WASHINGTON STATE UNIVERSITY
EXTENSION

Reducing Water and Energy Use:

RCM Stories From Across Washington

WSU Energy Program

Resource Conservation Management

June 22, 2022

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RCM Stories From Across Washington

Meeting Requirements for Building Tune-Ups and Performance Standards

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Resource Conservation Specialist, Seattle Public Schools

Reducing Water Usage at Spokane Falls Community College

Reed Williams and Andrew Lemberg

Resource Conservation Managers, Community Colleges of Spokane

Seattle Public Schools

Meeting Requirements for Building Tune-Ups and Performance Standards

Prepared for Washington State University Energy Program

June 22, 2022

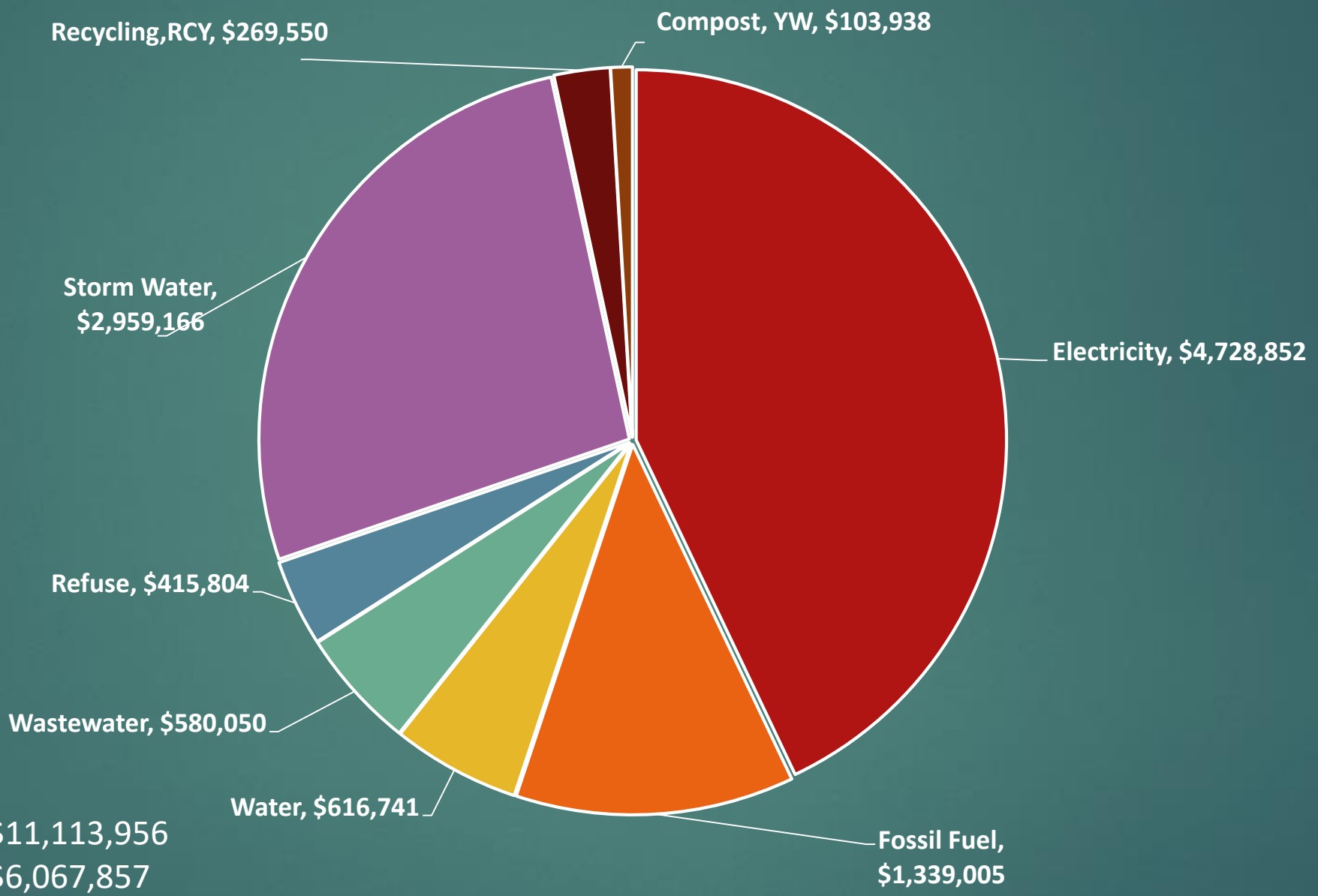
Ian Brown, Resource Conservation Specialist

Seattle Public Schools

Seattle Public Schools (SPS):

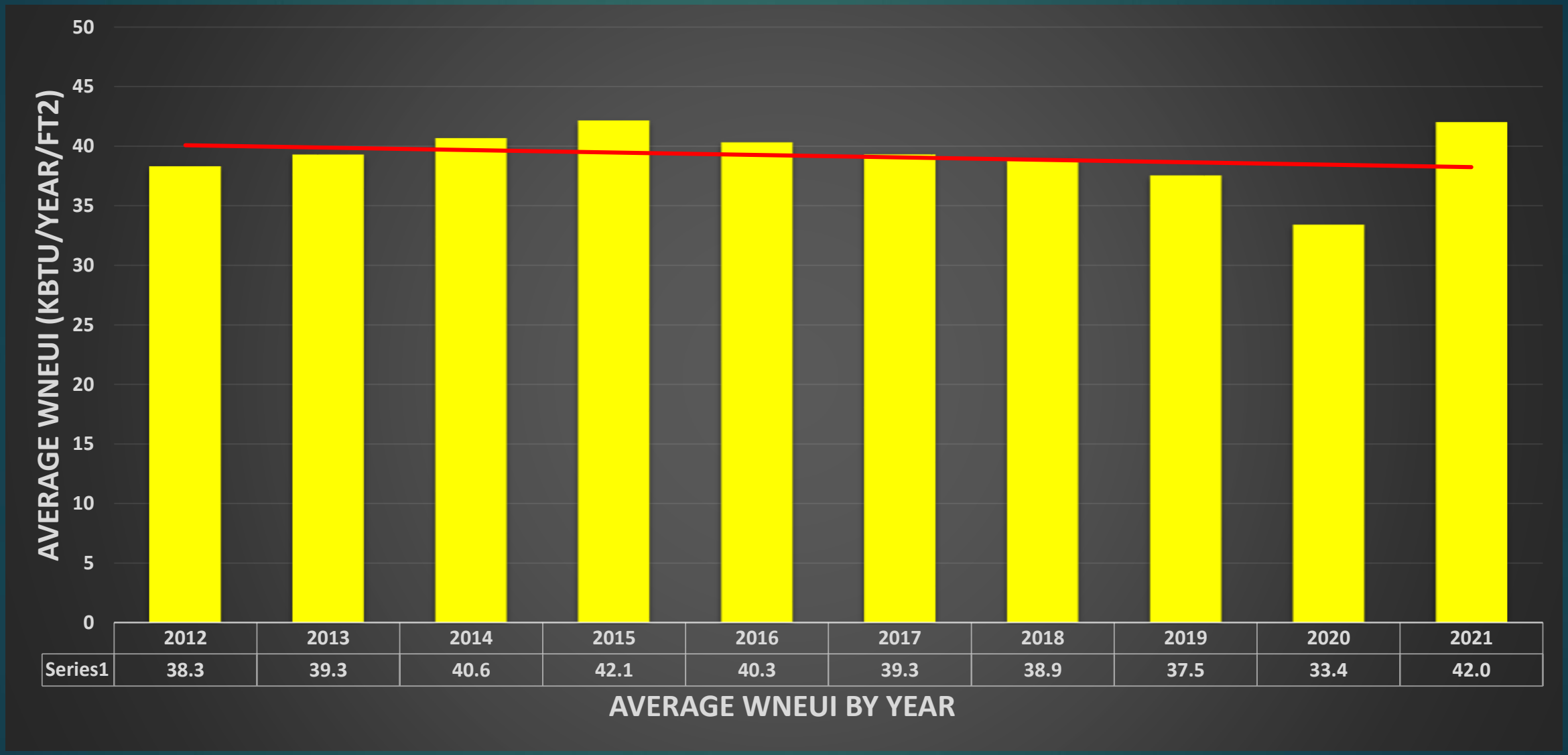
- 105 schools, 5 sports complexes, 1 stadium, 1 Central Admin, 1 forest
- 63 Elementary, 12 Middle, 11 K-8, 14 High, 5 alternate sites
- 10,176,986 ft2
- 52,381 students in 2020 (down from 53,627 in 2019, 2.3% decrease)
- All new buildings will be all-electric (Seattle Energy Code 2018)

Utility Expenses 2019-2020



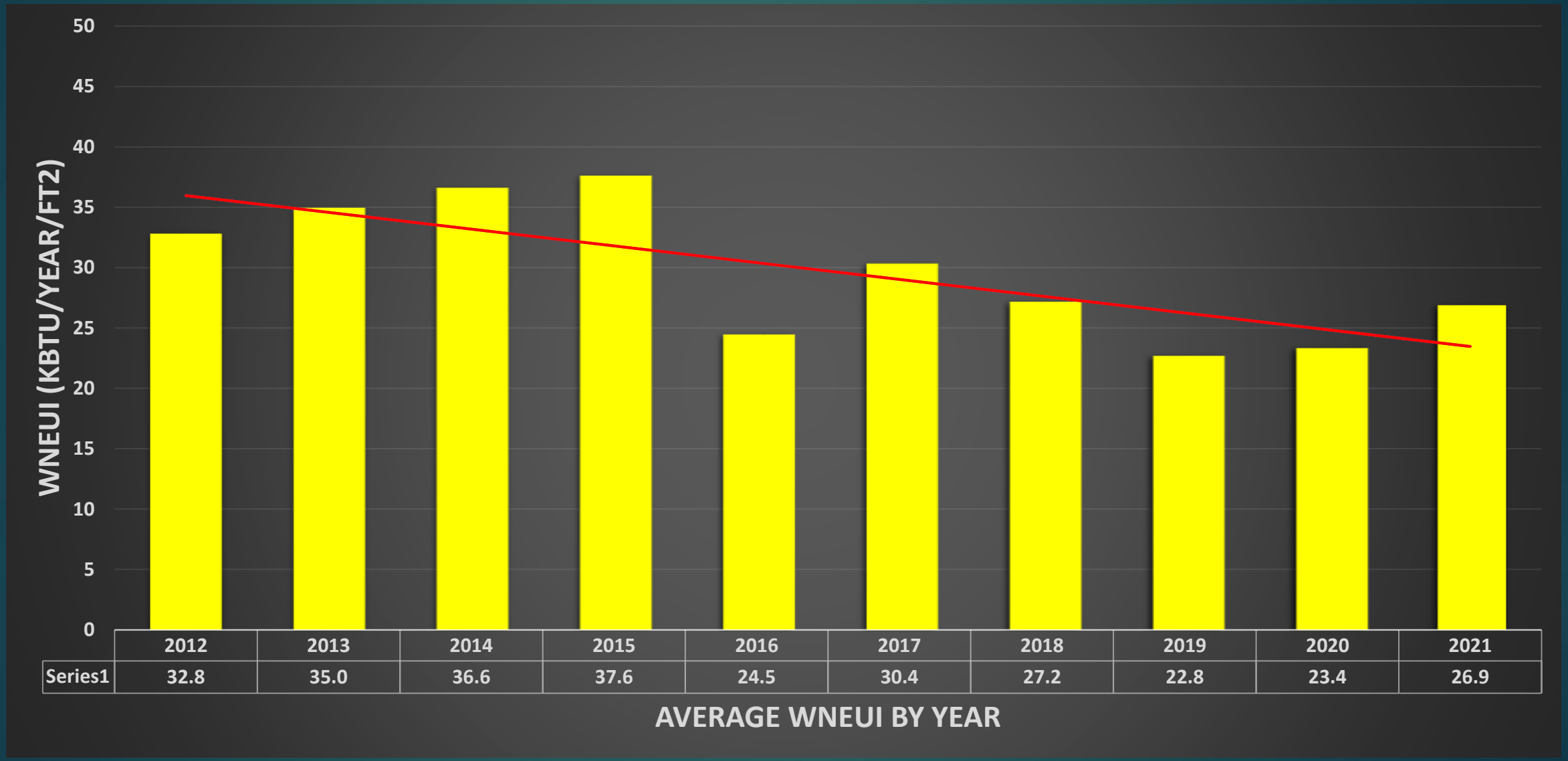
Total Utility Costs: $11,113,956
Energy Costs: $6,067,857

Weather-Normalized EUI (WNEUI) by Year



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Series1	38.3	39.3	40.6	42.1	40.3	39.3	38.9	37.5	33.4	42.0

All-Electric Buildings WNEUI by Year



Seattle's Office of Sustainability & Environment (OSE) Building Tune-Up Ordinance

- Adopted in March 2016
- Tune-ups aim to optimize energy and water performance by identifying low- or no-cost actions related to building operations and maintenance
- City-wide expected energy savings = 10-15% (Actual results may vary…)
- Who needs to do the work: Building Tune-Up Specialists are required to have BOC 2 credentials (or are mechanical engineers)

Recommissioning Team hired and trained for the Building Tune-Up Program

Why In-House?

Subcontractor:

- More expensive
- Auditors are only required to sample 12% of HVAC systems
- They only audit – don't do the actual work!
- addressing audit points is another task left to building owners
- Two-part process for subcontractors
- Second walk-through needed to confirm required measures have been addressed.
- Program is reiterative; every 4 years the process repeats

Recommissioning Team (RCx):

- RCx Team fixes most problems at time of audits
- OSE requires only 12% sampling AND correction of HVAC components; RCx Team does 100%
- Continuity and follow-through
- Identify potential upgrades, projects and maintenance concerns
- Able to rapidly increase ventilation rates (COVID)
- For good or bad, RCx Team has been requisitioned to address backlog of work orders
- RCx Team does ALL buildings (OSE cutoff is <50K ft2)
- SPS already maintains EPA Portfolio Manager Benchmarking

Tune-Up Accelerator Program

- SPS was part of Tune Up Accelerator Program
- 102 buildings in the city-wide program
- SPS participated with 22 buildings (22%)
- OSE collaborated with Seattle City Light (SCL) for incentives
- SPS received $185,000 from SCL for completion of the early submittals

EARLY TUNE-UPS FOR BUILDINGS 100K FT2 OR SMALLER

ALL SUBMITTED BY END OF 2019

102 BUILDINGS TOTAL IN PROGRAM

SPS HAD 22 SCHOOLS IN THE ACCELERATOR PROGRAM!

SCL UTILITY INCENTIVE PROGRAM AWARDED SPS **$185,000**

RCx TEAM SUBMITTED 48 BUILDINGS BY END OF 2019!

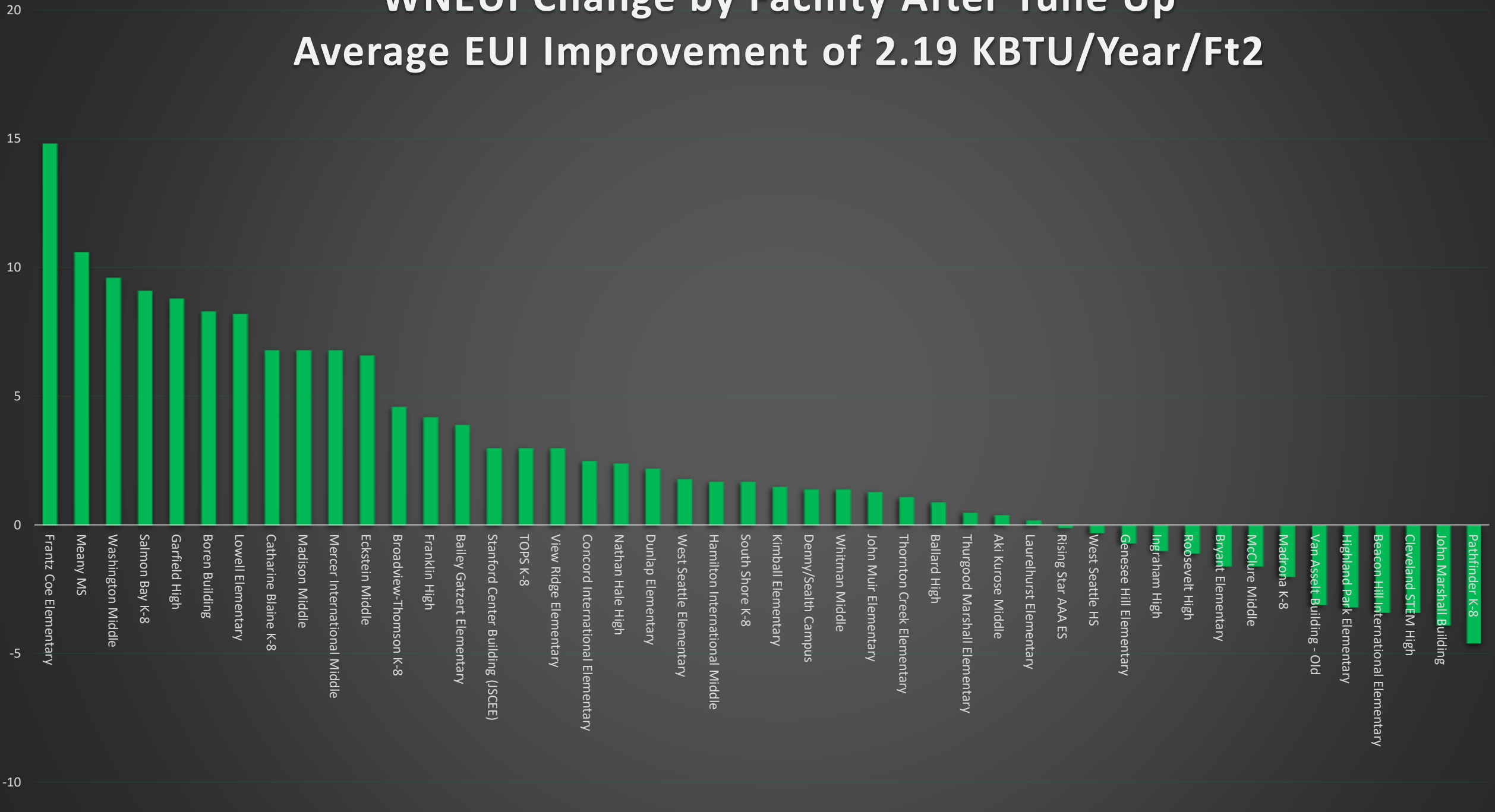
How did we fare?

There is no M&V for the Tune-Up Program – it is a prescriptive path program, though detailed and using common building operation sense.

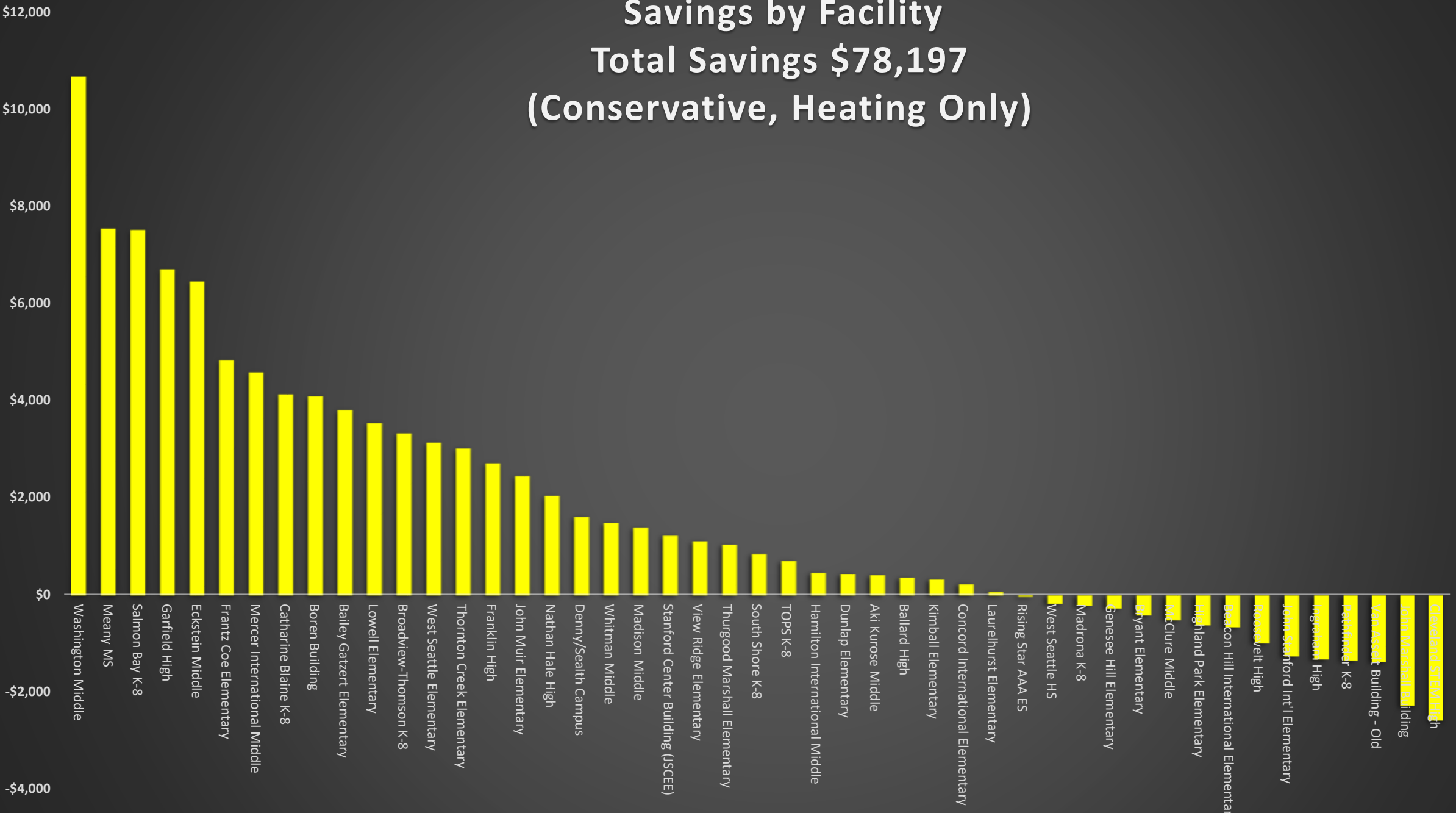
So, how can SPS assess the efficacy of the changes made by our RCx Team?

One way is to look at Weather-Normalized EUI's generated by Portfolio Manager.

WNEUI Change by Facility After Tune Up
Average EUI Improvement of 2.19 KBTU/Year/Ft2



Savings by Facility
Total Savings $78,197
(Conservative, Heating Only)



Reasons for lesser savings than the program predicted:

- SPS schedules are set around bell times for schools – buildings are required to be up to temperature by bell time
- SPS has standards on dead-bands – 68-74 DF for classrooms, 62 DF for gyms/hallways, 65-74 DF for lunchrooms and auditoriums
- Fixing failed ventilation components would improve IAQ, but not necessarily lower energy use (and who anticipated COVID?)
- NOT an energy audit or thorough re-commissioning – no engineering, modeling or energy savings calculations.
- Operating adjustments that address demand may save money, but not energy.

How do you measure success?

- Saving money?
- Saving energy?
- Improving IAQ for students and faculty?
- Reducing GHG emissions?
- Providing better lighting for students?
- Fewer cold calls?
- Correcting deferred maintenance?

Washington State Clean Building Performance Standard (CBPS)

- Relies on EPA's Portfolio Manager for building data
- Requires Energy Management Plan
- EUI targets (EUIt) defined by building types
- ASHRAE 2 audits required buildings that do not meet their targets
- Energy Efficiency Measures (EEMs) by Life Cycle Costs (LCCs) required
- Measurement and Verification (M&V) required
- Buildings must reduce to their EUIts
- Penalties for non-compliance

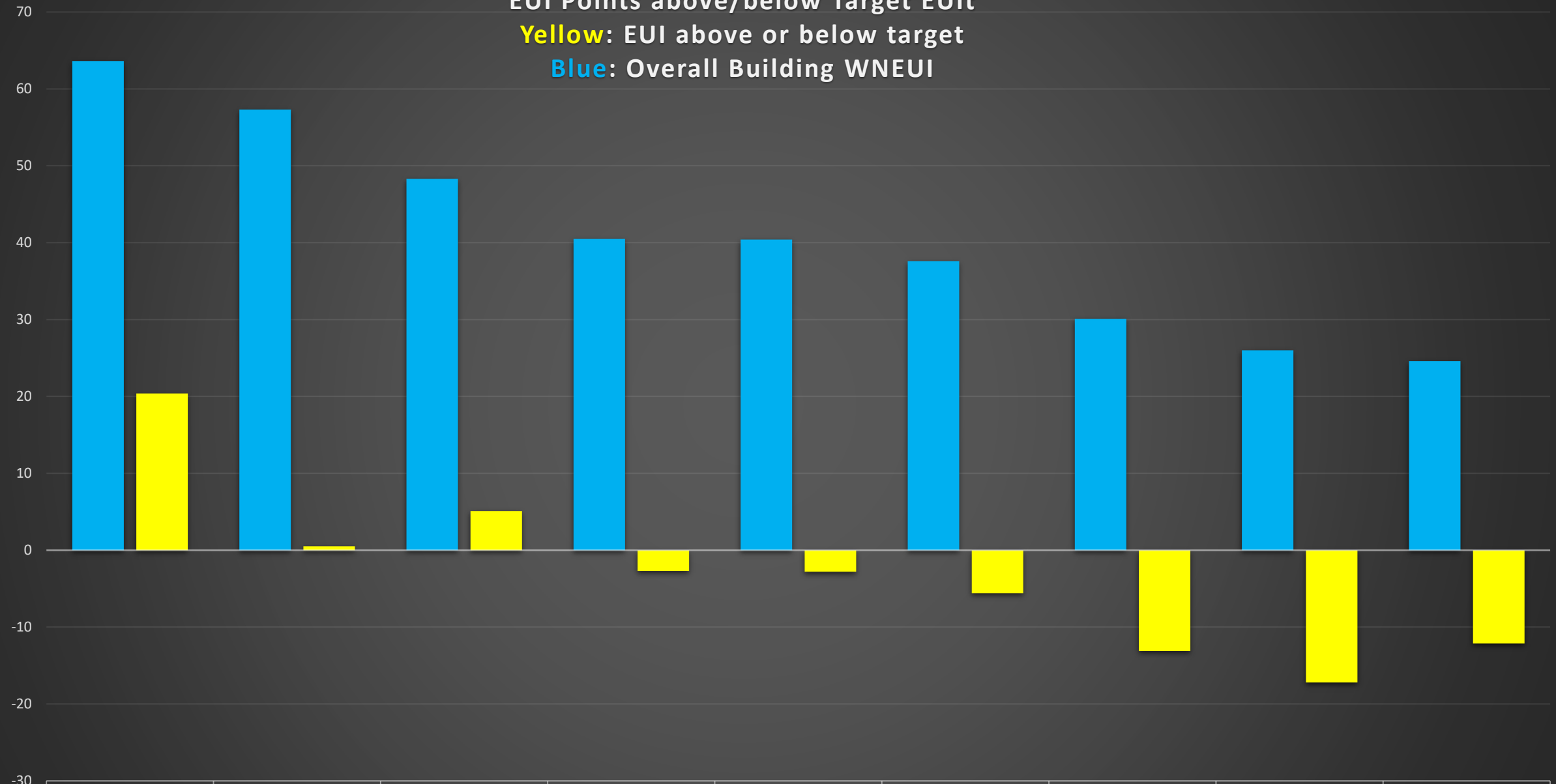
https://www.commerce.wa.gov/wp-content/uploads/2021/02/Role-and-Responsiblities.pdf

Where are we now with the CBPS?

- After assigning target EUI's (EUIt)
- After generating WNEUI's in Portfolio Manager for all facilities
- Assuming RCx Team info will suffice for O&M routines
- Assuming we collate building HVAC components useful life

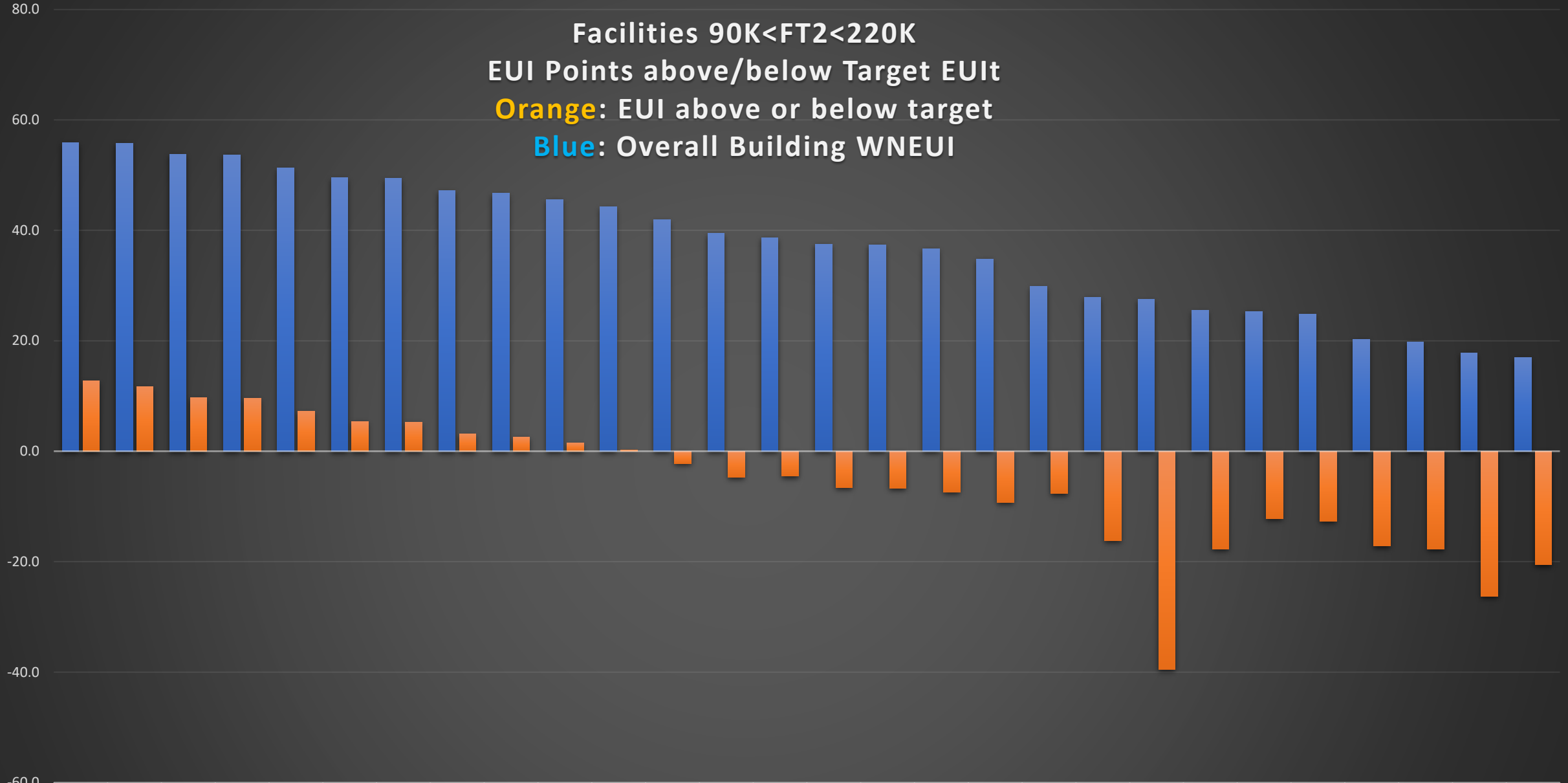
Where do our buildings stand in achieving their target EUI's?

Facilities>220K Ft2
EUI Points above/below Target EUIt
Yellow: EUI above or below target
Blue: Overall Building WNEUI

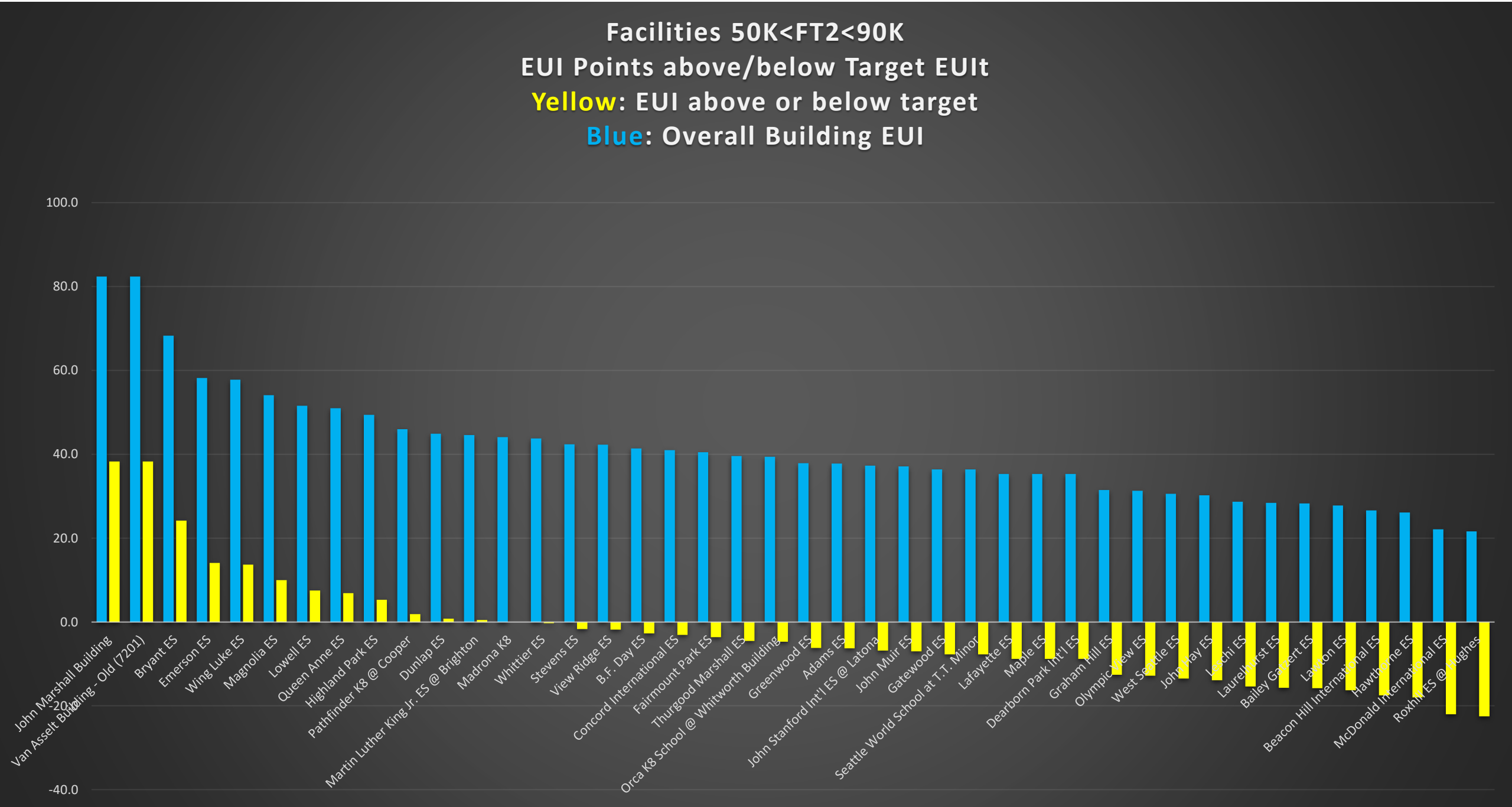


	Garfield HS	Stanford Center Building (JSCEE)	Ingraham HS	Roosevelt HS	Ballard HS	Denny/Sealth Campus	Nathan Hale HS	Franklin HS	Lincoln HS
WNEUI (kBtu/ft²)	63.6	57.3	48.3	40.5	40.4	37.6	30.1	26.0	24.6
EUI to make up:	20.4	0.5	5.1	-2.7	-2.8	-5.6	-13.1	-17.2	-12.1

Facilities 90K<FT2<220K
EUI Points above/below Target EUIt
Orange: EUI above or below target
Blue: Overall Building WNEUI

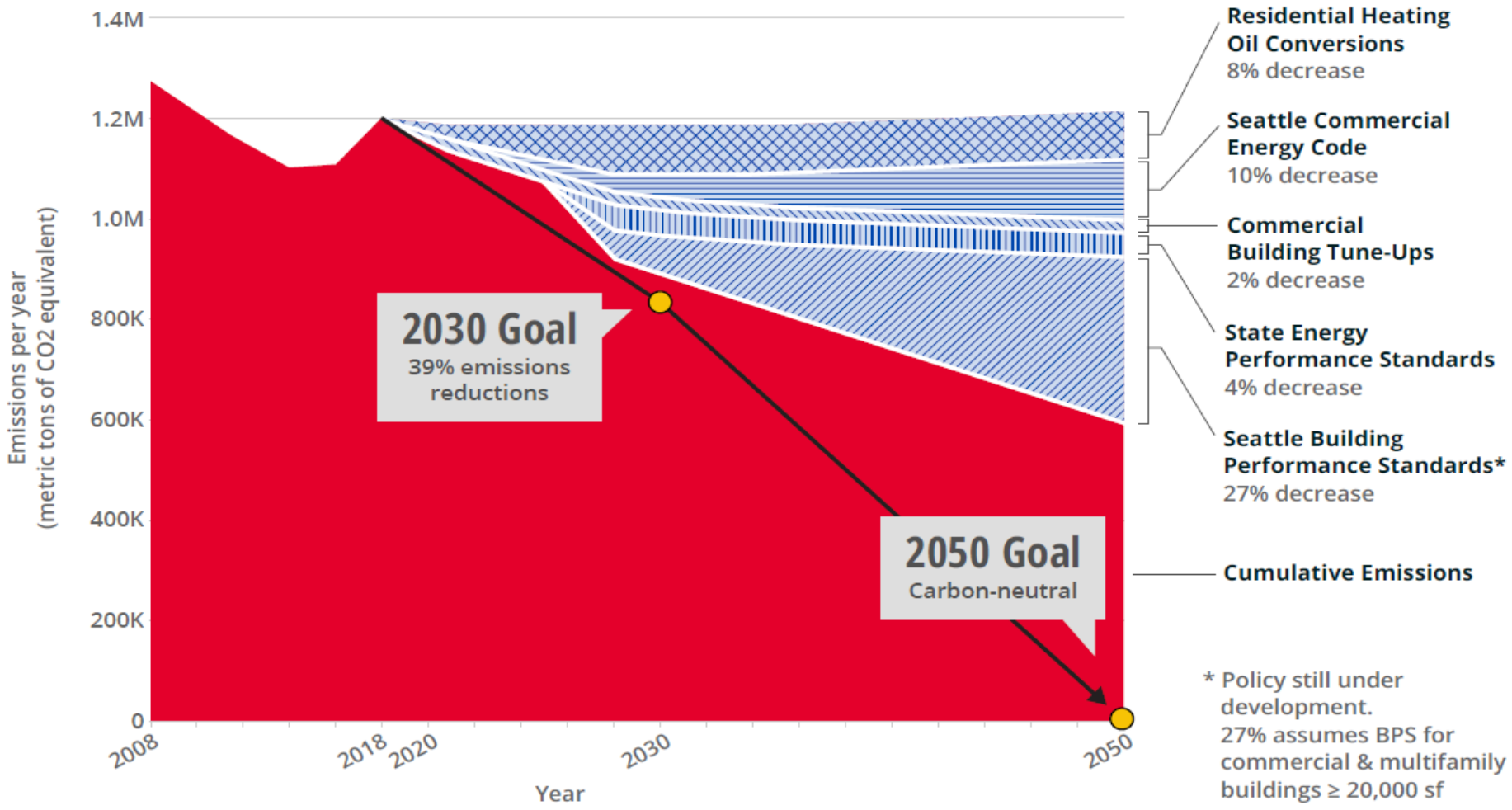


	West Seattle HS	Mercer International MS	Salmon Bay K8 @ Monroe	Aki Kurose MS	Whitman MS	Catharine Blaine K8	Meany MS	Broadview-Thomson K8	Jane Addams MS	Boren Building STEM K8	Eckstein MS	Hamilton International MS	Washington MS	Rainier Beach HS	TOPS K8 @ Seward	McClure MS	Rising Star (AAA) (8311)	South Shore K8	Eagle Staff MS	Madison MS	Memorial Stadium	Cleveland STEM HS	Cascadia ES	Genesee Hill ES	Olympic Hills ES	Hazel Wolf K8 at Pinehurst	Loyal Heights ES	Thornton Creek ES
WNEUI (kBtu/ft²)	55.9	55.8	53.8	53.7	51.3	49.5	49.4	47.2	46.7	45.6	44.3	41.9	39.4	38.7	37.5	37.4	36.7	34.8	29.8	27.9	27.5	25.5	25.3	24.8	20.3	19.8	17.8	16.9
EUI to make up:	12.7	11.7	9.7	9.6	7.2	5.4	5.3	3.1	2.6	1.5	0.2	-2.2	-4.7	-4.5	-6.6	-6.7	-7.4	-9.3	-7.7	-16.2	-39.5	-17.7	-12.2	-12.7	-17.2	-17.7	-26.3	-20.6


Facilities 50K<FT2<90K
EUI Points above/below Target EUIt
Yellow: EUI above or below target
Blue: Overall Building EUI
100.0
80.0
60.0
40.0
20.0
0.0
-20.0
-40.0
John Marshall Building
Van Asselt Building - Old (7201)
Bryant ES
Emerson ES
Wing Luke ES
Magnolia ES
Lowell ES
Queen Anne ES
Highland Park ES
Pathfinder K8 @ Cooper
Dunlap ES
Martin Luther King Jr. ES @ Brighton
Madrona K8
Whittier ES
Stevens ES
View Ridge ES
B.F. Day ES
Concord International ES
Fairmount Park ES
Thurgood Marshall ES
Orca K8 School @ Whitworth Building
Greenwood ES
Adams ES
John Stanford Int'l ES @ Latona
John Muir ES
Gatewood ES
Seattle World School at T.T. Minor
Lafayette ES
Maple ES
Dearborn Park Int'l ES
Graham Hill ES
Olympic View ES
West Seattle ES
John Hay ES
Leschi ES
Laurelhurst ES
Bailey Gatzert ES
Lawton ES
Beacon Hill International ES
Hawthorne ES
McDonald International ES
Roxhill ES @ Hughes

Projected Seattle Buildings Emissions Reductions

This diagram illustrates the role that each strategy plays in bringing Seattle to carbon neutrality. Each wedge indicates how emissions are projected to decrease against a business as usual scenario without these actions.



From OSE: https://www.seattle.gov/documents/Departments/OSE/Building%20Energy/OSE_buildings-infographic_combined_Sept2021.pdf

Takeaways

- Make sure your Portfolio Manager data is up to date
- Carefully read how to calculate EUIts
- If buildings are close to their EUIts, what can you do now to fix?
- Start planning NOW for funding and EEM's that will get you to your targets
- Consider whether audits will be performed internally, or subbed out
- Many engineering firms are gearing up to provide their services

END

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Reducing Water Usage at Spokane Falls CC

Andrew Lemberg and Reed Williams

Resource Conservation Management

Community Colleges of Spokane

Community Colleges of Spokane

Community Colleges of Spokane

Background Information

- The Community Colleges of Spokane (CCS) is comprised of two main campuses and surrounding satellite locations:
  - **Spokane Falls Community College (SFCC) – location of smart water irrigation project**
  - Spokane Community College (SCC)
  - 50 buildings totaling 2.1 million ft^2
  - 34 acres of irrigated land at SFCC
    - 41% more than SCC
    - Over 90% of SFCC water consumption is utilized for irrigation.

Community Colleges of Spokane

Project Overview

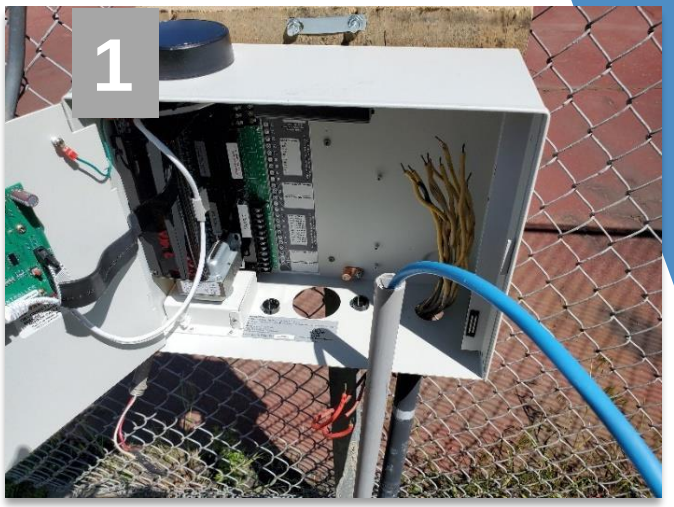
- Replace components of the irrigation system that are excessively watering various green spaces on the SFCC campus.

- Smart Water Irrigation System from Baseline Irrigation Solutions, including:
  - Controllers that are based on live weather and soil conditions
  - New low-spray heads in targeted areas
  - Online dashboard for programing and live troubleshooting

Community Colleges of Spokane

Project Images

- 1 – Controller box
- 2 – IDF room where CAT wire connection is made
- 3 – Direct burial of CAT wire
- 4 – Flow meter (hydrometer) installation
- 5 – Another flowmeter install and wiring example



Community Colleges of Spokane

Project Goals

- Reduce water costs and usage by making the irrigation system more efficient
  - Expected **savings of $40,000 annually**
  - Achieve **annual water reduction of 18 million Gallons**
- Maximize operational efficiencies with less need for routine maintenance, reliance on external entities identifying leaks, and regular “spot-checking”

Community Colleges of Spokane

Obstacles and Barriers

- Funding
  - Making the case to executive leadership about the importance of water conservation
- Consideration of infrastructural upgrades
  - Collaboration with IT regarding CAT6a wiring, electrical and plumbing upgrades
- Buy-in from current Grounds crew
  - Acknowledging the shift in both mentality and actual labor of our Grounds workforce

Community Colleges of Spokane

Metrics for Determining Success

- How do we know there will be success upon project completion?
  - Case Studies:
    - City of Boise, Idaho:
      - Experienced close to **70% water savings** compared with previous watering methods
    - City of Twin Falls, Idaho:
      - **50% water savings** since conversion to soil moisture sensor-based system
    - Commercial application in Portland, Oregon:
      - Five commercial business owners experienced **water savings ranging from 31% to 74%.**
  - Historical usage data makes changes in trends easily identifiable

Community Colleges of Spokane

Questions?

Community Colleges of Spokane

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