



# ***Hospital Energy Efficiency Program (HEEP) Action Panel***

*Allan Dai, Hospital for Sick Children: SickKids*

*Jen Wynne, Trillium Health Partners*

*Graham Crouse, North York General Hospital*



# HEEP Project Discussion

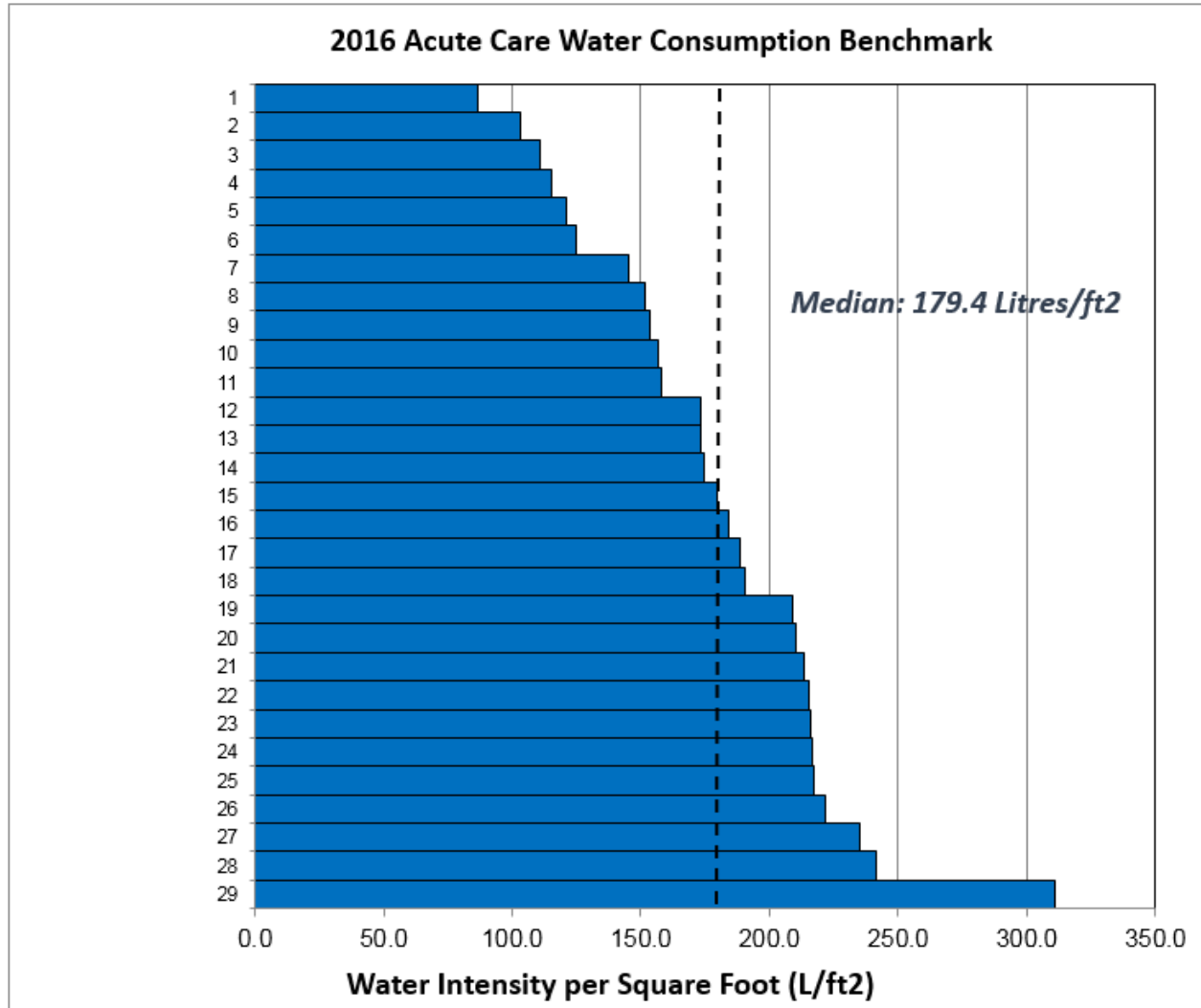
- **Making the application** – were you prepared with eligible project(s) ready to go? Did the amount of available funding change your proposed project at all? How did you put the application together?
- **The project(s)** – what was the total amount of approved HEEP funding vs how much you applied for? What were the projects? What are the projected energy, utility cost and emissions savings?
- **Resourcing** – who has responsibility for implementing the project? How were you able to fit it in with everything else going on?
- **Timelines** – what issues arose from the tight implementation timing? How did you manage them?
- **Departmental engagement** – were other departments affected? How did you engage them?
- **M&V and reporting** – how will you verify the actual savings? How will you manage project commissioning?
- **Lessons learned** – how are you preparing for future HEEP funding? What will you do differently next time around?



# ***Water Conservation***

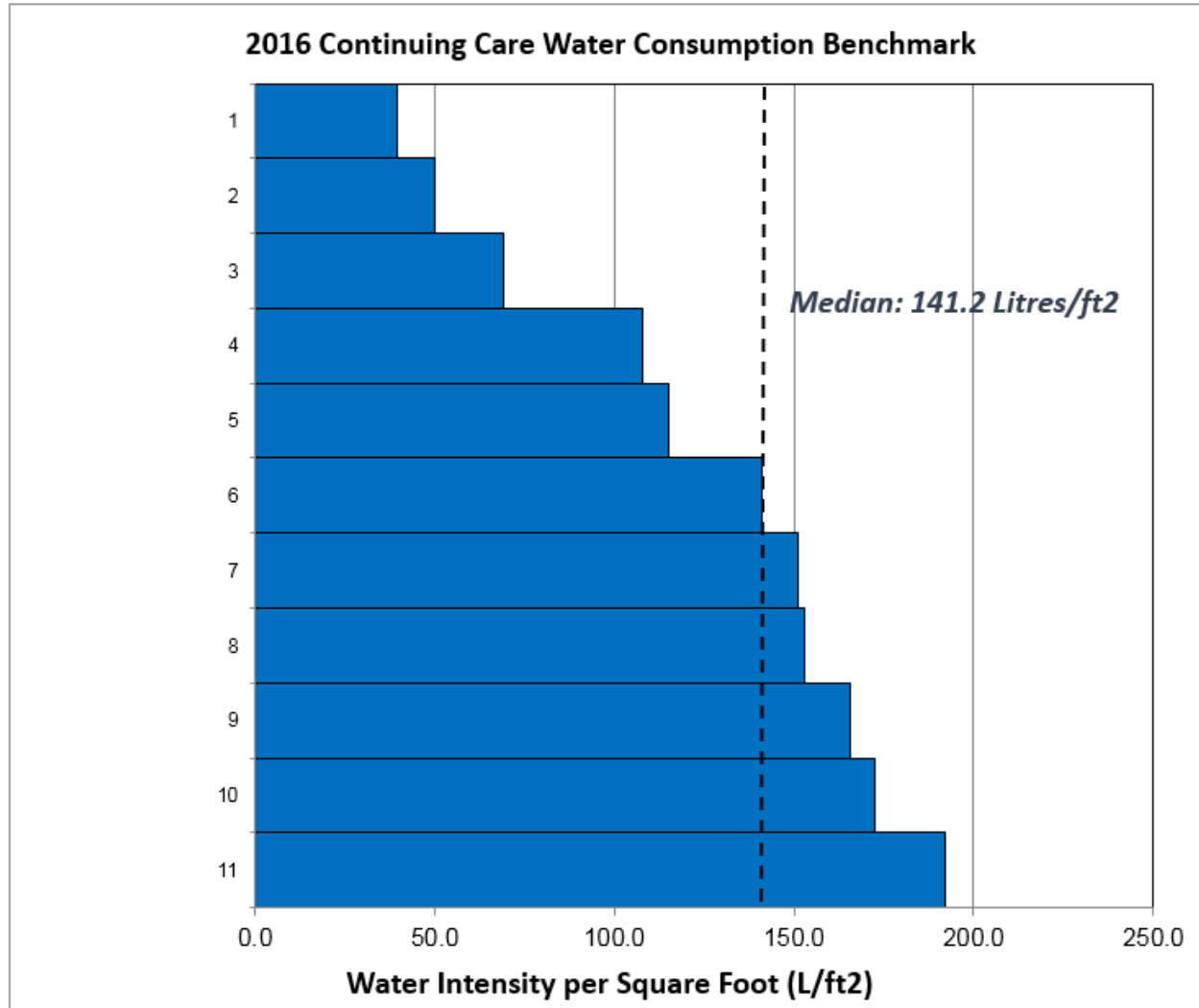


# Water Benchmarks – Acute Care



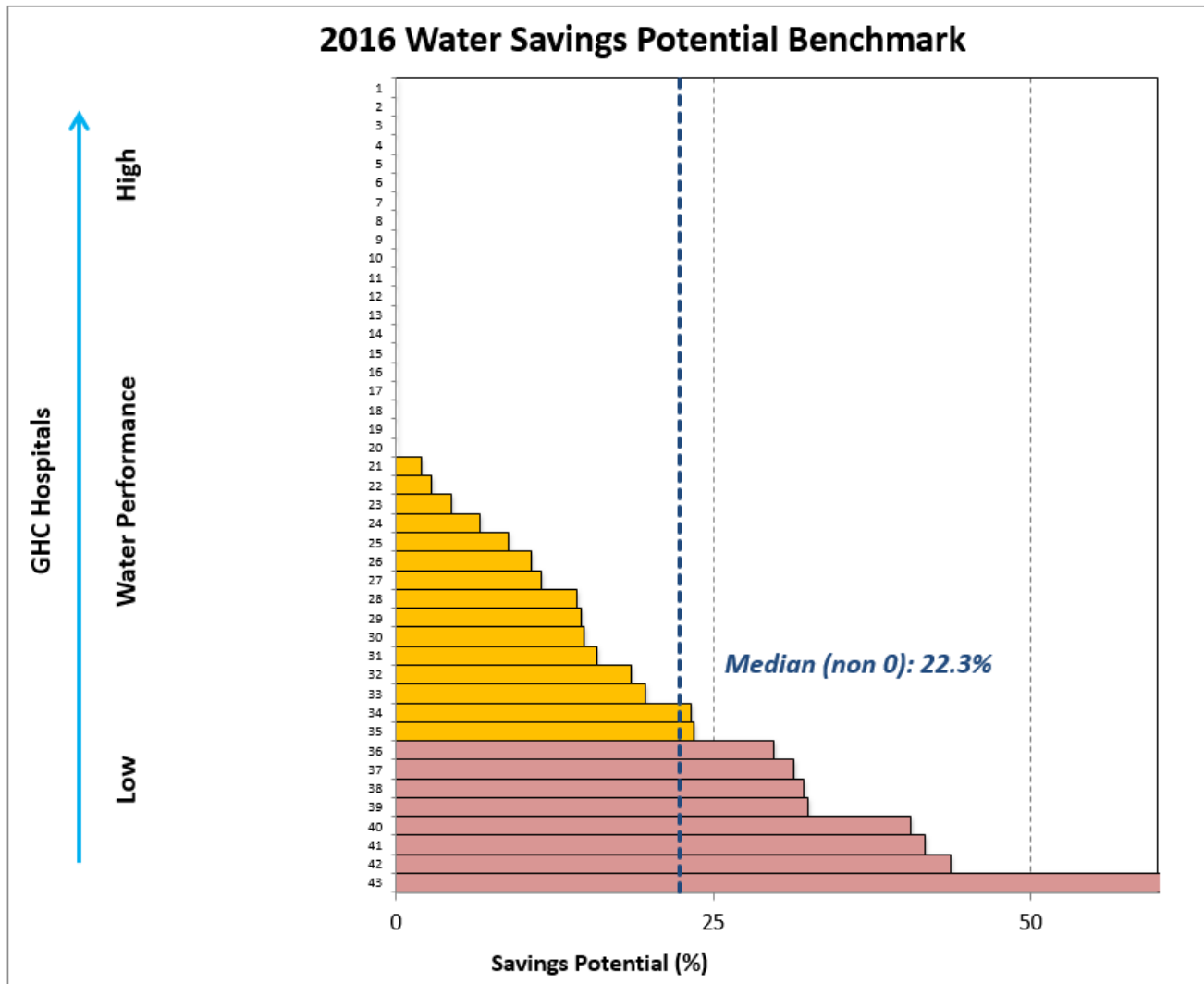


# Water Benchmarks – Non-Acute Care





# Water Benchmarks





# Water Balance

Processes	Flow Rate (LPM)	Operating Hours (Hrs/day)	Estimated Water Consumption		% of total	Estimation Method*
			(m <sup>3</sup> /d)	(m <sup>3</sup> /year)		
1 Domestic consumption						Engineering estimate
1a 4.8 LPF toilets	-	-	8.3	3,030		
1b 6 LPF toilets	-	-	20.7	7,556		
1c 1.9 LPF urinals	-	-	3.1	1,132		
1d 1.9 LPM faucets	-	-	2.8	1,022		
1e 5.7 LPM faucets	-	-	38.2	13,943		
1f 8.3 LPM faucets	-	-	55.6	20,294		
1g 7.6 LPM showers	-	-	15.1	5,512		
1h 9.5 LPM showers	-	-	18.8	6,862		
Domestic sub-total	-	-	162.6	59,351	31%	
2 Autoclaves	-	-	47.8	17,464	9%	Engineering estimate
3 Cooling Tower Makeup Water	-	-	-	11,091	6%	Sub-meter Data
4 Kitchen Water Use (sinks, water in food, etc.)			20.6	7,508	4%	Engineering estimate
5 Air Conditioners						
5a Server Room	-	-	5.2	1,881	1%	Measured Data
5b Nursing Station Bell Room	4.6	9.6	2.6	967	1%	Engineering estimate
5c Chiller Room	6.3	24	9.1	3,311	2%	Measured Data
5d South Elevator Room	4.6	9.6	2.6	967	1%	Engineering estimate
Air Conditioners sub-total			19.5	7,126	4%	
6 Boiler Makeup Water	-	-	-	4,211	2%	Sub-meter Data
7 Compressors (8)	-	-	10.6	3,856	2%	Measured Data
8 Kitchen Flight Dishwasher			6.5	2,354	1%	Engineering estimate
9 Reverse Osmosis	-	-	0.7	250	0.1%	Engineering estimate
10 Unaccounted for (equipment washers, background consumption, irrigation, etc.)			213.3	77,844	41%	Mass balance
<b>Total</b>				<b>191,056</b>	<b>100%</b>	



# Action Plan

Ref.	Opportunity Description	Recommended next action	Eligible for incentive
<b>Recommended for immediate investigation</b>			
6.1	Install 1.9 LPM Laminar Flow Aerator on Faucets	• Order low-flow laminar faucets for one floor as trial	No
6.2	Install 5.7 LPM Showers Heads	• Order 5.7 LPM shower heads for one floor as trial	No
6.3	Change Compressors to Rooftop Cooling Unit	• Obtain quote for converting compressors to rooftop unit	Yes
6.4	Change AC to Rooftop Unit (Chiller Room)	• Obtain quote for converting AC to rooftop unit	Yes
6.5	Change AC to Rooftop Unit (Server Room)	• Obtain quote for converting AC to rooftop unit	Yes
6.6	Change AC to Rooftop Unit (Elevator Room)	• Contact Toronto Water to meter AC	Yes
6.7	Change AC to Rooftop Unit (Nursing Station)	• Contact Toronto Water to meter AC	Yes
6.8	Install Sub-Meter for Irrigation	• Obtain quote for sub-metering irrigation water	No
6.9	Investigate Unaccounted for Consumption	• Analyze AMR data and/or complete 7-day flow monitoring of incoming water	No
<b>Recommended for further investigation</b>			
6.10	Install Efficient Dishwasher	• Contact Toronto Water to meter dishwasher	Yes
6.11	Install 4.8 LPF Toilets (as needed)	• As needed, replace 6 LPF toilet with 4.8 LPF ones	No





# Action Plan

	Estimated Gross Savings			Net Savings (\$/yr)	Estimated Investment Required** (\$)	Estimated Buyback Incentive from Toronto (\$)	Estimated Payback Period (Years)
	(m <sup>3</sup> /yr)	(\$/yr)	(% of total)				
<b>A) Opportunities (Immediate)</b>							
Install 1.9 LPM Laminar Flow Aerator on Faucets	24,922	\$94,793	13%	\$94,793	\$9,680	\$0	0.1
Install 5.7 LPM Showers Heads	4,123	\$15,682	2%	\$19,351	\$9,500	\$0	0.5
Change Compressors to Rooftop Cooling Unit	3,856	\$14,667	2%	\$14,667	\$12,000	\$3,169	0.6
Change AC to Rooftop Unit (Chiller Room)	3,311	\$12,594	2%	\$12,594	\$12,000	\$2,721	0.7
Change AC to Rooftop Unit (Server Room)	1,881	\$7,155	1%	\$7,155	\$12,000	\$1,546	1.5
Change AC to Rooftop Unit (Elevator Room)	967	\$3,678	1%	\$3,678	\$12,000	\$795	3.0
Change AC to Rooftop Unit (Nursing Station)	967	\$3,678	1%	\$3,678	\$12,000	\$795	3.0
Install Sub-Meter for Irrigation	Not quantified, but would allow NYGH to monitor irrigation water for abnormal water use						
Investigate Unaccounted for Consumption	Not quantified, but would allow NYGH to identify unaccounted for processes						
<b>B) Opportunities (Further Investigation)</b>							
Install Efficient Dishwasher	706	\$2,685	0.4%	\$3,313	\$150,000	\$580	>10
Install 4.8 LPF Toilets (as needed)	1,510	\$5,743	1%	\$5,743	\$266,600	\$0	>10
<b>Total (for immediate opportunities)</b>	<b>40,027</b>	<b>\$152,247</b>	<b>22%</b>	<b>\$155,916</b>	<b>\$79,180</b>	<b>\$9,026</b>	<b>0.4</b>
Water cost/m <sup>3</sup> (including sewer charge): \$3.8036							



# Dishwasher Replacement





# Dishwasher Replacement

## North York General

- Description of opportunity:
- There is a Champion flight dishwasher model UC-CW6-WS in the kitchen.
  - This dishwasher is nearing the end of its useful life and replacing it with a more water efficient dishwasher would conserve water, natural gas, and electricity.

- Estimated savings:
- 706 m<sup>3</sup>/year (\$2,685/year) of water
  - \$419/year in natural gas
  - Greater than 10-year payback period
  - Estimated \$580 buyback incentive

- Assumptions:
- Assumes cost for dishwasher replacement to be approximately \$150,000 based on similar dishwasher replacement (actual cost to be determined by a dishwasher contractor).
  - Assumes 30% savings by replacing dishwasher with a new one.
  - Assumes water heater heats the water from approximately 12 °C to 90 °C.

- Notes:
- Dishwasher water consumption estimated based on 426 US Gal of water consumed per hour and 4 hours operating per day. Dishwasher water consumption was not measured.

## Kings Harbor Case Study

- Hobart 390 Gallons FT800S-BD is installed.
- Nearing its end of life
- 1,921 m<sup>3</sup>/yr (\$6,290) of water
- \$2,553/yr in natural gas
- \$17,353/yr in electricity
- \$28,000 utility incentive
- Payback of 2.7 yrs
- Cost of dishwasher replacement is \$97,500
- Water usage taken from current N.S.F. Listing Book
- Assumes final rinse is in use 70% of the time
- Dishwasher use is 390 US Gal/hour and 6 hours operating per day.



# Dishwasher Replacement

Brand Model	Description	Water Usage per Hour <sup>1</sup>
Hobart FT800S-BD	Flight Type Continuous Racking Automatic Conveyor Dishwasher, 390 Gallons/Hour, Provided with blower dryer	390 Gallons
Hobart FT1000SD-BD	Dual Rinse Flight Type Continuous Racking Automatic Conveyor Dishwasher, 58 Gallons/Hour, S/S Pumps and Impellers, Variable Speed Conveyor, Insulated Doors, Controls at Both Ends, Blower Dryer	58 Gallons

Annual Usages	FT800S-BD	FT1000SD-BD	Savings
Rinse Water (Gallons)	596,232	88,670	507,562
Sewage Water (Gallons)	596,232	88,670	507,562
Primary Water Heat (Gas Therms) (55-110 °F)	3,905	581	3,324
Booster Water Heat (kWh) (110-185 °F)	109,267	16,248	93,020
Maintenance Heat (kWh)	117,941	98,277	19,663



***Technical Corner –  
Greening Health Care Applied  
Research***



# 2016 - OR Ventilation Best Practices

 **GREENING HEALTH CARE**  
Working together for healthier communities

## Operating Room Ventilation Systems Best Practices Guide for Energy Efficiency, Health and Safety

A GREENING HEALTH CARE RESEARCH PROJECT



ORIGINAL RELEASE: APRIL 2017 © GREENING HEALTH CARE 2017  
SPONSORED BY:

 ENBRIDGE

 ISO  
14001

 TORONTO  
HYDRO

 blue zone



# 2017 - Boiler Plant Operation and Controls

*Sponsored by:*





# Boiler Plant Operation and Controls

## 2017 Research Project

- The GHC database shows a wide range of thermal energy performance between hospitals, in large part attributed to boiler plant performance
- Case studies demonstrate big savings through improved plant operation and controls
- A collaboration among member hospitals, gas companies and industry experts
- Analysis of performance data from interval meters, boiler testing and trend logs
- Best Practices Guide to be issued in May





## Scope of Research

- Steam and hot water boiler plants
- Economizers
- Burners, FD fans and controls
- Auxiliaries and back-pressure valves
- Boiler testing, efficiencies and sequencing
- Steam pressure and hot water temperature controls
- Heating pump controls
- Feedwater and hot water pumps
- Operator logs
- Water treatment



# Participating Hospitals

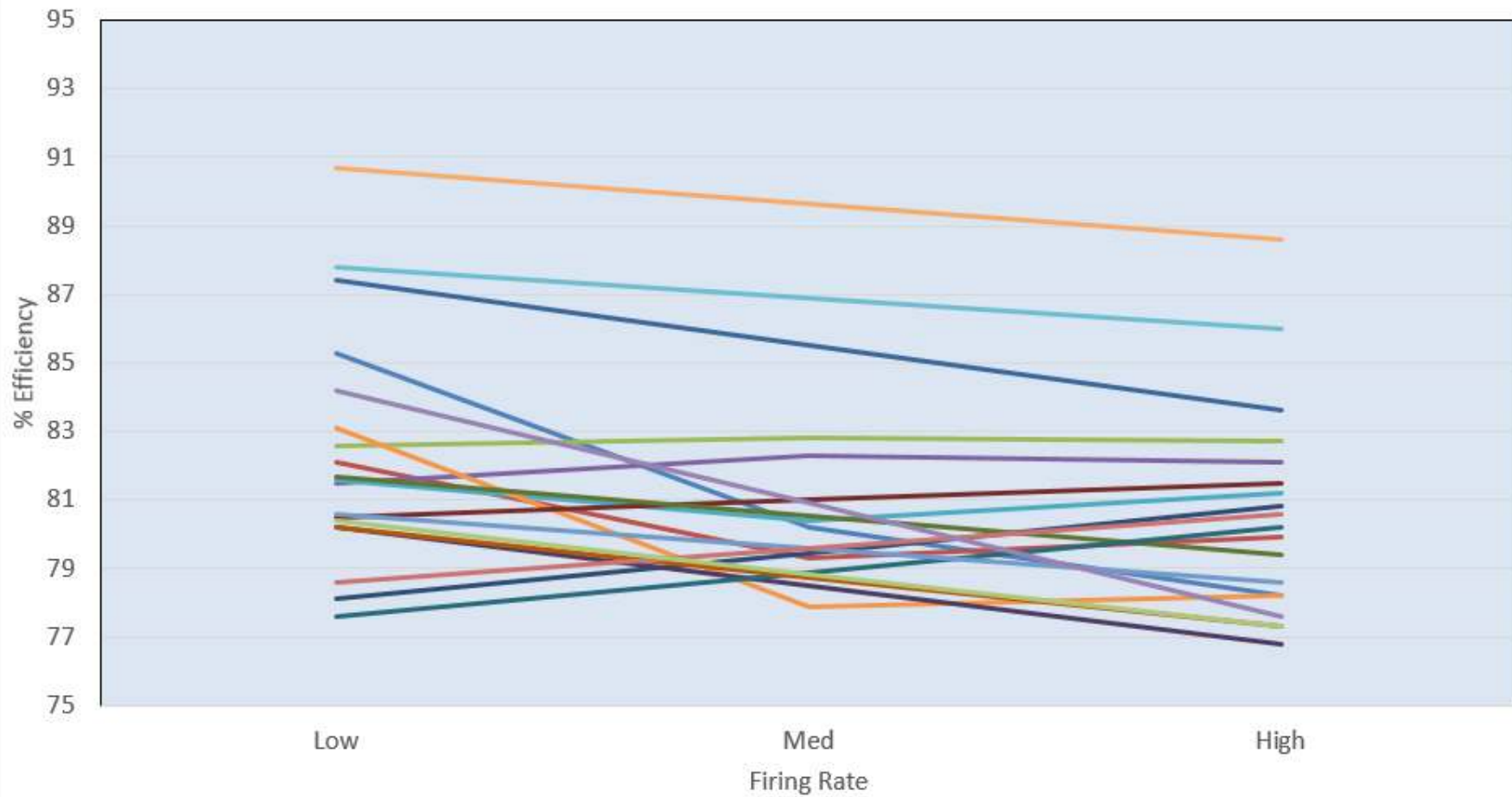
Hospitals	2016 Gas Use m3
Baycrest	1,979,878
West Park Healthcare Centre	945,668
Ontario Shores Centre	987,481
CAMH - Queen Site	1,368,765
Providence	1,347,388
THP - Queensway Site	1,428,562
Michael Garron Hospital	3,101,153
THP - Mississauga Site	3,130,043
Huntsville District Memorial	453,445
North York General Hospital	2,619,738
Ross Memorial Hospital	1,216,079
Credit Valley Main Hospital	3,006,975
Alberta Children's Hospital	4,819,350
Orillia Soldiers' Memorial	1,892,895
Etobicoke General Hospital	2,211,140
<b>Total</b>	<b>30,508,560</b>





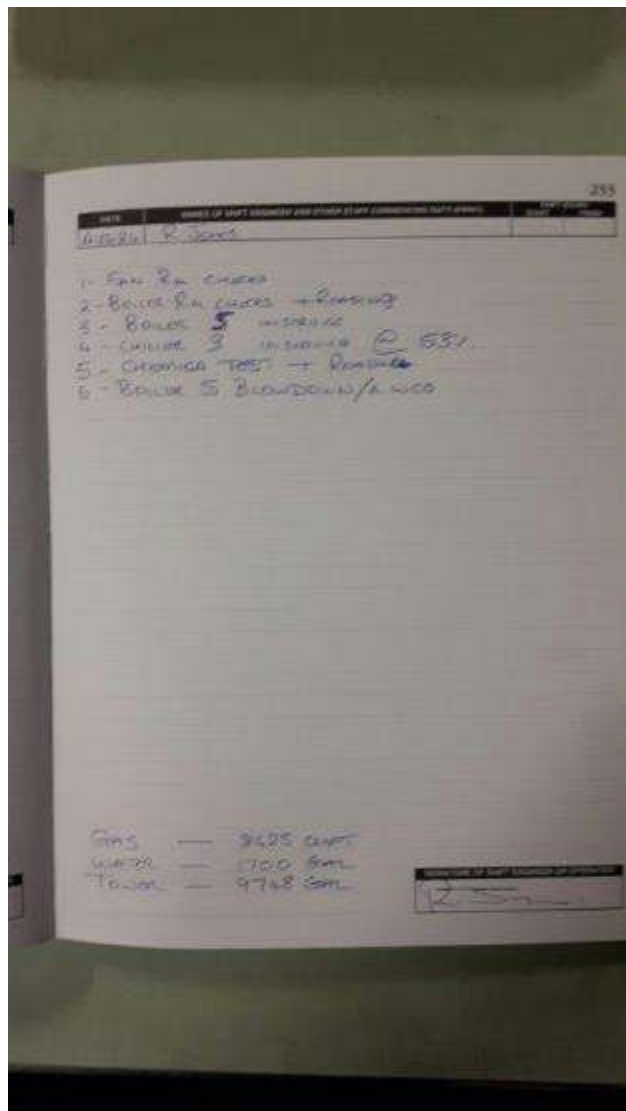
# Comparative Boiler Efficiencies

Boiler Efficiency Reporting





# Operating Logs



Date	Ship	Engineer	Date	Ship
	2007		August 2, 2007	
Engineer	Engineer No.	Engineer Name	Engineer No.	Engineer Name
Time	Start	Stop	Time	Start
08:00				
Description of Work		Remarks		
Fan Ra check		Fan Ra check		
Boiler Ra check + tuning		Boiler Ra check + tuning		
Boiler 5 increase		Boiler 5 increase		
Control 3 increase @ 53%		Control 3 increase @ 53%		
Chemical TDS + Purifier		Chemical TDS + Purifier		
Boiler 5 Blowdown/water		Boiler 5 Blowdown/water		
Total GMS		Total GMS		
3685		3685		
Total WATER		Total WATER		
700		700		
Total TOWER		Total TOWER		
9768		9768		



# Initial Best Practices

- Plant options (retrofit or new):
  - heat exchanger surface area, economizer
  - summer boiler
  - combination hot water and steam boiler plant
  - linkage-less controls
  - modulating burner control
  - VFD FD fan
  - VFD feedwater pump
  - back-pressure valves
- Pressure/temperature control:
  - reduce/reset steam pressure, primary HW temperature



# Initial Best Practices

- Boiler testing:
  - test upstream and downstream of economizers
  - tune burners, refurbish boilers to increase efficiency
  - sequence boilers to maximize plant efficiency
- Water treatment:
  - increase condensate return
  - optimize water makeup
  - monitor and maximize percent in control
- Operating logs:
  - implement electronic recording and reporting
  - monitor and respond to trends
- Systems' control:
  - implement demand-based heating pump control, ventilation supply air temperature reset



# 2018 Project Launch

## 2018 Research Project – Chilled Water Plants

- Best practices for replacement, retrofit, operation and controls
- Recruitment of hospitals and sponsors March – April 2018
- Initial webinar April 2018
- Data collection and analysis May – October 2018
- Review of findings and conclusions November – December 2018
- Final Best Practices Guide Spring 2019





# Greening Health Care - Next Steps

## 2018 Schedule

- February 28<sup>th</sup> – Workshop 1
- April 4<sup>th</sup> – Webinar 1
- May 30<sup>th</sup> – Forum 2018
- July 11<sup>th</sup> – Webinar 2
- September 26<sup>th</sup> – Workshop 3
- October 24<sup>th</sup> – Webinar 3
- November 27<sup>th</sup> – Workshop 4
- December 12<sup>th</sup> – Webinar 4

## Taking Action

- take part in the 2018 chiller plant project
- sign annual utility release letters
- review savings reports, make the connections, be a case study
- collect and send in your water data

## Workshop Evaluation

- help us ensure continuous program improvement



# Lunch and staying in touch

## *Membership/sponsorship:*

**Jason Choy**  
Toronto and Region Conservation  
(416) 661-6600 ext 5611  
Jason.choy@trca.on.ca

## *Technical/data support:*

**Michael Pagel**  
Enerlife Consulting  
(416) 915-1530 ext 207  
mpagel@enerlife.com

[www.greeninghc.com](http://www.greeninghc.com)