil	8.2%	Specific	8.2%			N/A
Controllership- Hydro	6.1%	Specific	6.1%			Estimates to Stations
Financial Proc. Services- Accts Payable	7.7%			> Transactions- Accts Payable > Blend- OM&A / CapEx	7.7%	
Financial Processing Services- Office	4.9%			Blend- OM&A / CapEx	4.9%	
Controllership- Accounting	7.0%			Blend- OM&A / CapEx	7.0%	
Corp Business & Investment Planning	9.9%			Historical\management estimate; Secondary Blend- OM&A / CapEx	9.9%	Blend- OM&A / CapEx
Financial Proc. Services- Accts Receivable and Asset Management	1.9%			Transactions- AR / Asset Management	1.9%	
Regulatory Accounting	1.4%	Regulated Revenue Requirement	1.4%			
Vice President, Financial Services Office	6.9%			Blend- OM&A / CapEx	6.9%	
Financial Processes	2.6%			Blend- OM&A / CapEx	2.6%	
Taxation - Income, Other	2.0%			Blend- OM&A / CapEx	2.0%	
Taxation - Commodity	4.2%			M&S/External Purchase Services Expenditures	4.2%	
	100.0%		38.0%		62.0%	

OPG CENTRALIZED SUPPORT AND ADMINISTRATIVE COSTS
REVIEW OF CENTRALIZED SUPPORT AND ADMINISTRATIVE COST ALLOCATION METHODOLOGY
SUMMARY OF COST DISTRIBUTIONS - 2010 BUDGET

		DISTRIBUTION TO BUSINESS UNITS				HYDROELECTRIC
		Direct Assignment		Allocation		Regulated / Unregulated
DEPARTMENT / Activities	Activity % Dept.	Method	Direct Assign	Cost Driver	BU Allocation %	Applies to Direct Assignment
FINANCE GROUP- TREASURY						
Treasury Operations	59.1%			Blend- OM&A / CapEx	59.1%	
Investor Relations	13.9%			Blend- OM&A / CapEx	13.9%	
Ontario Nuclear Funds Management	27.0%	Specific	27.0%			N/A
	100.0%		27.0%		73.0%	
FINANCE GROUP- RISK SERVICES						
Credit Risk	35.4%	Estimates	26.8%	Blend- OM&A / CapEx	8.6%	> Blend- Revenue / Fuel (excl. Hydro GRC) > Internal- Energy Markets Total > Est Hydro Reg / Hydro Unreg
Market Risk	27.1%	Estimates	20.3%	Blend- Revenue / Fuel (excl. Hydro GRC)	6.8%	> Blend- OM&A / CapEx > Internal- Energy Markets Total > Est Hydro Reg / Hydro Unreg
Operational Risk	35.3%	Estimates	25.1%	Blend- OM&A / CapEx	10.2%	> Blend- OM&A / CapEx > Internal- Energy Markets Total > Est Hydro Reg / Hydro Unreg
Risk Services Office	2.2%	Estimates	1.5%	Internal- Finance Total	0.7%	
	100.0%		73.7%		26.3%	
FINANCE GROUP- INTERNAL AUDIT						
Internal Audit	100.0%	Estimates	87.8%	Blend- OM&A / CapEx	12.2%	M&S / External Purchase Services Expenditures
	100.0%		87.8%		12.2%	
FINANCE GROUP- CFO OFFICE						
CFO Office	72.2%			Internal- Finance Total	72.2%	
Pension Fund Reviews External Purchase Service	27.8%			FTEs	27.8%	
	100.0%		0.0%		100.0%	
CORPORATE AFFAIRS GROUP- SUSTAINABLE DEVELOPMENT						
Sustainable Development	100.0%	Estimates	80.0%	Blend- OM&A / CapEx	20.0%	M&S / External Purchase Services Expenditures
	100.0%		80.0%		20.0%	
CORPORATE AFFAIRS GROUP- E8						
E8	100.0%			Blend- OM&A / CapEx	100.0%	M&S / External Purchase Services Expenditures
	100.0%		0.0%		100.0%	
CORPORATE AFFAIRS GROUP- EMERGENCY PREPAREDNESS						
Emergency Preparedness	100.0%	Estimates	85.0%	Blend- OM&A / CapEx	15.0%	Hydro OMA / CapEx
	100.0%		85.0%		15.0%	
CORPORATE AFFAIRS GROUP- PUBLIC AFFAIRS						
Public Affairs Labor Costs	30.3%	Estimates	24.7%	Blend- OM&A / CapEx	5.6%	Estimates to Stations
Corporate Citizenship Program	2.4%	Estimates	2.4%			Specific to Stations
Donations	12.9%	Estimates	12.9%			
Community Research Programs	3.4%	Estimates	3.4%			
Advertising	1.5%	Estimates	1.5%			N/A
Public Affairs - Site Specific	30.8%	Specific	30.8%			
Media Relations	2.8%	Estimates	2.4%	Blend- OM&A / CapEx	0.4%	
PA VP Office	4.7%	Estimates	4.5%	Blend- OM&A / CapEx	0.2%	
Water Safety Awareness	11.2%	Estimates	11.2%			MWh Generation
	100.0%		93.8%		6.2%	
CORPORATE AFFAIRS GROUP- REGULATORY AFFAIRS / STRATEGIC PLANNING						
Regulatory Affairs- Labor Costs	97.0%	Specific / Estimates	84.0%	Blend- OM&A / CapEx	13.0%	Blend- OM&A / CapEx
Regulatory Affairs- Consulting	3.0%	Specific / Estimates	3.0%			Blend- OM&A / CapEx
	100.0%		87.0%		13.0%	

OPG CENTRALIZED SUPPORT AND ADMINISTRATIVE COSTS
REVIEW OF CENTRALIZED SUPPORT AND ADMINISTRATIVE COST ALLOCATION METHODOLOGY
SUMMARY OF COST DISTRIBUTIONS - 2010 BUDGET

		DISTRIBUTION TO BUSINESS UNITS				HYDROELECTRIC
		Direct Assignment		Allocation		Regulated / Unregulated
DEPARTMENT / Activities	Activity % Dept.	Method	Direct Assign	Cost Driver	BU Alloc-ation %	Applies to Direct Assignment
CORPORATE AFFAIRS GROUP- SVP OFFICE						
Corporate Affairs Senior Vice President's Office	100.0%	Estimates	33.6%	Blend- OM&A / CapEx	66.4%	
	100.0%		33.6%		66.4%	
BS&IT GROUP- Outsourcing						
Service Management Services	0.9%	Specific/Estimates	0.6%	Primary driver - Service Mgmt Support	0.3%	
Data & Voice Network Services	0.9%	Specific/Estimates	0.4%	Primary driver - Field technician Support	0.5%	
End Users Services	0.9%	Specific	0.9%	Primary driver - End Users		
Disaster Recovery & BCP Services	1.2%	Specific	0.8%	Primary driver - allocation of major applications	0.4%	
Data Centre Services	9.8%	Specific	4.8%	Primary driver - Data Centre support; LAN IDs	5.0%	
Application Maintenance Services	2.1%	Estimates	1.0%	Primary driver - allocation of fixed application mtce support	1.2%	
Common Base Services, Transfer Fees, Procurement Services & Other	1.8%	Estimates		Lan ID's	1.8%	
Infrastructure Mgmt Service	25.3%	Specific	4.7%	Primary driver - LAN ID's & storage	20.6%	
Application Mgmt Service	9.2%	Specific	4.5%	Primary driver - users of Variable App Mtce	4.7%	
BS&IT GROUP- WORK PROGRAMS						
Services - Support	8.8%	Specific/Estimates	3.8%	Primary driver - Management Estimate	5.0%	
IT Transition	0.1%			CIO OH	0.1%	
Service - Director Increments	1.7%	Specific/Estimates	0.5%	Primary driver - Users of Increments	1.3%	
Corp Supply Chain	3.4%			CIO OH/Blend- OM&A / CapEx	3.4%	
Business Services	2.1%			CIO OH/Overall OPG	2.1%	
SVP - BS&IT	0.1%			CIO OH	0.1%	
ES&A Mgr	0.6%			CIO OH	0.6%	
SD AS-Software	2.6%	Specific	1.5%	Primary driver - Software user	1.1%	
Corp-Managed Contracts	2.3%	Specific	1.5%	Primary driver - contract user	0.7%	
SD AS-Managed Contracts	4.1%	Specific	0.6%	Primary driver - contract user	3.5%	
Projects - Support	2.3%	Estimates	1.3%	Primary driver - Management Estimate	1.0%	
Infrastructure Mgmt - Support	9.9%	Historical/Estimates	5.9%	Primary driver - Historical/LAN Id's	4.0%	
SD SS-VP Ofc	1.0%	Estimates		Primary driver - Management Estimate	1.0%	
Non-Capital Projects	8.6%	Specific / Estimates	5.9%	Primary driver - Management Estimate	2.6%	
	100.0%		38.7%		61.3%	
ENERGY MARKETS GROUP						
Portfolio Management	25.2%	Estimates	25.2%			Estimates to Stations
Trading	17.8%	Specific	17.8%			N/A
Planning & Analysis	20.4%	Estimates	14.3%	Blend- OM&A / CapEx	6.1%	Estimates to Stations
Energy Markets Support	14.3%	Estimates	13.8%	Blend- OM&A / CapEx	0.5%	
Fossil Fuels Procurement	11.8%	Specific	11.8%			N/A
Energy Markets Programming	7.3%	Estimates	6.6%	Blend- OM&A / CapEx	0.7%	Estimates to Stations
Electricity Sales Vice President's Office	2.6%	Estimates	2.6%			
Payroll variance	0.6%			Internal- Energy Markets Total	0.6%	
	100.0%		92.1%		7.9%	

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		DISTRIBUTION TO BUSINESS UNITS				HYDROELECTRIC
		Direct Assignment		Allocation		Regulated / Unregulated
DEPARTMENT / Activities	Activity % Dept.	Method	Direct Assign	Cost Driver	BU Allocation %	Applies to Direct Assignment
REAL ESTATE GROUP- REAL ESTATE SERVICES						
Rent & Utilities- Nuclear Facilities	58.7%	Specific	58.7%			N/A
Labor Costs	13.8%	Estimates	13.8%			> Blend- OM&A / CapEx > Internal- Various
Rent & Utilities- OPG Head Office	27.5%	Service Fees	27.5%			N/A
External Purchase Services	9.3%	Specific / Estimates	9.3%			> Blend- OM&A / CapEx > Internal- Various
Rent & Utilities- Wesleyville Site	4.0%			Square Footage	4.0%	
Murray St/Tenant Imp/COGS-Other Bus	(28.1%)	Specific	(28.1%)			N/A
Rent & Utilities- OSL Plant Group	0.2%	Specific	0.2%			Internal- OSL Common Support Total
Rent & Utilities- Kipling Site	14.6%	Service Fees	14.6%			N/A
	100.0%		96.0%		4.0%	
REAL ESTATE GROUP- BUSINESS SERVICES						
Business Services- Corp. Wide Costs	24.0%			FTEs	24.0%	
Business Services- Nuclear	25.2%	Specific	25.2%			N/A
Office Services- Corporate Wide Costs	50.8%			FTEs	50.8%	
	100.0%		25.2%		74.8%	
REAL ESTATE GROUP- FACILITY SERVICES						
OPG Head Office	33.9%	Service Fees	33.9%			N/A
Nuclear Sites	26.8%	Specific	26.8%			N/A
Kipling Site	23.8%	Service Fees	23.8%			N/A
Administration Costs	6.1%	Specific	1.2%	Internal- CSA Total (excl. Centrally Held Costs)	4.9%	N/A
Bruce Power Site	9.4%	Specific	9.4%			N/A
	100.0%		95.1%		4.9%	
REAL ESTATE GROUP- FLEET SERVICES						
Fleet Services	100.0%			FTEs	100.0%	
	100.0%					
REAL ESTATE GROUP- VICE PRESIDENT						
Real Estate Vice President's Office	100.0%			Internal- Real Estate Total	100.0%	
	100.0%		0.0%		100.0%	
CENTRALLY HELD COSTS			0			
Pension / OPEB- Amortization of Deferred Costs	45.4%	Pension / OPEB Costs	45.1%	Pension / OPEB Costs	0.4%	
Employee Incentives	17.6%	Historical	17.6%			> Labor Costs > Internal- Various
Scientific Research and Experimental Development Credits	(3.8%)	Specific	(3.8%)			N/A
Fiscal Calendar Payroll Adjustment	2.0%			Labor Costs	2.0%	
PWU Health Care	1.9%			Labor Costs	1.9%	Specific to Stations
Provincial Fee- CNSC	3.0%	Specific	3.0%			N/A
Vacation Accrual	2.5%			Labor Costs	2.5%	
PST Self-assessment	0.8%			M&S / External Purchase Services Expenditures	0.8%	
Insurance Premiums	9.8%	Specific	9.8%			> Specific to Stations > Insured Replacement Value
Fossil Provision	21.0%	Specific	21.0%			
	100.0%		92.5%		7.5%	

OPG CENTRALIZED SUPPORT AND ADMINISTRATIVE COSTS
REVIEW OF CENTRALIZED SUPPORT AND ADMINISTRATIVE COST ALLOCATION METHODOLOGY
SUMMARY OF COST DISTRIBUTIONS - 2010 BUDGET

		DISTRIBUTION TO BUSINESS UNITS				HYDROELECTRIC
		Direct Assignment		Allocation		Regulated / Unregulated
DEPARTMENT / Activities	Activity % Dept.	Method	Direct Assign	Cost Driver	BU Allocation %	Applies to Direct Assignment
HYDROELECTRIC BUSINESS UNIT COMMON SUPPORT COSTS						
Hydroelectric Development	23.5%	Specific	23.5%			Estimates to Hydro Regulated / Hydro Unregulated
Engineering Services	38.3%	Specific	38.3%			> Specific to Stations > Internal- Hydro Various
Water Resources and Aboriginal Affairs	11.2%	Specific	11.2%			Base OM&A
Business Support and Regulatory Affairs	6.7%	Specific	6.7%			Base OM&A
Supply Chain	5.6%	Specific	5.6%			Estimates to Stations
Environment	4.5%	Specific	4.5%			Base OM&A
Dam Safety and Emergency Preparedness	4.8%	Specific	4.8%			Base OM&A
Executive Vice President's Office	5.4%	Specific	5.4%			Internal- Hydro Total
	100.0%		100.0%		100.0%	
OTTAWA-ST. LAWRENCE COMMON SUPPORT COSTS						
Asset Management & Technical Support Services	11.4%	Specific	11.4%			Estimates to Stations
Project Management	85.3%	Specific	85.3%			Base OM&A- OSL
HR & Support Services	1.0%	Specific	1.0%			Base OM&A- OSL
Business Support	0.9%	Specific	0.9%			Base OM&A- OSL
Plant Group Management	1.4%	Specific	1.4%			Base OM&A- OSL
	100.0%		100.0%		0.0%	

Filed: 2010-05-26
EB-2010-0008
Exhibit F5-3-1

ScottMadden
Management Consultants

Ontario Power Generation HR Metrics Analysis

September 2009

Contents

ScottMadden
Management Consultants

Introduction

- Ontario Power Generation's HR department participates in a utility HR benchmarking group called the Electric Utility HR Metrics Group or EU-HRMG
  - The EU-HRMG benchmarks performance on a cross-section of HR metrics annually with data reported from each participating utility
  - The data uses a consistent definition of HR functions that are benchmarked across utilities and excludes functions such as wellness, safety, and payroll
  - The benchmarking group includes 10 other large utilities with more than 10,000 employees, including TVA, which has many similarities to OPG
  - 80% of the 40 member utilities have a mix of generation, with 40% including nuclear in the generation mix
- ScottMadden has prepared and presented a summary report of the HR benchmark analysis to the EU-HRMG for the 2006, 2007, and 2008 data years
- OPG hired ScottMadden to develop a custom assessment of OPG's HR department using the data and benchmarks collected by the EU-HRMG for the following areas:
  - Staffing and separation metrics
  - Compensation metrics
  - Human resources and management factors
- About the analysis and report:
  - ScottMadden considers factors that make OPG's HR operations in Canada different from the other U.S. based electric utilities that participate in the consortium
  - The report highlights one other utility as a close comparator among the benchmarking group
  - The analysis examines OPG HR metrics performance for 2008 compared to each company in the 'Very Large Companies' sub-group within the EU-HRMG and provides a comparison across the last five years between the 'Very Large Companies' median, the close comparator utility, and OPG
  - ScottMadden provides observations, considerations, and recommended targets and improvement areas (if applicable) associated with each metric
  - All costs shown are in U.S. dollars
- Details about the composition of the EU-HRMG and the sub-groups by company size are provided on the page 4

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Introduction – HR Metrics Included

The HR metrics included in this report are those ScottMadden typically uses for assessing the performance of the HR function and key HR processes. With each metric, longitudinal data is available through the EU-HRMG benchmarking consortium. This is ScottMadden's model for examining key HR metrics.

Human Asset Analytics

Manage the Employee Asset

- Management Span of Control
- Workforce Representation

HR Delivery System Analytics

Manage the HR Organization

- HR Expense Factor (HR only)
- HR Expense Percent
- HR FTE Investment Factor
- HR FTE Ratio

Employee Lifecycle

Recruit and Select Employees

- Hire Cycle Time
- Cost per Hire
- External Hire Rate
- Total Hire Rate

Compensate Employees

- Variable Compensation Ratio
- Loading Factor
- Percent of Workforce Eligible for Incentive Pay

Manage Employee Turnover

- Overall Separation Rate
- Separation Rate by Tenure

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Introduction – EU-HRMG Consortium Participants

EU-HRMG participants include a range of utility sizes and participation has grown in recent years. This benchmark assessment compares OPG to its peer group in the 'Very Large Companies' size group

Budget Year	Small Companies *(<2,000 employees)*	Mid-Size Companies *(2,000-5,000 employees)*	Large Companies *(5,000-10,000 employees)*	Very Large Companies *(>10,000 employees)*	Total
2004	6	10	2	5	23
2005	7	9	3	7	26
2006	7	12	3	9	31
2007	8	12	5	7	32
2008	10	11	3	11	35

Source: EU-HRMG Project Manager, HR Strategies and Solutions

Small Companies (<2,000 employees)

- Colorado Springs
- Constellation Power Generation
- Dynegy (IPP)
- Edison Mission
- El Paso Electric
- Hawaiian Electric Company, Inc.
- JEA
- Nashville Electric Service
- Mirant Corporation (IPP)
- STPNOC

Mid-Size Companies (2,000–5,000 employees)

- Bonneville Power Administration
- Constellation Nuclear
- CPS Energy
- E. ON U.S. LLC
- Idaho Power Company
- Kansas City Power & Light
- Omaha Public Power District
- Pepco Holdings, Inc.
- Portland General Electric
- TECO Energy
- Westar Energy

Large Companies (5,000–10,000 employees)

- Consumers/CMS Energy Corp
- PPL
- SCANA

Very Large Companies (>10,000 employees)

- Dominion Resources
- Duke Energy
- Entergy Corporation
- Exelon
- Ontario Power Generation
- Progress Energy
- PSEG Services Corp.
- Southern California Edison
- Southern Company
- Tennessee Valley Authority
- Xcel Energy

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Introduction – Benchmark Company Statistics

Ontario Power Generation total employees* is shown in comparison to the “very large companies” group defined by the EU-HRMG. All companies included have more than 10,000 employees. Although the size of OPG is comparable, there are some significant differences between OPG and the “very large companies” panel. These differences are highlighted throughout this report.

Very Large Companies (>10,000 employees)	# of Employees*
Dominion Resources	18,770
Duke Energy	17,475
Entergy Corporation	14,670
Exelon	19,550
Ontario Power Generation	12,000
Progress Energy	10,830
PSEG Services Corp.	10,340
Southern California Edison	15,800
Southern Company	23,335
Tennessee Valley Authority	11,585
Xcel Energy	11,345

* Total Permanent full-time or part-time FTEs (full time equivalents); excludes contractors and temporary employees

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Introduction – Canadian/OPG vs. U.S. Context

There are some differences in operating environment and regulations between Canada and the United States that contribute to different support requirements from the human resources function.

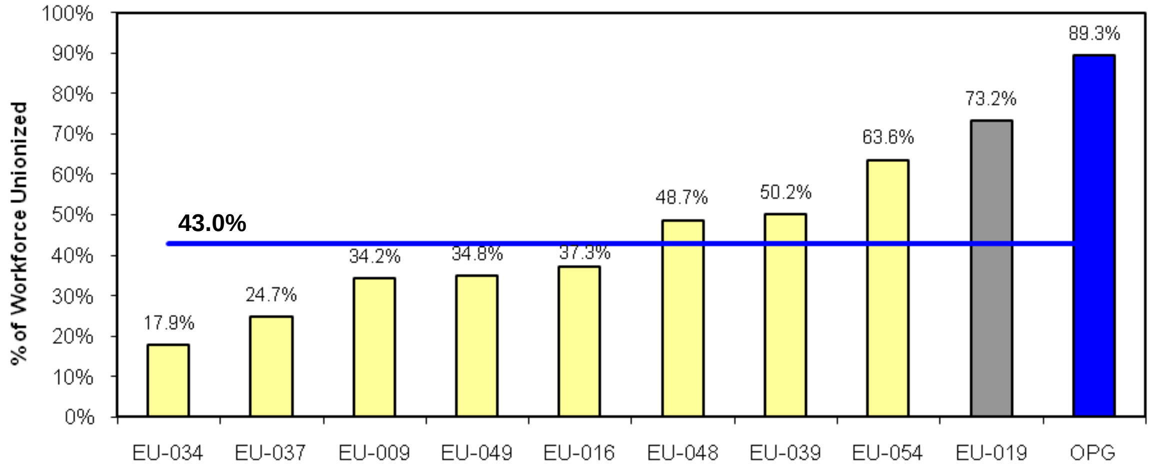
Aspect	Canada or OPG	U.S.	Impact for OPG
Labour Laws	Federal and provincial labour laws impact HR requirements and processes; significant rights exist for employees	Federal laws and minimal state laws impact HR requirements and processes; 22 states have 'employment at will' laws*	◆ More stringent process requirements impact how HR is organized and operates ◆ Higher unionization levels require greater support from the labor relations function and generalists
Pension legislation	Employers are not easily able to transition from a defined benefit plan to a defined contribution plan	Many U.S. utilities have shifted to defined contribution plans	◆ Requirement to continue offering and managing pension plan ◆ Pension plans are embedded in collective bargaining agreements making changes difficult
Retirement age	OPG rule of 82/84 (age + years of service)	Rule of 85 is more common; for some companies it is higher than 85 resulting in a later retirement age	◆ Lower potential retirement age to consider in workforce planning, however the trend is that people tend to stay beyond eligibility
Healthcare	Socialized healthcare, with employers providing supplemental coverage to employees	Privatized healthcare	◆ Relatively lower costs for providing health benefits for OPG, but difference offset by higher pension costs ◆ Health benefits are embedded in collective bargaining agreements making changes difficult

Note: Other differences noted between OPG and EU-HRMG peer companies are driven by OPG's public sector operating environment compared to private sector environments

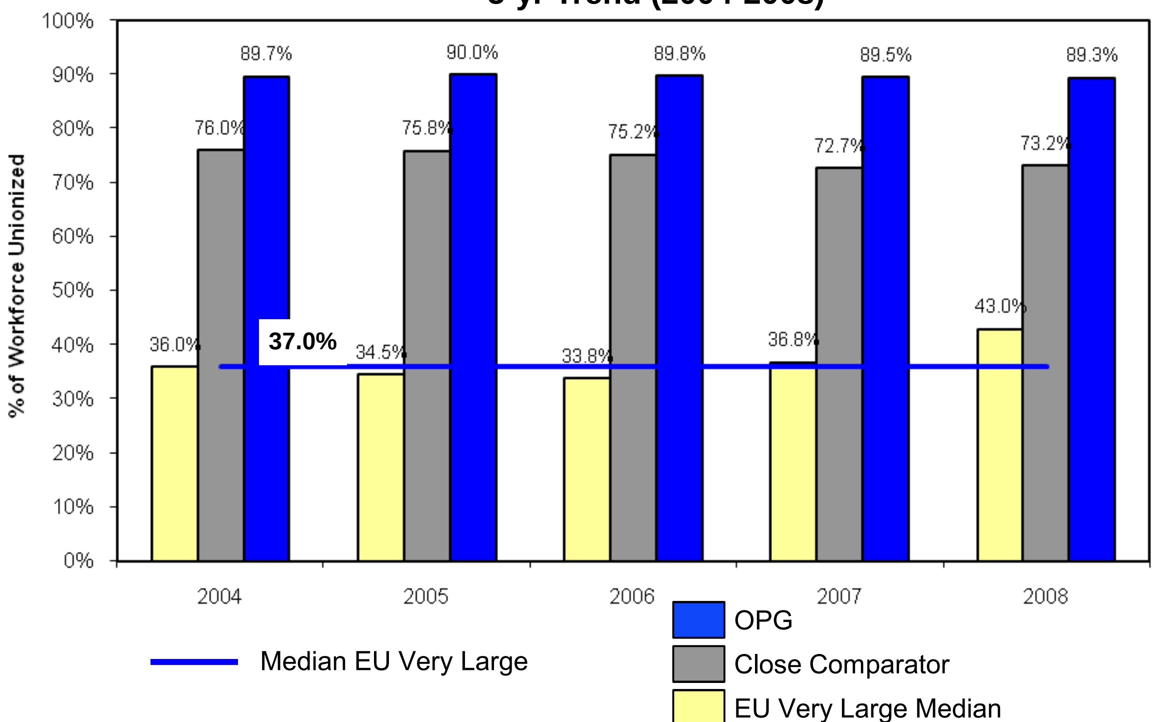
* 'Employment at will' provides an employment relationship in which employment can be terminated either by the employer or the employee at any time and for any reason.

Introduction – Workforce Representation (Union)

2008 Very Large Peer Group Comparison



5-yr Trend (2004-2008)



Definition:
Workforce Representation = (Union FTE/Regular FTE) * 100

Observations

- OPG's union representation has remained significantly higher over the last five years
- The median values of percent of workforce represented have increased by 19.4% for the very large company group over the last five years, which is most likely due to US utilities downsizing their management ranks

Qualifiers/Considerations

- The high level of represented employees will demand significant attention from HR, which will affect the HR FTE ratio

Recommendations

- Ensure labor relations roles and responsibilities between management and HR are clear

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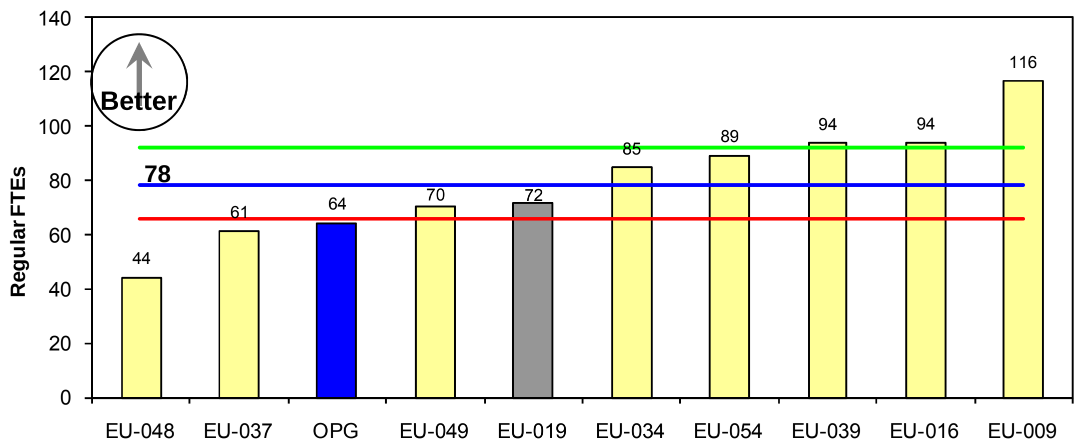
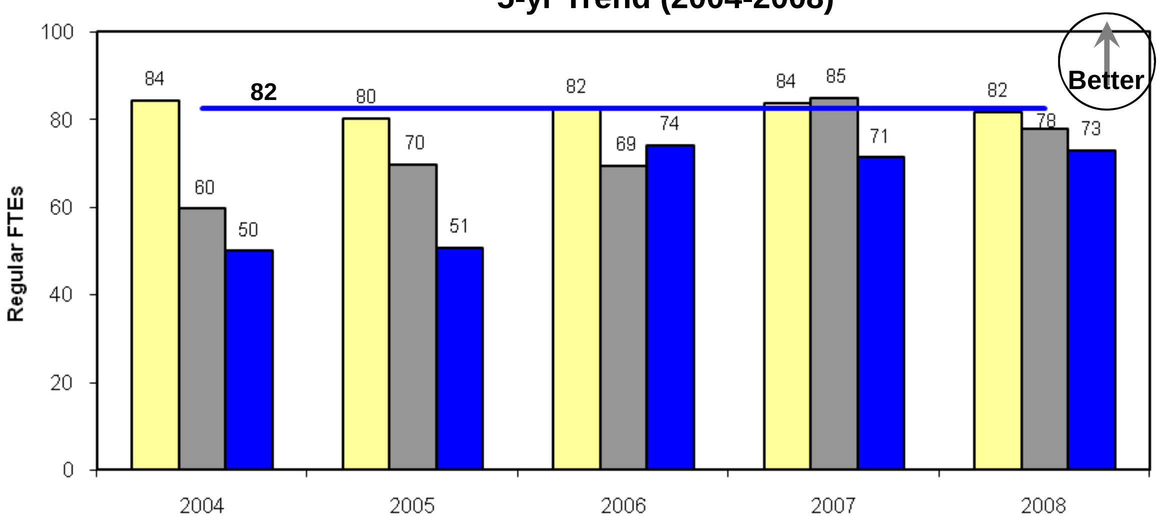
Introduction – HR FTE Ratio (Most Frequently Used Metric)

2008 Very Large Peer Group Comparison



Note: Organization and Workforce Development is a new function that was benchmarked for the first time in 2008; 5 year trend data excludes FTEs in this function for 2008 for historical comparisons

5-yr Trend (2004-2008)



Definition:
HR FTE Ratio = Regular FTE/Regular HR FTE

Observations/Questions

- OPG's HR FTE Ratio has increased by 46.0% in the last five years and by 2.8% since 2007 (excluding the Organization & Workforce addition)
- Median HR FTE Ratio for the very large utilities has decreased by 2.4% in the last five years and has decreased by the same percentage since 2007
- OPG is below the median for 2008 but ratios have improved over the five year period

Qualifiers/Considerations

- OPG HR staff serves employees widely dispersed geographically throughout the Province requiring more HR staff coverage
- HR support is provided to contract and temporary employees at OPG which differs from other peer group companies where HR only supports regular workers; OPG's HR FTE Ratio would be higher if these customers were reflected in the FTE count
- OPG has a very broad span of control for managers which may make managers more dependent on HR support

Recommendations

- Target median performance (78) for HR FTE Ratio in the short term and 85 (between median and first quartile) in the long term
- Track trends in HR generalist ratio

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General Observations

In preparing this report and through conversations with HR leadership at OPG, ScottMadden has made some overall observations about the OPG HR function

- Organization
  - HR accountabilities are rather distributed across the HR function with some work decentralized and some work handled through centers of expertise
  - Shadow HR functions (Non-HR staff performing HR work) have developed in some of the operating units in response to inconsistent levels of support from HR during recent years
  - The HR organization has recently added an organizational development function providing key functions of directing the performance management process and succession planning – critical competencies for the organization going forward
  - While some aspects of a leading practice shared services model exist (centers of expertise and services centers), they are not optimally organized or consistently implemented to achieve the full benefits of a shared services model
- Processes
  - Process improvement efforts have been limited to a small number of processes lately
  - While some processes are documented, they are not necessarily well known by all involved parties
  - The hiring process is fairly manual despite the investment in Taleo; some operating units are using automated workflow while others are using paper-based approval processes
  - The security clearance process is very time consuming when hiring staff, temporary employees, or contractors
  - The HR function has developed a competency on workforce planning and has utilized best practice research with other utilities to improve the function
- Technology
  - OPG has invested in quality HR technologies but they are not all being fully utilized
    - Limited process reengineering during system implementation has resulted in heavily customized systems
    - HR is not forcing line management to use the systems as designed with manager self-service

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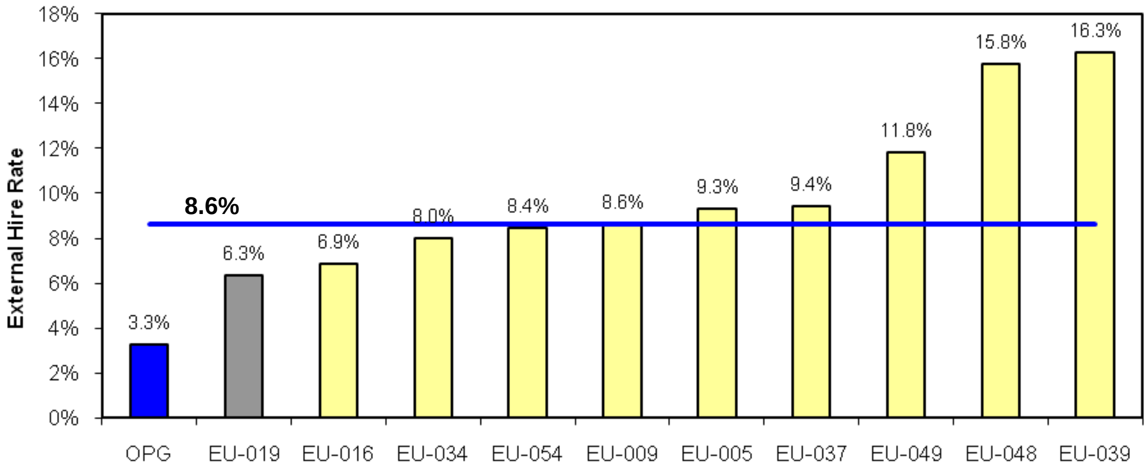
General Observations (Cont'd)

- Technology (Cont'd)
  - OPG uses two HR information systems for time reporting (Tempus and SAP); links exist from Tempus to SAP, the system of record for pay and employee records
  - Improvements in managing the HR Information System (HRIS) have resulted in high levels of data integrity and improved reporting capabilities for the company
  - The HR department has had some successes with implementing self-service tools such as the Mercer OneView tool for pension calculations and scenario analysis
  - There is no focused HR technology function in HR which impacts the ability to develop an effective HR technology strategy for the company
- Staff
  - Generalist role as designed is leading practice. However, some HR consultants are still doing transactional work and are not able to focus on higher value activities
    - Some generalists are providing high value strategic work, but transactional work and breadth of job responsibilities limits the extent of this work

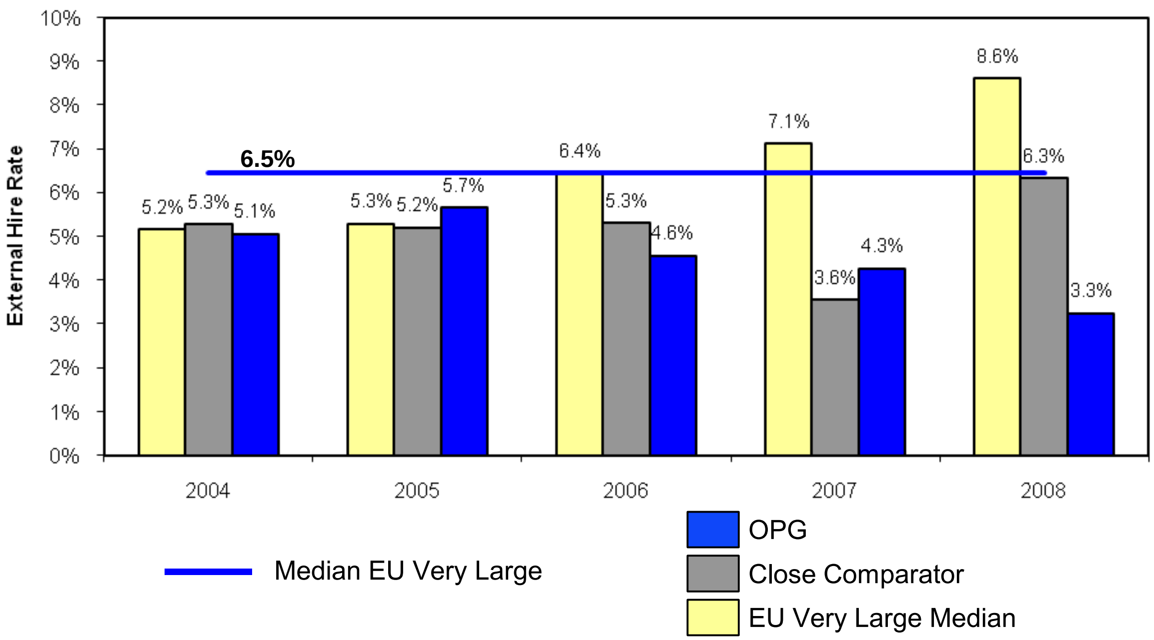
Recruit and Select Employees and Manage Employee Turnover

External Hire Rate

2008 Very Large Peer Group Comparison



5-yr Trend (2004-2008)



Definition:
External Hire Rate = Total External Hires/Regular FTE

Observations

- OPG's External Hire Rate has decreased by 35.3% over the last five years and shows the lowest value in 2008
- The very large utilities' median External Hire Rate has increased by 65.4% over the last five years

Qualifiers/Considerations

- OPG has strategically focused on hiring internal candidates whenever possible
- High unionization level also contributes to lower external hire rate as union employees move up through the ranks
- OPG hires large numbers of temporary workers that are often turned into regular staff; the external hire rate does not reflect these additions
- U.S. utilities went through a period of downsizing in the late 1990's and early 2000's and are now hiring again due to nuclear new build and green initiatives

Recommendations

- Track external hires as a percent of total hires rather than as a percent of regular FTEs

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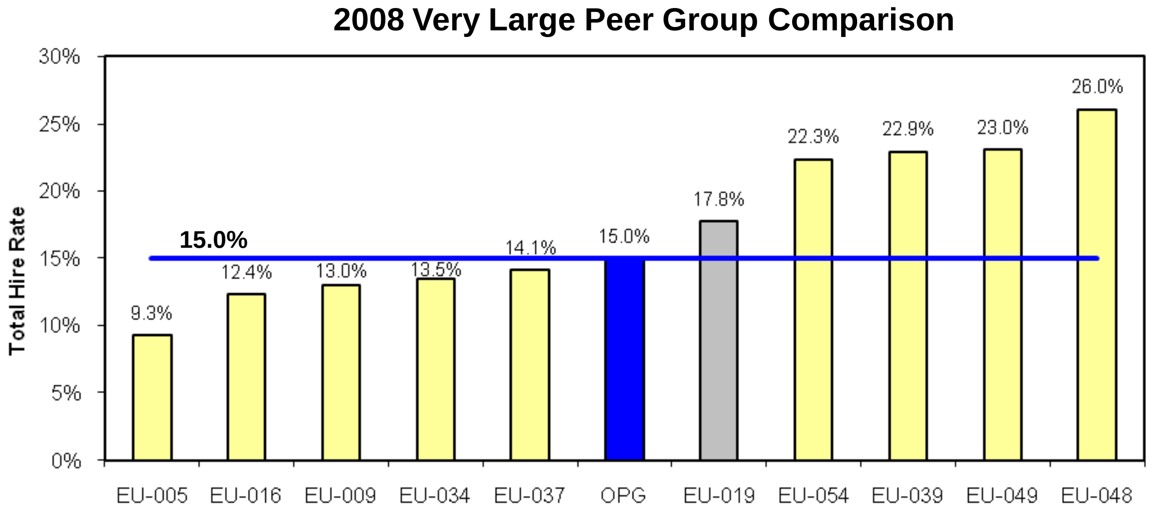
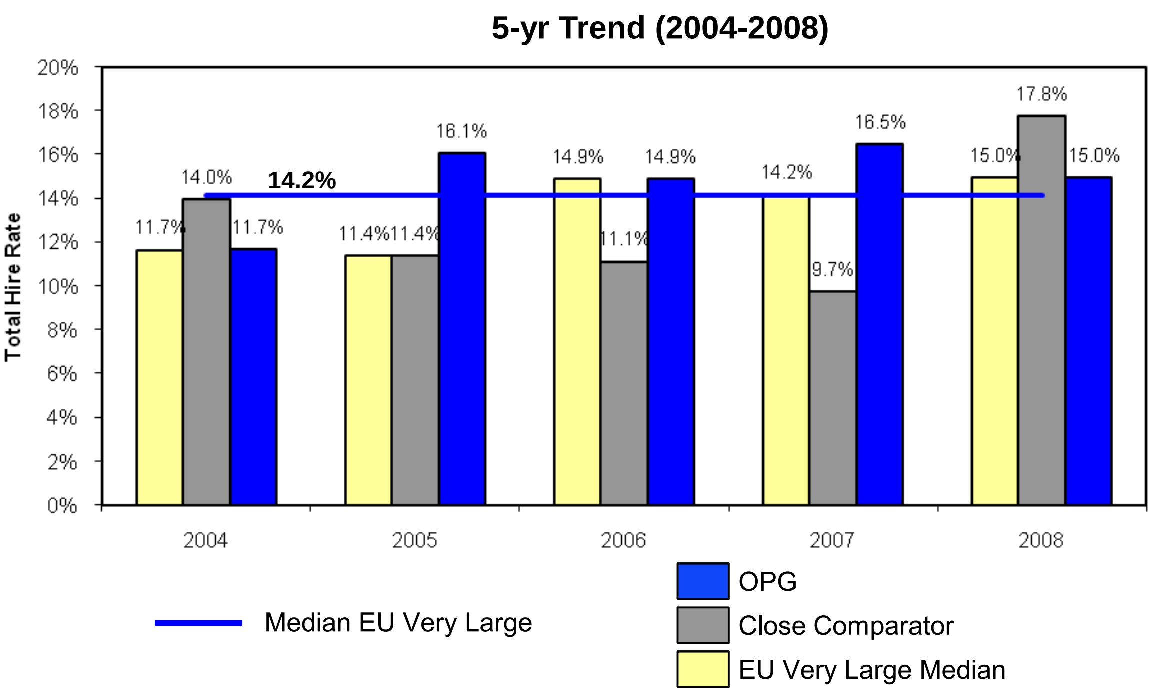
Total Hire Rate





Definition:
Total Hire Rate = Total Internal and External Hires/Regular FTE

Observations

- OPG's Total Hire Rate has increased by 28.2% over the last five years but has declined by 9.0% since 2007. It was at the median in 2008
- The very large utilities' median Total Hire Rate has increased by 28.2% over the last five years and by 5.6% since 2007

Qualifiers/Considerations

- OPG's total hire rate reflects the need for replacing "baby boomer" retirees consistent with the hire rates for the peer group
- The timing of the waves of retirements may differ from some of the peer group companies based on differences in retirement eligibility age
- The five year trend on hire rates reflects the impact of the economic downturn causing less attrition as retirements slowed

Recommendations

- Leverage existing workforce planning process to forecast hiring needs in the coming years; consider training ramp-up requirements to determine timing of hires

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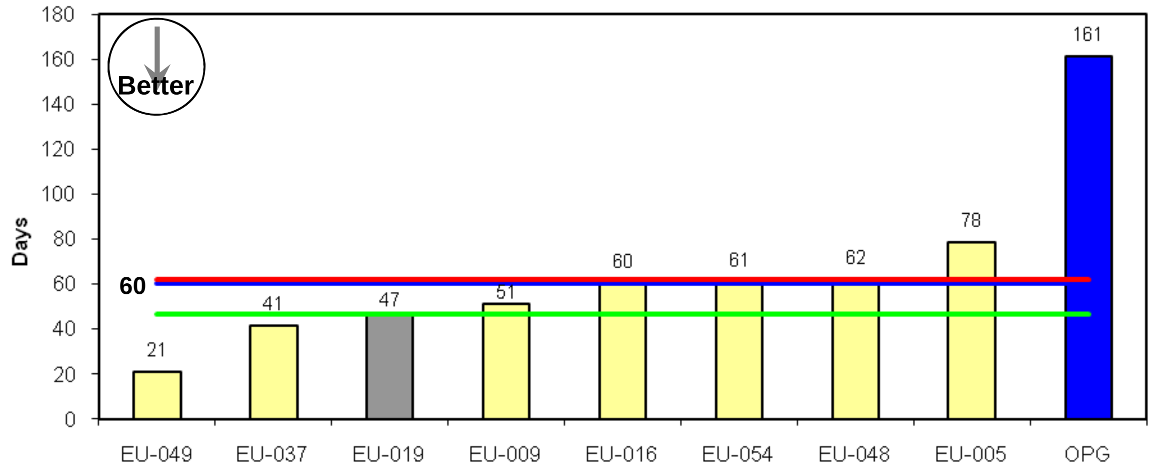
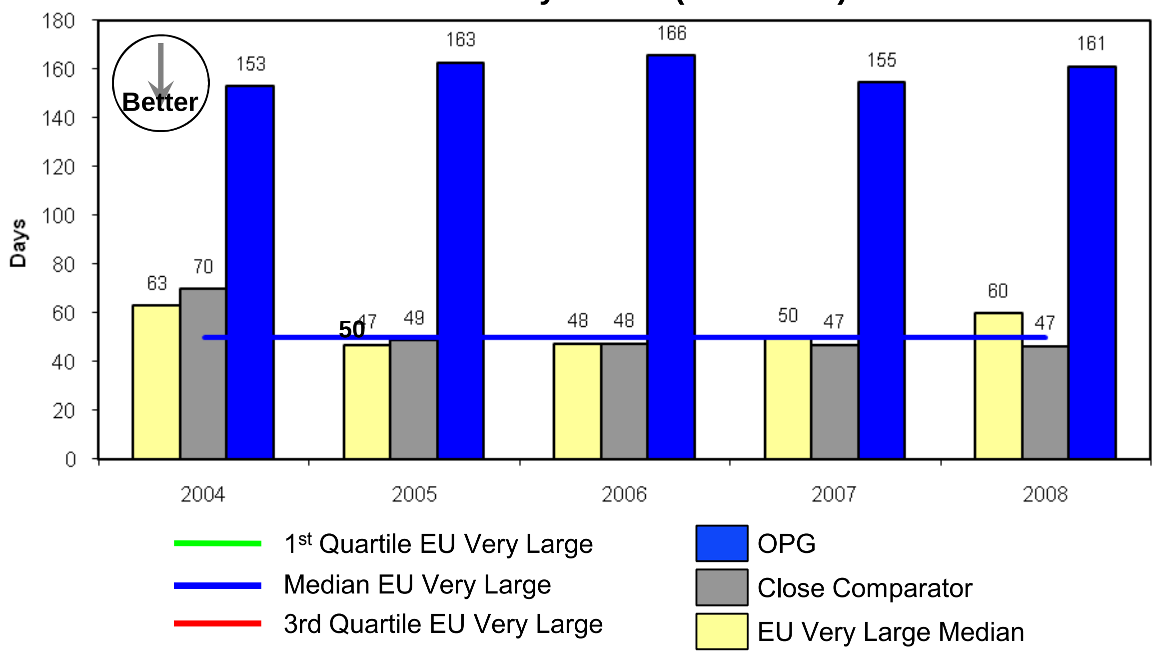
Hire Cycle Time

2008 Very Large Peer Group Comparison



5-yr Trend (2004-2008)



*Note: Days to Fill Position: number of days from vacancy approved to date position filled (offer accepted by candidate)

Definition:
Hire Cycle Time = Total Days to Fill Position*/Total Hires

Observations

- OPG's Hire Cycle Time has increased by 5% over the last five years and shows the highest value. It has increased by 3.9% since 2007
- Median Hire Cycle Time for the very large utilities has decreased by 5% over the last five years but has increased by 20% since 2007

Qualifiers/Considerations

- OPG days to fill is likely overstated due to inconsistent data entry in Taleo (applicant tracking system)
- Another peer group participant has indicated the reported figures are inaccurate and that hire cycle time is understated

Recommendations

- Reengineer the hiring process to address bottlenecks and separate the sourcing and recruiting tasks
- Address issues with reporting candidate acceptance data to improve accuracy of this metric
- Use service level agreements with vendors and management to govern the staffing process
- Target the peer group median of 60 for the hire cycle time

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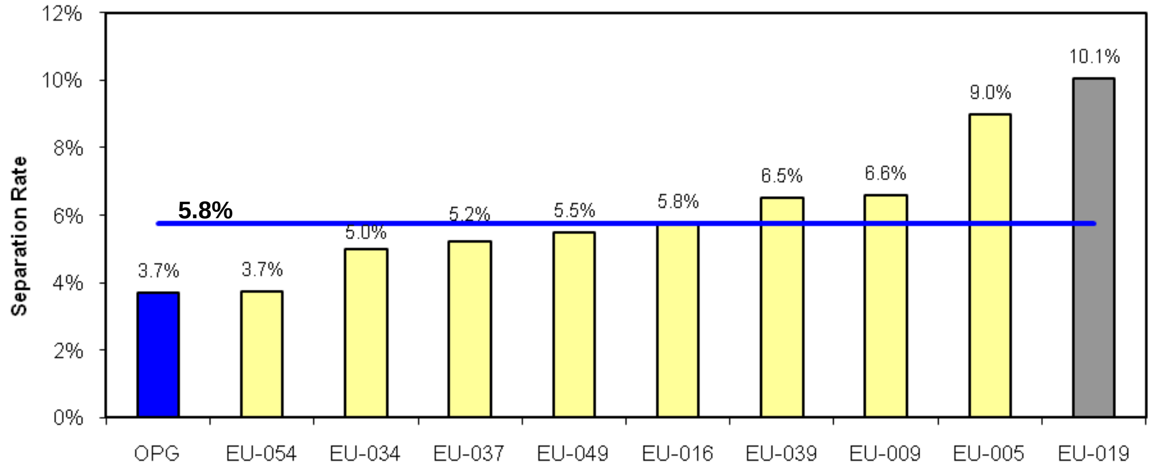
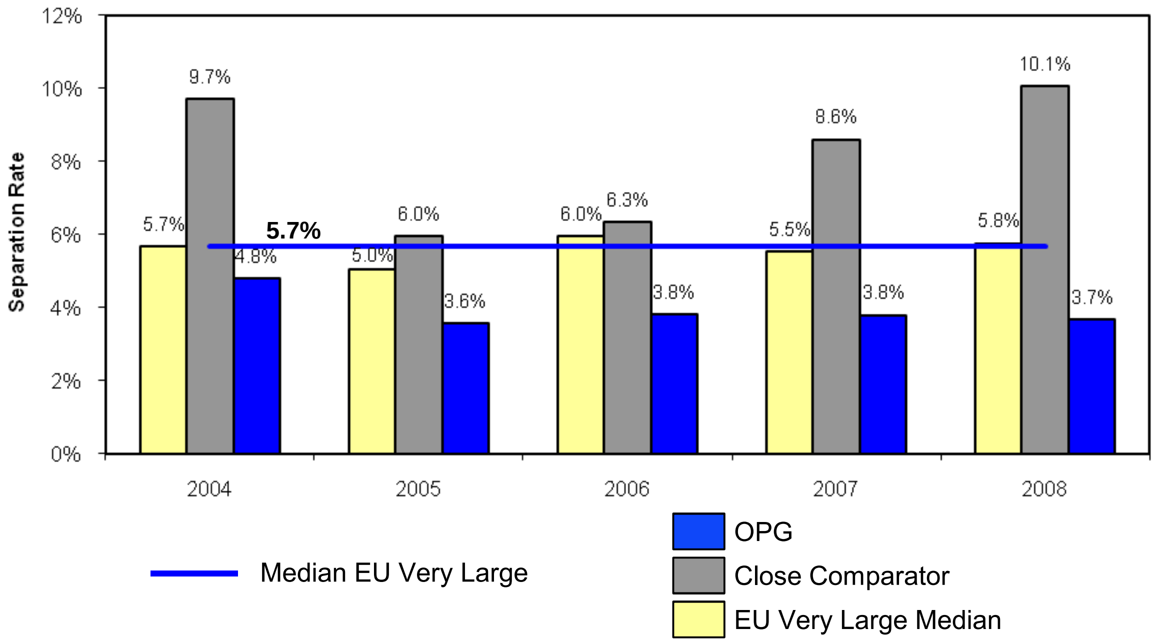
Separation Rate

2008 Very Large Peer Group Comparison



5-yr Trend (2004-2008)



Definition:
Separation Rate = Total Separations/Regular FTE

Observations

- OPG's Separation Rate has marginally increased by 3% over the last four years and is the lowest compared to the peer group in 2008; the 2004 OPG rate reflects the impact of a downsizing program
- Median Separation Rate for the very large utilities has increased by 16% over the last four years

Qualifiers/Considerations

- Electric utility personnel have fewer options for changing employers in Canada than in the United States contributing to less movement in personnel
- Good pension and benefits packages make OPG an employer of choice
- Historically, utility separation rates were frequently around 3%
- U.S. based companies have had early retirement programs in recent years, contributing to higher separation rates

Recommendations

- Continue to monitor trends in separation rates over time
- Target separation rates between 3-5% to keep OPG hiring costs low

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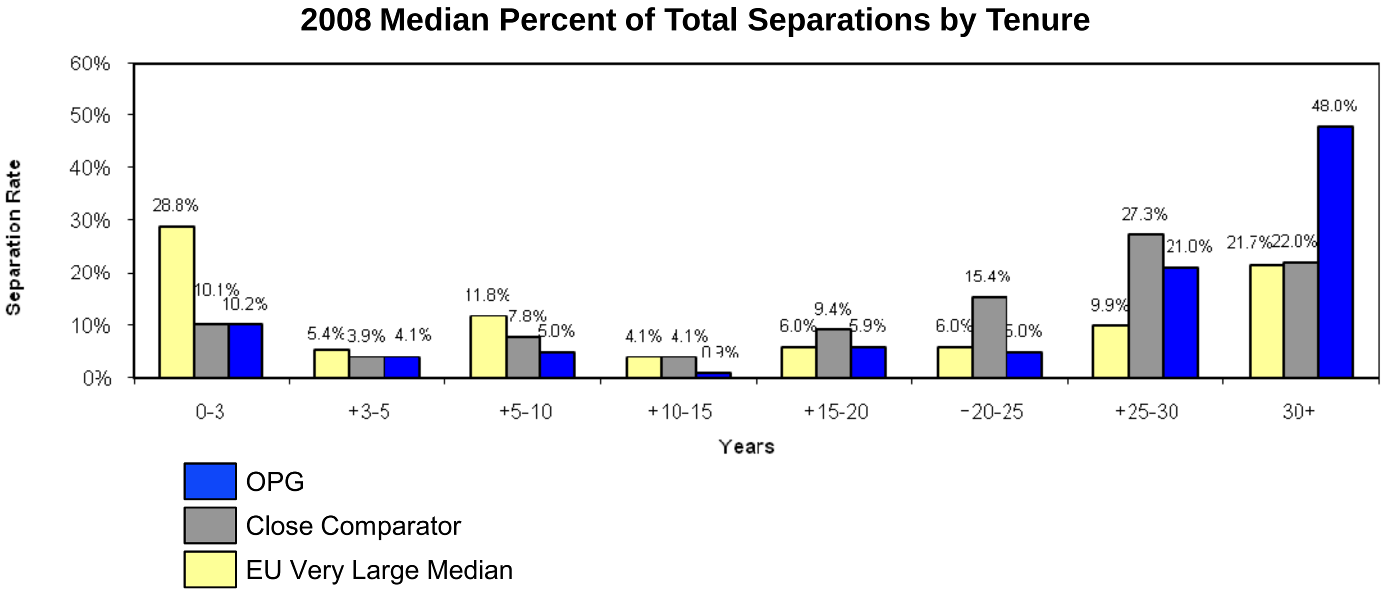
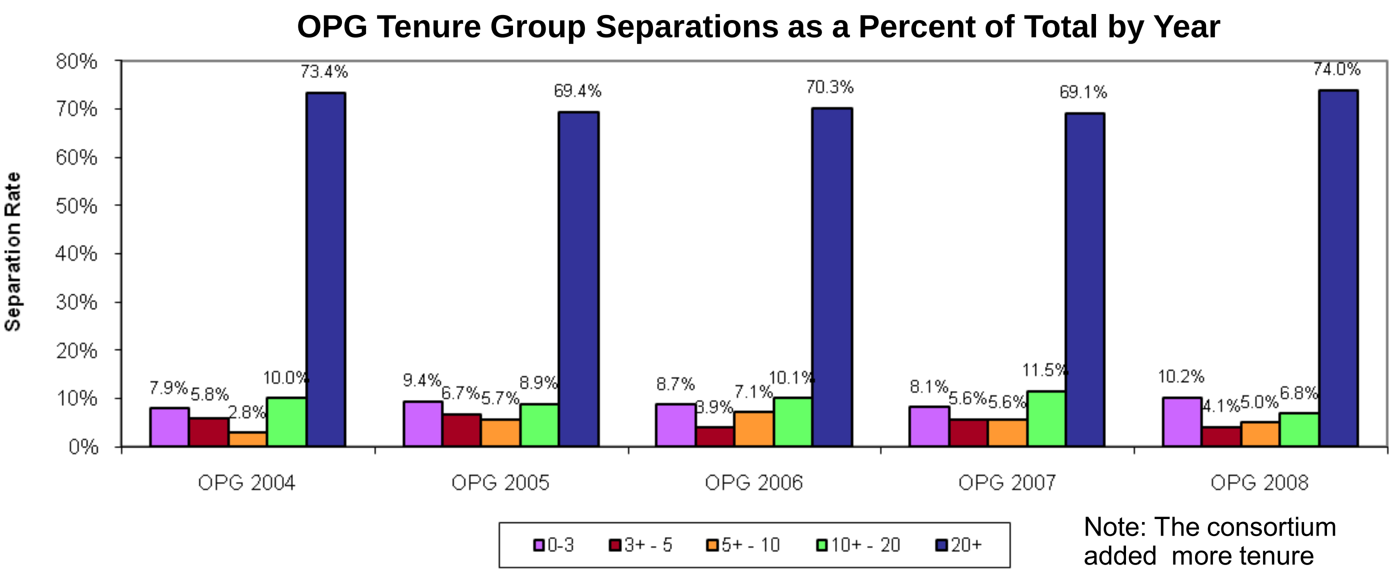
Separation Rate by Tenure (Tenure Group Separations as a Percent of Total)





Note: The consortium added more tenure categories in 2008 for employees with 20+ years

Definition:
Separations by Tenure = Total Separations by Tenure/Total Separations

Observations

- OPG's long tenure separations (30+) as a percent of total separations is more than twice the very large utilities' median in 2008.
- OPG's long tenure separations (20+) as a percent of total separations has increased by 0.82% in the last five years.
- OPG's new employee separations (0-3 years) as a percent of total separations is much lower than the very large utilities' median for new employees in 2008 and has increased by 29.1% in the last five years

Qualifiers/Considerations

- OPG's low turnover results in many long-tenure employees which contributes to the higher percentage of separations at 30+ years

Recommendations

- Assess and monitor increase in low tenure separations as a percent of total separations to ensure quality of hire is not driving separations
- Target less than 15% for 0-3 year separations as a percent of total separations

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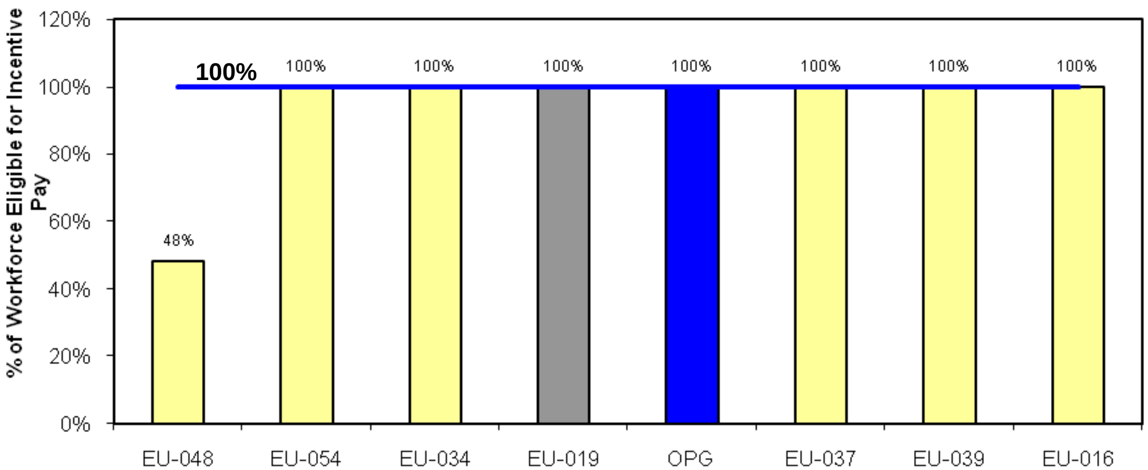
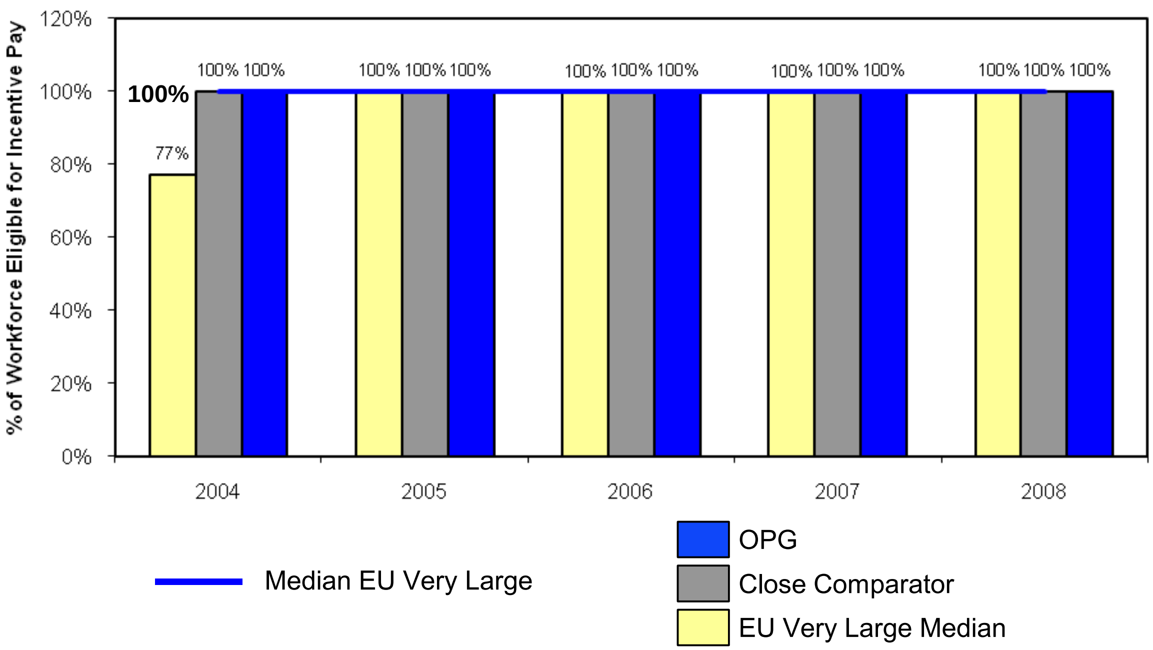
Compensate Employees

Percent of Workforce Eligible for Incentive Pay

2008 Very Large Peer Group Comparison



5-yr Trend (2004-2008)



Definition:
% of Workforce Eligible for Incentive Pay = Total Eligible Headcount (Not FTE)/Total Regular Headcount (Not FTE)

Observations

- Across the very large utilities, including OPG, all but one peer group company has made incentive compensation plans available to all employees
- Full eligibility for incentive plans has been the trend for the last four years in the peer group

Qualifiers/Considerations

- None

Recommendations

- Continue to offer incentive pay options to all staff as a means for incenting performance

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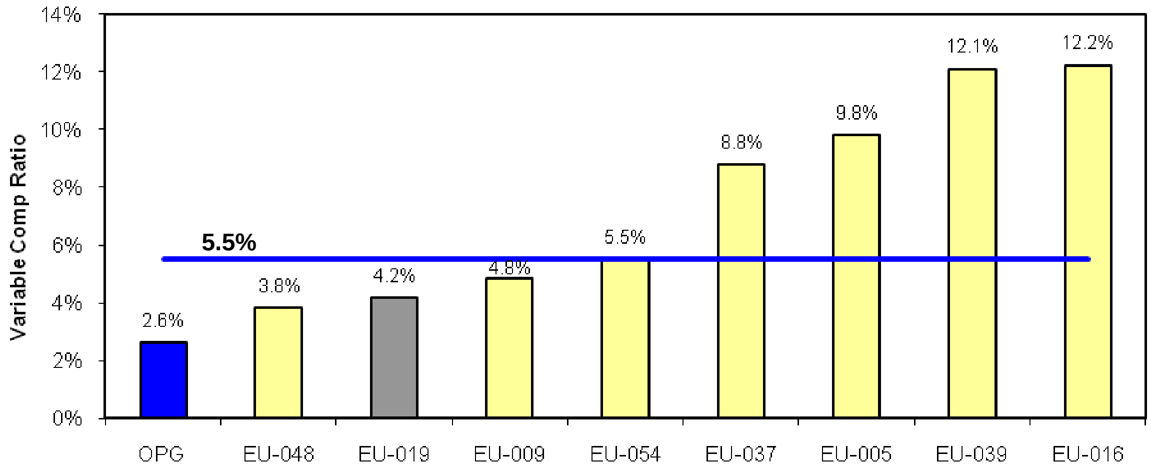
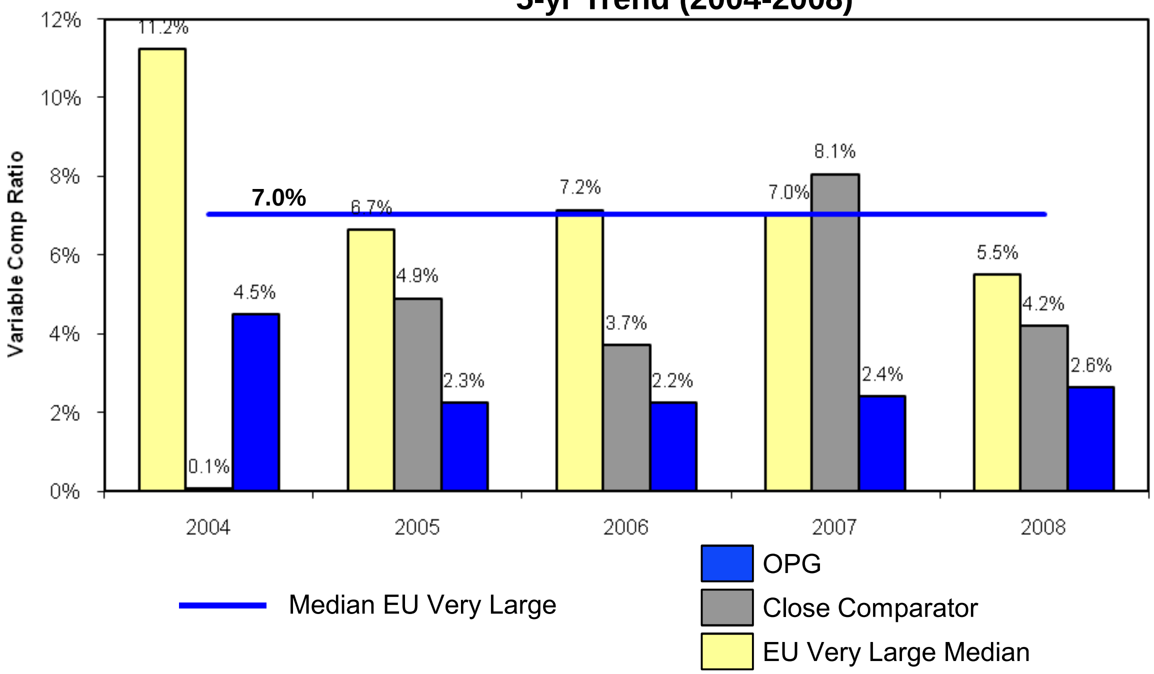
Variable Compensation Ratio

2008 Very Large Peer Group Comparison



5-yr Trend (2004-2008)



Definition:
Variable Compensation Ratio = Variable Compensation Expense/(Total Compensation + Benefits Costs)

Observations

- OPG's Variable Compensation Ratio has decreased by 42% over the last five years but has increased by 8.3% since 2007
- Median Variable Compensation Ratio for the very large company size group has decreased by 51% over the last five years
- While offering incentive pay to all employees, OPG is conservative in the amount paid for incentives

Qualifiers/Considerations

- Public sector compensation plans typically have lower variable compensation than private sector plans
- OPG has increased pension contributions in the last five years which has increased the denominator

Recommendations

- Examine trends in variable compensation per employee over time
- Maximize variable compensation percent within the allowable parameters to further incent employees

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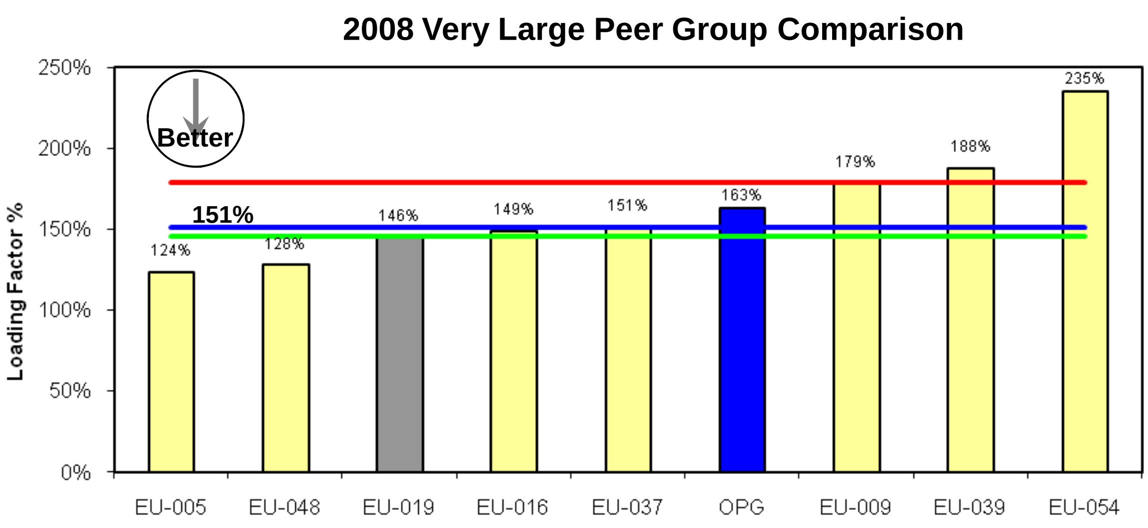
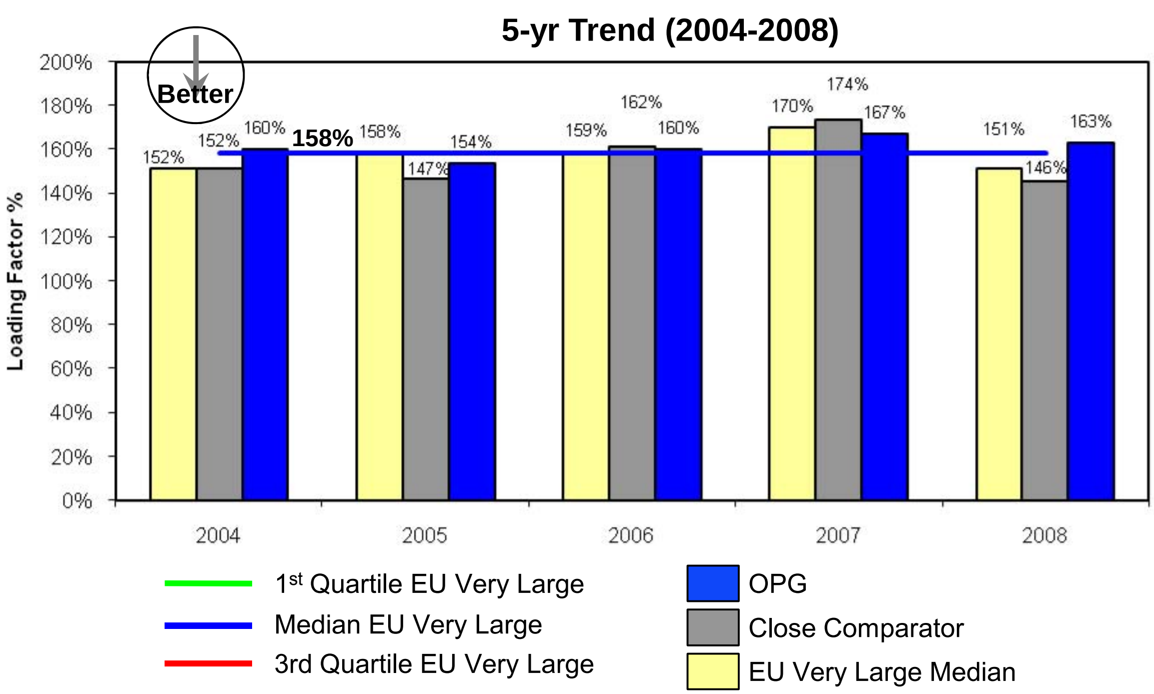
Loading Factor





Definition:
Loading Factor = Total Comp + Benefit Costs/ Regular Labor Costs (Base Pay)

Observations

- OPG's Loading Factor has increased by 1.9% over the last five years but has decreased by 2.4% since 2007
- Median Loading Factor for the very large company size group has decreased by 0.7% over the last five years and by 11.2% since 2007
- OPG loading factor has remained fairly consistent across the last five years

Qualifiers/Considerations

- OPG benefits costs as a percent of total compensation and benefits costs are just above the median for the very large peer group
- Benefits costs include pension contributions

Recommendations

- Target median peer group performance for loading factor

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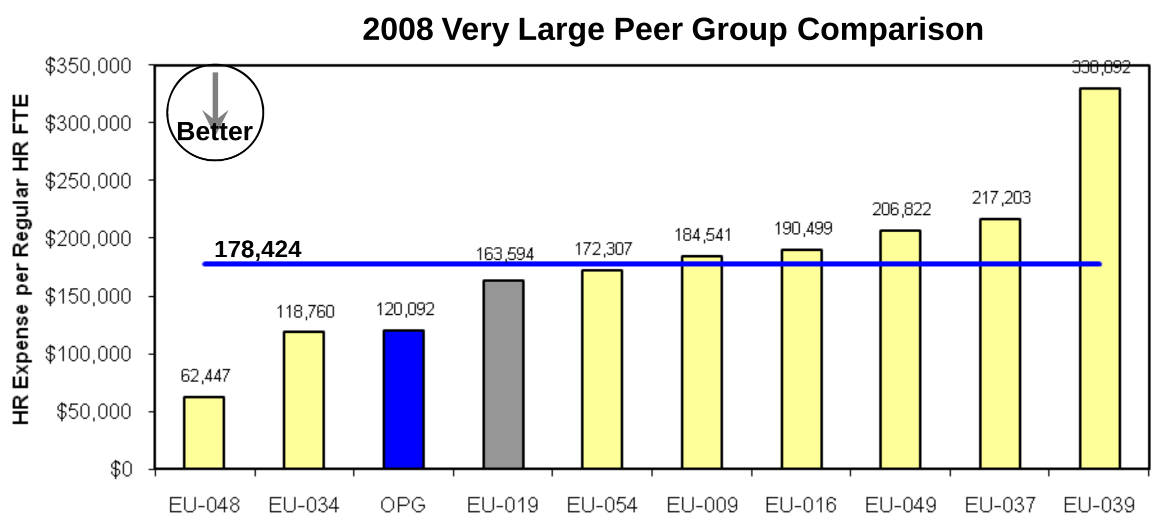
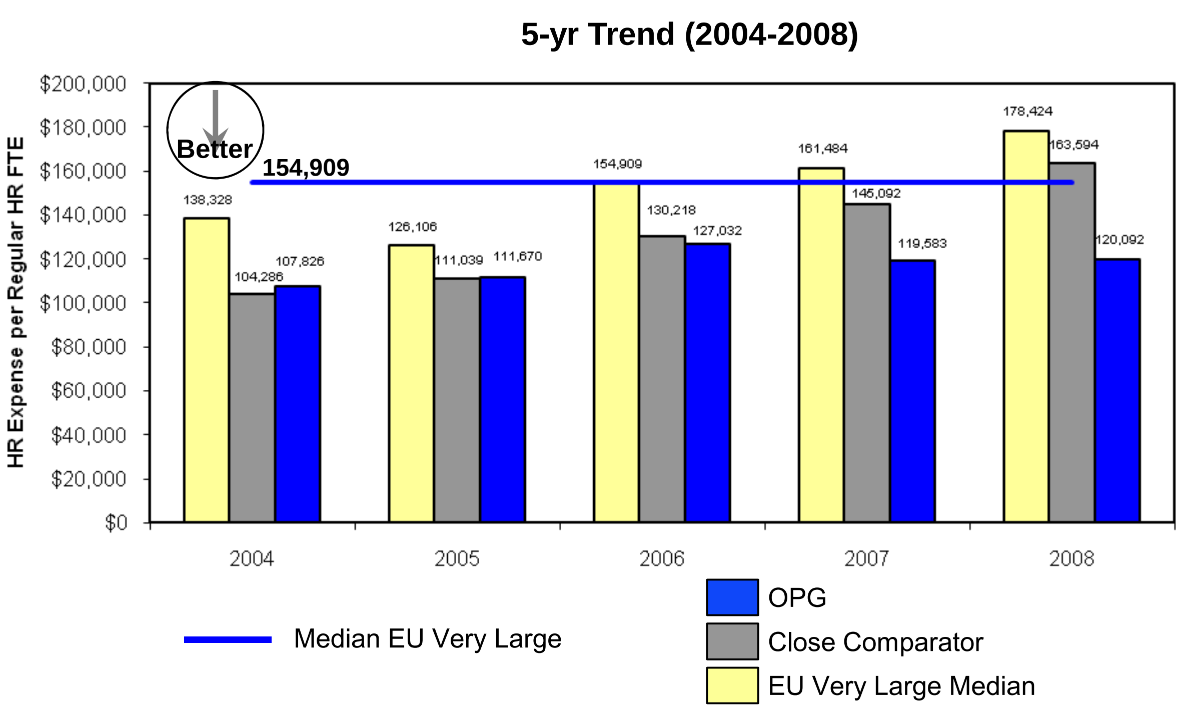
Manage the HR Organization and Employee Assets

HR Expense Factor





Definition:
HR Expense Factor = Total HR Expenses/Regular HR FTE

Observations

- OPG's HR Expense Factor has increased by 11.4% in the last five years but only slightly increased (0.43%) since 2007
- Median HR Expense Factor for the very large utilities has increased by 10.4% since 2007 and by 28.9% in the last five years
- OPG spends less per HR FTE to deliver services than most of the peer group companies and expenses per FTE have grown at less than half the rate of the peer group growth over the last five years

Recommendations

- Target remaining at or below first quartile performance for the HR Expense Factor

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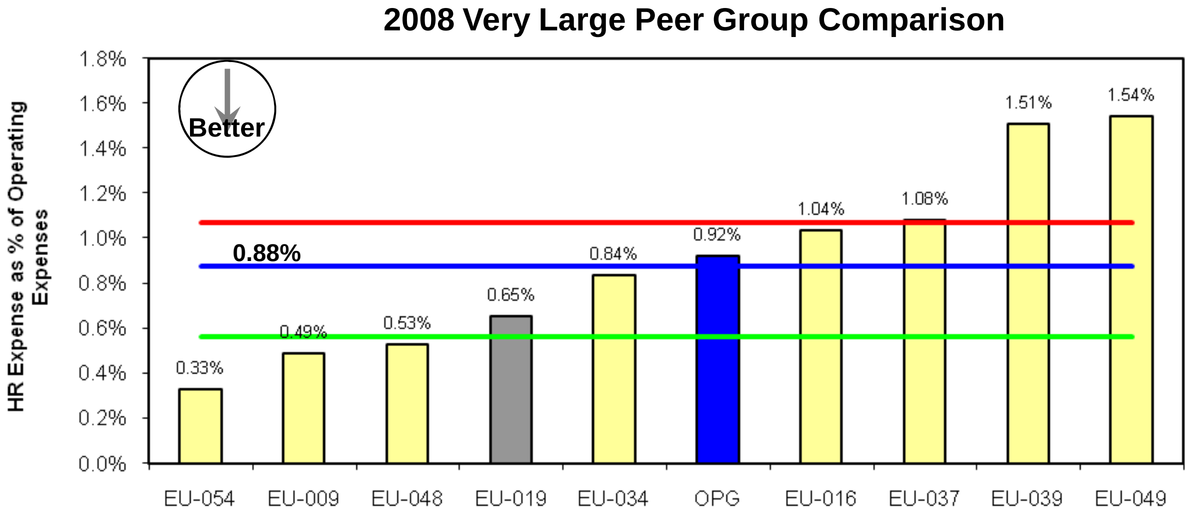
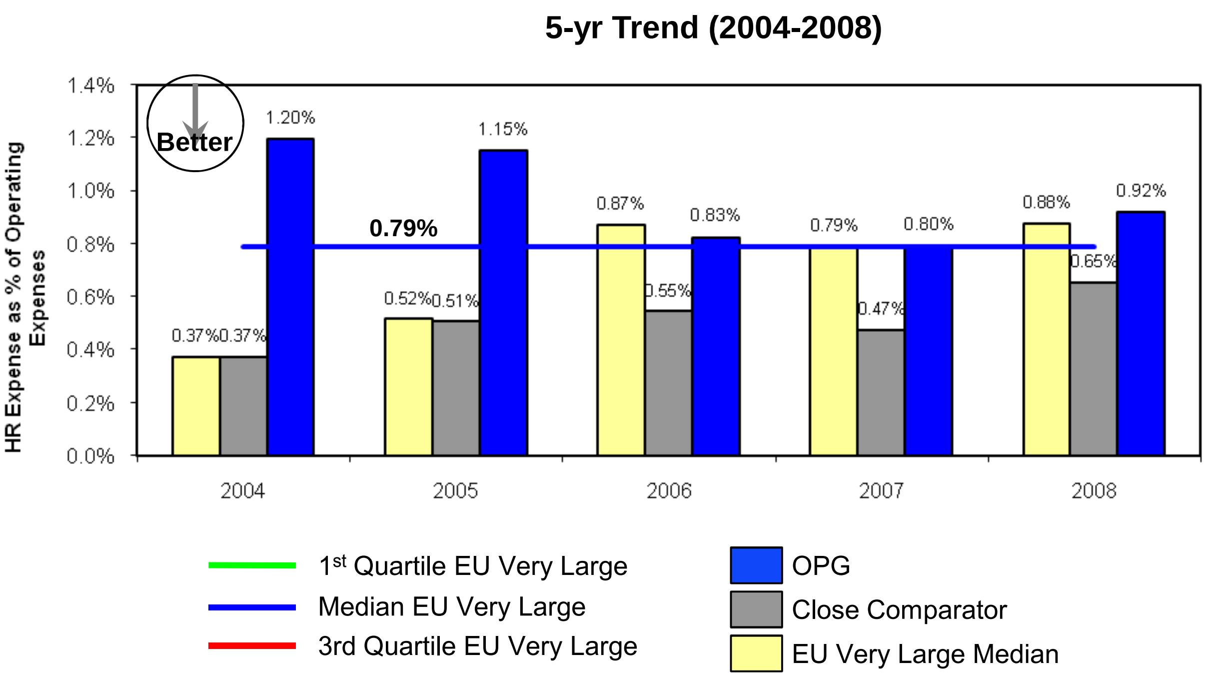
HR Expense Percent





Definition:
HR Expense Percent= Total HR Expenses/ Operating Expenses

Observations

- OPG's HR Expense Percent has decreased by 23.3% in the last five years but has increased by 15% since 2007
- Median HR Expense Percent for the very large utilities has increased by 138% in the last five years and by 11.4% since 2007
- One driver of the increase in HR Expense Percent for OPG in 2008 compared to 2007 is the inclusion of the organization and workforce development function in the 2008 HR metrics. This appears to have contributed to an increase in HR Expense Percent for some of the other utilities in 2008
- OPG's HR Expense Percent is close to the peer group median in 2008

Qualifiers/Considerations

- HR reduced headcount in 2006
- HR added an organizational development (OD) function in 2008

Recommendations

- Target median performance for HR Expense Percent with HR Expense Percent values at or below 0.90%

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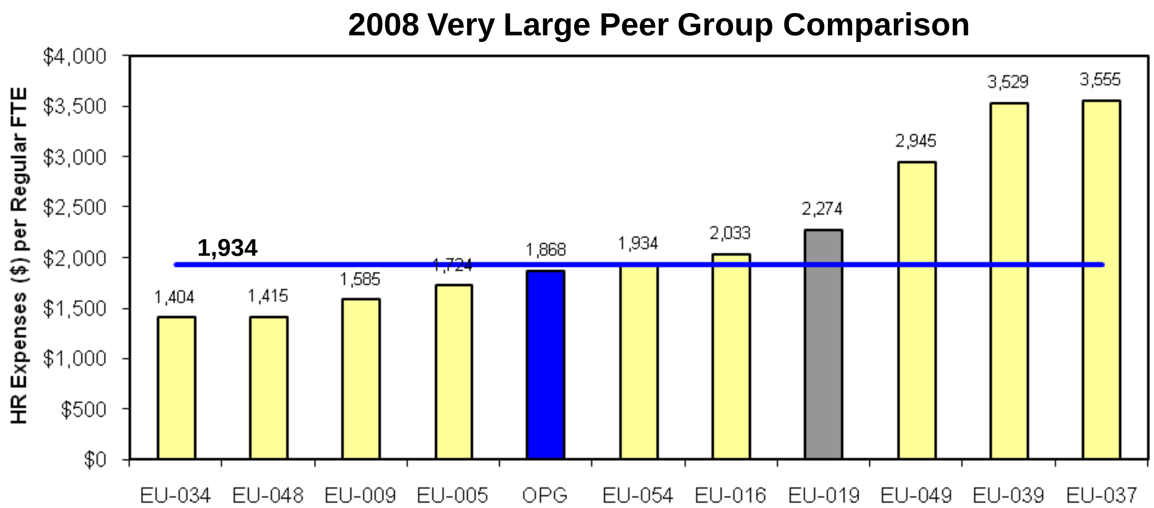
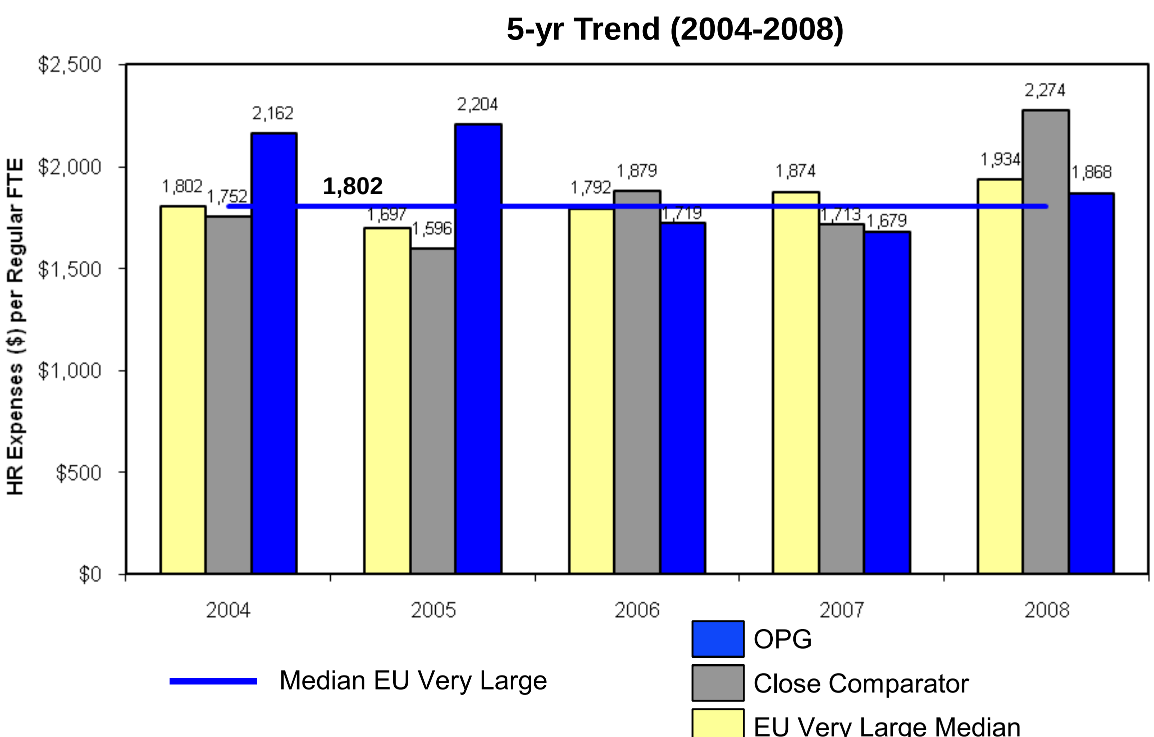
HR FTE Investment Factor





Definition:
HR FTE Investment Factor = HR Expenses/Regular FTE

Observations

- OPG has shown improvement over the five year period in managing the cost of delivering HR service
- OPG's HR FTE Investment Factor has decreased by 13.6% in the last five years but has increased by 11.3% since 2007
- The inclusion of the organization and workforce development function in the 2008 expenses has contributed to the increase in OPG's HR FTE Investment Factor since 2007
- Median HR FTE Investment Factor for the very large utilities has increased by 7.3% in the last five years and by 3.2% since 2007
- OPG invests close to the median benchmark per employee in its HR programs

Qualifiers/Considerations

- Hiring activity for most peer group companies has increased in the last five years, contributing to higher HR costs
- OPG HR supports a very disperse geography

Recommendations

- Target median performance for the HR investment factor and ensure HR investment factor is aligned with company strategy for managing human assets

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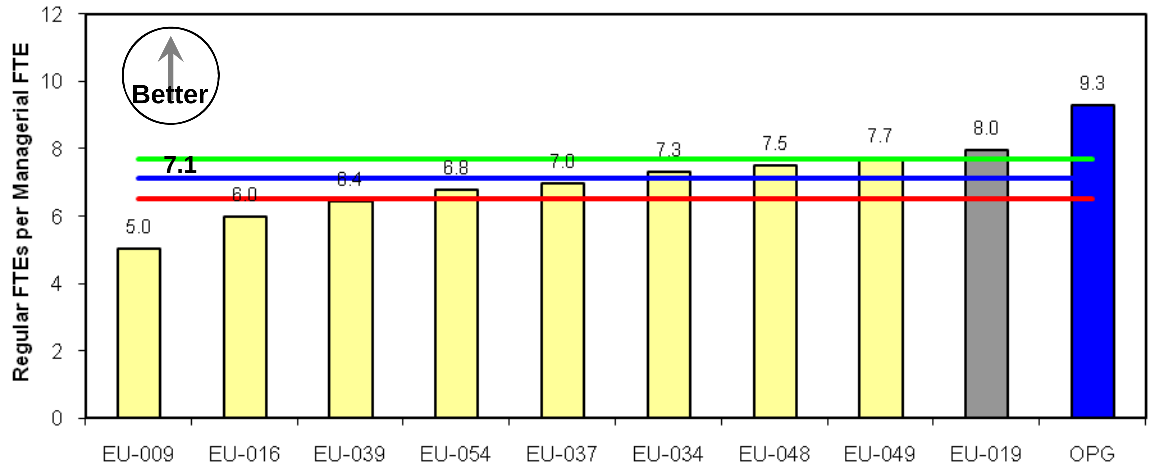
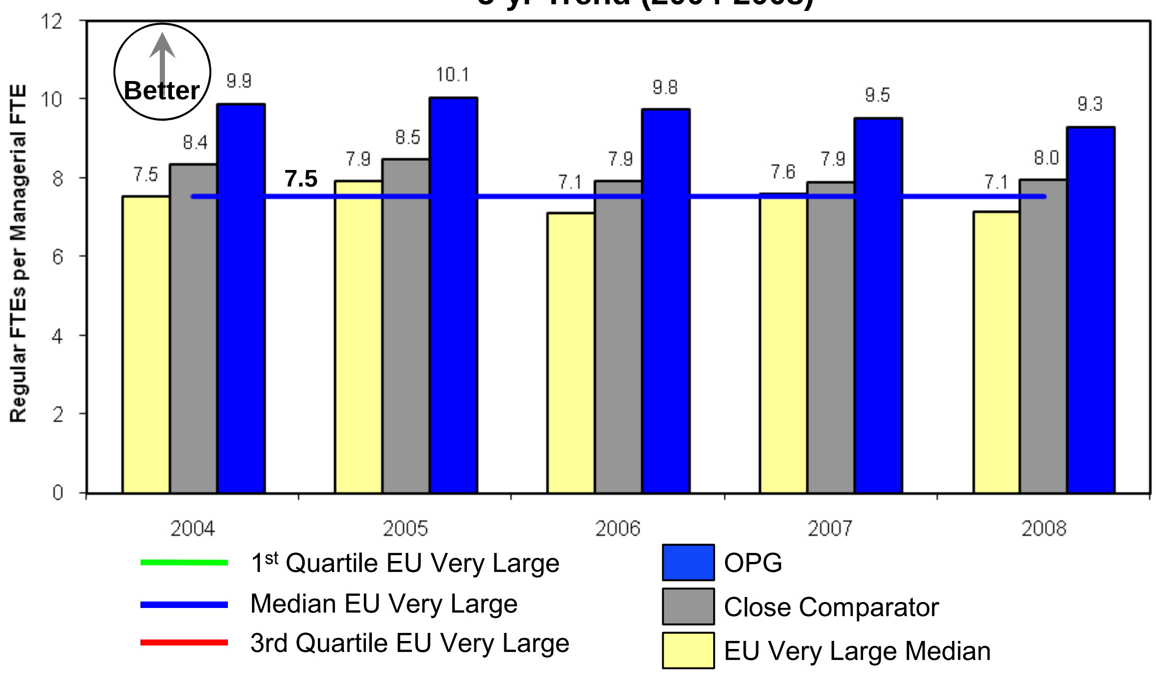
Management Span of Control (All OPG)

2008 Very Large Peer Group Comparison



5-yr Trend (2004-2008)



Definition:
Management Span of Control = Regular FTEs/ Managerial FTE

Observations/Questions

- OPG's Management Span of Control has decreased by 6.1% over the last five years, but it is still the broadest among the very large utilities
- Median Management Span of Control for the very large utilities has decreased by 5.3% in the last five years and by 7% since 2007

Qualifiers/Considerations

- Middle and senior managers at OPG are included in the definition of this metric
- Management spans should vary based on the diversity of work and geography served by the manager
- While broad spans are good for the enterprise, they drive a greater need for HR support with recruitment and other HR processes to maintain management's focus on operations

Recommendations

- Continue to keep overhead costs lower in the management ranks by targeting performance above first quartile for Management Span of Control

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Benchmark Summary

Areas of Positive Performance

- ScottMadden compliments OPG's efforts to benchmark and the organization's interest in leveraging benchmarks to improve the HR function
- OPG HR spends less per HR FTE to deliver a comparable set of HR services than most of the peer group companies
- OPG has shown a positive trend for reducing HR expenses as a percent of operating expenses over the last five years as opposed to the growth in relative HR expenses shown by the peer group over the same period
- OPG's management span of control is broadest among the peer group which relates to lower overhead costs related to management structure
- Decreases in HR expenses per employee show improvement in the cost of delivering HR services to employees over the five year period
- OPG's lower separation rates drive down overall hiring costs for the company
  - OPG's better retention rates for new hires (0-3 years) also keep hiring costs lower
- Even with HR staff ratios lower than most peer group companies, benchmark data indicates that OPG provides HR support at an average or relatively lower cost than peer group companies

Areas for Improvement

- Hire Cycle Time appears to be quite a bit higher than peer group companies, however, inconsistencies in reporting may make the gap in performance smaller
- Benefits costs (including pension) make OPG's loading factor a bit higher than the median for peer group companies
- The existing compensation structure at OPG involves higher fixed costs for the company since a smaller percentage of compensation is variable based on company performance than peer group companies
- OPG's lower HR FTE Ratio indicates an opportunity to improve HR's service delivery model

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Appendices

2008 Data Metrics

Electric Utility HR Metrics	Electric Utilities Code		OPG	EU-019 (Close Comparator)	Very Large Companies (Median) (>10,000)	All Companies (Median)
HUMAN RESOURCES & MANAGEMENT FACTORS	HR Expense Factor		$120,092	$163,594	$178,424	$158,950
	HR Expense Percent		0.92%	0.65%	0.88%	0.84%
	HR FTE Ratio		73	78	82	70
	Management Span of Control		9.3	8.0	7.1	7.1
	HR FTE Investment Factor		1,868	2,274	1,934	2,035
SEPARATION RATES	Separation Rate		3.69%	10.06%	5.77%	5.64%
	Separations by Tenure	0-3 years	10.18%	10.13%	28.83%	30.30%
		+3-5 years	4.07%	3.95%	5.43%	7.19%
		+5-10 years	4.98%	7.81%	11.82%	12.56%
		+10-15 years	0.90%	4.12%	4.12%	4.60%
		+15-20 years	5.88%	9.36%	5.98%	6.30%
		+20-25 years	4.98%	15.36%	6.02%	6.10%
		+25-30 years	21.04%	27.30%	9.88%	9.61%
		+30 years	47.96%	21.97%	21.68%	20.24%
		All Separations	3.69%	10.06%	5.77%	5.64%
COMPENSATION	Variable Comp Ratio		2.63%	4.19%	5.51%	5.61%
	Loading Factor		163%	146%	151%	157%
	Percent of Workforce Eligible for Incentive Pay		100.00%	100.00%	100.00%	100.00%
STAFFING	External Hire Rate		3.25%	6.34%	8.62%	7.42%
	Total Hire Rate		14.97%	17.77%	14.97%	13.03%
	Hire Cycle Time		161	47	60	52
UNION	Workforce Represented (Union)		89.35%	73.20%	42.98%	44.47%

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2007 Data Metrics

Electric Utility HR Metrics	Electric Utilities Code		OPG	EU-019 (Close Comparator)	Very Large Companies (Median) (>10,000)	All Companies (Median)
HUMAN RESOURCES & MANAGEMENT FACTORS	HR Expense Factor		$119,583	$145,092	$161,484	$149,844
	HR Expense Percent		0.80%	0.47%	0.79%	0.76%
	HR FTE Ratio		71	85	84	80
	Management Span of Control		9.5	7.9	7.6	7.3
	HR FTE Investment Factor		1,679	1,713	1,874	1,955
SEPARATION RATES	Separation Rate		3.80%	8.60%	5.55%	5.97%
	Separations by Tenure	0-3 years	8.13%	10.34%	29.28%	27.49%
		+3-5 years	5.64%	6.09%	6.41%	6.38%
		+5-10 years	5.64%	8.41%	11.16%	12.78%
		+10-20 years	11.51%	17.20%	10.96%	11.56%
		+20 years	69.07%	57.97%	40.21%	40.07%
		All Separations	3.80%	8.60%	5.55%	5.97%
COMPENSATION	Variable Comp Ratio		2.40%	8.07%	7.03%	5.97%
	Loading Factor		167.00%	174%	170%	167%
	Percent of Workforce Eligible for Incentive Pay		100.00%	99.85%	99.72%	98.13%
STAFFING	External Hire Rate		4.27%	3.56%	7.13%	7.39%
	Total Hire Rate		16.49%	9.74%	14.16%	13.90%
	Hire Cycle Time		155	47	50	55
UNION	Workforce Represented (Union)		89.53%	72.70%	36.80%	44.38%

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2006 Data Metrics

Electric Utility HR Metrics	Electric Utilities Code		OPG	EU-019 (Close Comparator)	Very Large Companies (Median) (>10,000)	All Companies (Median)
HUMAN RESOURCES & MANAGEMENT FACTORS	HR Expense Factor		$127,032	$130,218	$154,909	$140,781
	HR Expense Percent		0.83%	0.55%	0.87%	0.63%
	HR FTE Ratio		74	69	82	80
	Management Span of Control		9.8	7.9	7.1	7.5
	HR FTE Investment Factor		1,719	1,879	1,792	1,865
SEPARATION RATES	Separation Rate		3.82%	6.35%	5.96%	6.35%
	Separations by Tenure	0-3 years	8.70%	8.43%	22.15%	23.98%
		+3-5 years	3.89%	6.39%	7.69%	7.69%
		+5-10 years	7.09%	5.87%	14.65%	12.37%
		+10-20 years	10.07%	22.35%	10.33%	10.94%
		+20 years	70.25%	56.96%	34.05%	34.67%
		All Separations	3.82%	6.35%	5.96%	6.35%
COMPENSATION	Variable Comp Ratio		2.25%	3.73%	7.15%	4.91%
	Loading Factor		160.01%	161.56%	159.12%	158.23%
	Percent of Workforce Eligible for Incentive Pay		100.00%	100.00%	99.78%	99.02%
STAFFING	External Hire Rate		4.57%	5.32%	6.45%	6.70%
	Total Hire Rate		14.88%	14.88%	14.88%	15.47%
	Hire Cycle Time		166	48	48	54
UNION	Workforce Represented (Union)		89.80%	75.19%	33.82%	42.47%

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2005 Data Metrics

Electric Utility HR Metrics	Electric Utilities Code		OPG	EU-019 (Close Comparator)	Very Large Companies (Median) (>10,000)	All Companies (Median)
HUMAN RESOURCES & MANAGEMENT FACTORS	HR Expense Factor		$111,670	$111,039	$126,106	$114,412
	HR Expense Percent		1.15%	0.51%	0.52%	0.54%
	HR FTE Ratio		51	70	80	80
	Management Span of Control		10.1	8.5	7.9	8.0
	HR FTE Investment Factor		2,204	1,596	1,697	1,563
SEPARATION RATES	Separation Rate		3.58%	5.96%	5.05%	5.71%
	Separations by Tenure	0-3 years	9.38%	10.98%	25.34%	28.67%
		+3-5 years	6.67%	5.15%	10.56%	10.56%
		+5-10 years	5.68%	5.28%	14.91%	10.95%
		+10-20 years	8.89%	23.71%	10.25%	13.08%
		+20 years	69.38%	54.88%	36.42%	32.31%
		All Separations	3.58%	5.96%	5.05%	5.71%
COMPENSATION	Variable Comp Ratio		2.25%	4.91%	6.66%	5.14%
	Loading Factor		154%	147%	158%	147%
	Percent of Workforce Eligible for Incentive Pay		100.00%	100.00%	100.00%	99.67%
STAFFING	External Hire Rate		5.66%	5.21%	5.30%	5.60%
	Total Hire Rate		16.06%	11.38%	11.38%	11.11%
	Hire Cycle Time		163	49	47	62
UNION	Workforce Represented (Union)		89.96%	75.84%	34.53%	40.98%

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2004 Data Metrics

Electric Utility HR Metrics	Electric Utilities Code		OPG	EU-019 (Close Comparator)	Very Large Companies (Median) (>10,000)	All Companies (Median)
HUMAN RESOURCES & MANAGEMENT FACTORS	HR Expense Factor		$107,826	$104,286	$138,328	$137,579
	HR Expense Percent		1.20%	0.37%	0.37%	0.50%
	HR FTE Ratio		50	60	84	84
	Management Span of Control		9.9	8.4	7.5	7.7
	HR FTE Investment Factor		2,162	1,752	1,802	1,721
SEPARATION RATES	Separation Rate		4.81%	9.71%	5.68%	5.96%
	Separations by Tenure	0-3 years	7.92%	8.00%	21.65%	25.00%
		+3-5 years	5.85%	3.54%	8.67%	8.47%
		+5-10 years	2.83%	4.29%	8.32%	8.84%
		+10-20 years	10.00%	21.27%	15.26%	15.92%
		+20 years	73.40%	62.90%	45.17%	35.00%
		All Separations	4.81%	9.71%	5.68%	5.96%
COMPENSATION	Variable Comp Ratio		4.51%	0.08%	11.24%	4.65%
	Loading Factor		160%	152%	152%	152%
	Percent of Workforce Eligible for Incentive Pay		100.00%	100.00%	77.31%	74.44%
STAFFING	External Hire Rate		5.07%	5.28%	5.18%	4.76%
	Total Hire Rate		11.69%	13.96%	11.66%	9.29%
	Hire Cycle Time		153	70	63	65
UNION	Workforce Represented (Union)		89.67%	75.99%	35.96%	47.57%

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THE HACKETT GROUP FINANCE BENCHMARK PROGRESS REPORT

1.0 INTRODUCTION

In 2007, Finance partnered with the Hackett Group to assess the efficiency and effectiveness of its processes and procedures against benchmarked 2006 data. A follow-up mini benchmarking exercise was undertaken in 2009 using 2008 data. This exercise focused on areas related to resource allocation/utilization.

Certain information and statistics in the benchmarking report are considered by the Hackett Group to be sensitive, proprietary and confidential. For that reason, the Hackett Group has produced a report filed at Ex. F5-T3-S2 which does not include this proprietary information. The sensitive information relates to certain definitions, questionnaires, process taxonomy, research and programs related to a firm being considered “world class”. The sensitive information is considered by the Hackett Group to be proprietary and trade secrets. OPG’s agreement with the Hackett Group precludes the release of this confidential, proprietary information. However, the report at Ex. F5-T3-S2 does show how OPG compares to the median value of its peer group, as defined by Hackett. For the Benchmark Progress Report - Finance, the data from a group of 11 energy companies was compiled and compared to the data collected for OPG.

Filed: 2010-05-26
EB-2010-0008
Exhibit F5-3-2

Benchmark Progress Report – Finance

Presented to:

ONTARIO POWER GENERATION

The Hackett Group

May 6, 2010

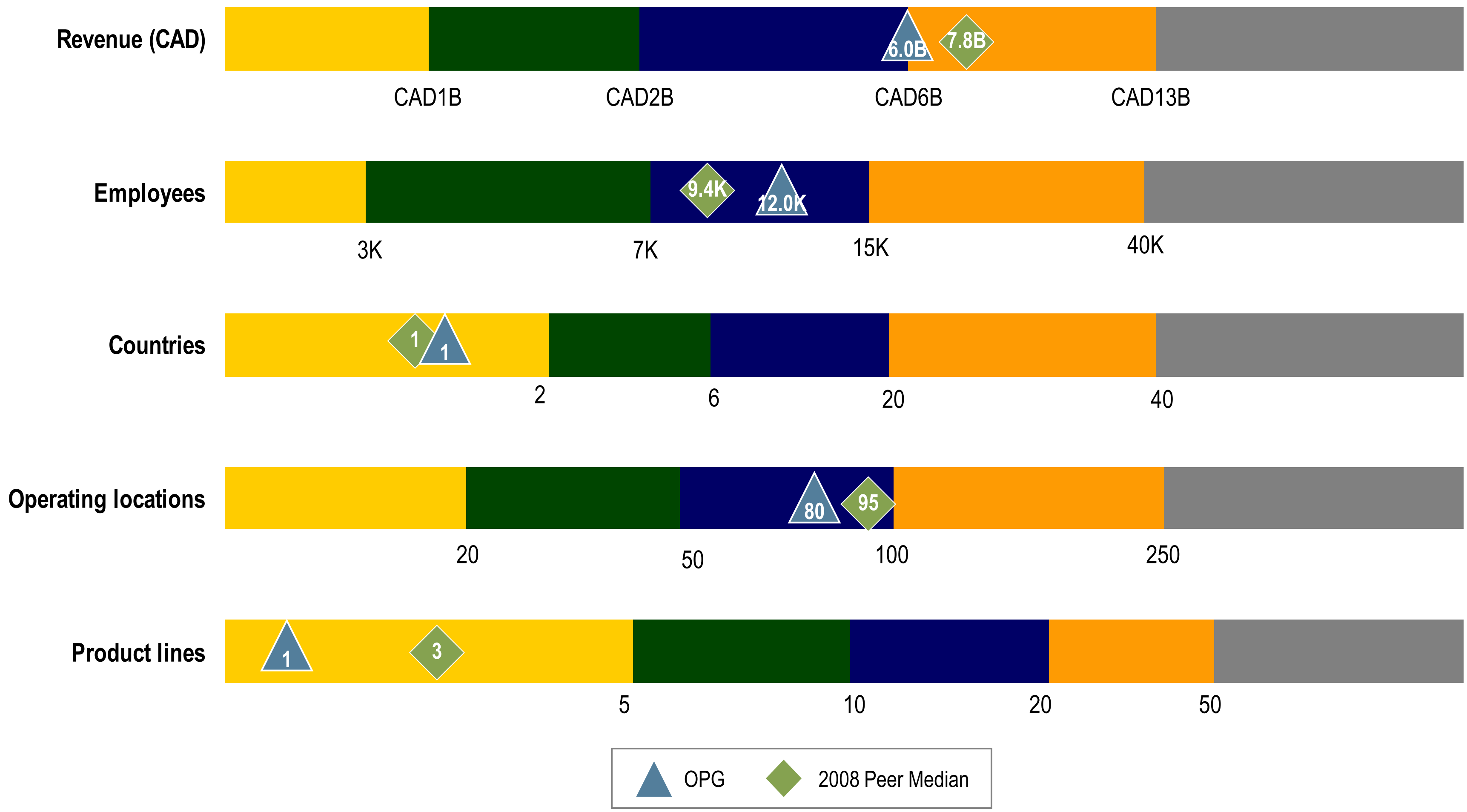
Contents

Background

Project Scope

- The data captured and represented in this report includes OPG's Finance operations
- Data was captured across 8 process groups as defined by Hackett
  - Revenue Cycle information was excluded from collection, analysis and comparisons
- The FTE, cost, and transaction data represents calendar 2008
- All currency information is displayed in Canadian dollars (.944 conversion to USD)

Finance demographics – Utilities Peer Group



Selected benchmark participants included in the custom peer group

Peer Comparison Approach

- Hackett selected organizations that have relatively similar demographics and business complexity as Ontario Power Generation (e.g. revenue, geographic footprint, regulatory environment, etc.)
- Peer group comparisons in the report represent the median value of the custom peer companies

The following is a list of the companies in the custom peer group for Ontario Power Generation:

- Ameren Corporation
- Areva
- CMS Energy Corporation
- Constellation Energy Group
- Dalkia
- FPL Group
- LCRA
- NorthWestern Corporation
- PSEG Energy Holdings
- Reliant Energy
- We Energies

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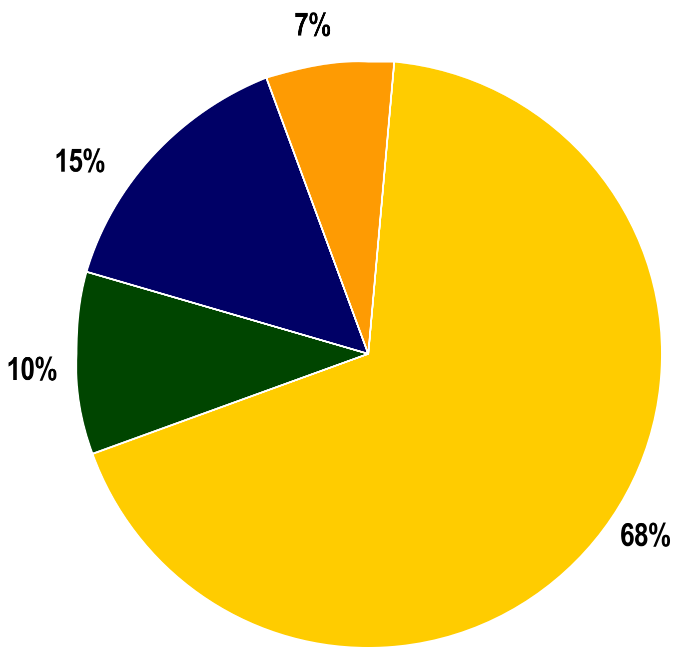
Baseline

For 2008, OPG's Finance Costs were CAD48.4 Million

2008 Total = CAD48.4 Million

2006 Total = CAD47.5 Million



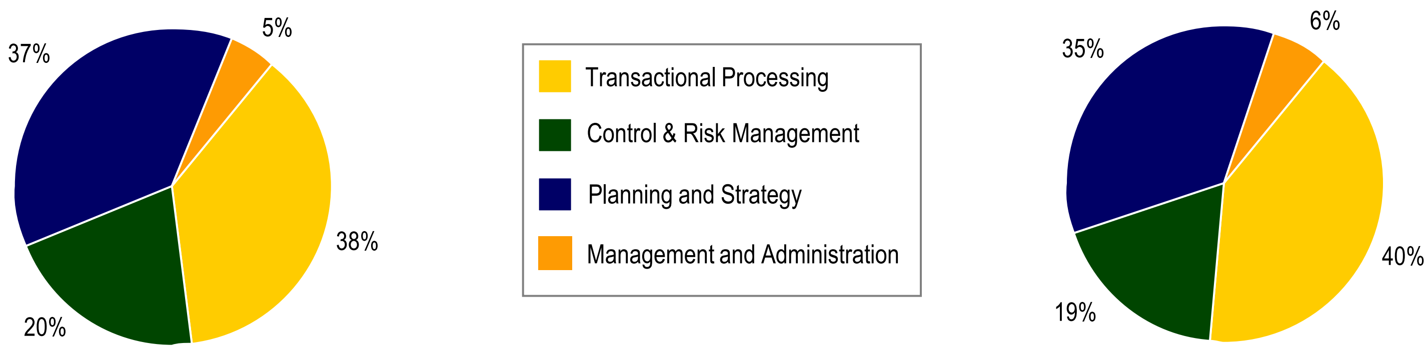
	2008	2006
Other cost –	CAD3.4 Million	CAD3.7 Million
▪ Facilities, travel ▪ Supplies, training		
Technology cost –	CAD7.5 Million	CAD7.8 Million
▪ Computer processing ▪ Maintenance		
Outsourcing cost –	CAD3.6 Million	CAD3.8 Million
▪ Outside services		
Labor cost –	CAD33.9 Million	CAD32.3 Million
▪ Wages (full-time and part-time) ▪ Overtime and bonuses ▪ Taxes and fringe benefits		
Process Cost:	CAD37.5 Million	CAD36.0 Million

2008 Annual Revenue after Rebates = CAD5.97 Billion

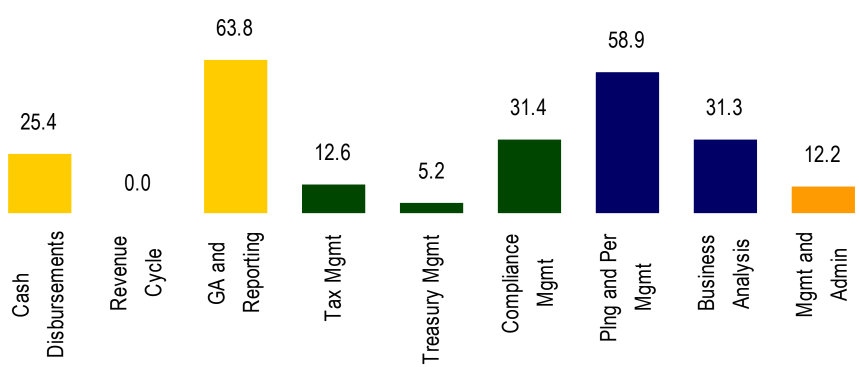
2006 Annual Revenue after Rebates = CAD5.72 Billion

Baseline FTEs

2006 Resource Allocation / 2008 Resource Allocation

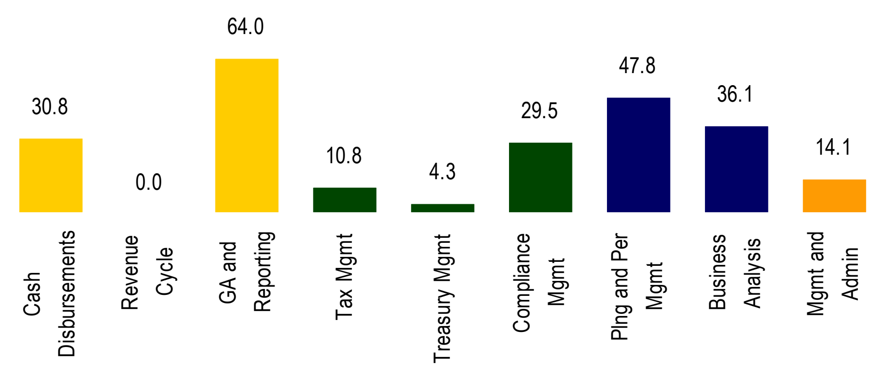


2006 Staff Time Allocation by Process Groups



240.7 FTEs

2008 Staff Time Allocation by Process Groups



237.4 FTEs

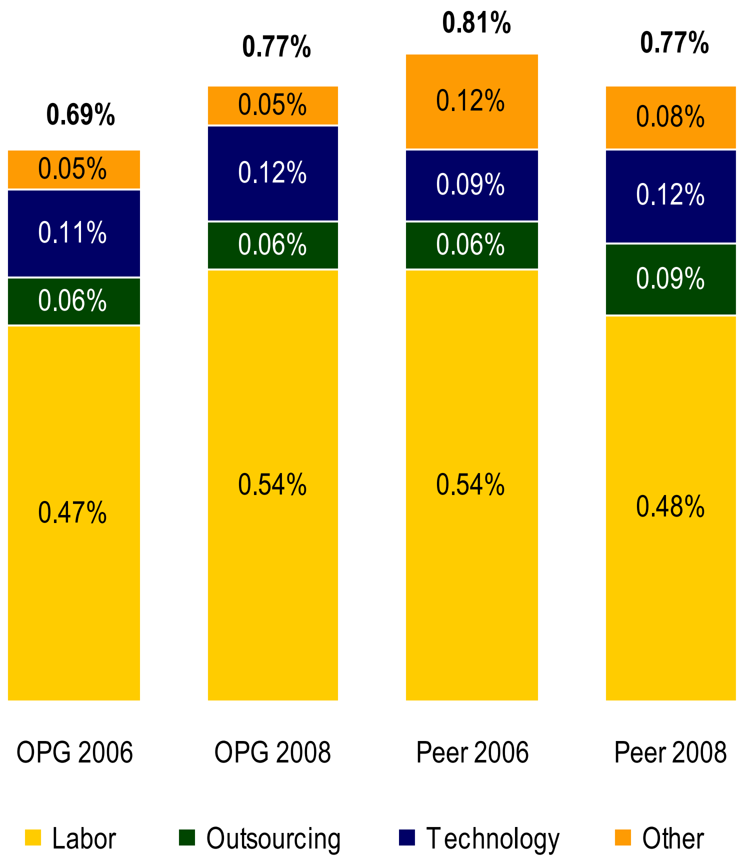
Observations and Findings

- Finance cost as a percent of revenue is 0.81% (vs. .84% for 2006)
  - Approximately 70% of Finance's costs are labor costs
  - Technology and other costs are comparable to the peer group
  - Total staffing has decreased, but is slightly higher than peer
- Overall, areas where OPG compares favorably against peers include General Accounting, Tax Management, Treasury Management, Function Management/Administration, and Staff Experience and Training
- Transactional process staffing levels are lower than peer, but opportunities exist
  - Higher wage rates and lower productivity cause cost per disbursement to be higher than peer
  - 67% of vendor invoices are received electronically, which is better than peer
  - 93% percent of journal entries are automated, with a days to close equal to peer
- Control and Risk Management processes use higher outsourcing investment
  - Treasury outsourcing cost as a percent of revenue is .004%, compared to .001% for peer
  - Compliance process cost is 18% higher than peer, driven by staffing levels
- High investment in Planning & Strategy achieves mixed levels of effectiveness and efficiency
  - Operations Managers do not enter budget information into an online application causing the budget cycle to be longer than required (128 days)
  - Business analysts spend the majority of their time analyzing data, and less time collecting / compiling
- Finance staff receive more formal training
  - 32 hours of formal training hours for finance employees
  - 55% of analysis staff is experienced in both finance and operations

External Comparisons

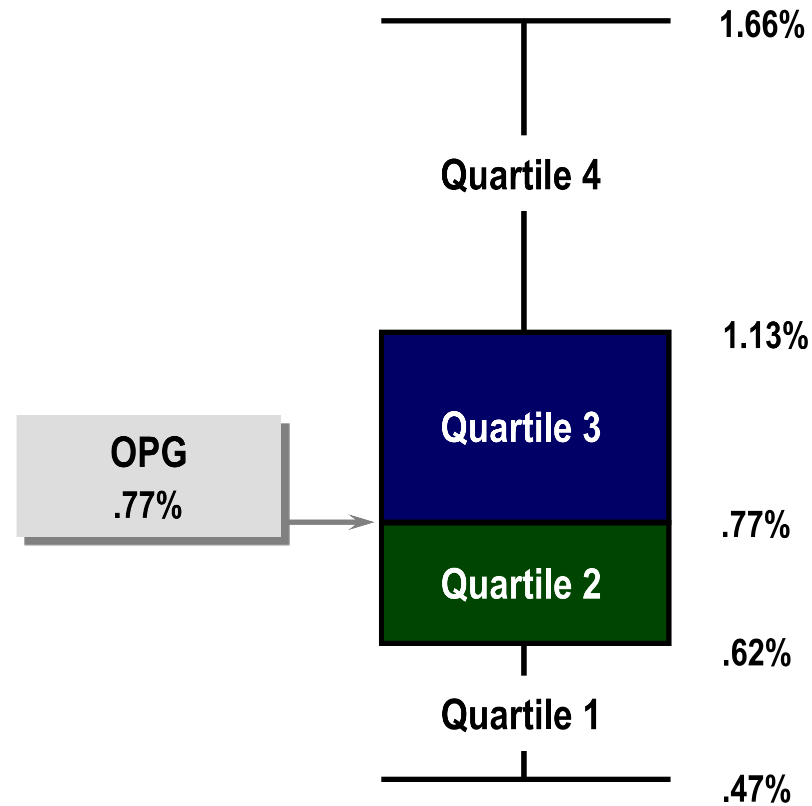
Total Cost

Finance Cost* as a Percent of Revenue before Rebates



* Revenue Cycle excluded from both OPG & Comparisons

OPG Finance Cost* as % of Revenue before Rebates vs. Peer Group Quartile Breakdown



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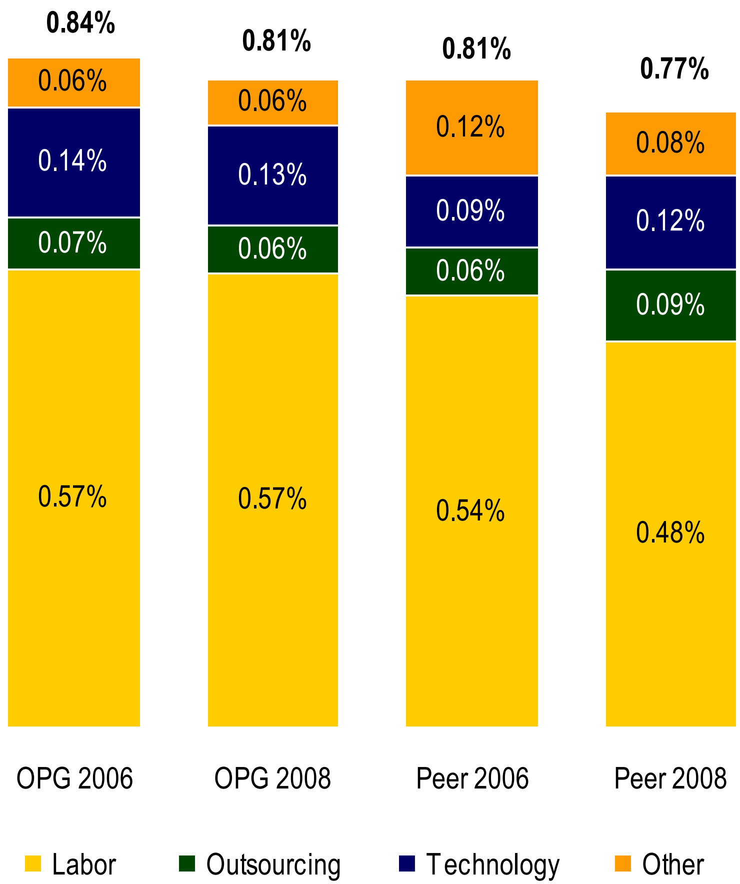
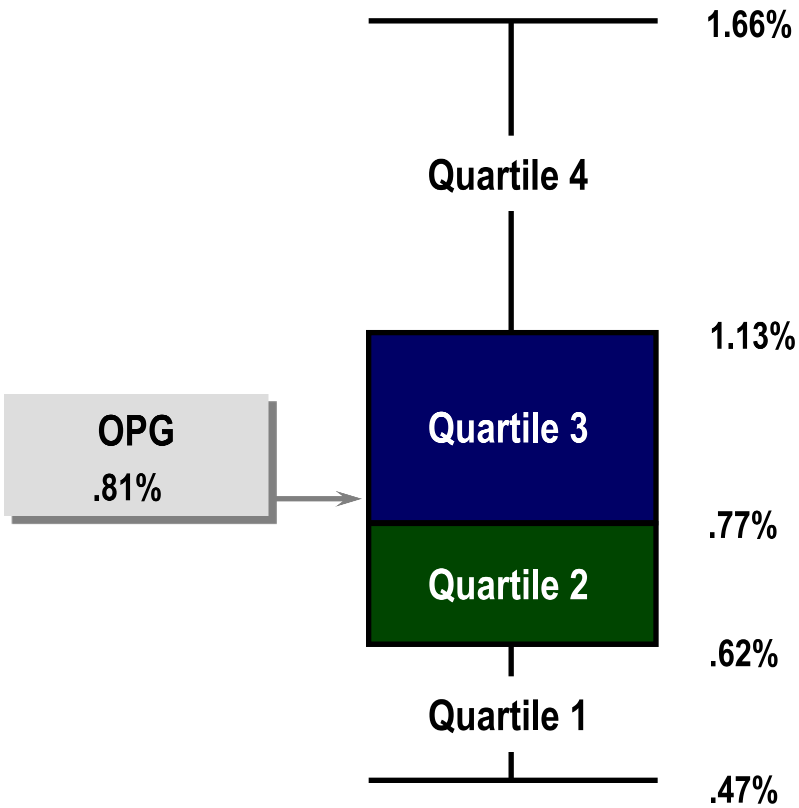
Total Cost

Finance Cost* as a Percent of Revenue after Rebates



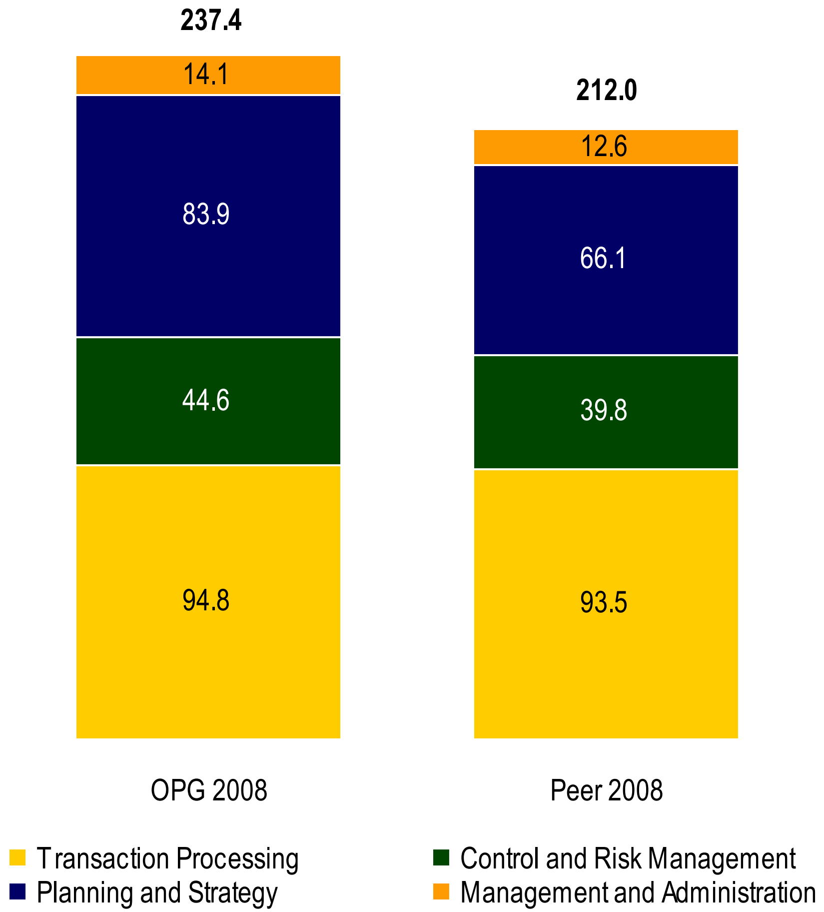
OPG Finance Cost* as % of Revenue after Rebates vs. Peer Group Quartile Breakdown



* Revenue Cycle excluded from both OPG & Comparisons

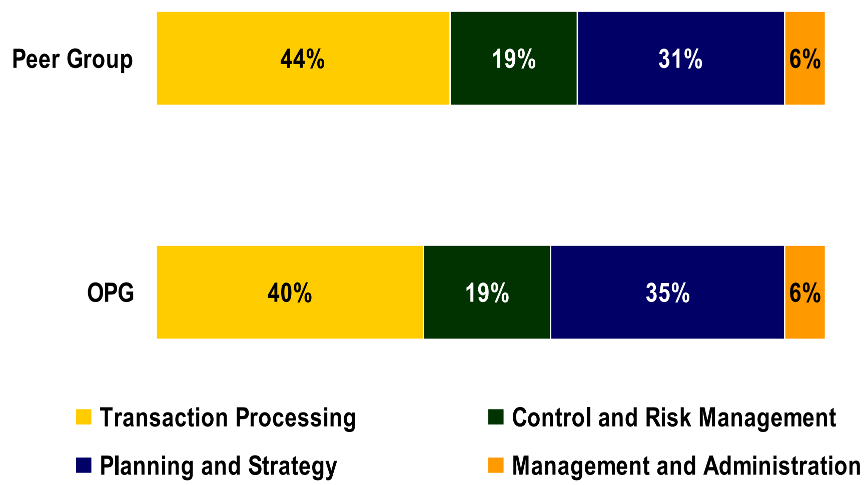
Total FTEs and Process Category Allocation

FTEs* per OPG's Revenue after Rebates

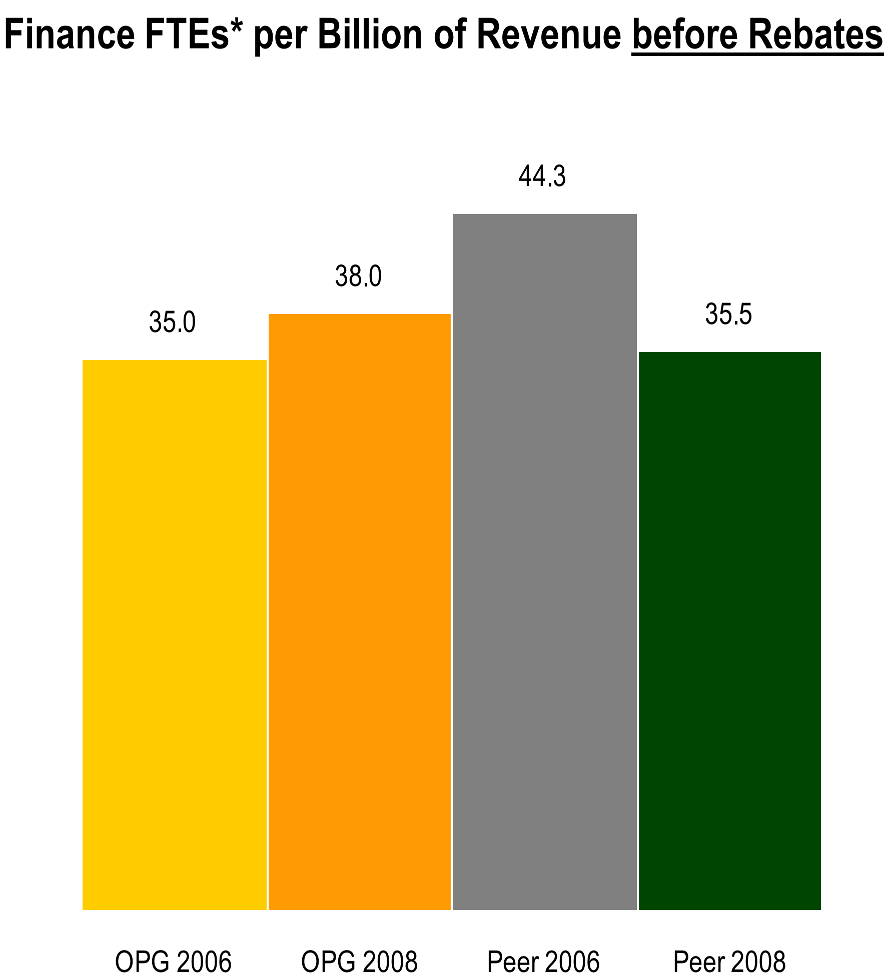


* Revenue Cycle excluded from both OPG & Comparisons

Finance Resource Allocation*

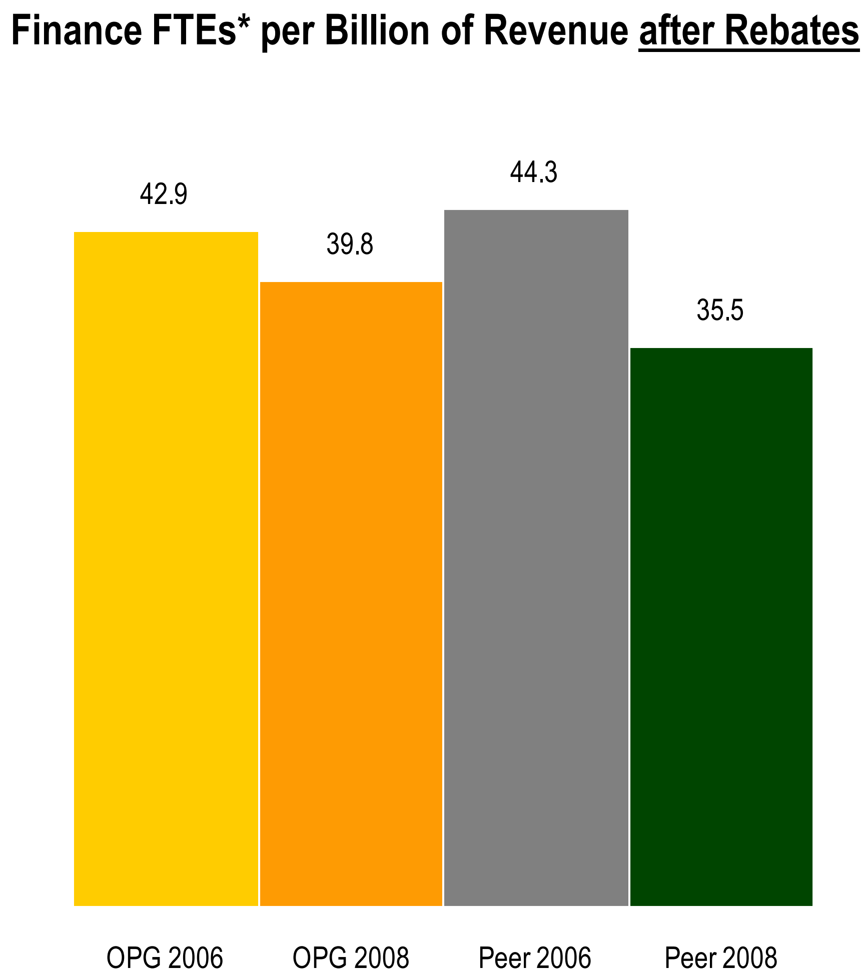


Total FTEs



* Revenue Cycle excluded from both OPG & Comparisons

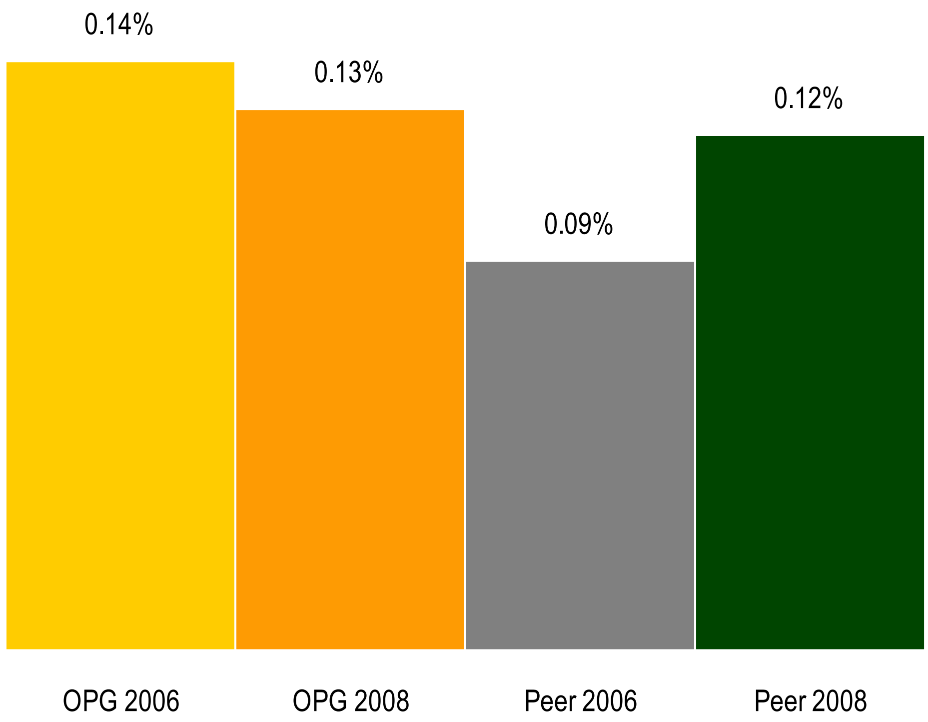
Total FTEs



* Revenue Cycle excluded from both OPG & Comparisons

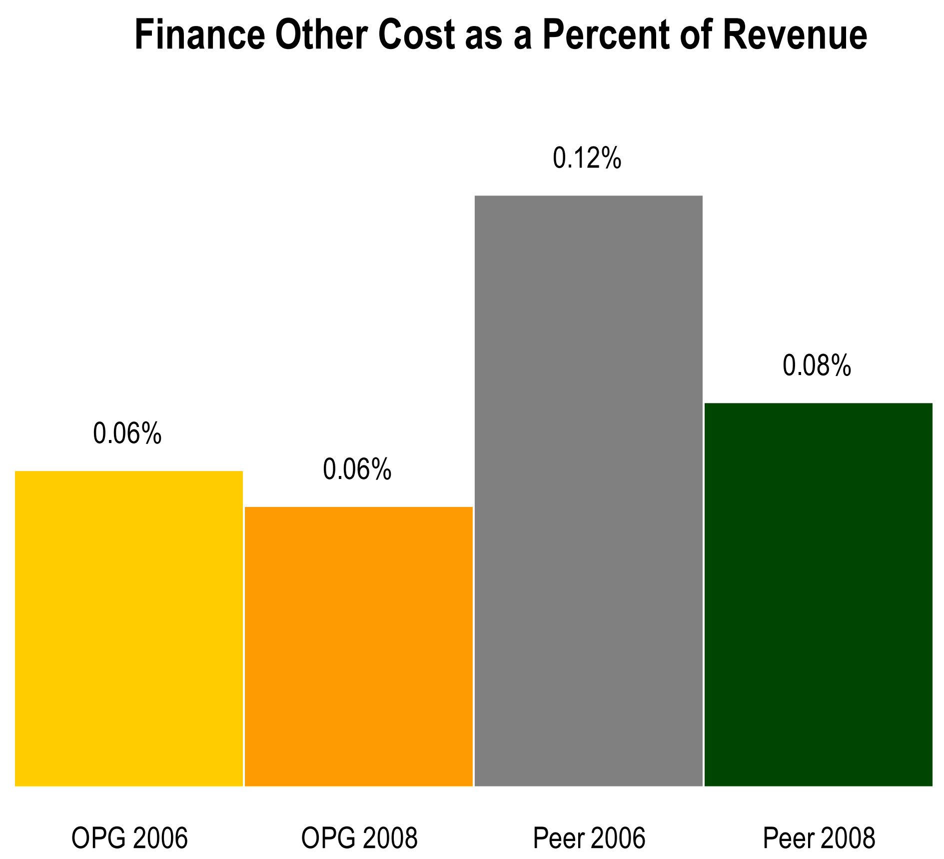
Finance Technology Investment

Finance Technology Cost as a Percent of Revenue



OPG's technology cost = CAD7.5 Million

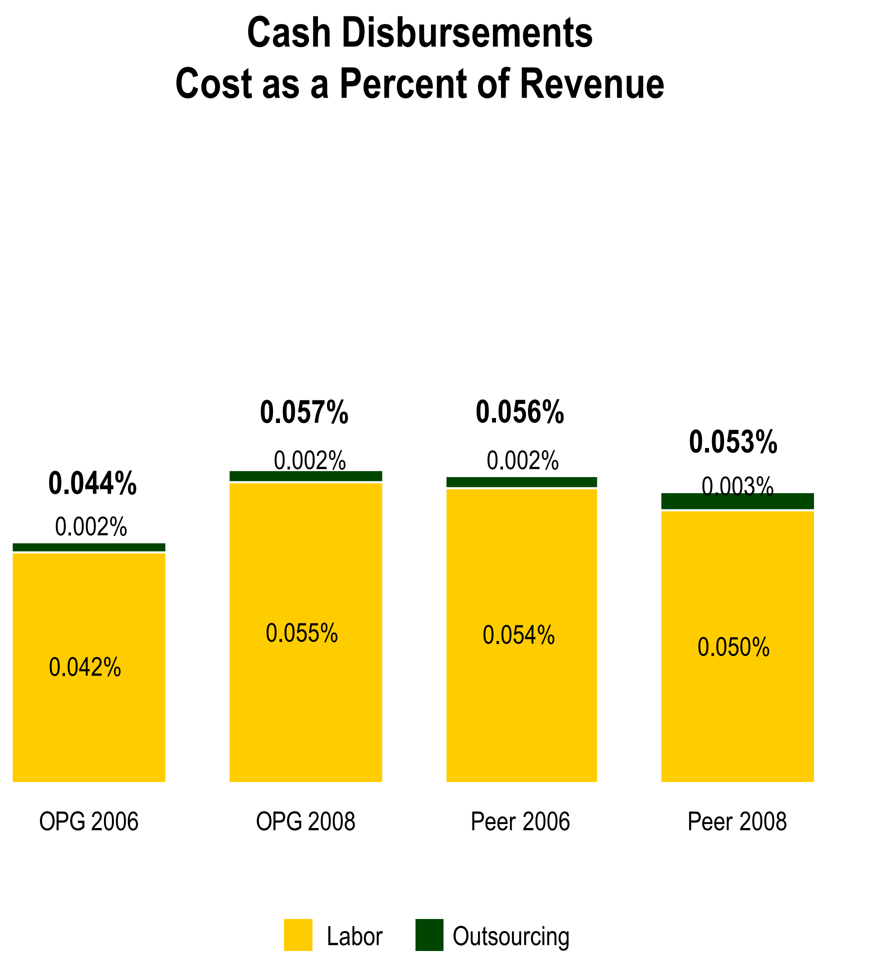
Finance's Other Costs

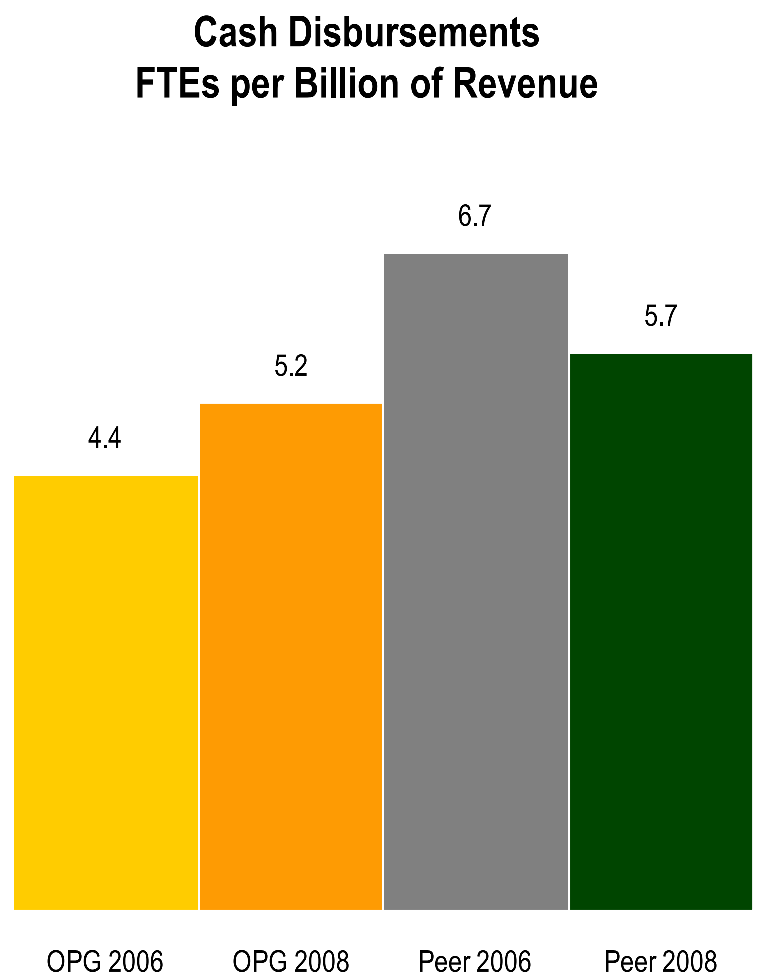


OPG's other cost = CAD3.4 Million

Process Group Analysis

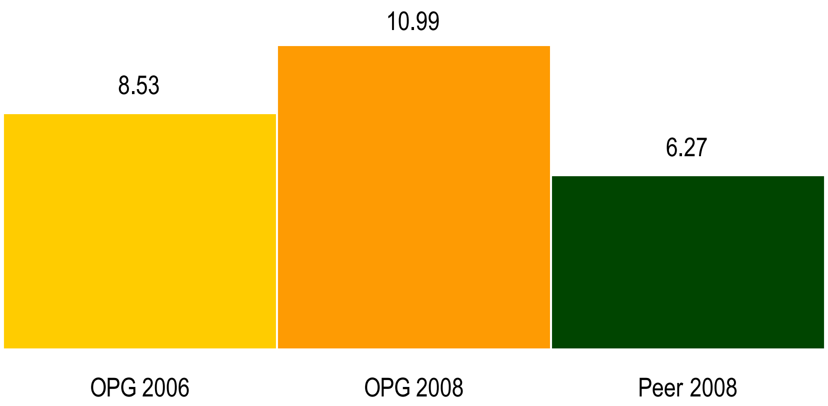
Cash Disbursements



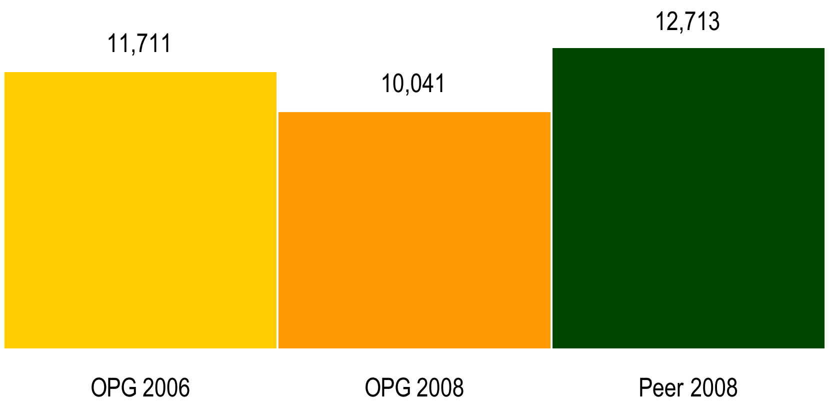


Cash Disbursements

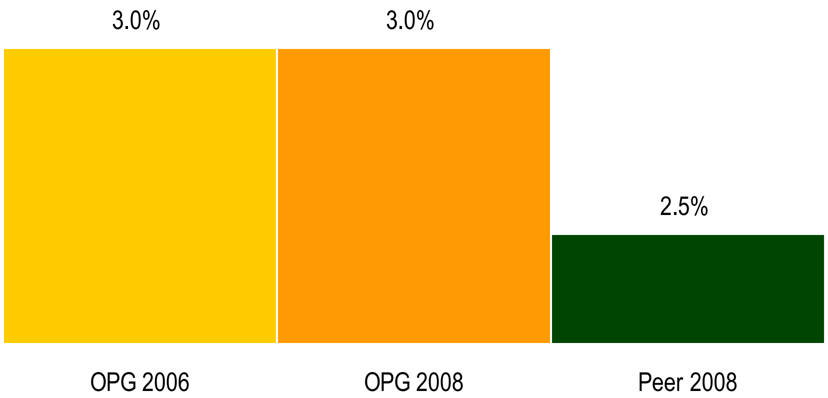
Cost per Transaction (Invoices/T&E Reports)



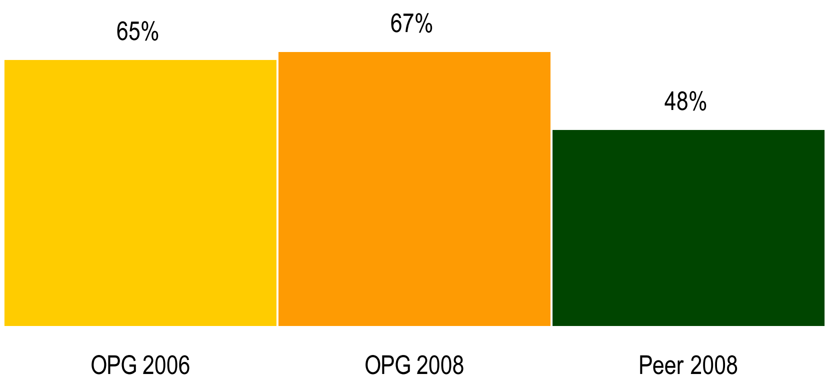
Transactions per FTE



Percent A/P Transactions Require Correction



Percent Electronic Transactions



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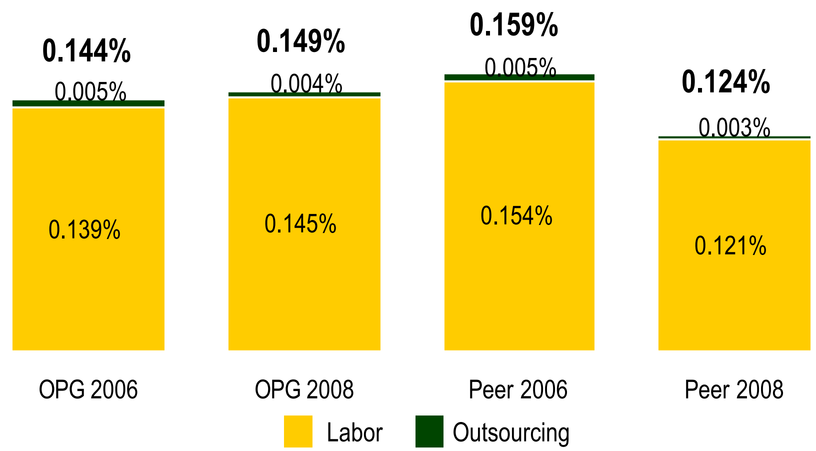
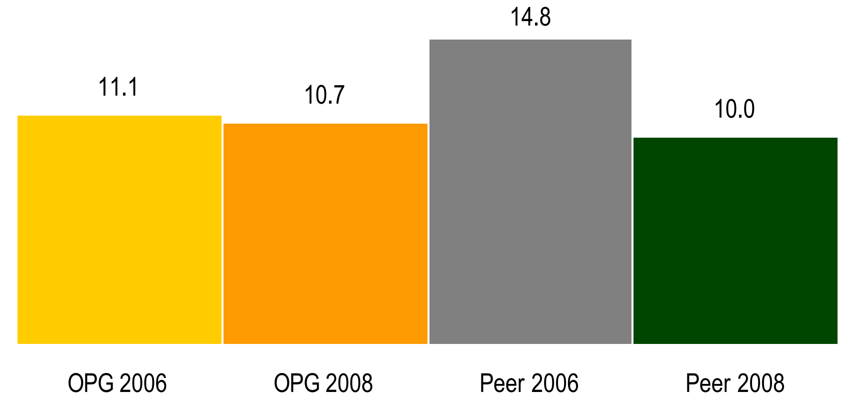
General Accounting

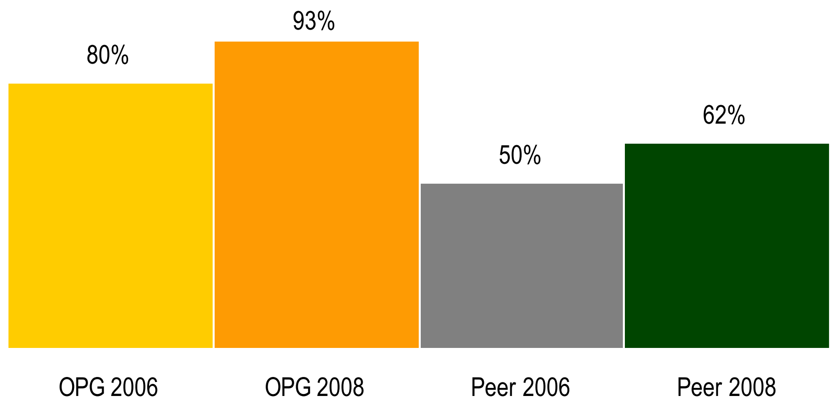
Cost as a Percent of Revenue - General Accounting



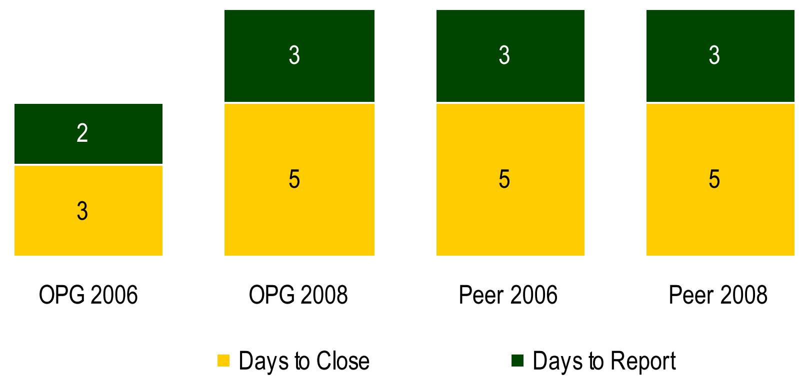
General Accounting FTEs Billion of Revenue



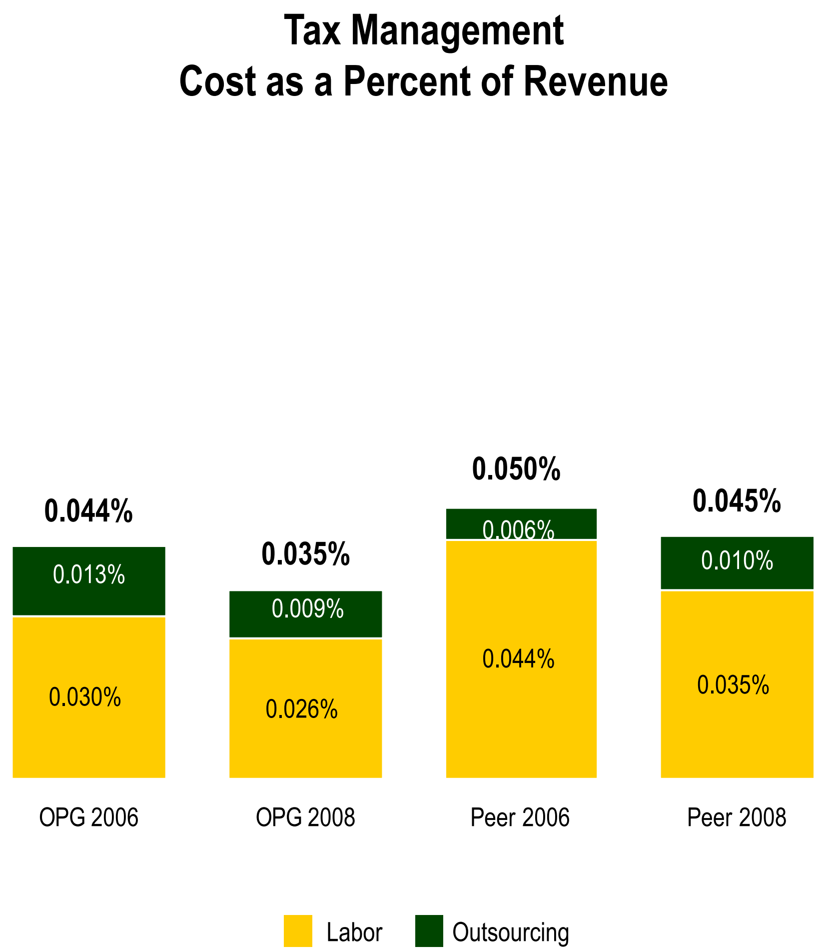
Percent Automated Journal Entries

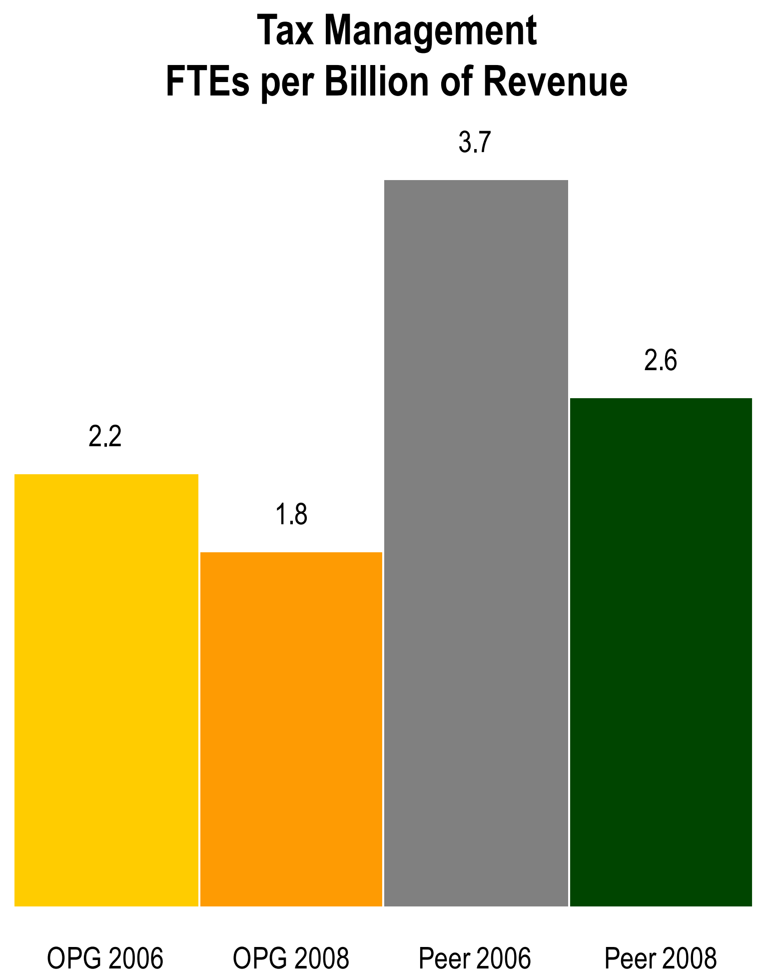


Month-end Close Cycle

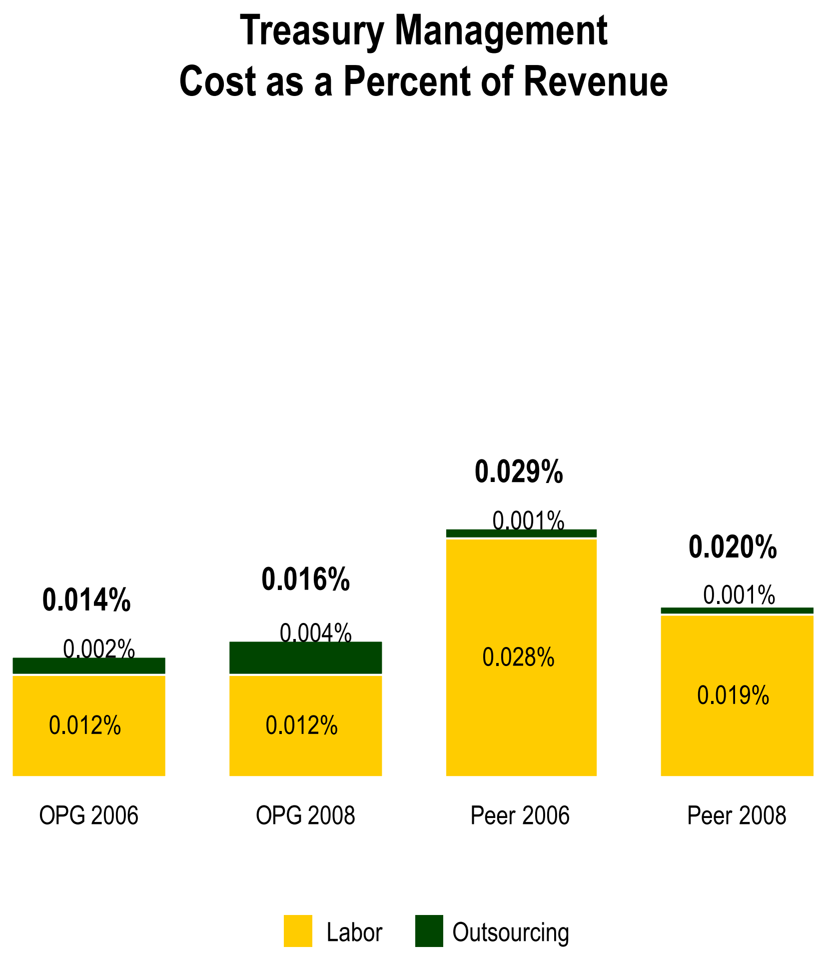


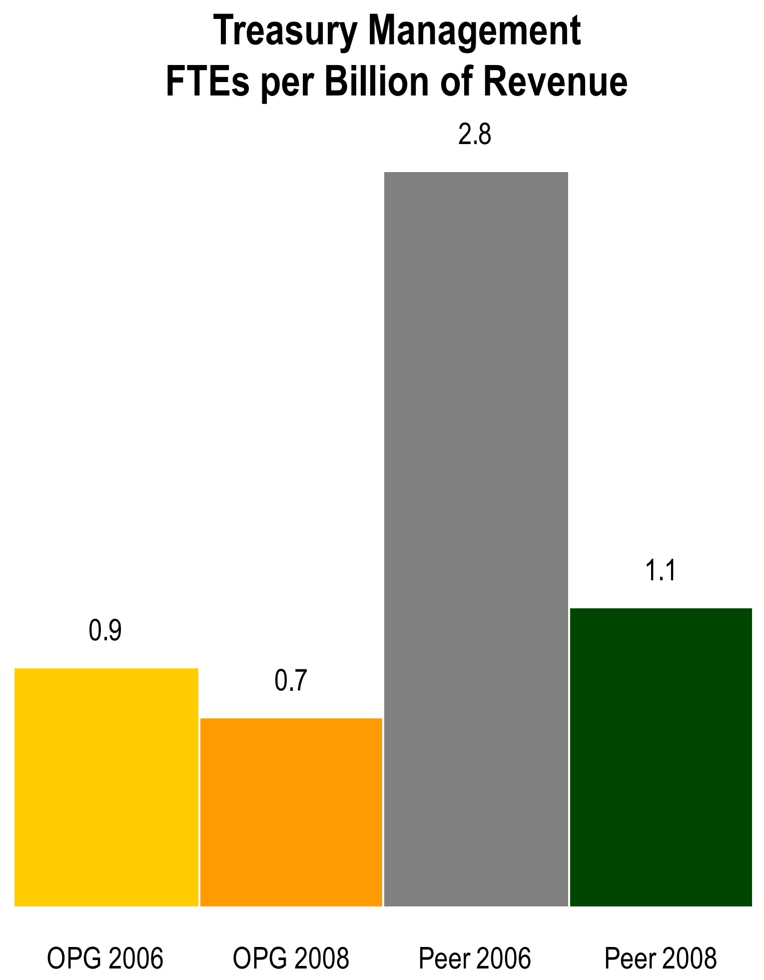
Tax Management



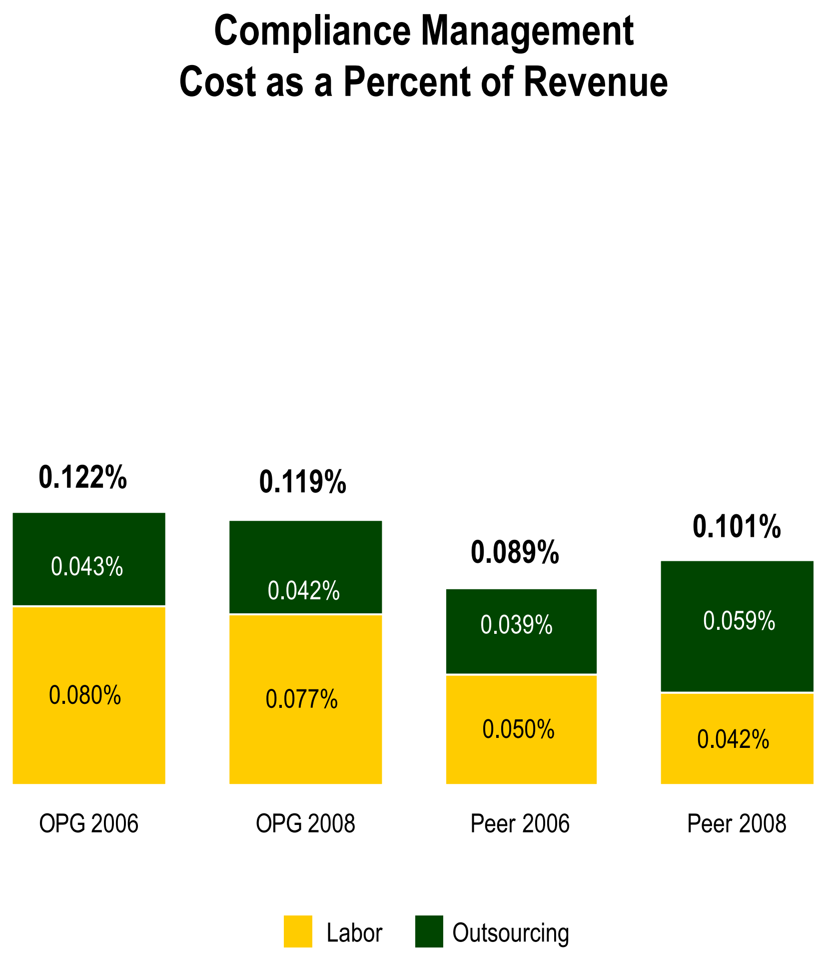


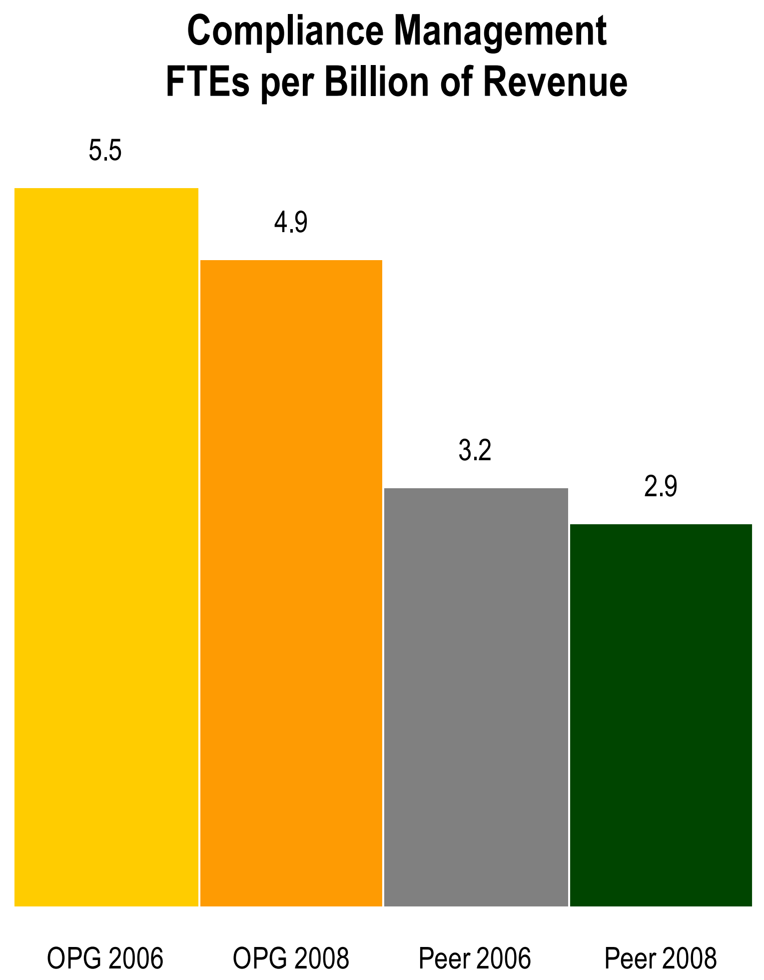
Treasury Management



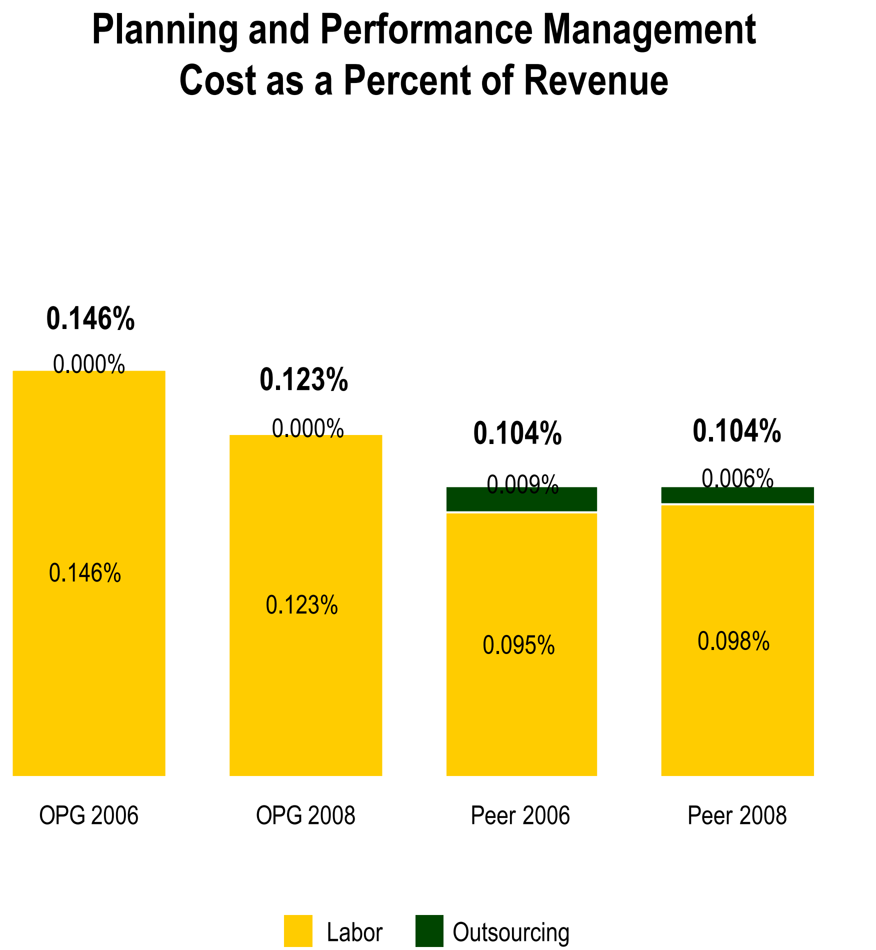


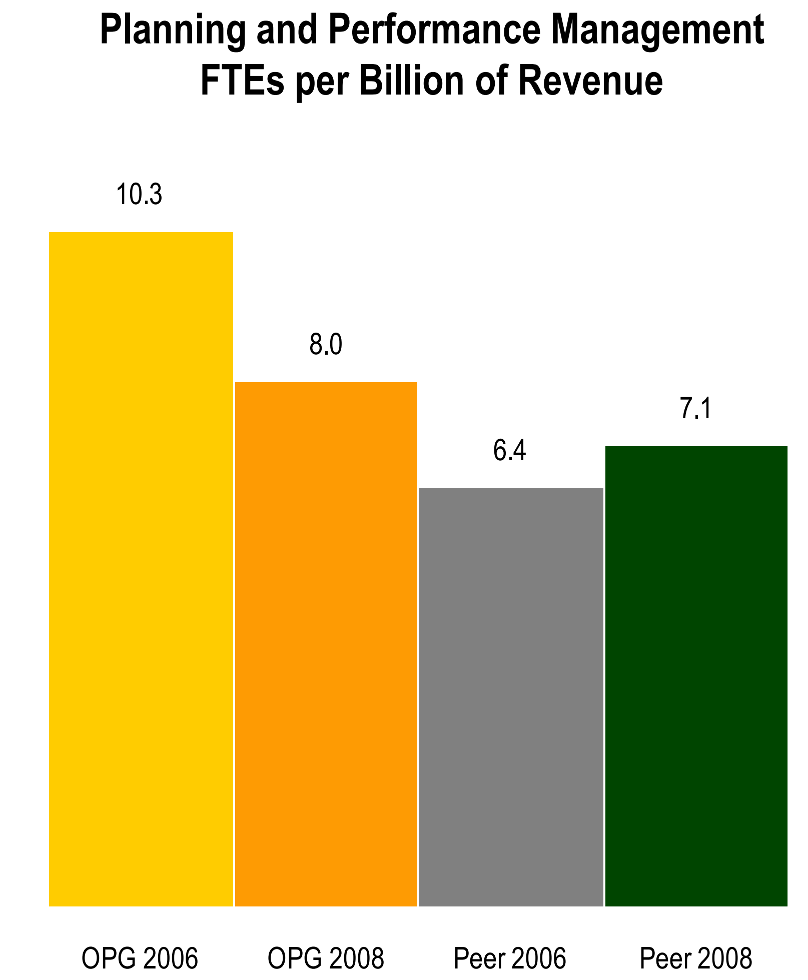
Compliance Management





Planning and Performance Management





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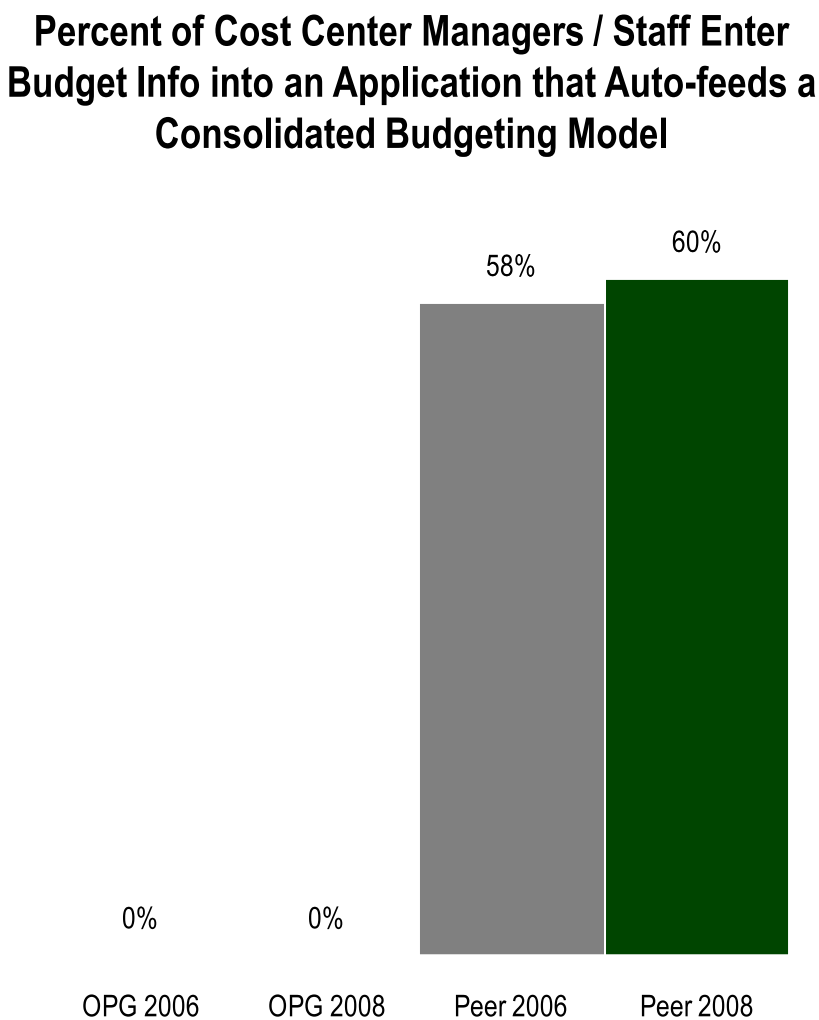
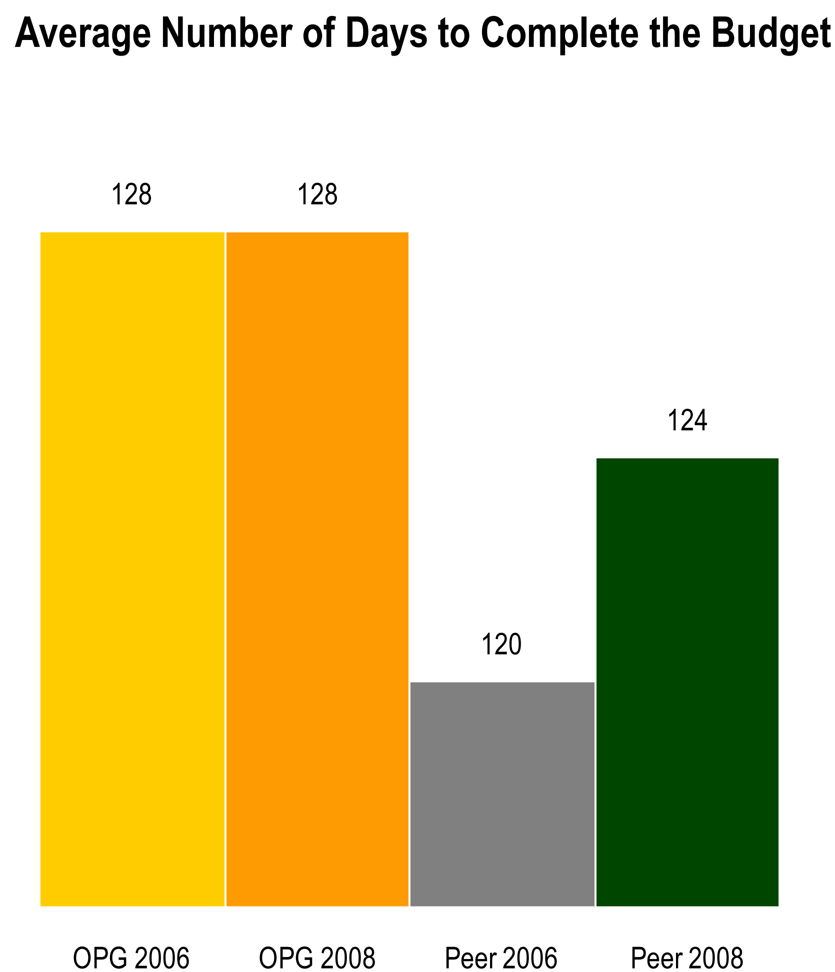
Budgeting





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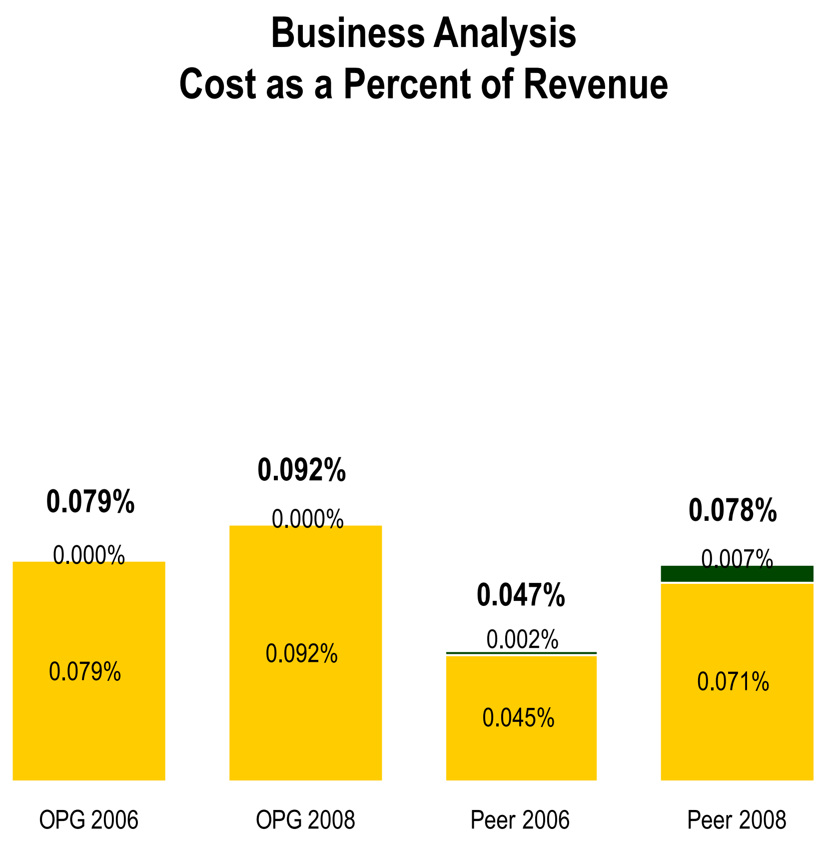
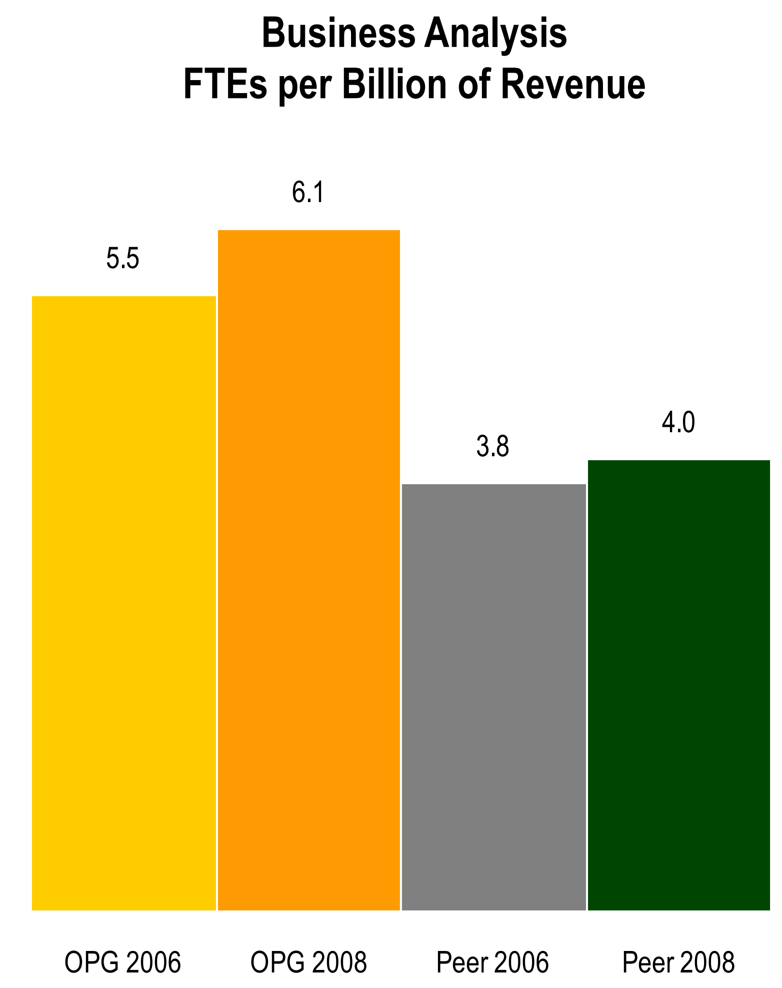
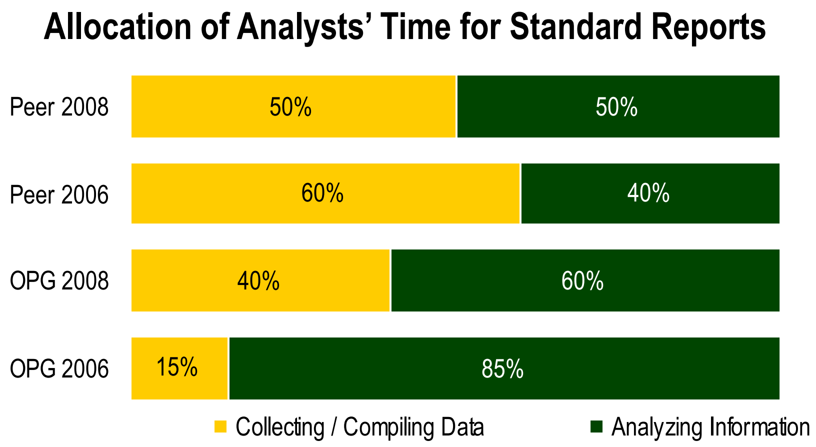
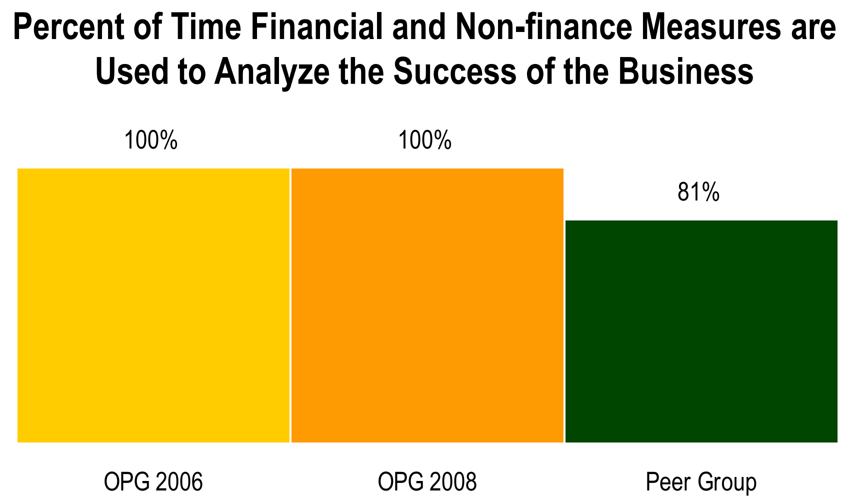
Business Analysis

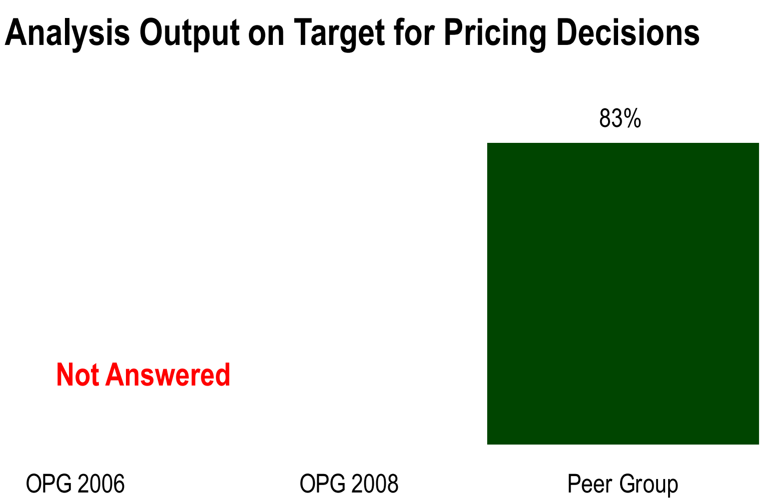


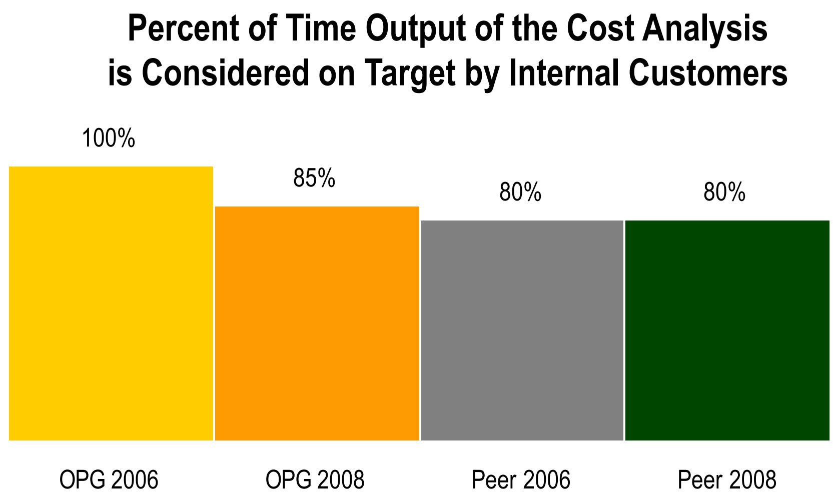


Business Analysis

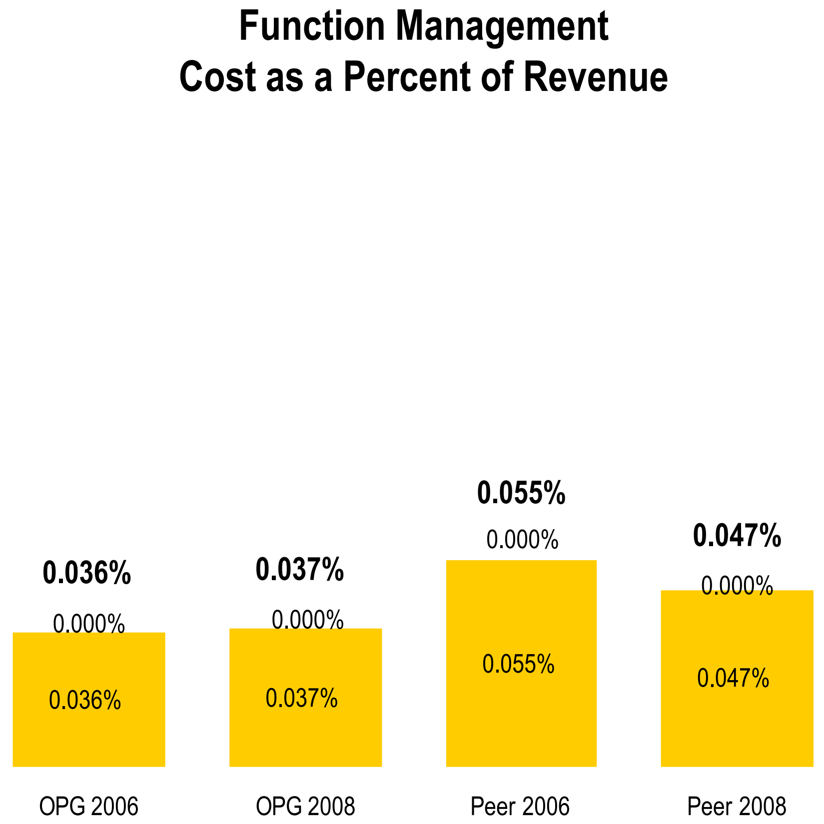


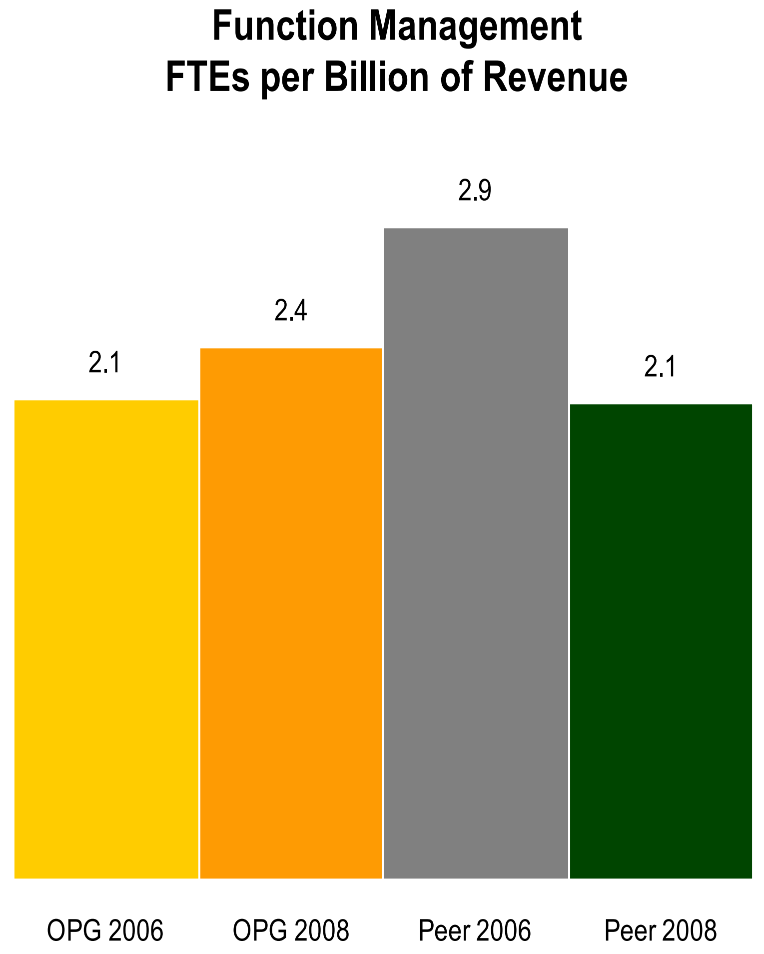




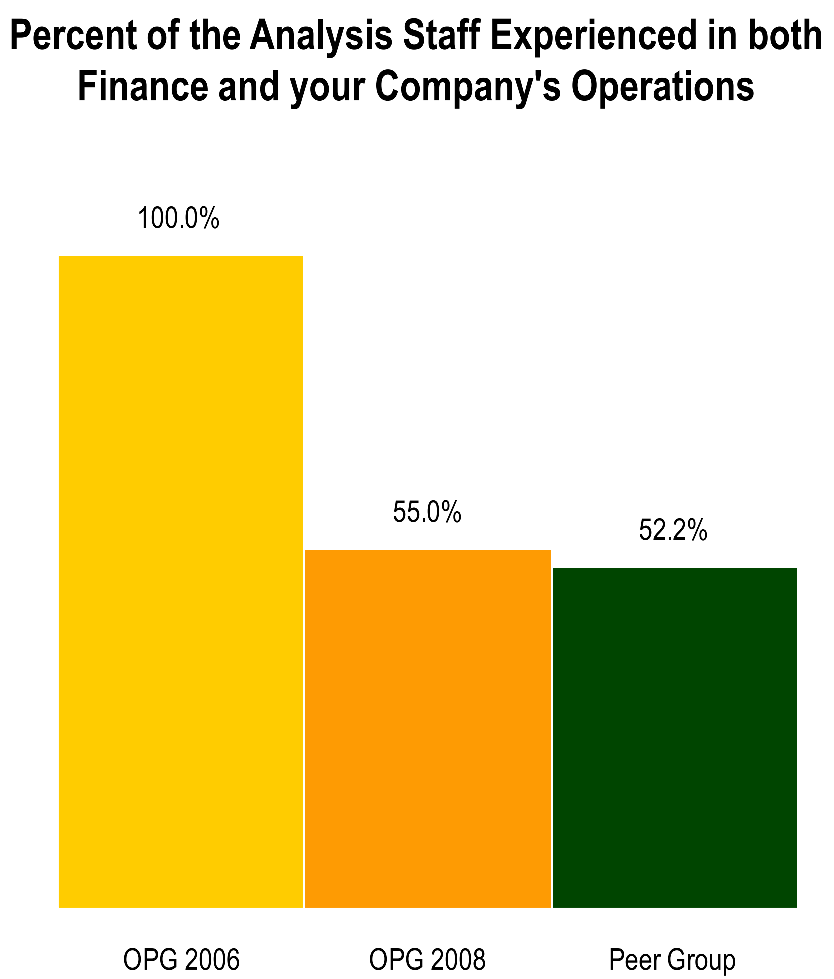


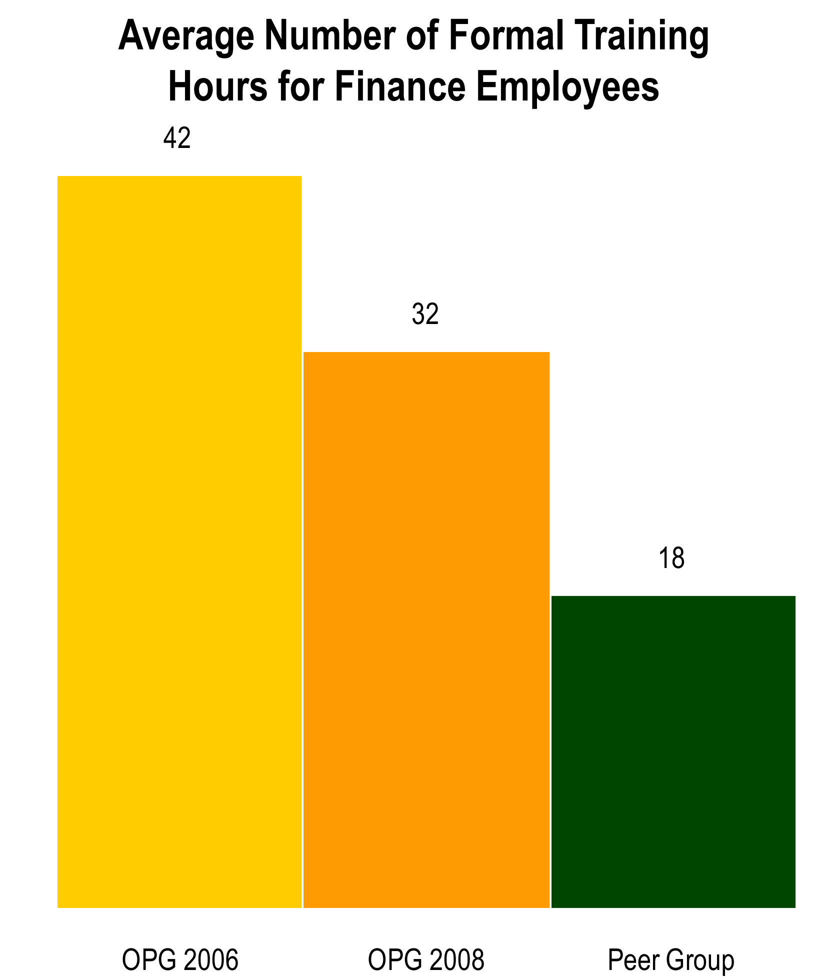
Function Management





Experience and Training





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Next Steps

Next steps

- Continue utilization of the World-Class Progress Report
  - Quarterly, semi-annual, or annual updates
- Use the results to communicate and draw awareness to current performance
- Use the progress report to track against identified gaps

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