



LGEA Presentation Princeton Day School

April 18, 2023

New Jersey's Clean Energy Program

Lighting the way to New Jersey's Clean Energy Future

INTRODUCTIONS

- Princeton Day School
 - Robert Clemens Director of Facility Operations
 - Gary Schumacher Assistant Director of Facility Operations
 - Michele Walsh Assistant to the Director of Facilities
- NJ Clean Energy Program
 - Sarah Walters LGEA Project Manager
 - Moussa Traore LGEA Lead Auditor
 - Ryan Knippenberg LGEA Project Auditor
 - Meredith Coley LGEA Account Manager



Agenda

- The audit process overview
- Energy use & existing conditions
- Review of Energy Conservation Measures (ECMs) identified & other recommendations
- Energy Efficiency Incentive Programs
- Questions regarding the draft audit report
- Next steps for Princeton Day School



LGEA PROCESS



- Application Approval
- Initial Call
- **Facility Interviews**
- Audit
- Benchmarking & Analysis
- **Draft Reports**
- LGEA Presentation
- Final Reports

SITE VISIT & UTILITY ANALYSIS

Overview of Systems, Baseline & Existing Conditions:

- Lighting System
- HVAC and Mechanical Systems
- Plug Load Equipment
- Cooking and Refrigeration Equipment
- Chiller for Ice Rink

Utility Consumption:

- Electric Consumption and Costs
- Natural Gas Consumption and Costs
- Solar Consumption and Costs



Sites Visited/Analyzed

- Main Building
- Carriage House
- Grounds Building
- Maintenance Garage
- Colross Building
- Rink/Athletic Center

UTILITY BREAKOUT

Percent of Total Annual Energy Costs



program

Pre & Post Implementation Cost



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BENCHMARKING



Site Name	ENERGY STAR [®] Score
Main Building, Carriage House, Grounds Building, Maintenance Garage	20
Colross Building	78
Rink/Athletic Center	N/A

National Median Comparison National Median Site EUI (kBtu/ft2) 74 133.3 National Median Source EUI (kBtu/ft²) % Diff from National Median Source EUI 36%

Benchmarking





ALL OPPORTUNITIES

Savings Potential





ALL OPPORTUNITIES

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (Ibs)
Lighting	Upgrades	298,146	48.5	-62.5	\$43,989	\$92,904	\$21,495	\$71,409	1.6	292,912
ECM 1	Install LED Fixtures	456	0.0	0.0	\$63	\$399	\$100	\$299	4.7	459
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	5,117	2.1	-1.1	\$763	\$2,774	\$415	\$2,359	3.1	5,028
ECM 3	Retrofit Fixtures with LED Lamps	292,573	46.3	-61.4	\$43 <i>,</i> 163	\$89,732	\$20,980	\$68,752	1.6	287,425
Lighting	Control Measures	125,513	18.5	-26.5	\$18,608	\$98,346	\$31,240	\$67,106	3.6	123,293
ECM 4	Install Occupancy Sensor Lighting Controls	95,328	14.4	-20.1	\$14,139	\$65,746	\$8,360	\$57,386	4.1	93,640
ECM 5	Install Daylight Dimming/Photocell Controls	64	0.0	0.0	\$9	\$200	\$0	\$200	22.7	64
ECM 6	Install High/Low Lighting Controls	30,122	4.1	-6.4	\$4,460	\$32,400	\$22,880	\$9,520	2.1	29,588
Motor L	Ipgrades	7,000	0.9	0.0	\$970	\$8,631	\$0	\$8,631	8.9	7,049
ECM 7	Premium Efficiency Motors	7,000	0.9	0.0	\$970	\$8,631	\$0	\$8,631	8.9	7,049
Variable	Frequency Drive (VFD) Measures	97,532	29.6	0.0	\$14,711	\$87,980	\$12,700	\$75,280	5.1	98,213
ECM 8	Install VFDs on Constant Volume (CV) Fans	97,532	29.6	0.0	\$14,711	\$87,980	\$12,700	\$75,280	5.1	98,213
Unitary	HVAC Measures	96,411	48.3	24.0	\$14,757	\$373,113	\$19,673	\$353,441	24.0	99,891
ECM 9	Install High Efficiency Air Conditioning Units	96,411	48.3	24.0	\$14,757	\$373,113	\$19,673	\$353 <i>,</i> 441	24.0	99,891
Electric	Chiller Replacement	177,780	26.5	0.0	\$24,640	\$161,500	\$2,520	\$158,980	6.5	179,023
ECM 10	Install High Efficiency Chillers	177,780	26.5	0.0	\$24,640	\$161,500	\$2,520	\$158,980	6.5	179,023

ALL OPPORTUNITIES

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (Ibs)
Gas Hea	ting (HVAC/Process) Replacement	0	0.0	152.1	\$1,226	\$21,154	\$2,000	\$19,154	15.6	17,811
ECM 11	Install High Efficiency Furnaces	0	0.0	152.1	\$1,226	\$21,154	\$2,000	\$19,154	15.6	17,811
HVAC Sy	ystem Improvements	0	0.0	86.0	\$770	\$1,557	\$186	\$1,371	1.8	10,074
ECM 12	Install Pipe Insulation	0	0.0	86.0	\$770	\$1,557	\$186	\$1,371	1.8	10,074
Domest	ic Water Heating Upgrade	0	0.0	25.6	\$216	\$1,312	\$300	\$1,012	4.7	3,003
ECM 13	Install Low-Flow DHW Devices	0	0.0	25.6	\$216	\$1,312	\$300	\$1,012	4.7	3,003
Food Se	rvice & Refrigeration Measures	3,620	0.3	0.0	\$546	\$4,415	\$280	\$4,135	7.6	3,646
ECM 14	Refrigerator/Freezer Case Electrically Commutated Motors	393	0.0	0.0	\$59	\$607	\$80	\$527	8.9	396
ECM 15	Refrigeration Controls	1,273	0.0	0.0	\$192	\$3,348	\$150	\$3,198	16.7	1,282
ECM 16	Vending Machine Control	1,954	0.2	0.0	\$295	\$460	\$50	\$410	1.4	1,968
Custom	Measures	-15,587	0.0	199.0	-\$654	\$9,311	\$0	\$9,311	-14.2	7,604
ECM 17	Replace Electric Water Heater with Heat Pump Water Heater	3,077	0.0	0.0	\$464	\$4,545	\$0	\$4,545	9.8	3,099
ECM 18	Replace Gas Fired Water Heater with Heat Pump Water Heater	-18,664	0.0	199.0	-\$1,118	\$4,766	\$0	\$4,766	-4.3	4,506
	TOTALS	790,416	172.5	397.8	\$119,778	\$860,223	\$90,393	\$769,829	6.4	842,521

* - All incentives presented in this table are included as placesholders and are based on previously run state rebate programs. Contact your utility provider for details on current programs

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

** - Negative payback periods are explained in the report.

COST EFFECTIVE OPPORTUNITIES

Savings Potential





COST EFFECTIVE OPPORTUNITIES

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO2e Emissions Reduction (Ibs)
Lighting	Upgrades	298,146	48.5	-62.5	\$43,989	\$92,904	\$21,495	\$71,409	1.6	292,912
ECM 1	Install LED Fixtures	456	0.0	0.0	\$63	\$399	\$100	\$299	4.7	459
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	5,117	2.1	-1.1	\$763	\$2,774	\$415	\$2,359	3.1	5,028
ECM 3	Retrofit Fixtures with LED Lamps	292,573	46.3	-61.4	\$43,163	\$89,732	\$20,980	\$68,752	1.6	287,425
Lighting	Control Measures	125,450	18.5	-26.5	\$18,599	\$98,146	\$31,240	\$66,906	3.6	123,229
ECM 4	Install Occupancy Sensor Lighting Controls	95,328	14.4	-20.1	\$14,139	\$65,746	\$8,360	\$57,386	4.1	93,640
ECM 6	Install High/Low Lighting Controls	30,122	4.1	-6.4	\$4,460	\$32,400	\$22,880	\$9,520	2.1	29,588
Motor L	Jpgrades	7,000	0.9	0.0	\$970	\$8,631	\$0	\$8,631	8.9	7,049
ECM 7	Premium Efficiency Motors	7,000	0.9	0.0	\$970	\$8,631	\$0	\$8,631	8.9	7,049
Variable	Frequency Drive (VFD) Measures	97,532	29.6	0.0	\$14,711	\$87,980	\$12,700	\$75,280	5.1	98,213
ECM 8	Install VFDs on Constant Volume (CV) Fans	97,532	29.6	0.0	\$14,711	\$87,980	\$12,700	\$75,280	5.1	98,213
Electric	Chiller Replacement	177,780	26.5	0.0	\$24,640	\$161,500	\$2,520	\$158,980	6.5	179,023
ECM 10	Install High Efficiency Chillers	177,780	26.5	0.0	\$24,640	\$161,500	\$2,520	\$158,980	6.5	179,023
HVAC Sy	stem Improvements	0	0.0	86.0	\$770	\$1,557	\$186	\$1,371	1.8	10,074
ECM 12	Install Pipe Insulation	0	0.0	86.0	\$770	\$1,557	\$186	\$1,371	1.8	10,074
Domest	ic Water Heating Upgrade	0	0.0	25.6	\$216	\$1,312	\$300	\$1,012	4.7	3,003
ECM 13	Install Low-Flow DHW Devices	0	0.0	25.6	\$216	\$1,312	\$300	\$1,012	4.7	3,003
Food Se	rvice & Refrigeration Measures	3,620	0.3	0.0	\$546	\$4,415	\$280	\$4,135	7.6	3,646
ECM 14	Refrigerator/Freezer Case Electrically Commutated Motors	393	0.0	0.0	\$59	\$607	\$80	\$527	8.9	396
ECM 15	Refrigeration Controls	1,273	0.0	0.0	\$192	\$3,348	\$150	\$3,198	16.7	1,282
ECM 16	Vending Machine Control	1,954	0.2	0.0	\$295	\$460	\$50	\$410	1.4	1,968
Custom	Measures	3,077	0.0	0.0	\$464	\$4,545	\$0	\$4,545	9.8	3,099
ECM 17	Replace Electric Water Heater with Heat Pump Water Heater	3,077	0.0	0.0	\$464	\$4,545	\$0	\$4,545	9.8	3,099
	TOTALS	712,605	124.3	22.7	\$104,904	\$460,989	\$68,721	\$392,268	3.7	720,248

* - All incentives presented in this table are included as placesholders and are based on previously run state rebate programs. Contact your utility provider for details on current programs

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Main Building, Carriage House, Grounds Building, Maintenance Garage

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (Ibs)
Lighting	Upgrades		249,728	42.4	-52	\$37,230	\$78,800	\$17,972	\$60,828	1.6	245,431
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	5,117	2.1	-1	\$763	\$2,774	\$415	\$2,359	3.1	5,028
ECM 2	Retrofit Fixtures with LED Lamps	Yes	244,611	40.3	-51	\$36,467	\$76,026	\$17,557	\$58,469	1.6	240,403
Lighting	Control Measures		111,392	16.8	-23	\$16,604	\$86,534	\$27,110	\$59,424	3.6	109,444
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	84,532	13.0	-18	\$12,601	\$58,184	\$7,380	\$50,804	4.0	83,054
ECM 4	Install High/Low Lighting Controls	Yes	26,860	3.8	-6	\$4,004	\$28,350	\$19,730	\$8,620	2.2	26,390
Variable	Frequency Drive (VFD) Measures		97,532	29.6	0	\$14,711	\$87,980	\$12,700	\$75,280	5.1	98,213
ECM 5	Install VFDs on Constant Volume (CV) Fans	Yes	97,532	29.6	0	\$14,711	\$87,980	\$12,700	\$75,280	5.1	98,213
Unitary	HVAC Measures		95,337	47.7	24	\$14,582	\$366,714	\$19,305	\$347,409	23.8	98,810
ECM 6	Install High Efficiency Air Conditioning Units	No	95,337	47.7	24	\$14,582	\$366,714	\$19,305	\$347,409	23.8	98,810
Gas Hea	ting (HVAC/Process) Replacement		0	0.0	22	\$188	\$2,639	\$500	\$2,139	11.4	2,602
ECM 7	Install High Efficiency Furnaces	No	0	0.0	22	\$188	\$2,639	\$500	\$2,139	11.4	2,602
HVAC Sy	ystem Improvements		0	0.0	62	\$526	\$1,343	\$166	\$1,177	2.2	7,289
ECM 8	Install Pipe Insulation	Yes	0	0.0	62	\$526	\$1,343	\$166	\$1,177	2.2	7,289
Domest	ic Water Heating Upgrade		0	0.0	19	\$159	\$883	\$212	\$671	4.2	2,208
ECM 9	Install Low-Flow DHW Devices	Yes	0	0.0	19	\$159	\$883	\$212	\$671	4.2	2,208
Food Se	rvice & Refrigeration Measures		3,620	0.3	0	\$546	\$4,415	\$280	\$4,135	7.6	3,646
ECM 10	Refrigerator/Freezer Case Electrically Commutated Motors	Yes	393	0.0	0	\$59	\$607	\$80	\$527	8.9	396
ECM 11	Refrigeration Controls	Yes	1,273	0.0	0	\$192	\$3,348	\$150	\$3,198	16.7	1,282
ECM 12	Vending Machine Control	Yes	1,954	0.2	0	\$295	\$460	\$50	\$410	1.4	1,968
Custom	Measures		-13,336	0.0	175	-\$533	\$7,241	\$0	\$7,241	-13.6	7,061
ECM 13	Replace Electric Water Heater with Heat Pump Water Heater	Yes	3,077	0.0	0	\$464	\$4,545	\$0	\$4,545	9.8	3,099
ECM 14	Replace Gas Fired Water Heater with Heat Pump Water Heater	No	-16,413	0.0	175	-\$997	\$2,696	\$0	\$2,696	-2.7	3,963
	TOTALS		544,273	136.8	227	\$84,014	\$636,550	\$78,245	\$558,305	6.6	574,705

* - All incentives presented in this table are included as placeholders for planning purposes and are based on previously run state rebate programs. Contact your utility provider for details on current programs

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

*** - Negative payback explained in section 4.9

COLROSS BUILDING

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (Ibs)
Lighting	Upgrades		5,677	1.6	-1	\$913	\$2,899	\$471	\$2,428	2.7	5,577
ECM 1	Retrofit Fixtures with LED Lamps	Yes	5,677	1.6	-1	\$913	\$2 <i>,</i> 899	\$471	\$2 <i>,</i> 428	2.7	5,577
Lighting	Control Measures		3,003	0.8	-1	\$483	\$5,106	\$1,065	\$4,041	8.4	2,950
ECM 2	Install Occupancy Sensor Lighting Controls	Yes	2,596	0.7	-1	\$417	\$4,206	\$540	\$3 <i>,</i> 666	8.8	2,550
ECM 3	Install High/Low Lighting Controls	Yes	407	0.1	0	\$65	\$900	\$525	\$375	5.7	400
Unitary	HVAC Measures		1,074	0.6	0	\$175	\$6,399	\$368	\$6,032	34.5	1,081
ECM 4	Install High Efficiency Air Conditioning Units	No	1,074	0.6	0	\$175	\$6,399	\$368	\$6,032	34.5	1,081
HVAC Sy	stem Improvements		0	0.0	24	\$243	\$214	\$20	\$194	0.8	2,785
ECM 5	Install Pipe Insulation	Yes	0	0.0	24	\$243	\$214	\$20	\$194	0.8	2,785
Domest	ic Water Heating Upgrade		0	0.0	1	\$9	\$22	\$8	\$14	1.6	98
ECM 6	Install Low-Flow DHW Devices	Yes	0	0.0	1	\$9	\$22	\$8	\$14	1.6	98
Custom	Measures		-2,251	0.0	24	-\$121	\$2,070	\$0	\$2,070	-17.1	543
ECM 7	Replace Gas Fired Water Heater with Heat Pump Water Heater	No	-2,251	0.0	24	-\$121	\$2,070	\$0	\$2,070	-17.1	543
	TOTALS		7,502	2.9	47	\$1,701	\$16,709	\$1,931	\$14,778	8.7	13,035

* - All incentives presented in this table are included as placeholders for planning purposes and are based on previously run state rebate programs. Contact your utility provider for details on current programs.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

*** Negative payback explained is section 4.6

RINK/ATHLETIC CENTER

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated M&L Cost (\$)	Estimated Incentive (\$)*	Estimated Net M&L Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (Ibs)
Lighting	Upgrades		42,741	4.5	-10	\$5,846	\$11,205	\$3,052	\$8,153	1.4	41,904
ECM 1	Install LED Fixtures	Yes	456	0.0	0	\$63	\$399	\$100	\$299	4.7	459
ECM 2	Retrofit Fixtures with LED Lamps	Yes	42,286	4.5	-10	\$5,783	\$10,806	\$2,952	\$7,854	1.4	41,445
Lighting	Control Measures		11,118	1.0	-3	\$1,521	\$6,706	\$3,065	\$3,641	2.4	10,898
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	8,199	0.7	-2	\$1,121	\$3,356	\$440	\$2,916	2.6	8,036
ECM 4	Install Photocell Controls	No	64	0.0	0	\$9	\$200	\$0	\$200	22.7	64
ECM 5	Install High/Low Lighting Controls	Yes	2,855	0.2	-1	\$390	\$3,150	\$2,625	\$525	1.3	2,798
Motor L	Ipgrades		7,000	0.9	0	\$970	\$8,631	\$0	\$8,631	8.9	7,049
ECM 6	Premium Efficiency Motors	Yes	7,000	0.9	0	\$970	\$8,631	\$0	\$8,631	8.9	7,049
Electric	Chiller Replacement		177,780	26.5	0	\$24,640	\$161,500	\$2,520	\$158,980	6.5	179,023
ECM 7	Install High Efficiency Chillers	Yes	177,780	26.5	0	\$24,640	\$161,500	\$2,520	\$158,980	6.5	179,023
Gas Hea	ting (HVAC/Process) Replacement		0	0.0	130	\$1,038	\$18,515	\$1,500	\$17,015	16.4	15,209
ECM 8	Install High Efficiency Furnaces	No	0	0.0	130	\$1,038	\$18,515	\$1,500	\$17,015	16.4	15,209
Domest	ic Water Heating Upgrade		0	0.0	6	\$48	\$407	\$80	\$327	6.9	697
ECM 9	Install Low-Flow DHW Devices	Yes	0	0.0	6	\$48	\$407	\$80	\$327	6.9	697
	TOTALS (COST EFFECTIVE MEASURES)		238,576	32.8	-6	\$33,016	\$188,249	\$8,717	\$179,532	5.4	239,507
	TOTALS (ALL MEASURES)		238,640	32.8	124	\$34,063	\$206,964	\$10,217	\$196,747	5.8	254,781

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ENERGY EFFICIENT BEST PRACTICES

- Reduce Air Leakage
- Close Doors and Windows
- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls
 Are Operating Properly
- Use Fans to Reduce
 Cooling Load
- Use Window
 Treatments/Coverings

- Clean and/or Replace
 HVAC filters
- Check and Seal Duct Leakage
- Perform Proper Boiler
 Maintenance
- Perform Proper Water Heater Maintenance
- Plug Load Controls
- Water Conservation

See individual reports for specific EE practices by building



MEASURES FOR FUTURE CONSIDERATION

- Window Replacements
- High Efficiency Energy Recovery Units (ERUs)



EV CHARGING STATION POTENTIAL

NJCleanEnergy.com/EV



- -

SOLAR ENERGY GENERATION POTENTIAL

NJCleanEnergy.com/renewable-energy

	Main Building	Rink/Athletic Center
Potential:	HIGH	HIGH
System Potential: (kW)	299	266
Electric Generation: (kWh per year)	356,220	316,905
Displaced Cost: (per year)	\$777,400	\$43,920



C&I ENERGY EFFICIENCY PROGRAMS

NJCleanEnergy.com



UTILITY RUN ENERGY EFFICIENCY PROGRAMS

NJCleanEnergy.com/Transition

PRESCRIPTIVE & CUSTOM REBATES:

- Individual high efficiency equipment rebates for renovation, remodeling, and equipment replacement
- Flexibility to do a little or a lot
- No size requirement

DIRECT INSTALL:

- Turn-key retrofit program to replace outdated and inefficient equipment including, lighting, HVAC, refrigeration, etc.
- The facility must have an average electric peak demand <200kW in the previous year to qualify

ENGINEERED SOLUTIONS:

- Comprehensive, whole-building approach to saving energy
- The facility must have an average electric peak demand >200kW in the previous year to qualify



UTILITY RUN ENERGY EFFICIENCY PROGRAMS

PSE&G

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