

Reporting Period: May 2022 to April 2023



UNB Energy Management Program Report

Investing in Energy Savings

Executive Summary

In 1996, the Board of Governors (BOG) approved a formalized Energy Management Program (EMP) for the University of New Brunswick, Fredericton campus (UNBF) to invest in energy projects that will have a return on investment through utility cost avoidances. These avoidances are tracked for 10 years and then archived.

Performance highlights to date for all phases of the UNBF EMP include:

- \$14.6 M invested in 183 projects with 10-yr forecasted cost avoidance target of \$29.5 M.
- Actual cost avoidance of \$27 M to the end of 2022/23 which is \$6.8 M in excess of target.
- Third party funding of \$2.9 M has been received and reinvested into the EMP.
- In Fiscal Year (FY) 2022/23, the EMP was responsible for avoidance of \$1.2 M of utility costs at UNBF.

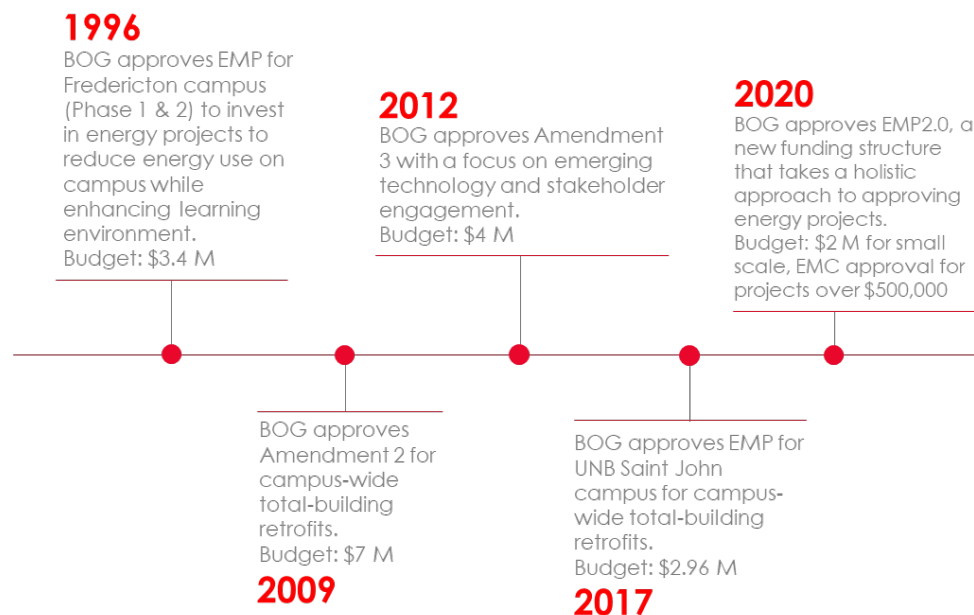
In 2017, BOG approved a formalized EMP for the UNB Saint John (UNBSJ) campus for campus-wide total building retrofits.

Performance highlights to date for the UNBSJ EMP include:

- \$3.7 M invested in 41 projects with 10-yr forecasted cost avoidance target of \$3.1 M.
- Actual cost avoidance of \$609k to the end of 2022/23 which is \$23k in excess of target.
- Third party funding of \$1.2 M has been received and reinvested into the EMP.
- In FY 2022/23, the EMP was responsible for avoidance of \$261k of utility costs at UNBSJ.

The Energy Management Committee (EMC) reports annually on the performance of the EMP on both campuses, which consists of: Fredericton – Phase 1 & 2, Amendment 2, Amendment 3, EMP2.0; and Saint John.

Overview of Energy Management Program



Oversight of the EMP is provided through the EMC. The EMC membership consists of:

AVP Capital Planning & Operations (CP&O) [Chair]	Treasurer
Director of Resource Planning & Budgeting	Comptroller
Director of Administration & Finance (CP&O)	Director of Planning (CP&O)
Director of Maintenance & Operations (CP&O)	Energy Coordinator (CP&O)
Director of Energy & Sustainability (CP&O)	Project Manager (UNBSJ)
Director of Financial & Admin Services (UNBSJ)	Director of Projects (CP&O)
Director of Facilities Management (UNBSJ)	

Investment & Cumulative Cost Avoidance Overview of UNBF & UNBSJ EMP

(See Appendix C for details, **black** circled numbers)

Program Phase	Approved Funding	Actual Project Work Completed	Committed or in Progress Projects	Actual & Committed Project Totals	Program Funding Remaining Balance	10-yr Cumulative <u>Forecasted</u> Cost Avoidance ¹
Phase 1 & 2	\$3,400,000	\$3,360,675	\$0	\$3,360,675	\$39,325	\$7,420,680
Amendment 2	\$7,000,000	\$6,986,047	\$0	\$6,986,047	\$13,953	\$15,960,397
Amendment 3	\$4,000,000	\$3,352,813	\$717,816	\$4,070,629	-\$70,629¹	\$5,726,430
EMP2.0	\$2,000,000	\$105,770	\$47,466	\$153,236	\$1,846,764	\$390,014
UNBF Totals	\$16,400,000	\$13,805,111	\$765,282	\$14,570,587	\$1,829,413	\$29,497,521
UNBSJ Totals	\$2,960,000	\$3,644,536	\$31,602	\$3,676,138	-\$716,138²	\$3,149,506

¹Automated metering, MacLaggan LED, and site lighting automation projects were over-budget.

²Does not reflect incentive amounts yet to be received. Campus metering over-budget but necessary.

UNBF & UNBSJ 2022/23 Annual Reconciliation of EMP Performance

(See Appendix C for details, **red** circled numbers)

Program Phase	Final Costs of Completed Projects being Tracked	2022/23 Annual Cost Avoidance	Average Weighted Simple Payback	<u>Actual</u> Cumulative Cost Avoidance to April 2023 (Measured)	<u>Target</u> Cumulative Cost Avoidance to April 2023 (Forecasted)
Phase 1 & 2 Active	\$48,036	\$12,964	3.7	\$91,764	\$91,764
Amendment 2 Active	\$4,466,075	\$741,052	6.0	\$6,196,111	\$4,820,182
Amendment 3 Active	\$3,352,813	\$381,603	8.8 ¹	\$2,021,770	\$2,281,245
EMP2.0 UNBF Active	\$105,770	\$21,472	4.9	\$31,233	\$41,159
Total (Active Reconciliations)	\$7,972,694	\$1,157,092	6.9	\$8,340,878	\$7,234,350
Phase 1 & 2 Archived	\$3,312,639	NA	3.7	\$9,044,445	\$7,291,040
Amendment 2 Archived	\$2,519,972	NA	2.5	\$9,903,849	\$5,921,006
UNBF Totals	\$13,805,305	\$1,157,092	NA	\$27,289,172	\$20,446,396
UNBSJ Totals	\$1,442,065	\$260,595	5.5	\$608,836	\$585,911

¹Greater than 8 years due to AUC Ice plant, HIL Level 3 modifications, and CP&O insulation projects not achieving intended savings.

Annual Utility Costs for 2022/23

Fredericton Campus

UNBF Utility Consumption and Costs Incurred 2022/23			
Utility	Fiscal Year Consumption	Fiscal Year Change from 2021/22	Cost
Steam (lbs.)	142,437,146	0.7% ¹	\$5,087,857
Electricity Consumption (kWh)	23,838,079	6.0%	\$3,409,727
Electricity Demand (kW)	58,639	12.1%	
Water (m ³)	206,957	-6.2%	\$440,789
Energy Amortization ²		-8.9%	\$519,543
Total Building Area (ft ²)	2,649,511	-0.2% ³	N/A
Actual Total Utility Costs with Energy Project Cost Avoidances			\$9,457,916
Total Annual Cost Avoidance from Active Energy Projects for 2022/23			\$1,157,092

¹Steam consumption change is normalized to weather.

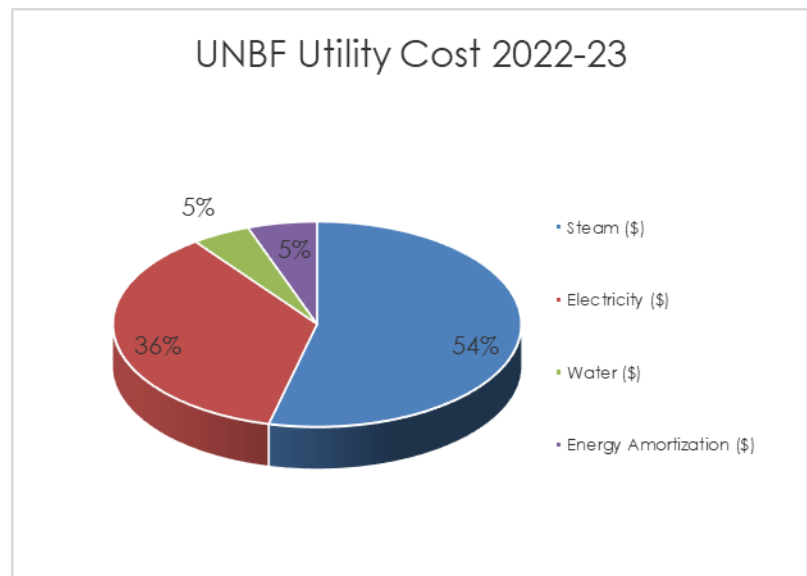
²Energy Amortization is the annual payment associated with the payback period of all active energy projects.

³Total building area decreased from 2022/23 with the demolition of Enterprise Building #3 (4,764 square feet).

Electrical Consumption and Demand increased compared to last FY due to students and staff returning to campus.

Water usage decreased due to the resolution of leaks found last FY.

Energy amortization fluctuates depending on projects that are still being paid off each year.



Saint John Campus

UNBSJ Utility Consumption and Costs Incurred 2022/23

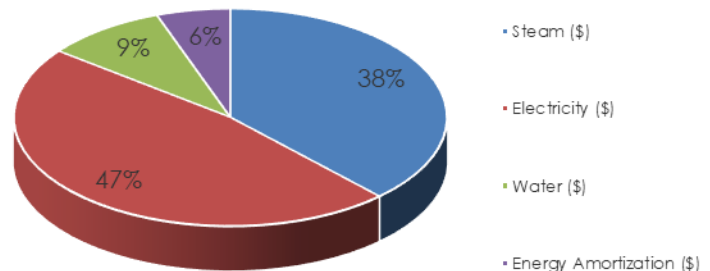
Utility	Fiscal Year Consumption	Fiscal Year Change from 2021/22	Cost
Steam (lbs.)	17,859,278	-17.3%	\$777,767
Electricity Consumption (kWh)	7,213,398	-1.4%	\$973,726
Electricity Demand (kW)	15,046	-3.8%	
Water (m ³)	69,941	-30.0%	\$185,592
Energy Amortization		-10.2%	\$112,930
Total Building Area (ft ²)	697,885	0.0%	N/A
Actual Total Utility Costs with Energy Project Cost Avoidances			\$2,050,016
Total Annual Cost Avoidance from Active Energy Projects for 2022/23			\$260,595

Steam, Electricity Consumption, and Demand decreased from last FY due to ongoing energy projects. The large decrease in Steam is partly attributable to the closure of Ward Chipman in the 2022/23 FY.

Water usage has decreased compared to last FY due to the identification and resolution of a water main break on campus in the 2021/22 FY.

Energy amortization fluctuates depending on projects that are still being paid off each year.

UNBSJ Utility Cost 2022-23



Annual Utility Consumption and Avoidance 2022/23

Fredericton Campus

Due to COVID, UNB implemented more frequent air purging cycles to all air handling units across campus from 2020/21 to 2022/23, which resulted in an increase in steam and electricity usage for most buildings. To ensure this increase was not reflected in the energy project savings, a calculated reduction was adjusted from each building.

Steam Consumption

Figure 1 below outlines the cumulative steam consumption on the UNBF campus, along with the steam avoidance and cost avoidance because of all EMP projects undertaken to date.

Examples of UNBF projects that reduce steam include heat recovery ventilation, updating mechanical systems, lab exhaust upgrades, insulation upgrades, and earth tube technology.

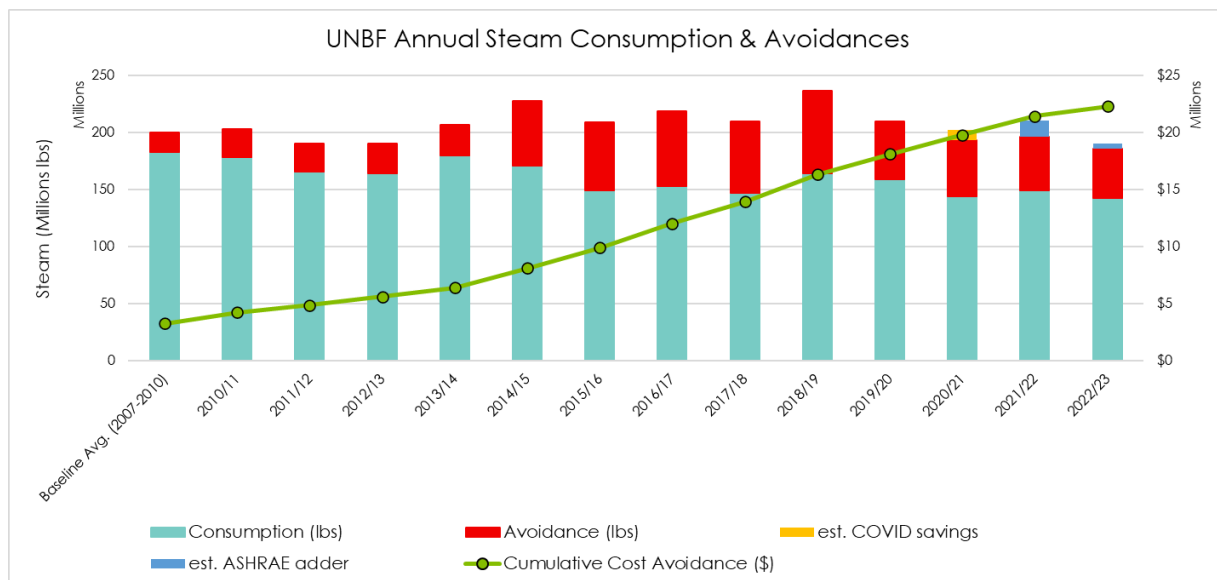


Figure 1 – UNBF Annual Steam Consumption and Avoidance

Since 1996, **817,453,707 lbs** of steam and **\$22,276,538** have been avoided due to energy projects approved under the EMP. For 2022/23, the increase in energy from new fresh air requirements outlined by ASHRAE was roughly **4,215,215 lbs**.



The total steam reduction achieved through the EMP projects is equivalent to: **3.9** years' worth of required steam supply to UNBF, Dr. Everett Chalmers Regional Hospital, and St. Thomas University.

Electricity Consumption

Figure 2 outlines the cumulative electricity consumption on the UNBF campus, along with the electricity avoidance and cost avoidance as a result of all EMP projects undertaken to date.

Examples of UNBF projects that reduce electricity include lighting upgrades, control systems upgrades, natural light harvesting, and renewable energy installation.

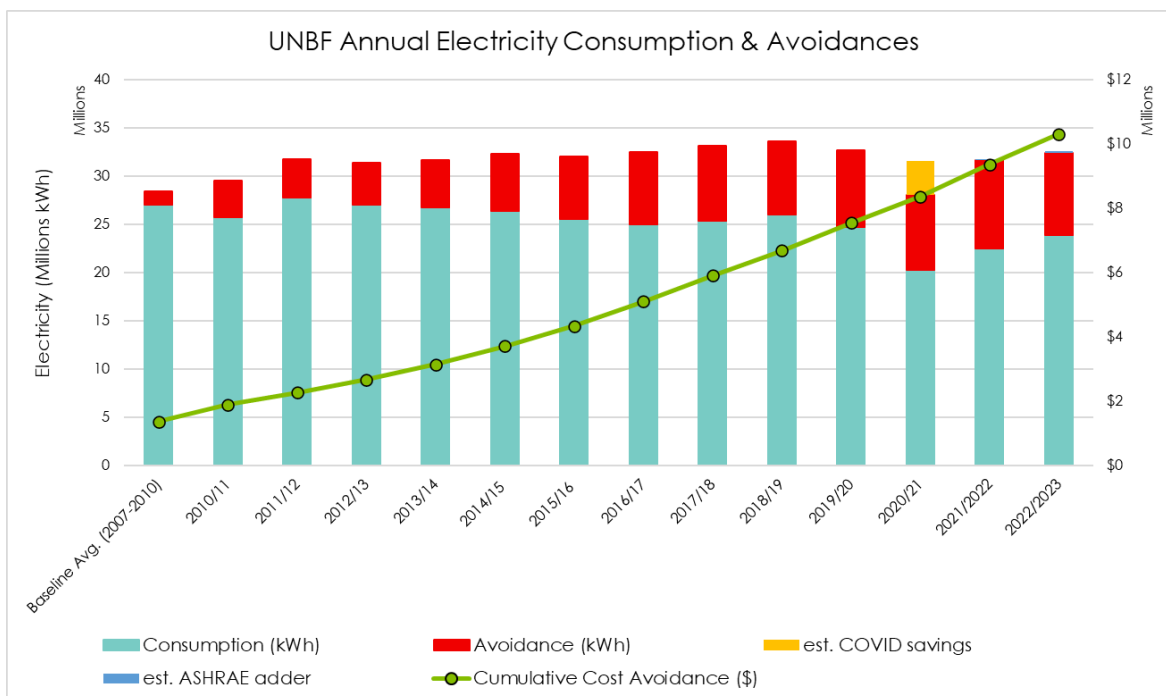


Figure 2 – UNBF Annual Electricity Consumption and Avoidance

Since 1996, **106,632,407 kWh** of electricity and **\$10,311,742** have been avoided due to energy projects approved under the EMP. For 2022/23, the increase in energy from new fresh air requirements was roughly **151,978 kWh**.



The total electricity reduction achieved through the EMP projects is equivalent to:

9,030

homes' energy use for one year.

Demand Consumption

Figure 3 outlines the cumulative demand consumption on the UNBF campus, along with the demand avoidance and cost avoidance as a result of all EMP projects undertaken to date.

Electrical demand charges apply to commercial customers (i.e. most campus buildings) as a cost for the peak monthly “demand” amount of energy consumed (kW), in addition to the electricity use charge (kWh).

Examples of UNBF projects that reduce demand include lighting upgrades, control systems upgrades, installing variable frequency drives (VFDs) on pumps and fans, and shifting/limiting equipment loads.

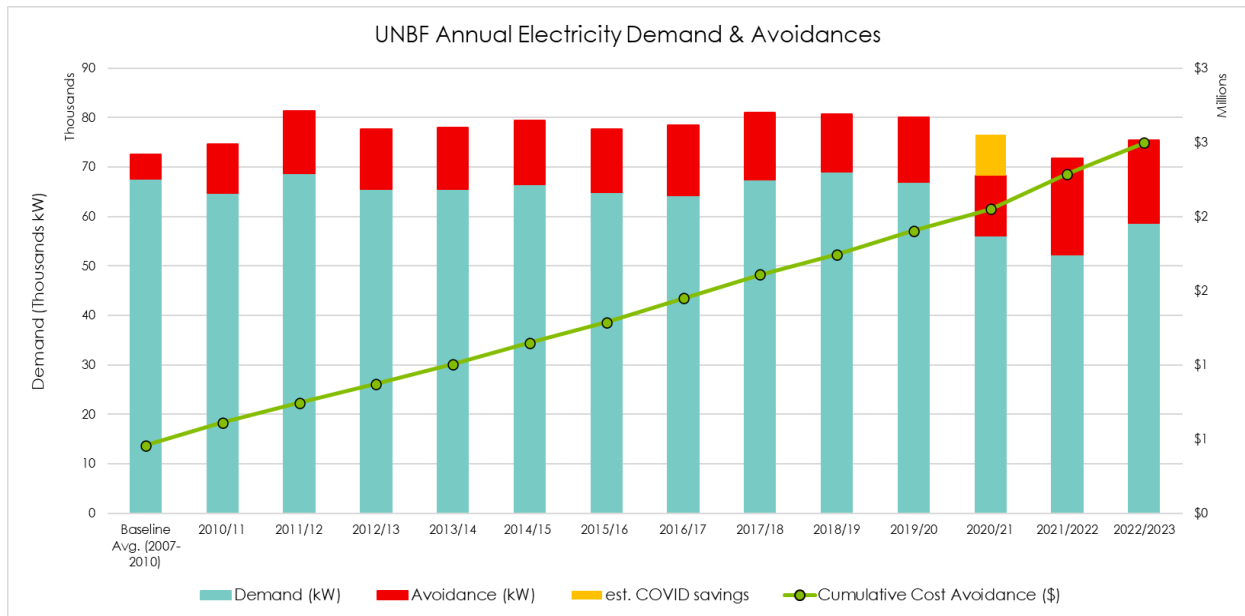


Figure 3 – UNBF Annual Demand Consumption and Avoidance

Since 1996, **224,411 kW** of demand and **\$2,497,166** have been avoided due to energy projects approved under the EMP.



The total demand reduction achieved through the EMP projects is equivalent to generation capacity of:

897,644

18-sqft solar panels.

Water Consumption

Figure 4 outlines the cumulative water consumption on the UNBF campus, along with the water avoidance and cost avoidance as a result of all EMP projects undertaken to date.

Examples of UNBF projects that reduce water include chilled water upgrades, low flow fixtures, recirculation systems, automated water fixtures, and low flow aerators.

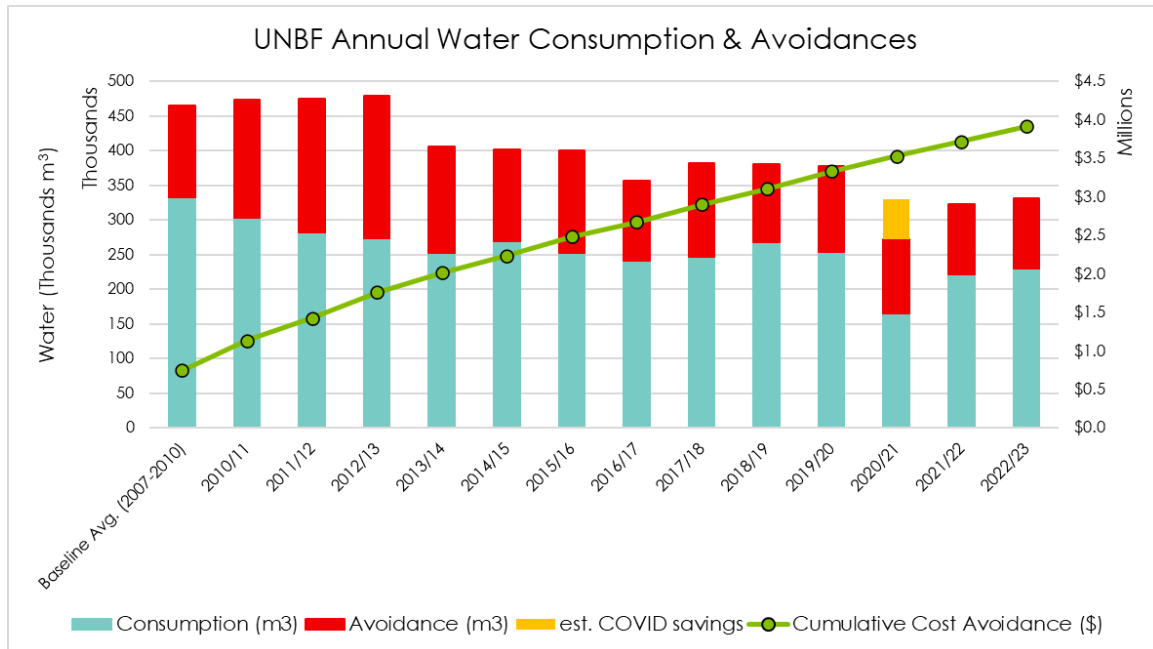


Figure 4 – UNBF Annual Water Consumption and Avoidance

Since 1996, **2,662,294 m³** of water and **\$3,915,197** have been avoided due to energy projects approved under the EMP.



The total water reduction achieved through the EMP projects is equivalent to:

1,407

City of Fredericton water towers.

UNBF EMP Emissions and Cost Avoidance Summary

Figure 5 below illustrates the cumulative CO_{2e} (carbon dioxide equivalent) emission avoidance and the cumulative cost avoidance as a result of all EMP projects undertaken (1996-2022). The red line represents a CO_{2e} reduction based on the yearly changes in emission factor due to the evolution of heating plant efficiency and the fuel mix used to generate steam. The black line represents the cumulative cost avoidance of all projects since the beginning of the EMP, showing the continuous savings even after the 10-year mark. The total cumulative cost avoidance is **\$39,000,643**.

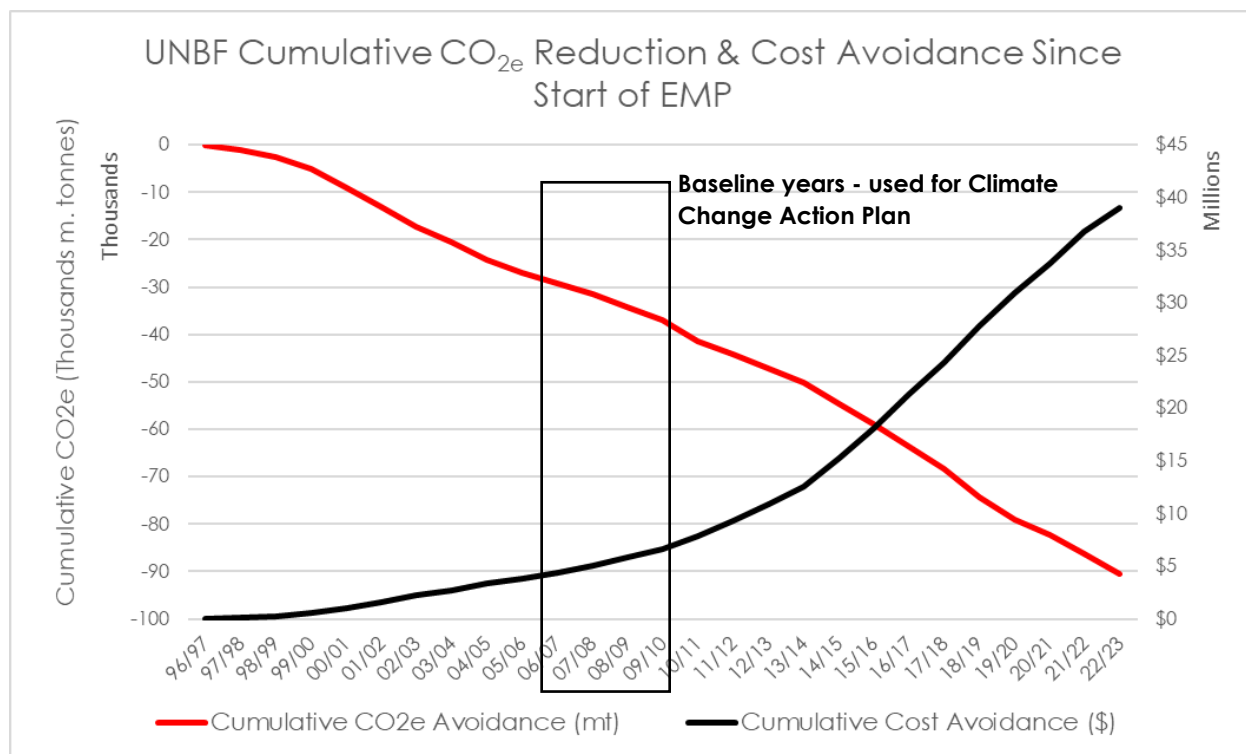


Figure 5 – UNBF Cumulative CO_{2e} Reduction and Cost Avoidance

Over the years, UNBF has evolved to lower CO_{2e} generating fuels (i.e., Natural Gas and Bunker oil) and continues to burn more biomass (a renewable resource) each year (45-60% of fuel burned), which affects the slope of the graph.

In the past two fiscal years, the EMP energy projects have resulted in a CO_{2e} emissions reduction of 4,057 metric tonnes (2021/22) and 4,240 metric tonnes (2022/23).

To date, UNBF buildings where energy projects have been completed have avoided CO_{2e} emissions by...

90,553 metric tonnes

(based on realistic year-to-year emission factors)

This is equivalent to planting 7,244,264 trees

OR

Taking 17,414 passenger vehicles off the road for one year

Saint John Campus

Steam Consumption

Figure 6 below outlines the cumulative steam consumption on the UNBSJ campus, along with the steam avoidance and cost avoidance as a result of all EMP projects undertaken to date.

Examples of UNBSJ projects that reduce steam include building automation system upgrades and kitchen ventilation upgrades.

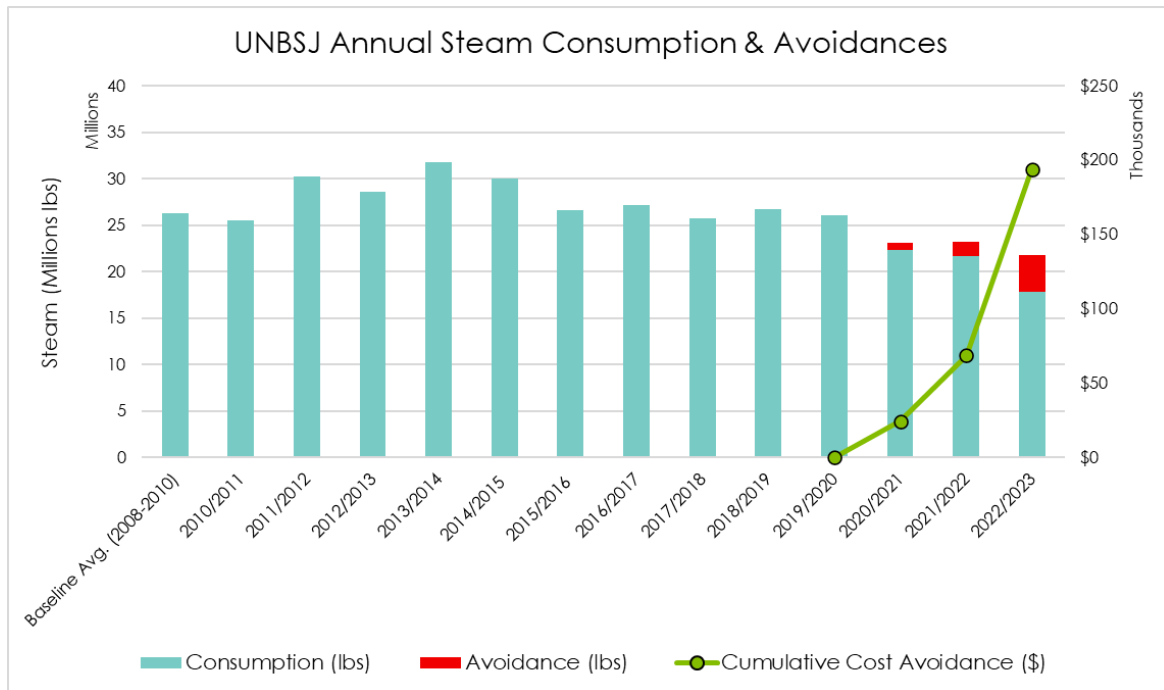
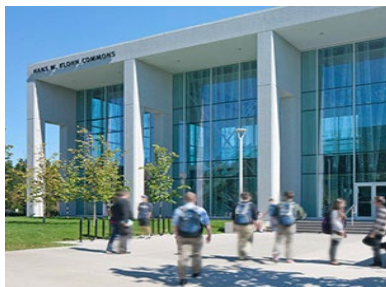


Figure 6 – UNBSJ Annual Steam Consumption and Avoidance

Since 2019, **6,333,709 lbs** of steam and **\$193,918** have been avoided due to energy projects approved under the EMP.



The total steam reduction achieved through the EMP projects is equivalent to:

4.25

months' worth of required steam supply to UNBSJ.

Electricity Consumption

Figure 7 outlines the cumulative electricity consumption on the UNBSJ campus, along with the electricity avoidance and cost avoidance as a result of all EMP projects undertaken to date.

Examples of UNBSJ projects that reduce electricity include lighting upgrades and building automation system upgrades.

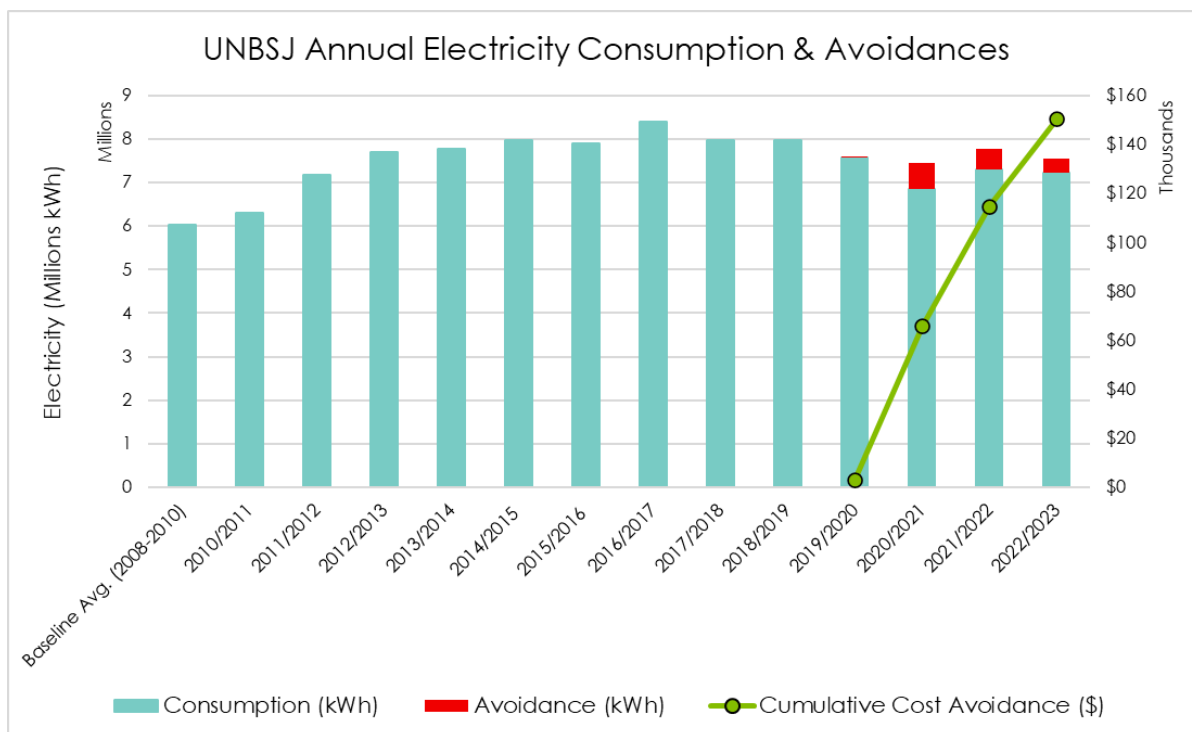


Figure 7 – UNBSJ Annual Electricity Consumption and Avoidance

Since 2019, **1,406,500 kWh** of electricity and **\$150,579** have been avoided due to energy projects approved under the EMP.



The total electricity reduction achieved through the EMP projects is equivalent to:

119

homes' energy use for one year.

Demand Consumption

Figure 8 outlines the cumulative demand consumption on the UNBSJ campus, along with the demand avoidance and cost avoidance as a result of all EMP projects undertaken to date.

Electrical demand charges apply to commercial customers (i.e. most campus buildings) as a cost for the peak monthly “demand” amount of energy consumed (kW), in addition to the electricity use charge (kWh).

Examples of UNBSJ projects that reduce demand include lighting upgrades and building automation system upgrades.

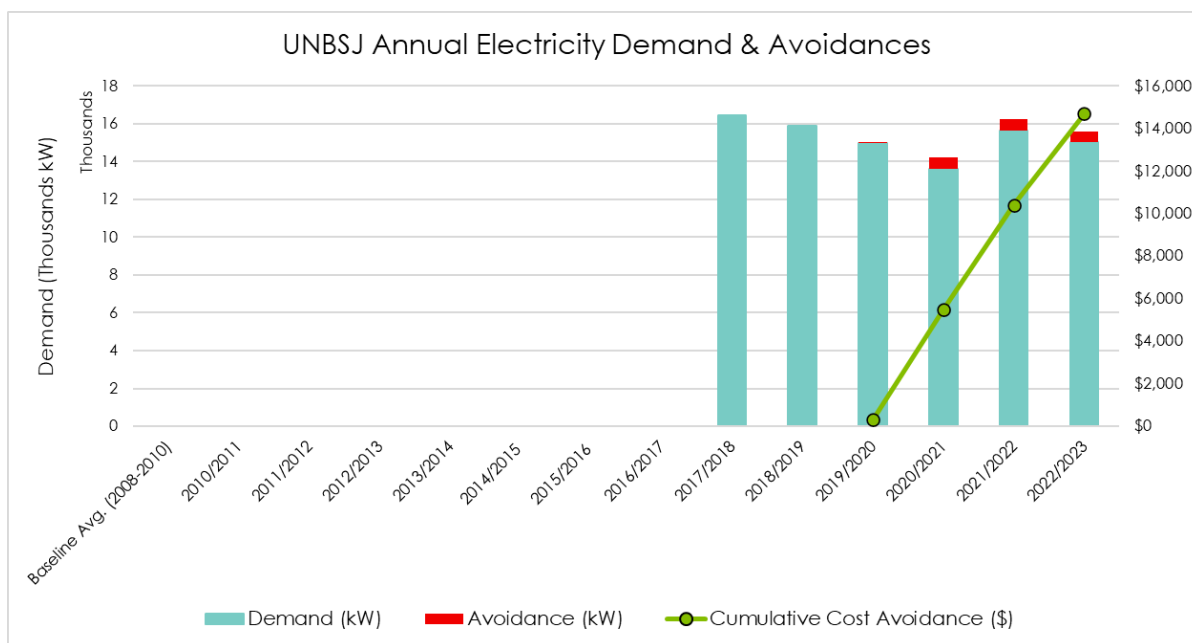


Figure 8 – UNBSJ Annual Demand Consumption and Avoidance

Since 2019, **1,825 kW** of demand and **\$14,695** have been avoided due to energy projects approved under the EMP.



The total demand reduction achieved through the EMP projects is equivalent to generation capacity of:

7,301

18-sqft solar panels.

Water Consumption

Figure 9 outlines the cumulative water consumption on the UNBSJ campus, from baseline to date. Water reduction projects started tracking in 2022/23 FY.

Examples of UNBSJ projects that will reduce water include domestic water retrofits, low flow fixtures, and automated water fixtures.

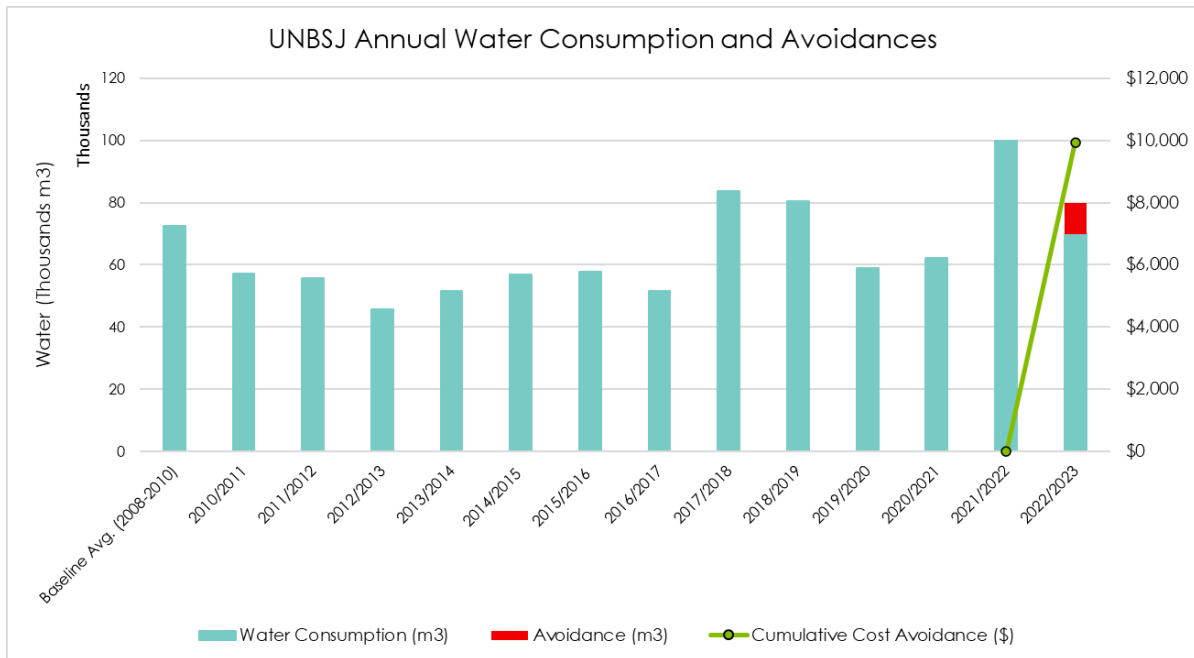


Figure 9 – UNBSJ Annual Water Consumption

Since 2022, **9,935 cubic meters** of water and **\$26,228** have been avoided due to energy projects approved under the EMP.



The total water reduction achieved through the EMP projects is equivalent to:

3

City of Saint John water towers.

UNBSJ EMP Emissions and Cost Avoidance Summary

Figure 10 below illustrates the cumulative CO_{2e} emission avoidance and the cumulative cost avoidance as a result of all EMP projects undertaken (2019-2022). The red line represents a CO_{2e} reduction based on the yearly changes in emission factor direct from the Saint John Regional Hospital. The black line represents the cumulative cost avoidance of all projects since the beginning of the EMP, to eventually show the continuous savings even after the 10-year mark. The total cumulative cost avoidance is **\$385,420**.

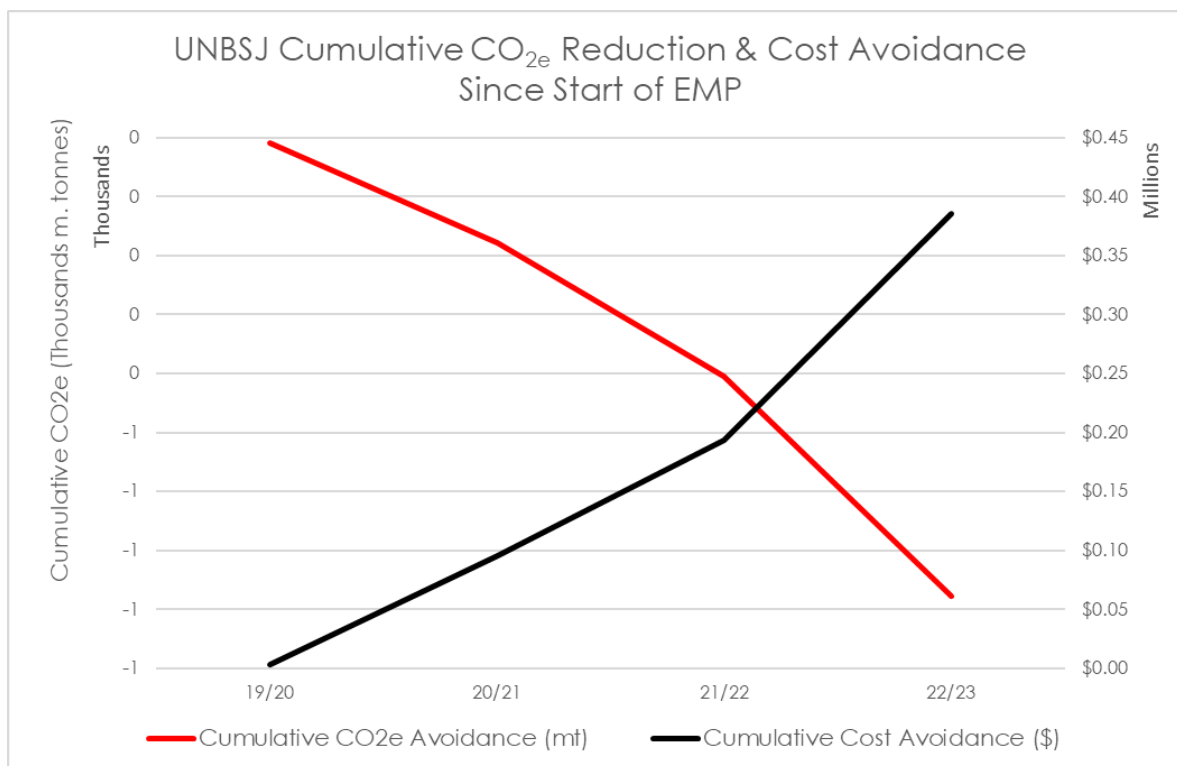


Figure 10 – UNBF Cumulative CO_{2e} Reduction and Cost Avoidance

In the past two fiscal years, the EMP energy projects have resulted in a CO_{2e} emissions reduction of 192 metric tonnes (2021/22) and 600 metric tonnes (2022/23).

To date, UNBSJ buildings where energy projects have been completed have avoided CO_{2e} emissions by...

777 metric tonnes

(based on realistic year-to-year emission factors)

This is equivalent to planting 62,180 trees

OR

Taking 149 passenger vehicles off the road for one year

Solar Production

During the October 2021 EMC meeting it was discussed and supported to use unexpected energy project incentive funds received to invest in future PV installations on both campuses. Solar PV plays a significant role in energy and carbon reduction, but still struggles to achieve paybacks typically supported by EMP funding.

With this fund, EMC has supported the following solar projects:

- **CP&O solar PV – 17kW system**, in operation since November 2022
- **UNBSJ ground mount solar PV – 10kW system**, under construction
- **Kinesiology solar PV – 39kW system**, in design phase
- **Aitken Centre solar PV – 100kW system**, in design phase

Solar PV Project	Allocated Funding (from solar fund)	Actual Funding	EMP contribution	Est. Annual savings	Est. Annual GHG emissions reduction (mtCO _{2e})
CP&O	\$83,500	\$75,740	\$0	\$2,498	6.5
UNBSJ	\$40,266	In progress	\$0	\$1,344	3.5
Kinesiology	\$181,120	In progress	\$0	\$6,399	12.9
Aitken Centre	\$343,361	In progress	\$36,119	\$16,497	23.5
Totals	\$640,487	\$75,740	\$36,119	\$26,256	48.9

As the solar projects come online, Figure 11 below will show the annual production (electricity avoidance) and cost avoidance as a result of these projects. Also shown is the target cumulative cost avoidance for all 4 projects over a 25-year lifespan.

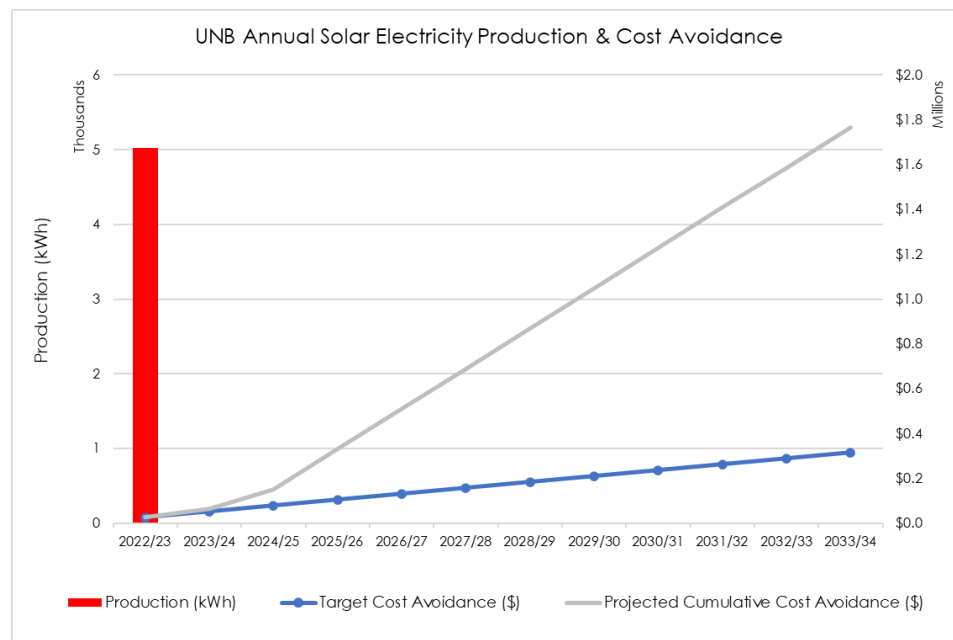


Figure 11 – Annual Solar Production and Cost Avoidance

Since 2022, **5,023 kWh** of electricity (equivalent to powering 0.4 homes) and **\$555** have been avoided due to the solar PV energy projects approved under the EMP.

Key Annual Developments

Throughout the 2022/23 fiscal year, Energy Management has been working on the following:

Fredericton Campus

Solar PV installations

During the 2022/23 FY, rooftop solar PV was installed at Capital Planning & Operations and the IUC Central Core green roof.

CP&O: The solar PV installation is 17 kW with a projected annual energy savings of 22,363 kWh and \$2,498. This solar project will have an annual GHG emissions offset of 6.5 mtCO₂e.

IUC Central Core: Although not funded through EMP, this solar PV installation is 60 kW with a projected annual energy savings of 30,059 kWh and \$3,204. This solar project will have an annual GHG emissions offset of 8.7 mtCO₂e.

Kinesiology building has also been designed for solar, to be installed in the 2023/24 FY. The installation is projected to be 39 kW, with an annual energy savings of 44,369 kWh, 120 kW, and \$6,399. This solar project will have an annual GHG emissions offset of 12.9 mtCO₂e.

A unique vertical mounted PV option is currently being designed for the AUC building. The installation is projected to be 100 kW, with an annual energy savings of 94,997 kWh, 600 kW and \$16,497. This solar project will have an annual GHG emissions offset of 23.5 mtCO₂e.

Continuing to improve reliability and accuracy of meters

Continued work on mapping and verifying meter and piping layouts across campus. The verification of pump trap capacities for all units that are measured on campus was also completed.

Establishing a steam trap maintenance program

Working with CHP staff to develop a steam trap maintenance program to ensure regular testing and monitoring of all ~2,000 steam traps on campus.

Saint John Campus

Building Optimization Projects

Building optimization projects were completed for both Ganong Hall and Canadian Rivers Institute. A full review was completed of each building on the energy systems that supply heat and air to the facilities, resulting in the replacement of key units to reduce the energy use and ensure functionality of the two facilities.

Upcoming solar PV installation

During the 2022/23 FY, a ground-mount solar PV system was approved to move forward for the UNBSJ campus.

This ground-mount system will be 10 kW with a projected annual energy savings of 13,980 kWh and \$1,344. The project will have an annual GHG emissions offset of 3.5 mtCO₂e.

Construction is expected to start in spring 2023.

Next round of energy audits

Since the first round of EMP projects is nearing completion, UNBSJ has engaged a consultant to conduct energy audits for the 5 remaining campus buildings that were not included in the first round: Hans Klohn Commons, K.C. Irving Hall, DAL Med, 40 Charlotte St., and Beaverbrook House.

These energy audits will focus on HVAC and controls upgrades, geothermal conversion/connection to current wells or a central geothermal plant, and solar.

Goals for 2023/24 Fiscal Year

In 2023/24, Energy Management aspires to continue these above efforts while also focusing on:

- Continuing to improve building meter reliability and sub-metering (F, SJ)
- Implementing solar PV projects on campus (F, SJ)
- Upgrading remaining campus buildings to LED, hopefully with in-house resources to save money and make use of UNB's excellent trades people (F)
- Identifying more opportunities for energy projects (F, SJ)
- Starting work on the next phase of energy audits (SJ)

Appendices

Appendix A

Definitions and Terminology

Archived project is a project which has had cost avoidances tracked for the 10-year annual reconciliation period, which is the EMC's mandated monitoring period. After 10 years, the cumulative cost avoidance is recorded and then "archived". No further cost avoidance is attributed to the project.

ASHRAE is the American Society of Heating, Refrigerating and Air-Conditioning Engineers to which UNB is a member. ASHRAE 62.1 is outlined in the National Building Code as the standard to follow for minimum fresh air requirements in a building. Since COVID, the standard is now 10 CFM/person or 0.6 CFM/sqft.

Completed and reconciled project is a project where construction has finished, construction costs are finalized, and a fiscal year of performance as an energy project has passed. The project is then monitored for 10 years where the annual cost avoidance is measured and tracked for the project.

Cumulative cost avoidance of active projects is the total sum to date of the annual cost avoidance of the current projects being tracked within their 10-year reconciliation period.

Cumulative cost avoidance of archived projects is the sum of all cost avoidance generated by archived projects at the completion of their 10-year reconciliation period.

Cumulative cost avoidance forecast is the total sum of forecasted cost avoidances anticipated over the 10-year reconciliation period. This is an estimated figure based on the anticipated annual cost avoidance as predicted from the energy audit.

Cumulative cost avoidance target is the sum of the annual projected cost avoidances of energy projects over a 10-year reconciliation period. This provides an estimated project life cycle cost avoidance to compare with actual cost avoidances over a 10-year period.

Emission Factor is a value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant.

Energy Amortization is the annual calculated cost allocation of an energy project charged to the respective building where the energy project occurred, and utility cost avoidance will occur.

Heating degree day is a measurement designed to quantify the energy needed to heat a building. It is the number of degrees that a day's average temperature is below 18 degrees Celsius.

CO_{2e} or carbon dioxide equivalent is a term which allows us to describe the environmental impact from different greenhouse gases from steam and electricity in a common unit.

Appendix B

EMP Third-Party Leveraging for UNB

Funding Program	Received in FY 2022/23	Cumulative Funding Received
UNB Fredericton		
NRCan Eco-Energy (2011)	-	\$101,830
Climate Action Fund (2012)	-	\$380,880
Efficiency NB (2011-2014)	-	\$1,135,808
NRCan Energy Manager (2020)	-	\$12,000
NB Power Energy Audit Incentive (2014-present)	\$3,800	\$37,095
NB Power \$30/GJ Commercial Building Retrofit (2014-2022)	\$0	\$111,982
NB Power \$60/GJ Commercial Building Retrofit (Dec 2022-present)	\$17,263	\$17,263
NB Power Peak Demand Rebate (2017-present)	\$2,750	\$16,950
NB Power Low Carbon Economy Funding (2019-present)	\$37,886	\$1,014,326
NB Power Business Rebate (2020-present)	\$22,459	\$40,459
UNBF TOTALS:	\$84,158	\$2,868,593
UNB Saint John		
NB Power (CBRP and LCEF) (2018-present)	\$922,112	\$1,205,993

Appendix C

UNBF Detailed Project Reconciliation and Financials

Phase 1 & 2

Phase 1 & 2 Energy Improvement Projects Annual Reconciliation (Measurement & Verification) - Updating Period Ending April 2023										
Project No.	Phase 1 & 2 Energy Projects	Estimates at Proposal Stage		Projections at Project Completion			Actual Cost Avoidance			
		Estimated Project Cost (\$)	Estimated Annual Cost Avoidance (\$)	Actual Project Cost (\$)	M&V Start Date	Forecasted Cost Avoidance (\$) Over 10 years	Annual Cost Avoidance (\$)	Cumulative Cost Avoidance (\$)	Reconciliation Completion Date	Simple Payback (Years)
137	SUB Variable Speed Range Hoods (Steam Table (Acc. 14343 Removed From Scope Acc# 14294). Approved at 8 yr spb	\$27,727	\$4,660	\$32,112	M&V May 2014	\$46,600	\$4,660	\$41,940	2024	6.9
166	SUB Steam Table (acc. 14343) - Deemed	\$16,448	\$8,304	\$15,924	M&V May 2017	\$83,040	\$8,304	\$49,824	2027	2.0
Phase 1 and 2 Program Budget Proposal		\$3,400,000								
Active Reconciliation (3 Projects) Totals		\$44,175	\$12,964	\$48,036		\$129,640	\$12,964	\$91,764		3.7
Target - Cumulative Cost Avoidance Forecasted			\$91,764							
Archived Reconciliation (64 Projects) Totals				\$3,312,639		\$7,291,040		\$9,044,445		
Phase 1 and 2 Energy Program Totals				\$3,360,675		\$7,420,680		\$9,136,209		
Program Balance		\$39,325								

Amendment 2

Amendment 2 Energy Improvement Projects Annual Reconciliation - Updating Period Ending April 2023													
Project No.	Amendment 2 Projects	Estimates at Proposal Stage					Projections at Project Completion <i>Includes Incentive \$\$ & Net Tax</i>			Actual Annual Cost Avoidances			
		Estimated Project Cost (\$)	Estimated Project Cost to EMC (\$) With Incentives	Annual Cost Avoidance (\$)	Simple Payback (Years)	Simple Payback (Years) With Incentive	Actual Project Cost (INCLUDES Actuals where Possible & Incentives if Received)	Measurement and Verification (M&V) Start Date	Forecasted Cost Avoidance (\$) Over 10 years	Annual Cost Avoidance (\$)	Cumulative Cost Avoidance (\$)	Reconciliation Completion / 10 Yr. Archived Date	Simple Payback (Years)
72	Aitken Center	\$156,976	\$133,429	\$19,758	7.9	6.8	\$143,264	M&V May 2013	\$197,580	\$19,758	\$179,341	May 2023	7.3
92	Bank Bookstore	\$87,376	\$80,909	\$6,624	13.2	12.2	\$99,822	M&V May 2013	\$66,239	\$4,615	\$46,152	May 2023	21.6
93	IUC Physics	\$531,631	\$455,311	\$63,818	8.3	7.1	\$328,234	M&V May 2013	\$638,183	\$95,641	\$956,414	May 2023	3.4
94	RN Scott Hall	\$5,189	\$4,724	\$579	9.0	8.2	\$4,690	M&V May 2013	\$5,792	\$3,535	\$35,349	May 2023	1.3
95	Toole Hall (EMC Appr. Changes)	\$946,661	\$872,301	\$105,806	8.9	8.2	\$856,056	M&V May 2014	\$1,058,055	\$107,881	\$970,925	May 2024	7.9
97	Smart Metering	\$61,560	\$61,560				\$61,560	N/A					
	Group C Total: Science Buildings	\$1,632,417	\$1,474,805	\$176,827	9.2	8.3	\$1,350,362		\$1,768,269				
	Group Audit Cost (incentive = \$36,000)	\$96,500	\$60,500				\$60,500	N/A					
98	Tilley Hall (2011 Scope EMC Approved)	\$614,182	\$546,292	\$61,426	10.0	8.9	\$454,330	M&V May 2013	\$614,260	\$103,348	\$1,033,477	May 2023	4.8
101	Singer Hall	\$30,188	\$28,951	\$5,409	5.6	5.4	\$42,149	M&V May 2013	\$54,090				
102	Memorial Hall	\$79,572	\$82,572	\$10,854	7.3	7.6	\$74,375	M&V May 2016	\$108,540	\$27,556	\$192,943	May 2026	2.7
103	Marshall d'Avray Hall	\$398,983	\$323,983	\$47,644	8.4	6.8	\$335,170	M&V May 2014	\$476,440	\$78,904	\$710,133	May 2024	4.2
104	MacLaggan Hall	\$135,620	\$112,640	\$11,755	11.5	9.6	\$73,387	M&V May 2015	\$117,550	\$18,952	\$151,614	May 2025	3.9
105	Law Building	\$56,306	\$50,805	\$7,560	7.4	6.7	\$52,348	M&V May 2013	\$75,600	\$9,103	\$90,969	May 2023	5.8

107	Keirstead Hall	\$1,312	\$1,267	\$183	7.2	6.9	\$2,504	M&V* May 2015	\$1,830	\$183	\$1,464	May 2025	13.7
108	IUC Forestry	\$434,301	\$359,301	\$60,648	7.2	5.9	\$423,540	M&V May 2016	\$606,480	\$49,112	\$343,784	May 2026	8.6
109	HIL - A2 Project Excluding Lighting	\$120,976	\$99,163	\$15,657	7.7	6.3	\$114,516	M&V May 2014	\$156,570	\$65,935	\$593,416	May 2024	1.7
148	HIL - LED Lighting	\$164,718	\$164,718	\$19,026	8.7	8.7	\$136,247	M&V May 2016	\$190,260	\$19,026	\$133,182	May 2026	7.2
110	Incutech #1	\$68,413	\$67,463	\$10,291	6.6	6.6	\$73,132	M&V May 2014	\$102,910	\$17,330	\$155,974	May 2024	4.2
111	Carleton Hall	\$61,512	\$56,472	\$4,876	12.6	11.6	\$38,518	M&V May 2013	\$48,760	\$3,452	\$34,519	May 2023	11.2
112	Alumni Memorial	\$59,474	\$39,434	\$7,434	8.0	5.3	\$41,893	M&V May 2015	\$74,340	\$7,434	\$59,472	May 2025	5.6
114	Submetering (South Gym Only)	\$12,563	\$12,563				\$12,563	N/A					
Group D Total: Academic Buildings		\$2,334,620	\$2,006,124	\$262,763	8.9	7.6	\$1,935,172		\$2,627,630				
Group F Audit Cost (incentive = \$4,000)		\$9,000	\$5,000				\$5,000	N/A					
115	Annex C	\$7,831	\$7,687	\$601	13.02	12.78	\$5,782	M&V May 2014	\$6,013	\$868	\$7,815	May 2024	6.7
116	Campus House	\$21,203	\$17,902	\$2,868	7.39	6.24	\$21,705	M&V May 2013	\$28,680	\$2,576	\$25,759	May 2023	8.4
117	Daycare	\$4,641	\$3,955	\$1,060	4.38	3.73	\$5,744	M&V* May 2015	\$10,600	\$1,060	\$8,480	May 2025	5.4
118	Enterprise #3 - Header House	\$21,785	\$20,396	\$1,077	20.23	18.94	\$17,621	M&V May 2014	\$10,770	\$3,036	\$24,288	May 2021	5.8
119	Grad House	\$6,328	\$5,867	\$803	7.88	7.31	\$2,411	M&V May 2014	\$8,030	\$1,042	\$9,374	May 2024	2.3
120	Incutech#2	\$42,501	\$37,377	\$3,998	10.63	9.35	\$41,259	M&V May 2014	\$39,976	\$4,086	\$36,775	May 2024	10.1
121	Muriel McQueen	\$5,507	\$4,809	\$966	5.70	4.98	\$4,585	M&V May 2014	\$9,660	\$2,755	\$25,080	May 2024	1.7
122	Neville Homestead	\$2,460	\$2,208	\$412	5.97	5.36	\$3,409	M&V* May 2015	\$4,120	\$412	\$3,296	May 2025	8.3
123	Sommerville House	\$7,323	\$7,323	\$1,202	6.09	6.09	\$1,780	M&V May 2016	\$12,020	\$351	\$2,457	May 2026	5.1
Group F Total: Ancillary Buildings		\$128,579	\$112,524	\$12,987	9.9	8.7	\$109,296		\$129,869				
125	Tunnel Insulation Upgrade	\$90,131	\$90,131	\$34,294	2.6	2.6	\$101,997	M&V* May 2015	\$342,940	\$34,294	\$274,352	May 2025	3.0
169	Bailey Hall Fish Lab Water Recirculation - R1	\$695,563	\$695,563	\$83,781	8.3	8.3	\$696,757	M&V 2020	\$837,810	\$15,249	\$45,748	May 2030	45.7
195	Bailey Hall LED Lighting	\$125,926	\$113,926	\$15,245	8.3	8.3	\$129,227	M&V 2022	\$152,450	\$43,558	\$43,558	May 2032	3.0
A2 Program Budget Proposal		\$7,000,000											
Actual Project Progress Totals To Date		N/A	N/A	N/A	N/A	N/A	\$4,466,075		\$6,056,548	\$741,052	\$6,196,111	Non-Appl.	6.0
Estimated/Projected Project Totals		\$0					\$4,466,075						
Target - Cumulative Cost Avoidance Forecasted				\$4,820,182									
Archived 10 Yr. Reconciliations							\$2,519,972		\$5,921,006		\$9,903,849		
Amendment 2 Program Totals (Estimated+Actual)							\$6,986,047		\$6,056,548				
Program Balance		\$13,953						10 Yr. Forecasted =	\$15,960,397				

Notes on projects outside their estimated SPB:

Bank/Bookstore – space usage has changed over the years (i.e. now a pharmacy and bookstore), causing the increase in consumption from what was estimated. Project was over-budget by roughly \$12,000. Project is achieving savings, but not to the level intended for the project.

Keirstead – over-budget by \$1,200, increasing SPB by 6.5 years.

IUC Forestry – a second report was submitted in 2013 with a major adjustment regarding the Controls and Ventilation upgrade, which increased the project cost while lowering the annual savings.

Campus House – slightly over-budget and not reaching the full amount of intended savings.

Neville Homestead – over-budget by \$1,000, increasing SPB by 2 years.

Bailey Fish Lab – readjusted the target reduction with consultation from MCW. However, the Bailey Chiller renewal project was still underway in 2021/22 which required the use of City of Fredericton water periodically, thus increasing the water usage in the building. The user group also never put the system in recirculation because they were dissatisfied with the equipment and the continued malfunctions/failures.

Amendment 3

Amendment 3 Energy Improvement Projects Annual Reconciliation - Updating Period Ending April 2023											
Project No.	Amendment 3 Projects	Estimates at Proposal Stage			Projections at Project Completion			Actual Cost Avoidances			
		Estimated Project Cost to EMC (\$) <i>Includes Incentives</i>	Annual Cost Avoidance (\$) Estimated	Simple Payback (Years)	Actual Project Cost (INCLUDES Actuals & Incentives if Received)	Measurement & Verification Start Date	Forecasted Cost Avoidance (\$) Over 10 years	Annual Cost Avoidance (\$)	Cumulative Cost Avoidance (\$)	Reconciliation Completion Date	Simple Payback (Years)
126	Automated Metering	\$400,000	\$60,000	6.7	\$482,403	M&V 2016	\$600,000	\$60,000	\$420,000	2026	8.0
	Totals Project Cost	\$400,000			\$482,403						
	Energy Manager Discretionary Fund										
127	Old Engineering Automated Damper	\$2,000	\$2,332	0.9	\$903	M&V 2013	\$23,320	\$2,332	\$23,320	2023	0.4
128	AUC Automated Lighting Control (Watt Stoppers)	\$2,384	\$771	3.1	\$4,810	M&V 2013	\$7,710	\$771	\$7,710	2023	6.2
129	FM Automated Lighting Control (Watt Stoppers)	\$450	\$95	4.7	\$477	M&V 2013	\$949	\$95	\$949	2023	5.0
130	FM Automated Main Steam Valve	\$3,552	\$1,332	2.7	\$2,548	M&V 2013	\$13,315	\$1,332	\$13,315	2023	1.9
131	FM Entry Heater Control	\$1,097	\$286	3.8	\$1,180	M&V 2013	\$2,862	\$286	\$2,862	2023	4.1
132	LB Gym Automated Lighting	\$3,200	\$1,199	2.7	\$1,476	M&V 2013	\$5,468	\$547	\$5,468	2023	2.7
133	2013 Exterior Lighting Upgrade to 5 LED (SUB)	\$1,142	\$228	5.0	\$1,142	M&V 2013	\$2,284	\$228	\$2,284	2023	5.0
134	2013 Exterior Lighting Upgrade to 5 LED (Wu)	\$1,142	\$228	5.0	\$1,142	M&V 2013	\$2,284	\$228	\$2,284	2023	5.0
137	Bailey Hall AHU#2 Energy Valve	\$2,030	\$406	5.0	\$2,030	M&V 2013	\$4,060	\$406	\$4,060	2023	5.0
138	Singer AHU#6 CO2 Control	\$1,000	\$216	4.6	\$455	M&V 2014	\$2,160	\$216	\$1,944	2024	2.1
139	Bailey Hall Rm 38 Growth Chambers (2) Lighting	\$2,127	\$634	3.4	\$2,127	M&V 2016	\$6,340	\$634	\$4,438	2026	3.4
140	SUB Lighting Fixture Upgrade	\$736	\$147	5.0	\$736	M&V 2014	\$1,470	\$147	\$1,323	2024	5.0
143	Path Lighting: 2 NW entrance to SUB	\$475	\$95	5.0	\$475	M&V 2015	\$950	\$95	\$760	2025	5.0
144	Path Lighting: 2 at entrance to Bankbookstore	\$475	\$95	5.0	\$475	M&V 2015	\$950	\$95	\$760	2025	5.0
145	Path Lighting: 6 at Headhall exterior steps (LBR parking)	\$1,425	\$285	5.0	\$1,425	M&V 2016	\$2,849	\$285	\$1,994	2026	5.0
156	For/Geo Summer Condensate Recovery	\$1,750	\$420	4.2	\$1,204	M&V 2015	\$4,200	\$420	\$3,360	2025	2.9
157	Presidents Residence Garage LED	\$303	\$61	5.0	\$267	M&V 2016	\$610	\$61	\$427	2026	4.4
158	MacLaggan Hall Exterior LED & Control Retrofit	\$800	\$239	3.3	\$295	M&V 2016	\$2,390	\$239	\$1,673	2026	1.2
159	IUC Physics Entry Heater	\$1,800	\$384	4.7	\$464	M&V 2016	\$3,840	\$384	\$2,688	2026	1.2
162	HIL 3 Way Valve - Simultaneous Heat/Cool	\$9,480	\$2,732	3.5	\$3,160	M&V 2016	\$27,320	\$2,732	\$19,124	2026	1.2
161	South Gym Lighting (EMC Vote/Approved Project)	\$20,071	\$4,545	4.4	\$13,164	M&V 2016	\$45,450	\$6,958	\$34,790	2021	1.9
163	Forestry/Geology Main Steam Valve Control	\$5,000	\$4,734	1.1	\$5,216	M&V 2016	\$47,340	\$4,734	\$33,138	2026	1.1
167	Campus House Exterior LED	\$554	\$111	5.0	\$554	M&V 2017	\$1,110	\$111	\$666	2027	5.0
172	Kierstead DHW Heat Pump	\$4,233	\$847	5.0	\$6,889	M&V 2020	\$8,470	\$847	\$2,541	2030	8.1
173	FM LED Lighting	\$9,333	\$3,378	2.8	\$7,908	M&V 2017	\$33,780	\$3,378	\$20,268	2027	2.3

174	College Hill Daycare LED Lighting	\$2,285	\$469	4.9	\$1,847	M&V 2018	\$4,690	\$469	\$2,345	2028	3.9
175	Alumni Memorial LED Lighting	\$4,935	\$1,531	3.2	\$4,894	M&V 2018	\$15,310	\$1,531	\$7,655	2028	3.2
176	Carleton Hall LED Lighting	\$9,433	\$2,695	3.5	\$7,324	M&V 2018	\$26,950	\$2,695	\$13,475	2028	2.7
177	Neville Homestead LED Lighting	\$1,022	\$206	5.0	\$779	M&V 2018	\$2,060	\$206	\$1,030	2028	3.8
178	Residence Administration LED Lighting	\$1,564	\$444	3.5	\$1,628	M&V 2018	\$4,440	\$444	\$2,220	2028	3.7
179	BankBookstore LED Lighting	\$9,967	\$3,315	3.0	\$5,315	M&V 2019	\$33,150	\$3,315	\$13,260	2029	1.6
180	SUB Cafeteria LED Lighting Leverage	\$6,213	\$1,243	5.0	\$6,213	M&V 2019	\$12,430	\$1,243	\$4,972	2029	5.0
181	Annex C LED Lighting	\$2,473	\$514	4.8	\$1,367	M&V 2018	\$5,140	\$514	\$2,570	2028	2.7
182	RN Scott LED Lighting	\$8,655	\$1,849	4.7	\$6,853	M&V 2018	\$18,490	\$1,849	\$9,245	2028	3.7
183	Dome MH Fixture #1 LED Leverage	\$4,753	\$951	5.0	\$4,753	M&V 2018	\$9,510	\$951	\$4,755	2028	5.0
185	Dome MH Fixture #2 LED Leverage	\$4,753	\$951	5.0	\$4,753	M&V 2019	\$9,510	\$951	\$3,804	2029	5.0
189	AUC basement LED Lighting (5 rooms)	\$757	\$413	1.8	\$435	M&V 2020	\$4,130	\$413	\$1,239	2030	1.1
190	Aitken House LED Lighting	\$3,073	\$1,413	2.2	\$3,282	M&V 2021	\$14,130	\$1,413	\$1,413	2022	2.3
	Totals Project Cost	\$136,441			\$109,965						
	Heat Recovery Projects										
165	AUC Ice Plant Waste Heat Utilization	\$380,979	\$47,622	8.0	\$363,221	M&V 2018	\$476,220	\$24,660	\$123,301	2028	14.7
188	Bailey Hall Chiller Plant Replacement	\$232,375	\$43,200	5.4	\$232,376	M&V 2023	\$432,000				
	Totals Project Cost	\$613,354			\$595,597						
	Capital Renewal Leveraging										
135	SUB Windows Leveraging (Summer 2012)	\$30,000	\$4,000	7.5	\$30,000	M&V 2014	\$40,000	\$4,000	\$36,000	2024	7.5
186	HeadHall S. PH Leverage (Priority 1-Option B)	\$349,280	\$43,660	8.0	\$359,378	M&V 2021*	\$436,600	\$57,151	\$114,302	2031	6.3
187	HIL Level 3 Mechanical Modifications	\$201,560	\$25,151	8.0	\$201,560	M&V 2021	\$251,510	\$331	\$331	2031	608.9
191	Toole Hall LED & Lab Controls Upgrade	\$717,816	\$113,657	6.3		M&V 2023	\$1,136,570				
	Totals Project Cost	\$1,298,656			\$590,938						
	Stakeholder Projects										
136	Site Lighting Automation	\$18,346	\$3,049	6.0	\$27,204	M&V 2015	\$30,490	\$3,049	\$24,392	2025	8.9
	Totals Project Cost	\$18,346			\$27,204						

	Emergent Technologies										
141	HIL Domestic Hot Water & Summer Shutdown	\$33,672	\$6,037	5.6	\$32,431	M&V 2017	\$60,370	\$6,037	\$36,222	2027	5.4
142	Currie Center Optimization - Rev 1 (M&V 12 yrs)	\$1,210,721	\$132,447	9.1	\$1,181,172	M&V 2016	\$1,324,470	\$115,349	\$807,446	2026	10.2
160	AUC LED Rink Lighting	\$150,738	\$18,638	8.1	\$129,245	M&V 2017	\$186,380	\$18,638	\$111,828	2027	6.9
168	FM Attic Spray Foam Insulation	\$82,800	\$12,280	6.7	\$76,930	M&V 2017	\$122,800	\$7,797	\$46,784	2027	9.9
170	MacLaggan Hall LED (Updated)	\$80,204	\$9,887	8.1	\$72,840	M&V 2022	\$98,870	\$9,887	\$9,887	2032	7.4
171	Central Heating Plant LED Lighting	\$84,557	\$11,873	7.1	\$54,089	M&V 2022	\$118,730	\$31,149	\$31,149	2032	1.7
	Totals Project Cost	\$1,642,692			\$1,546,707						
	A3 Program Budget Proposal	\$4,000,000									
	Actual Project Progress Totals To Date		N/A	N/A	\$3,352,813	10 Yr. Forecasted	\$5,726,430	\$381,603	\$2,021,770	Non-Appl.	8.8
	Estimated/Projected Project Totals	\$717,816	Active M&V Totals		\$3,352,813						
	Target - Cumulative Cost Avoidance Forecasted		\$2,281,245								
	Program Investment Total	\$4,070,629									
	Program Balance	-\$70,629									

Notes on projects outside their estimated SPB:

AUC Ice Plant – issues with the system for all of 2021/22 including leaks and maintenance on different equipment. Ice Plant was started up in March 2022, and savings were almost reached in 2022/23 with the system in operation.

HIL Level 3 Modifications – issues with the system during 2021/22 (not in operation). System only became operational in December 2022, should see better savings in 2023/24.

Site Lighting Automation – over-budget by \$12,144, increasing SPB by 2.9 years.

Currie Center Optimization – not reaching intended savings only by a slight amount, causing the SPB to increase minimally.

Facilities Management – baseline adjusted in 2018/19 to reflect the change in usage (Security moving into the building) not accounted for when the project was designed. SPB is over estimation by 3.2 years.

EMP2.0 Energy Improvement Projects Annual Reconciliation - Updating Period Ending April 2023											
Project No.	EMP2.0 Projects	Estimates at Proposal Stage			Projections at Project Completion			Actual Cost Avoidances			
		Estimated Project Cost to EMC (\$) <i>Excludes Incentives</i>	Annual Cost Avoidance (\$) Estimated	Simple Payback (Years)	Actual Project Cost (INCLUDES Actuals & Incentives if Received)	Measurement & Verification Start Date	Forecasted Cost Avoidance (\$) Over 10 years	Annual Cost Avoidance (\$)	Cumulative Cost Avoidance (\$)	Reconciliation Completion Date	Simple Payback (Years)
FREDERICTON CAMPUS											
	Energy Manager Discretionary										
198	LB Residence LED Lighting	\$17,182	\$3,598	4.8	\$17,617	M&V 2022	\$35,980	\$1,019	\$1,019	2032	17.3
201	Keirstead LED Lighting	\$11,784	\$2,605	4.5	\$19,105	M&V 2023	\$26,054			2033	
203	LB Gym LED Lighting for Gym	\$2,793	\$1,738	1.6	\$3,574	M&V 2023	\$17,380			2033	
204	McConnell LED Lighting	\$11,347	\$4,135	2.7							
	Totals Project Cost	\$43,106			\$40,296						
	Quick Wins										
192	Sir Howard Douglas Hall LED Lighting	\$15,509	\$1,596	9.7	\$6,291	M&V 2021	\$15,960	\$1,596	\$3,192	2031	3.9
193	Carleton Hall LED Lighting	\$25,931	\$2,029	12.8	\$5,743	M&V 2021	\$20,290	\$568	\$1,136	2031	10.1
194	Tilley/Singer LED Lighting	\$188,957	\$15,194	12.4	\$32,903	M&V 2021	\$151,940	\$15,194	\$22,791	2031	2.2
197	EPJ LED Lighting	\$43,485	\$12,241	3.6	\$20,537	M&V 2022	\$122,410	\$3,095	\$3,095	2032	6.6
	Totals Project Cost	\$273,882			\$65,474						
	Other Funding Sources										
196	CP&O Solar PV	\$83,500	\$2,498	33.4	\$75,740	M&V 2022	\$24,980	\$555	\$555	2032	136.4
200	Kinesiology Solar PV	\$181,120	\$6,399	28.3							
205	Aitken Centre Solar PV	\$36,119	\$16,497	2.2							
	Totals Project Cost	\$300,739			\$75,740						
SAINT JOHN CAMPUS											
	Other Funding Sources										
199	Ground Mount Solar PV	\$40,266	\$1,344	30.0							
	Totals Project Cost	\$40,266			\$0						
	EMP2.0 Program Budget Proposal	\$2,000,000									
	Actual Project Progress Totals To Date		N/A	N/A	\$105,770	10 Yr. Forecasted	\$390,014	\$21,472	\$31,233	Non-Appl.	4.9
	Estimated/Projected Project Totals	\$47,466	Active M&V Totals		\$105,770						
	Target - Cumulative Cost Avoidance Forecasted		\$41,159								
	Program Investment Total	\$153,236									
	Program Balance	\$1,846,764									
	Shading Represents Earmarked Funds for Solar Projects, not EMP money.					\$640,487	Earmarked Funds used for Solar Projects				

Notes on projects outside their estimated SPB:

LB Residence LED – not reaching intended savings.

UNBSJ Detailed Project Reconciliation and Financials

UNBSJ Energy Improvement Projects Annual Reconciliation - Updating Period Ending April 2023												
Project No.		Estimates at Proposal Stage				Projections at Project Completion			Actual Cost Avoidances			
		Estimated Project Cost to EMC (\$) Includes Incentives	Annual Cost Avoidance (\$) Estimated	Simple Payback (Years)	Simple Payback (Years) With Incentive	Actual Project Cost (minus Incentives Received)	Measurement & Verification Start Date	Forecasted Cost Avoidance (\$) Over 10 years	Annual Cost Avoidance (\$)	Cumulative Cost Avoidance (\$)	Reconciliation Completion Date	Simple Payback (Years)
1	KC Irving Hall Lighting Retrofits	\$49,371	\$6,413	7.7	6.9	\$46,470	M&V 2020	\$64,130	\$9,025	\$27,075	2030	5.3
2	KC Irving Hall Exterior LED Lighting	\$1,389	\$481	2.9	1.7	\$1,063		\$4,810				
3	Thomas J Condon Student Centre Lighting Retrofits	\$36,878	\$5,153	7.2	6.2	\$20,141	M&V 2020	\$51,530	\$34,170	\$56,765	2030	7.2
4	Thomas J Condon Student Centre Ventilation-Kitchen Hood Variable Air Flow Control	\$64,112	\$6,628	9.7	8.6	\$64,560		\$66,280				
5	Thomas J Condon Student Centre Building Automation System Upgrade	\$166,115	\$22,237	7.5	6.4	\$161,460	M&V 2022	\$222,370				
6	Thomas J Condon Student Centre Domestic Water Retrofits	\$984	\$1,867	0.5	0.5	\$89	M&V 2022	\$6,915				
7	G Forbes Elliot Athletics Centre Lighting Retrofits	\$22,467	\$2,630	8.5	7.6	\$39,727	M&V 2020	\$9,741	\$46,882	\$115,679	2032	6.7
8	G Forbes Elliot Athletics Centre Exterior LED Lighting	\$46,067	\$3,721	12.4	11.2	\$23,249		\$37,210				
9	G Forbes Elliot Athletics Centre Building Automation System Upgrade	\$244,427	\$28,970	8.4	7.3	\$251,435		\$289,700				
10	G Forbes Elliot Athletics Centre Domestic Water Retrofits	\$492	\$1,030	5.0		\$44	M&V 2022	\$10,300				
11	Beaverbrook House Exterior LED Lighting	\$3,470	\$488	7.1	6.3	\$219	M&V 2019	\$4,880	\$488	\$1,952	2029	0.4
12	Ward Chipman Building Exterior LED Lighting	\$2,524	\$291	8.7	7.5	\$2,689	M&V 2019	\$2,910	\$291	\$1,164	2022	9.2
13	Ward Chipman Building Unoccupied Space Isolation & Controls Upgrades	\$126,603	\$24,426	5.2	4.1	\$28,403		\$244,260	Bldg being decommissioned.			
14	Ward Chipman Building Domestic Water Retrofits	\$10,404	\$2,147	4.8	4.8	\$936	M&V 2022	\$21,470	No data.			
15	William Ganong Hall Exterior LED Lighting	\$7,302	\$752	9.7	8.6	\$1,050	M&V 2019	\$7,520	\$752	\$3,008	2029	1.4
16	William Ganong Hall Air Compressor Replacement	\$26,081	\$15,900	1.6	1.4	\$17,080	M&V 2022	\$159,000	\$8,149	\$8,149	2032	2.1
17	William Ganong Hall VAV Lab Control & Building Optimization	\$1,268,954	\$73,049	17.4	16.4	\$1,953,515	M&V 2023	\$730,490				
18	Colin B. Mackay Residence Lighting Retrofits	\$48,781	\$5,528	8.8	7.9	\$51,205	M&V 2020	\$55,280	\$1,302	\$3,905	2030	42.4
19	Colin B. Mackay Residence Exterior LED Lighting	\$2,994	\$187	16.0	14.8	\$4,034		\$1,870				
20	Colin B. Mackay Residence Flash Steam Conservation	\$8,084	\$1,711	4.7	3.7			\$17,110				
21	Canadian Rivers Institute Lighting Retrofits	\$238	\$37	6.4	5.5	\$21	M&V 2019	\$370	\$291	\$1,164	2029	3.9
22	Canadian Rivers Institute Exterior LED Lighting	\$1,764	\$254	6.9	5.8	\$1,118		\$2,540				
23	Canadian Rivers Institute VAV Lab Control & Building Optimization	\$143,585	\$9,248	15.5	14.5	\$248,870	M&V 2023	\$92,480				
24	Philip W. Oland Hall Exterior LED Lighting	\$2,497	\$240	10.4	9.2	\$385	M&V 2019	\$2,400	\$240	\$960	2029	1.6
25	Philip W. Oland Hall Building Automation System Upgrade	\$96,309	\$18,713	5.1	4.1	\$77,152	M&V 2020	\$187,130	\$10,936	\$32,809	2030	7.1
26	Sir James Dunn Residence Exterior LED Lighting	\$2,441	\$168	14.5	13.4	\$260	M&V 2019	\$1,680	\$168	\$672	2029	1.5
27	Sir James Dunn Residence Heat Recovery	\$23,518	\$2,651	8.9	7.7			\$26,510				
28	Sir James Dunn Residence Domestic Water Retrofits	\$1,898	\$241	7.9	7.3	\$171	M&V 2022	\$2,410	\$7,658	\$7,658	2032	0.0
29	Sir Douglas Hazen Hall Exterior LED Lighting	\$4,868	\$502	9.7	8.5	\$1,409	M&V 2019	\$5,020	\$502	\$2,008	2029	2.8
30	Sir Douglas Hazen Hall Building Automation System Upgrade	\$152,828	\$14,232	10.7	9.7	\$158,302	M&V 2021	\$142,320	\$29,522	\$59,045	2031	5.4
31	Physical Plant (Facilities Management) Domestic Water Retrofits	\$70	\$75	0.9	0.3	\$6	M&V 2022	\$750	\$75	\$75	2032	0.1
32	Canada Games Stadium Exterior LED Lighting	\$4,678	\$172	27.2	26.0	\$4,228	M&V 2019	\$1,720	\$172	\$688	2029	24.6
33	Canada Games Stadium Domestic Water Retrofits	\$7,733	\$1,982	3.9	3.2	\$696	M&V 2022	\$19,820	\$4,320	\$4,320	2032	0.2
34	Annex A & B (Saint John College) Lighting Retrofits	\$33,226	\$2,414	13.8	13.0	\$17,850	M&V 2020	\$24,140	\$3,228	\$9,684	2030	6.3
35	Annex A & B (Saint John College) Exterior LED Lighting	\$3,955	\$395	10.0	8.8	\$2,530		\$3,950				
36	Annex C (Engineering Building) Lighting Retrofit	\$10,232	\$926	11.0	10.3	\$5,895	M&V 2019	\$9,260	\$1,035	\$4,140	2029	7.0
37	Annex C (Engineering Building) Exterior LED Lighting	\$1,023	\$109	9.4	8.2	\$1,400		\$1,090				
38	Annex C (Engineering Building) Programmable Thermostats	\$703	\$103	6.8	5.7	\$63	M&V 2023	\$1,030				

39	Annex N (Student Health Centre) Lighting Retrofits	\$1,002	\$114	8.8	8.2	\$1,055	M&V 2019	\$1,140	\$244	\$976	2029	5.6	
40	Annex N (Student Health Centre) Exterior LED Lighting	\$681	\$130	5.2	4.1	\$308		\$1,300					
41	Annex N Programmable Thermostats	\$256	\$51	5.0	3.8	\$23	M&V 2023	\$510					
42	UNBSJ Campus Stream Trap Replacement	\$15,000	\$45,880	0.3	0.3	\$13,306	M&V 2022	\$458,800	\$45,880	\$45,880	2032	0.3	
43	UNBSJ Campus Metering Program	\$310,728	\$55,265	20.0	20.0	\$442,121	M&V 2019	\$155,360	\$55,265	\$221,060	2029	8.0	
	Totals Project Cost	\$2,956,732	\$357,511	8.3	7.5	\$3,644,536		\$3,149,506					
Program Budget Proposal (\$2,960,000)													
Actual Project Progress Totals To Date				N/A	N/A		\$3,644,536	10 Yr. Forecasted	\$3,149,506	\$260,595	\$608,836	Non-Appl.	5.5
Estimated/Projected Project Totals			\$31,602	Active M&V Totals			\$1,442,065						
Target - Cumulative Cost Avoidance Forecasted			\$585,911										
Program Investment Total			\$3,676,138										
Program Balance			\$716,138										

Notes on projects outside their estimated SPB:

Ward Chipman – exterior lighting project was over-budget by \$1,884, increasing the SPB by 7 years.

Colin Mackay – Over-budget by \$8,699. The project is not achieving targets due to unforeseen challenges with the instantaneous hot water heater. This is resulting in higher utility costs than baseline.

Sir Douglas Hazen Hall – exterior lighting project was over-budget by \$2,994, increasing the SPB by 6 years.