Alternate Routes: A Journal of Critical Social Research, 35, 101-117 (2023)

Just Transition in the Construction Industry: A Union's Campaign to Create Jobs by Promoting Climate Change Upgrades in Buildings

John Calvert[1]

ABSTRACT: Examples of unions successfully implementing climate change initiatives to reduce energy use and GHG emissions while simultaneously expanding members' jobs are not that common. This article documents one such initiative: an innovative energy audit program developed by a small construction union, Local Union 131 of New Brunswick and Prince Edward Island, whose members install mechanical insulation (MI) on furnaces, ductwork and pipes. Faced with the contraction, or closure, of the traditional heavy industries where its members worked - and in response to the failure of the insulation contractors employing its members to find new work in other sectors of the economy - the union decided to do this itself. It developed a free energy audit program to persuade building owners of the financial benefits, energy savings and GHG emission reductions from upgrading their insulation. These have lowered building operating costs while achieving climate benefits, healthier indoor air quality, improved temperature control, better moisture management and improved student, faculty and staff comfort. In finding new work for its members using a strategy outside the bargaining table, the union has implemented a just transition program which it plans to expand to hospitals, government buildings, offices and manufacturing facilities. In the process it has raised the profile and reputation of the union in the industry while promoting awareness among members and the wider public of how its work addresses climate change.

KEYWORDS: Climate Change; Just Transition; Building Energy Audits: Union Renewal

Introduction

The purpose of this article is to document the efforts of Local 131, a union representing New Brunswick and PEI mechanical insulators to expand its members' employment by establishing an energy audit program to reduce energy use and GHG emissions in buildings. Union members install mechanical insulation (MI) on heating, ventilation air conditioning (HVAC) systems. Starting in 2017, the union has offered free energy audits to school and university building managers to encourage them to upgrade their MI. Audits estimate the potential energy reductions and financial savings from MI upgrades. By the summer of 2022 it had conducted audits on 43 schools in 5 of the 7 school districts in New Brunswick and three quarters of Mount Allison University's 34 buildings, including its 3.5 km of tunnels.

Implementing audit recommendations has generated work for union members and facilitated a transition from employment in declining heavy industries such as pulp mills and oil refineries. The union is now engaged in expanding its program to other public and commercial buildings. It is unusual for a union to be generating work for the contractors who employ union members. Local 131 has pursued its audit initiative quite separately from traditional collective bargaining. It has created large numbers of new jobs employers would not otherwise have found. Its initiative shows how a small, provincially based union with an innovative idea can find new work for its members while contributing to address the climate crisis.

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[1] John Calvert was an Associate Professor at Simon Fraser University until his retirement in 2021. He researched labour and climate issues as part of a series of four SHIRC grants, including Adapting Canadian Work and Workplaces to Climate Change. He is currently part of an international research project to promote climate literacy in the apprenticeship program of building workers funded by the federal government's UTIP program and administered by the CBTU. Maddie Crabtree, a recent SFU MPH graduate provided research support for this article.

The structure of this article is as follows. It begins with a brief account of the impact of buildings as contributors to GHG emissions. It then reviews the evidence that MI can significantly reduce energy use in buildings by making HVAC systems more efficient. It next describes the work of the insulator trade and explains why MI is often poorly installed. It then outlines an earlier effort in British Columbia to initiate MI energy audits – an effort which, although unsuccessful, provided the model for Local 131's initiative. It proceeds to document the development of the union's energy audit program and the challenges it faced in gaining acceptance from building managers. Next it looks at the actual audits, including the data on energy savings and GHG reductions It concludes by discussing how the campaign has created jobs for insulators, raised the profile of the union and generated heightened member awareness of the value of their trade and their contribution to addressing the climate challenge.

The methodology utilizes a case study approach. The research began with a literature search on the impact of MI on building energy use. This confirmed that MI auditing has achieved major savings in commercial and institutional buildings in the US and Canada through using thermographic cameras and industry standard software. It documented Local 131's campaign through a series of interviews with Joshua Sherrard, president of Local 131, Lee Loftus, the former business manager of BC's Local 118, insulation contractors and officials from NB schools and Mount Allison University. It also analyzed data from the energy audits of several dozen school buildings in five NB school districts and the University. To confirm the accuracy of the findings a draft was shared with public school finance directors, facility managers and a national MI commercial insulation contractor operating in NB.

The Impact of Buildings on Climate Change

The science of climate change is now well established (IPCC 2022). Buildings are a major contributor to GHG emissions and energy use globally, making them a key target for climate change mitigation and adaptation. (IPCC 2014; IEA 2021). The United Nations Environment Program (UNEP) noted that, globally, the building and construction sector were responsible for 34% of global energy consumption and 37% of CO_2 emissions over the lifecycle of buildings (UNEP 2022). In its 2014 report on climate mitigation, the IPCC devoted an entire chapter - Chapter 9 - specifically on the role of buildings and construction as contributors to global warming (IPCC 2014).

Lowering energy use and GHG emissions in buildings was a key component of Canada's 2015 Paris Agreement commitment and the subsequent federal-provincial Pan-Canadian Framework on Climate Change (UN 2015; Canada 2016). Since then, there has been a veritable snowstorm of legislation at all levels of government to address mitigating or adapting to climate change. The Canadian Net-Zero Emissions Accountability Act of June 2021 gives the Federal Government the legal framework for significant additional climate commitments beyond its Paris commitments. The Government expects the building and construction sector to make a major contribution to its objective of lowering GHG emissions by 40 to 45% by 2030 and net zero by 2050 (Environment and Climate Change Canada 2021). Reducing the climate footprint of buildings and infrastructure is now a central component of Canada's climate strategy.

The Role of Mechanical Insulation in Conserving Energy and Reducing GHG Emissions

There are many ways to improve building energy efficiency such as sealing the building envelope, eliminating thermal bridges, triple glazing windows, installing LED lighting, and adding wall and ceiling insulation. However, upgrading MI in HVAC systems is a very cost-effective approach (Insulation Institute 2023). Poorly insulated boilers, pipes and ductwork are the source of substantial building energy losses (Lang, Fraser et. al. 2012). MI improves energy efficiency, reduces GHG emissions, regulates indoor temperatures, protects building occupants from dangerous hot surfaces and reduces noise. It also controls humidity and improves air quality by limiting particulate concentrations, bacteria, VOCs and mould in pipes and ventilation systems with corresponding benefits to health and occupant comfort (ASHRAE 2009; Racusin 2017; ASHRAE 2019; Babich and Demanega 2020). The importance of building air quality has become particularly significant since the outbreak of Covid-19.

It may seem simple to put insulation on pipes, ductwork, boilers and other components of HVAC systems. But this is not the case. Industrial, commercial and institutional systems differ widely in size, complexity and function. (NAIMA 2012; Srivastava et al 2020).[2] Insulation products are produced by different manufacturers using varying materials and technologies (Dasdemir 2017). Pipes and ductwork can be made of copper, stainless steel, or a variety of plastics and composites. The type and thickness of insulation required varies accordingly. (Kumar and Kumar 2020; TIAC 2021; ASHRAE 2022; de Rosa 2023). Thus, installers must know a wide variety of MI applications. Local 131's members have this competency because they have completed a four year Red Sea; apprenticeship involving 7200 hours of technical and on the job training (Ellis Chart 2023).

The positive role of MI in conserving energy is poorly understood and frequently overlooked by many in the construction industry. (King 2009; H. B. Lanarc 2010; Crall and King 2011; Insulation Institute 2019; Atienza-Márquez 2022). Contractors often skimp on MI to cut costs knowing that sub-standard work is unlikely to be spotted. Building owners usually are not aware of the extent of energy losses from missing or badly installed MI.

There is a widespread assumption in much of the building and construction industry that installing MI does not require much skill and can be done by almost any construction worker. Hence the way MI is (or is not) installed does not receive much attention, even in buildings that are promoted as low, or zero, energy structures. Unlike gas or electrical work, provincial building codes do not require MI to be installed by workers with a provincial trades' certificate or a Red Seal qualification. Decisions about the qualifications of installers are left to contractors who do this work. In Canada's low-bid, competitive construction industry, it is cheaper for contractors to hire, or sub-contract, to workers without a trades' ticket. Too often they do not have the skills to do the work properly. Confusion about appropriate MI standards and lack of attention to installation details means sub standard work often goes unnoticed and its adverse energy impact unmeasured (King 2009; H.B. Lanarc 2010).

Recent literature on the effectiveness of energy conservation buildings has highlighted the 'performance gap' in new and refurbished net zero buildings. This is the difference between their designed energy use and the actual energy used by the completed building. (Zero Carbon Hub 2014; Calvert 2014; Hart and Rosenberg 2015; Gleeson 2016; Aste et. al. 2020;; Atienza-Márquez 2022). Numerous factors influence the performance gap, such as flaws in the original design,

[2] A more detailed discussion of the various functions of MI can be found on the web page of the Thermal Insulation Institute. https://insulationinstitute.org/

inappropriate material and equipment substitutes, poor coordination among architects, engineers and contractors during construction and building occupant behaviour (de Wilde 2021). However, the energy efficiency of the HVAC system is also critical (ICF 2022). HVAC performance is contingent on all elements of the system being properly insulated so that energy consumption meets design standards such as ASHRAE 90.1.

Construction engineers and prime contractors often do not specify the details of the type, quality, thickness, and other properties of MI in the plans they provide to sub-contractors and installers for HVAC systems. They rely on those installing the MI to make the right choices. (NAIMA 2010). Even where HVAC manufacturers and building engineers specify more detailed standards, they cannot ensure those installing MI are qualified and their specifications followed properly (H.B Lanarc 2010; Gleeson and Lowe 2013).This problem is compounded by other trades, or contractors not appreciating the importance of MI and, for example, failing to leave sufficient clearance around pipes and ductwork for MI to be installed properly. MI is not a high priority for most contractors who often fail to give insulators adequate time to install it properly. Effectiveness can also be compromised by contractors performing HVAC maintenance and failing to put it back properly. As many HVAC components are hidden in basements and furnace rooms or within walls, improper installation practices go unnoticed. (Lang, Fraser et. al. 2012; Atienza-Marquez, Antonio et. al. 2022). This explains why there are often major gaps in the MI in school and university buildings.

Energy savings from upgrading MI can be substantial. A study in a sample of US schools found that energy savings from properly installed MI amounted to 20% of total energy used (King and Crall 2010). A more recent study by IFC Consulting found comparable savings in schools from a combination of roof insulation and MI (IFC 2022). The return on investment (ROI) for upgrading MI in existing buildings is also normally quite rapid, with costs typically being recovered within a year or two, while producing ongoing savings for decades (H.B. Lanarc; 2010).

Local 131's Efforts to Promote the Benefits of MI Through Energy Audits

The key feature of Local 131's innovative approach to upgrading MI in buildings is free energy audits. Audits identify thermal losses from missing, damaged, or improperly installed MI. They measure energy use and GHG emissions and calculate the cost of upgrades to MI. In developing its energy audit program, Local 131has built on well-established pathways to improving building energy performance. There is considerable evidence demonstrating how MI energy audits produce major energy and cost savings. (Atienza-Marquez 2022). For over a decade, the US Department of Energy's "Save Energy Now" program has helped numerous industrial and commercial facilities to benefit from energy audits. [3]

Engineers have been interested in how to calculate the energy impacts of various kinds and thicknesses of insulation. (NAIMA 2010; Khan and Abro 2018; TIAC 2019). With the advance of technology, methods for measuring the energy losses from pipes and ductwork have become more sophisticated. Among the most widely used is a system using a thermographic camera to take infrared images of the energy released by HVAC components. (FLIR 2011; NAIMA 2012; Fox and Coley 2014: Kylili 2014; Fox and Goodhew 2016). Thermography can assess heat emitted from pipes and ductwork.

[3] See the Department's "Save Energy Now" Website. https://www.energy.gov/search/site?keywords=save+energy+now+program. There are numerous examples in the publications of the Insulation Institute. https://insulationinstitute.org/about-naima/institute-experts/

Thermographic images are analyzed using an industry standard software package called 3E Plus (Insulation Institute 2023). According to ICF International, this is the "…primary tool for measuring heat loss" in HVAC systems. (ICF 2022 p. 26). 3E Plus software includes reference tables to make the needed calculations. According to the US Insulation Institute, it can determine the appropriate type and thickness of recommended insulation upgrades based on capital costs, labour, fuel use, taxes, installation expenditures and future maintenance costs. It can also estimate the return on investment (ROI) based on fuel costs, interest rates and other factors to give building owners the pay back time for their investment (Insulation Institute 2023).

Once building administrators agree to an audit, the union schedules a site visit for a physical inspection and to take thermographic photos. The union then prepares a technical report using the 3E Plus software and shares it with the building owner. Reports normally include dozens of paired infrared and standard photos of HVAC components. By comparing the two types of photos, building managers can see that pipes or ductwork which look well insulated often release large amounts of energy.

The union offers audits at no charge because it is difficult to persuade building administrators to pay for an audit when they have no idea whether this expenditure is prudent. A free audit, on the other hand, faces no such barrier. Building administrators review the audit reports and decide whether to commission MI upgrades. Most school and university administrators are not knowledgeable about the insulation industry so the local provides them with a list of qualified unionized contractors. However, it makes clear that administrators are free to share the audit with any contractor, whether unionized or not, and offer the work to the one who submits the best bid.

After a contractor completes the MI upgrade, Local 131 returns to do a final quality control inspection to ensure the upgrades meet the audit's specifications. Sometimes this has meant requiring contractors to fix problems identified in the inspection. It is in the interests of the Local to ensure that contractors achieve audit estimates of energy saving as this impacts the credibility of the process. While the local does not charge building owners for the audits, it does charge the audit and subsequent inspection costs to the successful bidder. If the work has not been commissioned, the local swallows the audit cost.

Building on Precedents: The BC Insulators Energy Audit Program

The idea for Local 131's auditing program was developed by BC Insulators Local as part of its program to encourage building owners to upgrade their MI. (BC Insulators 2011; BC Insulators 2017; Calvert and Tallon 2019).The union explicitly linked its campaign to Canada's efforts to lower the climate footprint of the construction sector, using as its moto: 'saving energy and saving the planet' (BC Insulators 2011). The campaign was triggered in 2010 by the failure of the newly constructed Olympic Village in Vancouver to meet its heavily promoted environmental and climate benefits. The union's detailed on-site examination of its HVAC installations found that much of the specified insulation was either missing, of the wrong type and thickness, or improperly installed. Failure to implement industry standard MI practices undermined its sustainability goals. Some problems, such as rapidly growing mould, excessive condensation and contaminated air were already emerging during construction (Calvert and Tallon 2016). That there were problems with poor quality building work in BC was well known as documented by the Barrett Commission's extensive report on BC's 'leaky condo' disaster. (Barrett 2000)

Facing resistance from the City of Vancouver to its critique, the union commissioned a 74-page report, "Pipes Need Jackets, Too" on the state of the MI industry in BC by a well-respected consulting engineering firm (H.B. Lanarc 2010). The report documented the widespread failure of the industry to install MI properly. This led to excessive energy consumption, premature deterioration of building components from condensation and shortened life span of HVAC systems. It identified major gaps in BC's regulations and argued for much stronger MI standards in building and energy codes.

The union also commissioned an 86-page manual on best practices entitled: "Mechanical Insulation Guide and Specifications for British Columbia" for the industry (Besant et. al. 2012). Local 118's campaign influenced inclusion of more detailed MI specifications in Canada's national building code. Additionally, the 2018 Red Seal revisions included a reference on the benefits of MI in lowering carbon emissions and achieving net zero. Drawing on the BC research, the International Association of Heat and Frost Insulators International introduced energy audit training for its Canadian locals.

In 2012, the BC Insulators' union established a not-for-profit company, Salamander Inspections, to provide free energy audits to building owners to demonstrate MI's energy and climate benefits.[4] The company audited HVAC systems in hospitals, schools, and shopping malls in BC, government buildings in Alberta and the legislature in Saskatchewan hoping that they would encourage building managers to commission MI work. (Calvert and Tallon 2019).

However, the BC insulators could not persuade the managers of the buildings it audited to commission the recommended insulation improvements. Senior government officials did not understand – or did not believe – that there were significant potential energy savings. They were also reluctant to commission upgrades as they were not familiar with HVAC systems or the insulation industry, so they did not include MI upgrades in their budgets. Without buy-in from administrators or contractors or support from government, the BC Insulators did not have the resources to continue its free auditing work. However, Local 118's efforts were not in vain. It succeeded in getting changes to building codes and mention of net zero in the Red Seal Standards for apprenticeship training. The International union introduced an audit training program for its locals. Most importantly, BC had provided the model for Local 131's subsequent MI auditing initiative.

The History of Local 131's MI Energy Auditing Program

Local 131's members work in industrial, commercial and institutional settings. Until recently, the membership was concentrated in the industrial sector, including pulp and paper mills, oil refineries, electrical power plants and nuclear facilities. The market share of unionized MI contractors in this sector, historically, has been about 95% according to Sherrard because the work requires a high degree of skill and careful installation practice. Industrial facility managers are acutely aware of their energy expenditures and the costs of faulty or inadequate insulation. Accordingly, they have demanded high standards of energy performance from qualified insulators. However, employment in NB's industrial sector has contracted as companies have downsized or closed. Industrial facilities have also become more automated and less energy intensive, impacting insulators' jobs and employment security.

[4] The term salamander has a special significance for insulators as there have been numerous historical references to the ability of the lizard to cope with heat. See: IAHFI 2023. The salamander story.

However, in the education, institutional and commercial sector, most building owners and managers were not aware of the impact of MI on their energy consumption. Consequently, there was a large, untapped potential for expansion. When the union's audit campaign began in 2017, unionized MI contractors had only about 5% of the work in the education sector. Since initiating the audit program, Sherrard estimates the market share of unionized contractors has increased to about 85%. Expanding in this sector offered new employment for union members, implementing a "just transition" out of declining sectors to new jobs in other parts of the province's economy (Paris Agreement 2015; Hampton 2015; UNRISD 2018).

Sherrard began performing MI energy audits after taking a thermography course sponsored by the International Union in 2017 and a Level 1certification course at Toronto's Infrared Training Center. As a result, he felt that energy audits could significantly expand the MI trade in NB. He persuaded the local to invest roughly $10,000 on the purchase of a thermographic camera.

He performed his first two energy audits in the elementary and high schools he had attended in the Anglophone North School District. The district has about 7,000 students and 29 schools according to its 2021 annual report. It spends about $4 million on energy, annually. He chose the schools because he knew their layouts. He also realized that there would be a learning curve to become proficient in the technology. Mr. Sherrard knew the finance director and the facility manager personally and persuaded them to allow him to do the audits.

The audits found major energy losses in school HVAC systems due to inadequate MI, costing the school district significantly, given the high price of the fuel for its heating and hot water systems. Upgrading MI could reduce energy use, justifying the investment. The finance director commissioned the work. To find contractors, the school district agreed that Mr. Sherrard could share the audits with insulation contractors who might be interested in the work. Three contractors submitted bids. Two were successful. Once the work was completed, Sherrard performed a second audit at each school to confirm they had met the anticipated reduction in energy use which they did. The District had recently built a new LEED certified school as a model for other NB schools. The provincial engineer overseeing the project agreed to an audit to compare its efficiency with the older schools. The audit found a 'performance gap.' The new school's HVAC system was no more energy efficient than the older schools.

Sherrard wanted to expand auditing to other school districts. However, he faced considerable skepticism from provincial building managers about the potential savings. They questioned whether the audit software was accurate and whether the union was competent to use the technology. While Sherrard was Red Seal qualified, he was not a professional engineer, so questions were raised about the accuracy of his audits. However, since he was using the same 3E Plus technology that engineers use across North America, the audits met industry standards and could be readily duplicated. His credibility was further supported by the evidence his school district administrator shared about the savings achieved in the Anglophone School District.

Eventually, Sherrard met with the NB Department of Transportation and Infrastructure Committee to explain the audit process and present the findings from his own school district. This sparked interest within the Department and with other school facility managers. His presentation led to four other school districts requesting audits, all of whom now have used Local 131's services.

Mount Allison University had considered upgrades to the MI on its campus. However, it found commissioning this work was not easy. To justify funding a major retrofitting project, it required information on the capital cost and ROI to ensure the money would be well spent. Without the expertise to carry out MI audits, Mount Allison was not equipped to make these estimates.

Identifying competent contractors to complete the work posed further challenges. However, a contractor working with the university on other projects was familiar with Mr. Sherrard's school initiative and suggested to the University's energy manager that it might benefit from Local 131's auditing program. Sherrard performed two pilot audits, one on the central heating plant and another a newly retrofitted building. After seeing the high level of technical detail and the projected savings from upgrades, the energy manager decided to commission audits of all 34 buildings on the campus. Three quarters of this work is now completed.

Recently the union has expanded its program to the private sector. It has audited a McCain food processing plant in Alberta, two in Manitoba and plants in Graham Falls and Florence Ville, NB. The audits in provinces outside of NB involve insulators from locals in those provinces, potentially expanding the program nationally, and providing opportunities for other insulation locals to gain auditing experience. Sherrard has also contacted several hospitals in PEI and is confident that the local can address the complexity of hospital heating and cooling systems. He is also exploring a federal government pilot project to audit six government buildings in NB as well as one with another university.

Local 131's Audit Model: An Innovative Approach to Expanding Union Jobs

As noted, the BC Insulators union had earlier initiated an auditing program, similar to that of Local 131 but could not ensure that its free audits resulted in contracts to do the work. Local 131 took a different approach. It had collective agreements with a number of insulation contractors in the province. Based on the experience of the first schools, where audits had been shared with prospective unionized contractors, it decided to make a practice of linking school facility managers to potential contractors. To guarantee competition and give school districts choice, the local normally arranges to have at least three contractor bids per project. As noted, school districts are free to share audits with any other contractors if they feel unionized contractors are not sufficiently competitive.

Local 131 has developed several quality control measures to ensure MI upgrades meet industry standards. Audits provide bidders with detailed information about the work, including a description of the standards of material and workmanship required. Sherrard normally offers a 'walk through' of the facilities to bidders to explain technical details of the project and the standards to be met. He also informs them that the union will perform an inspection once their work is finished. If the union's inspection of MI upgrades find they do not meet audit specifications, the local requires the contractor to redo the work. Contractors know work must pass inspection, so they have to do it properly to get paid.

To ensure installation quality, the union's audit reports recommend that the work be performed by contractors employing qualified Red Seal insulators (or apprentices working under them). This is because the MI upgrades must be done properly to achieve projected savings. Any contractor employing Red Seal insulators – both union and non-union - can meet this requirement. But unionized contractors always employ Red Seal insulators, so it is not an issue for them. The union has also signalled to its own members and the contractors employing them that high quality work is essential if it is to continue to find work for them. This is to maintain the union's credibility.

The audit program has addressed a problem faced by contractors. Typically, contractors contact potential clients and advertise the benefits of MI. The best way to persuade clients to upgrade MI is through an energy audit. If the contractor does an audit and the prospective client does not proceed, or chooses to give the work to another contractor, it has nothing to show for its effort. However, persuading potential clients to pay for an audit in advance was difficult given that

they had no guarantee the audit would lead to cost savings. Local 131's approach eliminated these risks by enabling contractors to bid on jobs after the audits had been completed and building owners had made a commitment to do the work.

Unionized contractors who have participated in the initiative are now advertising the local's auditing to other prospective clients. As this generates more work, they have an interest in promoting the initiative. And the union is key to its effectiveness. The union has created an unusual relationship in which contractors depend on it for their work. They, in turn, see it in their interest to promote the union's initiative.

Persuading Building Managers About the Climate and Energy Benefits of MI

The local's initiative has helped facility managers to learn about the energy performance of their HVAC systems. Sherrard has tried to build relationships with school facility managers and administrators, discussing audit findings with them to ensure they understand his calculations. Meeting with finance directors has been important as they are the final arbiters of whether to commission work. They need to feel comfortable that return on investment (ROI) projections are accurate. Facility managers interviewed commented that during his 'walk throughs' he also suggests helpful improvements to other aspects of their HVAC systems. They recognize his expertise and appreciate his interest in making their systems more efficient.

A factor facilitating the program's expansion has been the very short time period of the ROIs compared with other energy saving options. As part of their climate policies, school districts have been exploring energy saving programs such as roof and wall insulation, better windows, LEDs, low flow toilets and more efficient boilers. However, these investments are expensive, and often take a decade or more to brake even. In contrast, ROIs for upgrading MI is normally a year or two.

The local has recognized that there could be concerns about the fair allocation of contracts, with some contractors having privileged access. Any perception of favouritism would undermine the program's credibility. It deliberately plays a neutral role, leaving contract evaluation to school and university administrators. This is particularly important for the union, internally, because it has members who work with all the unionized contractors. To date, allocations of contracts appear to be fair. For example, in 2021 educational institutions awarded contracts for 16 MI projects of varying sizes. Each of the three contractors received about the same dollar value, with some getting more, but smaller, contracts and others getting fewer, but larger ones. The union says it has not received complaints on this issue.

A More Detailed Look at the Audits

By August 2022, 5 NB school districts had completed MI upgrades in 32 of the 43 audited schools and Mount Allison University. The following table presents total projected annual energy savings, financial savings, CO2 reductions and the ROIs. They total 22.6 million kBtu of energy, 3,327 megatons of CO2 and over five hundred thousand dollars. These are annual figures, so the savings over the lifetime of the upgrades will be substantially more. Average ROI period is 1.43 years, with the lowest 0.5 years and the highest 3.6 years.

Table 1: Summary of Projected Energy and Cost Savings Generated by MI Upgrading

Schools	Contract Cost ($)	Energy Savings (kBtu)	Annual Savings ($)	CO2 Reduction (Mt/Yr)	ROI (years)
School 1	2,961.00	140,448	2,159.00	9.95	1.6
School 2	41,966.00	2,348,299	65,474.00	137	0.7
School 3	43,532.17	862,146	38,512.00	58	1.3
School 4	10,545.22	255,168	7,527.00	14.79	1.6
School 5	7,239.13	154,629	4,547.69	9.39	1.8
School 6	9,312.17	174,689	5,728.00	20	1.9
School 7	21,488.00	2,143,494	26,886.01	123.3	0.7
School 8	5,335.00	50,793	5,913.67	28.38	1
School 9	4,243.00	35,387	3,990.69	18.68	1.2
School 10	3,985.00	76,449	3,045.69	14.73	1.2
School 11	10,656.00	138,271	8,531.00	27.93	1.4
School 12	22,485.00	2,139,657	56,626.90	180.76	0.5
School 13	4,752.00	8446	1,319.88	3.87	3.6
School 14	7,806.00	11,894	5,802.44	18.06	1.3
School 15	29,174.00	1,686,992	45,546.99	148.82	0.6
School 16	12,859.00	25,779	5,942.01	14.18	0.9
School 17	8,020.00	23,548	6,055.40	14.52	1.1
School 18	12,052.00	33,194	8,758.54	21.43	0.9
School 19	5,340.00	25,322	5,185.92	12.24	1.2
School 20	19,981.00	411,957	10,774.00	26.74	1.9
School 21	7,827.00	36,226	5,823.00	13.86	1.3
School 22	10,017.00	20,079	6,006.00	1576	1.7
School 23	8,805.00	19,665	4,972.00	12.32	1.8
School 24	21,264.00	932,606	22,866.50	57.74	0.9
School 25	4,660.00	20,612	3,838.00	8.99	1.2
School 26	16,210.00	488,861	9,131.00	30.63	1.8
School 27	32,153.00	1,438,253	28,958.00	112.37	1.1
School 28	5,554.00	137,958	5,173.00	22.5	1.1
School 29	12,806.00	225,790	8,519.00	37.54	1.5
School 30	7,857.00	94,459	3,501.00	15.75	2.2
School 31	15,595.00	662,394	13,168.00	43.91	1.2
School 32	7,439.00	240,933	4,859.45	19.48	1.5
Mt Allison	366,490.00	7,584,579.27	95,168.40	483.00	3.6
Total	797,447.69	22,648,977.27	528,151.18	3326.91	1.4

Source: Data compiled from the 33 individual audits conducted by Local 131

In addition to seeing the audit program's overall impact, it is helpful to examine a typical school audit to get a better picture of the long term financial impacts. Below is a sample from one audited school.

Table 2: Investment, Annual Savings, Cash Flow and Cumulative Savings for a Typical School

Simple Payback Period, years 0.9
Internal Rate of Return (ROI) 108.80%
Net Present Value (unadjusted) $513,009

Year	Investment	Annual Savings	Cumulative Cash Flow
0	($24,711)	0	($24,711)
1	0	$26,886	$2,175
2	0	$26,886	$29,061
3	0	$26,886	$55,947
4	0	$26,886	$82,833
5	0	$26,886	$109,719
6	0	$26,886	$136,605
7	0	$26,886	$163,491
8	0	$26,886	$190,377
9	0	$26,886	$217,263
10	0	$26,886	$244,149
11	0	$26,886	$271,035
12	0	$26,886	$297,921
13	0	$26,886	$324,807
14	0	$26,886	$351,963
15	0	$26,886	$378,579
16	0	$26,886	$405,465
17	0	$26,886	$432,351
18	0	$26,886	$459,237
19	0	$26,886	$486,123
20	0	$26,886	$513,009

Source: Data extracted from the MI audit of an Anglophone North School District school

As the table above shows, the capital investment was fully recovered in operational savings by the end of the first year. Subsequently, estimated savings continue to accumulate for the following 19 years. Of course, these numbers may change to reflect increases or decreases in fuel costs or any maintenance needed during the period. However, given the very large savings involved, the table provides a reasonable estimate of the financial and environmental benefits.

Each Individual audit contains more detail by identifying the potential savings within HVAC components so the building owner can decide to do part of the work one year and the remainder later, giving priority to the components with the quickest ROI. This provides flexibility in budgeting, making it easier to do upgrades, incrementally, over several budget years.

Co-Benefits of Upgrading MI

Most public institutions now have policies on climate change. Signalling that MI has been refurbished can contribute to implementing these policies. For example, Mount Allison now references its MI upgrade program in its climate plan. The Finance Vice President has spoken about the program on several occasions as an example of how the university is following through on its climate commitments. School districts also point to MI upgrades to demonstrate their progress on climate issues.

Facility managers interviewed noted that MI upgrades improve the health, safety and overall comfort of building users. Buildings have better moisture control and less mould and dampness. (ASHRAE 2020). Building air quality is improved. Better insulated pipes and ductwork reduce risk of burns from hot pipes and boilers and lower fire risks. Improved temperature control makes buildings more comfortable, something students and staff appreciate. It also makes working in furnace rooms more pleasant, while better insulation makes them quieter.

The union's audit program has encouraged building managers to focus on quality in contract specifications. Interviewees say they are more diligent in developing specifications in work they commission. Quality, not just low price, is now a key consideration in drafting contracts. They are also more concerned to monitor the work and to check that the standards in their contracts are met. The program has encouraged managers to recognize the value of using contractors employing properly trained staff, capable of doing high quality work. The focus on quality makes the low bid 'cowboys' far less attractive. Managers are now looking for work that meets industry standards and provides long term savings.

The union's audit program also involves checking for asbestos. Many older HVAC systems were insulated with it, creating significant health risks. Asbestos removal is specialized work which requires specific training and extensive precautions. It is essential that those performing work on HVAC systems are trained and qualified to do this work. Local 131's members receive extensive training in asbestos containment, or removal, as part of the trade's apprenticeship program. Safe asbestos practice is included in audit recommendations, an important reason that MI contracts should stipulate using qualified Red Seal trades' workers.

Conclusion

Local 131's energy audit program can be assessed from various perspectives. It has had significant financial benefits for NB's education system by reducing energy consumption and fuel bills. It has delivered climate benefits by lowering GHG emissions and energy use. Audits have generated new contract work for unionized contractors. They do not have to persuade building owners of the potential benefits of MI. But most importantly, it has created many new jobs for union members and training opportunities for apprentices, while increasing the profile and reputation of the union.

There is substantial evidence that net zero construction requires a more knowledgeable, skilled and highly trained workforce. Practices that were acceptable in the past when lowering GHG emissions and reducing energy use were not priorities are no longer acceptable. Net zero construction requires that every component of a building meets design standards to achieve climate objectives. The insulator union's emphasis on high quality performance is consistent with the direction that the industry must go to achieve Canada's climate objectives. (Clarke and Gleeson 2017; CGBC 2019; Clarke and Sahin-Dikmen et. al. 2020).

The MI energy audits illustrate the importance of quality work to apprentices in their classroom training. The thermography camera and 3E Plus software show the differences between shoddy and quality work. The technology enables apprentices to see the energy savings, GHG reductions and monetary benefits of properly installed MI. It also enables apprentices to assess how they are progressing in the practice of the trade. In showing apprentices the importance of doing their work properly, Sherrard believes it is fostering a more energy and climate aware workforce for the future, especially among younger workers. Knowing the climate and environmental benefits of their work increases their appreciation of its value to society and is something for which they can take pride.

Sherrard also believes the audit program has increased respect for the trade, among other trades and in the building industry. His numerous presentations to building managers, school finance directors, university administrators and provincial officials has raised their understanding of the work of the insulating trade and its contribution to making buildings better. It has enhanced the union's public reputation, both in terms of its commitment to promoting progressive environmental and climate issues and its competence in producing technical audit reports.

The audit program has also had a positive impact on members' perception of the union. When Local 131 began the audit program in 2017 some were skeptical, questioning how the time and money required to offer free audits could be justified. Other insulation locals in Canada were not doing it. It was new and risky, financially, and there was no guarantee of success. There was also concern that the technology might be a tool for assessing their work performance. However, the experience of the program and its success in generating jobs, increasing employment security, raising the profile of the trade, and adding new members appears to have addressed these concerns.

Local 131's initiative raises broader issues about the strategy of unions in addressing climate change. Undoubtedly, the fact that its members' work is directly related to saving energy and reducing GHGs has made the audit program attractive. However, it built on the fact that its members had skills that could be exercised outside the declining industrial sector. And while saving energy costs has been the key incentive for schools and the university to upgrade their MI, the fact that the union noted how it met important societal objectives relating to mitigating climate change has also been important.

Significantly, the local did not limit its focus to trying to persuade contractors employing its members to create more jobs. For they were clearly unable, or unwilling, to do so. Instead , it chose to circumvent them by going directly to school building owners, showing them why upgrade work was needed. Thus, it created new demand for their work. The union identified where new jobs could be found and developed a strategy for getting them. This process was completely outside traditional collective bargaining. It required the union to recognize the opportunity the audit technology created and to see the potential of the BC Insulators audit initiative but apply BC's idea in a different way. It involved the union learning how to build relationships with school administrators and provincial officials such that they came to recognize the value of what the union offered and the contribution it could make to achieving their energy and climate goals. It also meant having a vision of how the initiative could be expanded from its modest initial success in two schools, to a province-wide program covering five school districts, a university and, more recently, a number of other facilities in the public and private sectors. A lesson from Local 131's experience is that promoting just transition may require unions to develop strategies that go beyond the bargaining table and that identify opportunities in economic sectors outside where members normally work. (Hampton 2015; Calvert 2022).

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