

# Classroom Lighting Optimization

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Board Presentation

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# GREAT NEWS!

- The School Corporation, as a whole, reduced spending of both gas and electric from 2008 to 2009 by the following:
  - Electricity \$64,970
  - Gas \$97,411
- The % Reduction in usage also reflected this as follows:
  - Electricity 14%
  - Gas 16%

# BCSC Proposed Energy Strategy

Project Name	Estimated Savings/yr	Estimated Cost	Payback (Yrs)	Proposed Start	Proposed Completion
1. Classroom Lighting Optimization	\$86,000	\$20,590	0.2	April-10	August-10
2. Optimize Gym Lighting	\$25,000	\$95,000	3.8	Investigating Grants and Rebates from Electrical Providers	
3. Boiler Optimization	\$66,890	\$300,000	4.5	Investigating QSCB Monies	
->BHS, EMS, WMS, CarDel					
4. Add Variable Frequency Drive to Main Recirculation Pump at Pool	\$7,577	\$7,150	0.9	Investigate Rebates from Electrical Provider	
	=====	=====			
Totals	\$177,890	\$415,590			

# Goals of Classroom Lighting Project

- Assure safe environment for staff and students
- Assure optimal lighting levels for student achievement
- Re-lamp the classrooms to improve overall light levels, and de-lamp one lamp/fixture to Reduce energy costs.

# Corporation Lighting Evaluation

- Obtained 209 samples from across the Corporation in Classrooms
- One person completed all readings
- One sample per room was obtained, location was from middle of room, and not directly under the light fixture
- If it wasn't dark outside, the blinds were closed to simulate worst case
- All lights in the room were on at time of testing

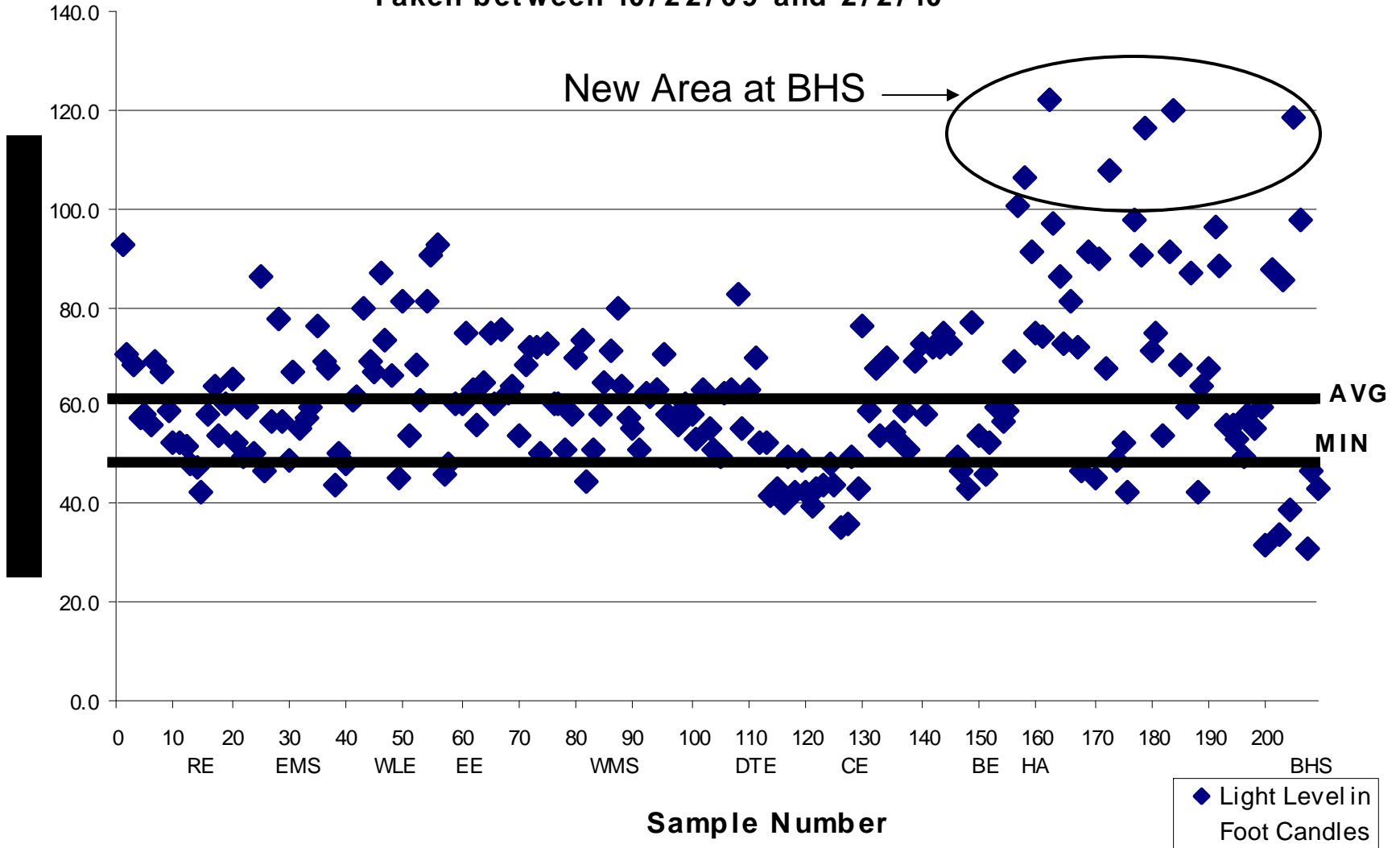
# Corporation Lighting Evaluation

- The following schools have already reduced lamps in halls
  - BHS, EMS, WMS, CarDel, RE, WLE
- Cardinal has also reduced lamps in classrooms explaining their low light levels
- Lamp life is approximately 25k to 30k hours, with average lamp hours/year of 1800, this equates to 13 years.

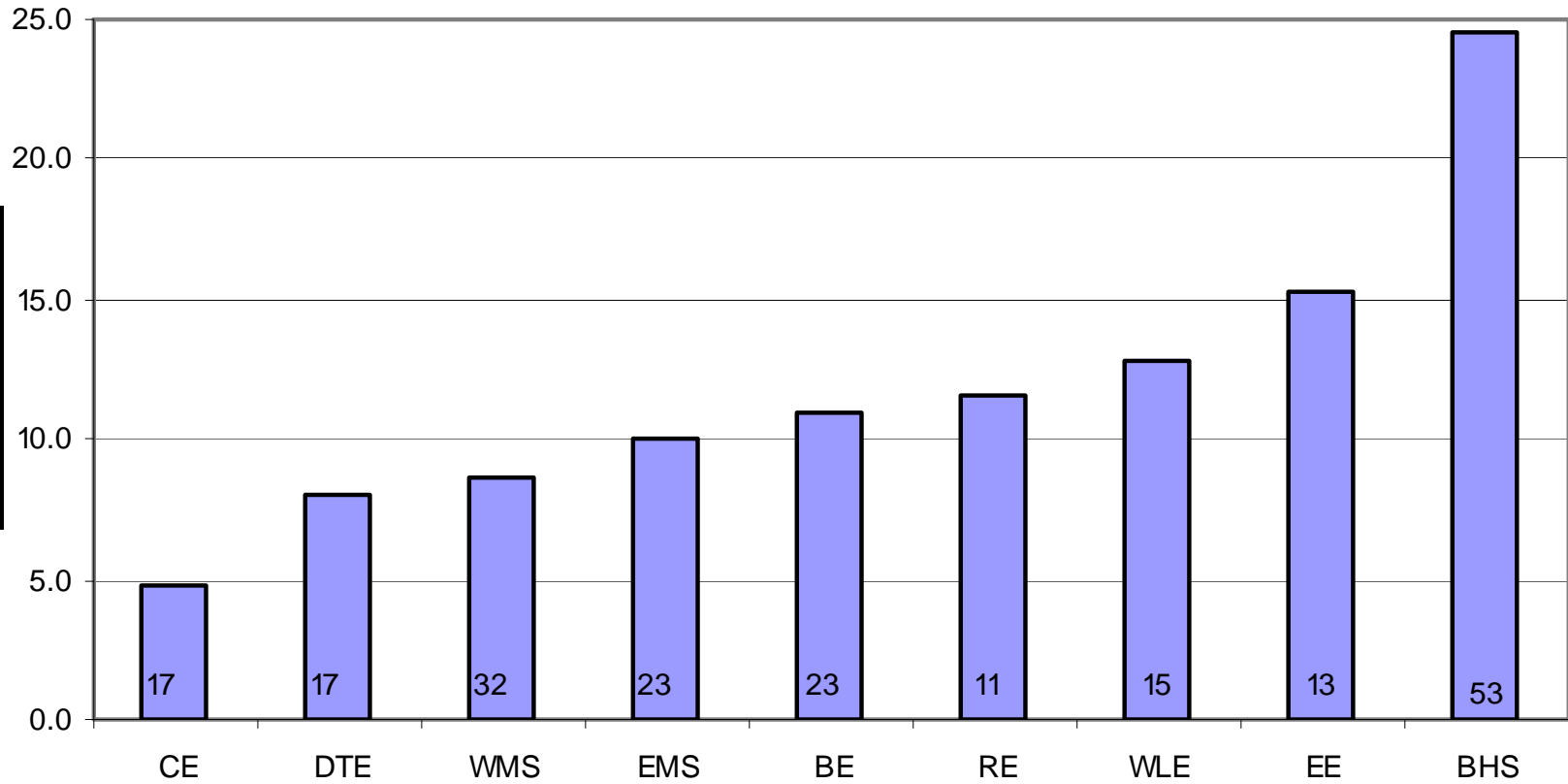
# Corporation Lighting Evaluation

- The Goal will be to provide between 50 and 60 foot candles on average within the classroom. Based on below gathered data:
  - Lighting Design Basics, 2004, Karlen, Benya - page 123, 30 - 50 FC is typical standard
  - Building Type Basics for Elementary and Secondary Schools, 2001, Perkins - page 167, The illumination of a classroom to 50 foot candles , the generally accepted level... Elementary 30 to 50, HS closer to 50, chemistry lab may be as high as 100 at the bench top.
  - Improving Reading Skills, 2004, Bhardwaj, page 27, Certain authorities recommend from 10 to 20 FC of light on the working surface for ordinary reading that is not continued for extended periods of time, and from 20 to 50 fc of light for ordinary reading when it is continues (sic) for extended periods of time.
  - National Science Teachers Association, NSTA Guide To Planning School Science Facilities, Motz, Biehle, West, page 64, A study of 100 fourth and fifth graders (Grocoff 1996) concluded...a general illumination of 50 fc more comfortable than that of 100 fc...

Sample of Class Room Light Levels from Buildings in the Corporation  
Taken between 10/22/09 and 2/2/10



## Variability of Light Level Data by Building



**Building**

Number on Bars  
Represent Sample Size

■ Variability  
of Data

# Light Evaluation in Room 213 at Cardinal Elementary

Description of Room	NE Corner	SE Corner	Middle	SW Corner	NW Corner	Average of All Samples
<b>Before any lamps were replaced 12-3lamp fixtures of which middle lamp was removed from all but 1 fixture near the NW sample point. Blinds closed and wall washers on.</b>	50.7	50.2	43.1	37.1	53.4	<b><u>46.9</u></b>
<b>All 36 lamps replaced, blinds closed, wall washers on.</b>	72.0	72.3	62.5	56.4	64.7	<b><u>65.6</u></b>
Removed the center lamp in each fixture, 24 lamps remain, blinds closed, wall washers on.	52.5	54.0	47.2	41.0	49.0	48.7
Removed the center lamp in each fixture, 24 lamps remain, blinds opened, wall washers on.	83.7	57.4	54.3	44.0	81.2	64.1
<b>Removed the center lamp in each fixture, but replaced 1 lamp in far SW fixture where light level lowest. Wall washers on, blinds closed</b>	52.2	54.1	48.8	49.3	48.8	<b><u>50.6</u></b>
Removed the center lamp in each fixture, but replaced 1 lamp in far SW fixture where light level lowest. Wall washers off, blinds closed	47.3	47.1	45.9	48.4	46.7	47.1
Removed the center lamp in each fixture, but replaced 1 lamp in far SW fixture where light level lowest. Wall washers on, blinds open	79.4	57.4	53.5	50.4	76.6	63.5
<b>Removed the center lamp in each fixture, but replaced 1 lamp in far SW fixture where light level lowest. Wall washers off, blinds open</b>	72.5	50.5	52.0	50.0	68.0	<b><u>58.6</u></b>

# Where We Wouldn't Remove Lamps

- Offices
- Restrooms
- Media Centers
- Café & Kitchen
- Auditoriums & LGI's
- Gymnasiums
- Stairwells
- Major Intersections in BHS

# Savings Evaluation

<b>Building</b>	<b>Cost of Lamp Replacement in Classrooms Only</b>	<b>Yearly Savings from Removing Lamps in Halls &amp; Classrooms</b>	<b>Month Removed Hall Lights/Yr Removed</b>
<b>BHS</b>	<b>\$7,060</b>	<b>\$23,500</b>	<b>January-10</b>
<b>EMS</b>	<b>\$4,330</b>	<b>\$13,200</b>	<b>March-09</b>
<b>WMS</b>	<b>\$3,270</b>	<b>\$7,840</b>	<b>November-10</b>
<b>Brown</b>	<b>\$1,200</b>	<b>\$3,280</b>	<b>March -10</b>
<b>Cardinal</b>	<b>\$1,555</b>	<b>\$3,975</b>	<b>April-09</b>
<b>Delaware Trail</b>	<b>\$1,555</b>	<b>\$3,975</b>	<b>December-09</b>
<b>Eagle</b>	<b>\$1,400</b>	<b>\$3,430</b>	<b>March-10</b>
<b>Reagan</b>	<b>\$885</b>	<b>\$3,590</b>	<b>June-09</b>
<b>White Lick</b>	<b>\$1,200</b>	<b>\$3,215</b>	<b>July-09</b>
	<b>=====</b>	<b>=====</b>	
<b>Grand Totals</b>	<b>\$22,455</b>	<b>\$86,000</b>	
<b>Overall Payback in Years if replace remaining 2 lamps per fixture in classrooms</b>			<b>0.3</b>

# Proposed Next Steps

- Purchase lamps.
- Utilize maintenance to assist with the change out project following the schedule developed.
- Once a building is optimized, resample light levels to assure they are adequate

# Corporation Re-lamping Schedule

Building	Key Contact	Communicate to Staff By	Begin Re-lamping	Building Complete
Cardinal Elementary	Carla Hubbard	April 5	April 5	April 12
Delaware Trail Elementary	Phil Utterbach	April 12	April 13	April 19
BHS (excludes New Addition, and Sr. Academy)	Bret Daghe	April 26	April 26	May 17
Brown	Julie VanLiew	May 17	May 19	May 26
Harris Academy	Bill Titus	May 26	June 1	June 2
EMS	Amber Schroering	June 1	June 7	June 18
WMS	Shawn Wooden	June 1	June 21	June 30
Eagle	Ryan Hoover	June 1	July 5	July 12
White Lick	Kat Jessup	June 1	July 13	July 21

Questions/Comments?