



# Accelerating Existing Building Tune-Ups in Seattle

**Webinar**

**Thursday, March 26, 2020  
12:00 PM – 1:00 PM ET**



PNNL is operated by Battelle for the U.S. Department of Energy

# Panelists



**Nora Wang, Ph.D.**  
Pacific Northwest National  
Laboratory



**Nicole Ballinger**  
Office of Sustainability &  
Environment / City of Seattle



**Dina Belon-Sayre**  
Pineapple Hospitality



**Rina Fa'amoe-Cross**  
Seattle Public Schools



**Holly Carr**  
Department of Energy

# Agenda

- Intro – Nora (5 min)
- Overview of TUA – Nicole (25 min)
- Asset Score Results – Nora (5 min)
- Hospitality Case Study – Dina (5 min)
- Education Case Study – Rina (5 min)
- Conclusion – Nicole (5 min)
- Q&A – Holly (10 min)



# Accelerating Existing Building Tune-Ups in Seattle, Washington

Nicole Ballinger

Tune-Up Accelerator Program Manager

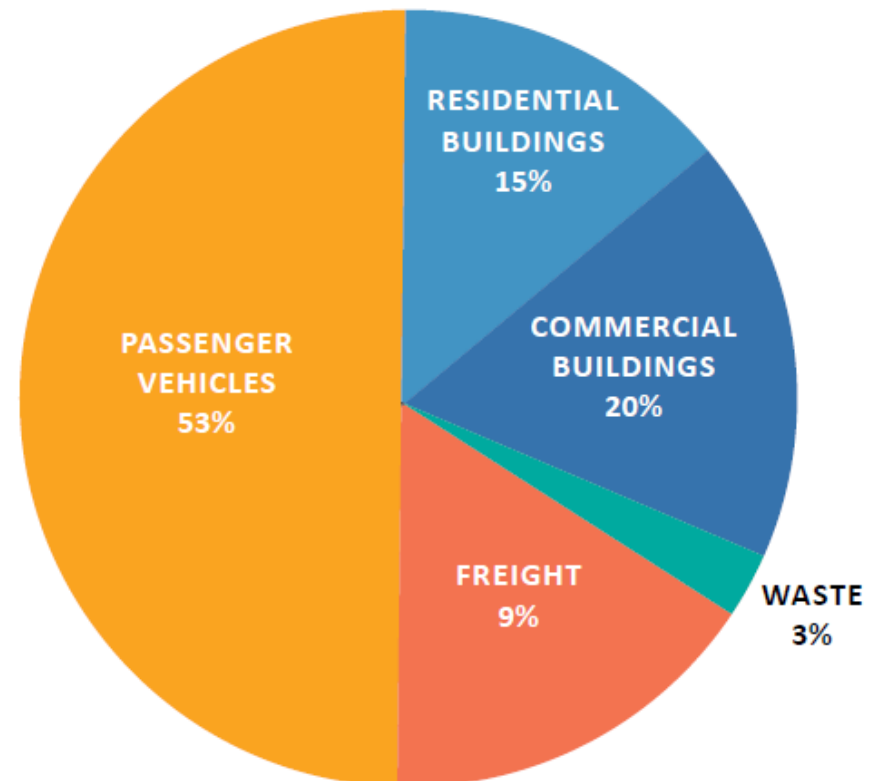


# Seattle Climate Action Plan



## 2016 GHG Sources

- Buildings make up over 1/3 of Seattle's core emissions
- Goal: Carbon neutral city by 2050
- 2030 Target: Buildings must reduce emissions by 39% from a 2008 baseline



Source: 2016 Seattle Community GHG Inventory



An energy efficiency mandate that helps building owners identify smart, responsible ways to reduce energy and water costs.



Like cars and bikes, all buildings need to be tuned regularly to keep them running as efficiently as possible.

# Tune-Up Requirements



## Operating Protocols

- HVAC systems
- Lighting
- Water heating
- Water usage

## Maintenance & Repair

- HVAC systems
- Lighting
- Water heating
- Water usage
- Envelope

### Examples of Operating elements

*“Review HVAC equipment schedules.”*

*“Set schedules to optimize operations for actual building occupancy patterns.”*

### Examples of Maintenance, Cleaning, and Repair elements

*“Verify HVAC equipment is clean and adequately maintained.”*

*“Clean where adversely impacting system performance.”*



# Elements of a Tune-Up



- **Conduct a Building Assessment**
  - of building systems to identify operational or maintenance issues
  - review benchmarking data and water bills
- **Identify Corrective Actions**
  - identify required operational and maintenance improvements
- **Implement Required Actions**
  - address all required corrective actions identified in the building assessment
- **Verify Changes & Report to City of Seattle**
  - confirm all corrected equipment and systems are functioning as intended



## TUNE-UP SCHEDULE

*Ongoing, every five years*

BUILDING SIZE*	WAIVER AND EXTENSION DUE DATE	TUNE-UP SUMMARY REPORT DUE DATE
200,000+ SF	September 4, 2018	March 1, 2019
100,000-199,999 SF	April 1, 2019	October 1, 2019
70,000-99,999 SF	April 1, 2020	October 1, 2020
50,000-69,999 SF	April 1, 2021	October 1, 2021

\* Excluding parking

# What is the Tune-Up Accelerator?









- Mid-Size buildings (approx. 100,000 SF or smaller) due 2020 or 2021
- Tune-up now to meet Seattle Building Tune-Ups requirements
- Financial incentives & enhanced technical support – offer sunset after 2018
- Goal of 20% average energy savings across at least 100 buildings or tenant spaces and 99.7 Million kBtu/year (~\$1.5 million annual cost savings)



# Program Partners & Funding



Partner	Primary Role
 <b>U.S. DEPARTMENT OF ENERGY</b>   Energy Efficiency & Renewable Energy	Federal funding (\$1.2 million) and project oversight
 <b>Seattle</b> Office of Sustainability & Environment	Program management, enrollment, coord. w/ Building Tune-Ups, evaluation, reporting to DOE
 <b>SMART BUILDINGS CENTER</b>	Provider training & curricula, tool lending library, project tracking, help desk
 <b>Pacific Northwest</b> NATIONAL LABORATORY <i>Proudly Operated by <b>Battelle</b> Since 1965</i>	Building Re-Tuning training, Asset Score support & research on energy-savings from tune-ups
 <b>Seattle City Light</b>	Tune-up and energy conservation measure incentives
 <b>INTEGRATED DESIGN LAB</b> UNIVERSITY of WASHINGTON // <b>W</b>	Building Renewal strategic plan development and support, Spark Tool engagement

# Program Approach



1. **Advance market expertise** to support building tune-ups  
**>> Tune-Up Trainings**
2. **Accelerate tune-ups** in mid-size buildings  
**>> Incentives & Owner Engagement**
3. **Generate voluntary** market action towards greater savings  
**>> Building Assessments & Implementation – 20% Savings Goal**
4. **Ensure the mandate** is effective for this market sector  
**>> Evaluation & Refinement**





# Program Development



- ❑ Create Incentive Program with Seattle City Light
- ❑ Incentive Agreements
- ❑ Reporting Forms
- ❑ Define Program Paths & Brand
- ❑ Plan, Prioritize & Recruit Buildings
- ❑ Program & Customer Tracking

## Seattle City Light

### Tune-Up Accelerator Incentive - Operating Hours Worksheet

Seattle Benchmark Building ID:

Facility/Building Name:

Seattle City Light Project #:

Worksheet completed by (Tune-Up Specialist):

Date:

**Instructions**

Use this spreadsheet to detail annual operating hours of the primary HVAC and lighting systems pre and post tune-up. The "Daily" optional tool to quickly calculate operating hours based on start/stop schedules for each building space. In many cases HVAC use there are separate entries for lighting and HVAC for buildings where they differ.

- Enter the generic space name (Whole building, Office 1, restaurant, etc.). There may only be one or two primary space types, but up to 10.
- Individual space types need only be listed if they are significant energy users (>20%) with an operating schedule that differs significantly from the building's overall schedule.
- Choose the primary space use(s) in the building from the drop down menu.
- Enter the Annual operating hours noted during the initial Tune-Up assessment, and estimated annual hours post tune-up in the green.
- ONLY** enter separate HVAC and lighting hours if there is >= 10% variation between the two schedules.
- If you are using the "Daily Schedule Calculator" Tab the annual hours will automatically populate in each space # based on the daily schedule.
- Manual entry of annual operating hours will overwrite formulas from the calculator tab.

**Operating Hours-Primary Building Spaces**

Space Name - List separately only if space uses 20% or more of total building energy	Space End Use (Type)	Initial Annual HVAC Operating Hours	Post Tune-Up Annual HVAC Operating Hours	% Reduction	Notes

### Tune-Up Accelerator Summary Report

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

**OPERATING PROTOCOLS, CALIBRATION, AND SEQUENCING**

Assessment Element	Corrective Action	Tune-Up Finding (select from list)	Status of Tune-Up Corrections (Track completion status)	Corrective Action Description (if applicable)
Review HVAC equipment schedules including daily, weekly, seasonal, and annual schedules.	If performance found, did you adjust to optimize function? Implementation is required.			
Review HVAC set points including space temperatures, supply air temperatures, CO2, indoor air quality, chilled water temperatures, economizer changeover temperatures, and building pressure.	If performance found, did you adjust to optimize function? Implementation is required.			
Review reset schedules including space temperature, supply air pressure, boiler and chiller water temperatures, outdoor air temperature, loop differential pressure.	If performance found, did you adjust to optimize function? Implementation is required.			
Review control capabilities including demand control ventilation, occupancy sensing, and other controls.	If performance found, did you adjust to optimize function? Implementation is required.			

First Name:  Last Name:

Organization Name:

Address Line 1:

Address Line 2:

City Name:  State Code:  Zip Code:

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:  City of Seattle ID:

Address:  Gross Floor Area (excl. parking):

**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

## 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 1<sup>st</sup> 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 renewal

## TUNE-UP ACCELERATOR DATABASE

Add New Record

BuildingID:

BuildingName:

Status:

TUA ID:

EPABuildingID:

Building Information

Contact Information

Project Tracking

### ASSESSMENT ELEMENTS

# Tune-Up Specialist Trainings



- ✓ 85 service providers attended trainings
- ✓ 30 firms on the “TUA” provider list
  - ✓ 16 firms participated in projects
  - ✓ Seattle Public Schools RCx /RCM staff
  - ✓ King County RCM staff

## Tune-Up Accelerator Service Providers

Company Name & Address	Contact for Tune-Up Accelerator Inquiries	Website
ACCO Engineering Systems 5300 Corner Ave S Seattle WA 98108	Joseph Bullock bullock@acco.com 206.787.8525	www.acco.com
Ameresco, Inc. 222 W. Barnes Ave. South, #300 Burien WA 98148	Jason Hite jhite@ameresco.com 206.789.2952	www.ameresco.com
Armstrong, LLC 1808 Bellevue Ave, Suite 202 Seattle WA 98122	Katherine Morgan karmstrong@armstrongllc.com 206.717.2260	www.armstrongllc.com
ATA Automation 4300 Shiloh Rd. South Burien WA 98148	John Taylor john@ata-automation.com 425.751.8480	www.ata-automation.com
BAO Analytics 710 2nd Ave, Suite 525 Seattle WA 98104	Lukas Hovee lukas@bao-analytics.com 206.557.4732 x202	www.bao-analytics.com
Ecotopix, Inc. 1917 1st Ave, Suite 300 Seattle WA 98101	Morgan Hester morgan@ecotopix.com 206.796.4700	www.ecotopix.com
Elemental Consulting Company 4440 35th Ave W Seattle WA 98199	Jessica Sanborn jessica@elementalcc.com 206.484.2403	www.elementalcc.com
Energy PAK, Inc. 10311 1st Main St, Suite 3 Portland OR 97224	Chris Smith chris@energypak.com 971.544.7213	www.energypak.com
Engineering Economics, Inc. 1205 Western Avenue, Suite 325 Seattle WA 98102	Shawn Martin shawn.martin@engineeringeconomics.com 206.822.3003	www.enr.com
EV3 consulting engineers 506 2nd Ave, Suite 700 Seattle WA 98104	Tom Roush tom@ev3-engineers.com 206.422.1323 x206	www.ev3-engineers.com
Fragile Engineers, Inc. 1205 2nd Ave, Suite 600 Seattle WA 98101	Michael Barwick michael@fragilellc.com 206.430.0448	www.fragilellc.com
Forman Engineering 1221 2nd Ave N Kirkland WA 98033	Ken Dordman kdordman@formaneng.com 206.817.6132	www.formaneng.com
Insulator Parts 4000 South 134th Place Seattle WA 98148	Chang Chang chang@insulatorparts.com 206.348.8700	www.insulatorparts.com
InuChk LLC 601 Union St, Ste 4200 Seattle WA 98101	George Ambush george@inuchk.com 206.321.5098	www.inuchk.com
Integrity Energy Solutions 14405 1st Main St, Suite 310 Bellevue WA 98005	Matt Montague matt@integrityenergy.com 206.415.7083	www.integrityenergy.com
Kelley Barber Associates 565 Anderson Park West, Suite 301 Tukwila WA 98188	Kent Barber kent@kelleybarber.com 206.947.8879	www.kelleybarber.com
MacDonald Miller Facility Solutions 7717 Central Ave. East Seattle WA 98108	Greg Nye greg.miller@macmillan.com 206.769.2002	www.mcmiller.com
McKinstry Electrical LLC 5005 3rd Ave S Seattle WA 98148	Eric Cochran eric@mcinstry.com 206.832.8250	www.mcinstry.com
MCMG Analytics 2005 Western Ave Suite 200 Seattle WA 98101	Doug Smith doug@mcmganalytics.com 206.387.3797	www.mcmganalytics.com
Meador Engineers, Inc. 5514 1st Ave S Seattle WA 98108	Jeff Harding jeff@meador-engineers.com 206.483.1957	www.meador-engineers.com
Northwest Engineering Services, Inc. (NWSI) 2000 1st Avenue South Seattle WA 98101	John Harbison john@nwsinc.com 206.901.1138	www.nwsinc.com
Paladin and Company 1932 1st Avenue Suite 200 Seattle WA 98101	Wesley Harwood harwood@paladinco.com 206.857.8565	www.paladinco.com
PGH Mechanical 2132 NE 133rd St Seattle WA 98125	Neil Smith neil@haskinsmechanical.com 206.367.2900 x339	www.haskinsmechanical.com
Siemens - PMA Energy Service 13900 SE Evergreen Way, Ste. 200 Bellevue WA 98006	Andrew Weynora andrew.weynora@siemens.com 425.281.4706	www.siemens.com
Seaton Environmental Services 601 Stewart Street, #1000 Seattle WA 98101	Kevin David kevin@seaton.com 206.267.3700	www.seaton.com
Seaton Environmental Services 1540 E. Madison St, Suite 200 Seattle WA 98112	Wesley Harwood harwood@seaton.com 206.267.3700	www.seaton.com
Sevens Consulting Engineers, LLC 7049 24th Ave NW Seattle WA 98107	Tina Sevens tina@sevensconsulting.com 206.901.0881	www.sevensconsulting.com
The Cadmus Group 720 3rd Washington St, Suite 400 Portland OR 97205	Katie Leichter katie.leichter@cadmusgroup.com 503.467.7158	www.cadmusgroup.com
The Greenbush Group, Inc. 1900 West Richardson Street, Suite 200 Seattle WA 98119	John Greenbush john@greenbush.com 206.478.0569 x311	www.greenbush.com
University Mechanical Contractors, Inc. 13413 4th Place West Burien WA 98148	Tony Turjan turjan@umc.com 425.407.2153	www.umc.com

This list is not intended to be a comprehensive list of all service providers. It is not intended to be a ranking of service providers. It is not intended to be a list of service providers who are not qualified to provide the services listed. It is not intended to be a list of service providers who are not qualified to provide the services listed. It is not intended to be a list of service providers who are not qualified to provide the services listed.



# Incentives & Program Paths



## A. BASIC TUNE-UP

City Light incentive of up to **\$0.12 per SF** for a tune-up that meets requirements

## B. TUNE-UP PLUS

Plus incentives for energy-saving improvements like lighting, HVAC

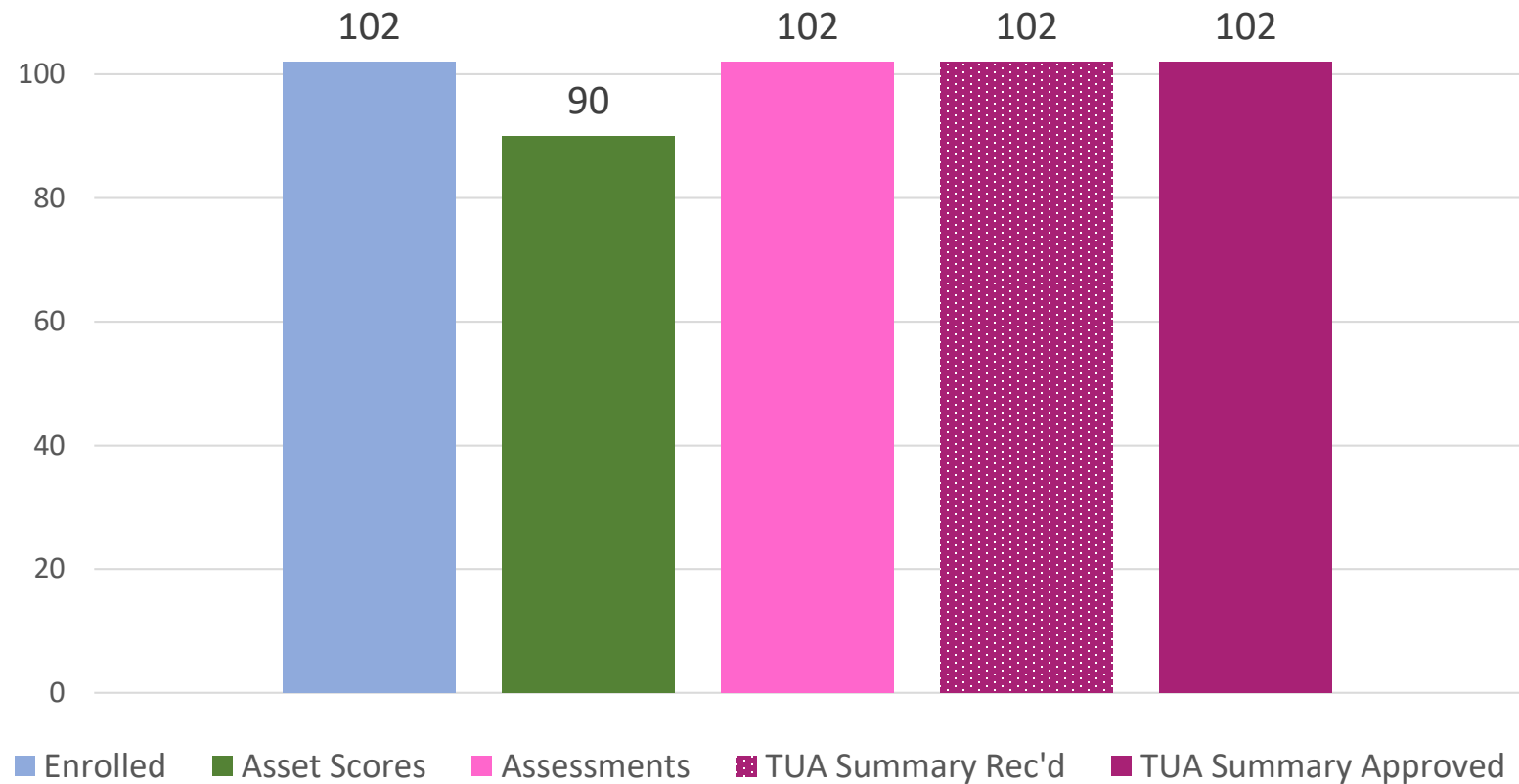
## C. BUILDING RENEWAL

Support for deeper investments like renovations or tenant improvements with 3 different levels of technical support

2017

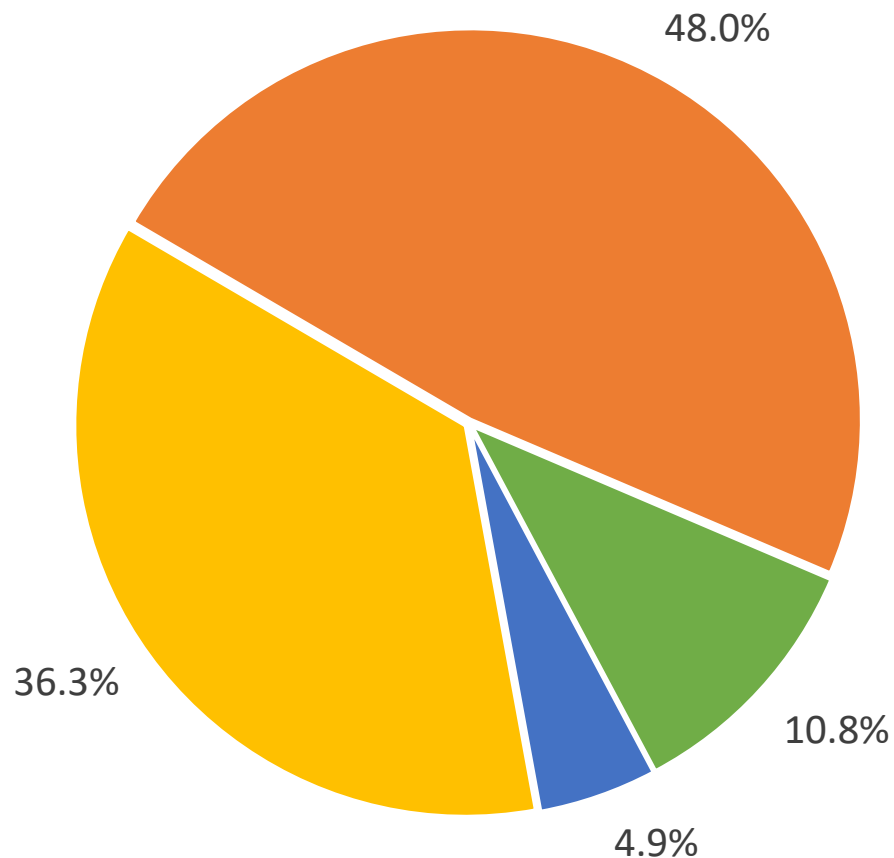
» Q4 2019

# Tune-Up Accelerator Project Status





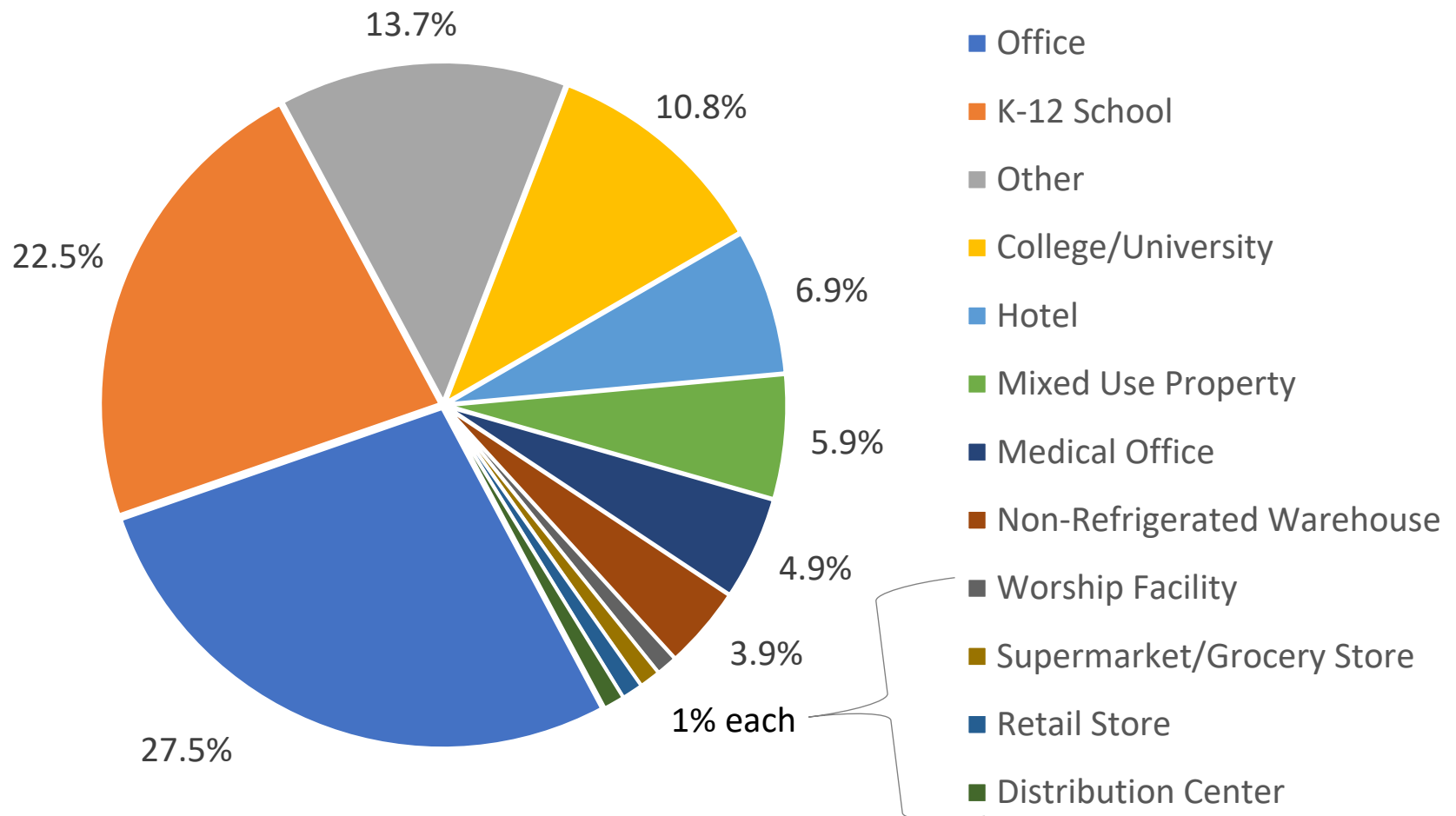
# TUA Participant Buildings By Size



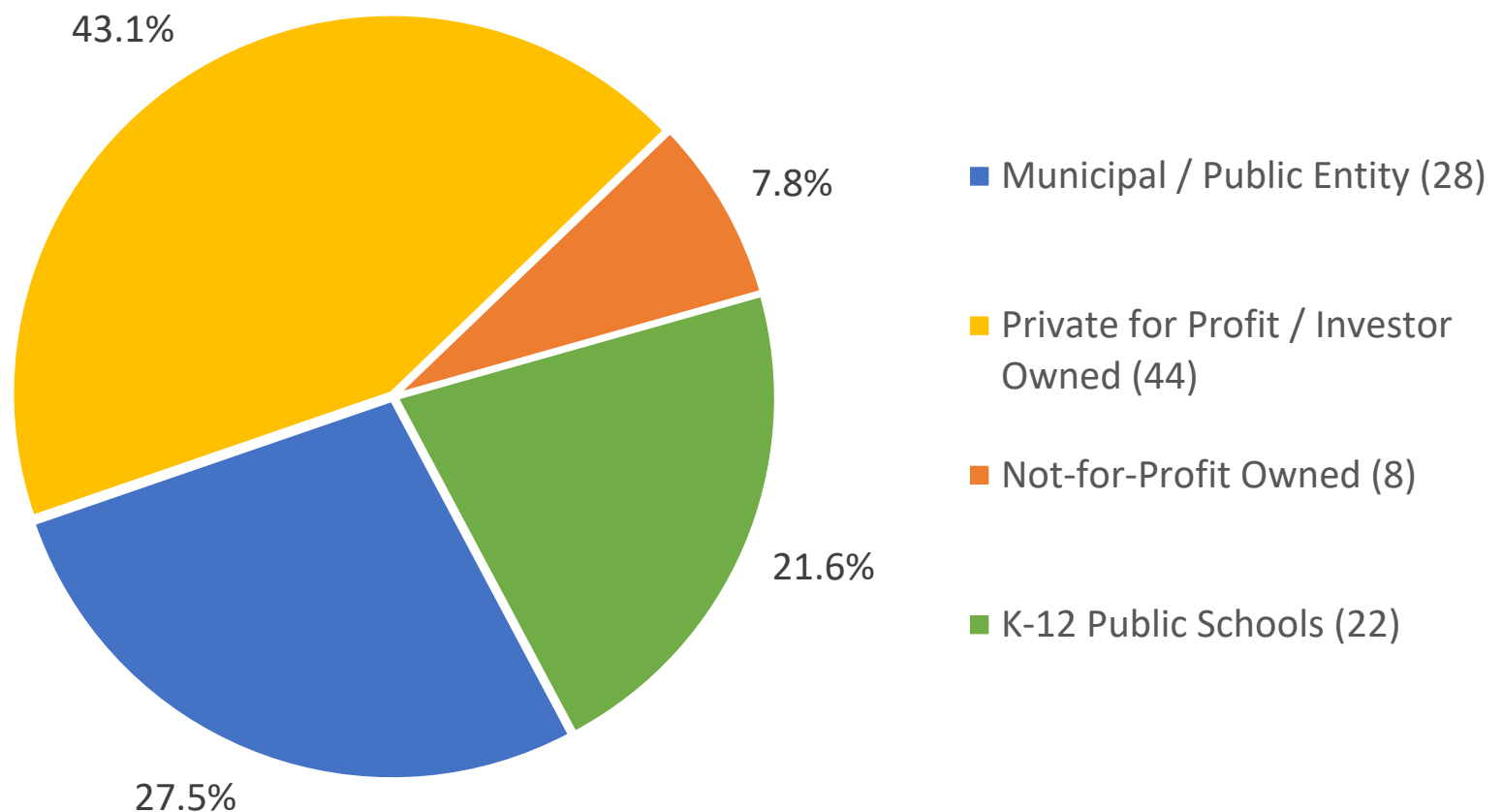
**6.9 Million SF Total!**  
**Average = 67,700 SF**

- > 100 - 110K SF (5 Buildings)
- 70 - 99K SF (37 Buildings)
- 50 - 69K SF (49 Buildings)
- < 50K SF (11 Buildings)

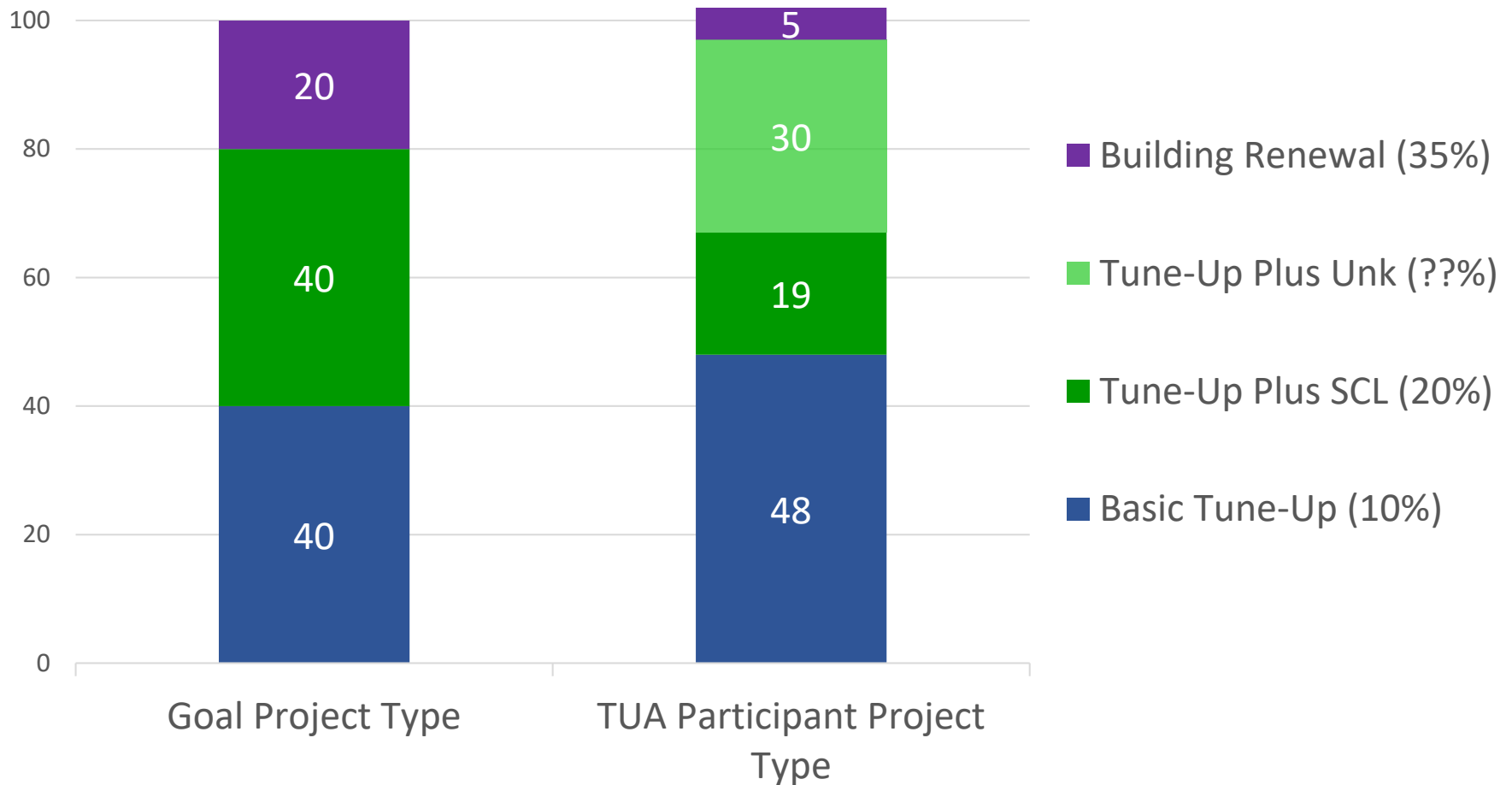
# TUA Participant Buildings By Type



# TUA Participant Ownership



# Goal & Actual Project Types





# Top Required Tune-Up Measures



Required Implementation Tune-Up Measure	Found & Corrected
G1 – Review <b>HVAC equipment schedules</b>	58%
G2 – Review <b>HVAC set points</b>	49%
G6 - Verify <b>HVAC controls</b> are functioning as intended	41%
G5 - Verify that <b>HVAC sensors</b> are functioning, calibrated, and in appropriate locations	40%
G17 – Check <b>valves and dampers</b> and adjust	36%
G11 – Verify <b>HVAC equipment maintenance</b>	34%



*Top 6 out of 20 required measures in 102 TUA buildings.*

# Top Voluntary Tune-Up Measures

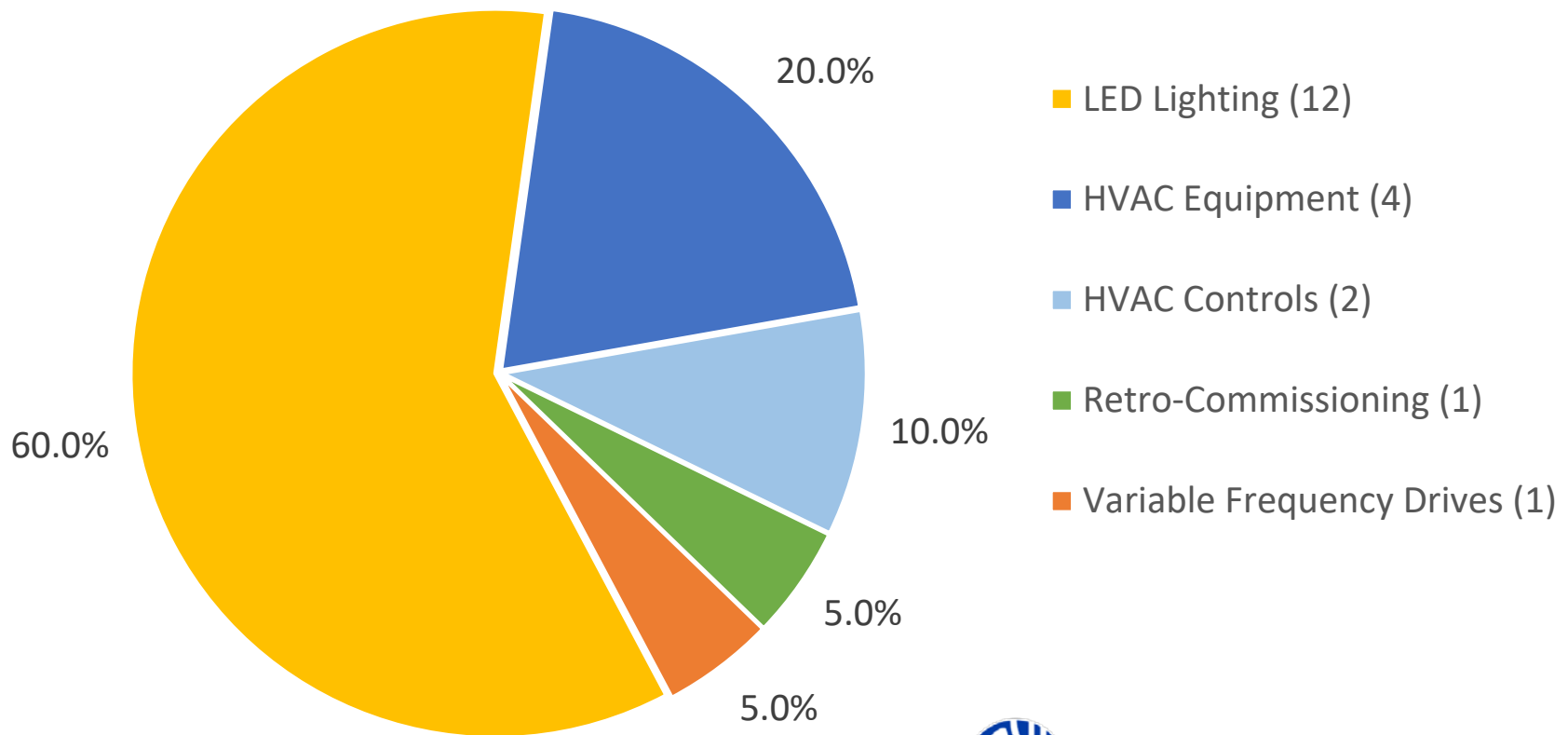


Voluntary Implementation Tune-Up Measure	Found	Corrected
H4 – Identify <b>inefficient lighting</b>	64%	20%
G18 - Identify <b>equipment approaching the end of its service life</b> , per ASHRAE	49%	10%
H2 – Verify <b>lighting sensors are working</b> and located appropriately	36%	17%
J12 – Check <b>water flow fixtures</b>	34%	10%
G9 – Identify areas with indications that <b>ventilation rates</b> may vary significantly from ASHRAE 62.1	33%	11%
G15 – Verify that <b>(HVAC) equipment observed</b> is in good working condition (such as motors, fans, pumps)	25%	12%



*Top 6 out 19 voluntary  
measures in 102 TUA  
buildings.*

# Tune-Up Plus ECMs with City Light



**Seattle City Light**

*Based on 20 ECMs in 19 TUA enrolled buildings.*

# Building Renewal with UW IDL



## Level 1 Findings

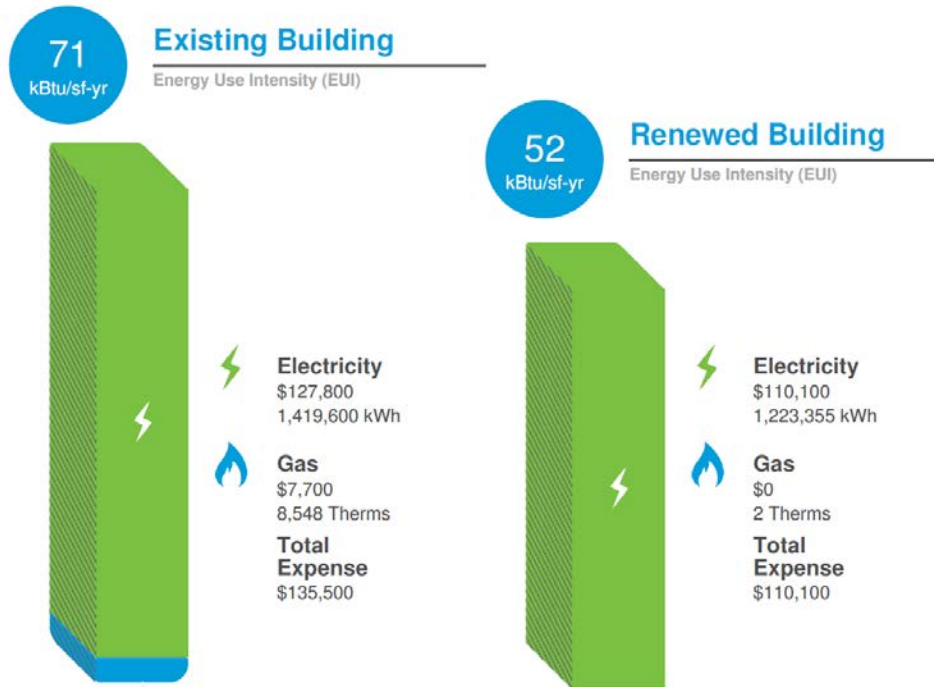
- 38 “Spark” reports created using benchmarking, Asset Score and tune-up reports as inputs
- 11 reports with a positive net present value were sent to building owners
- **If all measures completed, the average EUI could be reduced 47%!**



Developed by NEEA BetterBricks

- Uses EnergyPlus seed models to simulate energy performance
- Incorporates business case
- Exports report and technical appendix
- <https://buildingrenewal.org>

# Spark Report Example



Energy Use: 27%

Energy Cost: 18%

Annual Energy Savings: **\$25,400**





# Level 3 Findings



UNIVERSITY OF WASHINGTON  
INTEGRATED DESIGN LAB

## BUILDING TUNE-UP ACCELERATOR BUILDING RENEWAL - LEVEL 3 REPORT



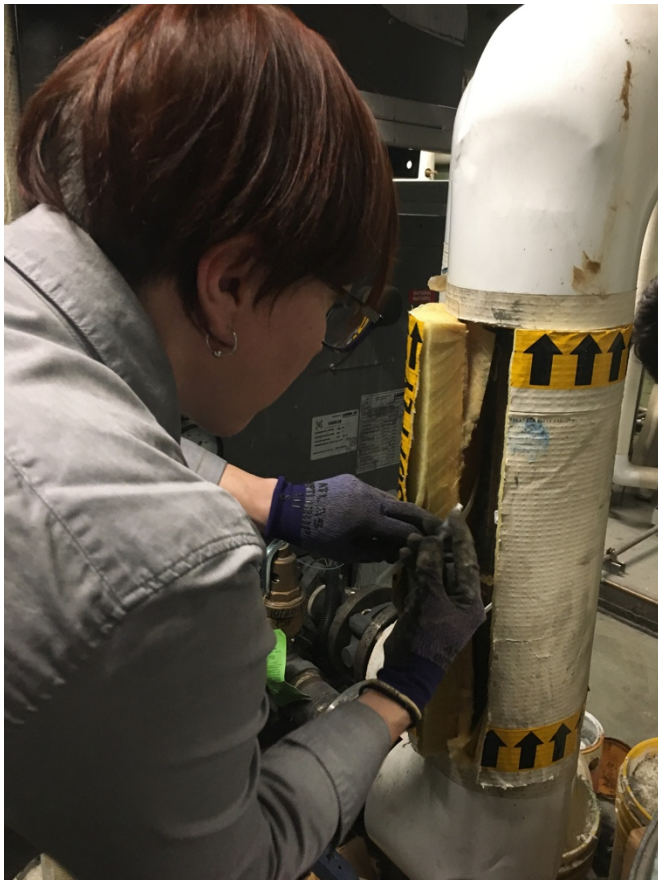
# Level 3 Building Renewal Potential



Measure Package	Description	Range of Savings in 5 Buildings	Average Savings	Average EUI
1	<b>O &amp; M</b> - measures and a DDC expansion or complete DDC retrofit where needed	6% - 28%	<b>16%</b>	71
2	<b>Retrofit</b> - lighting, envelope, and plug load management	21% - 37%	<b>30%</b>	59
3	<b>Mechanicals</b> - improve the performance of selected or out of date HVAC systems.	30% - 49%	<b>38%</b>	55
4	<b>Electrification</b> - replace gas (space heating and/or DHW) and or process steam equipment with heat-pump-based systems	49% - 65%	<b>56%</b>	41

*Total direct emissions savings of up to 900 MT CO<sub>2</sub>e*

# Evaluation: M & V Sample



- Evaluated 10 buildings
  - Mixed Use (1)
  - Hotel (1)
  - K-12 School (2)
  - Office (3)
  - Medical Office (1)
  - College/University (1)
  - Non-Refrigerated Warehouse (1)
- Site Visits
- Pre-Post Energy Data Analysis



# M & V: Site Visits



- Interviews with building owner/facility manager
- Visual verification of corrective actions reported to City
- Data loggers used to verify corrective actions requiring controls changes

**Strong measure persistence!**

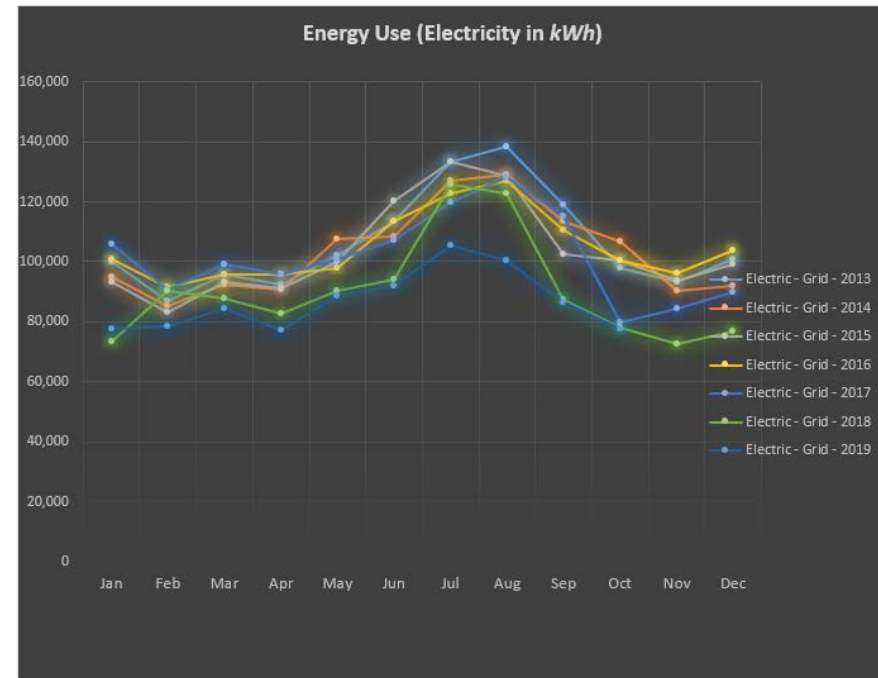


*SBC staff and building facility manager retrieve a HOBO UX90 motor runtime logger used to verify reduced parking garage exhaust fan schedule. It was confirmed.*

# M & V: Energy Data Analysis



- Monthly energy and emissions 1-year (2018) and 2-year (2017) gaps.
- 2017 baseline compared to 2019 using same pre and post months
- Emissions using Seattle GHG factors (carbon neutral utility)
- Challenges:
  - Unexplained data gaps & dips
  - Range of implementation timeline
  - Enough “post tune-up” data (range of 4 – 10 months available). Plan to update.
  - Not enough for weather normalization





# M & V: Post Tune-Up Savings



*Building Energy Consumption & Emissions Savings Post-Tune-Up in M & V Sample Buildings 2017 vs. 2019 Non-Normalized. (##) = increase in energy or emissions.*

Building	Electric %	Natural Gas %	Total Energy %	GHG Emissions %	Total Energy (kBtu)	Total Emissions (MT CO2e)	Months of Post Tune-Up Energy Data*
1	(3.81%)	0.51%	(1.84%)	0.14%	(65,924.91)	.13	6
2	12.69%	7.45%	12.32%	10.08%	344,344.47	2.13	10
3	4.92%	see note	4.92%	4.87%	102,520.81	.42	7
4	(7.13%)	see note	(7.13%)	(7.09%)	(97,216.68)	(0.4)	10
5	(3.16%)	17.57%	11.65%	16.95%	274,581.69	15.63	10
6	(1.18%)	see note	(1.18%)	(1.24%)	(23,041.24)	.01	4
7	20.38%	31.67%	27.17%	31.11%	749,318.72	28.84	5
8	16.73%	0.47%	14.42%	5.65%	597,868.71	2.6	10
9	5.65%	12.55%	8.59%	11.89%	282,930.94	9.8	7
10	11.31%	see note	11.31%	11.33%	371,639.58	1.54	7
<b>Average Savings</b>	<b>5.64%</b>	<b>11.70%</b>	<b>8.02%</b>	<b>8.37%</b>	<b>253,702.21</b>	<b>6.07</b>	

## Building Notes:

3 - Gas wasn't 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 didn't 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.

\* At the time of the evaluation, not all buildings had a full year of post tune-up data due to the implementation timing of the tune-up corrective actions, therefore these results should be considered preliminary.

# PNNL Re-Tuning Estimates



## METHOD

- “Crosswalk” between TUA measure prevalence & Re-tuning prototype energy model
- 71 buildings matched to DOE/PNNL’s 9 building types
- Eight ***required*** Seattle Tune-Up measures mapped to 18 different PNNL Re-tuning measures

## FINDINGS

- Predicted savings ranged from 3.8% to 11.2% for building types.
- If extrapolated to all TUA buildings:
  - Electric 4.3%
  - Gas 3.1%
  - Steam .1% (1 bldg.)
  - **Total 7.5%**



# Asset Score Data Analysis

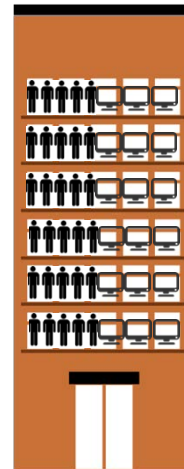
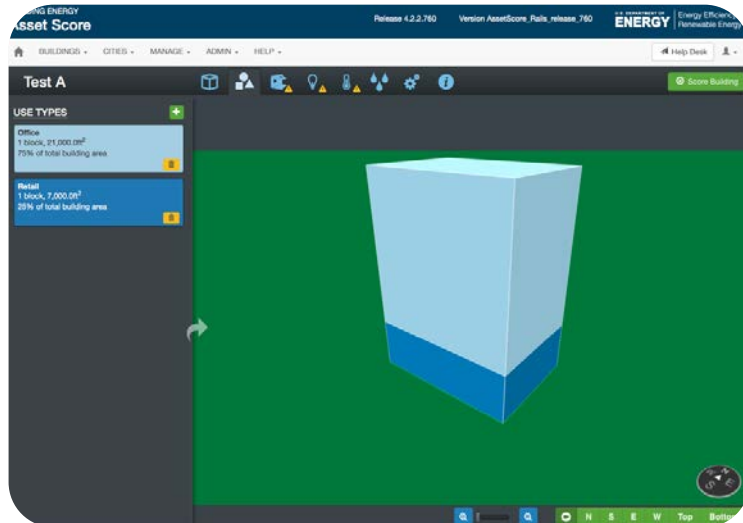
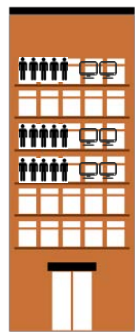
**Nora Wang, Ph.D. AIA**

Chief Engineer, Team Lead

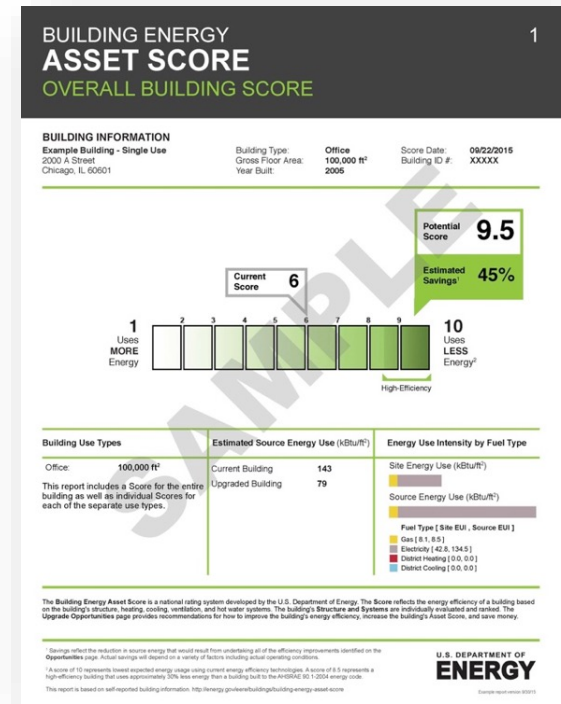


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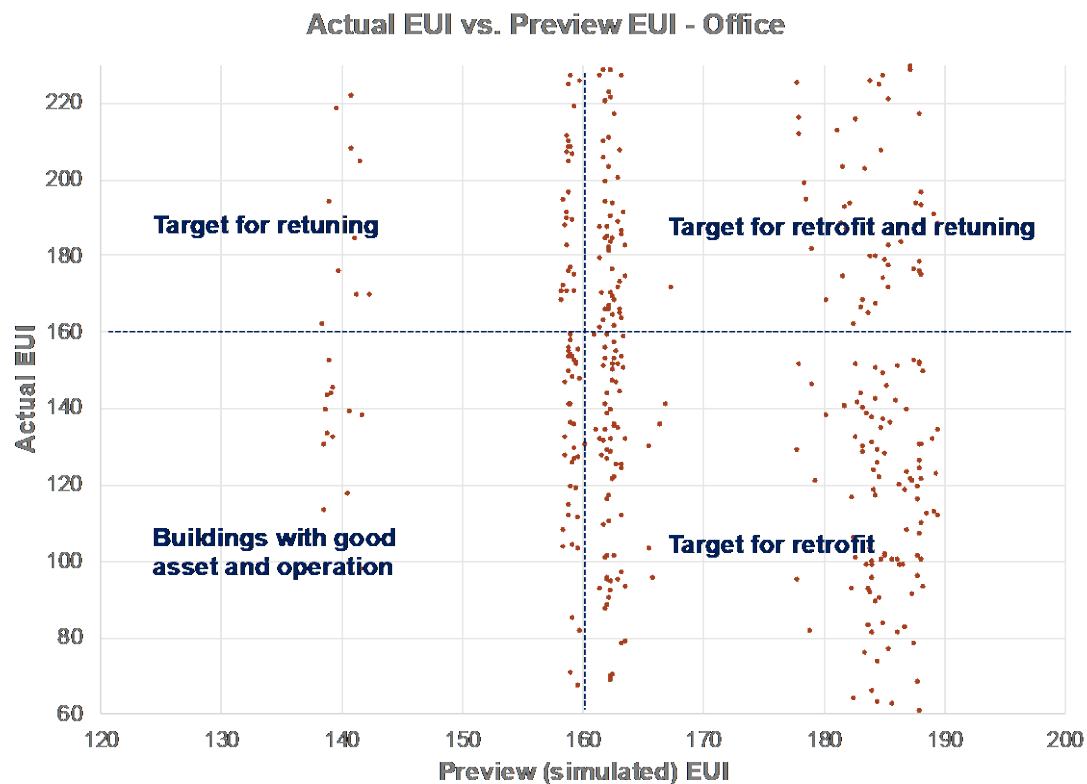
# What is Asset Score



Asset Score runs an energy simulation using EnergyPlus through OpenStudio. The simulation normalizes for building operations, occupancy and tenant behavior. Users enter building characteristics through a web interface. A standard Asset Score report is then generated.



## Asset Score Preview



In FY16, the City of Seattle identified over 2,600 small to medium size buildings (11,000-170,000 sq.ft.) from the energy benchmarking program. PNNL ran Preview Asset Score (AS) analysis based on their floor area, vintage, and use type. It was intended to help the City identify buildings with retuning or retrofit potentials with minimum inputs.

### Example analysis of office buildings (total count 466)

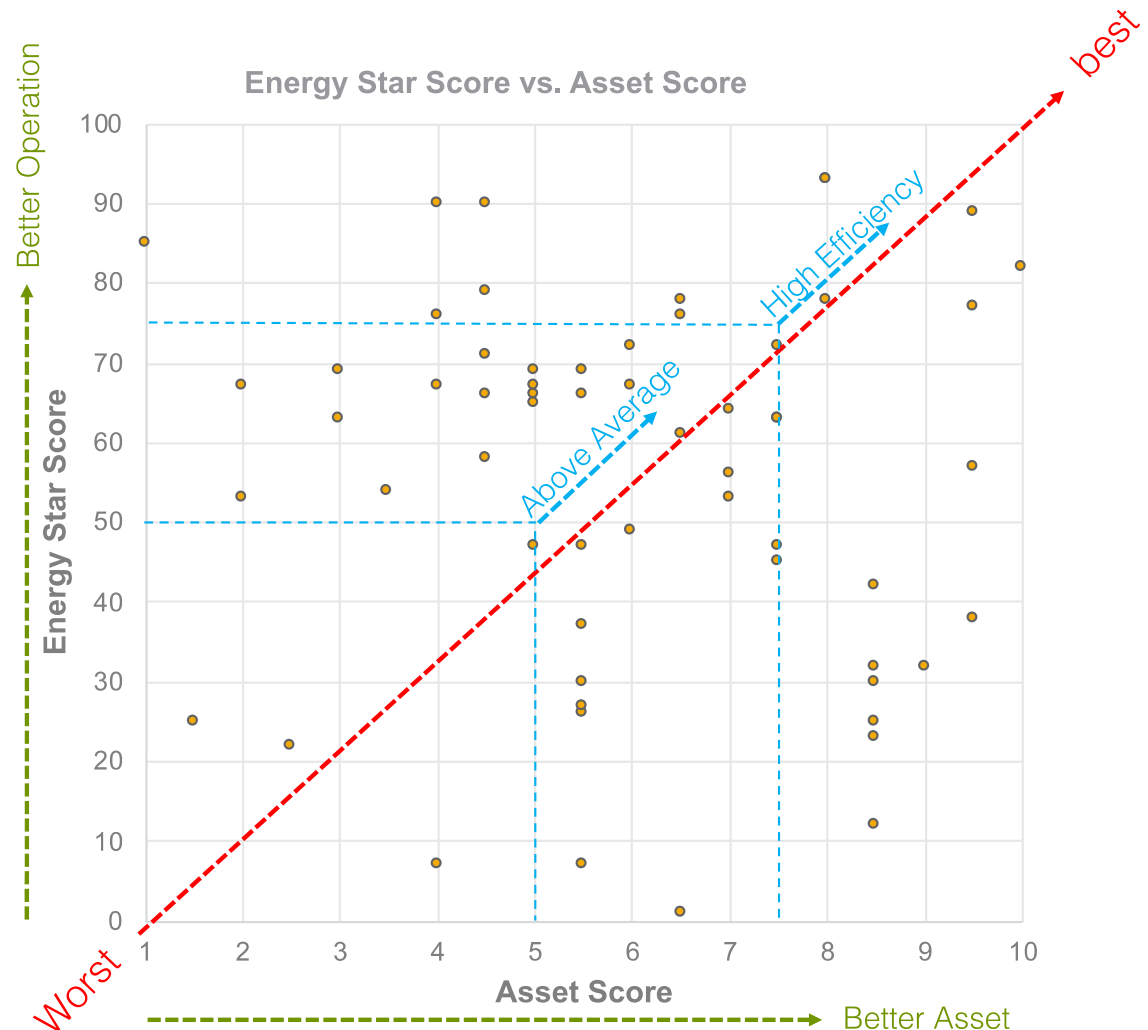
- Actual EUI is measured from Portfolio Manager.
- Preview EUI is the medium EUI from the uncertainty analysis.



## AS and ESPM as Complimentary Scores

60 out of the 90 TUA buildings have an ESPM Score.

Score comparison is less biased than EUI comparison because score normalizes weather and use type.



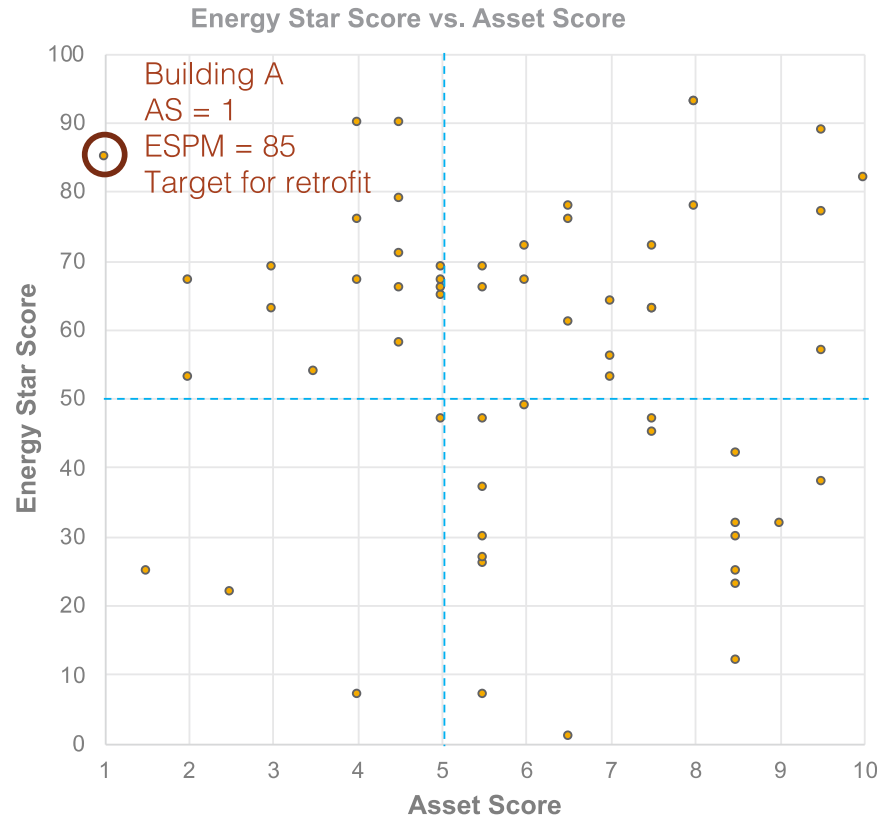
## Case Study A

### Field Assessment Report:

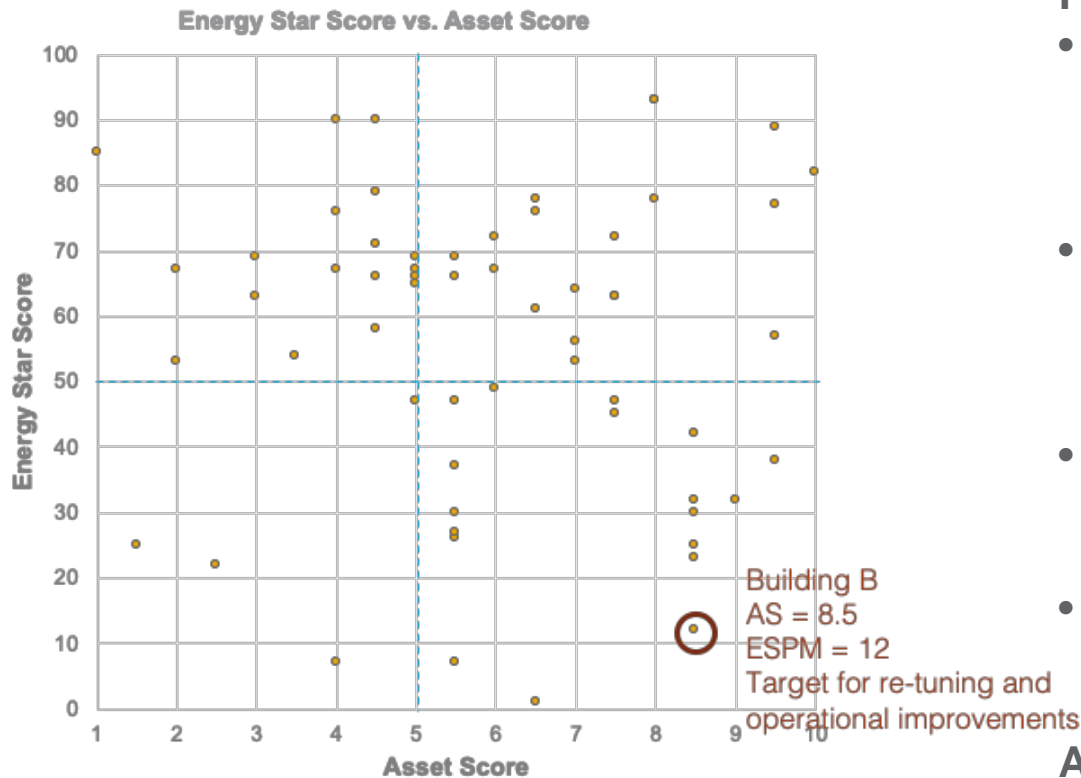
- Schedule exterior and interior lighting with energy management system.
- 30 years old water source heat pump units will need to be replaced.
- Upgrade all interior and exterior lighting.

### Asset Score Recommendations:

- 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.



## Case Study B



### Field Assessment Result:

- Replace valves on hot water loop and allow boilers and pumps to turn off when there is no heat demand.
- 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.

### Asset Score Recommendations:

- Replace T8-32 to LED lighting
- Add airside economizer
- Implement demand control ventilation

## EEM Comparison with Assessor's Analysis

The Asset Score EEMs align with the assessor's evaluations, except that the tune-up assessors do not generally recommend envelope retrofits.

EEMs (for 56 buildings)	TUA	AS
Lighting - Retrofit	32	47
HVAC - Implement Controls	28	36
Lighting - Install Controls/Sensors	25	46
HVAC - Add Equipment	11	33
HVAC - System Upgrade	9	14
Envelope - Add Insulation	5	41
DHW - Install low flow faucets	4	34
Envelope - Upgrade Windows	3	24
DHW - System Upgrade	3	4
Total	120	279

HVAC EEM examples:

Add Equipment:

- add air-side economizer
- add variable frequency drive to supply fans

System Upgrade:

- upgrade heating system with high efficiency natural gas furnace
- upgrade cooling plant pumping system to constant primary - variable secondary pumping system

Implement Controls:

- implement chilled water temperature reset
- lower VAV box minimum flow set points

# Owner / Manager Experience



*“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,  
VICE PRESIDENT OF REAL ESTATE ASSETS

[http://www.seattle.gov/Documents/Departments/OSE/Tune-Ups/OSE\\_BTU\\_CS\\_Hotel%20Five\\_Final.pdf](http://www.seattle.gov/Documents/Departments/OSE/Tune-Ups/OSE_BTU_CS_Hotel%20Five_Final.pdf)



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 \$2,000 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, all units would 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 \$2,000 SF	COSTS		PROJECTED ANNUAL SAVINGS	
ASSESSMENT	\$5,500	\$0.10/SF	\$1,100	\$0.02/SF
REQUIRED ACTIONS	\$3,000	\$0.06/SF	\$1,100	\$0.02/SF
TOTAL	\$8,500	\$0.16/SF	\$1,100	\$0.02/SF

Want to learn more?  
[seattle.gov/buildingtuneups](http://seattle.gov/buildingtuneups)





# Owner / Manager Experience



*“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**  
SEATTLE PUBLIC SCHOOLS  
RESOURCE CONSERVATION SPECIALIST

<http://www.seattle.gov/Documents/Departments/OSE/Tune-Ups/OSE BTU CS Concord R7 final.pdf>



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# Post-Participation Survey

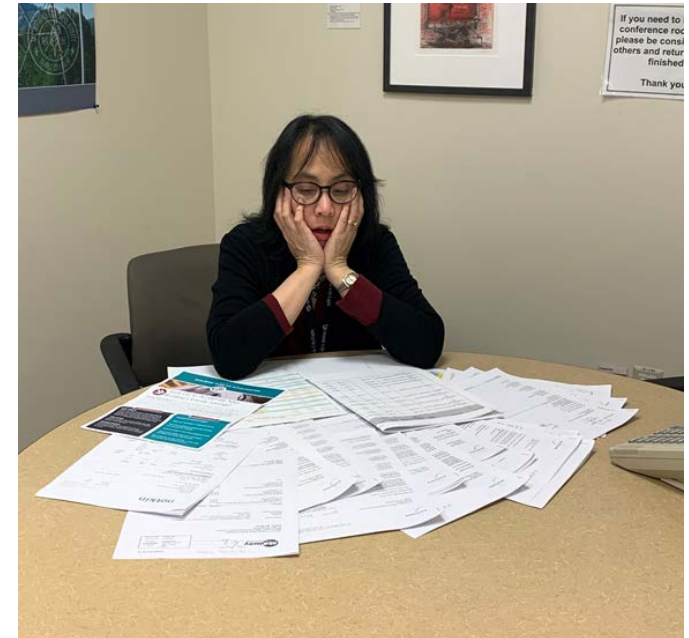


- ✓ **Positive Program Experience & Benefit to Building Operations**
  - **80% agreed to:** *Overall, participating in the Tune-Up Accelerator Program was beneficial to my building or organization.*
- ✓ **Strong Satisfaction with the Tune-Up Specialist**
  - **75% agreed to:** *Service providers that want to conduct Seattle Building Tune-Ups should be required to attend a City of Seattle program training.*
- ✓ **The Tune-Up Drives ECM Participation**
  - **80% “Yes”:** *After your participation, did you implement, or have you planned/budgeted for any voluntary ECM(s) beyond the required actions of the tune-up?”*
- ✓ **Offering an Incentive & Technical Support for Early Compliance is Good Policy**
  - **93% “Yes”** - *The City should use incentives and extra technical support to engage building owners with early compliance.*

# Tune-Up Costs



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
<b>Grand Total</b>	<b>100</b>	<b>\$0.21</b>



**Seattle City Light**

# TUA Revised Savings Estimates



Basic Tune-Up: **10% → 7%**

Tune-Up Plus: **20% → 15%**

Building Renewal: **35% → 35%**

Total Estimated: **20% → 12%**

kBtu: **99 → 67.8 million**

Seattle GHG: **13.3%**

MT CO<sub>2</sub>e/Yr: **10,500**



# Beyond Tune-Ups... Next Steps



- WA State Building Performance Standards
- Future Seattle Building Performance Standards
- Green New Deal
- Increased Support: “Hubs”, Financing
- Pilot “Retrofit Accelerator”





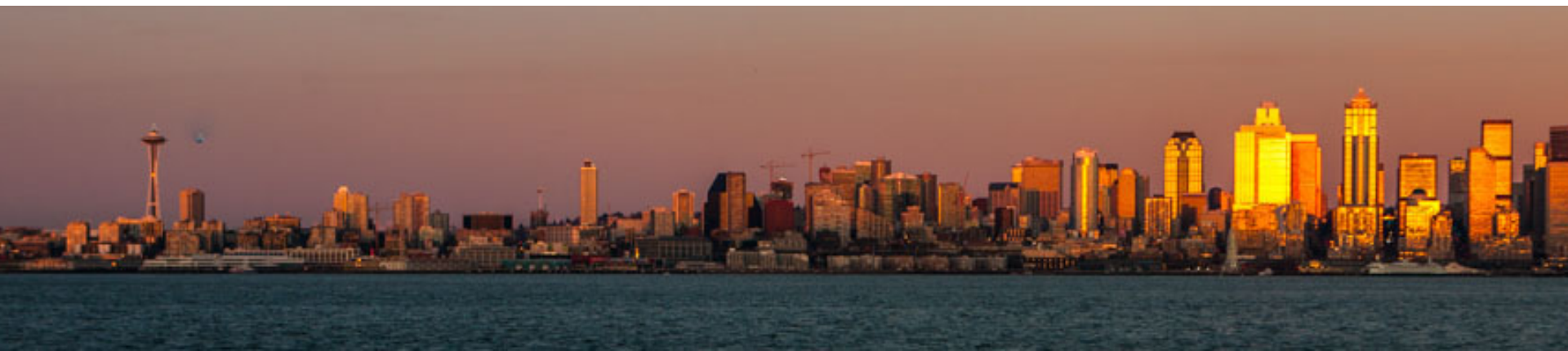
# Thank You!



Nicole Ballinger

[nicole.ballinger@seattle.gov](mailto:nicole.ballinger@seattle.gov)

**[www.seattle.gov/buildingtuneups](http://www.seattle.gov/buildingtuneups)**



# Questions