

# WORKFORCE DEVELOPMENT OPPORTUNITIES IN BUILDING AUTOMATION SYSTEM TRAINING

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## EXECUTIVE SUMMARY

Equitable workforce development and green jobs are currently at the front and center of policy development at every level of government and are a high priority with a variety of different stakeholders ranging from nonprofits to higher education. There are very important reasons for this growing momentum around equitable workforce development and green jobs. The pandemic saw a record high of 14.7% unemployment in the U.S. in April 2020,<sup>1</sup> and although the rate has declined gradually, in February 2021, there was still a 6.2% unemployment rate<sup>2</sup>. Additionally, the pandemic shone a light on existing workforce inequalities, revealing that the Black unemployment rate has consistently been twice the rate of white unemployment since 1992.<sup>3</sup> A commitment to give Americans who have endured systemic discrimination and exclusion for generations a fair shot at obtaining good paying jobs is finally gaining traction in the mainstream.<sup>4</sup>

Although a small part of this important conversation, A Better City, on behalf of the Boston Green Ribbon Commission, developed this research paper to look at a niche part of workforce development: the growing need for building automation system (BAS) operators in commercial and institutional buildings in Greater Boston that can maintain building operations at peak energy efficiency. Today's high-performance buildings place new skill and knowledge demands on facility managers, building operators, engineers, architects, commissioning agents, equipment installers, and other onsite technicians. Lack of BAS training among building professionals can prevent high-performance buildings from delivering on their peak energy efficiency, thereby adversely impacting their energy savings, indoor environmental quality, cost effectiveness, and long-term viability<sup>5</sup>. Since the building sector remains one of the largest sources of GHG emissions both city- and state-wide, the operation of buildings at peak efficiency is essential to the City of Boston and the Commonwealth reaching their carbon neutrality goals by 2050.

The research paper has three goals:

- To provide an internship opportunity for those training in high efficiency building operations or BAS at the Roxbury Community College's (RCC) [Center for Smart Building Technology](#) within Boston's large buildings, where there is a high demand for these skills;

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<sup>1</sup> [https://www.bls.gov/opub/ted/2020/unemployment-rate-rises-to-record-high-14-point-7-percent-in-april-2020.htm?view\\_full#:-:text=Unemployment%20rate%20rises%20to%20record%20high%2014.7%20percent%20in%20April%202020,-May%2013%2C%202020&text=The%20unemployment%20rate%20in%20April.available%20back%20to%20January%201948](https://www.bls.gov/opub/ted/2020/unemployment-rate-rises-to-record-high-14-point-7-percent-in-april-2020.htm?view_full#:-:text=Unemployment%20rate%20rises%20to%20record%20high%2014.7%20percent%20in%20April%202020,-May%2013%2C%202020&text=The%20unemployment%20rate%20in%20April.available%20back%20to%20January%201948)

<sup>2</sup> <https://www.bls.gov/news.release/pdf/empsit.pdf>

<sup>3</sup> <https://www.americanprogress.org/issues/economy/news/2020/09/28/490702/persistent-black-white-unemployment-gap-built-labor-market/>

<sup>4</sup> <https://punchbowl.news/wp-content/uploads/American-Jobs-Plan-Fact-Sheet.pdf>

<sup>5</sup> <https://documentcloud.adobe.com/link/track?uri=urn%3Aaid%3Aascds%3AUS%3A8781061a-9849-47da-bf31-94cb07502903#pageNum=3>

- To provide RCC students from underserved communities with industry-guided internship and skill building opportunities within Boston’s commercial and institutional buildings that can be an entry to well-paying and sought-after jobs; and
- To find a “home” for this internship program to be effectively administered and funded, either as its own program or as part of a broader workforce development and internship program.

Through interviews with commercial and large residential building owners, we gained insight into the huge potential and demand for BAS technicians and operators that will continue to grow in the future. The building owners we interviewed are very interested in hosting BAS interns in their buildings. They are willing to pay for internships with students at all stages of BAS training, are keen to start as early as summer 2021, are willing to be flexible with the length of time and the nature of the internship to meet academic internship requirements, and, importantly, these building owners see internships as an entry point into full-time positions and careers. As many real estate owners are working to diversify their workforce, they are also enthusiastic about RCC’s focus on promoting the training to the underserved community in which they are located, and to people of color in particular.

RCC, however, does not yet have students to meet this demand. Many organizations have undergone huge transitions and budgetary adjustments this last year as a result of the COVID-19 pandemic, and RCC is no exception. The two-year associates degree program slated to begin in Fall 2020 within the Center for Smart Building Technology, has been pushed back to Fall 2021. The Center was able to offer certificate-level courses during the pandemic, but only to professionals currently working in Boston’s large buildings and institutions. With the start date of the associates degree pushed back, new BAS students ready for internship opportunities are now not expected for one to two years.

While looking at workforce development and internship programs to find a “home” for this internship, we conducted research and interviewed representatives from federal, state, local, and other organizations. Many new workforce development program opportunities, based on recent legislative actions, are either at bill stage or recently passed. As a result, the structure for many of these new opportunities has not yet been defined. We therefore determined that a decision about internship program funding and administration would be better at a later date, once these programs are up and running.

This research is concluded by offering some potential next steps that include: working with other trade schools, institutes or academic institutions with students in BAS, HVAC, electrical or IT, to offer internships in Boston’s commercial and institutional buildings prior to RCC’s first cohort of students; working with RCC to refine details of an internship program with BAS students coming either from the Center for Smart Building Technology programs or from the dual enrollment program at Madison Park Vocational High School; and monitoring progress on the new and developing workforce development opportunities in order to determine the best program administration for this internship program.

## **INTRODUCTION**

Close to four years ago, A Better City and Boston Green Ribbon Commission members, many of whom own large commercial and institutional real estate in Greater Boston, identified building operations as the next “low hanging fruit” in energy efficiency. They said that many existing buildings (and some newly constructed buildings) were not operating at peak efficiency due to a lack of skilled workers to operate increasingly automated, high-performance “smart” buildings. The technology required to run smart buildings is complicated, and these buildings only achieve superior energy performance if they are operated by technicians who possess in-depth knowledge of both mechanical systems and the building automation system (BAS), which combines the operation of individual pieces of equipment into an integrated and

harmonized system.<sup>6</sup> This new profession and skill set is highly technical and requires expertise in computer science, as well as electrical and mechanical engineering.<sup>7</sup>

Based on these conversations with members and after some preliminary research, we determined that there were two immediate needs:

- Those currently working in large commercial/institutional buildings need BAS training; and
- A new, skilled BAS workforce is needed to meet the projected demand.

To update the skills of current facilities staff in our members' large buildings, in 2019, A Better City hosted a Building Operator Certification training, funded by the utilities, with over 30 member buildings staff. Other organizations have held additional trainings for municipalities and the health care sector. In addition, RCC's new [Center for Smart Building Technology](#), opened in early 2020, offers Building Operator Certification (BOC) training as part of its certification curriculum each semester—trainings have been at capacity, filled with existing staff from large buildings within Greater Boston including Northeastern University, Tufts University, UMass Amherst, Mass Division of Capital Management and Maintenance, Trinity Property Management, ENE Conserve, Johnson Controls, South Mountain Company and Fidelity.

To address the need for a new skilled workforce to run our region's smart buildings, A Better City joined forces with an array of stakeholders. Discussions about this new workforce coincided with a growing awareness that cities, home to most of today's high-performance buildings, are also home to many of our underserved communities, creating an ideal environment for developing a new generation of diverse workers skilled in BAS operations and maintenance<sup>8</sup>. RCC, a member of A Better City, was part of this stakeholder group and expressed interest in developing a program to meet these needs. RCC's location in Roxbury, that many describe as the "heart of Black culture in Boston<sup>9</sup>," as well as their commitment to community empowerment and opportunity regardless of past education, made them ideally suited to the development of this smart building technology program and to attracting a more diverse workforce of building professionals. On top of this, RCC's academic prowess has recently been acknowledged by Forbes, listing them as the nation's second-best community college (and top community college in Massachusetts)<sup>10</sup>. As a result of these discussions, the [Center for Smart Building Technology](#) opened at RCC in January 2020.

A Better City and Green Ribbon Commission members are enthusiastically awaiting the new cohort of building professionals emerging from RCC's programs. The goal of this paper is to begin to connect new BAS students and large buildings in Greater Boston through internship opportunities, as an entry to the stable, high-wage careers of the future. In this paper, therefore, we look at:

- Student training opportunities in BAS;
- Funding and program administration opportunities for internships across federal, state, and city levels, and within other organizations;
- Large building internship opportunities; and
- Potential next steps.

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<sup>6</sup> <https://www.usa.skanska.com/who-we-are/media/constructive-thinking/building-career-paths-in-boston-for-building-automation-specialists/>

<sup>7</sup> <https://documentcloud.adobe.com/link/track?uri=urn%3Aaaid%3Aascds%3AUS%3A8781061a-9849-47da-bf31-94cb07502903#pageNum=5>

<sup>8</sup> <https://documentcloud.adobe.com/link/track?uri=urn%3Aaaid%3Aascds%3AUS%3A8781061a-9849-47da-bf31-94cb07502903#pageNum=7>

<sup>9</sup> <https://www.boston.gov/neighborhood/roxbury>

<sup>10</sup> <https://www.forbes.com/sites/michaeltietzel/2021/03/07/academic-influence-ranks-the-best-community-colleges-nationally-and-by-state/?sh=36c2160f674b>

As the pandemic and other unforeseen academic challenges have meant that the new cohort of skilled students from RCC will not be available for an internship for one to two years, we conclude by offering some tangible next steps for consideration.

## STUDENT TRAINING OPPORTUNITIES IN BAS

The large number of smart buildings coming online over the past decade has highlighted the shortage of individuals with a unique blend of skills required to operate high-performing buildings within Greater Boston. The demand for this profession will only increase as the BAS market is expected to grow from \$75 billion in 2019 to \$121.5 billion by 2024<sup>11</sup>. The rise in the adoption of automated security systems in buildings and the development of wireless protocols and wireless sensor network technology for BAS are among the critical factors driving the growth of this market.<sup>12</sup> Therefore, there is a unique opportunity for students with this blend of skills.

## HIGHER EDUCATION

### Mass Maritime Academy

While BAS programs exist at community colleges across the country, before RCC's Center for Smart Building Technology opened, there was only one opportunity for BAS training in Massachusetts—at Mass Maritime Academy in Buzzards Bay. BAS training is incorporated into a four-year Facilities Engineering degree program at Mass Maritime Academy. Many of Boston's facilities and engineering leaders within commercial and institutional buildings are graduates of this excellent program.

The nature of the program at Mass Maritime being four-years and having an engineering focus was considered, by many, a deterrent to students who are interested in building operations but lack the resources or interest in a four-year full-time program. In the development of its Smart Building Technology programs, RCC, therefore, consulted with Mass Maritime in developing its associates degree and certification programs.

Discussions are also underway between RCC and Mass Maritime about the possibility of having an articulation agreement between the two institutions that would allow students who obtain an associate degree in BAS at RCC to transfer into the Facilities Engineering degree program at Mass Maritime Academy<sup>13</sup>.

### Roxbury Community College (RCC) Center for Smart Building Technology

In the development of RCC's [Center for Smart Building Technology](#), RCC formed an industry consortium that included area hospitals, universities, utility companies, state agencies, the City of Boston, and controls companies. When the Center opened in January 2020, it was a true partnership between public and private entities, and a model for collaboration that can be replicated in any region and in any sector of the economy.<sup>14</sup>

The goal of the Center for Smart Building Technology is to provide students with the expertise required to run increasingly complex BAS, as well as provide a solid grounding in heating, ventilation, and air conditioning (HVAC) equipment. It is also an “opportunity to ensure that individuals who live in Roxbury and surrounding neighborhoods have access to a program that will put them on the leading edge in the economy and give them equal footing for good jobs for themselves and for their families,” said RCC President, Dr. Valerie Roberson.<sup>15</sup> “We are trying

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<sup>11</sup> <https://documentcloud.adobe.com/link/track?uri=urn%3Aaaid%3Ascds%3AUS%3A8781061a-9849-47da-bf31-94cb07502903#pageNum=6>

<sup>12</sup> <https://documentcloud.adobe.com/link/track?uri=urn%3Aaaid%3Ascds%3AUS%3A8781061a-9849-47da-bf31-94cb07502903#pageNum=1>

<sup>13</sup> <https://www.usa.skanska.com/who-we-are/media/constructive-thinking/building-career-paths-in-boston-for-building-automation-specialists/>

<sup>14</sup> <https://www.usa.skanska.com/who-we-are/media/constructive-thinking/building-career-paths-in-boston-for-building-automation-specialists/>

<sup>15</sup> <https://rcc.mass.edu/about-us/news/1181-rcc-holds-ribbon-cutting-ceremony-for-its-center-for-smart-building-technology>

to create those pathways for young people from school into industry,” said Mike Kennealy, Massachusetts Secretary of Housing and Economic Development.<sup>16</sup>

The Center offers both certificate and degree programs that combine high-tech controls training with hands-on understanding of how buildings operate. Delays in the approval for a two-year associate degree program meant that in 2020 when the Center opened, training opportunities focused on certificate programs designed to prepare working professionals for nationally recognized certifications such as Building Operator Certification®, BPI Building Science Principles, HERS, LEED, WELL, FAA Drone Pilot, Passive House and GPRO<sup>17</sup>. Additional coursework offered includes BAS Fundamentals; Building Automation Controllers; Best Practices for Facility Operations & Maintenance Related to COVID-19; BAS Control Devices & Applications I and II, and BAS Networking.<sup>18</sup>

Post COVID, RCC plans to offer certificate programs in multiple phases to new students with some background in electrical, HVAC, and information technology (IT), to students at Madison Park Vocational School (described below) who already have this background, and to working professionals in facilities or maintenance within large buildings. For certificate students who are not working professionals, an internship will be included in the certification. The details of these internships are yet to be confirmed but students could have completed certification and be ready for an internship as early as the summer of 2022. The certificates include:

- Building Automation System Technician Associate (4 classes total)
- Building Automation System Technician Practitioner (8 classes total)
- Building Automation System Certified Technician (10 classes total)

The two-year associates degree, designed for new RCC students, is expected to begin in Fall 2021. In addition to courses offered within the certification programs, there will also be training in HVAC, electrical systems, and IT. An internship, like the possible internships in commercial and industrial buildings explored in this paper, will be a required component of the degree program. Decisions about the length of the internship and at what point in the training it will take place, are not yet finalized. There is potential to have internships included at the end of the program, halfway through the program, and at the end of each semester. We will continue these discussions about internships with the Center as the program gets underway.

## **Benjamin Franklin Institute of Technology (BFIT)**

Recently, a letter was sent to Congresswoman Pressley in support of an earmark from the Fund for the Improvement of Postsecondary Education (FIPSE)<sup>19</sup> to establish a new BAS program at BFIT. A federally designated Minority Serving Institution<sup>20</sup>, BFIT provides professional technical training to its students, 74% who are people of color, 99% who receive financial aid, and 57% who are first-generation college students. If BFIT receives these FIPSE funds they will establish a new BAS certificate program and install new classroom technology and laboratory equipment. The Building Automation program will be focused on building construction and will have courses in Building Information Modeling, Construction Management, and Building Controls. Students who are interested in becoming BAS certified, would still need to take classes at RCC. The program would also be designed to support dual enrollment with local STEM schools.

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<sup>16</sup> <https://rcc.mass.edu/about-us/news/1181-rcc-holds-ribbon-cutting-ceremony-for-its-center-for-smart-building-technology>

<sup>17</sup> <https://www.gpro.org/>

<sup>18</sup> <https://www.usa.skanska.com/who-we-are/media/constructive-thinking/building-career-paths-in-boston-for-building-automation-specialists/>

<sup>19</sup> <https://www2.ed.gov/about/offices/list/ope/fipse/index.html>

<sup>20</sup> <https://www.doi.gov/pmb/eeo/doi-minority-serving-institutions-program>

As more and more stakeholders understand the growing demand for these skilled high efficiency building operators, programs, such as the potential one at BFIT, will continue to be developed.

## HIGH SCHOOLS

Another opportunity for BAS training is at vocational high schools like Madison Park Vocational School in Roxbury where students are already training in topics relevant to BAS, including: Information Support Services & Networking (ISSN); Plumbing; Electricity; and Building and Facilities Management. RCC is currently working with Madison Park to establish a dual enrollment program for up to 70 high school students, beginning in Fall 2021. Upon completing the program, the student will receive a college level credit and a high school credit and be eligible to leave high school with a BAS apprenticeship certification. The certification will require an internship and high school students could begin these at the end of the spring semester of 2022.

This dual enrollment program is a model that could be duplicated at other vocational high schools or STEM Academies like the recently opened Dearborn STEM Academy in Roxbury. Boston Green Academy in Brighton and other STEM schools in the region could also replicate this model.

Another opportunity RCC is offering Madison Park students and others interested in the BAS field, is 40-hour boot camp introduction. As Madison Park is near RCC, students have the added benefit of being able to access the state-of-the-art BAS lab within the Center for Smart Building Technology.

## FUNDING AND PROGRAM ADMINISTRATION OPPORTUNITIES

The federal, state, and City governments, as well as peer organizations, are developing strategies for advancing equitable workforce development. These opportunities are responding to the growing awareness of workforce inequalities confirmed by differences in unemployment rates,<sup>21</sup> in job recovery rates,<sup>22</sup> and in wages<sup>23</sup> between white people and people of color. They are also responding to the need to transition to clean jobs in renewable energy, energy efficiency, net zero construction and retrofits, and high efficiency building operations if we are to meet city, state, and federal climate goals.

Below are new opportunities that may have the potential to offer funding or program administration for an internship connecting BAS students with large buildings in Boston.

### Federal

On March 31, 2021, the American Jobs Plan was released by the Biden Administration, indicating a commitment to investing in “strengthening our infrastructure and competitiveness, and in creating the good-paying, union jobs of the future.”<sup>24</sup> It proposes an investment of \$2 trillion this decade that includes: building, preserving, and retrofitting more than two million homes and commercial buildings, modernizing our nation’s schools and childcare facilities, and upgrading veterans’ hospitals and federal buildings; training Americans for the jobs of the future; and creating good-quality jobs that pay prevailing wages in safe and healthy workplaces.

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<sup>21</sup> <https://www.americanprogress.org/issues/economy/news/2020/09/28/490702/persistent-black-white-unemployment-gap-built-labor-market/>

<sup>22</sup> <https://www.reuters.com/article/us-usa-economy-unemployment-race/gap-in-u-s-black-and-white-unemployment-rates-is-widest-in-five-years-idUSKBN2431X7>

<sup>23</sup> <https://www.shrm.org/ResourcesAndTools/hr-topics/compensation/Pages/racial-wage-gaps-persistence-poses-challenge.aspx>

<sup>24</sup> <https://www.whitehouse.gov/briefing-room/statements-releases/2021/03/31/fact-sheet-the-american-jobs-plan/>

There are two sections of the plan that are particularly relevant: a \$213 billion investment specifically to produce, preserve, and retrofit more than two million affordable and sustainable places to live; and a \$100 billion investment in proven workforce development programs targeted at underserved groups and at getting our students on paths to careers before they graduate from high school. Although the American Jobs Plan has not yet passed Congress, there are opportunities within this plan for equitable job training in jobs of the future that could include BAS student training and internships.

On April 20, 2021 Senator Markey and Representative Ocasio-Cortez introduced the Civilian Climate Corps for Jobs and Justice Act<sup>25</sup> which establishes a Civilian Climate Corps (CCC) administered by the Corporation for National and Community Service within AmeriCorps. This legislation is an update and expansion to the CCC of the New Deal-era, ensuring all Americans can participate, broadening the range of eligible projects, providing health and education benefits, partnering with unions, and preserving Tribal sovereignty<sup>26</sup>. Aimed at a diverse and equitable group of 1.5 million Americans over five years completing federally funded projects to help communities respond to climate change and transition to clean energy, service projects will include reducing emissions, which may include:

- Weatherizing and retrofitting residential and non-residential buildings for energy efficiency and electrification and participating in the construction of new net-zero buildings;
- Maintenance and operation of energy efficient and net zero buildings and properties;
- Building energy-efficient affordable housing units;
- Conducting energy audits;
- Recommending ways for households to improve energy efficiency;
- Installing and upgrading public transit and electric vehicle infrastructure; and
- Installing clean energy infrastructure in homes and small businesses, on farms, and in communities.

Although just passed, this CCC bill has wide advocacy support. With service projects specifically dedicated to the maintenance and operation of energy efficient and net-zero buildings and properties, this bill holds promise for both funding of BAS and building operation training, internships, and jobs, and program administration by the Corporation for National and Community Service within AmeriCorps.

## State

At the end of December 2020, the Executive Office of Energy & Environmental Affairs (EEA) released the Massachusetts 2050 Decarbonization Roadmap<sup>27</sup> and the Interim Clean Energy and Climate Plan for 2030 (CECP),<sup>28</sup> mapping out a pathway to get us to 2030 greenhouse gas (GHG) emission reduction goals. The buildings section of the CECP mentions workforce development in two strategies: to *Pivot the Market for Building Envelope Retrofits and Clean Heating Systems* and to *Convene the Commission and Task Force on Clean Heat & Cap Heating Fuel Emissions*. A Better City, like many others, did not think the workforce development scope in the CECP was adequate to meet either the magnitude or the immediacy of clean energy workforce development needs if climate goals are to be met. We recommended that the EEA launch a comprehensive workforce development initiative in partnership with the private sector to uplift environmental justice communities and to fill the critically-needed jobs of the future that include: the design and construction of deep energy building retrofits; the design and construction of high efficiency buildings; the installation and maintenance of heat pump technologies; the installation and maintenance of onsite renewables installation and the procurement of offsite renewables; and broadly-defined building operations. In addition to supporting an emphasis on equitable workforce

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<sup>25</sup> [https://www.markey.senate.gov/imo/media/doc/ccc\\_bill.pdf](https://www.markey.senate.gov/imo/media/doc/ccc_bill.pdf)

<sup>26</sup> <https://www.markey.senate.gov/news/press-releases/senator-markey-and-rep-ocasio-cortez-introduce-civilian-climate-corps-for-jobs-and-justice-to-rebuild-america>

<sup>27</sup> <https://www.mass.gov/doc/ma-2050-decarbonization-roadmap/download>

<sup>28</sup> <https://www.mass.gov/doc/interim-clean-energy-and-climate-plan-for-2030-december-30-2020/download>

development in underserved and environmental justice communities, we specifically recommended attracting and training young and diverse participants through increased outreach and collaboration with vocational and technical schools, and increased funding for internships, apprenticeships, and other job placements. Comments on the CECP were due on March 22, 2021. EEA has indicated they will not have an update to the draft until mid-2022. Once the CECP has been released, we are hopeful it will include training and internships in building operations.

Additionally, Governor Baker signed *An Act Creating a Next-Generation Roadmap for Massachusetts Climate Policy*<sup>29</sup> into law on March 26, 2021. One of its provisions was that by the end of 2021, and every year afterward, the Department of Public Utilities must transfer \$12 million from utilities energy efficiency dollars to the Massachusetts Clean Energy Center (MassCEC) for a new Clean Energy Equitable Workforce and Market Development Program. Including this in the Climate Bill was: 1) a way to address existing workforce inequities; 2) a way to transition current and former workers from the fossil fuel industry into energy efficiency, clean energy and clean heating and cooling industries; and 2) a recognition that reaching a statewide 50% GHG emission reduction goal by 2030, a 75% reduction by 2040, and a net-zero goal by 2050, would be no small feat.

Although the Act was just passed and there are no further details about how the Clean Energy Equitable Workforce and Market Development Program will be implemented, many hope that the program will include essential training in all aspects of workforce development needed to get to net-zero by 2050 as indicated in the CECP recommendations above.

As part of the development of the next three-year energy efficiency plans for 2022-2024, the Energy Efficiency Advisory Council (EEAC) consultants presented recommendations to EEAC councilors specific to workforce development on December 15, 2020. They said that historically, spending on workforce development has been well below what has been planned, and is a small proportion of total spending to begin with. In 2019, less than 0.14% of energy efficiency spending went to workforce development, just over 50% of what was planned. This lags significantly behind other states. The EEAC consultants' suggestions for the 2022-2024 plan included:

- Delivering targeted training for emerging and/or critical technologies including building automation systems and heat pumps;
- Expanding investments in workforce development including but not limited to funding apprenticeships and internships, training and upskilling for incumbent workers, and outreach to draw new and diverse workers into the Mass Save ecosystem; and
- Targeting an increase in workforce development spending to 2% of total annual budget by the end of the 2022-2024 plan period.

The utilities are expected to release their draft 2022-2024 plan in late April 2021, based on recommendations from the EEAC and their consultants, and the comments from multiple stakeholders including A Better City and the Green Ribbon Commission. There will be additional opportunity for comments until the plan is released in its final version in October 2021. We will continue to advocate for workforce development opportunities specific to BAS training and internships and anticipate that this will be another opportunity to explore for internship program administration.

## City

The Boston Mayor's Office of Workforce Development distributes federal funding for public workforce development from the Workforce Innovation and Opportunity Act (WIOA) of 2014.<sup>30</sup> The Office supports many organizations through a variety of funding sources, each with its own purpose. The Neighborhood Jobs Trust administers the jobs and job training programs for low- and moderate-income Boston residents. The Trust is replenished by linkage fees paid by

<sup>29</sup> <https://malegislature.gov/bills/192/S9>

<sup>30</sup> <https://www.dol.gov/agencies/eta/wioa>

developers of large-scale commercial projects in Boston. Since 2014, new development approved by the Boston Planning & Development Agency (BPDA) has generated over \$75 million in linkage fees, with \$61.6 million to support affordable housing and \$13.5 million to support job training.<sup>31</sup> Currently, funds from NJT are provided to RCC to train students in smart building maintenance. Opportunities for internship funding may also be available from this source.

## Other Organizations

There are other organizations that have developed internship models that could either be potential program administrators, or that offer important lessons to consider for future internship program administration. Below are examples of each of these models.

### The Clean Energy Internship Program

The Clean Energy Internship Program is run by the Massachusetts Clean Energy Center (MassCEC), a quasi-public agency funded via the Massachusetts Renewable Energy Trust Fund, authorized by the Massachusetts Legislature in 1997 as part of the electric utility deregulation process.<sup>32</sup> The Internship Program offers paid spring, summer, and fall internships for students who are attending or have recently graduated within the past year from a Massachusetts college or university (or they must be a Massachusetts resident, with proof of residency, who attended an out-of-state college or university). Students add their name to a database, search an employer's database for open internship positions and apply to ones they are interested in. The program began in 2011, and is a great option for students and employers alike interested in clean energy jobs, that could include BAS technicians.

### Resilient Green Infrastructure and Workforce Development

The Codman Square Neighborhood Development Corporation (CSNDC) and The Nature Conservancy (TNC) partnered to develop a green infrastructure workforce development program guide for the Codman Square neighborhood that prioritizes environmental and social sustainability while offering equitable economic opportunities to people of color, particularly young people, and men of color, who are chronically underserved populations. Given CSNDC's previous experience working with community members and the targeted participant groups, strong relationships with local partner organizations, and training and organizational capabilities, as well as the multiple potential opportunities for green infrastructure work in the Greater Boston area,<sup>33</sup> they are well-positioned to explore a successful green infrastructure workforce development program. The guide was released in December 2020; we anticipate the program will begin soon. As the BAS internship program aims to train students from underserved communities as well, the development of this program in Codman Square, its challenges and successes, will be important to keep track of.

## LARGE BUILDING INTERNSHIP OPPORTUNITIES

To connect students studying BAS at RCC's Center for Smart Building Technology with internship opportunities in commercial and institutional buildings within Greater Boston, we needed to understand the level of interest among large building owners, like those in A Better City's membership. We therefore conducted interviews with five prominent commercial and multi-family residential owners within Boston—their response was resoundingly positive. Most wanted interns now, were willing to set up an ongoing program, would pay for internships, were willing to be flexible with the length of time and the nature of the internship to fit in with the training's internship requirements, and saw internships as an entry into full time jobs. As many real estate owners are working to diversify their workforce, they were also enthusiastic about RCC's focus on promoting the training to the underserved community in which they are located, and to people of color.

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<sup>31</sup> <http://www.bostonplans.org/news-calendar/news-updates/2020/06/10/mayor-walsh,-office-of-workforce-development-devot>

<sup>32</sup> <https://www.masscec.com/about-masscec>

<sup>33</sup>

[https://www.conservationgateway.org/ConservationPractices/cities/Pages/greeninfrastructure\\_report.aspx](https://www.conservationgateway.org/ConservationPractices/cities/Pages/greeninfrastructure_report.aspx)

To understand the nature of internship opportunities that would be available in these buildings for BAS students, we asked about their automation systems. In most cases, there are three automated systems: HVAC; fire; and elevators. In compliance with safety regulations, elevator systems and fire systems are almost exclusively run by outside consultants. HVAC systems that make up the backbone of BAS are designed specifically to a building's requirements by building control companies like Siemens,<sup>34</sup> Honeywell,<sup>35</sup> or Johnson Controls<sup>36</sup> that run different proprietary software. There is some flexibility within these HVAC systems for staff to manage, maintain, and troubleshoot problems that arise but if programming is required, then a vendor is needed. Interviewees said that the more staff understood about the BAS system and BAS integration programs such as BACnet/Modbus, the more troubleshooting could be done. Most troubleshooting is triggered by energy reporting and energy monitoring systems that track energy use data at 15-minute intervals and flag potential problems. These problems may be in the system or the equipment or both, so knowledge of equipment is also required by staff.

There are some newer open-platform options for BAS that can "plug and play" any device. An open-platform BAS is what RCC students are being trained on to promote maximum learning and flexibility. One interviewee is in the process of moving all the company buildings to an open-platform system. Another said they are transitioning all their buildings to the same BAS system to increase the internal maintenance and troubleshooting capacity.

The level of automation within buildings differs according to the level of staffing. For buildings with no or minimal operational/facilities staff, BAS systems tend to be more extensive, are operated remotely, and a building will need to be inspected when the BAS identifies a red flag. For buildings with 24-hour staffing, the BAS identifies the red flag and then staff usually have the technical aptitude to figure out the problem and solution. Some buildings have part time staff in which case there is a combination of onsite and consultant time needed to remedy red flags. In all interviewee's buildings, however, there were no staff members that deal solely with controls/automation; all staff are required to be proficient in all aspects of building maintenance. It may be possible in the future to have one person focused on automation and controls across a portfolio or region<sup>37</sup>, and the demand will grow as automation within buildings grows exponentially.

We also asked interviewees standard questions about internship experience, length, ideal skillset, and future opportunities. The following points were recorded:

- **Internship experience:** Most interviewees have hosted interns in the past, with all but one interviewee having some experience with interns in operations/maintenance. Some have taken up to 10 students at a time, while others have smaller numbers per internship. All pay interns anywhere from \$15-\$20 per hour.
- **Length of internship:** Most interviewees have experience with summer interns for a period of 2-3 months full time. These internships range from positions where they shadow staff to ones where they are given projects to work on over the duration of the internship, depending on an intern's skillset. All expressed flexibility regarding the length of time of an internship, whether it be full-time or part-time, and the number of hours per week, in order to fit in with any training internship requirements.
- **Ideal intern skillset:** All interviewees said an interest in learning and a mechanical aptitude is key. Understanding building automation and HVAC systems would be ideal, including understanding how equipment works.
  - Some interviewees provided internship job descriptions for relevant positions.
- **Post internship:** All interviewees said interns are a pathway to full time employment within their organization.
  - Some interviewees provided entry-level job descriptions and expected salary. They also provided expected job advancements and salary increases over time.

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<sup>34</sup> <https://new.siemens.com/global/en/products/buildings/automation.html>

<sup>35</sup> <https://buildingcontrols.honeywell.com/>

<sup>36</sup> <https://www.johnsoncontrols.com/>

<sup>37</sup> <https://www.propmodo.com/the-rise-of-the-chief-smart-building-officer/>

## POTENTIAL NEXT STEPS

Although large building owners are ready to host interns immediately, students from RCC are not yet available for these or any internships. That will change, however, within 12-24 months as students work through the BAS programs to begin in Fall 2021. In the interim, there are some potential next steps that can be taken to ensure an internship program is seamless for RCC BAS students once their internship requirement is due:

- Pilot an internship program in large buildings now with other trade schools, institutes, or academic institutions with students in BAS, HVAC, electrical or IT.
  - For students trained in BAS, the only option currently would be an internship program with Mass Maritime.
  - For students trained in HVAC, electrical or IT seeking internships, they could come from Madison Park Vocational High School (and other vocational high schools), Benjamin Franklin Institute of Technology, or Wentworth Institute of Technology, among others.
  - As additional BAS programs are developed, like the one proposed at BFIT or the dual program between RCC and Madison Park, students from these programs would be eligible to join a BAS internship program in the future.
- Work with RCC to refine details of an internship program with BAS students coming either from the Center for Smart Building Technology's certificate or associate degree programs, or from the dual enrollment program at Madison Park Vocational High School.
- Help shape the new and developing workforce development opportunities at the federal, state, and local levels to determine the best program administration for this internship program in the future.

With a growing demand for BAS technicians and operators within large buildings, the BAS industry is expected to see exponential growth in the coming years. In honoring commitments to communities of color and underserved populations that have been excluded from a fair shot at obtaining good paying jobs for generations, developing an internship program to connect students training in BAS technology from RCC and other school located in underserved communities with large buildings in Boston, can be a win on many fronts. Students trained in BAS—whether it be through a certification program, an associate degree, or a four-year engineering degree—will have enormous opportunity for high-paying and high-demand jobs in a short period of time. This could help to create a new generation of diverse skilled workers in the operations and maintenance of high-performing buildings. This skillset will be essential if we are to effectively decarbonize our building stock and meet 2050 carbon neutrality goals within the City of Boston and the Commonwealth.