Building Tune-Up Accelerator Program

FINAL TECHNICAL REPORT

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1.3 LIST OF ACRONYMS & DEFINITIONS

ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
BAS	Building Automation System
CBTU	Comprehensive Building Tune-Up
CRM	Customer Relationship Management Tool
DDC	Direct Digital Control
DHW	Domestic Hot Water
DOE	U.S. Department of Energy
ECM	Energy Conservation Measure(s)
EPA	U.S. Environmental Protection Agency
EUI	Energy Use Intensity (non-normalized site EUI used in this report unless noted)
HVAC	Heating, Ventilation and Air-Conditioning
kBtu	Thousand British Thermal Units
kWh	Kilowatt Hour
M&V	Measurement & Verification
NPV	Net Present Value
OSE	Seattle Office of Sustainability and the Environment
PNNL	Pacific Northwest National Laboratory
PSE	Puget Sound Energy
RCx	Retro-Commissioning
SBC	Smart Buildings Center
SBTU	Seattle Building Tune-Ups (ordinance)
SCL	Seattle City Light
SMC	Seattle Municipal Code
SF	Square Feet/Foot
TUA	Tune-Up Accelerator
UW IDL	University of Washington Integrated Design Lab
WMBE	Women and Minority Owned Business Enterprise

2 Executive Summary

In 2016, the City of Seattle passed a mandatory Building Tune-Up requirement for all commercial buildings 50,000 square feet (SF) and larger as part of its *Seattle Climate Action Plan* (City of Seattle 2013). Seattle Building Tune-Ups (SBTU) aims to optimize energy and water performance by identifying low- or no-cost actions related to building operations and maintenance. SBTU is closely modeled after Pacific Northwest National Laboratory's (PNNL) Building Re-tuning program, which estimates that re-tuning generates 10-15% in energy savings, on average (Fernandez et al. 2017).

The requirement is phased in by size with large buildings (200,000 SF or larger) required first, starting in 2019. This phase in enabled Seattle's Office of Sustainability & Environment (OSE) to market a Building Tune-Up Accelerator (TUA) Program to a pool of about 470 "mid-size" buildings (50,000 - 100,000 SF) to meet the requirements early. The program was also made available to smaller buildings 20,000 – 50,000 SF not impacted by the SBTU mandate Led by OSE, with funding from the U.S. Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy (EERE) Buildings Program, a package of support and tools were developed for building owners and energy service providers to encourage this hard-to-reach market to participate. DOE total funding was $1.2 million with a local cost share of $1.8 million. The grant period ran from mid-September 2016 until February 28, 2020.

The project envisioned the following high-level outcomes: 1) A pool of at least five service providers qualified for the specific needs of mid-size buildings; 2) 100 buildings approximately 20,000 – 100,000 SF participating in an operational tune-up assessment and then implementing at least one improvement pathway, for an average 20% per building energy savings; and 3) If fully implemented, the project could achieve an estimated total savings of 99.7 Million kBtu/year and about $1.5 million annual cost savings. Additionally, the project would make recommendations to revisions to the SBTU program for buildings 50,000 – 100,000 SF.

Building Tune-Up Accelerator Program Highlights

- 102 mid-size buildings or 6.9 million SF of total space tuned-up.
- 85 local energy efficiency service providers and/or facility staff attended tune-up trainings.
- All buildings completed the required Tune-Up measures and 59% indicated that at least one voluntary action was being implemented or planned.
- Of the voluntary actions underway, 20 are participating in additional utility incentive programs, such as LED upgrades.
- Five building owners created long-term "Building Renewal" strategic energy management plans.
- An evaluation of 10 buildings found that corrected tune-up measures are persistent.
- Total estimated savings are projected at 12.1% annually for energy (67.9 million kBtu/yr) and 12.0% for GHG emissions (EPA emissions factors).
- The Northwest Energy Efficiency Alliance awarded the TUA Program a "Leadership in Energy Efficiency Award for Innovation" in 2019.

The key driver for enrolling building owners was an incentive to complete a tune-up early—about two years earlier than required by SBTU. As a TUA program partner, Seattle City Light (SCL), the municipal electric utility, developed a simple per square foot financial incentive of $0.12 per SF with a 70% project cost cap for meeting the SBTU requirements. This offer was branded a "Basic Tune-Up" and the program had a recruitment goal of about 40 buildings for this "path" with 10% estimated average energy savings.

Since the TUA goal was to drive energy savings of 20% on average, the program also offered two other program paths: "Tune-Up Plus" and "Building Renewal." "Tune-Up Plus" was a Basic Tune-Up plus additional energy-saving measures, such as lighting and HVAC retrofits beyond the tune-up requirements. Additional measures would be eligible for additional per utility incentives through SCL or the local gas utility, Puget Sound Energy. The TUA program sought to enroll 40 "Tune-Up Plus" buildings with an average potential savings of 20%. The Program partners at the University of Washington Integrated Design Lab (UW IDL) offered a "Building Renewal" path for free technical support to develop long-term strategic energy management plans. This path had a goal of 20 buildings and 35% potential energy savings, although measures would not be expected to be implemented during the program timeframe. Additionally, all buildings, regardless of "path" would have a DOE Building Energy Asset score created for them to encourage retrofits. Preliminary Asset Scores, using the Preview function, were also used for prioritizing buildings to recruit.

To jump-start the energy efficiency service provider market to conduct tune-ups in mid-size buildings, PNNL and the Smart Buildings Center (SBC) created a curriculum modeled on PNNL's Re-Tuning program that was tailored to the Seattle requirements. Four trainings were offered. Service provider firms that signed an agreement with OSE to participate as "Accelerator Providers" were listed on the program website to help make it easier for building owners to select a qualified tune-up provider.

The TUA trainings were open to anyone that met the SBTU "Tune-Up Specialist" qualifications whether from an energy efficiency firm or in-house facility staff. Eighty-five people in total attended one of the four trainings and 27 energy service provider firms ultimately participated as Accelerator Providers—far exceeding the original target of five providers. Although most attendees were from energy efficiency firms, about 10 in-house staff from Seattle Public Schools, King County and Seattle City Light also attended. Sixteen different service provider firms worked with TUA buildings; thus, the program had a good distribution among firms and was not dominated by any one provider.

Over the course of the program, 115 buildings were signed up, but 13 dropped out leaving the 102 buildings that completed the TUA program. Thus, the program exceeded its target of 100 tune-ups. The completed buildings represent 6.9 million SF total and about 18% of the target market buildings, those 50,000 – 100,000 SF. The average size was 67,700 SF. Dropouts were generally due to changes in ownership or management and were expected for any incentive program.

About 84% of the buildings were in the target size range of 50,000 – 100,000 SF and about 5% were slightly larger than 100,000 SF. About 11% enrolled were voluntary or "not required" (e.g. less than 50,000 SF). Building types enrolled were most commonly office and K-12 schools, comprising 50% of the buildings, followed by unclassified "other" buildings (13.7%) and college/university (10.8%). Many of the "other" buildings were city-owned facilities such as public assembly spaces and fire stations. A mix of ownership types enrolled. Fifty were "Municipal or Other Public Entity" buildings, of which 22 buildings were part of the Seattle Public School District. Forty-four private for profit and/or investor owned and eight not-for-profit owned buildings enrolled.

A “Tune-Up Accelerator Summary Report,” signed by the building owner representative and the Tune-Up Specialist, was required to demonstrate completion of the tune-up. This report tracked 39 operational and/or maintenance measures and implementation of corrective actions for those found deficient, as well as details about the building’s assets and operations. Twenty of the tune-up measures were required to be corrected, if found deficient, and 19 were voluntary implementation. The average total number of corrective actions implemented across the 102 buildings was 5.4, with 4.2 required and 1.3 voluntarily implemented. Of the participating buildings, only eight had no required tune-up measures found, but four of those had at least one voluntary measure found.

The top required tune-up measures found deficient and corrected were all heating, cooling or ventilation (HVAC) measures. Problems with controls, sensors and valve/damper operations were found in more than a third of buildings (36-41%). Of note, several Tune-Up Specialists reported that TUA buildings had major controls issues, such as outdated software that needed a costly fix. This suggests an opportunity for controls incentives and automation system training in this market.

The top voluntary tune-up deficiencies found were in a mix of categories with inefficient lighting, HVAC equipment service life, and lighting sensor deficiencies most prevalent at 64%, 49% and 36%, respectively. Of those, about 20% of building owners implemented or planned the inefficient lighting corrections (mainly updates to LED) and 17% indicated they would install lighting sensors. Only 10% implemented or planned for new HVAC equipment, likely due to greater equipment and installation costs.

SBC conducted measurement and verification (M&V) services on 10 buildings, which included onsite verification of tune-up measure implementation and data analysis. The M&V process found strong persistence of both the required and voluntary measures. Most building representatives indicated that the tune-up had motivated them to take beneficial actions, whether for expected energy savings, improved maintenance, or influencing upgrade decisions that were already under consideration. These sentiments were also expressed through post-participation survey results.

Although preliminary, given that post tune-up monthly energy use data available for analysis ranged from eight to twelve months, the M&V analysis estimated average energy savings for the ten buildings at 8.3% with 5.9% electric savings and 11.0% gas savings (non-weather normalized). Based on the M&V results, DOE Asset Score models, the Building Renewal results, and the final TUA Program Path participation numbers, the projected TUA program energy savings estimates were updated. The Basic Tune-Up estimated average savings were revised down from 10% to 7%. The Tune-Up Plus estimate was reduced from 20% to 15%. The Building Renewal was kept at 35% for the five enrolled buildings.

With the updated savings estimates for each TUA path, the total program savings are projected at 12.1% annually for energy use (67.9 million kBtu/year) and 12.0% for GHG emissions (or 5,161 tons using EPA emissions factors).

Although the early estimates suggest the program didn’t achieve the originally projected energy savings overall, the revised savings projections are still substantial and the TUA Program was highly beneficial to the building owners and Tune-Up Specialists who participated, as well as the City of Seattle. From a City perspective, it is delivering energy savings from tune-ups two years earlier than would have been achieved based on compliance deadlines and it is encouraging this first crop of “early adopters” to enroll in energy and GHG saving efforts beyond the tune-up. The trainings kick-started the City’s engagement

with service providers and drew their attention to the harder to reach mid-size buildings market. The co-timing of SBTU's roll-out to the largest buildings and TUA's early offering to the mid-size market supported many iterative process improvements, such as better communications about tune-up requirements and results-based data on the actual cost to conduct a tune-up.

Perhaps most importantly, the opportunity for an incentive to support early compliance created goodwill among building owners and a strong sense that while the City is regulating them to do more, the City had created an O&M program designed to benefit their buildings and was committed to supporting compliance. It also turned some building owners and managers people who were reluctant about the tune-up requirement into supporters. One participant noted, "I went into the Tune-Up process begrudgingly, thinking it was just another government regulation. But halfway through I changed my mind. This program helps everybody—property managers, tenants, and owners. I plan on using the knowledge I gained from the Tallman Tune-Up to initiate cost-saving procedures and increase efficiencies in all my area buildings." (City of Seattle Office of Sustainability and Environment 2020).

Furthermore, the results indicate that incentivized programs to meet mandates early can and do engage buildings in going beyond requirements, especially for ECM participation, but also for strategic energy management, which will be increasingly important as more cities adopt increasingly stringent mandates, such as building performance standards. In sum, results from the Tune-Up Accelerator suggest that incentivized early compliance paths are a model for City and utility collaboration to meet aggressive energy and climate goals when developed and implemented to engage both building owners and service providers.

3 Introduction

3.1 SEATTLE BUILDING TUNE-UPS POLICY AND CLIMATE ACTION PLAN BACKGROUND

After extensive public engagement, in March 2016, The Seattle City Council passed Ordinance 125002 to require commercial buildings 50,000 square feet and larger to conduct a "building tune-up" per Seattle Municipal Code 22.930 (City of Seattle 2019). Seattle Building Tune-Ups (SBTU) aims to optimize energy and water performance by identifying low- or no-cost actions related to building operations and maintenance. Seattle's mandate is often referred to as a "light retro-commissioning." It is closely modeled after Pacific Northwest National Laboratory's (PNNL) Building Re-tuning program, which estimates, through several modeled and in-building research programs, that re-tuning generates 10-15% in energy savings, on average in individual buildings. (Fernandez et al. 2017).

Recognizing that buildings account for approximately one-third of Seattle's core greenhouse gas emissions, the SBTU policy is a key part of Seattle's 2013 Climate Action Plan which has a goal to reduce commercial building energy use by 45% and overall building emissions by 82% by 2050 (City of Seattle 2018). The SBTU policy builds upon the Energy Benchmarking and Reporting (SMC 22.920) mandate that Seattle has had in place since 2011 (City of Seattle Office of Sustainability and Environment 2019). The benchmarking policy, wherein Seattle's commercial and multifamily buildings 20,000 square feet or larger are required to report annual US Environmental Protection Agency (EPA) Portfolio Manager benchmarking metrics, including Energy Use Intensity (EUI) and ENERGY STAR™ score, provides important baseline energy use data for tune-ups, from policy development to implementation to evaluation.

Seattle's Office of Sustainability and the Environment (OSE) developed and is implementing both the SBTU and energy benchmarking policies. SBTU was enacted to require a tune-up every five years for commercial

SEATTLE building tune-ups

Seattle Building Tune-Ups are assessments of building systems to detect and correct operational or maintenance problems. Tune-Ups must be conducted by a qualified Tune-Up Specialist and include the following steps:

- **Find a Qualified Tune-Up Specialist**. A Tune-Up Specialist is a building energy professional with seven years of experience in energy management and one of several training or certification programs.
- **Conduct a Building Assessment**. The Tune-Up Specialist will assess building systems and operations, review and correct benchmarking data, and review water bills.
- **Identify Corrective Actions**. The Tune-Up Specialist will identify required operational and maintenance improvements to the building and submit to the building owner.
- **Implement Corrective Actions**. The building owner and Tune-Up Specialist will work to address all required corrective actions identified in the building assessment.
- **Verify Changes**. The Tune-Up Specialist will verify that all corrected equipment and systems are functioning as intended.
- **Report to the City**. The Tune-Up Specialist must complete the Seattle Building Tune-Ups Summary Report, review it with the building owner, and submit to the City.

More at [www.seattle.gov/buildingtuneups.](www.seattle.gov/buildingtuneups)

buildings 50,000 square feet or larger. Although most buildings would likely need to "tune-up" the City specified several "Alternative Compliance" pathways to allow flexibility for owners of buildings with extremely low energy use, exemplary energy performance certification, or those that have recently completed a tune-up equivalent project. The Tune-Up Accelerator was also considered an Alternative Compliance path although it was time limited to signing up by the end of 2018. Alternative Compliance paths are specified through *OSE Director's Rule 2016-01: Building Tune-Ups Requirement* (City of Seattle Office of Sustainability and Environment 2017) and are available on the website www.seattle.gov/buildingtuneups.

Tune-ups are phased in by building size, or "cohorts" as shown in Table 1. Building Tune-Ups were rolled out to the large size building market (100,000 SF or greater) concurrently with the Tune-Up Accelerator offering for smaller buildings. As of February 2020, about 320 large buildings in cohorts one and two have complied with the mandate, either through completing a tune-up or alternative compliance. Compliance for cohort 1 is 90%. (Cohort 2 compliance rate was not yet available as of this report.)

Table 1: Seattle Building Tune-Ups Deadlines by Cohort.

Cohort	Building Size in Square Feet (SF)	Alternative Compliance*	Tune-Up Compliance
1	200,000+	September 4, 2018	March 1, 2019*
2	100,000-199,999	April 1, 2019	October 1, 2019
3	70,000-99,999	April 1, 2020	October 1, 2020
4	50,000-69,999	April 1, 2021	October 1, 2021

**Deadline was originally October 1, 2018 but was extended to allow more time for SBTU to develop an online reporting tool. The Alternative Compliance dates shown do not apply to the Tune-Up Accelerator.*

3.1.1 TUNE-UP ASSESSMENT ELEMENTS

SBTU requires 39 tune-up measures to be assessed in each building and these same assessment elements were required for the TUA Program. The focus of the measures is on HVAC operations and maintenance, but the assessment also covers lighting, domestic hot water (DHW), water use, and building envelope. The measures were modified from the PNNL Re-Tuning Program. Of the measures 20 are required to be implemented by the City if found deficient and 19 are voluntary implementation if found deficient. The measures, and if they are required or voluntary implementation, ("Implementation Rule") are listed in Table 2, on pages 14 through 17.

Table 2: Tune-Up Assessment Elements and Corrective Actions.

Category & Measure Code	Assessment Element	Corrective Action	Implementation Rule
HVAC Operations (G1-G10)			
G1	Review HVAC equipment schedules.	Set schedules to optimize operations for actual building occupancy patterns. Implementation is required.	Required
G2	Review HVAC set points.	Set or adjust to optimize function and energy efficiency of operations as appropriate to support the building use and occupant needs. Implementation is required.	Required
G3	Review reset schedules.	Establish or adjust schedules as appropriate. Implementation is required.	Required
G4	Review optimal stop/start capabilities.	Implement optimal stop/start capabilities as appropriate to support the building use and occupant needs. Implementation is required.	Required
G5	Verify HVAC sensors are functioning, calibrated, and in appropriate locations. Identify where sensors should be repaired, adjusted, calibrated, or moved.	Adjust/calibrate sensors as appropriate (required) or recommend repairs if broken. Implementation of repairs is voluntary.	Required
G6	Verify HVAC controls are functioning as intended.	Adjust control sequences as appropriate for current facility requirements. Implementation is required.	Required
G7	Review HVAC controls for unintended or inappropriate instances of simultaneous heating and cooling.	Adjust HVAC controls to reduce or eliminate any unintended or inappropriate instances of simultaneous heating and cooling. Implementation is required.	Required
G8	Note any indications of significant air-balancing issues.	Recommend rebalancing of HVAC air and water systems where significant efficiency or comfort improvements can be achieved. Implementation is voluntary.	Voluntary
G9	Identify areas with indications that ventilation rates may vary significantly from ASHRAE 62.1 standards and be inappropriate for current facility requirements.	Recommend an analysis of ventilation system. Implementation is voluntary.	Voluntary
G10	Identify zones that are dominating multi-zone system operations.	Recommend solutions to isolate these zones. Implementation is voluntary.	Voluntary
HVAC Maintenance (G11-G18)			
G11	Verify HVAC equipment (grilles, coils, and ducts) is clean and adequately maintained according to ANSI/ASHRAE/ ACCA Standard 180-2012 (or current edition).	Clean where adversely impacting system. Implementation is required.	Required
G12	Check filters and strainers.	Clean or replace filters and strainers where appropriate and where they are adversely	Required

Category & Measure Code	Assessment Element	Corrective Action	Implementation Rule
		impacting system performance. Implementation is required.	
G13	Check filters and strainers.	Recommend maintenance as appropriate. (Refer to ASHRAE Standard 180-2012). Implementation is voluntary.	Voluntary
G14	Verify equipment observed (motors, fans, pumps, belts, pulleys, bearings, and steam traps) is in good working condition. Refer to ANSI/ASHRAE/ACCA Standard180-2012 (or current edition).	Repair as appropriate where it is generally a standard or regular maintenance action. Implementation is required.	Required
G15	Verify equipment observed (motors, fans, pumps, belts, pulleys, bearings, and steam traps) is in good working condition. Refer to ANSI/ASHRAE/ACCA Standard180-2012 (or current edition).	Recommend repairs or replacement if the scope of work is more than standard maintenance. Implementation is voluntary.	Voluntary
G16	If ducts and pipes are visible and accessible, verify HVAC duct and pipe insulation is in place.	Recommend installation or repair of insulation as appropriate. Implementation is voluntary.	Voluntary
G17	Check valves and dampers.	Adjust to ANSI/ASHRAE/ACCA Standard 180-2012 (or current edition) if not opening and closing fully. Implementation is required.	Required
G18	Identify equipment approaching the end of its service life, per ASHRAE Service Life Database.	Recommend a replacement plan and schedule as appropriate. Implementation is voluntary.	Voluntary
Lighting (H1-H4)			
H1	Identify any areas where lighting levels appear to be significantly higher than appropriate for the space use and occupant needs.	Recommend areas that could benefit from dimming or de-lamping and/or where the lighting power density can be improved. Implementation is voluntary.	Voluntary
H2	Verify lighting sensors are working and located appropriately for the current functioning of the building.	Identify areas that could benefit from occupancy or daylight sensors. Implementation is voluntary.	Voluntary
H3	Review lighting controls schedule and sequences.	Set or adjust schedules as appropriate to match actual building use patterns. Implementation is required.	Required
H4	Identify inefficient lighting equipment (such as incandescent, T12, or metal halide lighting).	Recommend lighting replacement(s). Implementation is voluntary.	Voluntary
Domestic Hot Water (DHW) (I1-I2)			
I1	Review domestic hot water temperature set points.	Adjust set points to improve efficiency as appropriate for building and occupant needs. Implementation is required.	Required
I2	Review circulation pump controls.	Set or adjust as appropriate according to ANSI/ASHRAE/ ACCA Standard 180-2012 (or current edition). Implementation is required.	Required

Category & Measure Code	Assessment Element	Corrective Action	Implementation Rule
Water Use (J1-J10)			
J1	Verify cooling tower conductivity meter used to control blow down is calibrated and functioning properly.	Adjust as appropriate. Implementation is required.	Required
J2	Verify cooling tower conductivity meter used to control blow down is calibrated and functioning properly.	Recommend repairs as appropriate. Implementation is voluntary.	Voluntary
J3	Evaluate cooling towers for water leaks and excess water consumption.	Repair as appropriate for standard or regular maintenance actions. Implementation is required.	Required
J4	In irrigated areas over 500 square feet, verify irrigation schedules are in place and review schedules.	Identify opportunities for schedule improvements to improve efficiency and recommend appropriate action. Implementation is voluntary.	Voluntary
J5	Verify irrigation rain sensors are calibrated, functioning properly, and located appropriately to collect relevant moisture data to trigger the operating system.	Adjust, calibrate, or repair as appropriate. Implementation is required.	Required
J6	Review water feature schedules.	Set to shut down during nighttime or unoccupied periods as appropriate. Implementation is required.	Required
J7	Check irrigation system for leaks, overspray, broken heads, foliage blocking, plugged nozzles, excess pressure, or other operational problems.	Adjust and repair as appropriate for standard or regular maintenance actions. Implementation is required.	Required
J8	Check irrigation system for leaks, overspray, broken heads, foliage blocking, plugged nozzles, excess pressure, or other operational problems.	Recommended repairs if scope of work is more than standard maintenance. Implementation is voluntary.	Voluntary
J9	Check plumbing fixtures for leaks.	Repair as appropriate for standard or regular maintenance actions. Implementation is required.	Required
J10	Check plumbing fixtures for leaks.	Recommend repairs if scope of work is more than standard maintenance. Implementation is voluntary.	Voluntary
J11	Check hands free sensor-activated plumbing fixtures for proper operation.	Recommend repairs if scope of work is more than standard maintenance. Implementation is voluntary.	Voluntary
J12	Check water flow fixtures.	Recommend repairs if scope of work is more than standard maintenance. Implementation is voluntary.	Voluntary
Building Envelope			

Category & Measure Code	Assessment Element	Corrective Action	Implementation Rule
K1	Assess for roof penetrations and damage to siding.	Recommend repairs if scope of work is more than standard maintenance. Implementation is voluntary.	Voluntary
K2	Identify duct leaks (such as disconnects and/or holes).	Recommend repairs if scope of work is more than standard maintenance. Implementation is voluntary.	Voluntary
K3	Identify any uninsulated attic areas or where attic insulation has been disturbed.	Recommend repairs if scope of work is more than standard maintenance. Implementation is voluntary.	Voluntary

3.2 A PROBLEM… AND A FUNDING OPPORTUNITY

Both the phased implementation by building size and the alternative compliance option created an opportunity for OSE to develop a program aimed at the harder to reach "mid-size building" market of buildings less than 100,000 SF. This market is identified as cohorts 3 and 4 (Table 1) and represents approximately 470 buildings that need to comply in 2020 or 2021. This market was of concern to OSE because during the extensive stakeholder engagement for the SBTU ordinance, OSE heard from energy efficiency service providers that this market was less familiar with retro-commissioning and building audits. Furthermore, smaller buildings in Seattle (and elsewhere) tend to be Class B and C buildings, which have been noted by many in the energy efficiency industry as a challenging market with less engagement in utility program incentives. Concerns about the market's preparedness were wide ranging and included:

- Are there enough service providers for assessments and implementation?
- Do building owners know where to start to get a tune-up?
- How much technical support does the City need to provide?
- Can greater energy savings beyond the tune-up requirements be found?
- Is the tune-ups mandate effective for this market?

Fortuitously, the U.S. Department of Energy (DOE) released a call for proposals for its Solutions to Improve the Energy Efficiency of U.S. Small and Medium Commercial Buildings (DE-FOA-0001385) funding opportunity in December 2015 (U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy 2015). Although SBTU had not yet been voted on by Seattle City Council, its development was nearly final and under Council review. Furthermore, OSE's SBTU policy development and public outreach had been met generally favorably by both the building owner community and policy decision makers. Thus, OSE thought the policy would likely pass making it important to convene partners on a proposal to DOE to support tune-ups in the mid-size building market. Furthermore, the ability to inform Council and the Mayor that OSE was already developing a proposal to seek funding for market support demonstrated OSE's commitment to a broad and equitable implementation of SBTU.

OSE sought to develop a "Tune-Up Accelerator" (TUA) program that would act as a "carrot" to the "stick" of the phased-in SBTU mandate. OSE's proposal to DOE envisioned a partnership with Seattle City Light (SCL), the Smart Buildings Center (SBC), University of Washington Integrated Design Lab (UW IDL) and Pacific Northwest National Laboratory (PNNL) to engage with building owners, managers and

service providers to develop market expertise and accelerate the voluntary implementation of energy efficiency improvements in Seattle's small to medium commercial buildings—buildings that would be subject to mandatory tune-ups beginning in 2020. A key component of the program was a financial incentive for completing the tune-up prior to the mandated deadline bolstered by increased technical support and a trained pool of service providers.

In 2016 the project team, with OSE as the lead recipient and SBC, UW IDL and PNNL as sub-recipients received funding from the US DOE Office of Energy Efficiency and Renewable Energy under Buildings Program Award #DE-RR0007556 to develop the program (U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy 2016). SCL was a key partner, but received no Federal funding, rather their commitment was local matching dollars in the form of energy efficiency incentives. DOE total funding was $1,207,152 with a local cost share of $1,812,097.

3.2.1 TUA PROGRAM TIMELINE

The TUA project kicked off in late September 2016, however, most work started in January 2017 due to the need to ramp up staffing and enact sub-recipient contracts. Figure 1 below shows a general timeline and the Appendix has a complete TUA project timeline and scope of work for reference. This timing also aligned with the publication of the Building Tune-ups Director's Rule in January 2017. It specified the requirements for compliance and specific tune-up energy efficiency measures in greater detail than the earlier ordinance and was a key outreach piece to have complete prior to further market engagement.

Project Tasks	2016-17	2018	2019-20	Key Milestones
Program Development				Enrollment Opened in August 2017
Workforce Development				Trainings in Summer 2017
Buildings Prioritization & Recruitment				Sign-Up / Agreement by February 2018
Building Assessment Phase				Assessments Complete by Sept 2018
Implementation Phase				Implementation Complete by June 2019
Energy Savings Analysis and M & V				M & V in 10 Buildings Summer/Fall 2019
Case Studies				Four Case Studies Completed
Final Reporting to DOE				Report & Analysis Complete

Figure 1: TUA Program General Timeline

3.3 TUA PROJECT OUTCOMES

The project envisioned the following high-level outcomes:

- A pool of service providers qualified for the specific needs of small/medium buildings.
- 100 participant buildings between approximately 20,000 -100,000 SF in size participating in an operational tune-up assessment and then implementing at least one improvement pathway, for an average 20% per building energy savings. If fully implemented, the project could achieve an estimated total savings of 99.7 Million kBtu/year and about $1.5 Million annual cost savings.
    A. 35-40 buildings will conduct re-tuning (10% savings)
    B. 35-40 will conduct re-tuning and implement additional energy conservation measures (ECMs) (20% savings)
    C. 20-30 will create strategic energy plans to support future comprehensive energy upgrades (35% savings)

- Recommendations to the OSE Director on revisions to the Seattle Building Tune-Ups program for mid-size commercial buildings (50,000 – 100,000 SF) that need to comply in either 2020 or 2021.

3.4 TUA PROJECT OBJECTIVES

The Tune-Up Accelerator Program was designed to address the specific needs of the small to mid-size commercial building market. Building on the momentum of Seattle's new policy, the project worked with service providers and owners of small to medium buildings to: 1) advance market expertise, 2) accelerate tune-up implementation, 3) generate voluntary market action towards even greater savings, and 4) ensure that the mandate is effective for this market sector. The program was carried out in two budget periods with the program partners (see Table 3 on page 20) taking the lead on different roles.

Budget Period 1 (BP1) – Program & Workforce Development: Work in BP1 built a foundation for implementation of tune-ups and upgrades in BP2. Program partners further refined the program scope and brand, and developed the incentive package, help desk support, participation requirements and customer agreements. Curricula was developed and used for service provider trainings. Tracking and evaluation tools were built for data collection and evaluation of customer information and building performance data. Owner engagement, along with building pre-assessments, ultimately drove enrollment of 102 buildings into the TUA program. Towards the end of BP1, nearly all buildings had a tune-up assessment and had a Building Energy Asset Score created. BP1 activities are further detailed in Chapters 3 through 7 of this report.

Budget Period 2 (BP2) – Implementation & Evaluation: In BP2, service providers worked with TUA enrolled building owners to implement tune-ups and energy conservation measures (ECMs). Owners of five buildings worked with IDL to develop strategic plans for deeper energy upgrades. At the end of BP2, participants had completed tune-ups and had ECMs planned or underway. Program partners tracked the implemented measures and assessed the effectiveness of the energy measures, owner engagement approach, and utility incentives. Results were then compiled to inform recommendations for revisions to the tune-up requirements and related policy development, a plan for establishment of a long-term program that will take emerging policies into account, and resources for replicability in other jurisdictions. BP2 activities are further detailed in Chapters 8 through 11 of this report.

Both the TUA and SBTU programs are managed out of OSE and continuous coordination took place as the mandate was rolled out to the largest buildings (greater than 100,000 SF) per the compliance timelines (see Table 1).

Table 3: Building Tune-Up Accelerator Program Partners and Primary Roles.

Partner	Primary Roles
City of Seattle Office of Sustainability & Environment (OSE)	Program management, enrollment, coordination w/ Building Tune-Ups mandate, evaluation, reporting to DOE
Smart Buildings Center (SBC)	Provider of training & curricula, tool lending library, project tracking, help desk
Pacific Northwest National Laboratory (PNNL)	Building Re-Tuning training, Asset Score support & research on energy-savings from tune-ups and retrofit potential
Seattle City Light (SCL)	Tune-up and energy conservation measure incentives
University of Washington Integrated Design Lab (UW IDL)	Building strategic plan development and support, Spark Tool engagement
US DOE Energy Efficiency & Renewable Energy Building Technologies Office	Federal funding and project oversight

4 Tune-Up Accelerator Program Development

Development of the TUA Program commenced in September 2016 (see Figure 1 timeline). Although sub-recipient contracts had yet to be created, OSE's past strong partnerships enabled starting the program design phase, which ultimately took about nine months to roll out the TUA Program offering. The goal was to have the program ready for the TUA service provider trainings (see Chapter 5) that were concurrently being planned for Summer 2017. Additionally, the Program strove to create a streamlined enrollment process that minimized barriers to participation, knowing that the mid-size building market tends to lack staff capacity to engage in incentive programs. Building owners would also have a list of Tune-Up Accelerator trained service providers to select from to conduct their tune-up and a dedicated Tune-Up Accelerator "help desk" for support with all aspects of the program, from enrollment to receiving their incentive payment.

4.1 BUILDING TUNE-UP INCENTIVE DEVELOPMENT

SCL was a key partner during program development since they would administer the tune-up incentive, which was likely the greatest hook to entice owners to complete a building tune-up early. SCL has a 40-year history of incentivizing energy efficiency measures, primarily based on deemed per kilowatt hour (kWh) electric energy savings from equipment upgrades such as lighting. Tune-ups, however, obtain energy savings from operational and maintenance changes to a facility that result from a variety of interactive and dependent energy measures. The energy savings may also come from changes to the operations and maintenance of equipment powered by electric *as well as* other fuel sources to the building, such as natural gas and steam, which serve some Seattle buildings. Based on its long experience implementing programs and more recent work to research a pilot retro-commissioning program, SCL knew that a per square foot (SF) incentive would be the best and most streamlined path forward for the TUA incentive pilot.

Fortunately, energy savings estimates from tune-ups had already been researched by PNNL's Re-tuning Program and the measures required by Seattle Building Tune-Ups generally aligned with re-tuning measures. Puget Sound Energy's (PSE) Comprehensive Tune-Up Program (recently renamed as Existing Building Commissioning (EBCx) Program), which is a full retro-commissioning incentive program well beyond the SBTU requirements, also provided some guidance for cost and savings estimates (Puget Sound Energy 2020).

In addition to its prior research on re-tuning energy savings, PNNL, through DOE funding external to this project, conducted a simulated analysis of energy savings potential from the measures required by the Seattle Building Tune-ups mandate. These results are documented in the report, *Energy Savings and Peak Load Reduction Benefits from Building Controls Measures in Seattle, Washington* (Fernandez N, S. Katipamula, W Wang, Y Xie 2017). PNNL's analysis estimated annual building energy savings to be between 14% and 32%, by building type, including electricity savings between 4% and 20% and natural gas savings between 20% and 65% (Fernandez N, S. Katipamula, W Wang, Y Xie 2017, iii).

Also critical to SCL's incentive development was the Seattle Energy Benchmarking data from the pool of about 470 buildings that would be eligible to enroll in the TUA program. This allowed SCL to use the "Table of Deemed Electric Energy Savings Percentage by EUI classification (Quartiles)" from the 2017

PNNL research cited above (Fernandez N, S. Katipamula, W Wang, Y Xie 2017, Table A-2) as a look-up tool against the actual 2016 electric energy consumption of the eligible buildings. Savings were estimated in four quartiles from Highest Use (an inefficient building with more savings potential) to Lowest Use (an efficient building with less savings potential). For example, an office building completing a tune-up could have electric energy savings ranging from 4.3% to 13.8%, depending on its relative energy efficiency pre-enrollment.

During development of the SBTU mandate, OSE reviewed available research and solicited input from regional energy efficiency audit and retro-commissioning providers about the cost to tune-up. Based on this information the cost was estimated to range between $0.20 to $0.50 per SF to conduct a tune-up assessment and implement corrective actions (City of Seattle Office of Sustainability and Environment 2015). These costs can vary greatly for size of building and complexity of systems and the estimates were generally based on costs for buildings somewhat larger than the mid-size market.

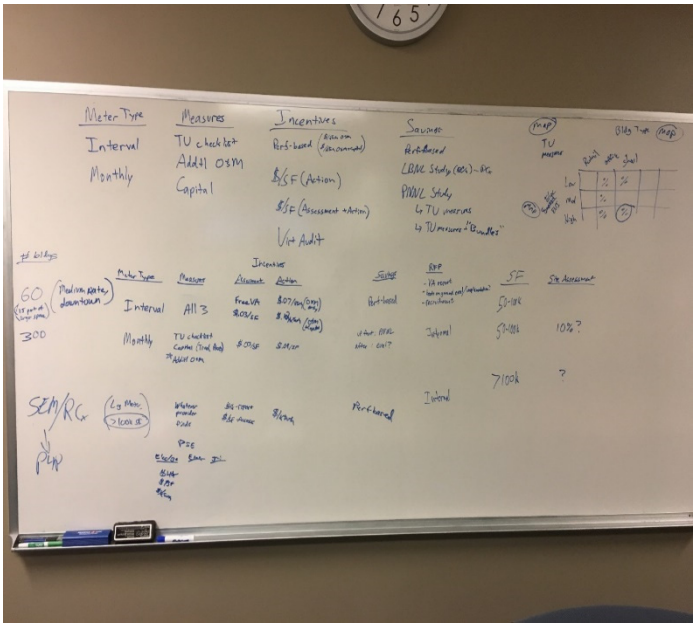

Figure 2: OSE and SCL met frequently throughout the design phase to design an incentive program. White boards proved indispensable.

Ultimately SCL selected an incentive of $0.12 per SF with a 70% of project cost cap. At $0.12 per SF, the incentive was intended to cover about 50% of the tune-up cost for most building owners, assuming an average total tune-up cost of $.25 per SF based on OSE's research. This incentive was branded as "The Basic Tune-Up." (Chapter 11 of this report includes a summary of the actual costs for the participating building types.)

OSE recommended splitting the incentive into two phases: $0.03 per SF upon completion of the assessment phase that identified the corrective actions and an additional $0.09 per SF towards the implementation of any corrective actions required by the tune-up. Although more work to the utility, a phased incentive provided several programmatic benefits. First, building owners concerned about the assessment cost could obtain some reimbursement sooner. Second, it created a financial benefit to the owner and service provider to meet a TUA Program requirement, which was to demonstrate documentation of having completed the assessment phase. Demonstrating completion of the assessment provided an opportunity for OSE to review partial tune-ups and help course correct service providers – all of whom were new to offering tune-ups that met City requirements as a service.

SCL agreed that additional voluntary (not required) capital measures identified through the tune-up assessment, such as lighting updates, would be eligible for existing SCL per kWh incentives if they met participation criteria. The team branded the option of doing a Basic Tune-Up and pursuing an ECM as "Tune-Up Plus." The interim review of assessments gave the program an opportunity to scan for ECM work beyond the tune-up that could be pitched "Tune-Up Plus" and/or recommended for the strategic

energy management technical support offered by UW IDL to identify deep energy savings. UW IDL coined their offering "Building Renewal."

In addition to the utility incentives from SCL, service providers were offered a direct incentive from the grant of $1,000 per building to collect information for Asset Score reports and share them with the TUA program. (See chapters 6 and 8 for more about the Asset Score and its benefit to the TUA Program.)

4.2 TUNE-UP ACCELERATOR PROGRAM PATHS

The TUA Program offered three program paths for participants to choose: Basic Tune-Up, Tune-Up Plus and Building Renewal. These paths are outlined in Table 4 below.

Table 4: Building Tune-Up Accelerator Program Paths.

Program Path	Benefit to Building Owner	Recruitment Goal	Potential Average Energy Savings
Basic Tune-Up	Meet City requirement early and obtain incentive and additional technical support.	35-40 Buildings	10%
Tune-Up Plus	Basic Tune-Up plus additional energy savings identified by provider already visiting for tune-up.	35-40 Buildings	20%
Building Renewal	Basic Tune-Up plus opportunity for free technical support to development strategic energy management plan.	20-30 Buildings	35%

In addition, the Building Renewal Path was designed with three levels of potential program engagement:

- **Level 1:** A "Spark" report (see box on next page) that provided financial and technical recommendations to the building owner with office spaces. (Note: the enrollment materials offered this free analysis to any building with office space.)
- **Level 2:** Level 1 activities, plus building walk-through with the UW IDL technical team that presented specific recommendations for implementation.
- **Level 3:** Level 2 activities, plus custom EnergyPlus[1] analysis and a Strategic Energy Plan. The Plans would consist of customized technical roadmaps for a phased deep energy retrofit to generate an average of 35% - 50% energy savings over time and identify incentive options, included existing utility programs for capital energy efficient measures (EEMs) as well as innovative performance-based incentive packages. Furthermore, an analysis of potential on-site renewables would be developed for each building site. The combined effect of this was intended

[1] EnergyPlus™ is a whole building energy simulation program that engineers, architects, and researchers use to model both energy consumption—for heating, cooling, ventilation, lighting and plug and process loads—and water use in buildings. (National Renewable Energy Laboratory 2019).

to accelerate whole building energy efficiency and greenhouse gas emissions reduction through integrated capital and operational savings.

In addition to the paths in Table 3, during the assessment phase, tune-up service providers also created a Building Energy Asset Score for each building for which an Asset Score was appropriate. The Building Energy Asset Score is a national standardized on-line tool created by the US DOE for assessing the physical and structural energy efficiency of commercial and multifamily residential buildings. Asset Score reports provided an additional assessment of retrofit potential in the buildings and the results were also used for inputs into the Spark tool (Northwest Energy Efficiency Alliance (NEEA), 2020) used for Building Renewal support (See Chapter 8).

About the Spark Tool

Spark is a web-based parametric energy simulation and financial analysis tool that generates a technical and financial scope or "Spark Report" for deep-energy retrofits that target 30-50% energy savings in commercial building typologies that are primarily office space. It was created by the Northwest Energy Efficiency Alliance (NEEA).

The data input requirements of Spark (building use-type, size, assemblies, and major system component vintages, and energy use data) significantly overlap with data collected for the Asset Score making it an ideal starting point for Spark tool data inputs. Additional data for the Spark tool include electrical and gas use, component vintages, and simplified market position financial data where applicable. **Learn more at** http://buildingrenewal.org.

4.3 INCENTIVE PROGRAM DOCUMENTATION

The "Basic Tune-Up" incentive documentation used a "Tune-Up Accelerator Summary Report" form for reporting that added the Accelerator branding, but otherwise mirrored the reporting form developed for SBTU. This Microsoft Excel reporting form captures the results of the 39 tune-up measures (see Table 2) that were required to be assessed as well as implementation of corrective actions for measures with deficiencies (both voluntary and required). The report is described in more detail in section 4.5.3.

SCL also wanted to collect additional data, beyond what was required by the City, on scheduling changes made to heating and cooling (HVAC) and lighting operating hours. To do so, SCL created a custom "Operating Hours" worksheet, also described in the tool sections of this chapter. This enabled SCL to compare the energy savings estimates for a building with the magnitude of changes made to operations of the building's primary energy-using systems.

Lastly, other important work led by SCL during the incentive design phase included developing the following materials needed for owners to apply for and eventually obtain the incentive:

- A streamlined *Program Application* that met the legal requirements of both SCL and OSE
- The *SCL Participation Agreement*, which was the incentive contract between the building owners and SCL

- Developing the *SCL Incentive Program Guidelines* that explained the obligations of the owner to obtain the incentive.

Samples of these documents are available in the Appendix.

4.4 MARKETING & RECRUITMENT PLAN

While SCL finalized the incentive structure, OSE developed a recruitment plan for TUA, with the goal to enroll 100 buildings or spaces. Developing a recruitment or marketing plan is a program development activity that is crucial to successfully implementing any incentive program or City mandate. While offering cash to meet a City mandate a few years early might seem like an obvious opportunity that building owners would flock to, the program still faced barriers towards meeting its enrollment goals and needed a strategy. Furthermore, the City still needed to clarify its target audience and determine how to prioritize buildings for recruitment.

The recruitment plan outlined strategies to address the following recruitment needs:

- Agreeing on the program partner recruitment and marketing roles, as well as how to align with the SBTU mandate rollout
- Determining the eligible buildings & creating a recruitment prioritization strategy
- Defining target audiences and key stakeholders
- Defining the Accelerator Program products and estimated costs (to participants)
- Outlining messaging to address barriers and talking points
- Creating outreach deliverables and implementation timeline
- Developing a budget

During the same time, the SBTU program was also developing its branding and outreach plan to roll out the mandate to engage the largest buildings to comply. SBTU and TUA determined that it was important to align the program messaging to leverage each other's outreach, while minimizing confusion about the differences. Key messages were that large building's (100,000 SF or greater) needed to "get ready to comply by October 2018" whereas the smaller buildings (less than 100,000 SF) could "jump-start their tune-up and get extra help doing it." The "limited time" nature of the Accelerator was promoted with messages like, "funding will sunset after 2018" and simply, "don't miss out on incentives." Emphasizing "seeking 100 buildings" was motivating to service providers to enroll their clients before the program filled up. Samples of marketing materials are available in the Appendix.

Figure 3: TUA Program tag.

Although the TUA Program had a very limited budget for branding and marketing development, the team felt that a tag or logo that visually conveyed the program's accelerated nature and emphasized its time limited nature would help promote it and could be used in conjunction with early outreach about the SBTU Program. A simple logo that emulated a "fast forward" button on a video using a bright magenta color was created in-house (Figure 3: TUA Program tag. The recruitment process is described in Chapter 6.

4.5 DEVELOPMENT OF TRACKING & REPORTING TOOLS

The last blocks in the program development foundation were to develop the following tracking tools:

- Customer relationship management ("CRM") tool to track program communications with participants and service providers.
- Database to track the progress of each participant's deliverables as they progressed through the program.
- Reporting form tool to track the measures implemented in each building.

4.5.1 CUSTOMER RELATIONSHIP MANAGEMENT (CRM) TOOL

For a communications tracking method, the TUA team looked for an inexpensive customer relationship management or "CRM" tool that could be accessed by partners at their four different locations: OSE, SCL, SBC and PNNL. With its limited budget, the team choose a low-cost basic online Zendesk plan, enabling all partners to see the site with a dedicated email accelerator@seattle.gov. We quickly learned, however, that many requests for program information came into OSE directly due to the concurrent roll out of the TUA and SBTU programs. Questions coming in often asked about both programs, because many building owners tended to have large portfolios of both small and large buildings. Furthermore, many questions were on the specifics of compliance, so the answers often needed vetting with the OSE SBTU team since they could set precedent with how building owners and service providers understood and complied with the SBTU mandate.

Thus, while Zendesk was somewhat useful, most questions needed to be routed through OSE and conversation forwarding on the low-cost Zendesk tool was not user friendly. Thus, the team also used a simple Excel tracking spreadsheet on SharePoint. More about the types of inquiries tracked is in Chapter 7. For programs of this size, our experience suggests an Excel spreadsheet is adequate.

4.5.2 DATABASE TOOL

To track the deliverables required by each participant as they moved through the program, from applying, to signing an incentive agreement with SCL, to eventual tune-up completion, a custom database was created by SBC using Microsoft Access. This robust tool could also later be used to tally the tune-up ECMs completed in each building for the final evaluation.

The Access tool had several custom data entry pages including, Building Information imported from benchmarking data, Contact Information, Project Tracking and (estimated) Energy Savings. The tune-up "Assessment Elements", HVAC, Lighting, Domestic Hot Water, Water Usage and Envelope also have custom energy fields (see Figures 4 and 5 on next page).

Monitoring deliverables kept participants and service providers on track, which was important for a time-limited program. A "Project Tracking" screen that could be easily queried and combined with the Contacts data enabled the program manager to email service providers and/or owners with outstanding deliverables as needed. For example, some participants were slow to get SCL Incentive Agreements signed because they often needed a signature from a person with greater budget authority than the TUA Program's primary contact.

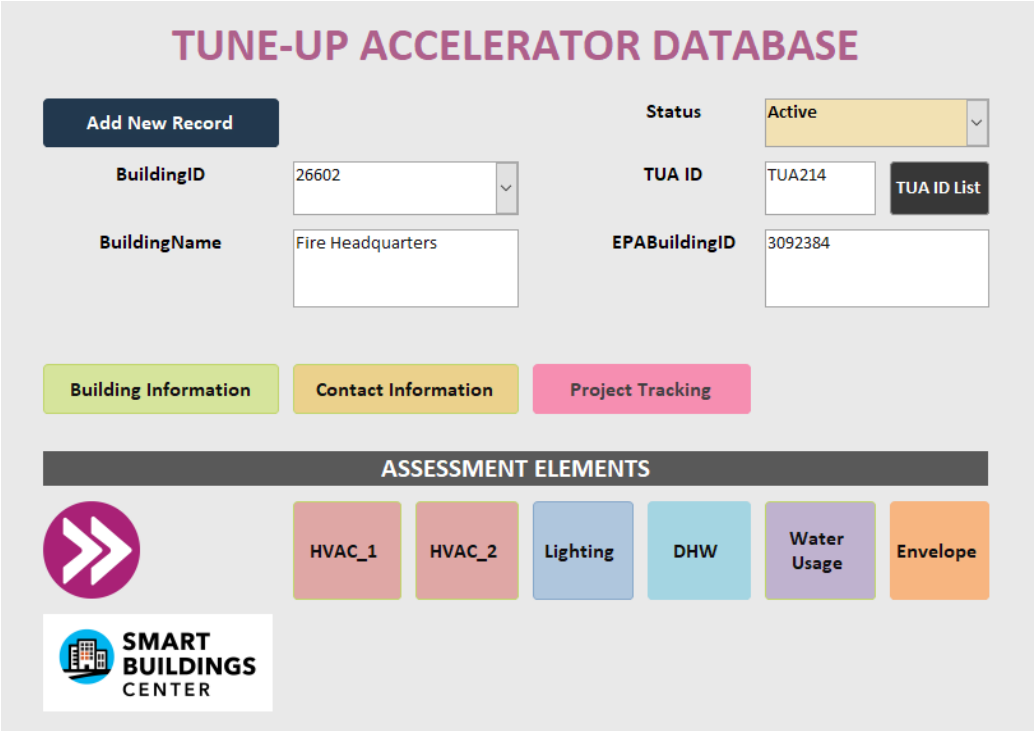

Figure 4: Screenshot of TUA database homepage.

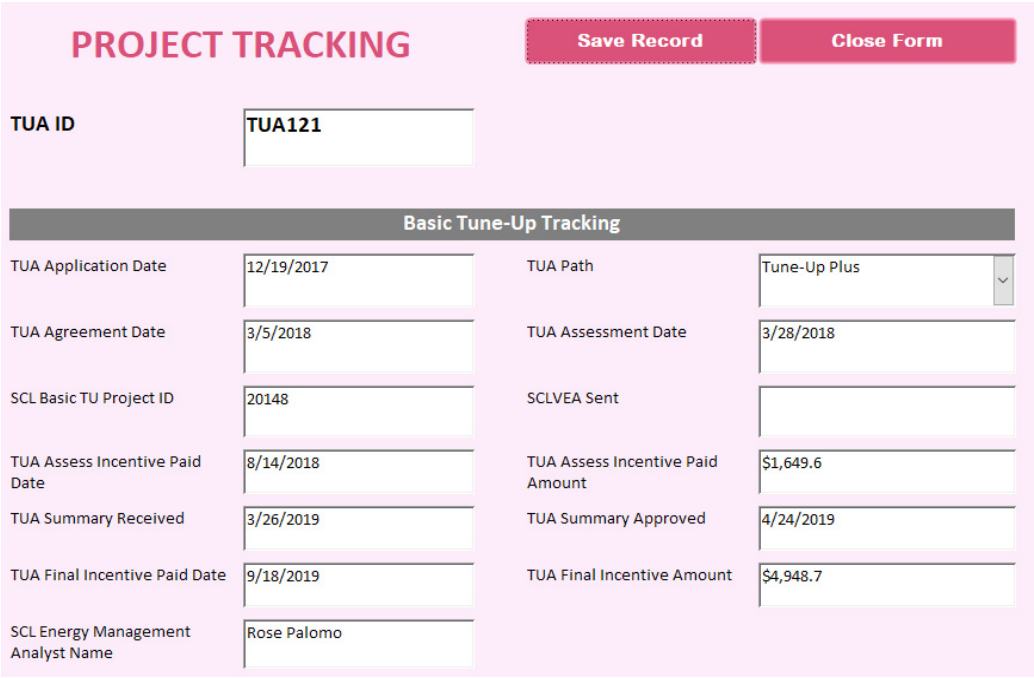

Figure 5: Screenshot of Project Tracking page.

4.5.3 TUNE-UP SUMMARY REPORTING FORM

As noted earlier, the "Basic Tune-Up" required that service providers fill out an Excel "Tune-Up Accelerator Summary Report" form for reporting (see Figure 6 for a screenshot). This report captured the results of the 39 tune-up measures (section 3.1.1) that were required to be assessed as well as implementation of corrective actions for measures with deficiencies (both required and voluntary). The form included a hidden tab that allowed completed forms to be extracted into the Access database. A link to download the full report is provided in the Appendix.

The Reporting from also captured the following additional details about the building:

- Tune-Up Specialist Information – the credentials and contact information for the service providers conducting the tune-up.
- Building Characteristics – details about the building's occupancy, space uses and assets for the five most energy intensive areas of the building, such as primary HVAC, lighting and DHW systems.
- Benchmarking Validation – results of the service providers review and validation of the building's ENERGY STAR Portfolio Manager account.
- Billing Analysis – Summary of energy and water use billing data.
- Summary of Tune-Up Findings – Service provider's overview of findings in the building and duplicate equipment sampling approach (if used). (For example, sampling of duplicate HVAC terminal units.)

Tune-Up Accelerator Summary Report

G. HEATING, VENTILATION, AND AIR CONDITIONING TUNE-UP ELEMENTS

CORRECTIVE ACTIONS SHADED IN GREEN ARE **REQUIRED**

CORRECTIVE ACTIONS SHADED IN YELLOW ARE **VOLUNTARY**

OPERATING PROTOCOLS, CALIBRATION, AND SEQUENCING

	Assessment Element	Corrective Action	Tune-Up Finding (select from list)	Status of Tune-Up Corrections (Track completion status) (select from list)	Corrective Action Description (If applicable)
G1.	Review HVAC equipment schedules (including daily, weekly, seasonal, day/night, occupied/unoccupied hours).	If deficiency found, did you set schedules to optimize operations for actual building occupancy patterns? Implementation is required.			
G2.	Review HVAC set points (including space temperatures, supply air temperatures, CO_2, boiler temperatures, chilled water temperatures, economizer changeover temperatures, and building pressure).	If deficiency found, did you set or adjust to optimize function and energy efficiency of operations as appropriate to support the building use and occupant needs? Implementation is required.			
G3.	Review reset schedules (including supply air temperature, supply air pressure, boiler and chiller water temperature, lockouts with outside air temperature, loop differential pressure).	If deficiency found, did you establish or adjust schedules as appropriate? Implementation is required.			
G4.	Review optimal stop/start capabilities.	If deficiency found, did you implement optimal start/stop capabilities as appropriate to support the building use and occupant needs? Implementation is required.			

Figure 6: Sample screenshot of TUA Summary Report.

4.6 LESSONS LEARNED: PROGRAM DEVELOPMENT

Although the TUA Program already had a scope of work developed as part of the DOE grant agreement, developing the incentive still required about 10 months until the partners were ready to launch the incentive application and "program paths." Although this may seem long, it is quick for an incentive-based program and is a testament to the commitment of the TUA partners and buy-in from senior leadership at the City to carry out the work.

It's important for cities, and is a lesson learned, to consider that having a grant scope and having the program ready for public consumption are very different things. The later requires the funding, which was available from DOE, but also the staff ready to conduct the work of developing owner and service provider participation agreements, reporting forms, marketing, tracking methods and the other program development resources described in this chapter. This can mean redirecting work to support those activities or hiring – and hiring usually can't happen until funding is available. Furthermore, some important activities require the participation of other City staff such as legal and contracting teams that likely were not involved in many of the initial grant activities.

Seattle was fortunate to have the buy-in of senior leadership in both OSE and our utility, SCL, to support the work. Similarly, OSE engaged SCL closely during the development of the SBTU mandate, which helped support their interest in testing the TUA per square foot incentive pilot, as well as better understanding if the mandate could spur additional incentive engagement beyond the tune-up.

Cities wanting to do similar grant-funded work should make sure leadership buy-in is in place when applying for grants – and keep those teams posted on timing, scope and staffing needs as grants are awarded and negotiated. Furthermore, partnering with more nimble organizations, like SBC and the UW IDL, who were more set up to utilize grant funding supported the early activities of developing the curricula and creating the tracking database. Partnering with the DOE supported National Labs, in Seattle's case, PNNL, was likewise extremely helpful. The Labs are relatively nimble due to the existing contracts with DOE and can provide early program support as other city/utility mechanisms are set in place.

For program nuts and bolts, the extra effort between SCL and OSE to create a streamlined application process paid off as it worked as intended to reduce confusion and paperwork among both service providers and building owners. The coordination between TUA and SBTU on recruitment messaging also reduced confusion about the mandate and voluntary program overlaps, although we found that service providers needed occasional reminders about what building sizes were eligible for TUA. In sum, program development pieces and the time – and staff – to thoughtfully deliver them are important and should be considered as key scopes of work by entities that want conduct similar efforts.

5 Tune-Up Workforce Development

With the program development in place or underway, the next step was to train at least five service providers who could offer tune-ups to buildings participating in the TUA Program. This chapter covers the curriculum development, service provider trainings and service provider qualifications.

5.1 CURRICULUM DEVELOPMENT

SBC, PNNL and OSE led the development of the curriculum, which was centered around a customization of the PNNL's Building Re-tuning training for consistency with SBTU requirements. It was originally envisioned as two-day training with the afternoon of day two for a site visit to demonstrate a tune-up in an actual building. The final curricula were organized as follows in a two-day training:

- Day 1
  - Seattle Building Tune-Ups Requirement – An overview of the TUA Program in context of the mandate requirement.
  - Building Tune-Up Accelerator – Am overview of the program timeline, application, target building audience and TUA goals so that service providers could help recruit buildings.
  - Asset Score – A short training by PNNL on how to set up a DOE Asset Score account to model a building.
  - Building Re-Tuning – An overview of the PNNL program, best practices and examples.

- Day 2
  - On-Site Building Re-Tuning – An approximately two-hour site visit to a demonstration building.
  - Tool Lending Library – An overview of SBC's online Tool Lending Library and the tune-up tool packages that were created by SBC to align with the SBTU requirements (https://www.smartbuildingscenter.org/tool-library/).
  - Utility Incentives – An overview by SCL of the "Basic Tune-Up" incentive requirements as well as standard incentives for measures beyond the tune-up. In addition, a PSE presentation on their incentives for natural gas equipment and a Saving Water Partnership presentation on incentives for water-saving equipment.
  - Building Renewal – UW IDL presentation on their optional additional technical support for strategic energy management planning and the Spark Building Renewal tool.

5.2 TRAININGS AND RECRUITMENT

The trainings were open to anyone that met the SBTU "Tune-Up Specialist" qualifications (see box on next page) whether from an energy efficiency firm, or in-house building staff. Local service provider interest in the trainings was strong from larger local energy efficiency firms because they saw the trainings as an opportunity to better understand the SBTU mandate so that they could market tune-ups as a business offering. It was also an opportunity to be listed on a "TUA Service Provider" list that would be marketed to potential participants during the building recruitment process (see Chapter 6). OSE also

worked with SCL to specifically market the trainings to women and minority owned businesses (WMBE) to grow the market to less represented firms.

One 2-day training and two 1.5-day trainings were held during summer 2017. One condensed 1-day training (without a site visit) was held in February 2018 due to demand and requests from providers with new employees. Eighty-five people in total attended the trainings. Of the attendees, 27 energy service provider firms signed an agreement with OSE to participate as Accelerator Providers and were listed on the website for owners to select to do their tune-up. Six of the participating providers were WMBE firms. Although most attendees were from service provider firms, about 10 in-house staff from Seattle Public Schools, King County and Seattle City Light also attended.

Figure 7: Service Provider Training at King County Metro Transit Building

The number of providers far exceeded the DOE scope of work deliverable of five providers. These providers met the criteria as "Tune-Up Specialists" according to the Building Tune-Ups requirements. Sixteen different service provider firms ended up working with TUA buildings; thus, the TUA Program had a good distribution among firms.

Tune-Up Specialist Qualifications

A Tune-Up Specialist is a person qualified to conduct a tune-up assessment, identify required tune-up actions, perform tune-up actions and/or verify that tune-up actions were completed, and submit the SBTU (or TUA) report to the City of Seattle. Tune-Up Specialists must meet the following qualifications:

At least seven years of experience, including educational and/or professional experience, with commercial building operations and/or building energy management and one of the following certifications:

- Professional Engineer (PE) in mechanical or architectural engineering
- Building Operator Certification (BOC) Level II
- Certified Energy Manager (CEM) by the Association of Energy Engineers
- Certified Commissioning Professional (CCP) by the Building Commissioning Certification Board
- Commissioning Authority (CxA) by the AABC Commissioning Group
- Existing Building Commissioning Professional (EBCP) by the Association of Energy Engineers
- Sustainable Building Science Technology Bachelor of Applied Science from South Seattle College

Learn more at [www.seattle.gov/buildingtuneups.](www.seattle.gov/buildingtuneups)

5.3 LESSONS LEARNED: WORKFORCE DEVELOPMENT

One of the clearest lessons learned from the trainings was that if an early incentive program is created to accelerate participation in an upcoming mandate, the service providers—especially from large firms—want to participate and will attend trainings. A training for a program not backed up by the teeth of a requirement would likely take more effort to recruit. Some extra effort was, however, needed to recruit WMBE providers and the pool of WMBE "Tune-Up Specialist" qualified providers in the Puget Sound Region is quite small. Although the current pool of all providers in Seattle seems adequate for now, providers reported being very busy throughout implementation. The SBTU program should continue to evaluate if the service provider pool is adequate to serve the market and seek ways to grow participation in tune-ups by WMBE firms.

Evaluations from participants after each training were overall quite positive; however, the service providers felt that the Re-tuning content was a bit too basic and not as aligned as they'd hoped with the mandate requirements. Since each attendee was already required to possess Tune-Up Specialist qualifications, they needed less detail on how to conduct a tune-up and were instead more interested in the specifics of what the City would view as complete tune-up documentation. For example, many providers had questions on the provision that allows sampling of duplicate equipment. The TUA team appreciated this feedback and condensed the re-tuning section from about four hours to about two hours for the last trainings and added more examples of how to address the requirements and more time for discussion of exceptions and unique scenarios.

Lastly, since most participants were professionally trained, they generally felt that the site visits were not needed although a few thought it was an opportunity to ask additional questions about the scope of the mandate. Also, two days is a lot of time to ask for from busy service providers. The second and third trainings were shortened to 1.5 days and the fourth one-day training excluded the site visit for this reason.

Figure 8: Since 22 public schools enrolled, a site visit to a school allowed more one-on-one discussion about tune-up needs unique to schools.

Tailoring site visits to specific audiences can be useful, however. Since 22 public elementary schools enrolled, a site visit to one of their schools was offered to answer questions specific to their in-house facilities team. This also allowed their team to ask questions about their larger high schools that were concurrently meeting the mandate requirement. A case study about the tune-ups in schools is available in the Appendix.

6 Building Prioritization & Recruitment

With the recruitment plan in place, program offerings under development, and the trainings scheduled or underway, the TUA Program turned its attention to recruiting buildings from its target audience of about 470 buildings that were due to comply with SBTU by either October 1st 2020 or 2021.

6.1 BUILDING PRE-ASSESSMENT & PRIORITIZATION

PNNL supported the prioritization of buildings to recruit by conducting a Building Energy Asset Score (AS) batch analysis with AS Preview using energy benchmarking performance data that had been reported to the City of Seattle. The Preview analysis was intended to help identify buildings with retuning or retrofit potentials with minimum inputs. Data for 2,600 Seattle buildings 11,000 to 170,000 SF were assessed. PNNL ran Preview AS analysis based on their floor area, vintage, and use type. (Building orientation was defaulted as north/south).

The results of the Preview analysis were sorted by building use types. Figure 9 shows an example of the comparison of actual office building EUI and the modeled EUI from Preview. Note that the modeled EUI is the medium EUI from the Preview regression models, which output an EUI range for each building. In Figure 9, Preview results are clustering around three EUI ranges because of the model defaults (construction types, geometry, and HVAC types) associated with building size and vintage.

Buildings were divided into four bins (see Figure 9) based on their improvement potential and if they should be targeted for TUA Program outreach:

1. *Buildings with good assets and operation* - Buildings with a low actual and low Preview EUI. Do not target for first-round TUA outreach since opportunity for energy savings may be limited.
2. *Target for re-tuning (tune-up)* - Buildings with high actual and low Preview EUI indicates less efficient building operation (or equipment malfunction) and/or less efficient building systems. Target for TUA outreach since tune-up opportunity may exist.

About Asset Score Preview

Building Energy Asset Score (Asset Score), developed by PNNL for the DOE, is a free on-line tool to help building owners and managers assess the efficiency of a commercial building's energy-related systems and encourage investment in cost-effective improvements. The Asset Score uses an EnergyPlus model to provide a quick assessment of building energy performance with minimum user inputs of building characteristics and identifies upgrade opportunities. Asset Score Preview allows users to enter as few as seven building characteristics to quickly assess their buildings before a more in-depth analysis. The characteristics are building name, location, year of construction/major renovation, conditioned floor area, use type, orientation, and number of floors.

Preview uses a regression model to calculate the possible range of the building's energy use based on stock simulations and uncertainty analysis and supports batch analyses of large numbers of buildings. The estimated energy use range is mapped to the Asset Score scale to provide users with an estimated score range. Building models can be converted from the Preview mode into a full Asset Score assessment mode by entering additional building characteristics.

Learn more at www.buildingenergyscore.energy.gov.

3. *Target for retrofit* - Buildings with high Preview EUI and low actual EUI indicates older or less efficient building systems and more system upgrade opportunities. Target for TUA outreach since building will need to tune-up per the mandate and may also have equipment or ECM opportunities.
4. *Target for retrofit and re-tuning* - Buildings with both high actual and Preview EUIs indicate opportunities for both tune-ups and retrofits. Target for TUA outreach since both opportunities may exist.

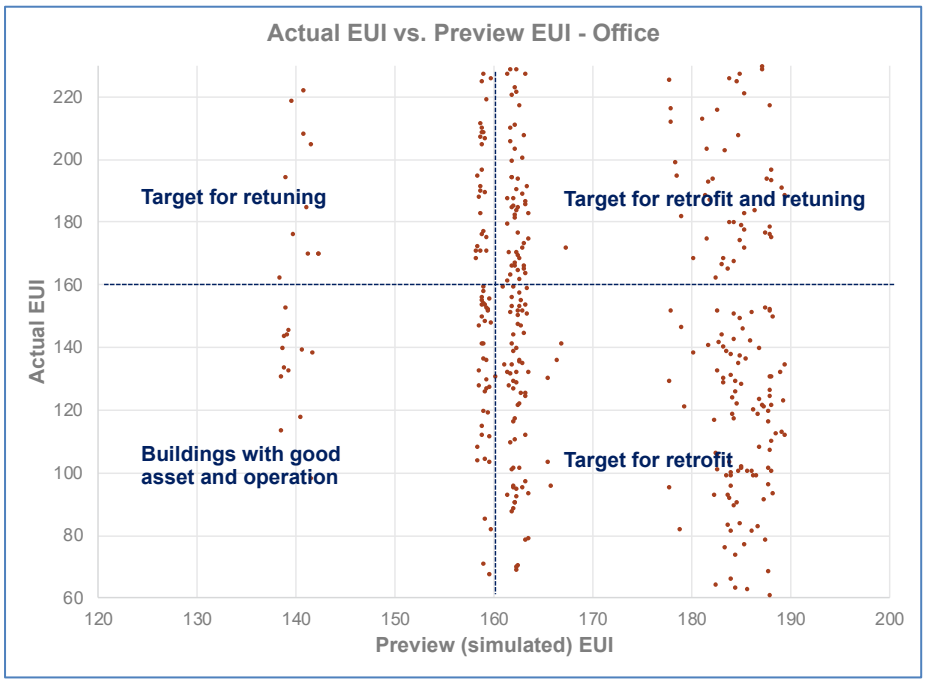

Figure 9. Example Asset Score Preview analysis of office buildings (total count 466).

Preview provides users an option to verify or edit the known building characteristics to override the defaults which significantly improves the accuracy of the predicted EUI range. Although the Seattle benchmarking performance data does not have building information beyond building use type, size, and vintage, the training of Tune-Up Specialists in the Asset Score made this additional data available for creating full Asset Scores and for the later analysis by PNNL described in Chapter 8.

The buildings prioritization using Preview resulted in a list of about 340 buildings 50,000 to 100,00 SF in size that were most likely to benefit from a tune-up and/or have retrofit opportunities (bins 2,3 and 4 as discussed above). OSE prioritized these buildings for its first round of outreach mailings described in the next section.

6.2 RECRUITMENT METHODS & IMPLEMENTATION

Broad outreach to enroll buildings used many different channels to build interest in the program as the application materials were being developed for release. The program also took advantage of the SBTU outreach to the larger buildings, by including content that "support to comply with tune-ups would be available for mid-sized buildings." This was because service providers and property managers usually work with a range of building sizes or a portfolio – rarely does an ownership firm only have large buildings.

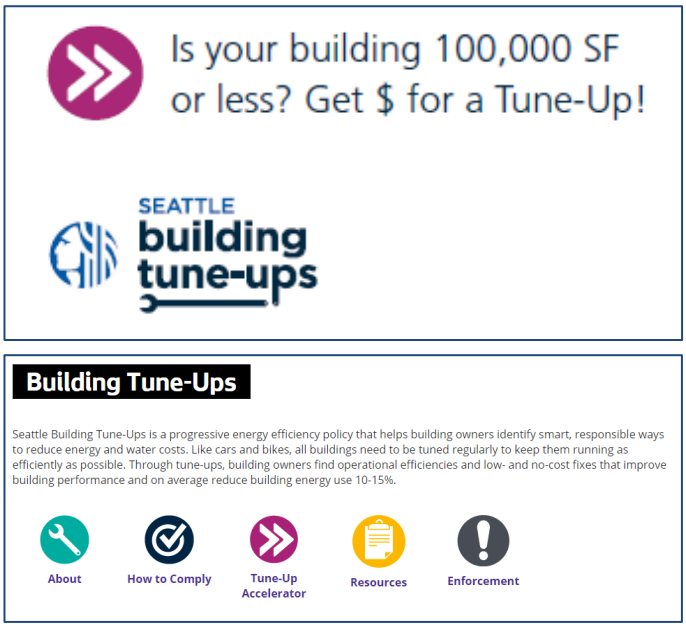

Figure 10: Screenshot of SBTU postcard text (above) and SBTU website (below) using TUA logo.

Other successful outreach content and methods included:

- On-line content for a TUA landing page on the SBTU website.
- Flyers and postcards to use at public input meetings held for the development of the SBTU Director's Rule to let the market know that the TUA Program was coming in 2017.
- Targeted content for partner and service provider newsletters, such as the Seattle 2030 District, and the Seattle International Facility Management Association (IFMA) chapter.

Once the TUA application materials were ready in August 2017, the TUA Program sent targeted pitches via letters and email to contacts for about 340 buildings 50,000 to 100,000 SF using the list of prioritized buildings developed through the Asset Score Preview analysis described in Section 6.1. Seattle's benchmarking and reporting database was used for building owner and manager contacts. Service providers that had signed up for trainings were emailed to inform them that enrollment was open. Each mailing had a clear "call to action" to sign-up by December 1, 2017. Once signed up, building owners were asked to sign an incentive agreement with SCL by February 28, 2018.

Additional mailings were sent later in the fall to the contacts of about 100 buildings identified in the pre-assessment as likely having "good assets and operation" that would still need to comply with SBTU in 2020 or 2021. This was done to ensure that OSE notified all buildings about the incentive opportunity because they would eventually have to comply with the mandate regardless of the building's current asset quality or operations. Sample mailings are available in the Appendix.

6.2.1 TARGETED OUTREACH TO NOT FOR PROFIT OWNED BUILDINGS

Targeted emails and phone calls were also made to contacts of about 25 nonprofits and/or community-based organizations located in areas identified by OSE's Equity and Environment Initiative as priority communities. This was important because this ownership is less likely to have prior contracts with service providers that would try to recruit them and are less likely to have a portfolio of larger buildings

that might be targeted through the early SBTU outreach. Furthermore, our experience is that nonprofits often do not have the staff capacity to apply for utility incentives.

6.3 LESSONS LEARNED: BUILDING RECRUITMENT

Overall, recruitment was successful due to the combination of direct outreach through letter and emails to building contacts and the early engagement of service providers. Having building manager contacts from the energy benchmarking database was especially helpful. Additionally, service providers actively worked to advertise the program with existing clients, and many recommended that their clients sign up. Several service providers created content about TUA and SBTU on their own websites or marketing materials and most had the details correct (if not, OSE contacted them to make corrections). A particularly strong example is PSR Mechanical's online *Seattle's Building Tune-Up Policies Ebook*. (PSR Mechanical 2018).

The outreach from the providers, in tandem with the "official" letter or email, as well as online content from the City of Seattle confirmed the requirements of the mandate with building owners, which was important for convincing them to participate. In short, the importance of engaging service providers, or "trade allies" as many utilities refer to them, is critical for early building owner engagement and participation in energy efficiency mandates.

7 Building Enrollment & Help Desk Support

Initial building owner response to the August 2017 mailings was slow, likely because of summer vacations; however, Tune-up Specialist interest was high as many sought to recruit their existing customers. The approaching TUA sign-up deadline increased interest among owners, however, and about 90 signed up by the December 1 deadline. Anecdotally, most building owners were motivated by the coming mandate and enrolled since they'd get an incentive for something they'd be required to do anyway. Several, however, cited interest in making their building more energy efficient and the additional technical support through UW IDL. More feedback from owners is available from the post-participation owner survey results in Chapter 11.

The deadline was extended two months and by the end of January 2018, 109 buildings were enrolled. While active recruitment and outreach stopped and enrollment was closed, a waitlist was offered. Knowing that attrition was likely, having more buildings sign-up helped ensure 100 participants would eventually complete and meet program goals. Ultimately owners of 122 buildings applied and were accepted and twenty dropped out before they started work, leaving 102 buildings that completed the TUA Program. This equates to approximately 6.9 million square feet of building space, excluding parking garages. Drop-outs were mainly attributed to building sale and management changes.

7.1 CHARACTERISTICS OF ENROLLED BUILDINGS

Table 5 summarizes the 102 enrolled buildings by size range and SBTU mandate reporting deadline. Eleven buildings less than 50,000 enrolled were not required to comply because the mandate only applies to building 50,000 SF and greater. Thus, their motivation for participation was something other than the mandate. Anecdotally, these "voluntary" building owners or managers reported being interested in the opportunity to get an incentive for the tune-up and were motivated by anticipated energy or operational cost savings. Of the eleven "not required," five are privately owned buildings, five are owned by City of Seattle and one is owned by King County. A handful of larger buildings just above 100,000 SF were approved to participate because they had nearby similar, smaller buildings enrolled.

Table 5: Enrolled Buildings and Seattle Building Tune-Ups Deadlines.

Building SF Range	SBTU Deadline	Number	Percent
> 100-110K SF	Oct 2019	5	4.9%
70-99K	Oct 2020	37	36.3%
50-69K	Oct 2021	49	48.0%
< 50K SF	Not Required	11	10.8%
Total		**102**	**100%**

A variety of building types, as defined by ENERGY STAR, enrolled as shown in Table 6. Office and K-12 schools were most common, comprising 50% of the buildings. Many of the "Other" buildings are city owned facilities such as public assembly spaces and fire stations.

Table 6: TUA Enrolled Building Types.

ENERGY STAR Building Type	Number	Percent
Office	28	27.5%
K-12 School	23	22.5%
Other	14	13.7%
College/University	11	10.8%
Hotel	7	6.9%
Mixed Use Property	6	5.9%
Medical Office	5	4.9%
Non-Refrigerated Warehouse	4	3.9%
Worship Facility	1	1.0%
Supermarket/Grocery Store	1	1.0%
Retail Store	1	1.0%
Distribution Center	1	1.0%
Total	**102**	**100%**

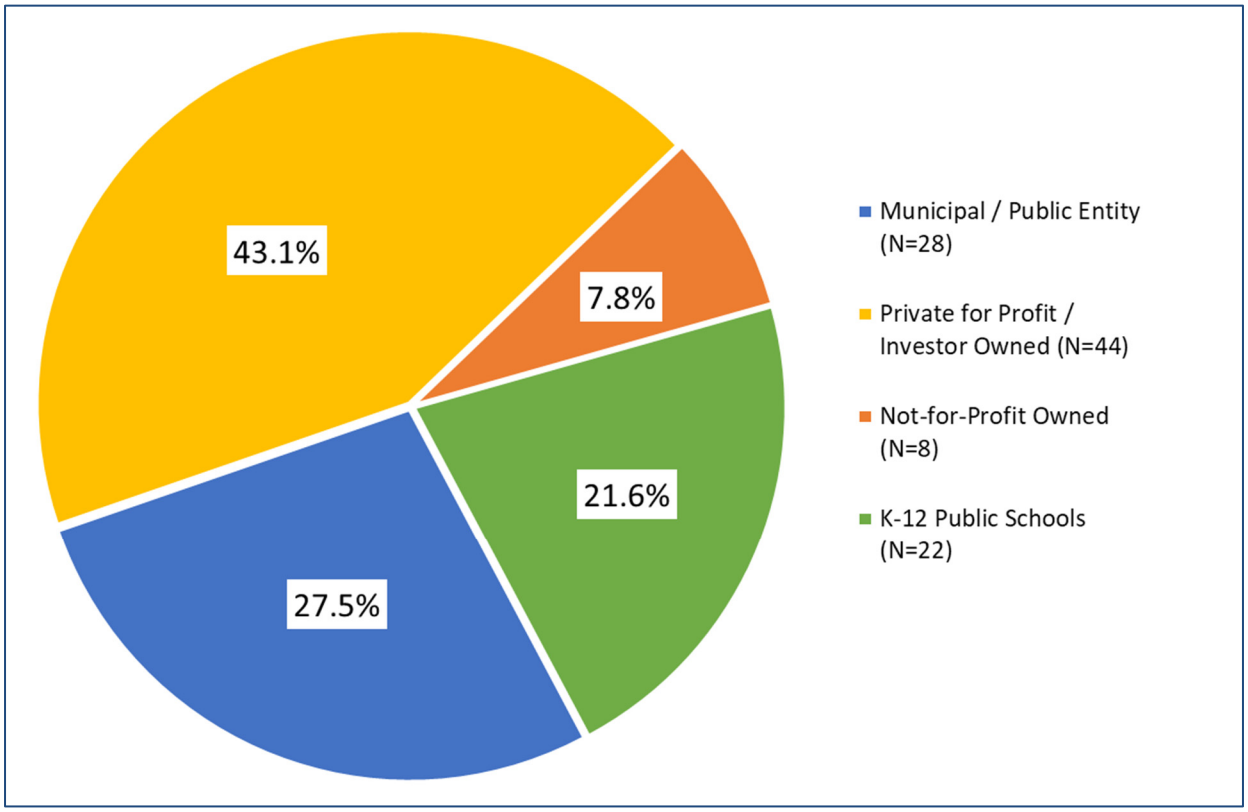

Figure 11: Ownership Types Enrolled in TUA

A mix of ownership types enrolled as shown in Figure 11. Of the "Municipal or Other Public Entity" category, 22 buildings were part of the Seattle Public School District, 14 buildings were owned by the City of Seattle, 11 buildings were owned by Seattle Colleges (State of Washington), two were owned by University of Washington Medical Center and one was owned by King County. The increased efforts noted in Chapter 6 to contact 25 not-for-profit owned buildings resulted in eight buildings enrolled of this ownership type.

7.2 TUA ENROLLED BUILDINGS VERSUS NOT ENROLLED

OSE completed an initial scan for differences between buildings 50,000 to 100,000 SF required to comply with SBTU that enrolled in the TUA Program versus buildings that *did not* enroll, to help inform future outreach to buildings that will still need to comply in 2020 or 2021. As of this report, the City had identified about 470 buildings in this size range. Of those, 385 (82%) did not enroll in the TUA Program and will therefore still need to comply with SBTU and 86 (18%) completed the TUA, thereby meeting the mandate requirements before the deadline.

Prior to the tune-up work, the 2017 median EUI values for TUA enrolled buildings was higher at 57.2 kBtu/sf versus not enrolled buildings at 53.4 kBtu/sf (excluding null values and high or low outliers). When ENERGY STAR scores of 1 or 100 were excluded, the median ENERGY STAR score was 63 for enrolled and 66 for unenrolled. A regression analysis, which is outside the scope of this work, would be necessary to determine if these differences are significant.

Enrollment based on major neighborhoods in the City was also reviewed and the distribution of buildings in both groups across neighborhoods was similar. Downtown, Greater Duwamish and the Northeast neighborhoods had the most buildings enrolled which corresponds with the location of nearly half the buildings in both groups.

Although somewhat difficult to assess, whether the City of Seattle had a building manager, facility and/or sustainability contact, in addition to an owner contact, appears to influence if the building was enrolled in TUA or not. Of the enrolled buildings, the City had a manager, facility or sustainability contact for about 87% versus 61% for buildings not enrolled. Contacts with greater familiarity and access to the building likely increases interest and ability to participate in early-adopter incentive programs. Based on this finding, outreach to the remaining "unenrolled" buildings that need to comply in 2020 or 2021 may be a challenge. Targeted outreach to buildings without known managers as well as efforts to increase management contact information is recommended, especially to not-for-profit buildings and those in underserved areas.

7.3 PROGRAM PARTICIPATION TRACKING & HELP DESK SUPPORT

The TUA Program tracked participant interactions whenever possible to provide insights how much help desk support was needed to run TUA or similar future programs. As noted earlier, a custom email was used (accelerator@seattle.gov) that was forwarded to a customer relationship management (CRM) tool called ZenDesk. Many owners and Tune-Up Specialists also called or emailed the program manager directly and those communications were tracked using an Excel spreadsheet. In general, the spreadsheet was preferred because the basic ZenDesk package that the program could afford did not have a straightforward means summarize email and call details.

The amount of assistance needed to enroll participants and then guide them, from application to completion of the tune-up was high – on average each building required about nine interactions with staff. About 28% of inquires (including buildings that did not enroll or later cancelled) were during the application phase. For the 102 that enrolled, most inquiries (about 25%) were during the assessment phase, which is not surprising as this is when many technical questions about the tune-up requirements were asked. About 19% of inquiries were related to the completion of the final Tune-Up Summary report. The most frequent other questions were about assistance with Portfolio Manager followed by questions about Building Renewal, Tune-Up Plus incentives and Asset Score support.

For TUA participants, inquiries from Tune-Up Specialists (service Providers or in-house facility staff) occurred somewhat more often (54%) than from the building owner or manager (44%), although this finding still reflects a lot of owner or manager involvement in the tune-up. Anecdotally, several manager questions were about how their in-house facilities' staff or existing mechanical contractors could support implementing the Tune-Up Specialist's findings, and about whether ECMs beyond the tune-up would be counted as part of the Basic Tune-Up per SF incentive or through a different SCL or PSE incentive program that needed a separate application. This demonstrated that managers were thinking strategically about how to get the most value (implementation cost vs energy cost savings) out of the program.

Lastly, inquiries to both OSE and SCL about the incentive offered by the TUA Program were high. SCL had predicted during the development phase that 100 TUA participants would be an increase of 20% to their custom incentive participation. While the workload for TUA administration was not unusual for a utility incentive program, this increase in customer volume necessitated a full-time temporary SCL staff dedicated to TUA incentive administration.

7.4 LESSONS LEARNED: ENROLLMENT & HELP DESK SUPPORT

The enrollment process and help desk support resulted in several lessons learned which are summarized below.

1. Building owners were primarily motivated by the incentive to get ahead of the mandate; however, it was important to reinforce deadlines to keep them on track with signing agreements so they wouldn't miss the incentive opportunity. This required a high level of assistance and follow-up.
2. Since the TUA Program was part of the SBTU mandate roll-out, many questions to the help desk, from both owners and service providers, were about specifics of compliance with the mandate whose answers could set precedent for the mandate roll-out. This required frequent and timely communication with the SBTU team to answer these questions, so that both the voluntary TUA and mandate had consistent responses. This issue necessitated that most of the help desk work be done within OSE by the TUA Manager who worked in the same office as the SBTU mandate staff. A more mature program that had a longer lead time to clarify rules and create detailed FAQs could consider using a third-party help desk.
3. As noted later, in the assessment phase results (Chapter 8), participants needed a lot of support with making updates and/or corrections to Portfolio Manager energy benchmarking data, which was a required part of the tune-up. SBTU concurrently found that additional Portfolio Manager help was needed for larger buildings. Since the opportunity to correct benchmarking errors and

improve baseline energy data accuracy is important for tracking energy savings, it's critical to have this support. Additional trainings on how to update benchmarking data may be warranted.

4. Although SCL was prepared, it's important to convey that entities wanting to offer incentive programs should be prepared for incentive administration costs with their supporting utility or funder.
5. For a program of TUA's size, a custom CRM for help desk interactions was not needed. A spreadsheet, such as Microsoft Excel, which can be shared and updated by partners was adequate. The more detailed Access database, which tracked contacts and milestones, such as application, agreement signing, etc. was extremely useful for keeping enrolled buildings on track towards completion.
6. Lastly, and most importantly, the increased efforts noted in Chapter 6 to contact not-for-profit owned buildings resulted in a few additional buildings enrolled of this ownership type. Incentive programs for early compliance should amplify outreach to engage non-profits because these organizations may often lack staff capacity or existing service provider relationships that support enrollment. Although the TUA Program didn't have specific messaging for non-profits, we view this as another area for enhanced communications and help desk support. Likewise, increased efforts to enroll and support buildings that are owned by or have tenants that serve low income populations, people of color, refugees and immigrant populations is critical to ensure that those that need the most support can benefit. Partnering early – at the outset of scope and design with equity focused teams is important to create programs that meet this need.

8 Implementation Results: Tune-Up Assessment Phase

8.1 OVERVIEW OF TUNE-UP ASSESSMENT PHASE RESULTS

Service providers were asked to complete the building assessment or "walkthrough" by September 2018 and share a copy with the program. By that deadline, 75% had completed the assessment and the Asset Score and staff continued outreach to Tune-Up Specialists if not complete. Delays were generally due to service providers negotiating scopes of work, owner budget availability and coordination/timing of the site visit. Service providers reported that buildings with tenants needed additional lead time to access those spaces.

Overall, the reviews of the assessments found that most Tune-Up Specialists understood the reporting form and the requirement, however, issues were found with the following areas:

- **Benchmarking Account Verification** – Tune-Up Specialists needed the most help accessing utility data to verify that the correct utility meters were being reported and help updating changes to space uses in Portfolio Manager. Although they understand the importance of benchmarking, our experience was that most Tune-Up Specialists (or building managers) do not use Portfolio Manager often and in some cases only to report annually to the City of Seattle for benchmarking. Therefore, they needed additional guidance to make more complex updates, such as correcting square footage or changing space uses. There was also confusion with providers as to whether it was their or the Portfolio Manager account holder's (typically the building owner or manager) responsibility to make corrections.
- **Technical Implementation Questions** – During the assessment phase, many providers sought guidance from OSE on specific use cases related to the buildings they were assessing. For example, more explanation of required verses voluntary actions, and questions about requirements to repair equipment versus replace equipment. This was expected and TUA worked closely with SBTU to address technical questions given that they could set a precedent for implementation.
- **Reporting Form Inconsistencies** – While most providers had the right level of detail OSE expected on the reporting form, some needed additional guidance on how to correctly and consistently fill it out. This was expected and seeing the drafts reports from the assessments helped improve the overall quality and consistency of the final reports.
- **Questions on the Asset Score** – see section 8.2 below.

8.2 ASSET SCORE DATA COLLECTION

PNNL partnered with the TUA Program to include the Asset Score tool in the TUA workforce trainings (Chapter 5) in hopes that it would help building owners and service providers to identify areas for energy retrofits and cost savings beyond the tune-up. As part of the curriculum, PNNL provided classroom and onsite trainings to walk the assessors through the Asset Score data collection form and web-based tool.

The Asset Score data collected by the Tune-Up Specialists were used for three purposes. First, PNNL compared the detailed data obtained from the TUA site visits to the results from the early screening

analysis to verify the effectiveness of Asset Score Preview. Second, the Asset Score provided basic building models for the customized deep-retrofit analysis performed by the UW IDL team through the Building Renewal path. Third, PNNL compared the energy efficiency measures generated by Asset Score with those recommended by Tune-Up Specialists to investigate Asset Score's relevance and value-added.

Service providers collected and entered building data into Asset Score to generate an Asset Score report that was then shared with the TUA Program Asset Score account. Many of the data inputs collected for the Tune-Up Summary reporting form were the same as needed for Asset Score, though additional inputs for floor type; envelope thermal property; counts of lighting lamps and fixtures; and building geometry were required for the Asset Score. Many assessors relied on the Asset Score defaults for difficult-to-obtain data, such as building envelope insulation values and fan efficiency.

Ninety buildings were entered and scored (a few of the TUA enrolled buildings were not suitable types for scoring and seven completed too late). Prior to reviewing for analysis, PNNL reviewed the accounts for errors and accuracy. A few issues were identified, and some service providers were asked to correct and resubmit reports. Issues included missing windows, incorrect floor area entered and/or overly complex building blocks (which are the 3-D representations of a building in Asset Score), abnormal lighting power density values (due to incorrect lighting counts), and errors entering HVAC systems.

After the score reports were received, Tune-Up Specialists were asked for feedback regarding their experience with using Asset Score. Positive comments were received regarding the ease of use of the tool and the efficiency measures identified in the reports. Some of the challenges included difficulty creating appropriate blocks for odd shaped buildings and campuses; HVAC systems that were not supported in Asset Score, such as radiators (which have since been added), and multi-zone air handler units with reheat and constant volume fans. Lastly, some users wanted to see actual cost savings values for the energy efficiency measures recommended in the Asset Score reports, instead of ranges of energy cost savings (low, medium, and high), which the tool does not provide.

8.3 TUNE-UP PLUS ADDITIONAL OUTREACH RECRUITMENT

As noted earlier, requiring an interaction with either Tune-Up Specialists or managers mid-way through the tune-up at the assessment phase, gave the TUA Program an opportunity to encourage work beyond the required measures, such as the Tune-Up Plus and Building Renewal paths. The enrollees with large portfolios, such as the school system and City owned buildings, were contacted via phone or email or met with in person.

To look for opportunities, OSE and SBC scanned completed the assessments for potential voluntary work beyond the tune-up that might be eligible for an incentive from SCL or PSE (for natural gas) and the local water partnership, when applicable. The utilities vetted the pitches and building owners received an email with options customized to their building (see box on next page). About 46 buildings were emailed incentive information and eleven were recruited for Building Renewal (described below). A few buildings

that were already participating in utility programs were excluded from the outreach because the program did not want to overwhelm them with marketing.

Example of Tune-Up Plus Email Pitches

LIGHTING INCENTIVES FROM CITY LIGHT

- **Lighting to Go** – Need replacement LED lamps or want to install with your staff? Get instant discounts on qualified lighting products with **savings of $2 to $6 per lamp**! **View list of participating distributors** >
- **Luminaire Level Lighting Controls (LLLCs)** – Combine LEDs, controls, connectivity and data with LLLCs for flexible lighting that can improve occupant comfort. Controls include occupancy sensing, daylighting, continuous dimming and more. **Savings of $50 per fixture! Learn more** >
- **Get Started!** Contact a Seattle City Light Energy Advisor and let them know you are a Tune-Up Accelerator customer: **206.684.3800 or SCLEnergyAdvisor@seattle.gov**.

HEATING & COOLING

- **Chillers, Heat Pumps, PTAC, PTHP, Economizers, Variable Speed Drives and More** – If your project will save kWh, chances are Seattle City Light can help with a standard or custom HVAC incentive. **View details** > or call **206.684.3800.**

WATER SAVINGS

- Need faucet aerators, new toilets, urinals or kitchen equipment? The Saving Water Partnership has great rebates on commercial high-efficiency equipment. **View details** >.

8.4 BUILDING RENEWAL PATH RECRUITMENT

Since just four building owners were pursing the Building Renewal path (all Level 3), the assessment phase was an opportunity to recruit more buildings for Building Renewal. To do this, eleven buildings with office space were reminded, as part of the Tune-Up Plus outreach, above that they'd already qualified for a free Spark retrofit analysis (see section 4.2 for description) by UW IDL and were sent a Spark report, if the Spark report had reasonable results (a positive net present value). Those buildings were sent an invitation from UW IDL to obtain additional technical guidance. This section explains how UW IDL used the Spark tool for screening.

Energy Benchmarking data provided to the City of Seattle, in conjunction with the Asset Score data collected by tune-up service providers offered an opportunity to screen buildings for recruitment into the Building Renewal path. To identify candidate buildings, project data was evaluated by OSE and the UW IDL technical team using the selection criteria (described below), and the Spark tool.

The data input requirements of Spark (building use-type, size, assemblies, and major system component vintages, and energy use data) significantly overlap with data collected for Asset Score making it an ideal

starting point for Spark tool data inputs. Additional data for the Spark tool include electrical and gas use, component vintages, and simplified market position financial data where applicable.

Of the 102 buildings enrolled in the TUA Program, 38 buildings were selected for Spark screening. This included the four buildings that already selected the Building Renewal path. Selection criteria focused on potential for high energy savings (site EUI greater than 55 kBtu/SF/yr), longevity (likely to remain standing for 15+ years), and for common building types deemed informative to the City of Seattle's future policy direction. Since the Spark tool was developed to provide retrofit guidance for existing office buildings, projects that contained greater than 50% office use were prioritized for screenings.

The workflow for Spark screenings was carried out in seven key steps: (1) collect building condition and system information from Asset Score rating tool (as submitted by service providers); (2) collect corresponding energy consumption (electricity, natural gas, etc.) data from the Seattle Energy Benchmarking data set; (4) enter building characteristics, system vintages, and energy data into the Spark tool; (5) Spark generates an optimized energy efficiency measure, scope of work, and estimated energy and cost savings using EnergyPlus and a measure costing table; (6) Spark generates a business case for the retrofit; and (7) If the screening generated a positive net present value (NPV), a Spark Report was packaged and submitted to the TUA contact (building owner and/or manager) with an offer for more in-depth consultation.

Through this workflow, a total of 38 Level 1 Spark reports were generated. Eleven reports indicated a positive net present value (NPV) and were emailed to the TUA contacts with the incentive pitches described earlier.

8.5 LESSONS LEARNED: ASSESSMENT PHASE

Although most providers kept on track, a key take-away from the assessment Phase was the importance of on-going outreach to service providers. On-going outreach was critical to ensure that required documentation was sent to the TUA Program. In addition to the timeline on building owner agreements, the TUA Program created a "Tune-Up Accelerator Program Required Documentation & Timeline" document specifically for service providers to remind them of deadlines (a sample is available in the Appendix). The staff also emailed service providers every couple of months, or in advance of a reporting deadline to remind them of due dates and share important tips and new resources as they were developed either by TUA or the SBTU program (a sample is available in the Appendix). Service providers were also important to include to support additional recruitment into the Tune-Up Plus and Building Renewal paths.

The additional Tune-Up Plus and Building Renewal recruitment netted one additional building that enrolled in the Building Renewal at Level 3 (full analysis). It is not clearly known if the Tune-Up Plus outreach drove more ECM participation or if building owners had already determined their interest via the tune-up itself or another building need. Anecdotal feedback from Tune-Up Specialists was that after the assessment, most building owners were focused on what they needed to correct to meet the tune-up requirement, whether that was finding budget or scheduling staff or a mechanicals contractor to make the correction. Interestingly, the post-participation survey results described in section 11.4 indicated that the tune-up was a motivator. It is likely that building owners just needed more time to plan and consider next steps.

9 Implementation Results: Action Phase

After each of the 102 completed TUA Summary Reports were approved, OSE forwarded them to SBC to upload the required measures (N=20) and voluntary tune-up measures (N=19) found and their implementation status to the TUA Database. The implementation status of all required measures was always 'complete' because these measures were required to meet the SBTU alternative compliance and for SCL Basic Tune-Up incentive eligibility. The average total number of actions implemented across the 102 buildings was 5.4, with 4.2 required and 1.3 voluntary. (For detailed descriptions of each assessment element, refer to Table 2.)

9.1 MEASURE IMPLEMENTATION TRACKING: BASIC TUNE-UP RESULTS

Of the 102 participating buildings, only eight had no required tune-up measures found, but four of those had one voluntary measure found. On average, the buildings had at least four required and a little more than one voluntary measure implemented. Table 7 lists the prevalence of required tune-up measures found and corrected by assessment element.

Table 7: Frequency of Required Tune-Up Elements Found and Corrected in TUA Buildings (N=102).

Tune-Up Assessment Element (Required Implementation)	Found & Corrected	Frequency
G1: HVAC schedules	59	58%
G2: HVAC set points	50	49%
G6: HVAC controls	42	41%
G5: HVAC sensors calibration	41	40%
G17: Valve & damper operation	37	36%
G11: Grille, coil, duct maintenance	35	34%
G3: HVAC reset schedules	29	28%
G12: Filter & strainer maintenance	26	25%
G14: Motor, fan, pump, belts, etc. maintenance	25	25%
G7: Simultaneous heating & cooling	24	24%
G4: Optimal Stop/Start	19	19%
H3: Lighting control schedules	11	11%
I1: DHW set points	11	11%
J9: Plumbing fixtures maintenance	8	8%
I2: Circ pump controls	5	5%
J7: Irrigation system maintenance	1	1%
J3: Cooling tower water leaks	1	1%
J5: Irrigation rain sensors	1	1%
J1: Cooling tower conductivity meter calibration	1	1%
J6: Water feature schedules	1	1%

The top ten required tune-up deficiencies found and corrected were all in HVAC systems, with schedule (G1) and set point (G2) adjustments most prevalent in at least half of the buildings. Tune-Up Specialists anecdotally reported correcting problems like these at the time of the assessment. Problems with controls (G6), sensors (G5) and valve/damper operations (G17) were found in more than a third of buildings (36-41%). These problems often required a work order or service provider familiar with the controls system (for example, Siemens or Alerton).

The low incidence of cooling tower leaks (J3) and meter calibration (J1) was expected because only a handful of buildings reported having a cooling tower. Similarly, irrigation issues (J7 and J5) and water feature schedules (J6) were rarely found because few buildings had irrigated landscaping.

9.2 MEASURE IMPLEMENTATION TRACKING: TUNE-UP PLUS RESULTS

The TUA Program also tracked all tune-up voluntary measures found deficient and whether the measure was corrected or planned for implementation. Fifty-nine percent (59%) of TUA Building Summary Reports indicated that at least one voluntary action was being implemented or planned. Buildings that planned/implemented one or more HVAC or Lighting voluntary measures were categorized as "Tune-Up Plus," although only a subset of these buildings completed a measure that qualified for a utility incentive beyond the Basic Tune-Up incentive. Table 8 lists the prevalence of measures found and corrected (or planned) for the voluntary tune-up elements.

Table 8: Frequency of Voluntary Tune-Up Elements Found and Corrected in TUA Buildings (N=102).

Tune-Up Assessment Element (Voluntary Implementation)	Found	Frequency	Corrected (or Planned)	Frequency
H4: Inefficient lighting equipment	65	64%	20	20%
G18: HVAC equipment service life	50	49%	10	10%
H2: Lighting sensors	37	36%	17	17%
J12: Water flow fixtures	35	34%	10	10%
G9: Inappropriate ventilation rates	34	33%	11	11%
G15: Motor, fan, pump, belts, etc. repairs	26	25%	12	12%
K1: Envelope penetrations	25	25%	9	9%
G16: Duct & pipe insulation issues	25	25%	5	5%
H1: Lighting levels excessively high	24	24%	7	7%
G8: Air balancing issues	20	20%	3	3%
K2: Damaged ductwork	16	16%	4	4%
G13: Filter & strainer maintenance protocols	15	15%	9	9%
G10: Rogue zones	13	13%	3	3%
J8: Irrigation system repairs	3	3%	3	3%
J11: Hands free sensor-activated plumbing	4	4%	2	2%
J10: Plumbing fixtures repairs	3	3%	2	2%
J4: Irrigation schedules	2	2%	1	1%
J2: Cooling tower repairs	1	1%	1	1%
K3: Attic insulation issues	0	0%	0	0%

The top ten voluntary tune-up deficiencies found were in a mix of categories with inefficient lighting (H4), HVAC equipment service life (G18) and lighting sensors (H2) most prevalent at 64%, 49% and 36%, respectively. Of those, about 20% of building owners implemented or planned the inefficient lighting corrections (mainly updates to LED) and 17% indicated they were going to install lighting sensors. The most common lighting upgrade was to LED, typically from older fluorescent or incandescent. Most LED and occupancy sensor installations can qualify for SCL incentives (see Table 9). Only 10% implemented or planned for new HVAC equipment, likely due to greater equipment and implementation costs.

The next seven voluntary tune-up elements were found in 20% to 34% of the buildings but implemented in 10% or fewer buildings. These remaining voluntary measures represent opportunities for future utility incentive outreach or deep retrofit programs.

In-house Tune-Up Specialists for the Seattle Public Schools and those hired for the City of Seattle owned buildings noted that they went "beyond the tune-up" in other ways, such as reviewing "all duplicate equipment" (instead of a sample that was allowed) and by reviewing non-required spaces such as kitchen areas. Although difficult to incentivize and quantify energy savings, this is an area for education and outreach to Tune-Up Specialists.

9.2.1 TUNE-UP PLUS WITH SCL INCENTIVE PROGRAM PARTICIPATION

Although it is difficult to determine if the tune-up or another motivator, such as a tenant improvement, encouraged building owners to participate in an incentive qualifying ECM beyond the tune-up, the Program tracked SCL ECM participation for TUA buildings.

As of this report, 19 buildings completed an SCL ECM incentive program or had one underway for a total estimated kWh savings of 1.24 million. The projects, listed by largest to smallest estimated kWh savings, are summarized in Table 9 on the next page. An additional six buildings have reported planning or having a bid for work that was likely to be eligible for an incentive. Lighting conversion to LED is by far the most common project type, but some HVAC projects have been pursued as well.

Table 9: TUA "Tune-Up Plus" ECM Projects Completed or Underway.

Building Area (SF x 1000)	Building Type	Project Description	Complete/In Progress	Estimated Savings (kWh)
31-40	Other	HVAC - Fume Hood Replacements	In Progress	186,247
91-100	Hotel	Enrolled in CBTU (RCx Program)	In Progress	171,903
71-80	Office	HVAC Controls	Complete	170,307
41-50	Office	LED Lighting	Complete	164,001
51-60	K-12 School	LED Lighting	Complete	105,049
51-60	Other	Garage fan VFDs and controls	Complete	101,929
51-60	Office	HVAC Controls Upgrade	Complete	60,198
71-80	K-12 School	LED Lighting	Complete	56,535
81-90	Hotel	Common Area LED Lighting	In Progress	53,376
61-70	Other	HVAC – Variable Speed Drives	Complete	49,893
91-100	Non-Refrig. Warehouse	LED Lighting & Fixture Removal	In Progress	26,338
71-80	Office	Office & Common Area - LED Lighting	Complete	23,235
91-100	Mixed Use Property	Two Projects: VRF HVAC and LED Lighting & Sensors	In Progress	19,350
21-30	Office	LED Lighting	Complete	11,914
81-90	Other	Exterior LED Lighting	Complete	11,156
51-60	K-12 School	LED Lighting	Complete	10,943
51-60	K-12 School	LED Lighting & Exterior Pole Lights	Complete	6,048
91-100	K-12 School	LED Lighting, Lamps & Ballasts	Complete	5,026
61-70	Hotel	HVAC VRF Air to Air Heat Pump	In Progress	3,535
			Total	**1,236,983**

9.3 CORRECTIVE ACTION IMPLEMENTATION BY BUILDING TYPE

The TUA Program presented an opportunity for OSE to understand the total number of corrective actions per building and if certain building types tended to have different frequencies of implemented corrective actions. Table 10 summarizes the results and shows that different building types had different frequencies of corrected actions.

For example, of building types with more than one building participating, K-12 schools had the greatest number of required and voluntary actions implemented with an average of 7.7. This was followed by hotels (7.3 actions) and medical officed (5.6). Somewhat surprisingly, office buildings had 4.6 actions found and implemented, which is less than the average of 5.4 for all building. For the non-refrigerated

warehouses, some Tune-Up Specialists anecdotally reported that the absence of building automation systems or DDCs resulted in few opportunities to tune HVAC systems.

Table 10: Corrected Tune-Up Actions by TUA Enrolled Building Types (N=102).

Building Type	Number of Buildings	Number of Actions Corrected		Average # of Actions Corrected		
		Required	Voluntary	Required	Voluntary	TOTAL
K-12 School	23	127	49	5.5	2.1	**7.7**
Hotel	7	39	12	5.6	1.7	**7.3**
Retail Store	1	6	0	6	0	**6**
Medical Office	5	25	3	5	0.6	**5.6**
Other	14	54	21	3.9	1.5	**5.4**
Worship Facility	1	4	1	4	1	**5**
Office	28	112	18	4	0.6	**4.6**
Mixed Use Property	6	18	7	3	1.2	**4.2**
Distribution Center	1	3	1	3	1	**4**
College/University	11	29	11	2.6	1	**3.6**
Non-Ref. Warehouse	4	8	5	2	1.3	**3.3**
Supermarket/Grocery	1	2	0	2	0	**2**
Total	**102**	**427**	**128**	**4.2**	**1.3**	**5.4**

9.4 BUILDING AUTOMATION SYSTEM (BAS) & CONTROLS DEFICIENCIES

As noted earlier in this chapter, the frequency of HVAC control deficiencies (Table 7) is interesting because it was unknown at the outset of the TUA Program the extent to which buildings less than 100,000 SF in Seattle even had controls or a building automation system (BAS). The results summarized in Figure 12 indicate that some type of BAS is common with nearly 82% of buildings reporting either a Direct Digital Control (DDC) (69.6%), DDC and pneumatic (9.8%) or pneumatic only (2.3%). Only 18 buildings (17.7%) had no BAS.

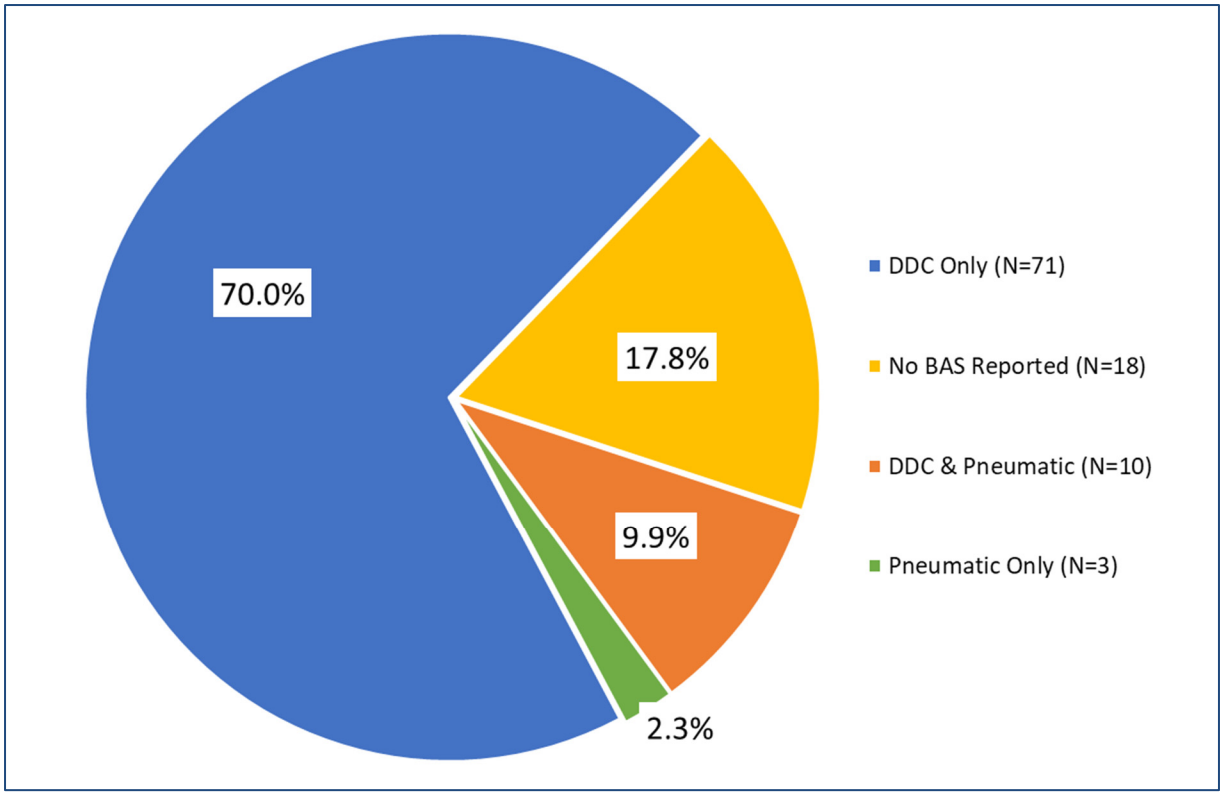

Figure 12: Frequency of BAS in TUA Enrolled Buildings

Of note, several Tune-Up Specialists reported that TUA buildings had major controls issues, such as outdated software or the system running on an old computer that needed a costly fix. One Tune-Up Specialist commented that saying "controls were 'automated' was a stretch" for many buildings. Sometimes lack of documentation about the sequencing and/or facility staff with limited training on how to run the DDC system was a problem. Control issues are a major barrier to an effective and low-cost building tune-up. These observations and the high prevalence of major control problems (beyond tuning) in the mid-size market suggests that the SBTU program should ask for detail about the condition of the control system and clarify the meaning of controls vs. automation. It further suggests the opportunity for controls incentives and building operator training in this market.

9.5 HVAC & LIGHTING SCHEDULING CHANGES

To get more definition on the extent of HVAC and Lighting scheduling adjustments (elements G1 and H3), SCL required their Operating Hours Worksheet (see Appendix for example), which provided a weighted average for the building, to be filled out as an incentive requirement. This is because scheduling changes are not always adjusted or adjustable for the entire building. For example, a primarily warehouse building reported that they reduced the HVAC operating hours by 38% in the small office supporting the warehouse space, but this space was estimated as using only 5% of the building energy. Therefore, the weighted operating hours adjustment for the building was only 1.6%.

The results from these forms were uploaded to the TUA Database and are presented in Table 11. For HVAC, about 58% of buildings reduced their HVAC operating hours, but when weighted to the entire

building, the average adjustment was 16.9%. For Lighting, 20.5% of buildings reduced their lighting operating hours, but when weighted to the entire building, the average adjustment was 13.6%. Anecdotally, many providers reported buildings without any controls to adjust lighting schedules. These findings suggest that SBTU should consider requiring this level of detail for buildings reporting for the mandate and that lighting controls are an ECM opportunity in this market.

Table 11: HVAC & Lighting Scheduling Reductions in TUA Buildings (N=102).

Scheduling Change (G1 and H3)?	Number of Buildings	Percent	Avg Operating Hours Reduced	Weighted Avg for Entire Building
No - HVAC Scheduling Unchanged	43	42.2%	NA	**NA**
Yes - HVAC Hours Reduced	59	57.8%	847	**16.9%**
No - Lighting Scheduling Unchanged	81	79.4%	NA	**NA**
Yes - Lighting Hours Reduced	21	20.5%	504	**13.6%**

9.6 BUILDING RENEWAL RESULTS

As noted earlier, eleven mainly office buildings were sent Level 1 Spark reports as part of the Building Renewal recruitment outreach. No building owners chose to participate in the Level 2 offering so there are no Level 2 findings. The Level 3 custom deep energy retrofit analysis was conducted by the UW IDL technical team on five buildings in close collaboration with the building ownership and operations team. It included an on-site building walk-though, the creation of a calibrated energy model, and the development of energy-efficiency measures that were aligned with the owners self-reported needs and their long-term capital plan. The section details the process and findings from the Level 1 and Level 3 Building Renewal paths.

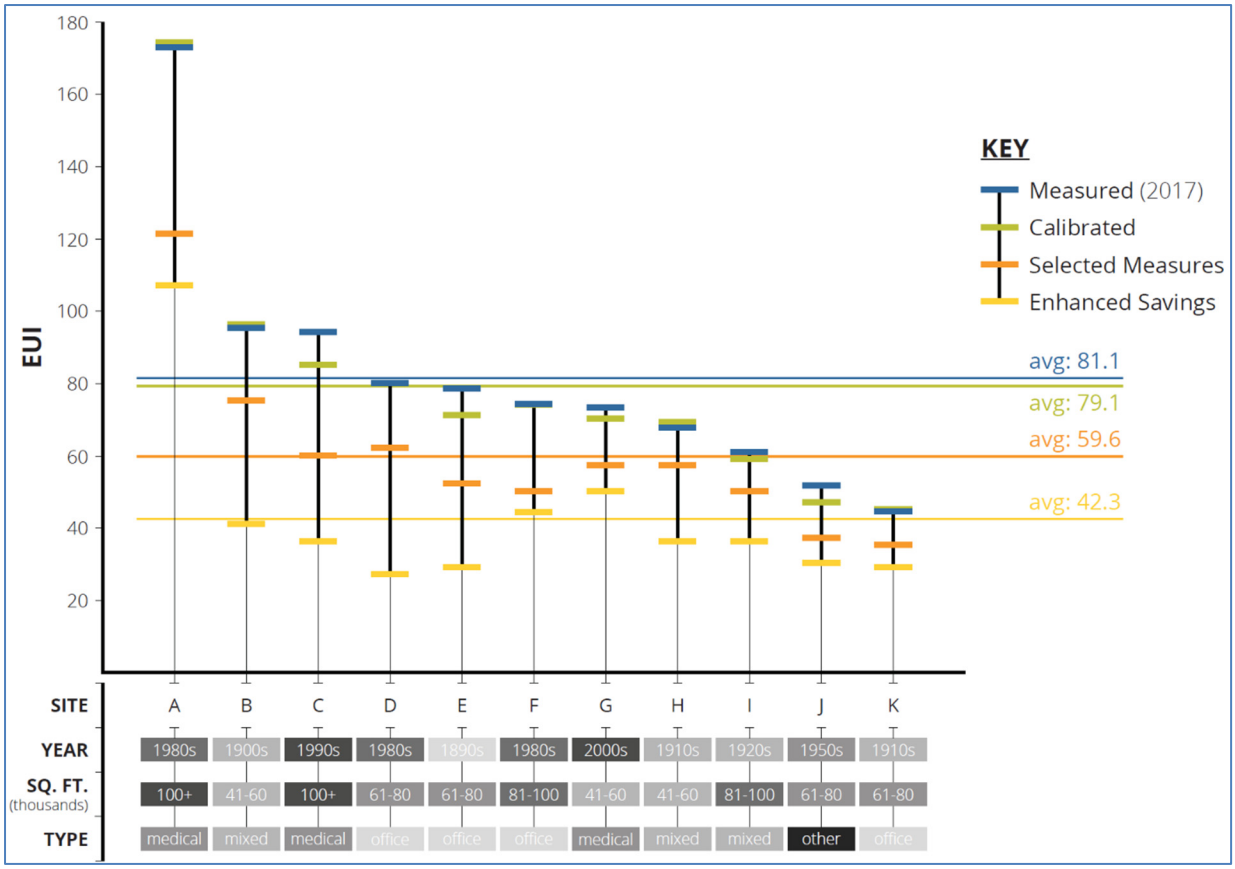

Figure 13: Level 1 baseline energy consumption with projected savings.

9.6.1 LEVEL 1 FINDINGS

In total, thirty-eight (38) Level 1 reports were generated, with any reports indicating a positive net present value (NPV) issued to the building owner and service provider. A total of eleven Level 1 projects met this threshold. A description of the baseline/actual energy consumption, the cost optimized savings and energy-optimized (enhanced) savings of Level 1 projects is detailed in Figure 13. “Selected Measures” were auto generated by Spark to meet a savings target of at least 35% at the lowest possible total cost. “Enhanced Savings” measures were auto generated by Spark to maximize total energy savings.

The completed Asset Score reports submitted by the service providers, combined with readily available information about the property, enabled relatively quick generation of Spark simulations and reports. Given the nature of the Spark tool as a financial and technical analysis tool with predetermined savings targets (35% and 50% respectively), most of the energy savings results fell in these ranges. Office buildings built between the 1970s and 1990s showed the greatest total potential savings as well as the highest percentage of savings. The potential greenhouse gas (GHG) emissions reduction was primarily dependent on whether the building used natural gas as a heating fuel. In the cases where Level 1 Spark reports were used as a starting point for Level 3 detailed analysis, the Spark tool provided measure recommendations (lighting upgrades, pump replacements, etc.) like those ultimately selected in the custom process.

Level 1 reports, though useful as a screening tool, did not generally result in direct engagement on Building Renewal projects. Anecdotally, there was feedback that simply complying with the Tune-Up mandate was a primary concern, and that going well beyond the current tune-up requirement was not an immediate priority. It is unknown if the building owners have used the Spark reports for any future planning, or whether it provided education or influence on the economic or technical potential of future building investments. Evaluating this impact via survey or other outreach method was beyond the scope of this project.

9.6.2 LEVEL 3 FINDINGS

The five Level 3 buildings were all accepted for participation because the owner proactively indicated interest in doing a deep energy retrofit, and the type and vintage was representative of a significant portion of the Seattle building stock. This process included a conventional building audit, walk-though, and the development of a manually produced calibrated baseline energy model using the Open Studio interface to Energy Plus. Next, several bundles of measures of varying depths were produced that could be implemented over time, along with an on-site renewables plan for net-zero energy and/or carbon neutral operations. This data was presented to building owners or managers and the Tune-Up Specialist via a detailed report. One of the Level 3 projects was developed as a case study (see Appendix) and will be shared with building owners for recruitment into potential future programs, such as the Retrofit Accelerator Pilot discussed in the conclusions chapter of this report.

The Level 3 analysis targeted an initial first-year average of 20% direct reduction in energy consumption (gas and electricity) from participating buildings and presented implementation packages that could result in energy savings upwards to 50% or more if implemented overtime (typically 10-15 years). Figure 14 and Table 12 summarize the energy savings for each building. These savings, if implemented, could be verified via required annual energy consumption disclosure data, collected through the utility meter. Recommended measures were documented, along with expected future projected building EUI estimates for up to four implementation packages.

Implementation packages were generally built around the following structure:

- **Measure Package 1 (O & M)** focuses on operation and maintenance measures already identified, and a DDC expansion or complete DDC retrofit where needed.
- **Measure Package 2 (Load Reduction:)** Retrofit focusing on lighting, envelope, and plug load management.
- **Measure Package 3 (Mechanical System Improvements):** Improves the performance of selected or out of date HVAC systems.
- **Measure Package 4 (Electrification/Operational Carbon Reduction):** replaces the gas-fired heating (space and/or DHW) and or process steam equipment with a heat-pump-based system for heating and cooling.
- **Renewables:** Provides a concept level plan for sizing and locating on-site photovoltaic equipment and/or solar-thermal water heating systems sized to deliver net-zero energy operation.

Five (5) detailed Level 3 projects were completed and are anonymized for this report:

- **Medical Office Building ("A")** – The medical office building analyzed is approximately 100,000 square feet and about 45 years old. Excluding renewables, an energy savings potential of 49% was identified with all measures included.
- **Mixed Use Office ("L")** – The mixed-use financial office building analyzed is approximately 40,000 square feet and about 25 years old. Excluding renewables, an energy savings potential of 54% was identified with all measures included. (Note: A case study for this building, "Verity Credit Union" is available in the Appendix.)
- **Hotel ("M")** – The hotel building analyzed consists of 2 wings; one that is about 60 years old and has approximately 40 guest rooms, and a newer addition that is about 30 years old and has approximately 60 guest rooms. Including savings associated with an on-site swimming pool, a savings potential of 50% was identified.
- **K-12 School ("N")** – The first K-12 school building analyzed is approximately 60,000 square feet and about 70 years old, though several renovations have been completed. Excluding renewables, an energy savings potential of 64% was identified with all measures included.
- **K-12 School ("O")** – The second K-12 school building analyzed is approximately 75,000 square feet and is originally about 100 years old, though a major addition was completed in the 1950s. Excluding renewables, an energy savings potential of 65% was identified with all measures included.

The energy efficiency packages were structured to deliver synergistic, cumulative savings with the intent of leveraging load reduction and expanded building controls capabilities to enable smaller and/or more energy efficient DHW, heating, cooling, and ventilation systems. Furthermore, measures were coordinated with capital investments that were in-progress, planned, or would be part of end-of-life equipment replacement. The complete packages typically represented investments over a 10 to 15-year timeframe corresponding with the owners' long-term capital plan for the building.

For the five projects where the owners were provided with detailed evaluation and analysis, the identified energy savings potential was significant. These are detailed in Table 12., but generally averaged about 16% for operations and controls upgrades and well over 50% for full implementation of the complete package recommendations.

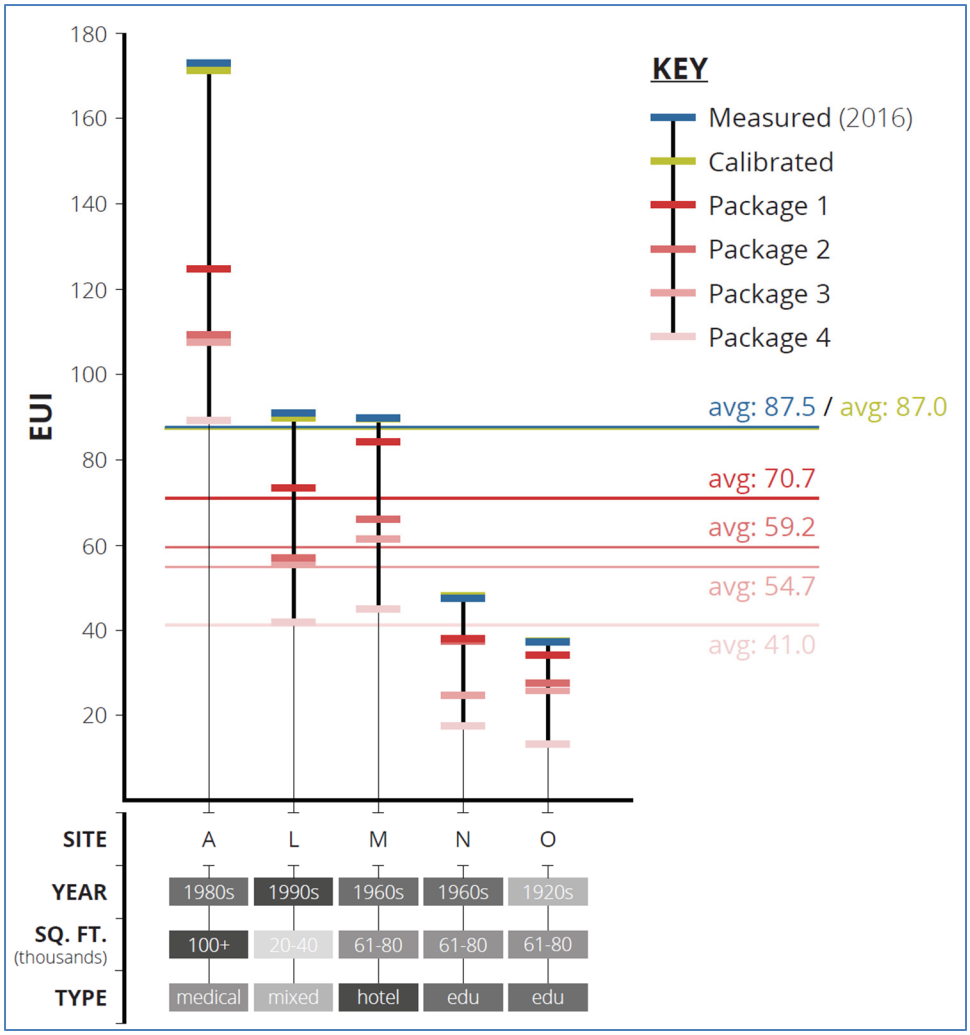

Figure 14: Level 3 baseline energy consumption with projected savings.

Table 12: Annual Projected EUI and Savings for Level 3 Building Renewal.

Building Area (SF x 1000)	TUA Building Name	Seattle Benchmark Site EUI (kBtu/SF/yr)	Package 1		Package 2		Package 3		Package 4	
			EUI	% Savings	EUI	% Savings	EUI	% Savings	EUI	% Savings
100+	"A"	173	124	28%	109	37%	107	38%	89	49%
20-40	"L"	91	73	20%	57	37%	55	39%	42	54%
61-80	"M"	90	84	6%	66	26%	61	32%	45	50%
61-80	"N"	47	38	19%	37	21%	24	49%	17	64%
61-80	"O"	37	34	9%	27	27%	26	30%	13	65%
Average EUI / % Savings			**71**	**16%**	**59**	**30%**	**55**	**38%**	**41**	**56%**

The “Package 4” measures converted most of the buildings from fossil fuel sources to all-electric heat pumps for space heating and domestic hot water. These measures tended to have the greatest impact on greenhouse gas emissions reductions, however, emissions reductions were found for nearly all packages and buildings. As indicated in Table 13. below, all but one building (Hotel “M”) was provided with a technical pathway to net-zero carbon operations by transitioning to all-electric operations. Furthermore, all but the hotel was determined to have enough site area for solar photovoltaics to meet net annual energy use.

Table 13: Annual Projected Direct Greenhouse Gas Emissions Reduction (GHG).

Building Area (SF x 1000)	TUA Building Name	Type	Seattle Benchmark Emissions (MT CO2e)	Package 1 (MT CO2e)	Package 2 (MT CO2e)	Package 3 (MT CO2e)	Package 4 (MT CO2e)
100+	"A"	Medical	454	138	275	272	454
20-40	"L"	Mixed-Use	88	1	31	38	88
61-80	"M"	Hotel	205	0	65	65	125
61-80	"N"	Education	120	31	24	72	120
61-80	"O"	Education	113	2	25	30	113
						Total Emissions (MT CO2e)	**900**

*Note: Using US EPA’s direct emissions factor for natural gas (0.0053 MT CO2/therm). **https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references**. Indirect electric emissions, which are nearly carbon neutral for City Light due to 100% hydroelectric power with only occasional offsets for peak purchases were not included in the UW IDL analysis.*

Building owners (or usually their manager representative) were, when engaged, very receptive to Level 3 assistance and provided significant collaboration and feedback to identify specific energy efficiency measures and their potential implementation. These building owners typically were proactively interested in deeper levels of energy savings and had previous experience working with the City or the Utilities on energy retrofit projects. Of the five Level 3 projects completed, all of them have implemented some of the capital measures recommended within the project period, except for the 4-story hotel that will likely be torn down in the next five years and replaced with a larger building. This change was due to the owner’s reaction to a recent zoning change which “up-zoned” the neighborhood to 40 stories.

Given the anticipated timeframe of Strategic Energy Plan implementation, there is insufficient time within the DOE award period to comprehensively evaluate direct energy savings from the Building Renewal component. However, OSE and UW IDL will track direct savings with Portfolio Manager on an ongoing basis. Further, by delivering direct technical assistance and documenting project specific services delivered, outcomes, and lessons learned, using broadly available tools and best practices, replicable implementation guidelines will be developed for jurisdictions with benchmarking information who aim to use energy transparency data to take targeted action for carbon emissions reductions in future projects aimed at the existing commercial building market.

10 Energy & GHG Emissions Savings

10.1 MEASUREMENT AND VERIFICATION (M&V) ON SAMPLE BUILDINGS

The Smart Buildings Center (SBC) conducted Measurement and Verification (M&V) services on 10% of the participating building population (10 buildings), which included onsite verification and data analysis. The goal of the site visits and analysis was to evaluate the energy and cost savings resulting from energy measures implemented. This analysis can help inform OSE's ongoing administration of SBTU as well as give the participating building's operational staff additional knowledge about the energy-consumption characteristics of their facilities, with the potential of further improved operations and maintenance (O&M). The following section summarizes the methodology and analytical framing of the analysis and summarizes the findings. The complete M&V Report is available in the Appendix and provides detailed findings for each building.

Figure 15: SBC staff and building facility manager retrieve a HOBO UX90 motor runtime logger used to verify reduced parking garage exhaust fan schedule. It was confirmed.

The M&V analysis included sample selection, site visits and energy savings analysis. For each building in the sample, the SBC conducted a whole building analysis, which included onsite verification and functional testing of a sample of the building equipment using temperature and power loggers to document operating conditions of equipment within the scope of the tune-up and energy conservation measures (ECM's) coupled with a comparison of pre- and post-implementation non-normalized and weather normalized energy use.

The SBC team worked with OSE to identify a set of criteria that would adequately cover the breadth of unique building types, the diverse service provider pool (Tune-Up Specialists) and other characteristics that might shape or influence the building performance and subsequent energy savings. The following methodology was used for selecting the sub-set of buildings for M&V:

- **Include a diverse set of primary use building types.**[2] The team assessed the spread of building types in the population and selected the following types:
    - Mixed Use (1)

[2] Primary use type was obtained from the building's ENERGY STAR Portfolio Manager benchmarking report. For buildings with more than one space use, EPA determines use type based on the space that is greater than 50% of the building. If no one space is greater than 50%, the building is classified as mixed use.

    - Hotel (1)
    - K-12 School (2)
    - Office (3)
    - Medical Office (1)
    - College/University (1)
    - Non-Refrigerated Warehouse (1)
- **Select buildings where corrective actions were found and implemented.**
- **Include a diverse group of service providers in the sample set, such as both in-house Tune-Up Specialists and those from energy efficiency firms, and people with different qualifications.**
- **Include buildings with and without building automation systems (BAS)**

For each building in the sample, the SBC conducted a preliminary interview with the building representatives and the Tune Up Specialists who completed the initial assessment and signed off on the final TUA Summary Report to the City of Seattle. SBC staff then visited each building at least once to provide visual verification and gather contextual information that might be helpful in the analysis. The site visit was largely guided by the completed building's TUA Summary Report (and other documents as available such as the Asset Score, SCL Operating Hours worksheet, and any documentation obtained from Tune Up Specialists) and included the following tasks:

- The SBC team visually observed corrective actions to better understand persistence of the Tune-Up measures (e.g., repairs to dampers, equipment, control settings, etc.).
- Installed data loggers or leveraged BAS trend data to verify that any corrective actions requiring control changes were still in place (set points, scheduling, resets, etc.) for at least each major HVAC system component; for example, one VAV multiple zone air-handler plus one VAV terminal box. In instances where an equipment sampling methodology was applied to the verification, the SBC requested that the Tune-Up Specialist identify at least one piece of equipment in each sample group that was included in the tune-up services.

10.1.1 MEASUREMENT & VERIFICATION (M&V) ENERGY CONSUMPTION ANALYSIS METHODOLOGY

The energy consumption analysis of utility data included a building level pre- and post-tune-up energy data analysis and a regression analysis for weather normalized data where applicable. This was informed by an analysis of other data collected through the on-site verification process. The following describes the methodology of the overall M&V energy consumption analysis, while the analysis of the data collected on-site to verify persistence of tune-up actions is provided under each building's summary section in the full report in the Appendix.

- *Data sources:* The energy data analysis relied upon monthly utility (electric and gas) data collected from ENERGY STAR Portfolio Manager.
- *Data analysis tools:* The team built an Excel dashboard of the building's energy consumption trends over time for each building to determine pre- vs. post-tune-up energy consumption savings. The dashboards helped visualize energy use patterns across different years and highlighted data gaps and unusual dips or spikes in energy consumption. Dips or gaps that could not be explained were cleaned to match the trend. SCL's "regress-o-matic" Excel tool was used to run a baseline regression to obtain weather-normalized savings if applicable.

- *Pre- and post- tune-up timeframes:* SBC compared the monthly post tune-up energy consumption in 2019 to the monthly consumption for two different preceding years: 2017 and 2018, using a time period of January 1 through December 31.[3] This allowed SBC to observe for differences in energy consumption before any tune-up implementation activities started (year 2017) as well as during the time period that some tune-up activities were underway (year 2018). For calculating the energy savings, however, SBC selected the 2017 baseline because most of the sampled buildings started their tune-up assessment (and may have started making corrections) in early 2018 and finished implementation between October 2018 and June 2019. Because the post tune-up analysis timeframe (Jan-Dec 2019) overlaps with the timeframe for tune-up measure implementation (through June 2019) in six buildings, it doesn't fully represent the post tune-up condition and may under-estimate savings. OSE's experience with both TUA and SBTU has been that individual tune-up measures have a wide range of implementation timing. Some measures, such as HVAC scheduling corrections, may be implemented early in the tune-up at the time of the assessment, whereas other measures, such as sensor repairs, are implemented later due to the need to order new equipment or schedule a specialist to do the repair. Therefore, having a long window for implementation of corrective actions is important.
- *Assumptions/limitations:* The data analysis relied on energy use data provided by the utilities and uploaded to Portfolio Manager. It was assumed that the occupancy, hours of operation, and energy using equipment (apart from implemented tune-up measures), as well as other building operations remained reasonably constant in the pre and post periods, unless noted in the individual reports in the Appendix. The GHG emissions values reported used the EPA factor for natural gas (direct emissions) and a custom factor for indirect electric emissions provided by Seattle City Light[4]. Natural gas consumption was converted into kWh to be used in the SCL regression tool for weather normalization.

10.1.2 MEASUREMENT & VERIFICATION (M&V) CONCLUSIONS

The M&V analysis examined a 10% sample (N=10) of the total population of TUA buildings (N=102). In most all cases, the SBC team was working with limited post-tune-up utility data making it difficult to draw definitive conclusions regarding the impact on energy consumption. Likewise, the diversity of building types in the sample coupled with the limited post-tune-up utility data make it a challenge to apply perceived energy consumption impacts observations across the entire population. That said, the M&V process provided relevant and informative insights about the function of the overall TUA Program.

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[3] At the time of the M&V study, energy data through October 31, 2019 were available. For this final report to DOE, the pre and post time periods for the two-year analysis were updated through December 31 since more months of post tune-up energy use data had become available through Seattle's energy benchmarking program. Building 6 was updated with post tune-up data through 2/29/20 and building 7 was updated with post data through 1/31/20 to obtain at least 8 months of post data across all buildings (pre-periods were adjusted accordingly). Updates are reflected in Table 15 of this report, but not in the M&V report itself.

[4] Indirect electric emissions are nearly carbon neutral for City Light due to primarily hydroelectric power. The factor used in this analysis was 31.12 lbs CO2e/MWh. SCL secures carbon offsets equal to the greenhouse gas emissions resulting from all aspects of SCL's operations, including those created by the generation of electricity the utility buys, employees' travel, and the trucks and other equipment used in its operations (Seattle City Light 2019).

Likewise, on-site observations confirmed that actions were being accurately reported by the participants, providing assurance that this is likely consistently reflected throughout the overall cohort.

Overwhelmingly, the most common required and voluntary actions completed in both the sample and the total population were in HVAC. This is not surprising, as HVAC equipment is varied and complex with many possible combinations of systems and components, and thus presents the most opportunity for improvement. The most frequently required actions in the M&V sample were in HVAC schedules and HVAC controls (70% each). These results provide assurance that the sample is somewhat reflective of the overall cohort.

Efficiency loss due to schedule, set point, and controls issues are typical in any building that has been operating for an appreciable amount of time, for various reasons such as occupants changing settings, manual overrides for temporary situations that aren't changed back afterward, accidental changes in control settings by facility staff or contractors, occupancy changes that don't get changed in HVAC schedules, etc. Fortunately, these are usually the easiest situations to both identify and rectify, and this is reflected in the M&V results. All required actions in the sample that were reported to the City were completed, with all but one action persisting for a 98% persistence rate. (This action, a thermostat re-set, was corrected again during the site visit but may continue to pose a problem because the thermostat is in a public event space.) Table 14 summarizes the results.

Table 14: Persistence of Tune-Up Actions found in Ten Buildings in TUA M&V Analysis.

Building	Use Type	Required Actions Completed/ Persisted	Voluntary Actions Found/ Completed	Other Actions*	BAS?	M&V Notes *(Completed actions showed persistence unless noted.)*
1	Hotel	5/5	3/1	2	No	Updated maintenance plan still phasing in.
2	Office	3/3	1/1	1	Yes	Legacy BAS was upgraded as another action, as per tune-up recommendation.
3	Non-Ref. Warehouse	2/2	5/2	2	No	
4	K-12 school	7/7	2/1	0	Yes	
5	Mixed Use	7/6	5/1	0	Yes	One required action did not persist, but it was corrected by facility manager during M&V visit.
6	Medical Office	2/2	1/0	0	Yes	
7	K-12 school	8/8	7/3	1	Yes	One voluntary action completed did not persist.
8	Office	5/5	5/0	0	Yes	
9	College/ University	8/8	3/2	0	Yes	
10	Office	3/3	4/0	0	Yes	One required action was 75% complete & scheduled for immediate completion.

**A few of buildings voluntarily implemented other actions that were not specific voluntary tune-up actions, so were not captured on the tune-up form and measure tracking. For example, the BAS in Building 2.*

Only one of the buildings in the sample did not have any kind of BAS, but the remaining nine buildings varied widely in sophistication and level of control, from pneumatics to legacy DDC systems to recently upgraded, state of the art DDC systems. There was no observed correlation between amount of energy savings and the type of BAS system in use, however, the energy savings data is preliminary, so this could be an area for further investigation. One building completed a BAS upgrade during the tune-up timeframe.

Table 15 shows the results of the preliminary energy savings analysis, which were updated from the M&V report for this final report to DOE (see footnote 3 on page 63). Energy use or emissions *decreases,* or *savings,* are shown as positive numbers since reducing energy and emissions is the desired tune-up outcome, whereas *increases* in use are shown as negative numbers. For non-weather normalized savings analysis, the average savings across the group were 8.3%. Eight out of the ten buildings sampled showed some total preliminary total energy savings, ranging from 2.8% to 22.2%, as shown in Table 15.

Table 15: Building Energy Consumption & Emissions Savings Post-Tune-Up in M&V Buildings, 2017 vs. 2019 Non-Normalized.

Note: Increases in energy and emissions are shown as a negative percent or number.

Building	Electric %	Natural Gas %	Total Energy %	GHG Emissions %	Total Energy (kBtu)	Total Emissions (MT CO2e)	Months of Post Tune-Up Data*
1	-2.6%	-0.4%	-1.6%	-0.6%	-69,730.46	-0.7	8
2	14.4%	13.3%	14.4%	13.8%	483,393.4	3.6	12
3	5.6%	*see note*	5.6%	5.6%	147,560.98	0.6	9
4	-6.5%	*see note*	-6.5%	-6.6%	-107,847.83	-0.5	12
5	-2.0%	16.4%	11.6%	15.9%	371,176.6	20.5	12
6	2.8%	*see note*	2.8%	2.7%	64,585.75	0.3	8
7	13.1%	27.7%	22.2%	27.1%	734,333.0	31.0	8
8	16.7%	-4.4%	13.2%	1.6%	656,430.8	1.0	12
9	5.1%	13.6%	8.9%	12.8%	367,870.9	13.9	9
10	12.8%	*see note*	12.8%	12.7%	517,516.5	2.1	9
Average	**5.9%**	**11.0%**	**8.3%**	**8.5%**	**316,529.0**	**7.2**	10

Notes by Building Number:
3 - Gas was not analyzed because the tenant using gas left and service stopped on 6/30/18.
4 - Gas not analyzed because the meter was malfunctioning, and the management did not realize it until M&V visit.
6 - Building is electric only with no natural gas use.
10 - Gas analysis was excluded due to unexplained high variability in usage trends.
** - Because the post tune-up analysis timeframe (Jan-Dec 2019) overlaps with the timeframe for tune-up measure implementation(through June 2019) in six buildings, it doesn't fully represent the post tune-up condition and may under-estimate savings. Building 6 uses post tune-up data through 2/29/20 and building 7 uses post data through 1/31/20 to obtain at least 8 months of post data across all buildings (pre-periods were adjusted accordingly).*

The hotel (building 1) saw a modest overall *increase* in energy use of 1.6%. The hotel energy increase was driven by electric use and could be related to increased occupancy or air-conditioning use by guests. Updating the energy consumption data with more months of post tune-up data and running a weather-normalization may provide more insights.

Building 4, a K-12 school, had about a 6.5% *increase* in electricity use. The TUA Program has contacted the facility manager for more details – as a school it is possible that summer classes were added in 2019 or portable classrooms were brought in, which is very common from year to year in the public-school system.

As noted in Table 15, some buildings only had only eight or nine months post tune-up energy use, thus the savings figures presented here may not reflect all the measures implemented. Furthermore, while a regression tool was used for weather normalized savings, those results also are based on incomplete post tune-up data, so are not presented here. Our review of weather data shows a 6% decrease in Heating Degree Days (HDD) from 2017 to 2019 (4,659 to 4,369 HDD). Cooling days decreased 2% between 2017 and 2019. Both metrics are based on a 65-degree balance point.

For a more conclusive M&V analysis on similar programs in the future, it is recommended that at least one year of post-implementation utility data is obtained. Ideally, we would have compared 2017 vs 2020 as pre vs post to ensure that corrective measures were implemented thoroughly and changes in systems would have started to kick in. Another recommendation that would be helpful from an M&V standpoint would be to require participants to report completion dates for each action implemented.

Lastly, most of the building representatives that SBC talked with indicated that the tune-up had motivated them to take beneficial actions, whether in terms of expected energy savings, improved maintenance processes and efficiencies, or influencing decisions that were already on the table. They were also generally happy with the support provided by the program in achieving compliance. More details on building owner feedback from post-tune-up survey of all participants is discussed in chapter 11 of this report.

10.2 BUILDING ENERGY AND GHG EMISSIONS SAVINGS ANALYSIS

Although the TUA Program results provided a rich accounting of tune-up measures found and completed, as well as additional Tune-Up Plus and Building Renewal findings, drawing conclusions about the energy and emissions saved is challenging. First, it is difficult to assess energy savings from, and attribute them to, specific O&M measures. This is due to several known issues such as, inability to measure energy savings directly from each action, the interplay between different actions, and the measure persistence over time. Furthermore, the TUA Program does not yet have a full year of post tune-up energy use data for all the participating buildings. The preliminary results from the ten M&V buildings are promising though and the Program does plan to update those data in 2020, pending funding. Nonetheless, our experience lends us to conclude that tune-ups overall did save energy and reduce GHGs in this market and that there is great potential in this market for savings beyond the tune-up.

In this chapter, we've attempted to paint a broad picture of estimated energy and GHG emissions based on SBC's M&V work and backed up by other data where possible. OSE reviewed four main program areas from which we drew conclusions:

- Update of Projected Energy & GHG Emissions Savings – This effort updated the savings projections with the final known TUA path.
- Re-Tuning Impact Estimates – PNNL assessed estimated savings from the actual tune-up measures completed in the TUA buildings using a modeling design similar to their prior Re-tuning energy savings research.
- Asset Score Modeled (Potential) Energy Savings – PNNL reviewed outcomes from the cost-effective measures assigned to each building Asset Score to derive potential savings estimates for retrofit work in the TUA buildings.

10.2.1 UPDATE OF PROJECTED ENERGY SAVINGS

Based on available data, the projected TUA Program energy savings estimates of an average of 20% per building and an estimated total savings of 99.7 Million kBtu/year were updated. Originally the TUA Program projected that buildings enrolled in the Basic Tune-Up could save an average of 10%, those in Tune-Up plus could save an average of 20% and those in Building Renewal could save an average of 35%. Each TUA participating building was reevaluated at the conclusion of their tune-up and assigned a final TUA path. Based on both the M&V analysis and the program experience, the values used for the original savings estimated were updated as follows:

- **Basic Tune-Up** – The estimated annual average savings were revised down to 7%. This was based on the finding from six M&V buildings[5] that were not known to have completed any additional voluntary ECM measures and the variability of the number of required tune-up measures completed for the entire dataset (average was 4.2 per section 9.3.1.) (The four buildings that did not have any required tune-up measures found and corrected were revised to 0% savings and the ten M&V buildings were revised to their preliminary savings estimates per section 10.1.2.)
- **Tune-Up Plus** – The Tune-Up Plus estimate was reduced to 15% for the following reasons. Of the M&V buildings, three completed a voluntary ECM with an average total building savings of 14.1%. To consider the potential for other buildings that might do additional voluntary ECMs, the Building Renewal Level 3 Package 1 found estimated 16% savings (based on 5 buildings modeled) and the Spark tool runs estimated 24%. Below, in section 10.2.3, PNNL estimates that an average 26% savings opportunity exists for TUA enrolled buildings through cost-effective retrofits. These other estimates, however, assume multiple ECM interventions, while the TUA experience is that most buildings only participated in one ECM that was eligible for an incentive from SCL (section 9.2.1) and that voluntary tune-up actions implemented averaged 1.25 actions per building (section 9.3). On a positive note, the Building Owner survey results (presented in section 11.3) show strong interest in this mid-size building market for making their buildings more energy efficient and more sustainable. The key to delivering on the savings will be future market outreach and engagement and additional owner support and incentives.
- **Building Renewal** – Building Renewal was kept at 35% for the five enrolled buildings. This potential was based on the Building Renewal Results shared in section 9.5.2 which found that

[5] This excludes the K-12 school whose energy increase of -6.5% could not be explained as of this report.

the buildings had the potential to save up to 38% for package 3 and up to 50% for a nearly all electric option (package 4).

With the updated savings projections for each TUA path, the total annual savings are estimated at 12.1% for energy use (67.9 million kBtu/yr) and 12.0% for GHG emissions (using EPA emissions factors). Using Seattle emissions factors, the GHG potential savings is 13.3%. Table 16 summarizes the results.

Table 16: Final Revised Projected TUA Annual Energy and GHG Emissions Savings.

TUA Path	Number of Buildings	ENERGY (kBtu/yr)		GHG EMISSIONS (MT CO2e/yr)			
		2017 Site Total	Estimated Savings	EPA Total[1]	Estimated EPA Savings	Seattle Total[2]	Estimated Seattle Savings
Basic Tune-Up	48	261,457,128	17,533,251	20,239	1,361	4,173	272
Building Renewal	5	33,092,532	11,582,386	2,388	836	908	318
Tune-Up Plus	49	266,379,801	38,777,001	20,413	2,965	5,430	804
Total	**102**	**560,929,461**	**67,892,638**	**43,039**	**5,161**	**10,511**	**1,394**
Percent of Totals		**Energy**	**12.1%**	**Emissions**	**12.0%**		**13.3%**

1 – The EPA Total Emissions and Estimated Savings were calculated using the ENERGY STAR Portfolio Manager emissions factor for indirect electric energy use (https://portfoliomanager.energystar.gov/pdf/reference/Emissions.pdf). This methodology uses the Northwest Grid, which is a dirtier grid than Seattle City Light's.
2 – The Seattle Total Emissions and Estimated Savings use a Seattle City Light indirect emissions factor of 31.12 lbs CO2e/MWh. Indirect electric emissions are nearly carbon neutral for Seattle City Light due to primarily hydroelectric power.

While updated estimates are lower than our original estimate of 20% average per building energy savings and estimated total emissions savings of 99.7 million MT CO2e/yr, they still represent significant energy and GHG emissions savings as well as strong potential for the mid-size market to build on the momentum of the SBTU requirement to encourage ECMs beyond the tune-up and even deep retrofits through efforts like Building Renewal.

10.2.2 PNNL RE-TUNING PROGRAM IMPACT ESTIMATES

As noted in earlier chapters of this report, the PNNL Building Re-tuning program was a key partner in the TUA Program, sharing their expertise on potential energy savings during the BTU policy and TUA incentive development, and offering their Re-tuning training and resources as part of the Tune-Up Specialist trainings (https://buildingretuning.pnnl.gov/). The results of the TUA measure implementation tracking conducted (Chapter 9) offered an opportunity to assess potential energy savings using nine Department of Energy (DOE) commercial building prototype models that PNNL modified for the purpose of evaluating re-tuning measures.

To do this, PNNL conducted a "crosswalk" between the measure prevalence (count of required tune-up measures found and corrected) for 71 TUA participating buildings that could be reasonably matched to PNNL's building type categories used with the Re-tuning prototype energy models. Eight of the required

operational Seattle Tune-Up elements (listed in Table 17 below) were mapped to the 18 different PNNL Re-tuning measures listed in the table. The mapping resulted in fewer than the Seattle required measures listed in Table 2 (Chapter 3) because PNNL's Re-tuning approach does not include irrigation and water usage measures.

Table 17. Seattle Tune-Up Assessment Elements Mapped to PNNL Re-Tuning Measures.

Seattle Tune-Up Assessment Elements	Measure Names from PNNL Re-Tuning
G1: HVAC schedules	04: Shorten HVAC Schedules
G2: HVAC set points	16: Widen Thermostat Deadbands & Night Setback
G3: HVAC reset schedules	05: Supply Air Temperature (SAT) Reset 08: Static Pressure Reset 11: Chilled Water Temperature Reset 12: Condenser Water Temperature Reset 14: Hot Water Temperature Reset
G4: HVAC Optimal Start/Stop	27: Optimal Start 28: Optimal Stop
G5: HVAC sensors calibration	01: Re-calibrate Faulty Sensors
G6: HVAC controls	06: Outdoor Air Damper Faults & Control 07: Exhaust Fan Control
G7: Simultaneous heating & cooling	16: Wider Thermostat Deadbands and Night Setback
H3: Lighting control schedules	External Calculation: Lighting Schedules
I2: Circulation pump controls	09: Plant Shutdown When There is No Load 11: Chilled Water Temperature Reset 14: Hot Water Temperature Reset

PNNL used the results of individual measure simulations in tandem with simulations of measures packaged together to understand a "competition ratio" – or in other words, to what degree individual measures either compete for the same pool of savings or alternatively work together synergistically to produce additional savings. This allowed PNNL to translate individual measure savings along with the prevalence estimates from TUA into an estimated total savings by building type for the 71 TUA buildings. These results are shown in Table 18.

This exercise provided a useful reference for Seattle to understand what other buildings could save based on the prevalence of measures found and corrected in TUA office building participants. For example, per Table 18, a Seattle Office larger than 50,000 SF could predict an energy savings of 10.9% if they complete a tune-up, whereas a college/university could predict 6.8%.

Table 18. Estimated Tune-Up Savings by Building Type from Crosswalk of TUA Required Measure Prevalence with PNNL Re-Tuning Model.

Seattle Building Type & Count	Office 10-50K SF or all-electric *19*	Office >50K SF *9*	K-12 School *23*	College/ University *11*	Hotel *7*	Retail Store[2] *1*	
Prototype Energy Model Type[1] (DOE/PNNL)	Medium Office	Large Office	Primary School	Secondary School	Large Hotel	Stand-alone Retail	Strip Mall
Electric Savings[3]	11.2%	2.7%	1.5%	1.3%	1.6%	3.9%	3.1%
Gas Savings[3]	0%	8.3%	2.8%	5.4%	2.2%	9.4%	4.5%
Total Predicted Energy Savings	**11.2%**	**10.9%**	**4.3%**	**6.8%**	**3.8%**	**13.3%**	**7.6%**

Notes:
1. The "Supermarket" PNNL type was matched to 1 Seattle building, but no measures were found & corrected in the Seattle building, making its estimated savings 0%. It is excluded from this chart but included in the portfolio-wide prediction.
2. The one Retail Store participating did not neatly fit either PNNL category, so both PNNL types were modeled.
3. Electricity and Gas savings are the % of total building energy consumption reduced, not % of electricity or gas only.

If these predicted savings are extrapolated out to the TUA portfolio, the estimated energy savings are 4.3% for electric, 3.1% for gas, and 0.1% for steam, for a total predicted savings of 7.5%. While not an exact match for all building types or measures, this total predicted savings provided insight to refine our predicted savings for the Basic Tune-Up path.

10.2.3 ASSET SCORE MODELED (POTENTIAL) ENERGY SAVINGS

PNNL continued its support for the TUA Program by assessing the potential energy savings from the 90 buildings with full Asset Scores. This analysis was intended to show the potential savings if these buildings are retrofitted. The results also highlighted areas where the Asset Score model differed from what the Tune-Up Specialist found during their on-site building assessments.

The 90 buildings entered in Asset Score were representative of the buildings included in Seattle's 2017 commercial building benchmarking data set in terms of vintage and building size. The Seattle Public Schools enrolled 22 buildings in the TUA Program, and as a result, the education use type was a little overrepresented, and office buildings were a little under-represented compared to the full benchmarking dataset. Figure 16 shows the use type distribution of the scored buildings.

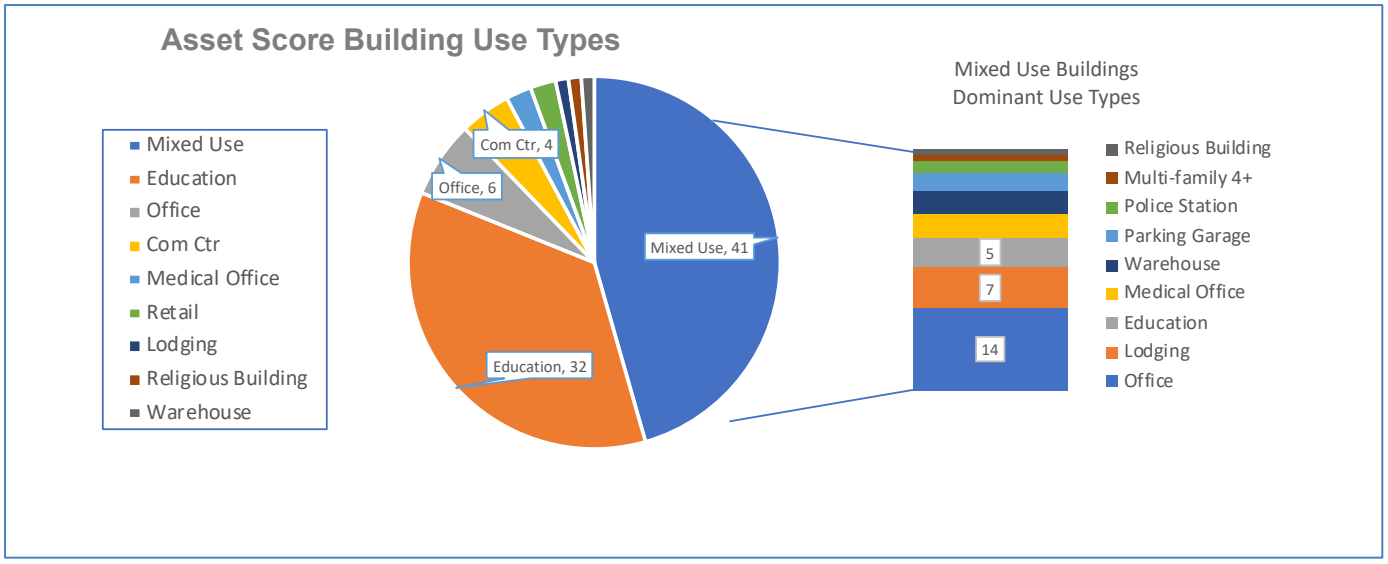

Figure 16: Use Type Distribution in Asset Score of 90 TUA Enrolled Buildings

Overall, the scores generated by the TUA buildings generally followed the range of scores seen from all buildings entered in Asset Score to date. Figure 17 shows the current (modeled) and potential scores of the 90 buildings. The average current score was 6.2, and the average potential score was 8.9, with an average change in score of 2.6. On average, the tool identified 26% savings opportunities through cost-effective retrofits for TUA enrolled buildings.

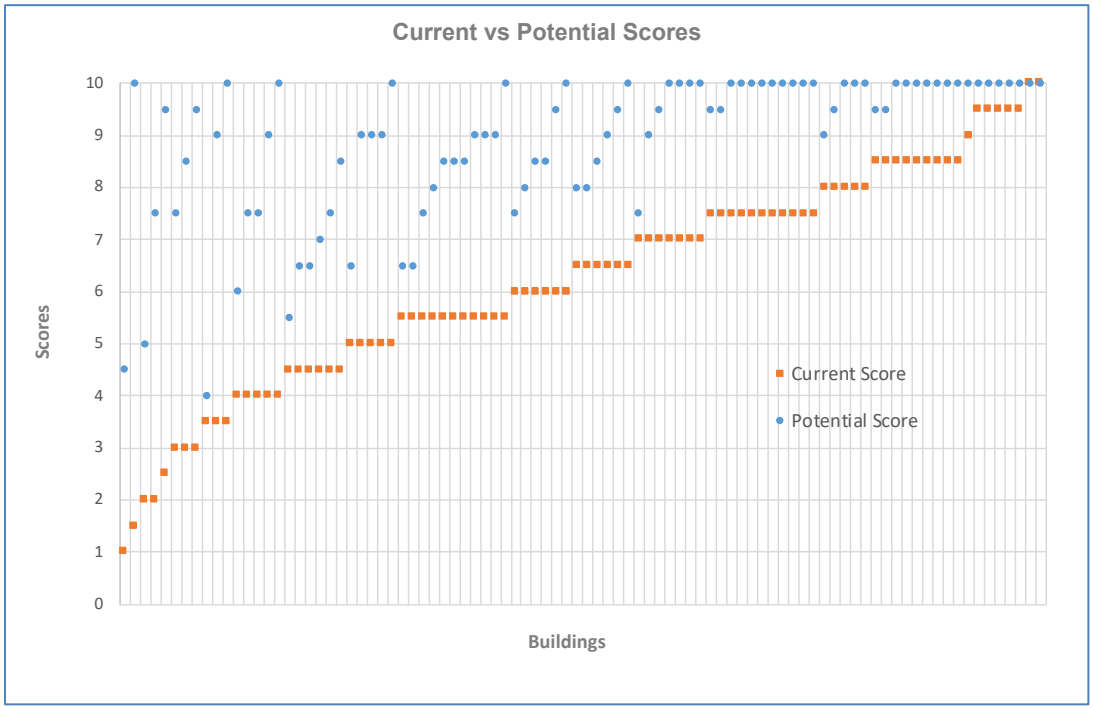

Figure 17: Current Asset Score and Potential Asset Score of TUA Enrolled Buildings.

In addition, each building had an average of five recommended energy conservation measures (ECMs). Table 19 shows the top ECMs. All buildings received a recommended lighting retrofit and 86% of the

buildings received a recommendation to add insulation. HVAC upgrade recommendations are summarized in three categories: add equipment, implement controls, and upgrade system. “Add Equipment” includes adding air-side economizer and adding variable frequency drive to supply fans. “System Upgrade” includes upgrading heating system with high efficiency natural gas furnace and upgrading cooling plant pumping system to constant primary -variable secondary pumping system. “Implement Controls” include implementing chilled water temperature reset and lowering VAV box minimum flow set points.

Table 19: Identified Cost-effective ECMs in 90 Asset Score Modeled TUA Buildings.

Asset Score ECM Recommendation	Buildings	%
Lighting - Retrofit	90	100%
Lighting - Install Controls/Sensors	77	86%
Envelope - Add Insulation	69	77%
HVAC - Implement Controls	60	67%
HVAC - Add Equipment	55	61%
DHW - Install low flow faucets	51	57%
Envelope - Upgrade Windows	33	37%
HVAC - System Upgrade	25	28%
DHW - System Upgrade	0	0%
Total	**460**	

PNNL compared the Tune-Up Summary reports with the Asset Score results and found that the measures identified by the Asset Score model generally aligned with the Tune-Up Specialist’s on-site assessments. The implementation of or adjustments to HVAC controls, lighting retrofits, and the installation of lighting controls or sensors were among the top four recommended by both methods as shown in Table 20 on the next page. Envelope upgrades were not identified by most Tune-Up Specialists because these measures usually have higher cost and the tune-up requirement is more focused on operations of building electrical and mechanical systems. Furthermore, the Asset Score model recommended nearly double the number of ECMs than the Tune-Up Specialists. Again, this is likely because Tune-Up Specialists were more focused on helping building owners identify the required O & M tune-up measures.

In April 2019, Asset Score released the High-Performance Buildings (HPB) ECM analysis function, which identifies deep-retrofit measures beyond cost-effectiveness. For example, a building with boiler and chiller may receive a cost-effective HVAC ECM of adding constant primary and variable secondary pumping system, whereas the same building could receive a deep retrofit recommended HVAC ECM of adding a dedicated outdoor air system with water loop heat pump.

Table 20: Comparison of Number of ECMs Identified in Asset Score and Tune-Up Assessment.

ECMs	TUA Assessment Identified	Asset Score Model Identified
HVAC - Implement Controls	61	69
Lighting - Retrofit	54	90
Lighting - Install Controls/Sensors	47	60
HVAC - Add Equipment	25	51
HVAC - System Upgrade	20	25
DHW - Install low flow faucets	15	55
DHW - System Upgrade	15	0
Envelope - Add Insulation	10	77
Envelope - Upgrade Windows	5	33
Total	**252**	**460**

PNNL ran 90 TUA-enrolled buildings through the new simulation and compared the potential scores. Sixty-seven (67) out of 90 received an HPB HVAC ECM and 21 received higher potential scores. That is 4% average increase in energy savings compared to the cost-effective upgrade options. Forty-three (43) had no change in score but saw a 3% average increase in energy savings.

In summary, PNNL's analysis revealed that an average, 26% savings opportunities through cost-effective retrofits potential exists for TUA enrolled buildings. The new HPB package identified up to an additional 4% energy savings. Interestingly, the Asset Score model identified more ECMs than the Tune-Up Specialists did on-site. This likely speaks to the primary motivation of the building owners and their service provider to complete the tune-up to meet the SBTU requirement and may not be indicative of actual potential ECMs. As such, OSE may want to consider ways to revisit potential ECM opportunities with building owners after they complete the tune-up and/or find ways to support the identification of ECMs through the tune-up process. For example, specifically requiring the Tune-Up Specialists to recommend cost-effective and high performance ECMs beyond the tune-up as part of the assessment.

11 Analytic Tools, Building Owner Feedback & Incentive Evaluation

11.1 ASSESSMENT OF ASSET SCORE PREVIEW

Since PNNL had both an Asset Score Preview model and a full Asset Score for most of the TUA enrolled buildings, PNNL used the opportunity to run an internal analysis of the effectiveness of Preview. The results of this effort are in the Appendix and summarized here. When PNNL compared the two score versions, 42% of the full Asset Score buildings had scores that were outside (either lower or higher) than the predicated score range using Preview with only the original inputs from the energy benchmarking dataset. Thus, Preview was within range only 58% of the time.

PNNL then added the known lighting and HVAC types from the full Asset Score models and reran Preview. This addition of data inputs increased the accuracy of Preview to 89% (21% fell out of range). Overall, including lighting and HVAC type in the initial assessment would greatly improve the result accuracy because both are sensitive model inputs. This is important information for cities or other entities that seek to use benchmarking data to predict retrofit opportunities using the Asset Score. It is possible that collecting just a few additional data points could improve the Preview accuracy and potentially save time and effort for high-level estimates of large datasets. A full Asset Score data collection, however, is still important for more accurate scoring of individual buildings.

In addition to the Asset Score Preview analysis, PNNL also compared Asset Score to ENERGY STAR Portfolio Manager to investigate how the two scoring systems can be used together to provide more insight into a building's systems and operation. This supplemental analysis is included in the Appendix.

11.2 SEATTLE CITY LIGHT VIRTUAL ENERGY AUDIT

As the TUA Program was being developed several vendors had proposed that remote building analytics (based on 15-minute interval consumption data) could replace the physical building assessment. SCL conducted a pilot project to test "Virtual Energy Assessments" (VEA's) in conjunction with the Accelerator. These assessments provided visualizations of building energy use and suggestions for efficiency measures based on building type and electric consumption patterns.

The visualizations of energy consumption were helpful in highlighting scheduling and equipment operational opportunities (Figure 18). They readily identified situations where a building's operations did not follow a schedule. However, the assessments were not a substitute for 'boots in the building".

The analytics tool could only recommend high-level generalized efficiency opportunities (lighting retrofits, occupancy sensors, higher efficiency HVAC equipment). Many of the required Tune-Up measures such as temperature resets, economizer sequencing, or other control optimizations were not readily identified by the VEA tool. Some building operators had already substantially completed measures, lighting for example, that were presented to them as efficiency opportunities leading them (and SCL staff) to question the credibility of the analytics tool. Building analytics vendors have recognized these limitations and most are now positioning their applications as a customer engagement tool rather than a "virtual" audit.

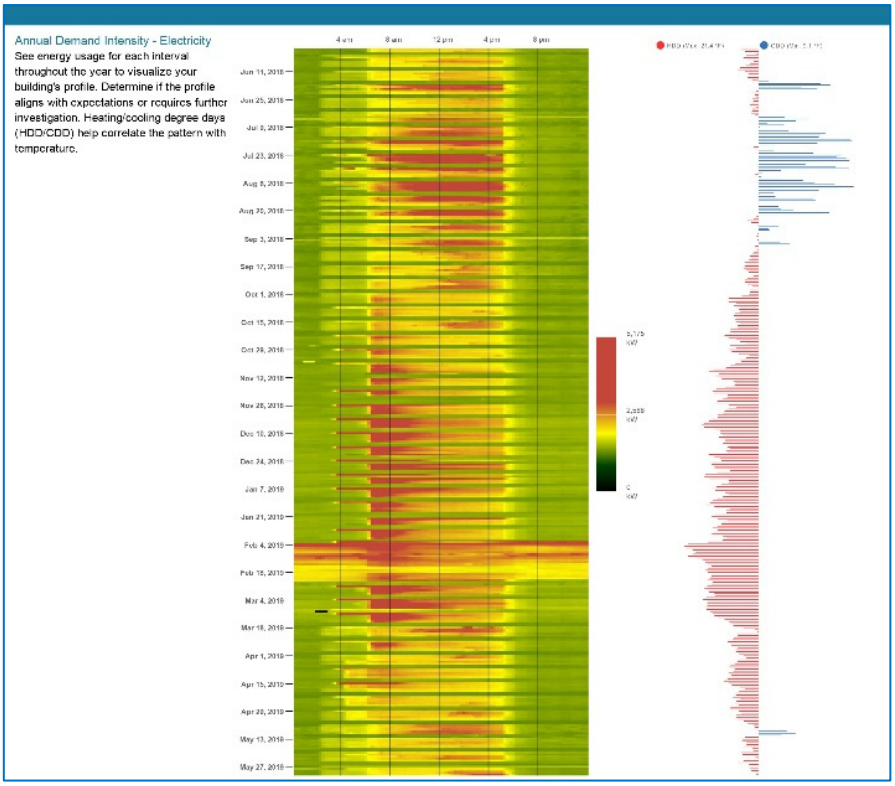

Figure 18: Visualizations like this heat map from the VEA tool could be used to identify opportunities to improve building scheduling when conducting the tune-up.

11.3 BUILDING OWNER FEEDBACK ON VALUE OF TUNE-UPS & ECMS

In Fall 2019, when nearly all 102 buildings were complete, OSE created an online survey using Survey Monkey to obtain feedback on the TUA Program and learn more about owner motivations for work beyond the tune-up. To ensure anonymous responses, SBC administered the survey, which was sent to 55 building owner or building manager contacts with buildings enrolled in the TUA Program. The entire survey results are included in the Appendix of this report with key findings highlighted here.

- **High Response Rate:** The return rate was excellent with 52% (N=29) responding. This was likely aided by the offer of a $20 Starbucks card as an incentive to those willing to fill out the 15-minute survey. Eighty-six percent of the respondents worked for the company or organization owning the building and the remaining 14% worked for a property management firm. Among ownership types, the responses were evenly distributed among investor owned (24%), private owner (24%), not-for-profit organization (27%) and municipal/public entity (21%) demonstrating that no single ownership type perspective dominated the results.

- **Positive Program Experience & Benefit to Building Operations:** When asked about their experience with the TUA Program on a 5-point scale, the majority of respondents had very positive experiences with the quality of program documentation, the incentive offering, the list of service providers, and their experience with the Tune-Up Specialist (service provider) they selected. A summary question, "Overall, participating in the Tune-Up Accelerator Program was beneficial to my building or organization" was agreed or strongly agreed to by 89% of respondents (score of 4.26 out of 5). When asked if participating in the Tune-up would help them better manage the current building or other buildings in their portfolio there was still

strong agreement, but scores were slightly lower at 3.95 out of 5. Still, this is a very positive result indicating the value of tune-ups beyond immediate energy savings.

- **Strong Satisfaction with the Tune-Up Specialist:** About 75% agreed/strongly agreed with, "Service providers that want to work as Tune-Up Specialists to conduct Building Tune-Ups should be required by the City to attend a City of Seattle program training" (score of 4.26). We infer this to mean that owners understood that the required TUA training was to have likely supported their positive experience with their chosen provider based on other question responses. SBTU does not require a training to be a "Tune-Up Specialist" as TUA did – this finding suggests a required training could benefit owners by ensuring that TUA Specialists are well versed in SBTU requirements and processes.

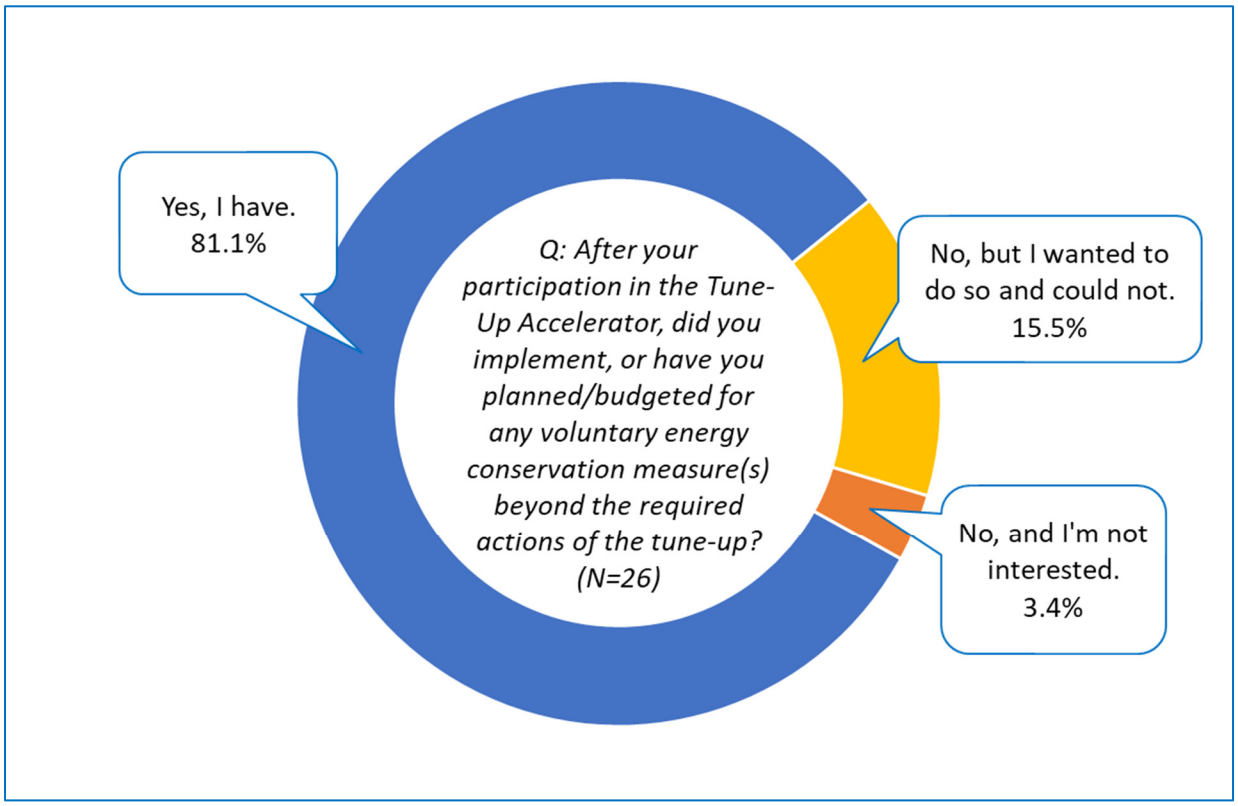

Figure 19: Post-participation survey responses from building owner representatives indicating the TUA Program increased their interest in pursuing voluntary ECMs.

- **The Tune-Up Drives ECM Participation:** Several questions asked if the TUA support and incentives encouraged voluntary work beyond the Tune-Up. The participants were experienced with energy efficiency with 73% reporting that they'd completed a different energy efficiency-related project in their building in the past 3-5 years. When asked to specify, the majority had completed a lighting project. It was not asked though if they had participated in an SCL incentive program and SCL generally felt that TUA increased their reach to owners that had not previously participated in their programs (see section 10.6). Despite recent ECM participation, the statement, "The extra support and incentives from the TUA Program helped influence me to

implement or plan for additional (voluntary) energy-saving projects in my building" was agreed or strongly agreed to by 70% (score of 4.19). Furthermore, as shown in Figure 19, 81% of respondents answered "yes" to the question, "After your participation in the Tune-Up Accelerator, did you implement, or have you planned/budgeted for any voluntary energy conservation measure(s) beyond the required actions of the tune-up?" When asked why they implemented or committed budget for any voluntary energy conservation measure(s) beyond the required actions of the tune-up, energy/cost savings and sustainability received the most responses. Only one respondent said they were not interested in additional ECMs and four said they wanted to but had a barrier. Of the barriers, the most common were lack of budget, time or staff to manage or that it was difficult to get decision makers to approve the project. These barriers were very similar to what the program heard anecdotally from Tune-Up Specialists.

- **Offering an Incentive and Technical Support for Early Compliance is Good Policy:** A near majority of respondents (93%) felt that the City should use incentives and extra technical support to engage building owners with early compliance. And 79% agreed or strongly agreed with the statement, "The incentive offered by Seattle City Light to complete the tune-up early was a primary reason for my participation in the Tune-Up Accelerator" (score of 4.26).

Overall, these survey results are very positive about the tune-up and ECM opportunities in this market. It also supports the TUA Program's vision that offering an incentive and technical support or "carrot" for early compliance before the "stick" works. It is also important to note that TUA Program participants and/or the 52% responding to the survey may have self-selected to enroll in TUA because of their energy efficiency interest. An interesting follow-up to better understand the market would be to ask similar questions of owners of buildings that did not participate. While it is highly likely that those that did not enroll in TUA would also be motivated by an incentive, getting them to enroll will mean addressing more barriers to their participation.

11.4 EVALUATION OF SCL UTILITY INCENTIVE

The opportunity to provide a "carrot" before the "stick" to early Tune-Up adopters increased participation in the incentive program and significantly expanded the reach of the program to building owners that had not previously participated in SCL's utility incentives. Documentation of optional tune-up opportunities and utility incentives available to support those measures also led many building owners to go beyond the basic tune-up requirements and pursue greater levels of efficiency.

A challenge for this type of incentive is how to estimate the persistence (longevity) of the efficiency gains which is a key factor for the utility's valuation of the tune-up. The assumptions around persistence determine the amount of incentive funding that the utility can provide. The Accelerator was the first program of its type according to SCL research. The program required owners to implement most of the primary energy saving measures found in retro-commissioning of existing buildings. However, the tune-up did not require aspects of training and documentation found in full retro-commissioning projects. Based on that difference, SCL opted to estimate that the tune-up would produce energy savings like retro-commissioning projects, but those savings would only last an average of three years compared to the five years or more typical in a retro-commissioning project.

SCL evaluated the actual tune-up costs to building owners for TUA based on invoices sent to them for incentive reimbursement (99 buildings were available for review). The results, summarized in Table 21, show that SCL's initial estimate that $0.12/SF would cover 50% of the tune-up was very close. The average cost was $0.21/SF and the median was $0.25. By building type, the tune-up ranged from $0.13 to $0.27 per square foot. These results also demonstrate that the actual cost to tune-up TUA participating buildings was at the lower end of the $0.20 to $0.50 per SF predicted during the SBTU mandate development (see Chapter 4).

Table 21: Average Tune-Up Cost per Square Foot for TUA Participants.

Primary Building Use	Number of Buildings	Avg. Tune-Up Cost/SF
College/University	11	$0.13
Hotel	7	$0.19
Office	27	$0.19
Medical Office	5	$0.20
Other	15	$0.21
Retail/Grocery Store	2	$0.21
Mixed Use Property	6	$0.24
Non-Refrigerated Warehouse / Distribution Center	4	$0.25
K-12 School	23	$0.27
Average	**100**	**$0.21**

Future operational savings pursued by building owners may also be eligible for custom SCL incentives, but the window of eligibility is reduced to projects that are completed at least 18 months prior to the building's next SBTU compliance date. Those measures are incentivized based on an expected measure life of one year. These stipulations are in place to allow owners to take advantage of utility funding to improve efficiency during the 3-4-year interval that they're not required to tune-up but minimize the likelihood that utility funding will be used to pay for corrections required by the SBTU ordinance.

SCL now offers a full retro-commissioning incentive program called the "Comprehensive Building Tune-Up Program" that aligns with a similar offering by PSE. One building enrolled in TUA is voluntarily pursuing this in-depth retro-commissioning and it is also accepted as an "alternative compliance" path for SBTU. In 2020 PSE will be rolling out a lighter "tune-up" incentive for buildings in its territory (Puget Sound Energy 2020).

12 Conclusions

Overall, the TUA Program was highly beneficial to the building owners and Tune-Up Specialists who participated, as well as to the City of Seattle. The Program was awarded a 2019 “Leadership in Energy Efficiency Award in Program Innovation” by the Northwest Energy Efficiency Alliance (NEEA), which recognized TUA as a new model to help existing buildings achieve energy savings and cost-effectively meet state and city climate and energy policies (Figure 20: Several of the TUA Program Partners shown with their 2019 NEEA "Leadership in Energy Efficiency Award in Program Innovation" awards.).

Figure 20: Several of the TUA Program Partners shown with their 2019 NEEA "Leadership in Energy Efficiency Award in Program Innovation" awards.

From a City perspective, it is delivering energy savings from tune-ups two years earlier than SBTU would have seen based on the mandate timeline and it is encouraging this first crop of “early adopters” to enroll in energy and GHG saving efforts beyond the tune-up. The early trainings for service providers to become “Tune-Up Specialists” kick-started the City’s engagement with service providers and drew their attention to the harder to reach mid-size buildings market. The co-timing of SBTU’s roll-out to the largest buildings and TUA’s early offering to the mid-size market supported many iterative process improvements, such as improved communications about tune-up requirements and results-based data on the actual cost to conduct a tune-up.

The screenings used for building recruitment prioritization also demonstrated that Asset Score Preview can be used as a quick way to identify candidate buildings and, later, with full Asset Score models, to identify their retrofit opportunities at scale. Asset Score Preview provides an easy entry point using energy benchmarking building use details and adding a few sensitive building characteristics (lighting and HVAC types) can significantly increase the accuracy of the screening results.

Perhaps most importantly, the offering of an incentive to support early compliance created goodwill among participants and a strong sense that while the City is regulating them to do more, the City had created an O&M requirement that would benefit their buildings and that the City was there to help them meet the mandate. It also turned several folks who were reluctant about the tune-up requirement into supporters.

These sentiments are exemplified by the following quotes from the case studies (see Appendix).

- "We were already doing a fair job managing the building, but we could only address the obvious things that were broken or not working right. The Tune-Up program gives us the opportunity to have our retro-commissioning staff dig in deep and find the source of a problem that isn't as obvious. That's the best thing about this program—finding the hidden opportunities is a big win." —RINA FA'AMOE-CROSS, SPS RESOURCE CONSERVATION SPECIALIST

- We participated in the Tune-Up Accelerator because it was a good business choice for us to get ahead of the game. The financial incentive helped; but more importantly, it allowed us to focus on energy efficiency and gave us a needed process, timeline and amazing support to get our necessary fixes done and create an informed plan for future capital upgrades." —DINA BELON-SAYRE PINEAPPLE HOSPITALITY, DIRECTOR OF REAL ESTATE ASSETS

- "I went into the Tune-Up process begrudgingly, thinking it was just another government regulation. But halfway through I changed my mind. This program helps everybody—property managers, tenants, and owners. I plan on using the knowledge I gained from the Tallman Tune-Up to initiate cost-saving procedures and increase efficiencies in all my area buildings." —SUSAN MOORE, WELLTOWER REAL ESTATE MANAGER

- "Participating in the City of Seattle's Building Tune-Up Accelerator program and choosing the Building Renewal Path allowed us to create a great 5-year plan for energy improvements alongside our other capital improvements. Having more time for planning helps us optimize for long-range savings—which is best for the company, the building, and the community." —STEPHEN CHANDLER, VERITY CREDIT UNION FACILITIES MANAGER

As a final program outcome, TUA also considered ways to refine the SBTU requirements and offer long-term owner engagement. The next sections summarize our findings.

12.1 RECOMMENDATIONS TO REFINE TUNE-UP REQUIREMENTS

The TUA Program did not uncover any significant issues with the SBTU requirements as applied to the mid-size building market that would lead to major revisions. This is a testament to OSE's careful development of the Tune-Ups Director's Rule and experienced approach to implementation gained through its benchmarking program. There are, however, minor program and data collection recommendations that could benefit SBTU in the short-term and for analysis.

SBTU Program Recommendations

- **Require anyone qualified to be a Tune-Up Specialist to attend a training.** The TUA experience shows that building owners benefit, and Tune-Up Specialists submit more thorough Tune-Up Summary reports. Portfolio Manager data verification training and more emphasis on when and how to sample duplicate equipment would support better energy data quality and tune-ups. Tune-Up Specialists, in our experience, also relished the chance to learn about tune-ups from each other and discuss challenging or unique situations. A regular Tune-Up Specialist training/coffee meet-up could be beneficial.

- **Provide examples of strong "Tune-Up Summary Reports."** Reviews of completed reports were often cumbersome for the TUA Program with a lot of back and forth with the Tune-Up Specialist to clarify their submittals and fix data entry errors. A few "best performer" Tune-Up Specialists stood out for their comprehensive and clear tune-up reporting. Examples of clean, understandable reports will also help with future detailed data analyses.

- **Provide updated tune-up cost estimates to the market in outreach materials.** Owners participating in TUA had a lot of questions about costs both for evaluating bids and budgeting for the work. Some also received wide-ranging proposals from service providers. Informing them that $0.21/SF was the average for this market, as well as providing the range, will help set expectations.

- **Expand owner support and engagement to help them comply and understand the benefits of Tune-Ups.** The 82% of the 50,000 – 100,000 SF building market that TUA did not engage will likely be much harder to reach and more reluctant to participate in SBTU. Turn TUA participants into tune-up advocates where possible. Share examples and seek to engage building owners, especially not for profits, as early as possible. Offer more ways to connect with qualified service providers and help owners understand bid basics.

Data Collection Recommendations

Although SBTU wisely limited the amount of data collection to help keep owner costs low, the following small additions are recommended:

- **Ask more specific questions about the quality/functionality of the BAS.** Based on our experience, this mid-sized market has a lot of legacy and outdated BAS systems that are costly to repair and are hindering tune-up efforts. From old software to broken sensors to limited facility staff understanding, this market is ripe for support, such as incentives and training, to correct these systems and support better operations of them. Collecting a few more details on BAS status would provide more data to back this experience.

- **Ask about scheduling changes.** A version of the SCL Operating Hours worksheet would help contextualize the extent of actual impact of scheduling changes on the building.

- **Include dates of corrective action implementation.** From anecdotal feedback and the M&V process, TUA learned that corrective actions are implemented sometimes during the first assessment and then throughout the process, until just prior to report submittal. Asking for an approximate completion date will help with estimating implementation timeframe for future analysis.

- **Estimate percent of building impacted by corrective action.** Many corrective actions are specific to only certain building spaces, while others have the potential to impact all building operations and therefore can have greater energy savings potential. Asking for a rough estimate of impact to building (e.g. less than 20%, 21-40%, etc.) will help with estimating impact for future analysis.

The suggestions above are recommended to the SBTU program in the near-term. OSE is considering a proposed GHG emissions-based Building Performance Policy that could set interim GHG targets as early as 2026. This builds upon the State of Washington's Clean Building policy—already passed— that will set average or better energy efficiency targets (site EUI based) to be met starting in 2026. To meet both policies, many buildings will need retrofits beyond the tune-up. The tune-up is a strong vehicle to engage the market and deliver energy savings. It should be leveraged and updated when possible to engage and support owner strategic planning to meet these ambitious new policies.

12.2 LONG-TERM OWNER ENGAGEMENT & ASSISTANCE

With a new Washington State policy passed that mandates energy performance standards for existing commercial buildings (Washington State Department of Commerce 2020) and a Seattle Building Performance policy in development, current attention is focused on understanding what processes, resources, and roles are required to accelerate market compliance. The TUA experience suggests that early incentives and technical support are critical – and the support needed for the deep retrofits to meet these policies will be far greater than what was needed for TUA or the current SBTU mandate. SBTU and TUA are strong engagement models and OSE's experience with them should be leveraged. Furthermore, small updates to SBTU data collection and outreach (as described earlier) would begin to prepare building owners and Tune-Up Specialists to think and plan more strategically for upgrades beyond "replace when broken."

Seattle commercial buildings larger than 50,000 SF will be required to comply with the new Washington State energy performance mandate beginning in 2026. However, applications for State incentive funding for early compliance will be accepted starting July 2021. With a limited amount of state funding available ($75 million), it behooves owners to start project planning and budgeting as early as 2020 and OSE wants to support accelerating that effort.

OSE proposed a "Retrofit Accelerator" development project to SCL, working in partnership with UW IDL, to design and pilot a program that will accelerate market preparedness and move building owners towards greater efficiency sooner. OSE received a funding commitment from SCL for this work in 2020 and additional funding from Institute for Market Transformation to draft a building owner financing mechanism.

As a first step, OSE will work to identify buildings with EUIs worse than the State performance threshold to find owners needing the greatest level of support, e.g. non-profit owners and/or buildings with WMBE businesses. The Program will seek to engage 2-3 buildings in a pilot, building on our work through the TUA Building Renewal scope. This effort will grow OSE and SCL's understanding of the market's needs to meet the WA State BPS requirements and Seattle's goal of highly efficient, carbon neutral buildings. Outcomes will present a draft a framework and plan, as well as estimate funding needed to bring a Retrofit Accelerator pilot to scale.

Increasing climate urgency and Seattle's and other cities efforts to enact performance standards are rapidly changing the policy landscape. Our market work through the TUA Program and our survey results show that many mid-size building owners want energy efficient and climate friendly buildings—but funding, technical understanding and the time to engage with service providers are major barriers. Innovative and equitable support programs that breakdown these barriers are critical to success.

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14 Appendices List

A. TUA Program Documents & Supplemental Information (PDF Format)

1. Final TUA Project Timeline (Gantt Chart)
2. SCL Participation Agreement Sample
3. SCL Tune-Up Accelerator "Basic Tune-Up" Incentive Program Guidelines
4. OSE Greenspace Blog Post Announcing SBTU Rule, Including Early TUA Pitch – 2/2017
5. OSE Greenspace Blog Post Announcing TUA – 8/2017
6. Seattle Building Tune-Up Accelerator New Release – 10/2017
7. Building Tune-Up Accelerator Recruitment Fact Sheet – 10/2017
8. TUA: Building Renewal Path Fact Sheet – Fall 2017
9. Seattle Building Tune-Ups / Tune-Up Accelerator Postcard - 11/2017
10. Sample of Direct Outreach Letter to Building Owner – 8/2017
11. Sample of Direct Outreach Follow-Up Email to Building Owner – 8/2017
12. TUA Service Providers List
13. TUA Program Required Documentation & Timeline
14. Seattle Public Schools Tune-Up Accelerator New Release – 2019
15. Sample of E-news to TUA Service Providers – June 2018
16. PNNL Asset Score Preview Analysis and Asset Score to Portfolio Manager Comparison
17. Building Owner Survey Results

B. Case Studies (PDF Format)

1. Hotel Five
2. Verity Credit Union
3. Tallman Medical Office
4. Concord International Elementary School

C. Program Documents Available Online

Please use the links below to access these documents.

1. Building Tune-Up Accelerator Program Application (MS Excel)
   http://www.seattle.gov/Documents/Departments/OSE/Accelerator/Tune-Up%20Accelerator%20Application%201.0.2.xlsm
2. TUA Training Curricula – Links to Slides and Resources (PDF)
   http://www.seattle.gov/Documents/Departments/OSE/Accelerator/TUAResources.pdf
3. Tune-Up Accelerator Re-Tuning Training Video (YouTube, 1 hr 22 min.)
   https://www.youtube.com/watch?v=w39zPRQK2nU
4. Smart Buildings Center Tool Lending Library Video (YouTube, 33 min.)
   https://www.youtube.com/watch?v=IO9YN1IG1U4
5. TUA Summary Report (MS Excel)
   http://www.seattle.gov/Documents/Departments/OSE/Accelerator/Tune-Up_Accelerator_Summary_Report_v2.5.1.xlsx

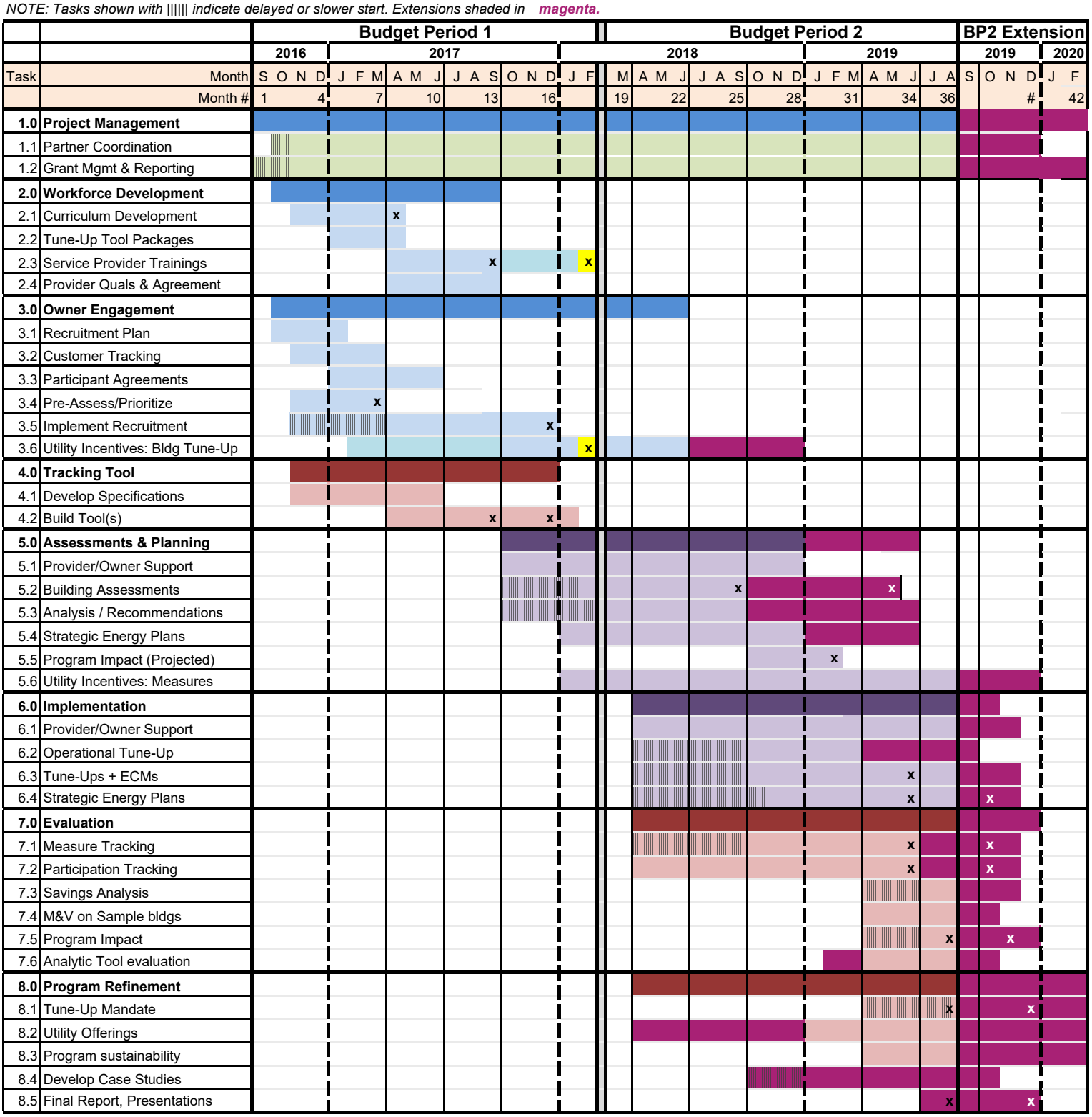
6. City Light TUA Operating Hours Worksheet (MS Excel)
   http://www.seattle.gov/Documents/Departments/OSE/Accelerator/SCL%20Accelerator%20Operating%20Hours.xlsx
7. Monitoring & Verification (M&V) Report for City of Seattle Tune-Up Accelerator, Smart Buildings Center (PDF Format) – January 2020
   http://www.seattle.gov/Documents/Departments/OSE/Accelerator/OSE_TUA_MV_Report_2020.pdf

Building Tune-Up Accelerator Program

FINAL TECHNICAL REPORT - APPENDIX A

APPENDIX A-1. Final TUA Project Timeline (Gantt Chart)

NOTE: Tasks shown with |||||| indicate delayed or slower start. Extensions shaded in ***magenta.***



x Milestone

x Go/No Go Milestone

APPENDIX A-2

Seattle City Light

CUSTOMER ENERGY SOLUTIONS
PARTICIPATION AGREEMENT

[DATE]

PROJECT NUMBER **PROJECT NAME**

CUSTOMER NAME **SITE ADDRESS**

TERMS & CONDITIONS

This Program Participation Agreement is entered into by and between the City of Seattle, doing business as Seattle City Light (hereinafter referred to as "the City") and Customer/Program Participant" (hereinafter referred to as "Customer" or "Participant"). Customer is voluntarily participating in the Seattle City Light Business Conservation Program ("hereinafter "Program") to implement energy conservation measures ("Measures") at the Site Address and other locations as identified on Program documents, (collectively referred to as "Project") applicable to Participant's Program Application and Project information for the opportunity to receive an incentive payment from the City for estimated energy savings and conservation purposes. All references to Customer or Participant shall mean the legal property owner, corporate officer, agent or representative of the business entity named in this agreement, notwithstanding any use of any inconsistent terms referenced herein. In consideration for Customer's participation and full performance in the Program, both parties agree to the following:

1. **Term of Agreement.** This Participation Agreement shall become effective on the date of execution and shall remain in effect for two years subject to any terms set forth herein.
2. **Incorporation of Program Requirements**. This Participation Agreement shall incorporate as terms and conditions to this agreement all of the Program's Specifications and Program Requirements. In the event of any conflict or inconsistency between this Participation Agreement and attachments, this Participation Agreement shall be controlling.
3. **Amendments.** If either party desires a change in the items specified in this Participation Agreement an amendment must be requested through written notice. Changes to this Participation Agreement will only be effective if set forth in a document signed by authorized representatives of both the City and the Participant.
4. **Voluntary Participation/Assumption of Risk.** Participant is fully aware of the risks and hazards connected with the activities of implementing Measures, and Participant is aware that such activities include the risk of injury and even death, and Participant hereby elects to participate voluntarily in the Program knowing that the activities may be hazardous to Participant's property and person. Participant voluntarily assumes full responsibility for any risks of loss, property damage, or personal injury, including death, which may be sustained by Participant, or any loss or damage to property owned by Participant, as a result of being engaged in such activities, to the fullest extent allowed by law.
5. **Equipment Selection, Operation and Maintenance.** Implementation of the Measure(s) shall be the sole responsibility of the Customer. Neither the City nor any of its departments, subsidiaries, affiliates

and officers, directors, employees, agents, representatives or volunteers are responsible for determining whether the design, engineering and implementation of the Measures are proper or compliant with any particular laws, codes, or industry standards. Participant understands and agrees that he/she is solely responsible for all aspects related to the Measures and project work at the Site Address, including but not limited to: selecting the equipment; selecting contractors to perform any Project work; inspecting the Project work and the equipment; ensuring that the equipment is in good working order and condition; ensuring that the equipment is of appropriate manufacture, design specifications, size and capacity, and that the equipment and Project are safely and properly installed and suitable for Participant's purposes; and otherwise performing and meeting all Program requirements and applicable laws, regulations and codes. Participant acknowledges and agrees that the City is not a manufacturer of, or regularly engaged in the sale or distribution of, or an expert with regard to, any equipment that Participant selected, purchased, replaced, retrofitted and/or installed under this Program.

6. **Installation and Payment.**

a. Participant shall implement measures at the Site Address according to the Program Requirements and any project Specifications. Upon completion of the performance of such implementation activities in the manner required by applicable Specifications and Requirements, Participant shall also provide accurate and complete documentation acceptable to the City, including Program Forms and information related to Measures, such as the purchase, replacement and/or installation costs, in order to become eligible for an incentive payment under the Program.

b. The City is not obligated to pay any incentive or incentive amount until the City has performed a post-installation verification and analysis of energy savings for conservation program purposes and determined in its sole discretion that all Program Requirements and M&V Guidelines have been fulfilled to the satisfaction of the City. The City will pay the Participant the City's Program Rate as defined in the Program Requirements, unless City funding becomes unavailable, depleted or the Program Specifications, Requirements, and other Program policies change or limit the incentive payment. The incentive calculation rate and methodology, and the method and timing of disbursement under the Program shall at all times be in the City's sole discretion, and subject to change without notice.

c. Participant shall be responsible for payment of any applicable federal, state or local income and corporate tax liability associated with Participant's receipt of the City's Incentive Payment. This Participation Agreement applies to only the Program Participant and the Project at the Site Address. Should additional projects be requested by the SCL customer, new program forms must be submitted and approved by the City in accordance with all applicable Program Requirement, Specifications, and other Program policies.

7. **Verification Inspection & Data Collection.**

a. The Participant shall grant permission and access to the City, and the City may, at its option, during reasonable hours and with notice to the participant, perform pre- and post- installation monitoring and visual verification of the implemented Measures for a three-year period following the completion of the Project, in order to determine the energy savings, and if necessary, to verify Participant's compliance and performance obligations under this Participation Agreement. **The Customer understands that the scope of any visual verification and review performed by The City does not include any kind of safety, code, or other compliance review or inspection, and is for administrative and verification purposes only.** Failure to grant permission and access to the City for the purposes set out in this section shall constitute a breach of this Agreement by Participant and may result in loss of incentive payment.

b. Participant acknowledges that the City collects and compiles certain energy information, building design specifications and the results of the design assistance, for purposes of evaluation and preparing of energy conservation reports and case studies under the Business Conservation Program. Should this energy use information not be available without tenant approval or consent following occupancy,

Participant grants permission and consent to the City to obtain such information from the tenants for the same consecutive period. If the City is unable to perform monitoring or verification due to a tenant failing to provide approval of consent, the City may withhold incentive payment to the Participant regardless of whether the Participant was at fault for the failure to obtain consent from tenants.

8. **Compliance with Laws.** Participant represents and warrants that Participant, his/her agent and employees, or any contractors retained to install or maintain the equipment, are familiar with, and at all times will comply with all applicable federal, state and local laws, codes, ordinances, rules and regulations, Program Specifications, Guidelines and other Program policies and requirements, including but not limited to those pertaining to the implementation of Measures at the Site Address.
9. **Public Records Act Compliance** – The City may release documents and records related to this Participation Agreement when the City determines it is required to do so by Washington's Public Records Act, RCW Chapter 42.56, or other disclosure laws. Additionally, as a party contracting with a governmental entity, Participant may have obligations under disclosure laws. Participant is responsible for understanding and complying with any applicable disclosure requirements.
10. **The City of Seattle Disclaimer.** THE CITY DISCLAIMS, ANY AND ALL IMPLIED OR EXPRESS WARRANTIES, including without limitation, ANY REPRESENTATIONS OR PROMISES WITH RESPECT TO THE MEASURES, MATERIALS OR LABOR REQUIRED FOR THE implementation OF THE MEASURES ON CUSTOMER'S SITE, OR THE COST OF SUCH equipment, MATERIALS AND LABOR, OR ANY ENERGY SAVINGS THAT MAY ACCRUE FROM THE IMPLEMENTATION OF SUCH MEASURES. THE CITY MAKES NO IMPLIED OR EXPRESS WARRANTIES REGARDING THIS PROGRAM, ITS POLICIES, PROCEDURES, ITS ADMINISTRATIVE VERIFICATIONS, AND / OR ANY OWNER INSTALLED equipment, OR equipment INSTALLED BY A THIRD PARTY CONTRACTOR, AND SPECIFICALLY DISCLAIMS ANY WARRANTY OR MERCHANTABILITY OR FITNESS OF SUCH equipment FOR ANY PARTICULAR PURPOSE. Any required maintenance, repair or replacement of the equipment shall be the sole responsibility of, and at the expense of the Customer. THIS DISCLAIMER SHALL SURVIVE ANY CANCELLATION, COMPLETION, TERMINATION OR EXPIRATION OF THE CUSTOMER'S PARTICIPATION IN THE PROGRAM.
11. **Indemnity/Limitation of Liability.**

a. Participant acknowledges and agrees: (i) participation in this Program is voluntary, (ii) that the City is providing limited incentive payments for estimated energy savings and conservation purposes only, and (iii) that the City assumes no liability for Participant's decision to enter into this Agreement, for the Measures selected by Participant, any third parties selected by Participants to implement such Measures, or any disputes arising out of repair or replacement of the equipment installed hereunder. To the fullest extent allowed by law, Participant agrees to release, and defend, indemnify, and hold harmless the City, its departments, subsidiaries, affiliates and officers, directors, employees, agents, representatives or volunteers, from any and all claims, losses, harm, costs, liabilities, damages and expenses (including attorney's fees) of any nature whatsoever, or allegations thereof, arising directly or indirectly out of any act, omission, fault or negligence of Participant or any third party selected by Participant in connection with this Agreement, or the purchase, installation, or use of the equipment applicable under this Agreement, except to the extent that any such claims, losses, harm, costs, liabilities, damages and expenses are caused by the City's negligence or willful misconduct. Participant's indemnity, protection, and hold harmless obligations shall include any demand, claim, assignment, suit or judgment for damages to property or injury to or death of persons, or for any incentive payment by the City, or for any payment made under or in connection with any Workers' Compensation law or under any plan for employees' disability and death benefits. Participant expressly waives by mutual negotiation, all immunity and limitation on liability under any industrial insurance act, including Title 51 RCW, other Workers' Compensation Act, Disability Benefit Act, or other Employee Benefit Act of any jurisdiction, which would otherwise be applicable in the case of such claim.

b. To the fullest extent allowed by law, the City's liability shall be limited to paying only the City approved incentives in accordance with this Participation Agreement and the Program's Specifications, Requirements, and other Program policies. The City, and its departments, affiliates and officers, directors, employees, agents, representatives or volunteers shall maintain no liability to the Participant or any other party for any other obligation under the Program. In no event, whether as a result of breach of contract, tort, or any other theory of recovery shall the City be liable in connection with this Participation Agreement or the Program for any or all special, indirect, incidental, penal, punitive or consequential damages of any nature.

12. **Assignment.** This Participation Agreement will inure to the benefit of and be binding upon the successors and assigns of the respective parties hereto. Participant may legally assign its rights and interests of any incentive payment over to a third party contractor, but only upon execution of a Program Payment Assignment Form as set forth in the Program Requirements and Forms, and upon the City's pre-approved consent.
13. **Governing Law and Venue.** This Agreement shall be construed and interpreted in accordance with the laws of the State of Washington. Any action at law or in equity to enforce the terms and conditions of this Agreement shall be brought solely in a court in King County Superior Court.
14. **Survivability:** The provisions of Sections 3-6 and 8-12 shall survive the expiration, termination, or completion of the Customer's participation in the Program.
15. **Severability:** If any provision of this Participation Agreement, in whole or in part, is deemed invalid by any court or administrative body of competent jurisdiction, then these provisions shall be construed as reformed to the extent necessary to render such provision valid, and the remaining provisions shall remain in effect as reformed. The Customer and the City agree that all provisions of these Terms and Conditions are severable.

By signing this Participation Agreement, I acknowledge that I have fully read, understand, and agree to be bound by the above Terms and Conditions of this Participation Agreement for participation in the Seattle City Light Business Conservation Program.

I certify or declare, under penalty of perjury, under the laws of the State of Washington that I am the Seattle City Light customer and Program Participant, or the legal property owner, corporate officer, agent or representative of the business entity listed below, who is authorized on behalf of the Seattle City Light customer and Program Participant, to execute and agree to the terms and conditions of this Participation

Agreement for participation in the Seattle City Light Business Conservation Program.

Authorized Signature of Program Participant: _____ Date: _____

Printed Name of Authorized Signer of Program Participant: _____

Title: _____

APPENDIX A-3

Seattle City Light

BUSINESS CONSERVATION PROGRAM

PROGRAM GUIDELINES

[MONTH ##, ####]

PROJECT NUMBER	PROJECT NAME	SEATTLE BUILDING ID#
[Number]	[Name]	[Number]
CUSTOMER "PARTICIPANT" NAME	**SITE ADDRESS**	
[Name, Title]	[Subject]	

TUNE-UP ACCELERATOR "BASIC TUNE-UP" INCENTIVE PROGRAM GUIDELINES:

1. The Tune-Up Accelerator "Basic Tune-Up" Incentive Program (the "Program") is offered to non-residential buildings of approximately 100,000 square feet or less of gross floor area (excluding parking) that have been deemed eligible to participate by the Seattle Office of Sustainability and Environment "OSE". This is a one-time incentive opportunity to encourage building owners to voluntarily participate in the early adoption of a tune-up that will meet the Seattle Building Tune-Ups mandate (SMC 22.930) before the building is required to comply (See section 12 for buildings not subject to the Seattle Building Tune-Ups mandate.).
2. Building(s) and Basic Tune-Up incentive eligible square footage are detailed in the Incentive estimate form included with this participation agreement.
3. This incentive opportunity will be offered until 12/31/2018. Incentives have been designed to support both a "Building Assessment" phase ($0.03/square foot-sf), as well as a "Tune-Up Action" phase ($0.09/sf):
    - The **Building Assessment** phase is an assessment conducted by a Tune-Up Specialist to identify building conditions and corrective actions necessary to tune up the building. Tune-up assessment elements are defined in Section 11 of the OSE Building Tune-Ups Director's Rule 2016-01. The Assessment will also include any additional documentation required by these Program Guidelines.
    - The **Tune-Up Action** phase is defined as the implementation of corrective actions by the building owner (or their designee) and a verification of implementation by the Tune-Up Specialist that meets the requirements of Section 11 of the OSE Building Tune-Ups Director's Rule 2016-01. The Action phase includes submittal of the Tune-Up Accelerator Summary Report to OSE and any additional documentation required by these Program Guidelines.

4. The Program Participant (Building Owners or their designee) must allow their selected Tune-Up Specialist (section 5) access to the entire building and all tenant spaces (Spaces less than 5,000 SF with tenant owned equipment may be excluded) to collect information about the building's equipment, operations, and energy consumption as needed to complete the Building Assessment and Tune-Up Action phases. This includes completing the building assessment, collecting data to complete a building Asset Score, verifying corrective actions required, and completing the Tune-Up Accelerator Summary Report (section 7).

5. Program Participants (Building Owners or their designee) in the Tune-Up Accelerator Program must work with a "Tune-Up Specialist" from a service provider firm that has completed a Tune-Up Accelerator Program Service Provider Training, sponsored by OSE. These firms are listed on the Accelerator Program website. The Program Participant understands that the scope of OSE's service provider training is limited to the reporting requirements of the Tune-Up Accelerator program, and Program Participant further acknowledges that this is not intended by OSE or Seattle City Light (SCL) to be a contractor recommendation. If the Program Participant would like an exception to work with another firm or to work with Program Participant's qualified in-house facility engineering staff, Program Participant must contact OSE in writing for pre-approval prior to any work to ensure the Tune-Up Specialist meets the requirements of the Tune-Up Accelerator Program and is qualified as a Tune-Up Specialist, which is an individual that meets the qualifications specified in Section 12 of the OSE Building Tune-Ups Director's Rule 2016-01.

6. Program Participant's Tune-Up Specialist shall perform a Building Assessment as defined in Section 3 of these Program Guidelines. ***The Building Assessment portion should be completed no later than 11/30/2018.***

    - Assessment shall also include current annual operating hours for HVAC and facility lighting systems. SCL Operating Hours Worksheet available for use on the Accelerator Program Website

7. Program Participant shall submit the following documentation to a Seattle City Light Energy Management Analyst to receive payment #1, the Building Assessment incentive:

    - Tune-Up Specialist's own assessment report
    - Invoice(s) detailing cost of Building Assessment
    - Participants performing Building Assessment(s) with their own qualified staff should submit detail of costs associated with tune-up assessment:
        - Name of personnel involved in assessment
        - Hours each employee devoted to tune-up assessment activities
        - Hourly rate for each employee performing assessment activities (base pay rate plus benefits, overhead)

8. ***The Tune-Up Accelerator Summary Report (available on the Accelerator Program website)***

certifying the tune-up Building Assessment and completion of the Action Phase, as defined in Section 2 of these Program Guidelines shall be signed by the Building Owner and Tune-Up Specialist and submitted to OSE no later than 06/30/2019.

- This report will be reviewed by OSE to determine if the Tune-Up Accelerator Summary Report meets the requirements of Section 11 of the OSE Building Tune-Ups Director's Rule 2016-01. If the Summary Report is approved by OSE, the building owner will be granted a one-time exemption to the first required Seattle Building Tune-Ups Program deadline. Program Participants that submit reports determined as not meeting the requirements will be contacted and offered an opportunity to correct and resubmit.
- Tune-Up Accelerator Summary Reports that are determined by OSE to meet the requirements will be forwarded to Seattle City Light. Seattle City Light will make any and all incentive payments at SCL's sole discretion and under the terms of and conditions of the SCL Program Participation Agreement and the Program Guidelines.
- See section 12 for buildings not subject to the Seattle Building Tune-Ups mandate.

9. Program Participant shall submit the following documentation to a Seattle City Light Energy Management Analyst (EMA) to receive payment #2, the Tune-Up ("Action") incentive:
    - Scheduled annual operating hours of primary building HVAC and Lighting systems. Note any changes compared to operating hours identified in Tune-Up assessment.
        - Operating hours worksheet available on the Accelerator Program website
    - Tune-Up Specialist's own final actions or summary report (if separate report provided)
    - Invoice(s) detailing cost of Tune-Up (corrective actions and/or Tune-Up Specialist charges)
    - Participants performing Building Tune-Up corrective actions with their own qualified staff should submit detail of costs associated with corrective actions
        - Name of employees involved in corrective actions
        - Hours each employee devoted to tune-up corrective actions
        - Hourly rate for each employee performing assessment activities (base pay rate plus benefits, overhead)
10. The Energy Management Analyst will confirm that OSE has deemed that the building has met the requirements as defined in section 7 prior to authorizing Payment #2, the Tune-Up Action incentive.
11. Other recommended (optional) Tune-Up actions and/or or capital equipment upgrades to the building may be eligible for SCL efficiency incentives. Any efficiency incentives pursued by the Program Participant in addition to this Tune-Up Accelerator incentive will be offered to the Program Participant in separate Participation Agreement(s) that outline the requirements and

incentive funding.

12. The Energy Management Analyst may conduct a verification site visit to confirm that corrective actions have been completed as described in the Tune Up Accelerator Summary Report. Any site visit will be at the discretion of the EMA, but will be scheduled in advance at a mutually agreeable time for EMA and participant.

13. Buildings within the City of Seattle (less than 50,000 SF excluding parking) and buildings outside of the City of Seattle, but within City Light territory (City Light customers) are not subject to the City of Seattle Building Tune-Ups requirement. Buildings meeting these criteria may still participate in the Tune-Up Accelerator program and are eligible for the "Basic Tune-Up" incentive. OSE will review the Tune-Up Summary Report for completeness and accuracy, and make a recommendation to City Light for the final "Tune-Up Action" incentive. City Light will determine the final incentive payment.

Table 2. Accelerator Funding Amounts and Milestones

Payment No.	Incentive Formula	Milestone/Documentation
Payment #1: Tune-Up Building Assessment Incentive	1.1 Lesser of: a. $0.03 per Square Foot of eligible floor area (Defined in Incentive Estimate) b. 70% of Costs incurred for the Tune-up Assessment	Documentation of Completed Tune-Up Assessment (Specialist's own report to Building Owner as required in Director's Rule 2016-01, Sec. 10-B.) Assessment cost documentation submitted to SCL, as detailed in Paragraph #6 (above).
Payment #2: Tune-Up Action Incentive	2.1 Lesser of: a. $0.09 per Square Foot of eligible floor area (Defined in Incentive Estimate) b. 70% of total costs incurred for the Tune-up assessment, corrective actions, and reporting. c. Combined total of payments #1 and #2 cannot exceed 70% of total costs of the tune-up assessment, corrective actions, and tune-up reporting.	Completed Tune-Up Accelerator Summary Report SCL Operating Hours Worksheet Documentation of Tune-Up costs as detailed in Paragraph #8 (above).

Seattle.gov

APPENDIX A-4

Greenspace Blog

Office of Sustainability & the Environment

OSE Releases Final Rule for Seattle Building Tune-Ups Requirement

February 1, 2017 by **WysockS**

OSE is pleased to issue **OSE Director's Rule 2016-01** which implements the **Seattle Building Tune-Ups Ordinance** adopted in March 2016. The Director's Rule further explains the Tune-Ups requirement, and is the result of more than a year of collaboration with stakeholders to make this new policy clear and workable, with a focus on saving energy and flexibility for building owners. OSE thanks the Tune-Ups Technical Working Group and the dozens of other building owners, managers and energy management experts who helped shape these requirements.

The Rule clarifies the following: tune-up assessment components, corrective actions, and reporting; compliance extensions and exemptions; qualifications for tune-up specialists; and buildings and spaces subject to the requirement. This final version has several edits to address public comments received on the draft Rule, which was released in November. Highlights of the changes include:

- The size threshold for tenant spaces with tenant-owned equipment that are not required to be tuned-up was increased from 2,500 to 5,000 square feet.
- References to costs and payback periods were edited to make it clear that cost calculations are not required.
- One Alternative Compliance Pathway – that of demonstrating at least $1/square foot of investment in energy conservation measures over three years – was removed from Section 9 "Exemptions" because of the challenges in identifying a form of evidence about actions taken, energy savings, and associated costs.

- Additional certification and license options were included as eligible qualifications for a Tune Up Specialist in Section 12.

Seattle Building Tune-Ups phases in a periodic tune-up requirement for nonresidential buildings 50,000 square feet or larger (excluding parking), beginning in 2018 with buildings 200,000 SF or greater due first. Tune-ups aim to optimize energy and water performance by identifying no- or low-cost actions related to building operations and maintenance, focusing on actions that typically pay back within three years and generate 10-15% in energy savings on average. The legislation is a key piece of **Seattle's Climate Action Plan**, our roadmap to achieving carbon-neutrality, by helping ensure buildings don't use energy and water wastefully.

Support for Mid-Size Buildings to Comply with Seattle Building Tune-Ups

We're recruiting up to 100 buildings (less than ~100,000 SF excluding parking) to jump-start their Tune-Up through the new **Building Tune-Up Accelerator Program** Benefits will include enhanced technical support and financial incentives to help comply with the Seattle Building Tune-Ups requirement. This funding will sunset after 2018, so contact us now if your building is due in 2020 or 2021. Trainings for service providers and in-house facility managers will also be offered on the Accelerator Program in mid-2017. Email **nicole.ballinger@seattle.gov** or call 206-233-7184 for more information.

Questions about the Seattle Buildings Tune-Up Requirement?

Visit **www.seattle.gov/buildingtuneups** for more information, or contact Christie Baumel at (206) 233-7173, or **christie.baumel@seattle.gov**.

Filed Under: **Climate change**, **Energy Conservation**, **Greenbuilding**, **Greenspace**

Seattle.gov

APPENDIX A-5

Greenspace Blog

Office of Sustainability & the Environment

Seattle Building Tune-Up Accelerator Now Accepting Applications

August 23, 2017 by **WysockS**

OSE is recruiting owners of 100 mid-size buildings (100,000 SF or less excluding parking) to enroll in the new **Tune-Up Accelerator Program**. We are partnering with Seattle City Light to offer financial incentives of **up to $0.12 per square foot** and additional support to help building owners get a jump-start on meeting the upcoming **Seattle Building Tune-Ups requirement**.

By participating in the Accelerator program, owners of mid-size buildings can accelerate their energy savings and meet their first mandated building tune-up. These incentives will sunset after 2018, so enroll soon to take advantage of the program. Find the Program Application, Tune-Up Accelerator Service Provider List and additional program details **on the website**. Please complete and submit the Program Application to accelerator@seattle.gov by December 1, 2017. Questions? Email **accelerator@seattle.gov** or call 206-233-7184.

Filed Under: **Greenspace**

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Seattle
Office of Sustainability
& Environment

APPENDIX A-6

FOR IMMEDIATE RELEASE:

Contact: Sara Wysocki, Office of Sustainability & Environment, 206.233.7014, Sara.Wysocki@seattle.gov

New Incentives for Building Owners to Meet Seattle Building Tune-Ups Mandate

Applications for Tune-Up Accelerator Program Due December 1

SEATTLE (October 16, 2017) - The City of Seattle is recruiting owners of 100 mid-size buildings to enroll in the new Tune-Up Accelerator Program to get a jump-start on meeting the Seattle Building Tune-Ups requirement. Owners of all types of non-residential buildings (approximately 100,000 SF or less excluding parking), such as offices, retail, hotels, and schools are encouraged to participate.

Through the Accelerator Program, Seattle City Light and the Office of Sustainability and Environment are offering **financial incentives of up to $0.12 per square foot** for mid-size buildings that meet the Seattle Building Tune-Ups requirement early**.** The incentive is estimated to cover at least 50% of the typical cost of a tune-up. Other incentives for energy conservation, such as lighting upgrades that go beyond the tune-up requirements, are also available. And, the University of Washington Integrated Design Lab has technical support for owners considering major renovations, equipment replacement, or tenant improvements.

Building tune-ups include an inspection of building systems to identify operational or maintenance issues; completion of corrective actions; and a report to the City of Seattle summarizing the work. Buildings less than 50,000 SF may participate in the Accelerator incentive program as well, even though the tune-up mandate does not apply to them. The program is supported by the U.S. Department of Energy's Building Technologies Office with its award geared towards solutions to improve the energy efficiency of small and medium commercial buildings.

Owners should enroll in the Accelerator Program by December 1, 2017 and complete the tune-up by mid-2019 to take advantage of the incentive. Service providers qualified to conduct tune-ups are available to work with building owners.

Visit the Tune-Up Accelerator Program website for the application, a list of service providers and additional details. For questions, email accelerator@seattle.gov or call 206-233-7184.

# # #

SEATTLE
BUILDING TUNE-UP ACCELERATOR

Tune-Up to Accelerate Your Building's Energy Savings!

And get help doing it! We're recruiting owners or managers of up to 100 mid-size nonresidential buildings (100,000 SF or less) to jump-start their building's Tune-Up. Don't miss out on technical support and financial incentives for a tune-up that meets the new Seattle Building Tune-Ups requirement – **funding that will sunset after 2018**. Complete a building assessment and implement corrective operations and maintenance actions or do more for deeper energy savings and a more valuable building asset.

ACCELERATOR INCENTIVES

BASIC TUNE-UP
Seattle City Light incentive of **up to $0.12 per SF** for the tune-up assessment and corrective actions. Buildings with interval data will also be offered a complimentary virtual energy assessment and may be eligible for additional incentives for energy saved.

TUNE-UP PLUS
Includes the Basic Tune-Up plus Seattle City Light rebates for energy-saving improvements including lighting, HVAC and more.

BUILDING RENEWAL
UW Integrated Design Lab support for energy modeling and Spark Tool savings/income analysis for more complex projects. Above and custom incentives may apply.

ACCELERATOR BENEFITS

- Financial and technical support
- Meet your building's 1st required tune-up
- Pick from qualified providers that will help you through the Program
- Technical support from Smart Buildings Center
- Asset Score analysis that rates a building & identifies cost-saving opportunities
- Basic Tune-Up can save 10-15% — more with Tune-Up Plus and Building Renewal

Don’t miss out on incentives and enhanced technical support.

Accelerator incentives and technical support for **buildings 100,000 SF or less** (excluding parking) for tune-ups that meet the Seattle Building Tune-Ups requirements will sunset after 2018.

Timeline

- Sign-up your building by December 1, 2017.
- Select a service provider, negotiate scope of work & obtain utility incentive approval.
- Start your building’s tune-up between Fall 2017 and end of 2018.
- Complete by mid-2019 or sooner.

Sign Up

Nicole Ballinger
Tune-Up Accelerator Program Manager

accelerator@seattle.gov
206-233-7184

PARTNERS

City of Seattle
Office of Sustainbility & Environment

—

Seattle City Light

—

Smart Buildings Center

—

University of Washington
Integrated Design Lab

—

Pacific Northwest
National Laboratory

The Tune-Up Accelerator is supported by the U.S. Department of Energy’s Office of Energy Efficiency and Renewable Energy (EERE) under the Buildings Program Award Number DE-EE0007556.

WHAT IS THE SEATTLE BUILDING TUNE-UPS REQUIREMENT?

Building tune-ups include an inspection of building systems to identify operational or maintenance issues; corrective actions to fix issues identifiedin the inspection; and a report to the City of Seattle summarizing issues identifiedandactionstaken.

Per SMC 22.930, mid-size nonresidential buildings, 70,000 to 99,999 SF, are required to comply by October 2020 and those 50,000 to 69,999 SF are required to comply by October 2021. Larger buildings are required in 2019.

LEARN MORE
seattle.gov/buildingtuneups
buildingtuneups@seattle.gov
206-727-TUNE (8863)

SEATTLE building tune-ups

10-15%
AVERAGE ENERGY SAVINGS

Tune-ups generate energy and cost savings with no- or low-cost building operations and maintenance actions.

seattle.gov/buildingtuneups
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TUNE-UP ACCELERATOR PROGRAM: **BUILDING RENEWAL PATH**

Program Overview for Service Providers, Facility Engineers, and Building Owners

Through the **Building Tune-Up Accelerator Program**, the City of Seattle is working to advance Tune-Ups of small to mid-size commercial buildings (less than 100,000 SF). Approximately 100 buildings are expected to participate in the Tune-Up Accelerator program, which will run through Spring 2019.

Building Renewal and Deeper Energy Savings Opportunities

For buildings where capital investments such as renovations or tenant improvements are planned, or where major equipment is nearing end-of-service-life replacement, the Tune-Up Accelerator Program offers limited no-cost resources to provide technical support aimed at **Building Renewal**.

Owners, in-house building engineers and service providers requesting **Building Renewal** services may request technical support and best practices guidance from the **University of Washington's Integrated Design Lab (UW IDL)** and its technical partner **Solarc Energy Group**.

INTEGRATED DESIGN LAB
UNIVERSITY of WASHINGTON // W

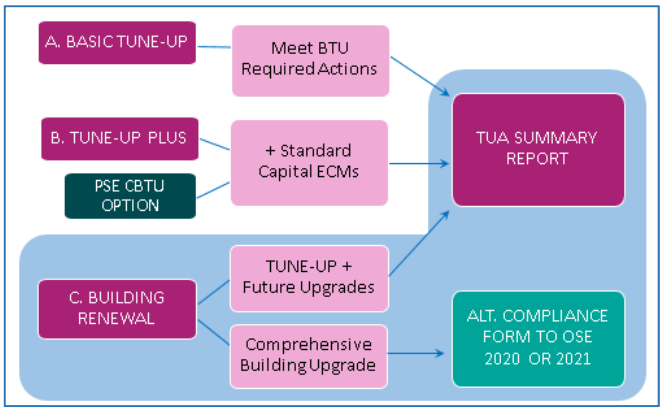
Building Renewal Opportunities

Building Renewal offers additional levels of technical support for participants that want deeper savings beyond the Basic Tune-Up and Tune-Up Plus paths. This could include technical support for capital improvements such as lighting, or support for more complex needs, such as renovations, improvements to the building envelope or replacement of major HVAC equipment approaching end-of-life. Three different levels of Building Renewal are available:

- **Level 1:** UW IDL will provide best practices recommendations, implementation guidance, and where appropriate SPARK Tool-derived energy efficiency measure packages at no cost (up to 25 buildings). SPARK is an on-line screening, evaluation, and concept-level design guidance tool for building energy retrofits.
- **Level 2:** Level 1 activities and **walk-through with Provider/Building Owner and technical recommendations**. In collaboration with Accelerator partners and project participants, UW IDL will provide, supplemental technical assistance which may include: setting performance goals, Implementation process guidance, and systems integration recommendations (up to 15 buildings).
- **Level 3:** Level 2 activities plus Technical Assistance including **simulation-based analysis and recommendations**. In collaboration with Accelerator partners and project participants, UW IDL will provide, as time and resources permit, project-specific analytical assistance including climate and site analysis and energy simulation modeling (up to 5 buildings).

Documenting the Tune-Up

Most participants in the Tune-Up Accelerator Building Renewal path will use the **Tune-Up Accelerator (TUA) Summary Report** form to document the tune-up assessment and verification of corrective actions. However, more comprehensive projects that pursue the Level 3 Building Renewal option may consider meeting the Building Tune-Ups requirement using the Alternative Compliance for Exemplary Energy Performance pathway, and submitting the form to the City before the building's deadline in 2020 or 2021.



ACCELERATOR PROGRAM PATHS & DOCUMENTATION
OPTION C: BUILDING RENEWAL

How to Participate in Building Renewal

Participation in the Building Renewal option is limited. Owners and providers interested in participating in the Building Renewal component of the Tune-Up Accelerator Program should express their interest by March 31, 2018 by contacting the Accelerator Help Desk with a brief description of their project needs and how they will manage the project. Building Renewal Staff will contact you to meet, schedule a walk-though (if needed) and further discuss your plan.

Accelerator Help Desk

accelerator@seattle.gov
206-233-7184
www.seattle.gov/buildingtuneups
Click 

SEATTLE
building tune-ups

Ready, Set, Comply.

Building Tune-Ups are required every five years for Seattle properties with 50,000 SF+ of commercial space. Visit seattle.gov/buildingtuneups to learn more.

Seattle
Office of Sustainability
& Environment

PO Box 94729
Seattle, WA 98124-4729

RETURN SERVICE REQUESTED

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Like cars and bikes, all buildings need to be tuned up regularly to keep them running as efficiently as possible. Through Tune-Ups, building owners find operational efficiencies and low- and no-cost fixes that improve building performance and on average reduce building energy use 10-15%.

Building owners with 50,000 SF or more of non-residential space must comply with the City of Seattle's Building Tune-Ups mandate, a progressive energy efficiency policy that helps owners and managers identify smart, responsible ways to reduce energy and water costs.

Is your building 100,000 SF or less? Get $ for a Tune-Up!

TUNE-UP SCHEDULE

Ongoing, every five years

BUILDING SIZE*	DUE
200,000+ SF	March 1, 2019
100,000-199,999 SF	October 1, 2019
70,000-99,999 SF	October 1, 2020
50,000-69,999 SF	October 1, 2021

** Excluding parking*

SEATTLE
building tune-ups

seattle.gov/buildingtuneups | buildingtuneups@seattle.gov | 206-727-TUNE (8863)

Seattle Office of Sustainability & Environment

Seattle City Light

<FirstName> <LastName>
<OrganizationName>
<AddressLine2>
<AddressLine1>
<CityName>, <StateCode> <ZipCode>

August 18, 2017

RE: Incentives from Seattle City Light to help you meet Seattle's new Building Tune-Ups requirement

Dear Building Owner or Manager,

The City of Seattle Office of Sustainability & Environment (OSE) is recruiting 100 mid-size buildings (100,000 SF or less excluding parking) to enroll in the new **Tune-Up Accelerator Program**. We are partnering with Seattle City Light to offer financial incentives of **up to $0.12 per square foot** and additional support to help you get a jump-start on meeting the upcoming Seattle Building Tune-Ups requirement (see factsheet).

Your building is eligible:

Name: <BuildingName>	**City of Seattle ID:** <Buildingid>
Address: <Address>	**Gross Floor Area (excl. parking)[1]:** <GFA>

What's in it for you?

You can meet the Building Tune-Ups requirement through these options:

- **Basic Tune-Up**: Seattle City Light incentive of up to **$0.12 per square foot** (excluding parking). This includes $0.03 per square foot for completion of the "Building Assessment" and an additional $0.09 per square foot for completing the required operational and maintenance "Tune-Up Actions." The incentive is estimated to cover at least 50% of the typical cost of a tune-up. In most cases, the simple payback from the electric energy savings alone would be 1.5 years. Buildings with interval electric meter data (primarily downtown) will also be offered a complimentary virtual energy assessment from City Light.
- **Tune Up Plus**: Includes the Basic Tune-Up, **plus** standard City Light rebates for additional voluntary capital improvements, such as lighting or HVAC upgrades. Implementing additional energy conservation measures will provide even greater energy and cost savings.
- **Building Renewal:** In-depth technical support for building owners and investors looking to understand the potential savings from larger investments. Leased office buildings will also be offered a complimentary financial analysis of building upgrades. Plus, City Light incentives described above, as applicable.

[1] Based on City of Seattle Energy Benchmarking data and subject to confirmation. Incentive eligible floor area will be negotiated in the building owner's signed Participation Agreement with Seattle City Light. Total incentive must not exceed 70% of the total tune-up costs.

How to Enroll in the Tune-Up Accelerator

1. **Go to www.seattle.gov/buildingtuneups** and **click on Tune-Up Accelerator.** You'll find the Program Application, Tune-Up Accelerator Service Provider List and additional program details.
2. Complete and submit the **Program Application** to **accelerator@seattle.gov** **by December 1, 2017**.
3. **Select a Service Provider** – You may fill out the **Program Application** before you know who you want to complete the Building Assessment, but please contact a service provider from the Tune-Up Accelerator Provider list soon. Your provider will work with you to create a scope of work for the Building Assessment.

Don't miss out on this opportunity to get Seattle City Light incentives for your building tune-up. By participating in the Accelerator program and successfully completing the Basic Tune-Up by June 2019 (or sooner) you can meet your building's first mandated tune-up (2020 or 2021, depending on building size).

I hope you will consider participating in this program to complete your tune-up early with this extra support. If you have any questions, please email me at **accelerator@seattle.gov** or call **206-233-7184**.

Sincerely,

Nicole Ballinger | Tune-Up Accelerator Program Manager
accelerator@seattle.gov | 206-233-7184

What happens after you submit the Tune-Up Accelerator Program Application?

- Once OSE receives your Program Application, we will confirm program eligibility and GFA, and forward to Seattle City Light. City Light will contact you to sign a Participation Agreement that will explain the steps and documentation required to get the Basic Tune-Up incentive. (Your Service Provider can assist with this process.)
- Negotiate a scope of work with your selected Service Provider for the Building Assessment.
- Once your Participation Agreement is approved, schedule your Service Provider to complete the Building Assessment by August 30, 2018 (or earlier). If desired, enroll in any additional Tune-Up Plus incentives or the Building Renewal option.
- When the Building Assessment is complete, work with your Service Provider to submit City Light's required documents to obtain the Building Assessment incentive.
- Complete Tune-Up Actions by June 30, 2019.
- Work with your Service Provider to submit the final Tune-Up Accelerator Summary Report to OSE and City Light's required documents to obtain the final Tune-Up Action incentive.

APPENDIX A-11

Example of Follow-Up Email to Building Owner

Subject: Building Tune-Up Accelerator incentives available - now accepting applications

August 14, 2017

Dear [First Name] [Last Name],

Thank you for contacting me previously about the **[BUILDING NAME]** building participating in the **Tune-Up Accelerator Program**. We are now accepting applications and would be thrilled to have this building participate. Please enroll by December 1st or sooner.

The Seattle City Light "tune-up" incentives are **up to $0.12 per square foot** to help building owners get a jump-start on meeting the upcoming Seattle Building Tune-Ups requirement. Choose from three options:

- **Basic Tune-Up**: Seattle City Light incentive of up to **$0.12 per square foot** (excluding parking). This includes $0.03 per square foot for completion of the "Building Assessment" and an additional $0.09 per square foot for completing the required operational and maintenance "Tune-Up Actions." The incentive is estimated to cover at least 50% of the typical cost of a tune-up. In most cases, the simple payback from the electric energy savings alone would be 1.5 years. Buildings with interval electric meter data (primarily downtown) will also be offered a complimentary virtual energy assessment from City Light.
- **Tune Up Plus**: Includes the Basic Tune-Up, **plus** standard City Light rebates for additional voluntary capital improvements, such as lighting or HVAC upgrades. Implementing additional energy conservation measures will provide even greater energy and cost savings.
- **Building Renewal:** In-depth technical support for building owners and investors looking to understand the potential savings from larger investments. Leased office buildings will also be offered a complimentary financial analysis of building upgrades. Above City Light incentives as applicable. I'm happy to answer more questions about this and can connect you with the Integrated Design Lab at UW that is offering this support.

How to Enroll in the Tune-Up Accelerator

1. **Go to** the **Tune-Up Accelerator webpage.** You'll find the Program Application, Tune-Up Accelerator Service Provider List and additional program details. (I've also attached the Program Application to this email for your convenience. Our Provider List will be updated, so please check the website for current version.)
2. Submit the **Program Application** to accelerator@seattle.gov **by December 1, 2017**.
3. **Select a Service a Provider** – You may fill out the **Program Application** before you know who you want to complete the Building Assessment, but please contact a service provider from the Tune-Up Accelerator Provider list soon. Your provider will work with you to create a scope of work for the Building Assessment and Tune-Up Actions.

I hope you can participate in this program to complete your tune-up early with this extra support.

If you have any questions about the process or applying, please email me or call 206-233-7184.

Sincerely,

Nicole Ballinger | Tune-Up Accelerator Program Manager
accelerator@seattle.gov | 206-233-7184

What happens after you submit the Tune-Up Accelerator Program Application?

- Once OSE receives your Program Application, we will confirm program eligibility and GFA, and forward to Seattle City Light. City Light will contact you to sign a Participation Agreement (signed by the Building Owner) that will explain the steps and documentation required to get the Basic Tune-Up incentive. (Your Service Provider can assist with this process.)
- Negotiate a scope of work with your selected Service Provider for the Building Assessment and Tune-Up Actions.
- Once your Participation Agreement is approved, schedule your Service Provider to complete the Building Assessment by August 30, 2018 (or earlier). If desired, enroll in any additional Tune-Up Plus incentives or the Building Renewal option.
- When the Building Assessment is complete, work with your Service Provider to submit City Light's required documents to obtain the Building Assessment incentive.
- Complete Tune-Up Actions by June 30, 2019.
- Work with your Service Provider to submit the final Tune-Up Accelerator Summary Report to OSE and City Light's required documents to meet the requirement and obtain the final Tune-Up Action incentive.

APPENDIX A-12

Tune-Up Accelerator Service Providers

Last Updated 6.6.18

Company Name & Address					Contact for Tune-Up Accelerator Inquiries				Website
ACCO Engineered Systems	5300 Denver Ave S	Seattle	WA	98108	Joseph	Balducci	jbalducci@accoes.com	206-787-8525	www.accoes.com
Ameresco, Inc.	222 Williams Ave South, #100	Renton	WA	98057	Jason	Hite	jhite@ameresco.com	206-708-2952	www.ameresco.com
ArchEcology, LLC	1808 Bellevue Ave, Suite 202	Seattle	WA	98122	Katherine	Morgan	katherinem@archecology.com	206-717-2269	www.archecology.com
ATS Automation	450 Shattuck Ave South	Renton	WA	98057	Pete	Segall	petes@atsinc.org	425-251-9680	www.atsinc.org
360 Analytics	710 2nd Ave, Suite 925	Seattle	WA	98104	Lukas	Hovee	lukas@360-analytics.com	206-557-4732 x202	www.360-analytics.com
Ecotope, Inc	1917 1st Ave, Suite 300	Seattle	WA	98101	Morgan	Heater	morgan@ecotope.com	206-596-4709	www.ecotope.com
Elemental Commissioning Company	4440 35th Ave W	Seattle	WA	98199	Jessica	Sanborn	jessica@elementalcx.com	206-484-2403	www.elementalcx.com
Energy 350, Inc.	1033 SE Main St, Suite 1	Portland	OR	97214	Chris	Smith	chris@energy350.com	971-544-7211	www.energy350.com
Engineering Economics, Inc.	1201 Western Avenue, Suite 325	Seattle	WA	98101	Brendon	Mattis	brendon.mattis@eeiengineers.com	206.622.1001	www.eeiengineers.com
FSi consulting engineers	506 2nd Ave, Suite 700	Seattle	WA	98104	Ben	Roush	benr@fsi-engineers.com	206-622-3321 x236	www.fsi-engineers.com
Hargis Engineers, Inc.	1201 3rd Ave, suite 600	Seattle	WA	98101	Michael	Baranick	michael.baranick@hargis.biz	206-436-0448	www.hargis.biz
Hermanson Company	1221 2nd Ave N	Kent	WA	98032	Ken	Dyckman	kdyckman@hermanson.com	206-617-6132	www.hermanson.com
Holaday Parks	4600 South 134th Place	Seattle	WA	98168	Edwing	Chang	engwinc@holadayparks.com	206 248-9700	www.holadayparks.com
HughCx LLC	601 Union St, Ste 4200	Seattle	WA	98101	George	Amburn	gamburn@hughcx.com	206-321-5098	www.hughcx.com
Integrity Energy Solutions	14405 SE 36th St Suite 210	Bellevue	WA	98006	Matt	Montagner	mattm@iesinnovates.com	206-413-7693	www.iesinnovates.com
Keithly Barber Associates	565 Andover Park West, Suite 101	Tukwila	WA	98188	Kent	Barber	kent@keithlybarber.com	206-947-8879	www.keithlybarber.com
MacDonald-Miller Facility Solutions	7717 Detroit Ave SW	Seattle	WA	98106	Greg	Noel	greg.noel@macmiller.com	206-768-4202	www.macmiller.com
McKinstry Essention LLC	5005 3rd Ave S	Seattle	WA	98134	Ric	Cochrane	ricc@mckinstry.com	206-832-8250	www.mckinstry.com
MENG Analysis	2001 Western Ave Suite 200	Seattle	WA	98121	Doug	Smith	doug@menganalysis.com	206-587-3797	www.menganalysis.com
Neudorfer Engineers, Inc.	5516 1st Ave S	Seattle	WA	98108	Jeff	Harding	jharding@neudorferengineers.com	206-683-1957	www.neudorferengineers.com
NorthWest Engineering Service, Inc. (NWESI)	7000 SW Redwood Lane	Tigard	OR	97224	John	Herboth	johnh@nwesi.com	503-701-9138	www.nwesi.com
Paladino and Company	1932 1st Avenue Suite 200	Seattle	WA	98101	Hanna	Swaintek	hannas@paladinoandco.com	206-957-8585	www.paladinoandco.com
PSR Mechanical	3132 NE 133rd St	Seattle	WA	98125	Neil	Bavins	neil.bavins@psrmechanical.com	206-367-2500 x339	www.psrmechanical.com
Siemens - PNW Energy Service	15900 SE Eastgate Way, Ste. 200	Bellevue	WA	98008	Andrew	Waymire	andrew.waymire@siemens.com	425-281-4706	www.siemens.com
Sazan Environmental Services	601 Stewart Street, #1400	Seattle	WA	98101	Kevin	David	kevind@sazan.com	206.267.1700	www.sazan.com
Solarc	1501 E Madison St., Suite 200	Seattle	WA	98122	Mike	Hatton	mikeh@solarcenergygroup.com	541-349-0966	www.solarcenergygroup.com
Sweek Consulting Engineers, LLC	7049 24th Ave NW	Seattle	WA	98117	Treasa	Sweek	treasa@sweekengineers.com	206-601-6681	www.sweekengineers.com
The Cadmus Group	720 SW Washington St., Suite 400	Portland	OR	97205	Katie	Leichliter	katrina.leichliter@cadmusgroup.com	503-467-7159	www.cadmusgroup.com
The Greenbusch Group, Inc.	1900 West Nickerson Street, Suite #201	Seattle	WA	98119	John	Greenlaw	johng@greenbusch.com	206-378-0569 x111	www.greenbusch.com
University Mechanical Contractors, Inc	11611 49th Place West	Mukilteo	WA	98275	Troy	Turpin	tturpin@umci.com	425-407-2153	www.umci.com

The firms listed above have staff that attended an Accelerator Program training and meet the requirements of the "Tune-Up Specialist"; however, this list is not intended by OSE or SCL to be a contractor recommendation. If you do not see your preferred provider listed, or would like to use qualified in-house facility engineering staff, please contact nicole.ballinger@seattle.gov or 206-233-2184 for more information and prior to starting any work.

APPENDIX A-13

Tune-Up Accelerator Program Required Documentation & Timeline

Tune-Up Accelerator (TUA) Step	Required Documentation	Send To	Timeline
CONTRACTS & AGREEMENTS			
City Light Incentive Participation Agreement signed by Building Owner. Makes Owner eligible for the TUA "Basic Tune-up" **Two Incentive Payments:** 1. Building Assessment phase ($0.03/SF) 2. Tune-Up Action (Implementation) phase ($0.09/SF)	• City Light Incentive Participation Agreement – Refer to SCL Program Guidelines	Owner E-Sign with City Light	**Due 6/30/2018**
BUILDING ASSESSMENT PHASE			
Building Assessment (walkthrough, etc.) completed by Tune-Up Specialist (TU Spec) • Completion makes Building Owner eligible for **Payment #1.** Refer to SCL Program Guidelines & work with City Light Energy Management Analyst (EMA) for payment.	• TU Spec's own summary format or partial TUA Summary Report (Excel)	accelerator@seattle.gov	*Recommended completion before 8/31/2018*
Asset Score completed by TU Spec • Completion makes TU Spec firm eligible for up to $1,000 per building incentive	• Shared Asset Score of building • Invoice to Office of Sustainability & Environment (OSE)	• Follow Asset Score Sharing Instructions • Invoice to: accelerator@seattle.gov	**Due 15 days after Bldg. Assessment complete (or earlier)**
TUNE-UP ACTION (IMPLEMENTATION) PHASE			
Optional: Capital Incentive Agreements with Seattle City Light or Puget Sound Energy for optional ECMs (if in Tune-Up Plus or Building Renewal)	• Utility Incentive Agreement(s)	City Light or PSE	*Recommended enroll before 3/31/2019*
Tune-Up Accelerator Summary Report - Required Tune-Up Corrective Actions implemented & verified by TU Spec. Optional ECMs (if applicable) underway or completed.	• Tune-Up Accelerator Summary Report (Excel). Download from Website	accelerator@seattle.gov	**Due 6/30/2019**
City Light Operating Hours Worksheet completed by TU Spec	• Completed Excel worksheet Download from Website	accelerator@seattle.gov	*Send with TUA Summary Report*
REVIEW PHASE & FINAL DOCUMENTATION			
OSE Reviews Tune-Up Accelerator Summary Report • Approved reports will be granted "Alternative Compliance" to meet building's first required Building Tune-Ups deadline. OSE will contact TU Spec if report needs corrections & resubmittal. • Reports meeting "Alternative Compliance" will be forwarded by OSE to SCL for incentive **Payment #2** documentation.	*NA*	City Light EMA will contact Building Owner/Manager to submit final incentive documentation	*Please allow up to 3 weeks for Tune-Up Summary Report review*
Measurement & Verification - If requested, allow access to building to conduct program M & V. (Will not impact incentives.)	*NA*	*NA*	*9/30/2019*

NEWS RELEASE
FROM THE SEATTLE OFFICE OF SUSTAINABILITY & ENVIRONMENT and SEATTLE PUBLIC SCHOOLS

FOR IMMEDIATE RELEASE:

Contact: Sara Wysocki, Seattle Office of Sustainability & Environment
206.233.7014, Sara.Wysocki@seattle.gov

Tim Robinson, Seattle Public Schools
206.252.0203, tirobinson@seattleschools.org

Seattle Public Schools is a stellar student when it comes to energy efficiency

Building Tune-Ups in 35 school buildings earned $185,646 in rebates for Seattle Public Schools

SEATTLE (October 9, 2019) – While they may not realize anything is different, many students at Seattle Public Schools are now attending classes in buildings that are more energy efficient and will save the school district money on its energy bills going forward. Seattle Public Schools (SPS) recently completed building "tune-ups" in twenty-two elementary schools, three middle and K-8 schools, nine high schools, and the John Stanford Center. A building tune-up involves helping building owners identify smart, responsible ways to reduce energy and water costs and then implement the improvements.

"Our new schools are being designed and built to be energy efficient, but the Building Tune-Up Program ensures that we keep all of our buildings, not just the new ones, running as efficiently as possible," said Rina Fa'amoe-Cross, resource conservation specialist for SPS. "Receiving incentive money to tune up buildings ahead of schedule has been a wonderful bonus!"

The City of Seattle requires commercial buildings 50,000 square feet and larger to conduct periodic tune-ups with the largest buildings, 100,000 square feet or greater, required to comply in 2019. Building Tune-Ups optimize energy and water performance by identifying low- or no-cost actions related to building operations and maintenance, that generate 10-15% in energy

savings, on average. Building energy use is the second largest source of climate pollution in Seattle and accelerating our transition to an energy efficient building sector is critical to meeting our climate goals.

Seattle Public Schools participated in the Tune-Up Accelerator program, a voluntary program for owners of buildings up to 100,000 square feet that gave them access to technical assistance and incentives for compliance with the Seattle Building Tune-Up requirement ahead of the deadline. As a result of the successful tune-ups in the twenty-two buildings enrolled in the Accelerator program, SPS was eligible for $185,646 in rebates from Seattle City Light. The rebate money was reinvested in building operations improvements. The building improvements are expected to pay for themselves within 3 to 4 years through substantial savings on utility bills.

“I applaud Seattle Public Schools for their extensive work on improving performance in so many of their buildings,” said Jessica Finn Coven, Director of the Seattle Office of Sustainability & Environment. “Our institutional leaders in Seattle are key partners in our climate action efforts and their leadership in being an “early adopter” of Seattle’s Building Tune-Up policy has provided an excellent example for others to follow.”

“Helping our customers be more efficient with the energy they use maximizes our existing clean, renewable energy resources and furthers Seattle’s effort to reduce our collective carbon footprint,” said Debra Smith, Seattle City Light General Manager and CEO. “This great partnership with Seattle Public Schools demonstrates what is possible and we look forward to working with many others in the days ahead.”

The Tune-Up Accelerator program was supported by a grant from the U.S. Department of Energy’s Building Technologies Office. Seattle’s award was geared towards solutions to improve the energy efficiency of small and medium commercial buildings.

Seattle’s efforts in driving building energy efficiency continue to show results in national rankings. Recently, the American Council for an Energy-Efficient Economy anked Seattle 3rd overall out of 75 cities nationwide in their 2019 Clean Energy Scorecard. Seattle scored high marks for the Seattle Energy Code, its enforcement of the code, and its efforts to make its existing building stock more energy efficient.

###

APPENDIX A-15

Dear "Tune-Up Specialist,"

Thank you for supporting your clients' (or building owners') participation in the Tune-Up Accelerator Program! Please read on for program updates and news from City Light on changes to their capital commercial incentives.

Tune-Up Accelerator Program Updates

1. Program Documentation and Timing

Have questions about documents required for the Tune-Up Accelerator, timing and incentives? If so, check out the attached new one-page summary with links to the documents or **review it on the website** to help keep your project on track.

- As of last week, all but about 10 Building Owners have e-signed their City Light Incentive Participation Agreements. Please confirm with owner or contact me if you are not sure this step is complete prior to conducting the Building Assessment.

2. New Seattle Building Tune-Ups Owner's Guide

This **guide** will help building owners and managers understand the Building Tune-Ups process and explains what a Tune-Up Specialist will assess and verify in buildings, so that the owner can plan for their property's required scope of work. It also clearly lists required vs. voluntary corrective actions that apply to both Tune-Up Accelerator Projects and buildings complying with the Building Tune-Ups requirement. **View it here** and share with your clients.

3. Accelerator Report Updates

Please use the latest **Accelerator Summary Report** (updated 05.31.18) and **SCL Operating Hours Worksheet** (updated 04.09.18) on the website under **Forms and Summary Reports**. If you've already started using older versions (dated 01.24.18 and 03.08.18) that is OK – there are only minor changes based on user feedback. The Corrective Action text on the HVAC Assessment is also now better formatted to match the new Owner's Guide (see below).

4. City Light 2018 Incentives Update for Commercial Retrofit Lighting and HVAC

For projects doing capital upgrades, City Light is updating its incentives for both small and medium/large commercial customers. These changes will go into effect on **August 1, 2018**. New incentives will be applied to projects that submit an application, project bid and cut sheets beginning August 1, 2018. Projects with an application, project bid and cut sheets submitted by July 31, 2018 will receive current incentive offerings.

August 1, 2018 Changes Include:

- LED fixtures - $0.15/kWh
- LED retrofit kits (excluding downlights/recessed can retrofit kits) - $0.15/kWh
- Lighting controls - $0.15/kWh
- Mogul-base LEDs (ex. E39, EX39, etc.) - $0.10/kWh
- Fixture w/ Networked Lighting Controls (NLC) (click **here** for a list of qualified products) - $50/fixture bonus
- Small Commercial Customers - 20% bonus for LED fixtures, LED retrofit kits (excluding downlights) and lighting controls (does not apply to NLC bonus or mogul base LED lamps)

NEW! incentives list (*starting August 1, 2018*): **Commercial and Multifamily Retrofit**

Current Incentives Expiring July 31, 2018:

- "The Works" bonus program
- Fluorescent lamps, retrofit kits and fixtures
- "Lamp-only" LEDs, and "Hardwired" TLEDs (Types B and C) - point-of-sale rebates for qualified products will be available at the distributor level through upcoming 2018 Midstream Lighting Program

Current Incentive Lists: **Small Commercial** | **Medium and Large Commercial and Multifamily Buildings**

Please talk to building owners about these upcoming changes, especially if they are considering ECMs beyond the Basic Tune-Up, and visit City Light's **NEW website** for updates. Questions? Please call a Seattle City Light Energy Advisor at (206) 684-3800 or email **SCLEnergyAdvisor@seattle.gov**.

In case you missed it in the last email update…

5. Asset Score Data Collection Tips

Thank you to those who have already completed the **Asset Score.**

- Except for grocery stores, most buildings enrolled in the Accelerator are a building type that is compatible with the Asset Score. This **cheat sheet** will be helpful when choosing the building type.
- When adding walls, it is not necessary to create separate wall and window entries for every side of the building. Just create entries for each *unique* wall and window type present.
- Support – Links to additional Asset Score materials are on our **Resources Page**. On the **Login page**, there are links to more resources and to contact the Asset Score Help Desk.
- When you've got a complete "score," please use these **instructions to Share the Building** with the Accelerator Program. Refer to your Agreement with OSE for invoicing.

6. Tips for Benchmarking Validation on Tune-Up Accelerator Summary Report

- **Portfolio Manager Login** – OSE can provide Portfolio Manager Property ID and username to help you find the account owner. Email accelerator@seattle.gov.
- **Meter Data Verification** – If the benchmarking account uses a virtual or aggregate meter, you should review the list of meters that comprise the aggregate meter(s) to confirm they are correct.
    - **City Light "Virtual" meters** – If the meter looks like the building address (i.e. 700_5th_ave_seattle_municipal_tower_07062011), the building uses a "virtual meter" that is an aggregate of the buildings' actual meters. Please send accelerator@seattle.gov an email to obtain lists for your building(s). *Please do not contact SCL directly for buildings enrolled in the Tune-Up Accelerator.*
    - **PSE MyData** – the meter name syntax will look like, "PSE MyData Usage – GAS." To determine the meters aggregated to that meter, obtain the "MyData" login information for the person who benchmarked and log in to **https://mydata.pse.com**.
- For a great 12-minute overview of how to make corrections, check out the **Smart Building Center's Training Video 7: Maintain Your Account and Verify Data Accuracy**.
- Additional help is available from City of Seattle Benchmarking Help Desk: **energybenchmarking@seattle.gov** or 206-727-8484.

Questions, comments? Send a note to accelerator@seattle.gov or give me a call.

Best,
Nicole

Appendix A-16: Asset Score Preview Analysis and Asset Score to Portfolio Manager Comparison Supplemental Findings from PNNL

Asset Score Preview Analysis

PNNL compared each TUA building's Asset Score (using data collected by assessor) against its Preview score range (using benchmarking data) to assess the accuracy of Preview.

Forty-two percent (42%) of the Asset Score buildings (38 of the 90 buildings) scored outside of the predicted Preview range when building inputs were not verified or edited. In comparison, 21% scored outside of the Preview range after PNNL reran the Preview analysis with known lighting and HVAC types for a preliminary set of 75 buildings. Nine out of the 16 buildings (that were outside of the Preview range) have HVAC systems unsupported by Preview (e.g. water-loop heat pump, ground-source heat pump, No Cooling).

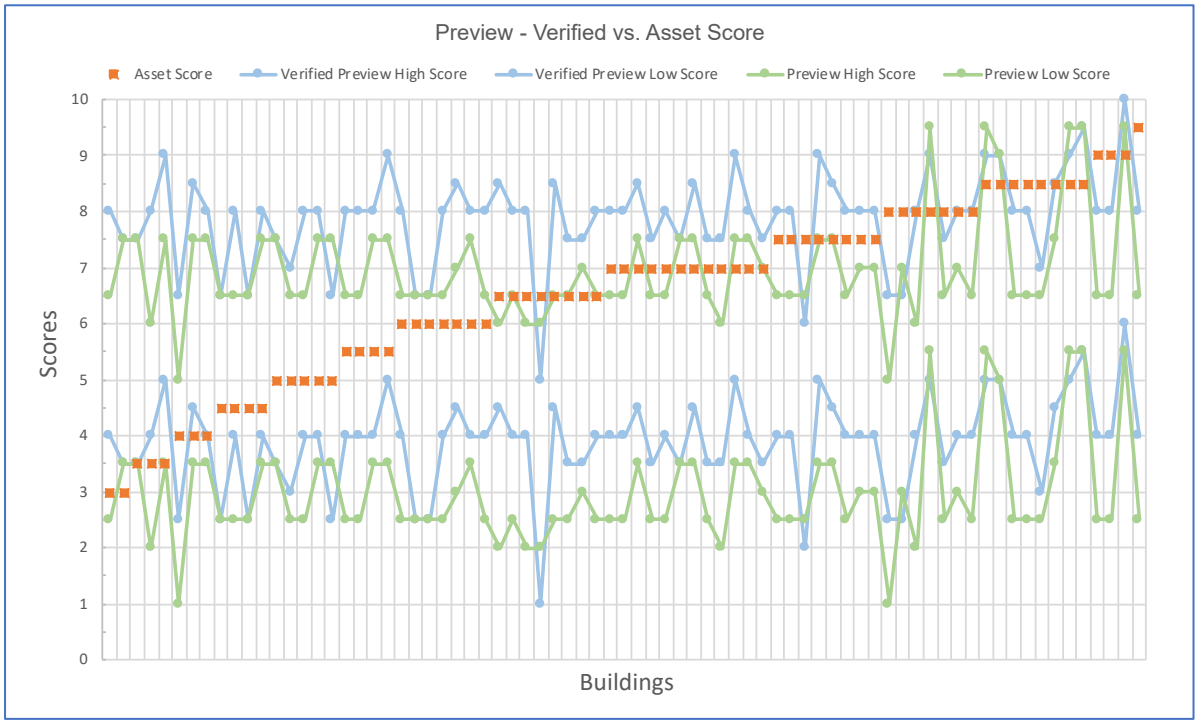


Figure 1: Comparison of Preview, updated Preview (with lighting and HVAC), and Asset Score of 75 buildings.

These HVAC systems are usually more advanced and efficient. Adding more HVAC systems to Preview in the future will increase its applicability to more buildings. Overall, including lighting and HVAC type in the initial assessment would greatly improve the result accuracy because both are sensitive model inputs. Figure 1 shows the initial Preview results, updated Preview results, and Asset Score results.

Comparison of Asset Score and Portfolio Manager

Asset Score was compared to ENERGY STAR Portfolio Manager (ESPM) to investigate how the two scoring systems can be used together to provide more insight into a building's systems and operation. Eighty-two (82) out of the 90 TUA buildings had an ESPM EUI value. Nine buildings with exceptionally

high ESPM Source EUI include buildings with spaces used for large data centers, laboratory equipment, and manufacturing, which are not modeled in Asset Score (see Figure 2). These buildings may not have been properly assessed in ESPM either, as five of them were listed as “office” buildings. These nine buildings, as outliners, were removed from further analysis. Figure 3 shows that there does not appear to be a high correlation between ESPM and AS site and source EUIs. This is expected because Asset Score focuses on buildings systems independent of building operation while ESPM reflects the outcome of building systems and operation. An efficient building may not be well operated and therefore its energy performance will be lower than expected.

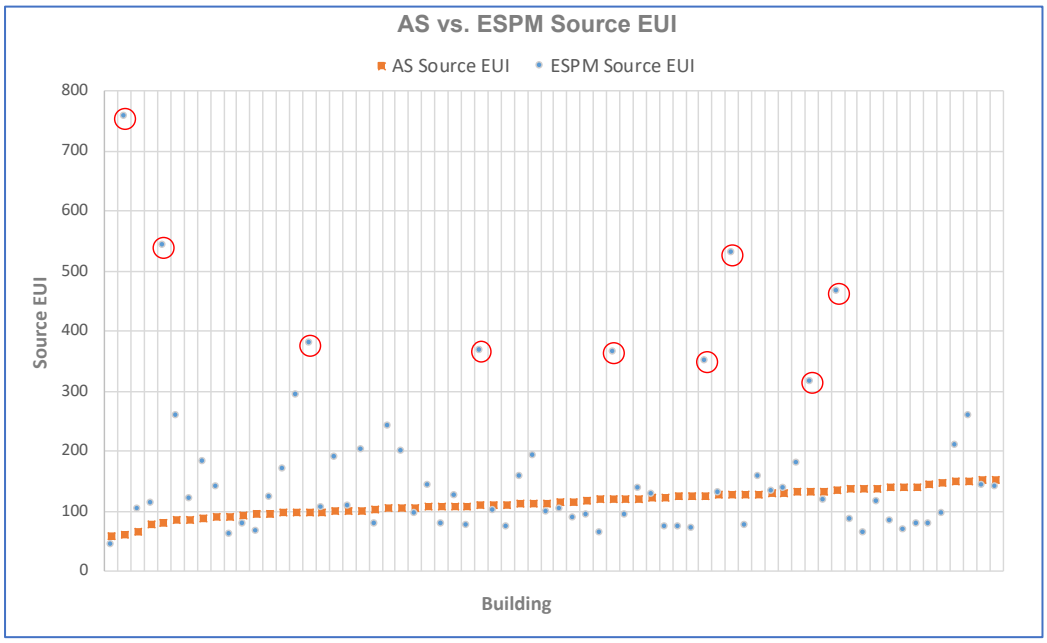


Figure 2: Source EUI reported in Portfolio Manager and modeled in Asset Score.

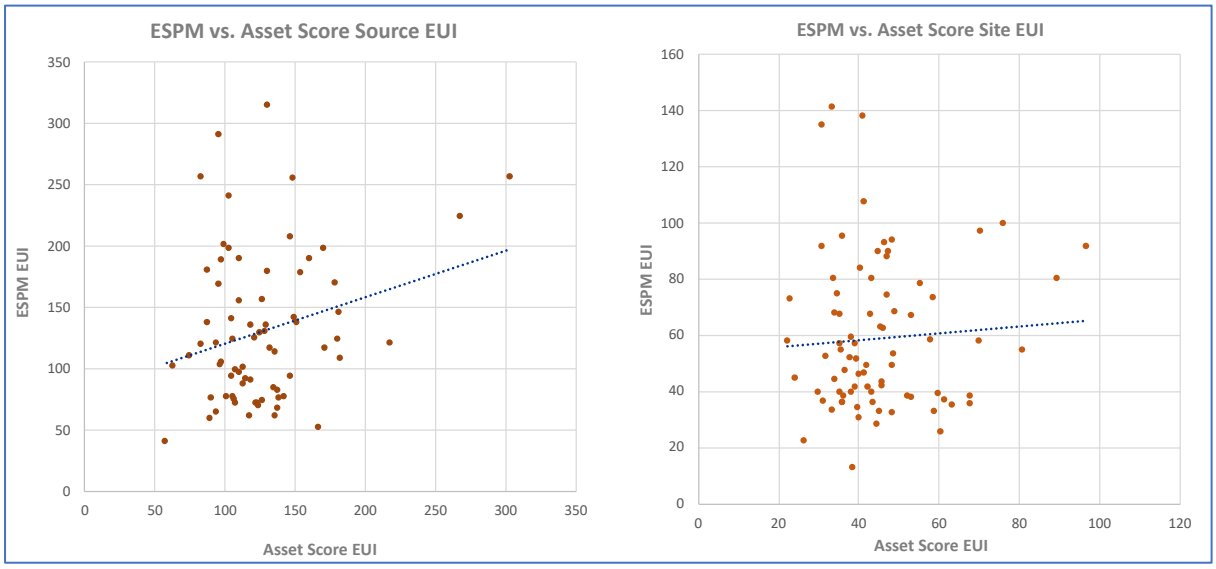


Figure 3: Comparison of site EUI and source EUI from Portfolio Manager and Asset Score.

A building's Asset Score is further compared against its ESPM score. Sixty (60) out of the 90 TUA buildings have an ESPM Score. Score comparison is less biased than EUI comparison because both scoring systems normalize weather and use type. Note that AS and ESPM scores are not directly comparable because AS uses a technical scale (which uses an EUI-to-score look up table for each use type) and ESPM uses a statistical scale (which converts an EUI to a percentile). An Asset Score of 5 represents the energy use intensity of the median building (using a prototypical building model) for a specific use type. Asset Score aligns this median building EUI with the median from EIA's Commercial Buildings Energy Consumption Survey (CBECS) and defines the score of 10 as the super high-performance building, which is net-zero ready before renewables. In comparison, an ESPM score of 50 represents the energy use of the 50% percentile (using CBECS) for a specific use type and a higher score corresponds to a higher percentile.

Figure 4 shows the score comparison of 60 TUA buildings. A higher Asset Score (x-axis) represents better building system; a higher ESPM score (y-axis) represents better building operations, which are also affected by a building's system efficiency. The best buildings are located on the top-right corner of the chart because they have the best asset and good operation. Accordingly, the worst buildings are located on the bottom left of the chart. The datapoints that are close to the diagonal line between the best and the worst represent buildings that perform as expected. The datapoints that are further away from the diagonal line represent buildings that are operated well (above the line) or poorly (below the line) comparing to a standard operation (Asset Score model).

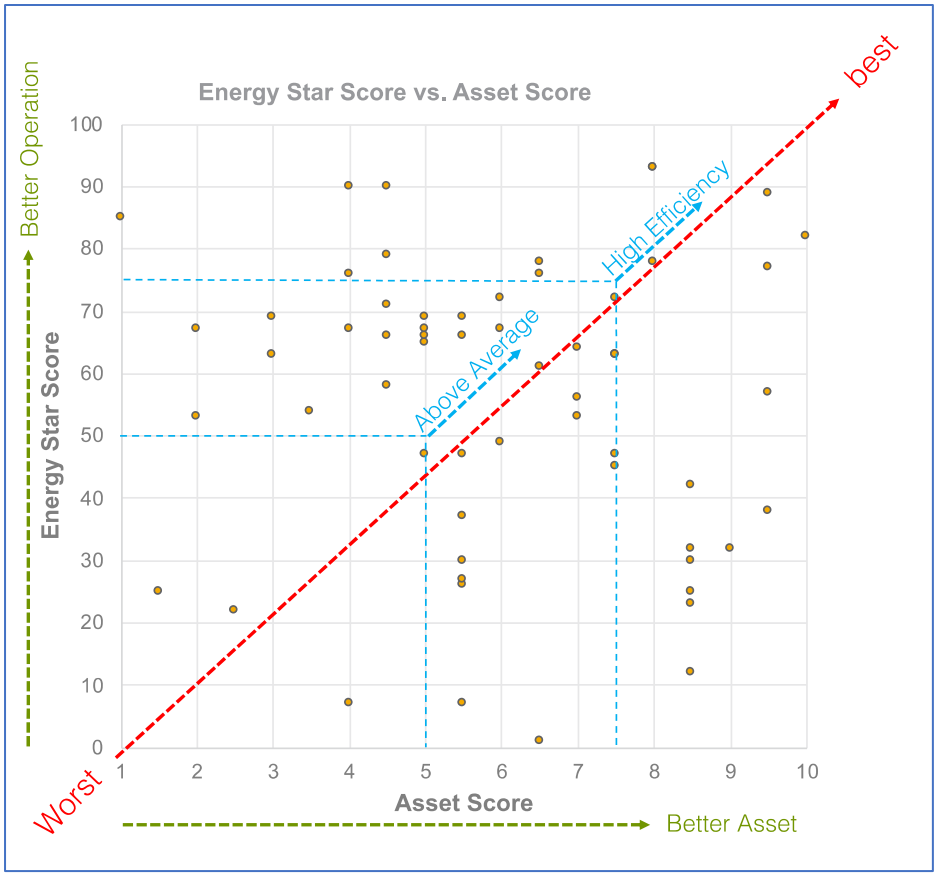


Figure 4: Score Comparison of Asset Score and Portfolio Manager

The two buildings in Figure 5 were selected as examples to illustrate how the two scores can be used side by side. Building A has low-efficient building systems (Asset Score of 1) but it has been well operated (ESPM score of 85). Asset Score identifies four upgrade measures:

- Replace all existing lights with LEDs.
- Install occupancy sensors.
- Upgrade heating system to natural gas boiler.
- Add variable frequency drives to cooling tower fan and condenser pumps.

The field assessment (before an Asset Score report was generated) also pointed out that the building needs significant upgrades:

- Control the exterior and interior lighting schedule using energy management system.
- 30 years old water source heat pump units will need to be replaced.
- Upgrade all interior and exterior lighting.

Building B has efficient building systems (Asset Score of 8.5) but it is not well operated (ESPM score of 12). The field assessment report shows that most improvement opportunities are from building operation:

- Replace valves on hot water loop and allow boilers and pumps to turn off when there is no heat demand.
- Install aerators or replace high flow faucets in the kitchen and restaurant employee restrooms.
- Install timer or aqua-stat control on domestic hot water recirculation pump to reduce 24/7 operation.
- Install occupancy sensors in storage room and the “back of house” spaces.
- Restaurant AHU nearing end of useful life.

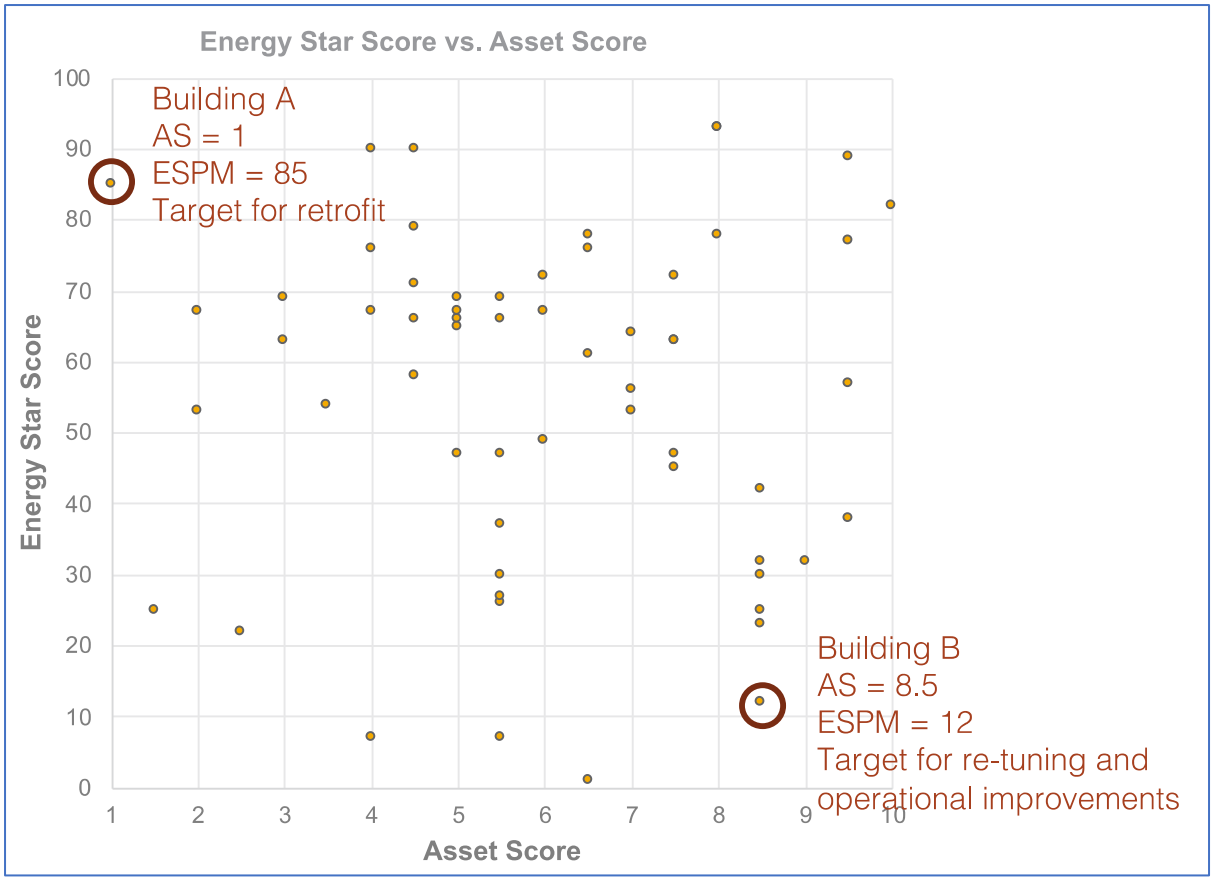
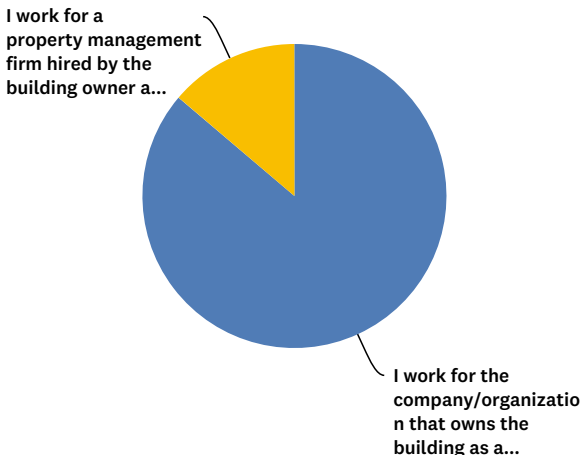


Figure 5: Example of two buildings with asset and operational improvements.

Q1 Which of the following best describes your role regarding the building(s) that participated in the Tune-Up Accelerator:

Answered: 29 Skipped: 0

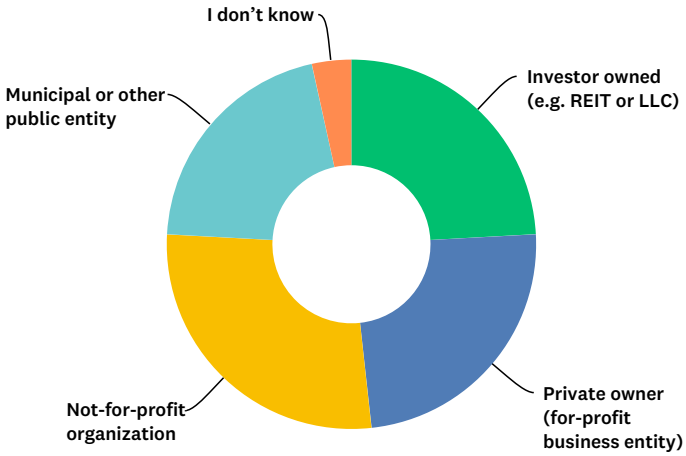


ANSWER CHOICES	RESPONSES	
I own the building	0.00%	0
I work for the company/organization that owns the building as a property, sustainability or facility manager	86.21%	25
I work for a property management firm hired by the building owner as a property, sustainability or facility manager	13.79%	4
I am a tenant in the building	0.00%	0
Something else? Please specify	0.00%	0
TOTAL		29

#	SOMETHING ELSE? PLEASE SPECIFY	DATE
	There are no responses.	

Q2 Please select the ownership type that is most like your building's:

Answered: 29 Skipped: 0

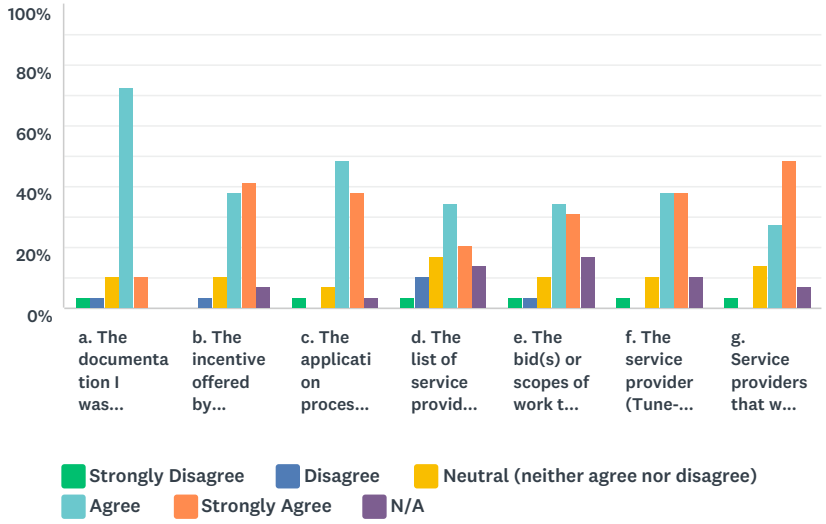


ANSWER CHOICES	RESPONSES	
Investor owned (e.g. REIT or LLC)	24.14%	7
Private owner (for-profit business entity)	24.14%	7
Not-for-profit organization	27.59%	8
Municipal or other public entity	20.69%	6
I don't know	3.45%	1
Something else? Please specify:	0.00%	0
TOTAL		29

#	SOMETHING ELSE? PLEASE SPECIFY:	DATE
	There are no responses.	

Q3 Please tell us about your experience with the Tune-Up Accelerator Program by rating the following statements on the scale below from “Strongly Disagree” to “Strongly Agree.”

Answered: 29 Skipped: 0



	STRONGLY DISAGREE	DISAGREE	NEUTRAL (NEITHER AGREE NOR DISAGREE)	AGREE	STRONGLY AGREE	N/A	TOTAL	WEIGHTED AVERAGE
a. The documentation I was provided about the requirements for “tuning-up” my building in Seattle was clear to me.	3.45% 1	3.45% 1	10.34% 3	72.41% 21	10.34% 3	0.00% 0	29	3.83
b. The incentive offered by Seattle City Light to complete the tune-up early was a primary reason for my participation in the Tune-Up Accelerator.	0.00% 0	3.45% 1	10.34% 3	37.93% 11	41.38% 12	6.90% 2	29	4.26
c. The application process to sign up for the Tune-Up Accelerator incentives from Seattle City Light was straightforward.	3.45% 1	0.00% 0	6.90% 2	48.28% 14	37.93% 11	3.45% 1	29	4.21
d. The list of service providers (Tune-Up Specialists) that had attended a Tune-Up Accelerator Program training was an important resource for helping me select a firm to do the tune-up.	3.45% 1	10.34% 3	17.24% 5	34.48% 10	20.69% 6	13.79% 4	29	3.68
e. The bid(s) or scopes of work to conduct the tune-up that I received from service providers (Tune-Up Specialists) were clear to me.	3.45% 1	3.45% 1	10.34% 3	34.48% 10	31.03% 9	17.24% 5	29	4.04
f. The service provider (Tune-Up Specialist) I worked with clearly explained to me what Seattle requires for Building Tune-Ups.	3.45% 1	0.00% 0	10.34% 3	37.93% 11	37.93% 11	10.34% 3	29	4.19

g. Service providers that want to work as Tune-Up Specialists to conduct Building Tune-Ups should be required by the City to attend a City of Seattle program training.	3.45% 1	0.00% 0	13.79% 4	27.59% 8	48.28% 14	6.90% 2	29	4.26

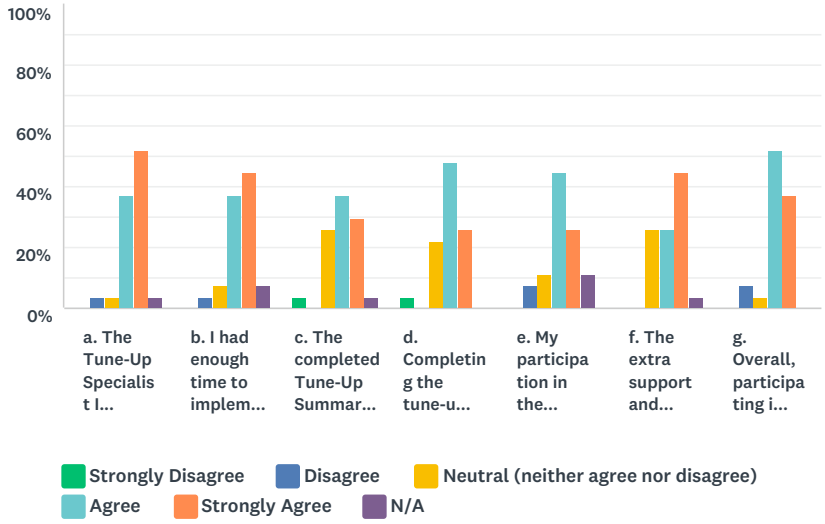
Q4 Optional:If you disagreed with any of the above statements, please let us know how we can improve

Answered: 6 Skipped: 23

#	RESPONSES	DATE
1	We already knew what consultant we wanted to work with so the list was not needed.	10/31/2019 9:10 AM
2	When I asked for information from City of Seattle regarding this program...I got nothing..no help	10/28/2019 1:38 PM
3	My primary incentive was to provide as far advance notice of what system changes we might need to make. To allow for financial planning. Also to benefit from energy savings ASAP and not wait. As for service provider I wished to work with my mechanical services vendor. Who because a Tune Up services provider through this process.	10/25/2019 9:33 AM
4	For g., service providers obviously need skills and training to be qualified, but I'm not sure the usual sensitivity-oriented silliness that Seattle classes specialize in is anything but a waste of time.	10/24/2019 12:45 PM
5	N/A responses: we conducted the tune ups in house and didn't use an outside agency.	10/23/2019 1:12 PM
6	There was a huge difference in what they were quoting and the amount of the proposals was very different. I went with a provider that was more straight forward and didn't have all of the extra stuff in the proposal.	10/23/2019 12:32 PM

Q5 Please continue to rate your experience with the Tune-Up Accelerator Program by rating the following statements on the scale below from “Strongly Disagree” to “Strongly Agree.”

Answered: 27 Skipped: 2



	STRONGLY DISAGREE	DISAGREE	NEUTRAL (NEITHER AGREE NOR DISAGREE)	AGREE	STRONGLY AGREE	N/A	TOTAL	WEIGHTED AVERAGE
a. The Tune-Up Specialist I worked with was able to clearly explain the difference between corrective actions I would be required to fix at my building (if they were found deficient) versus actions that would be voluntary (not required) for me to fix.	0.00% 0	3.70% 1	3.70% 1	37.04% 10	51.85% 14	3.70% 1	27	4.42
b. I had enough time to implement the required corrective actions based on the timeline provided by the Tune-Up Accelerator program.	0.00% 0	3.70% 1	7.41% 2	37.04% 10	44.44% 12	7.41% 2	27	4.32
c. The completed Tune-Up Summary Report will be a helpful reference for me (and/or the facility manager/engineer in my building) to manage the building.	3.70% 1	0.00% 0	25.93% 7	37.04% 10	29.63% 8	3.70% 1	27	3.92
d. Completing the tune-up will help me (and/or the facility manager/engineer in my building) better manage our building going forward.	3.70% 1	0.00% 0	22.22% 6	48.15% 13	25.93% 7	0.00% 0	27	3.93
e. My participation in the Tune-Up Accelerator will make it easier for me to manage and/or meet the Building Tune-Ups requirements in other buildings that I own or manage.	0.00% 0	7.41% 2	11.11% 3	44.44% 12	25.93% 7	11.11% 3	27	4.00

f. The extra support and incentives from the TUA program helped influence me to implement or plan for additional (voluntary) energy-saving projects in my building.	0.00% 0	0.00% 0	25.93% 7	25.93% 7	44.44% 12	3.70% 1	27	4.19
g. Overall, participating in the Tune-Up Accelerator Program was beneficial to my building or organization.	0.00% 0	7.41% 2	3.70% 1	51.85% 14	37.04% 10	0.00% 0	27	4.19

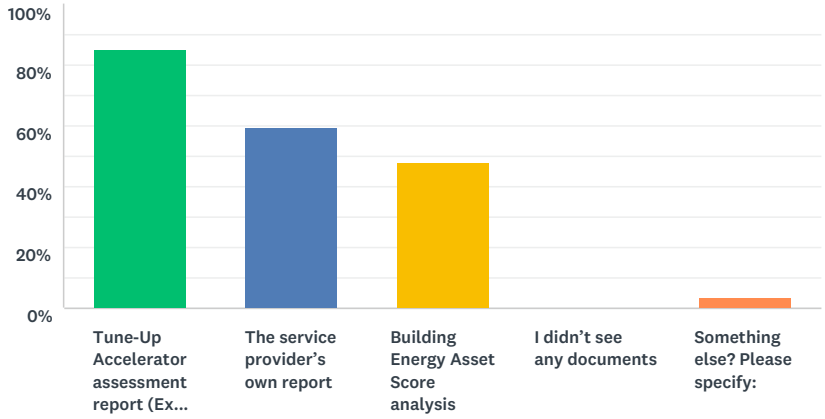
Q6 Optional: If you disagreed with any of the above statements, please let us know how we can improve:

Answered: 4 Skipped: 25

#	RESPONSES	DATE
1	e. is not applicable for us, as we included all of our buildings in the tune-up accelerator.	10/31/2019 9:12 AM
2	We do what makes sense to conserve energy and be more efficient without silliness like this, aimed at the lowest operatives. It's tremendously wasteful to apply it to all. The only thing the City can help me with is incentives, which frequently make the difference in moving forward with new technologies, and making resources available as needed. Everyone was delightful, both at the City and at the Vendor we chose, but the whole process was a big waste of time and resources, in my view.	10/24/2019 1:00 PM
3	Probably would not have participated if not forced to do a Tune-ups.	10/23/2019 12:34 PM
4	we didn't have any projects that there were incentives for so no benefit to that part.	10/23/2019 11:34 AM

Q7 Which of the following documents did the Tune-Up Specialist share with you to inform you of the results of the assessment (building walkthrough)? Check all that apply:

Answered: 27 Skipped: 2



ANSWER CHOICES	RESPONSES	
Tune-Up Accelerator assessment report (Excel spreadsheet)	85.19%	23
The service provider's own report	59.26%	16
Building Energy Asset Score analysis	48.15%	13
I didn't see any documents	0.00%	0
Something else? Please specify:	3.70%	1
Total Respondents: 27		

#	SOMETHING ELSE? PLEASE SPECIFY:	DATE
1	energy star	10/23/2019 9:48 AM

Q8 Did the Tune-Up Accelerator Program provide other benefits to your building and/or its occupants/management? Check all that apply:

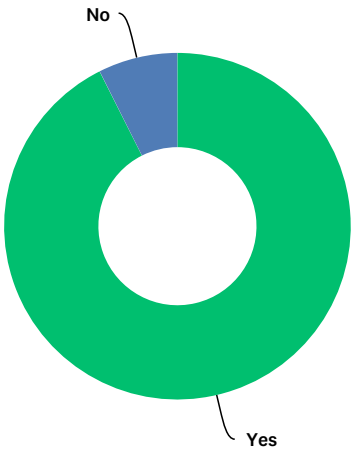
Answered: 27 Skipped: 2

ANSWER CHOICES	RESPONSES	
Improved occupant comfort	25.93%	7
Improved operations and maintenance processes	48.15%	13
Provided useful information about the building's operations/maintenance to facilities staff	62.96%	17
Supported long-term asset management planning	37.04%	10
No, it didn't provide other benefits	14.81%	4
Something else? Please specify:	7.41%	2
Total Respondents: 27		

#	SOMETHING ELSE? PLEASE SPECIFY:	DATE
1	Improved the operations teams understanding and connection to energy efficiency for the buildings they manage.	10/31/2019 9:38 AM
2	Service provider followed up with resources regarding sustainable practices and energy efficient practices.	10/23/2019 4:16 PM

Q9 The Tune-Up Accelerator Program incentives and technical support were created to encourage building owners to “comply early” with the Building Tune-ups mandate. Do you think the City should use this approach for other future mandates?

Answered: 27 Skipped: 2



ANSWER CHOICES	RESPONSES	
Yes	92.59%	25
No	7.41%	2
TOTAL		27

#	COMMENTS, IF ANY	DATE
1	waste of ownership money and management time	11/8/2019 10:05 AM
2	I think the city should not have these mandates. But the incentives helped.	10/24/2019 1:04 PM
3	Another benefit of early adoption is to figure out the bugs in the forms and process.	10/23/2019 1:14 PM
4	If we "have" to do something, the city should definately help financially and with proper education.	10/23/2019 12:37 PM
5	never hurts to have an incentive to get things done sooner than later	10/23/2019 11:36 AM

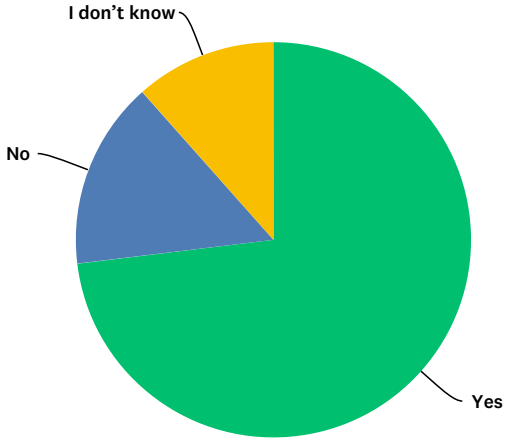
Q10 Optional: Do you have additional suggestions on the types of support that would help building owners be successful in complying with the Seattle Building Tune-Up Mandate?

Answered: 6 Skipped: 23

#	RESPONSES	DATE
1	city mandated way of taking our money	11/8/2019 10:05 AM
2	I believe the consultant mandate is essential. Most building owners would not have successfully completed the tune-up process on their own. Moving forward I would recommend differentiation by size of building as we found some of the program didn't align with our smaller real estate assets. For example we don't have central mechanical systems but decentralized PTACs per room.	10/31/2019 9:38 AM
3	Less is more, please. We're all very busy, and the extremely high utility rates (increasing at 2-3 times the rest of inflation every year) already incentivise us to conserve. Seattle City Light has hundreds of people on six figure salaries, and has a culture of waste and insane political correctness, rather than a culture of carefully shepharding our tax dollars. However, everyone I've dealt with has been unfailingly pleasant, so there's that, they smile while the consider the effect of how they can spend more making utility deliver fit "progressive" causes, when it should just serve all tax payers and rate payers regardless of politics or social engineering.	10/24/2019 1:04 PM
4	More case studies on different types of buildings to show owners the benefits.	10/23/2019 1:14 PM
5	Provide a range in which proposal should fall into from providers.	10/23/2019 12:37 PM
6	not at this time	10/23/2019 11:42 AM

Q11 Prior to your participation in the Tune-Up Accelerator, were any other energy efficiency related projects completed in your building in the past 3 to 5 years?

Answered: 26 Skipped: 3



ANSWER CHOICES	RESPONSES	
Yes	73.08%	19
No	15.38%	4
I don't know	11.54%	3
TOTAL		26

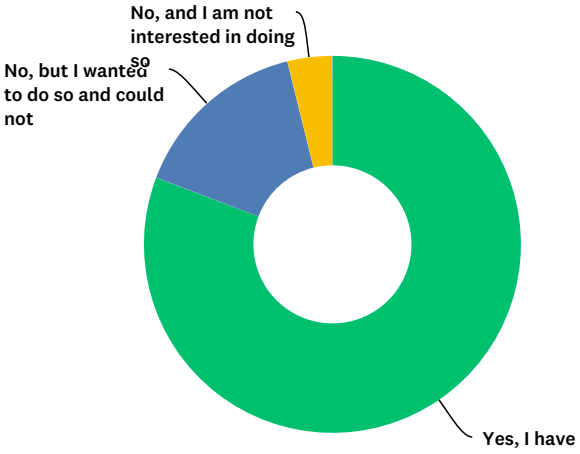
Q12 Optional: If you answered yes to the above, can you tell us what was done?

Answered: 15 Skipped: 14

#	RESPONSES	DATE
1	Replaced lighting	11/1/2019 9:55 AM
2	Water efficiency. As replacements are completed, replacing with high-efficiency equipment. Lighting retrofits to LED.	10/31/2019 9:39 AM
3	Energy audits and similar no-to-low cost conservation measures were implemented in our portfolio.	10/29/2019 1:01 PM
4	Partial lighting upgrade.	10/28/2019 6:28 AM
5	LEDs, full HVAC replacement.	10/24/2019 4:40 PM
6	Lots and lots of lighting upgrades, many of which Seattle City Light helped with incentives or rebates, plus some water savings projects as well.	10/24/2019 1:05 PM
7	Led lighting	10/24/2019 10:30 AM
8	Many smaller projects, particularly lighting retrofits	10/24/2019 8:54 AM
9	New cooling Tower	10/23/2019 1:56 PM
10	Changed out mr16 lamps to LED lamps	10/23/2019 1:27 PM
11	Of the 22 buildings in the Accelerator Program, we have done lighting retrofits, added insulation, upgraded windows and boilers. (Different projects at each building.)	10/23/2019 1:16 PM
12	Lighting upgrades, chiller and boiler replacements.	10/23/2019 12:38 PM
13	Mostly conversion to LED lighting	10/23/2019 12:32 PM
14	Lighting retrofit	10/23/2019 11:43 AM
15	Upgraded HVAC controls, changing flourescent lights to LED.	10/23/2019 11:38 AM

Q13 After your participation in the Tune-Up Accelerator, did you implement, or have you planned/budgeted for any voluntary energy conservation measure(s) beyond the required actions of the tune-up?

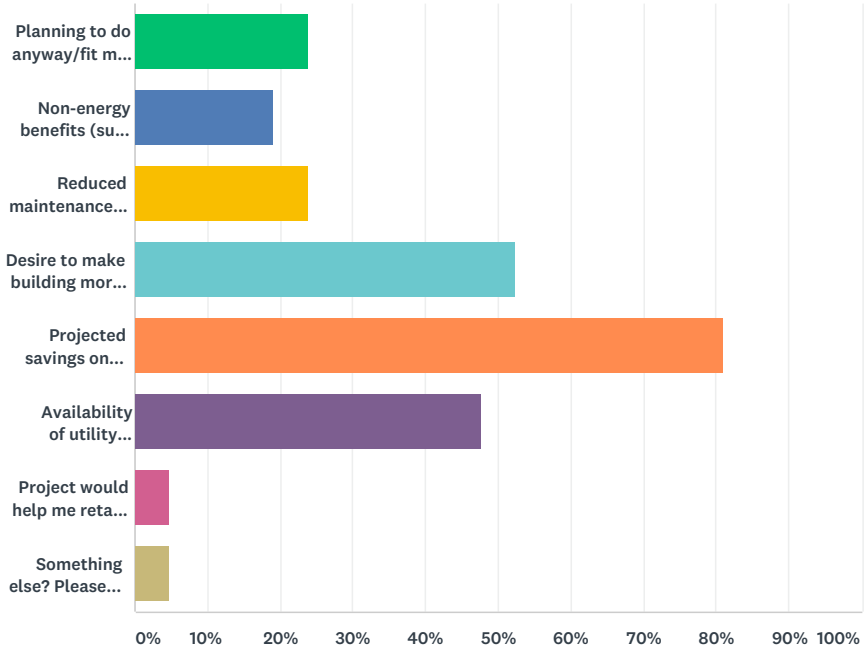
Answered: 26 Skipped: 3



ANSWER CHOICES	RESPONSES	
Yes, I have	80.77%	21
No, but I wanted to do so and could not	15.38%	4
No, and I am not interested in doing so	3.85%	1
I don't know	0.00%	0
TOTAL		26

Q14 What prompted you to implement or commit budget for any voluntary energy conservation measure(s) beyond the required actions of the tune-up? Please select up to three that apply:

Answered: 21 Skipped: 8



ANSWER CHOICES	RESPONSES	
Planning to do anyway/fit my timeframe for equipment replacement	23.81%	5
Non-energy benefits (such as newer lighting that looks better)	19.05%	4
Reduced maintenance needs for the new equipment	23.81%	5
Desire to make building more sustainable / “greener” / reduce carbon emissions	52.38%	11
Projected savings on utility bills	80.95%	17
Availability of utility incentive(s)	47.62%	10
Project would help me retain tenants	4.76%	1
Something else? Please specify:	4.76%	1
Total Respondents: 21		

#	SOMETHING ELSE? PLEASE SPECIFY:	DATE
1	Need to replace aging equipment	10/24/2019 8:56 AM

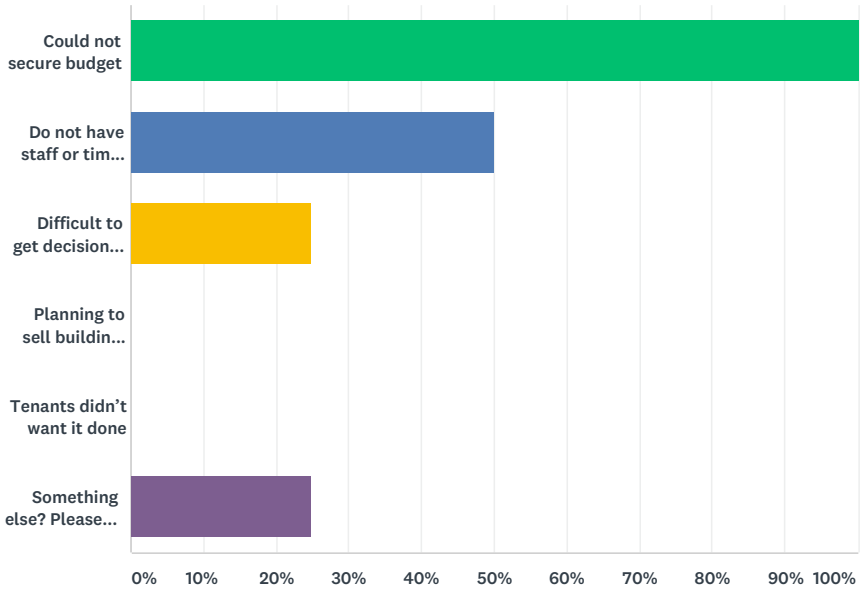
Q15 Optional: Do you have suggestions for what would lead owners to undertake energy and water improvements (e.g. lighting upgrades, HVAC replacement), beyond the minimum Tune-Up requirements and/or reduce the barriers to doing so?

Answered: 9 Skipped: 20

#	RESPONSES	DATE
1	Requiring after a year, reporting the proof of savings, not just projected. That will overcome some of the non-belief in proposed savings.	10/31/2019 9:41 AM
2	Additional funding sources	10/29/2019 1:02 PM
3	Financial incentives.	10/28/2019 6:30 AM
4	Subsidies, or no interest payments spread over X years. Clear information on projected savings, ROI. Cite several examples for reference.	10/25/2019 9:37 AM
5	People do more of what they're incentivized to do, and less of what they're taxed on. But please get politics out of this. If anything should be non-partisan, it's utility delivery (and public safety, and cleanliness and civility, basically everything that Seattle has capitulated on and given up caring about completely.)	10/24/2019 1:06 PM
6	Acquiring the capital to complete major projects is the sticking point. We are considering new methods such as electricity as a service and HVAC as a subscription	10/24/2019 8:56 AM
7	an easier way to do lighting retrofits besides the worksheet required to fill out that takes a masters in excel to finish. common sense HVAC replacements that doesn't then trigger another code issue i.e. more insulation in the roof	10/23/2019 1:33 PM
8	Outline utility rebates and incentives; by upgrading now, can capture savings before those systems fail, which will cost much more down the line.	10/23/2019 1:18 PM
9	Increasing power costs will make owners look to ways to save money	10/23/2019 11:45 AM

Q16 Since you indicated that you wanted to pursue voluntary energy conservation measure(s) beyond the required actions of the tune-up, but were unable to do so, were any of the following issues barriers? Please select up to three that apply:

Answered: 4 Skipped: 25

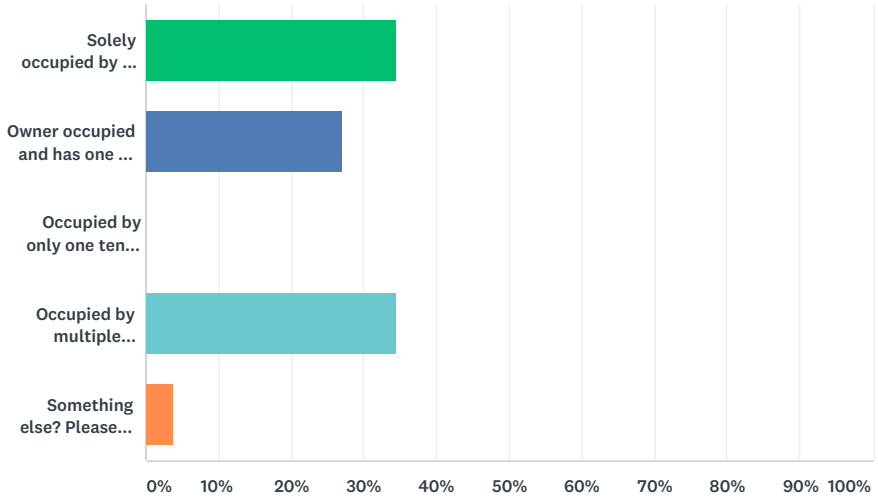


ANSWER CHOICES	RESPONSES	
Could not secure budget	100.00%	4
Do not have staff or time manage the project	50.00%	2
Difficult to get decision makers to approve project	25.00%	1
Planning to sell building soon	0.00%	0
Tenants didn't want it done	0.00%	0
Something else? Please specify:	25.00%	1
Total Respondents: 4		

#	SOMETHING ELSE? PLEASE SPECIFY:	DATE
1	Time is the biggest issue and cost is the 2nd.	10/23/2019 12:39 PM

Q17 Please select the occupancy that is most like your building's:

Answered: 26 Skipped: 3

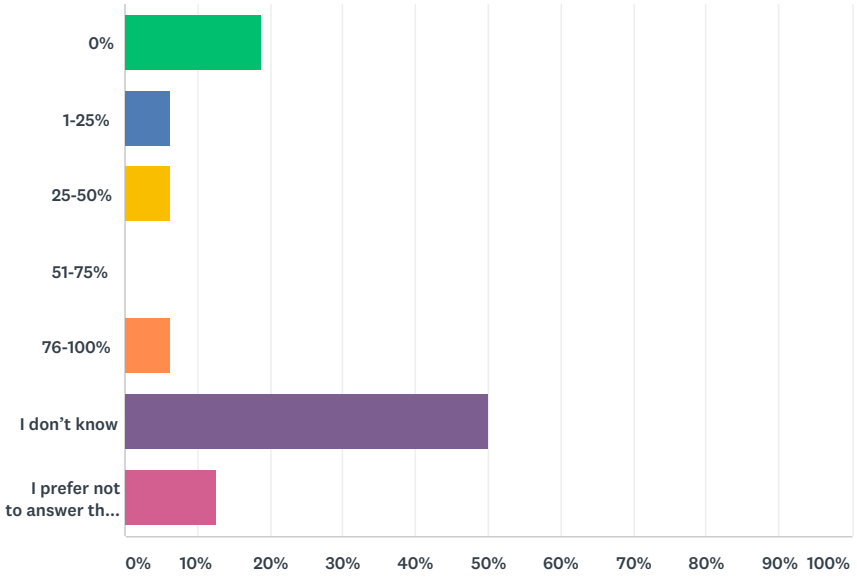


ANSWER CHOICES	RESPONSES	
Solely occupied by the building owner	34.62%	9
Owner occupied and has one or more tenants	26.92%	7
Occupied by only one tenant	0.00%	0
Occupied by multiple tenants	34.62%	9
Something else? Please specify:	3.85%	1
TOTAL		26

#	SOMETHING ELSE? PLEASE SPECIFY:	DATE
1	building and company (sole tenant) are owned by the same corporation.	10/23/2019 4:19 PM

Q18 To what extent are your tenant businesses owned and/or managed by people of color, immigrants or refugees?

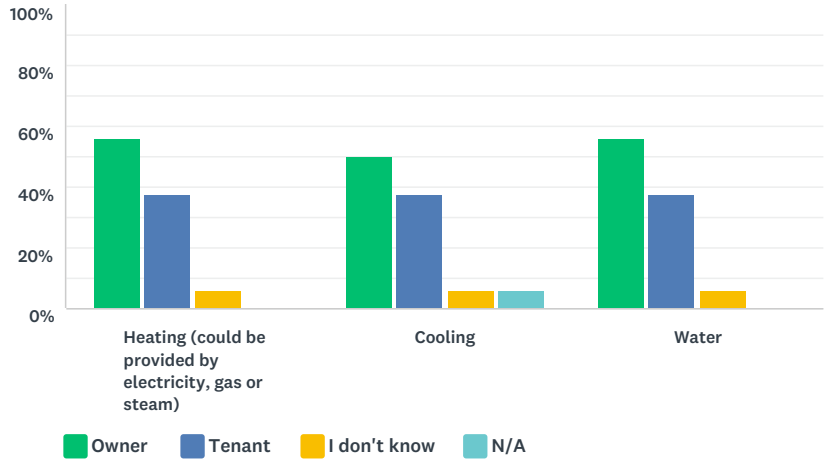
Answered: 16 Skipped: 13



ANSWER CHOICES	RESPONSES	
0%	18.75%	3
1-25%	6.25%	1
25-50%	6.25%	1
51-75%	0.00%	0
76-100%	6.25%	1
I don't know	50.00%	8
I prefer not to answer this question	12.50%	2
TOTAL		16

Q19 Who pays the rentable area utility costs in your building for the following:

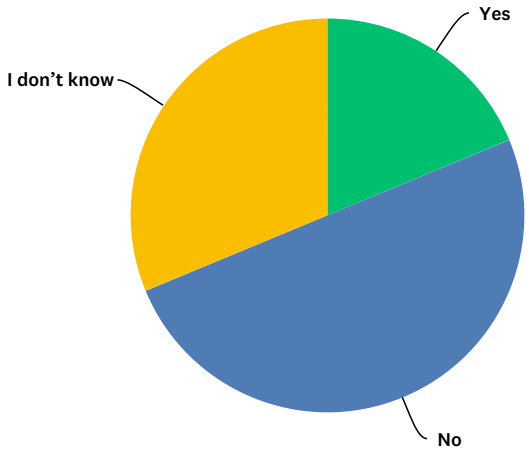
Answered: 16 Skipped: 13



	OWNER	TENANT	I DON'T KNOW	N/A	TOTAL	WEIGHTED AVERAGE
Heating (could be provided by electricity, gas or steam)	56.25% 9	37.50% 6	6.25% 1	0.00% 0	16	1.63
Cooling	50.00% 8	37.50% 6	6.25% 1	6.25% 1	16	1.67
Water	56.25% 9	37.50% 6	6.25% 1	0.00% 0	16	1.63

Q20 Have you, or do you intend to, recoup the costs of the Tune-Up from your tenants?

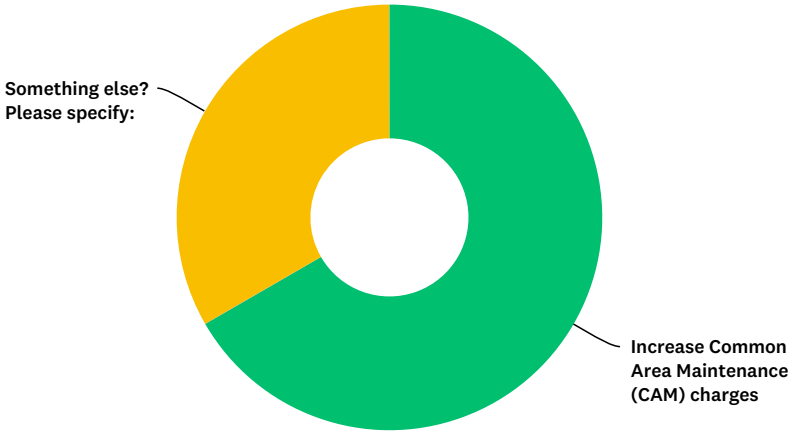
Answered: 16 Skipped: 13



ANSWER CHOICES	RESPONSES	
Yes	18.75%	3
No	50.00%	8
I don’t know	31.25%	5
I prefer not to answer this question	0.00%	0
TOTAL		16

Q21 If yes, what is the process to recoup the costs?

Answered: 3 Skipped: 26



ANSWER CHOICES	RESPONSES	
Increase Common Area Maintenance (CAM) charges	66.67%	2
Increase rent	0.00%	0
Something else? Please specify:	33.33%	1
TOTAL		3

#	SOMETHING ELSE? PLEASE SPECIFY:	DATE
1	CAM charges but not neccesarialy increased CAM charges	10/23/2019 1:35 PM

Building Tune-Up Accelerator Program

FINAL TECHNICAL REPORT - APPENDIX B

CASE STUDY Hotel Five

Hotel Five is a funky and fun boutique hotel in Seattle's downtown core boasting a lobby filled with games. Part of the Staypineapple brand, Hotel Five caters to families, professionals, and their furry companions.

The 52,000 SF hotel includes 116 guest rooms, a full-service restaurant, bar, and an espresso stand in the lobby. The hotel is within walking distance to major attractions like Pike Place market and six blocks from light rail transit. To further provide car-free options, guests also have free access to bicycles during their stay.

In 2018, Hotel Five participated in the City of Seattle's Building Tune-Up Accelerator Program to get a head start on their required Tune-Up, which is designed to help building owners identify smart, responsive ways to reduce energy and water costs. What hotel managers discovered, however, is that doing a Tune-Up not only helped them save energy, water, and money, it also helped them develop a tailored roadmap and budget for future improvements to the building to further boost the hotel's sustainability.

Near-term energy and water saving opportunities identified by the Tune-Up were implemented at the hotel right away. Hotel Five has an extensive number of heating and cooling (HVAC) units with independent controls—in the lobby, back of the house, and in guest rooms. Upon inspection of the guest room units, the Tune-Up Specialist found that several needed immediate maintenance and all units would benefit from better ongoing upkeep. Water fixtures were also evaluated, revealing that showerheads were leaking in more than 10 guest rooms. Hotel managers invested $3,000 in addressing these issues and are already seeing the savings accumulate. These fixes are projected to save the hotel $1,100 on utility bills annually.

HOTEL FIVE
52,000 SF

	COSTS		PROJECTED ANNUAL SAVINGS	
ASSESSMENT	$5,500	$0.10/SF		
REQUIRED ACTIONS	$3,000	$0.06/SF	$1,100	$0.02/SF
TOTAL	**$8,500**	**$0.16/SF**	**$1,100**	**$0.02/SF**

Photos by Marcela Gara

WHAT IS A BUILDING TUNE-UP?

Building Tune-Ups are assessments of building energy and water systems to detect and correct operational or maintenance problems. Through Tune-Ups, building owners find operational efficiencies and low- and no-cost fixes that improve building performance. The City of Seattle requires Tune-Ups every five years for buildings with 50,000 SF or more of non-residential space.

Want to learn more?
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"We participated in the Tune-Up Accelerator because it was a good business choice for us to get ahead of the game. The financial incentive helped; but more importantly, it allowed us to focus on energy efficiency and gave us a needed process, timeline and amazing support to get our necessary fixes done and create an informed plan for future capital upgrades."

DINA BELON-SAYRE
PINEAPPLE HOSPITALITY, DIRECTOR OF REAL ESTATE ASSETS

Photo by Michael Sayre

FINDINGS AND FIXES REVEALED

After assessing the building's energy and water systems, energy usage, and maintenance plans, the Tune-Up team identified three key required fixes:

- **Guest room HVAC units:** implementing an annual HVAC maintenance plan as part of a room refresh, including: opening outdoor vents, cleaning out condensate pans, brushing and cleaning coils, and washing filters.
- **Showerheads:** repairing the fixtures on more than 10 guest rooms, which will save about 2,000 gallons of water annually, and adding a leak check to the hotel's preventative maintenance checklist.
- **Hot water:** reducing hot water storage tank temperatures by eight degrees to improve efficiency while maintaining hotel water needs.

Projected energy savings for the required fixes are 10,000 kWh/year and projected combined electric and water utility bill savings are $1,100/year.

GOING ABOVE AND BEYOND

In addition to the required fixes, the Tune-Up Specialist found two fundamental inefficiencies that, if addressed, would also save the hotel energy and money. Hotel Five voluntarily undertook these changes to ensure the building's systems would run more efficiently:

- **Lobby HVAC system:** Two HVAC units installed side-by-side in the lobby were "fighting" each other energy-wise: one was trying to heat while the other cooled, which wasted energy. A single wireless thermostat was installed to jointly control both units.
- **Hot water boiler:** The hotel's hot water boiler circulation pumps were running when the boilers were not firing. The pumps were adjusted so they only run when needed, thereby reducing energy waste.

Projected energy savings for these voluntary fixes are 100 kWh/year and 200 therms/year and projected utility savings are $200/year.

UNEXPECTED BENEFITS

Beyond the energy and water savings, undergoing the Tune-Up helped Hotel Five improve overall guest experience by spotting areas to improve lighting quality. The team replaced existing bulbs with LEDs with matching wattage and temperatures to improve the overall look and feel of the guest rooms.

MEET THE TUNE-UP TEAM

Lacey King, Pineapple Hospitality, General Manager; Ray Rodrigues-Reyes, Pineapple Hospitality, Field Maintenance Manager – Seattle; Dina Belon-Sayre, Pineapple Hospitality, Director of Real Estate Assets; Treasa Sweek, Sweek Consulting Engineers, Principal

This project was supported by the Seattle Building Tune-Up Accelerator Program through the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE) under the Buildings Technologies Office Award Number DE-EE0007556. Seattle City Light provided a limited time incentive to owners of mid-size buildings that met the Building Tune-Ups requirement in advance of their mandated deadline.

CASE STUDY VERITY CREDIT UNION BUILDING RENEWAL

"Participating in the City of Seattle's Building Tune-Up Accelerator program and choosing the Building Renewal Path allowed us to create a great 5-year plan for energy improvements alongside our other capital improvements. Having more time for planning helps us optimize for long-range savings—which is best for the company, the building, and the community."

STEPHEN CHANDLER, VERITY CREDIT UNION FACILITIES MANAGER

The 38,000 square foot Verity Credit Union building located in Northwest Seattle was designed in 1997 by the Miller Hull Partnership. At the time of its construction, it was a model of sustainable design with large banks of windows to maximize daylighting, deep overhangs to shade the building from the summer sun, and many other innovative design features and technologies. Fast forward twenty-plus years, and while the building is still a great example of sustainable design for its time, building managers knew that its energy efficiency could be greatly improved. Additionally, building managers wanted to improve the building's ENERGY STAR score and address occupant complaints by ensuring more comfortable temperatures year-round and installing better lighting. Sustainability is also part of Verity's mission as a member of the Global Alliance for Banking on Values.

Ready to get started, the Verity team enrolled in the City of Seattle Tune-Up Accelerator program's Building Renewal path. This option connected facility managers with building energy experts from the University of Washington Integrated Design Lab (IDL) to help them develop a deep retrofit plan to maximize the building's energy efficiency and savings over the long term. For Verity, this also meant learning from IDL what it would take for the building to become carbon neutral—meaning a highly energy-efficient building that doesn't produce climate-impacting greenhouse gas emissions and whose energy needs could be met by on-site renewable solar energy.

BUILDING RENEWAL PLAN ESTIMATED SAVINGS PROJECTIONS

	ENERGY SAVINGS (KBTU/YR)	ELECTRIC	GAS	UTILITY*
STEP 1	624,750	31%	1%	$16,230
STEP 2	1,252,330	38%	35%	$22,530
STEP 3	1,827,980	19%	100%	$18,450

*Based on 2018 utility rates

Stephen Chandler,
Verity Credit Union Facilities Manager

WHAT IS A BUILDING RENEWAL?

A Building Renewal is a real estate enhancement strategy for "deep energy retrofits" to modernize a building, make it competitive with new construction, and increase its market appeal by focusing on comprehensive energy efficiency upgrades. The strategy can deliver energy savings of over 35% from current energy use. Building Renewal teams use an integrated design approach that emphasizes connections throughout the building to identify opportunities for operational savings and major equipment replacement at end-of-service life, while leveraging utility incentives. This process delivers better building performance and more energy savings than siloed approaches that typically focus on just one equipment upgrade at a time.

Photo by PSR Mechanical

IDL conducted a walk-through of the building and provided recommendations for deep energy-savings and a simulation-based analysis to create the long-term plan. IDL also worked with PSR Mechanical to craft an implementation pathway for the Verity team to achieve its goals over 10 years while building on the energy-efficiency upgrades and equipment replacements for which Verity had already planned.

VERITY'S BUILDING RENEWAL PLAN

The IDL team crafted a plan with Verity and PSR Mechanical to improve the facility's 2017 ENERGY STAR score of 68 to 90 (better than 90% of similar buildings), reduce its site Energy Use Intensity (EUI) from 91 to 42 kBtu/sf/yr and ultimately make it a carbon-neutral building. The fully implemented plan is estimated to provide overall energy savings of up to 54% and utility cost savings of up to $18,450 annually.

Step 1:

- Continue ongoing improvements to the building's HVAC systems and building automation controls
- Upgrade the lighting system and add controls and dimmers
- Add controls for occupants to manage plug loads

Step 2:

- Upgrade to more efficient condensing boilers and rebuild the air-cooled chiller
- Conduct a variable air volume (VAV) retrofit
- Add ceiling fans on the third floor

Step 3:

- Replace gas water boilers with electric heat pump boilers for space and water heating
- This step brings the building's energy use down enough so that its remaining needs could be met by an on-site solar array

IMPLEMENTATION TO DATE

In 2019, Verity Credit Union continued updates to its building automation and installed new high-efficiency condensing boilers as an interim step, since the existing units were at end-of-life. The new boilers are projected to reduce annual gas use by about 13,800 therms and the incremental cost ($12,000) of installing the more efficient equipment will pay back in 10 years with annual cost savings of about $1,200. Electric heat pumps will be considered again during step 3. In 2020, Verity will continue its path to a more efficient facility by upgrading the air-cooled chiller and lighting system.

MEET THE TUNE-UP SPECIALIST TEAM

Stephen Chandler, Facilities Manager, Verity Credit Union, Seattle, WA
Neil Bavins, Consultant, PSR Mechanical, Seattle, WA
Christopher Meek, Director, University of Washington Integrated Design Lab, Seattle, WA

This project was supported by the Seattle Building Tune-Up Accelerator Program through the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE) under the Buildings Technologies Office Award Number DE-EE0007556. UW IDL provided technical support to building owners seeking to plan for deep retrofits beyond the tune-up.

SEATTLE building tune-ups

CASE STUDY Tallman Building

The Tallman Medical Office Building serves the healthcare needs of thousands of Seattle residents each year. A recent Tune-Up at the building is helping its tenants and owner save on energy bills and improve patient and tenant comfort.

The Tallman Building is located at the Swedish Medical Center Ballard Campus in North Seattle. The five-story, 85,000 SF-building is leased to the hospital, which has an emergency department and imaging center on the first and second floors, and another three floors of medical office and clinical space. The building is connected to the main hospital via a sky bridge, allowing patients, staff, and physicians to conveniently move between the main hospital and the emergency department, imaging and medical offices.

Completed in 2010, the Tallman Building is owned and managed by Welltower Inc.—a real estate investment trust with healthcare assets including medical buildings, assisted living facilities and senior housing complexes across the U.S. Welltower Real Estate Manager Susan Moore enrolled the building in the City of Seattle's Building Tune-Up Accelerator program to get a head start on completing the requirement before the deadline. She was able to take advantage of the financial assistance provided by the program to hire a specialized contractor to evaluate the building and complete the necessary efficiency improvements. Susan hired Martin Clinton of UMC, a Washington-based building systems and engineering company with extensive experience in the healthcare industry.

After a thorough assessment of the building, Martin found that while it was in good shape overall, there were still areas where its energy efficiency could be improved. Some actions required cleaning and adjusting mechanical systems and performing some minor repairs, while others involved educating the building's occupants. The Tune-Up and all the required corrective actions were implemented in the medical office space as of June 2019, and Susan is looking forward to seeing the energy bill savings add up.

"You always want to see savings in 10 to 18 months. But if people are feeling better, that has tremendous value too," said Susan. "Brightness, efficiency, and comfort—if we have all three, the 'Big Three' as I call them—that's worth something."

Welltower Maintenance Engineer Kevin Gray checks the building's energy management system controls. Photos courtesy Welltower Inc.

WHAT IS A BUILDING TUNE-UP?

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Want to learn more?
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"I went into the Tune-Up process begrudgingly, thinking it was just another government regulation. But halfway through I changed my mind. This program helps everybody—property managers, tenants, and owners. I plan on using the knowledge I gained from the Tallman Tune-Up to initiate cost-saving procedures and increase efficiencies in all my area buildings."—**SUSAN MOORE**, WELLTOWER REAL ESTATE MANAGER

Photo courtesy Welltower Inc.

FINDINGS AND FIXES REVEALED

Required actions included:

- **Lighting controls:** On/off controls were overridden, leaving all third-floor lights on 24/7. Welltower's actions included educating janitorial staff to turn off lighting overrides when work was completed and/or to schedule work in conjunction with the lighting control schedule.
- **Heating and cooling (HVAC) maintenance:** Two of the building's HVAC units needed cleaning and general maintenance and air intake sensors needed replacement.
- **HVAC scheduling:** Schedules and set points on multiple terminal units had been overridden causing them to run 24/7. A "re-set" ensured the occupied spaces are heated and cooled at the right times and temperatures.

GOING ABOVE AND BEYOND

The Tune-Up process revealed several other energy-saving opportunities, such as:

- **Lighting:** Installing lighting occupancy sensors in exam rooms and bathrooms with manual switches and reducing the excessive brightness of elevator lobby lighting, which will save on electricity.
- **HVAC sensors:** Adding velocity sensors to each air handler unit (rather than relying on one to serve all units), which could help save significant energy in the summer and winter months by limiting over- and under-ventilation.
- **HVAC filters:** Switching out fan terminal unit filters from one-inch filters to two-inch ones could cut labor costs in half and save approximately $2,700 on energy costs per year and reduce HVAC noise in tenant spaces. Removing outdated air handling unit filters could save another 39,000 kWh or $4,000 per year.

Following the Tune-Up, Welltower continues to proactively engage in improving the building. Maintenance Engineer Kevin Gray has been at the center of much of this effort, working to ensure the air handlers, terminal units and other systems are running as efficiently as possible.

UNEXPECTED BENEFITS

While Susan expected to find energy-saving opportunities through the Tune-Up, she didn't anticipate it resulting in better relationships with her tenants and staff. Many of the steps needed to improve the building's efficiency relied on occupants and staff having a better understanding of how overriding lighting schedules and thermostats impact energy use. Susan launched a tenant education campaign on how to use the thermostats to stay comfortable, yet not override the backup setpoints, as well as remind janitorial staff to turn off lights when they are done cleaning for the night. Through this process, Susan learned what her tenants and staff wanted and needed to make the building more comfortable and workable, and now has a stronger relationship with them because of it.

MEET THE TUNE-UP TEAM

Susan Moore, Real Estate Manager, Welltower; Kevin Gray, Welltower Maintenance Engineer; Martin Clinton, Building Performance Service Manager, UMC

This project was supported by the Seattle Building Tune-Up Accelerator Program through the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE) under the Buildings Technologies Office Award Number DE-EE0007556. Seattle City Light provided a limited time incentive to owners of mid-size buildings that met the Building Tune-Ups requirement in advance of their mandated deadline.

SEATTLE building tune-ups

CASE STUDY CONCORD INTERNATIONAL ELEMENTARY SCHOOL

Concord International Elementary School provides its student body with a global education and perspective to help them succeed in a 21st century world. A recent Building Tune-Up is providing students a healthier, more comfortable place to learn, work and play.

Concord public school is located along the Duwamish River in the South Park neighborhood of Seattle. It serves a multiethnic community of 347 students, 74% of whom were on free or reduced-price lunch plans during the 2017-2018 academic year.

Built in 1913, the 64,500 SF Concord building was originally designed in the Colonial Revival style and constructed in brick, steel and heavy timber. It is listed as a Seattle Historic Preservation Landmark. In 2000, the building was renovated to add a new gym and several classrooms.

In 2018 and 2019, the Seattle Public School District's in-house retro-commissioning staff of four formed a "Tune-Up Team" to ensure its 113 school buildings' water and energy systems met or even exceeded the Seattle Building Tune-Ups requirements. Working with the District's Resource Conservation Specialists to review past energy use, the team also identified elementary schools in need of immediate fixes that could benefit from participating in the City of Seattle's Tune-Up Accelerator Program to get a head start on their required Tune-Up, including Concord.

"We were already doing a fair job managing the building, but we could only address the obvious things that were broken or not working right. The Tune-Up program gives us the opportunity to have our retro-commissioning staff dig in deep and find the source of a problem that isn't as obvious. That's the best thing about this program—finding the hidden opportunities is a big win." **—RINA FA'AMOE-CROSS,** SPS RESOURCE CONSERVATION SPECIALIST

Undergoing the Tune-Up process revealed the importance of occupant behavior. No matter how energy efficient a building is, SPS Resource Conservation Specialist Rina Fa'amoe-Cross notes, "We need the teachers, staff and students to take action. If we get everything done and people still leave doors and windows open, our fixes won't accomplish much. When we all change habits and follow-through on energy-smart actions, we'll see really significant savings."

Concord school circa 1965

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FINDINGS AND FIXES REVEALED

After assessing Concord's energy and water systems, the Tune-Up Team identified the following required fixes:

- **Improve HVAC preventative maintenance:** Better preventative maintenance standards were needed to make sure the school's heating, cooling and ventilation continued to work properly.
- **Repair dampers:** Several dampers were not shutting or opening properly, limiting airflow for cooling, heating and fresh air.
- **Replace or adjust lighting photocells and sensors:** Many of the sensors and photocells that control school lighting had been painted over or were not functioning properly, causing the lights to be on all day.

GOING ABOVE AND BEYOND

The Tune-Up Team also implemented the following voluntary measures to create an even healthier and more comfortable learning environment:

- **Space heating:** Make the more efficient condensing boiler the school's primary heating source.
- **Hot water:** Reprogram hot water controls to save on natural gas and money.
- **Lighting:** Confirm occupancy sensors are working, replace batteries and adjust sensor positions to ensure they are pointing in the right direction to save electricity.

SPS: COMMITTED TO IMPROVING SCHOOLS

As one of the largest building owners in the city, Seattle Public Schools is committed to operating their buildings as efficiently as possible to provide a great learning environment and manage costs. For those reasons, it made sense for the District to enroll 22 elementary schools in the City's Tune-Up Accelerator Program to jump-start upgrades to buildings most in need of improvements. At the same time, SPS also "Tuned-Up" three middle and K-8 schools, nine high schools and the John Stanford Center to comply with the mandated Tune-Ups required in 2019. Common actions included:

- Aligning HVAC operating times and setpoints to match school schedules.
- Adjusting HVAC dampers and valves for optimal performance.
- Fixing lighting photocells and sensors and identifying opportunities to update to LEDs.

The SPS Tune-Up Team estimates that most of the work they do to improve the energy and water efficiency of school buildings pays itself back in three years or less through utility bill savings.

"We go far beyond the requirements and touch every piece of energy consuming equipment and device in the entire building including the portable classrooms. From heat pumps to boilers to faucets to light switches. Besides evaluating the buildings, we fix them too. Ninety-five percent of the problems we identify, we correct on the spot."—**PHIL JOHNSON,** SPS RETRO-COMMISSIONING MECHANICAL COORDINATOR

MEET THE SPS TUNE-UP TEAM

SPS Retro Commissioning team: Left to right: Michael Workman, Phil Johnson, Dax Parry, Kin Lam

SPS Resource Conservation Team: Left to right: Rina Fa'amoe-Cross, Ian Brown, Graham Goodman

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