2022 PROJECT PROPOSAL CHECKLIST

2023-25 Biennium Four-year Higher Education Scoring Process

INSTITUTION	CAMPUS LOCATION
365 - Washington State University	Pullman, WA
PROJECT TITLE	**OFM/CBS Project #**
Clean Buildings Performance Standard Energy Efficiency Improvements - CBPS	40000346
PROJECT CATEGORY	**FPMT UNIQUE FACILITY ID # (OR NA)**
Infrastructure	NA (multiple facilities)
PROPOSAL IS	
New or Updated Proposal (for scoring)	**Resubmitted Proposal (retain prior score)**
☒ New proposal ☐ Resubmittal to be scored (more than 2 biennia old or significantly changed)	☐ Resubmittal from 2018 (2019-21 biennium) ☐ Resubmittal from 2020 (2021-23 biennium)
CONTACT	**PHONE NUMBER**
Kate Kamerrer	Click or tap here to enter text.

Proposal content

- ☒ Project Proposal Checklist: this form; one for each proposal
- ☒ Project Proposal Form: Specific to category/subcategory (10-page limit)
- ☒ Appendices: templates, forms, exhibits and supporting/supplemental documentation for scoring.

Institutional priority

- ☒ Institutional Priority Form. Sent separately (not in this packet).

Check the corresponding boxes below if the proposed project meets the minimum threshold or if the item listed is provided in the proposal submittal.

Minimum thresholds

- ☒ Project is not an exclusive enterprise function such as a bookstore, dormitory, or contract food service.
- ☒ Project meets LEED Silver Standard requirements.
- ☒ Institution has a greenhouse gas emissions reduction policy in place in accordance with RCW 70A.45.050 and vehicle emissions reduction policy in place per RCW 47.01.440 or RCW 43.160.020 as applicable.
- ☐ A complete predesign report was submitted to OFM by July 1, 2022 and approved.
- ☐ Growth proposals: Based on solid enrollment projections and is more cost-effectively providing enrollment access than alternatives such as university centers and distance learning.
- ☐ Renovation proposals: Project should cost between 60 – 80% of current replacement value and extend the useful life of the facility by at least 25 years.
- ☐ Acquisition proposals: Land acquisition is not related to a current facility funding request.
- ☒ Infrastructure proposals: Project is not a facility repair project.

2022 PROJECT PROPOSAL CHECKLIST

2023-25 Biennium Four-year Higher Education Scoring Process

☒ Stand-alone, infrastructure and acquisition proposals is a single project requesting funds for one biennium.

Required appendices

☒ Project cost estimate: Excel C-100

☐ Degree Totals and Targets template to indicate the number of Bachelors, High Demand and Advanced degrees expected to be awarded in 2023. (Required for Overarching Criteria scoring criteria for Major Growth, Renovation, Replacement and Research proposals).

☐ Availability of Space/Campus Utilization template for the campus where the project is located. (Required for all categories/subcategories except Infrastructure and Acquisition proposals).

☐ Assignable Square Feet template to indicate program-related space allocation. (Required for Growth, Renovation and Replacement proposals, all categories/subcategories).

Optional appendices

Attach supplemental and supporting project documentation, *limit to materials directly related to and needed for the evaluation criteria*, such as:

☐ Degree and enrollment growth projections

☐ Selected excerpts from institutional plans

☐ Data on instructional and/or research space utilization

☐ Additional documentation for selected cost comparables (acquisition)

☐ Selected materials on facility conditions

☐ Selected materials on code compliance

☐ Tables supporting calculation of program space allocations, weighted average facility age, etc.

☐ Evidence of consistency of proposed research projects with state, regional, or local economic development plans

☐ Evidence of availability of non-state matching funds

☒ Selected documentation of prior facility failures, high-cost maintenance, and/or system unreliability for infrastructure projects

☒ Documentation of professional assessment of costs for land acquisition, land cleanup, and infrastructure projects

☒ Selected documentation of engineering studies, site survey and recommendations, or opinion letters for infrastructure and land cleanup projects

☐ Other: Click or tap here to enter text.

I certify that the above checked items indicate either that the proposed project meets the minimum thresholds, or the corresponding items have been included in this submittal.

Name: Kathleen Kamerrer Title: AVP, Capital Budget & Facilities Business Administration

Signature: Kathleen Kamerrer Date: 8/8/22

INSTITUTION	CAMPUS
Washington State University	Pullman, WA
PROJECT TITLE	
Clean Buildings Performance Standard Energy Efficiency Improvements - CBPS	

SUMMARY NARRATIVE

§ Problem statement (short description of the project – the needs and the benefits)

Washington State University requests $5 million in the 2023-25 capital budget to implement energy efficiency measures in the system's largest complexes requiring compliance in 2026 with Washington's new Clean Buildings Performance Standard (CBPS). WSU has identified 115 buildings/complexes across the system totaling almost 11.3 million gsf which must comply with this standard between 2026 and 2029. Early audits indicate significant renovations will be necessary to achieve energy efficiency and compliance with CBPS.

Buildings are the fastest growing source of greenhouse gas emissions in Washington. Investment in building energy efficiency is the most cost-efficient way to significantly reduce greenhouse gas emissions.

§ History of the project or facility

Washington's new CBPS is designed to secure energy efficiency opportunities. All buildings and/or complexes (multiple buildings connected via conditioned space) that exceed 20,000 gross square feet (gsf) must comply with this standard or face financial penalties. The general path to compliance is as follows:

- Develop and maintain an energy management plan
- Install metering and collect consumption data on all building utilities
- Track Energy Use Intensity (EUI) for each building/complex
- Calculate an Energy Use Intensity Target (EUIt) for each building/complex based on occupancy use
- Identify and implement energy efficiency measures such that EUI is less than EUIt
- Conduct energy auditing for buildings/complexes where EUI is greater than EUIt and implement additional energy efficiency measures
- Satisfy all necessary administrative and reporting requirements

System-wide, WSU, has 115 buildings/complexes totaling almost 11.3 million gsf that must comply with this standard between 2026 and 2029. Based on the results of preliminary energy audits of five representative buildings, WSU estimates a significant energy efficiency effort will be necessary to bring these buildings/complexes into compliance. Therefore, the university's 10-year Facility Development Plan (go.wsu.edu/WSUDevelopmentPlan2022) includes reoccurring funding requests over multiple biennia in order to achieve compliance with this standard.

§ University programs addressed or encompassed by the project

Energy efficiency improvements in all major WSU buildings will benefit all campuses, all colleges and all organizations. On the surface, energy improvements will reduce the university's carbon footprint and lower utility costs. In addition, these improvements will also improve operations, enhance reliability and

reduce deferred maintenance because it will not be possible to achieve the required energy reductions without addressing aging infrastructure, building systems and controls.

GENERAL CATEGORY SCORING CRITERIA

1. Significant health, safety, and code issues

A. Identify whether the project is needed to bring the facility within current life safety (including seismic and ADA), energy, utilities or transportation code requirements.

This funding is needed to identify and execute energy efficiency measures necessary to bring numerous university buildings/complexes into compliance with the state's CBPS.

B. Clearly identify the applicable standard or code, and describe how the project will improve consistency with it. Provide selected supporting documentation in appendix and reference in the body of the proposal.

The applicable standards and codes are as follows:

- Clean Buildings Performance Standard (formally known as House Bill 1257).
- Washington Administrative Code (WAC) 194-50 has amended and adopted a version of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 100 to govern energy efficiency in existing buildings.

2. Evidence of increased repairs and/or service interruption

Identify prior facility repairs, work order repair history or contractor repair call-outs, increased utility and/or maintenance costs, and/or system unreliability. Provide selected supporting documentation in appendix, and reference them in the body of the proposal.

The CBPS focuses on building-level energy efficiency improvements which will directly lower utility costs and improve system reliability. WSU's systemwide deferred maintenance backlog is estimated to exceed $1.6 billion. As a result, the university operates at a high risk of service interruptions, system failures and rising maintenance costs. WSU proposes to dedicate a portion of this funding to address the deferred maintenance in buildings/complexes that would otherwise prohibit the success of each energy efficiency measure necessary for compliance.

Table 1: Summary of repair/renewal work (exceeding $5,000/work order) since 2016 in the largest complexes requiring compliance with the CBPS in 2026. A significant amount of repair and renewal work is required each year to avoid service interruptions in these facilities. Reference Appendix B for a detailed breakdown by complex.

Complex	Year	# of Projects	Total Spent
All Complexes Requiring Compliance by 2026	2016	116	$ 7,126,126
	2017	143	$ 7,655,693
	2018	108	$ 7,068,793
	2019	119	$ 6,554,811
	2020	90	$ 4,942,609
	2021	89	$ 2,323,841
		665	**$ 35,671,872**

Table 1 - Summary of Work History

3. Impact on institutional operations without the infrastructure project

Describe how and the extent to which there would be an impact on existing operations and programs. Describe the potential impact on future, already funded or planned construction projects or program needs should this infrastructure project not occur.

Not taking action would have a serious impact on existing operations and programs, funded future construction projects, and planned construction projects. The financial penalty for non-compliance with the CBPS is an annual fine as high as $1/gsf, which for WSU could reach as high as $11.3 million per year. For WSU, a financial penalty of this magnitude would negatively impact other projects in the 10-year capital plan, impede ongoing preservation and deferred maintenance reduction initiatives, and frustrate CBPS compliance. Reducing energy use and greenhouse gas emissions is necessary for the long-term success of WSU, the state, and the nation.

4. Reasonable estimate

Provide as much detailed cost estimate information as possible, including documentation of professional assessment of costs (may contain opinions of external experts or experienced project management staff from the institution).

A detailed project cost estimate has been prepared based on results of energy audits developed by applicable specialty professionals (Appendix C).

In 2021, WSU hired an energy engineering consultant to conduct ASHRAE level 2 energy audits on five Pullman campus buildings. The goal of this study was to evaluate the potential impact (cost and schedule) of the CBPS on WSU buildings of different occupancy type (office, classroom and lab). The results of this study identified energy efficiency measures in these five building/complexes totaling approximately $9.5 million and predicted energy savings of approximately $790,000 per year. Extrapolating this data across the entire WSU system results in a projected cost of approximately $100 million along with noteworthy energy savings and greenhouse gas reductions. Understanding that the state's capital budget capacity is limited, WSU requests $5 million in 2023-25 to start this effort and reoccurring requests in future biennia to continue towards compliance.

Reference the C100 (Appendix A) for a detailed project cost estimate.

5. Engineering study

Identify whether there is a completed comprehensive engineering study, site survey and recommendations or opinion letter. Provide referenced supporting documentation in appendix.

During the comprehensive engineering study (Appendix C) referenced in question 4 above, the energy consultant identified a wide variety of energy efficiency measures in these five building/complexes including, but not limited to:

- Retro-commissioning and controls modernization
- HVAC improvements (transition from constant volume to variable volume systems)
- LED lighting upgrades
- Filter, coil, and trap renewal
- Envelope enhancements

6. Support by planning

Describe the proposed project's relationship and relative importance to the institution's:

A. Campus/facilities master plan
B. Ongoing academic and/or research program need and strategic plan

This funding request and resulting energy efficiency work is integral to the university's 10-year Facility Development Plan, strategic plan, and ongoing program needs.

On May 7, 2019, the CBPS was signed into law. While this legislation aligned with the university's inclusion of energy improvements and greenhouse gas reductions in strategic planning and project execution for new construction and renovations, it requires a more focused and proactive approach to addressing energy efficiency concerns in existing facilities.

In addition, the 10-year capital plan reflects the university's continued commitment to reinvestment in existing facilities and infrastructure while also advancing programmatic priorities. It is focused on identifying and prioritizing capital projects that balance stewardship and renewal within a framework for responsible growth, as informed by WSU's Facility Development Plan. This plan also begins the process of identifying important legacy facilities in the core of WSU's oldest campus, and prioritizing space optimization and renovation in that area.

Identifying and implementing energy efficiency measures in buildings across the system must be coordinated with existing deferred maintenance and operational issues within those same buildings. Potential fines associated with the CBPS could negatively impact the university's academic and research mission.

7. Resource efficiency and sustainability

Document project benefits associated with low-impact stormwater management techniques, improvements in energy and resource conservation, and use of renewable energy sources.

100% of this standalone infrastructure request will contribute to improvements in energy efficiency and resource conservation, reduction in greenhouse gas emissions, and exploration into the use of alternative energy sources.

APPENDICES

- Appendix A – C100
- Appendix B – Work History Summary
- Appendix C – ASHRAE Level 2 Energy Audit / Cost Estimate Prepared by: Glumac

STATE OF WASHINGTON
AGENCY / INSTITUTION PROJECT COST SUMMARY

Updated June 2022

Agency	Washington State University
Project Name	Clean Buildings Performance Standard (CBPS)
OFM Project Number	40000346

Contact Information	
Name	Phil Johnson
Phone Number	509-335-9029
Email	philrjohnson@wsu.edu

Statistics			
Gross Square Feet	N/A	MACC per Gross Square Foot	
Usable Square Feet	N/A	Escalated MACC per Gross Square Foot	
Alt Gross Unit of Measure			
Space Efficiency		A/E Fee Class	A
Construction Type	Research Facilities	A/E Fee Percentage	13.97%
Remodel	Yes	Projected Life of Asset (Years)	Varies
Additional Project Details			
Procurement Approach	DB-Progressive	Art Requirement Applies	Yes
Inflation Rate	4.90%	Higher Ed Institution	Yes
Sales Tax Rate %	7.90%	Location Used for Tax Rate	3,812
Contingency Rate	10%		
Base Month (Estimate Date)	June-22	OFM UFI# (from FPMT, if available)	Multiple Facilities
Project Administered By	Agency		

Schedule			
Predesign Start		Predesign End	
Design Start	August-23	Design End	December-23
Construction Start	February-24	Construction End	December-24
Construction Duration	11 Months		

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Project Cost Estimate

Total Project	**$4,563,135**	Total Project Escalated	**$5,000,327**
		Rounded Escalated Total	**$5,000,000**

Cost Estimate Summary

Acquisition

Acquisition Subtotal	**$0**	**Acquisition Subtotal Escalated**	**$0**

Consultant Services			
Predesign Services	$0		
Design Phase Services	$227,969		
Extra Services	$550,000		
Other Services	$167,421		
Design Services Contingency	$94,539		
Consultant Services Subtotal	**$1,039,930**	**Consultant Services Subtotal Escalated**	**$1,116,937**

Construction			
Maximum Allowable Construction Cost (MACC)	$2,150,000	Maximum Allowable Construction Cost (MACC) Escalated	$2,372,095
DB-Progressive Risk Contingencies	$100,000		$110,330
DB-Progressive Management	$350,000		$386,155
Owner Construction Contingency	$215,000		$237,210
Non-Taxable Items	$0		$0
Sales Tax	$222,385	Sales Tax Escalated	$245,357
Construction Subtotal	**$3,037,385**	**Construction Subtotal Escalated**	**$3,351,147**

Equipment			
Equipment	$50,000		
Sales Tax	$3,950		
Non-Taxable Items	$0		
Equipment Subtotal	**$53,950**	**Equipment Subtotal Escalated**	**$59,524**

Artwork			
Artwork Subtotal	**$24,877**	**Artwork Subtotal Escalated**	**$24,877**

Agency Project Administration			
Agency Project Administration Subtotal	$275,358		
DES Additional Services Subtotal	$0		
Other Project Admin Costs	$81,635		
Project Administration Subtotal	**$356,993**	**Project Administration Subtotal Escalated**	**$393,871**

Other Costs			
Other Costs Subtotal	**$50,000**	**Other Costs Subtotal Escalated**	**$53,970**

Project Cost Estimate			
Total Project	**$4,563,135**	Total Project Escalated	**$5,000,327**
		Rounded Escalated Total	**$5,000,000**

Funding Summary

	Project Cost (Escalated)	Funded in Prior Biennia	New Approp Request 2023-2025	2025-2027	Out Years
Acquisition					
Acquisition Subtotal	$0	$0	$0	$0	**$0**
Consultant Services					
Consultant Services Subtotal	$1,116,937	$0	$1,116,937	$0	**$0**
Construction					
Construction Subtotal	$3,351,147	$0	$3,351,147	$0	**$0**
Equipment					
Equipment Subtotal	$59,524	$0	$59,524	$0	**$0**
Artwork					
Artwork Subtotal	$24,877	$0	$24,877	$0	**$0**
Agency Project Administration					
Project Administration Subtotal	$393,871	$0	$393,871	$0	**$0**
Other Costs					
Other Costs Subtotal	$53,970	$0	$53,970	$0	**$0**
Project Cost Estimate					
Total Project	**$5,000,327**	**$0**	**$5,000,326**	**$0**	**$1**
	$5,000,000	**$0**	**$5,000,000**	**$0**	**$0**
	Percentage requested as a new appropriation		**100%**		

What is planned for the requested new appropriation? (*Ex. Acquisition and design, phase 1 construction, etc.*)
A standalone infrastructure project to identify, execute and verify energy efficiency measures in some of the largest complexes in the WSU system.
The 23-25 request includes design and construction.
Insert Row Here

What has been completed or is underway with a previous appropriation?
Utility metering has been installed/renewed and energy audits have been conducted in the past to prepare for compliance with the Clean Building Performance
Standard.
Insert Row Here

What is planned with a future appropriation?
Similar standalone infrastructure projects are included in the university's 10-year plan to continue along the road to compliance with the Clean Building
Performance Standard.
Insert Row Here

Cost Estimate Details

Acquisition Costs					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
Purchase/Lease					
Appraisal and Closing					
Right of Way					
Demolition					
Pre-Site Development					
Other					
Insert Row Here					
ACQUISITION TOTAL	**$0**		**NA**	**$0**	

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Cost Estimate Details

Consultant Services				
Item	**Base Amount**	**Escalation Factor**	**Escalated Cost**	**Notes**
1) Pre-Schematic Design Services				
Programming/Site Analysis				
Environmental Analysis				
Predesign Study				
Other				
Insert Row Here				
Sub TOTAL	**$0**	**1.0537**	**$0**	Escalated to Design Start
2) Construction Documents				
A/E Basic Design Services	$227,969			69% of A/E Basic Services
Other				
Insert Row Here				
Sub TOTAL	**$227,969**	**1.0642**	**$242,606**	Escalated to Mid-Design
3) Extra Services				
Civil Design (Above Basic Svcs)				
Geotechnical Investigation				
Commissioning	$250,000			including retro-commissioning
Site Survey				
Testing	$50,000			
LEED Services				
Voice/Data Consultant				
Value Engineering				
Constructability Review				
Environmental Mitigation (EIS)				
Landscape Consultant				
Other	$250,000			ASHRAE Level 2 Energy Auditing
Insert Row Here				
Sub TOTAL	**$550,000**	**1.0642**	**$585,310**	Escalated to Mid-Design
4) Other Services				
Bid/Construction/Closeout	$102,421			31% of A/E Basic Services
HVAC Balancing	$65,000			
Staffing				
Other				
Insert Row Here				
Sub TOTAL	**$167,421**	**1.1033**	**$184,716**	Escalated to Mid-Const.
5) Design Services Contingency				
Design Services Contingency	$94,539			
Other				
Insert Row Here				

Sub TOTAL	**$94,539**	**1.1033**	**$104,305**	Escalated to Mid-Const.
CONSULTANT SERVICES TOTAL	**$1,039,930**		**$1,116,937**	

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Cost Estimate Details

Construction Contracts				
Item	**Base Amount**	**Escalation Factor**	**Escalated Cost**	**Notes**
1) Site Work				
G10 - Site Preparation				
G20 - Site Improvements				
G30 - Site Mechanical Utilities				
G40 - Site Electrical Utilities				
G60 - Other Site Construction				
Other				
Insert Row Here				
Sub TOTAL	**$0**	**1.0794**	**$0**	
2) Related Project Costs				
Offsite Improvements				
City Utilities Relocation				
Parking Mitigation				
Stormwater Retention/Detention				
Other				
Insert Row Here				
Sub TOTAL	**$0**	**1.0794**	**$0**	
3) Facility Construction				
A10 - Foundations				
A20 - Basement Construction				
B10 - Superstructure				
B20 - Exterior Closure				
B30 - Roofing				
C10 - Interior Construction				
C20 - Stairs				
C30 - Interior Finishes				
D10 - Conveying				
D20 - Plumbing Systems				
D30 - HVAC Systems	$1,300,000			
D40 - Fire Protection Systems				
D50 - Electrical Systems	$300,000			
F10 - Special Construction				
F20 - Selective Demolition				
General Conditions	$50,000			
Other Direct Cost	$500,000			Controls Optimization
Insert Row Here				
Sub TOTAL	**$2,150,000**	**1.1033**	**$2,372,095**	
4) Maximum Allowable Construction Cost				
MACC Sub TOTAL	**$2,150,000**		**$2,372,095**	
	NA		*NA per GSF*	

5) GCCM Risk Contingency				
GCCM Risk Contingency	$100,000			
Other				
Insert Row Here				
Sub TOTAL	**$100,000**	**1.1033**	**$110,330**	
6) GCCM or Design Build Costs				
GCCM Fee	$100,000			
Bid General Conditions	$150,000			
GCCM Preconstruction Services	$50,000			
Bonds/Insurance	$50,000			
Insert Row Here				
Sub TOTAL	**$350,000**	**1.1033**	**$386,155**	
7) Owner Construction Contingency				
Allowance for Change Orders	$215,000			
Other				
Insert Row Here				
Sub TOTAL	**$215,000**	**1.1033**	**$237,210**	
8) Non-Taxable Items				
Other				
Insert Row Here				
Sub TOTAL	**$0**	**1.1033**	**$0**	
9) Sales Tax				
Sub TOTAL	**$222,385**		**$245,357**	
CONSTRUCTION CONTRACTS TOTAL	**$3,037,385**		**$3,351,147**	

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Cost Estimate Details

Equipment					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
1) Equipment					
E10 - Equipment	$50,000				
E20 - Furnishings					
F10 - Special Construction					
Other					
Insert Row Here					
Sub TOTAL	**$50,000**		**1.1033**	**$55,165**	
2) Non Taxable Items					
Other					
Insert Row Here					
Sub TOTAL	**$0**		**1.1033**	**$0**	
3) Sales Tax					
Sub TOTAL	**$3,950**			**$4,359**	
EQUIPMENT TOTAL	**$53,950**			**$59,524**	

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Cost Estimate Details

Artwork					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
1) Artwork					
Project Artwork	$0				0.5% of total project cost for new construction
Higher Ed Artwork	$24,877				0.5% of total project cost for new and renewal construction
Other					
Insert Row Here					
ARTWORK TOTAL	**$24,877**		**NA**	**$24,877**	

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Cost Estimate Details

Project Management					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
1) Agency Project Management					
Agency Project Management	$275,358				
Additional Services					
Other	$81,635				On-Site Construction Management (2.9%)
Insert Row Here					
Subtotal of Other	*$81,635*				
PROJECT MANAGEMENT TOTAL	**$356,993**		**1.1033**	**$393,871**	

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Cost Estimate Details

Other Costs					
Item	**Base Amount**		**Escalation Factor**	**Escalated Cost**	**Notes**
Mitigation Costs					
Hazardous Material Remediation/Removal					
Historic and Archeological Mitigation					
Other	$50,000				WSU Shops Support
Insert Row Here					
OTHER COSTS TOTAL	**$50,000**		**1.0794**	**$53,970**	

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C-100(2022)
Additional Notes

Tab A. Acquisition
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Tab B. Consultant Services
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Tab C. Construction Contracts
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Tab D. Equipment
Insert Row Here

Tab E. Artwork
Insert Row Here

Tab F. Project Management
Insert Row Here

Tab G. Other Costs
Insert Row Here

Clean Buildings Performance Standard (CBPS)

Complex Summary Requiring Compliance in 2026				
WSU Campus	**WSU Complex ID**	**WSU Facility Name**	**Compliance Area (GSF)**	**Compliance Year**
Pullman	C-0011	PEB+Smith+Bohler+Bohler Addition	395,895	2026
Pullman	C-0082A	Owen+Abelson+Heald+Eastlick	434,506	2026
Pullman	C-0807	VTH+ADBF+Bustad+McCoy	482,138	2026
Pullman	C-0055	Todd+Todd Addition+Johnson Tower	272,169	2026
Pullman	C-0063	CUB+Terrell+Holland	663,829	2026
Pullman	C-0093E	Stephenson South+Dining Hall+East+North	268,963	2026
Pullman	C-0058	ETRL+EEME+Sloan+Dana	414,449	2026
Pullman	C-0003A	Fulmer Lab+Annex+Synthesis+Vibration Free	224,263	2026
Pullman	C-0836	VBR+BLS+REC5	347,592	2026
		Subtotal =	**3,503,804**	**9**

Project/Repair/Service Interuption Summary			
Complex	**Year**	**# of Projects**	**Total Spent**
All Complexes Requiring Compliance by 2026	2016	116	$ 7,126,126
	2017	143	$ 7,655,693
	2018	108	$ 7,068,793
	2019	119	$ 6,554,811
	2020	90	$ 4,942,609
	2021	89	$ 2,323,841
		665	**$ 35,671,872**

Clean Buildings Performance Standard (CBPS)
Complex Project/Repair/Service Interuption History

Complex	Year	# of Projects	Total Spent
Bohler - Bohler Addition - Smith Gym - PEB	2016	24	$ 890,823
	2017	26	$ 2,263,938
	2018	19	$ 1,554,301
	2019	22	$ 1,131,275
	2020	14	$ 1,039,458
	2021	10	$ 271,387
		115	**$ 7,151,183**

Complex	Year	# of Projects	Total Spent
Owen - Abelson - Eastlick - Heald	2016	16	$ 636,909
	2017	18	$ 667,673
	2018	14	$ 1,588,425
	2019	9	$ 380,951
	2020	10	$ 885,287
	2021	11	$ 622,897
		78	**$ 4,782,143**

Complex	Year	# of Projects	Total Spent
Todd - Todd Addition - Johnson Tower	2016	12	$ 695,610
	2017	19	$ 1,237,587
	2018	10	$ 1,454,171
	2019	13	$ 670,834
	2020	10	$ 572,456
	2021	8	$ 141,388
		72	**$ 4,772,046**

Complex	Year	# of Projects	Total Spent
Terrell - Holland	2016	12	$ 605,133
	2017	14	$ 625,386
	2018	8	$ 452,440
	2019	15	$ 472,269
	2020	5	$ 364,711
	2021	8	$ 72,461
		62	**$ 2,592,399**

Complex	Year	# of Projects	Total Spent
Fulmer - Fulmer Syn - Fulmer Annex - Fulmer VIF	2016	6	$ 256,240
	2017	8	$ 256,596
	2018	11	$ 346,827
	2019	8	$ 367,484
	2020	9	$ 314,679
	2021	4	$ 26,946
		46	**$ 1,568,772**

Complex	Year	# of Projects	Total Spent
VBR - Biotech - Plant Sciences	2016	4	$ 204,154
	2017	11	$ 396,850
	2018	6	$ 231,833
	2019	9	$ 500,097
	2020	14	$ 495,192
	2021	15	$ 167,523
		59	**$ 1,995,649**

Complex	Year	# of Projects	Total Spent
VTH - ADBF - Bustad - McCoy	2016	25	$ 3,049,119
	2017	24	$ 1,193,712
	2018	19	$ 803,259
	2019	27	$ 1,159,801
	2020	17	$ 558,759
	2021	18	$ 546,232
		130	**$ 7,310,881**

Complex	Year	# of Projects	Total Spent
ETRL - EEME - Sloan - Dana	2016	17	$ 788,139
	2017	23	$ 1,013,950
	2018	21	$ 637,537
	2019	16	$ 1,872,099
	2020	11	$ 712,067
	2021	15	$ 475,008
		103	**$ 5,498,799**

Existing Energy Use | Campus Map | Energy Efficiency Measures

Link to Energy Audit Data Analytics:https://app.powerbi.com/view?r=eyJrIjoiZWMzZmY5MzAtNWYwZi00MTVlLTk5ZDctMTFjNWNjMmRhYjE1IiwidCI6ImE0MGZlNGJhLWFiYzctNDhmZS04NzkyLWI0Mzg4OTkzNjQwMCIsImMiOjZ9&pageName=ReportSection1ba6ba02798e800972e0

WA Clean Buildings (HB 1257) Energy Study

Washington State University Pullman

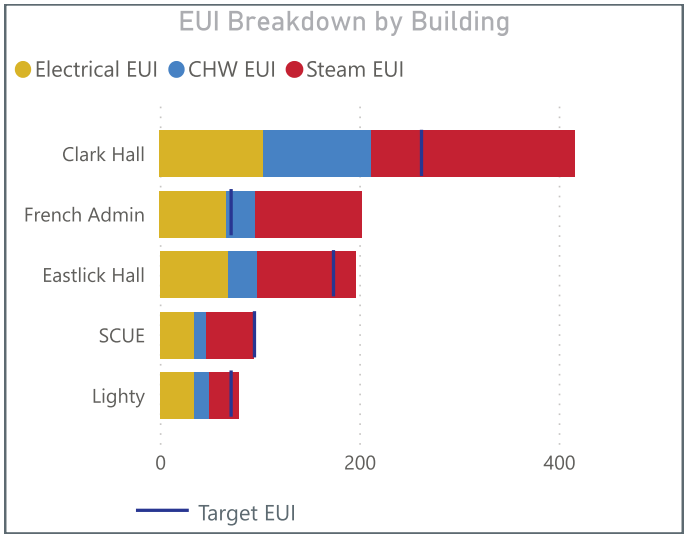
Building Existing Energy Usage

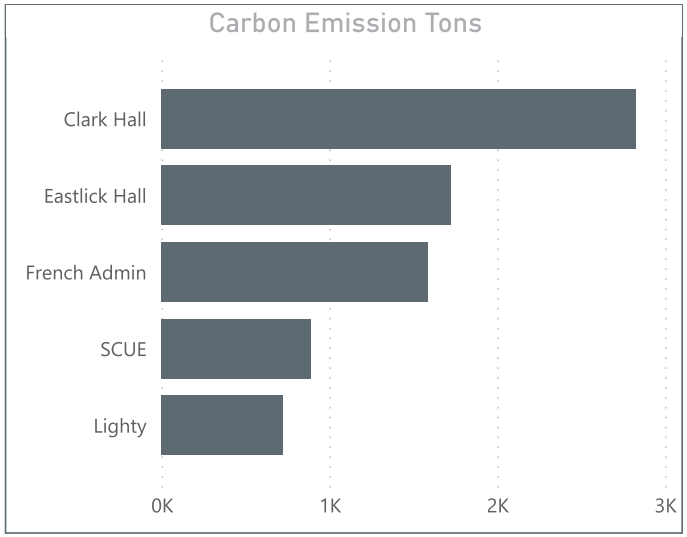
Home | EEMs | Map

Building	CHW EUI	Steam EUI	Electrical EUI	Total EUI
Clark Hall	108.9	204.1	103.4	416.4
Eastlick Hall	29.2	98.5	68.6	196.2
French Admin	28.9	107.2	66.4	202.6
Lighty	15.5	29.1	34.6	79.3
SCUE	12.2	47.3	34.8	94.3

Select an individual building or Ctrl+select multiple buildings to look at only certain buildings.

None of the buildings in this study have CHW meters. All CHW energy numbers are from energy modeling. In order to show compliance with the EUI target, CHW meters are required for each building.





Audit Results Summary									
Building	Target EUI	Current EUI	Type	Audit $/SF	EEM $/SF	Annual Energy $/SF	SF	EEM Total $	~Annual Energy Savings
SCUE	94	121	Classroom + Office	$ 0.18	$ 1.20	$ 0.38	102,050	$ 122,653	$ 38,970.00
Clark	249	416	Research Lab	$ 0.26	$ 45.19	$ 3.95	104,207	$ 4,709,400	$ 412,000.00
French	68	203	Office	$ 0.17	$ 20.54	$ 1.37	110,000	$ 2,259,230	$ 150,434.46
Lighty	68	107	Office	$ 0.18	$ 1.30	$ 0.28	94,924	$ 123,225	$ 26,153.36
Eastlick	183	196	Teaching Lab + Research Lab + Animal	$ 0.27	$ 18.94	$ 1.32	123,241	$ 2,334,705	$ 162,154.60
							534,422	$ 9,549,213	$ 789,712

Extrapolated System-Wide Estimates							
Space Data		Audit		EEM		Annual Energy Savings	
General Use	Total ASF	~$/SF	~$	~$/SF	~$	~$/SF	~$
Animal	213,891	$ 0.27	$ 57,751	$ 10.00	$ 2,138,910	$ 1.00	$ 213,891
Circulation	2,049,230	$ 0.18	$ 368,861	$ 2.00	$ 4,098,460	$ 0.30	$ 614,769
Classroom	1,285,122	$ 0.18	$ 231,322	$ 2.00	$ 2,570,244	$ 0.30	$ 385,537
Clinic	938,921	$ 0.27	$ 253,509	$ 5.00	$ 4,694,605	$ 1.00	$ 938,921
Food	160,276	$ 0.18	$ 28,850	$ 5.00	$ 801,380	$ 0.30	$ 48,083
Greenhouse	352,423	$ 0.18	$ 63,436	$ 5.00	$ 1,762,115	$ 1.00	$ 352,423
Library	435,840	$ 0.18	$ 78,451	$ 2.00	$ 871,680	$ 1.00	$ 435,840
Mechanical	990,569	$ 0.18	$ 178,302	$ 5.00	$ 4,952,845	$ 1.00	$ 990,569
Office	1,892,444	$ 0.18	$ 340,640	$ 5.00	$ 9,462,220	$ 1.00	$ 1,892,444
Other	285,234	$ 0.18	$ 51,342	$ 5.00	$ 1,426,170	$ 0.30	$ 85,570
Research Lab	1,458,526	$ 0.27	$ 393,802	$ 40.00	$ 58,341,040	$ 3.00	$ 4,375,578
Residential	835,252	$ 0.18	$ 150,345	$ 2.00	$ 1,670,504	$ 0.30	$ 250,576
Restroom	179,345	$ 0.18	$ 32,282	$ 2.00	$ 358,690	$ 0.30	$ 53,804
Support	448,196	$ 0.18	$ 80,675	$ 2.00	$ 896,392	$ 0.30	$ 134,459
Teaching Lab	296,229	$ 0.27	$ 79,982	$ 10.00	$ 2,962,290	$ 1.00	$ 296,229
	11,821,498	$	2,389,551	$	97,007,545	$	11,068,692

Estimated system-wide cost to implement energy efficiency measures. Extrapolated from the results of (5) ASHRAE level 2 energy audits.

Smith Center for Undergraduate Eduction (SCUE)

Target EUI =	**94**	Target EUI prorated - See calculation below. This approach was approved by WA Commerce.
Current EUI =	**121**	(Including chilled water energy use from energy modeling)
Current EUI w/o Snow Melt[1] =	**94**	Snow melt EUI is estimated based on controls and metered energy data.
Annual Utility Cost =	**$ 336,154**	
Utility Cost $/sf =	**$ 3.29**	
Annual Carbon Emissions (Tons) =	**689**	
EEM $ =	**$ 122,653**	
Area SF =	**102,050**	
EEM $/SF =	**$ 1.20**	
Potential Rebates =	**$ 26,930**	
Potential Rebates/SF =	**$ 0.26**	
Audit $ =	**$ 18,369**	
Audit $/SF =	**$ 0.180**	

			Meets Payback Criteria?	EUI			Cost Savings		Carbon			First Cost[2]		Cost per EUI Reduction	Simple Payback	Measure Lifespan	Potential Incentives	Payback w/Incentives
				New	Reduction	% Savings	Reduction	% Savings	Reduction (Tons)	% Savings	Annual Cars Off the Road	$	$/sf					
EEMs	EEM 1	VFDs on Garage Exhaust Fans	Yes	88	6	5%	$ 15,000	4.5%	48	7%	242	$ 86,935	$ 0.85	$ 2,387	5.8	20	$ 19,080	4.5
	EEM 2	Temperature Setbacks	Yes	92	2	2%	$ 2,120	0.6%	17	2%	86	$ -	$ -	$ 953	0.0	10	$ -	0.0
	EEM 3	EEM 2+ Economizer High Limit	Yes	92	3	2%	$ 2,470	0.7%	18	3%	89	$ -	$ -	$ 950	0.0	10	$ -	0.0
	EEM 4	EEM 3 + SAT reset	Yes	85	9	8%	$ 8,290	2.5%	62	9%	316	$ -	$ -	$ 874	0.0	10	$ -	0.0
	EEM 6	Retro-commissioning[3]	Yes	83	11	9%	$ 11,090	3.3%	74	11%	374	$ 35,718	$ 0.35	$ 1,003	3.2	10	$ 7,850	2.5
	Does Not Meet Payback Criteria - Not Required for Compliance with Annex X																	
	EEM 5	VFDs on pumps	No	94	0	0%	$ 200	0.1%	1	0%	4	$ 117,163	$ 1.15	$ 2,157	585.8	20	$ 7,850	546.6
Bundles	Bundled Measures																	
	Bundles	EEM 1 and EEM 4	Yes	79	16	13%	$ 23,290	6.9%	110	16%	559	$ 86,935	$ 0.85	$ 1,477	3.7	22	$ 7,850	3.4

1. Commerce will allow energy use from the snow melt system to be deducted if it is properly submetered. Since the snow melt system has a large EUI for SCUE, we recommend submetering this system.
2. First cost includes:
   12% for General Conditions
   10% for Overhead/Profit
   10% for Contingency
3. This assumes the entire building undergoes retro-commissioning. Costs for EEM 2, 3, and 4 are included in this measure.

SCUE summary:	In general, SCUE operates relatively well and should be able to meet the EUI target with comparatively low first cost. We successfully made the case to Commerce that the snow melt energy should be excluded from the EUI calculation, as long as that system is properly submetered. Commerce will be providing formal guidance on this issue later in 2021.

Building	EEM #	Measure	Current Conditions	Proposed Changes
SCUE	EEM 1	VFDs on Garage Exhaust Fans	Currently the two garage exhaust fans are controlled by CO sensors and run at constant speed when required.	Add VFDs to the garage exhaust fans as well as the necessary controls to allow the fans to run at reduced speed when the CO sensor reading is low.
	EEM 2	Temperature Setbacks	During unoccupied hours at night the building is heated to 65F and cooled to 78F.	Turndown the heating setback to 63F and turn up the cooling setback to 81F
	EEM 3	EEM 2 + Adjust Economizer High Limit	In addition to the conditions listed in the measure above, the AHUs have upper economization limits of 65F, fully opening the OA damper when the outdoor drybulb air temperature is below 65F and building spaces are in cooling mode.	Everything in the measure above and increase the economizer high limit to 70F which will reduce the need for cooling from the chilled water system.
	EEM 4	EEM 3 + SAT Reset	In addition to the conditions listed in the measure above the supply air temperature currently resets up to 60F when there is minimal need for cooling.	Everything in the measure above and the supply airflow is allowed to reset up to 65F when there is minimal call for cooling. This will reduce the energy required to reheat the air when some spaces are calling for cooling while other spaces are calling for heating.
	EEM 5	VFDs on Pumps	The primary chilled water pumps that serve the building and the secondary pumps which serve the AHUs are constant speed. The hot water pumps which serve the AHUs are also constant speed.	Replace the secondary hot water and chilled water pumps with variable speed pumps. Include controls to allow the pumps to reduce the flowrate down to what is needed by the AHUs. This measure does not affect the primary chilled water pumps which serve the building.
	EEM 6	EEM 4 + General Retro-Commissioning		Implement EEM 4 controls measures as part of a general Retro-commissioning effort.

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

OVERVIEW

BUILDING INFORMATION

SCUE
300 Troy Ln
Pullman, WA 99164

Report Type	**WA Commerce Grants Report**	Report Status:	**In Progress**
		Report Date:	**05/27/2021**
Gross Floor Area:	**102,050.0 ft²**	Year Built:	**2003**
Building ID #:	**12403**	Software Release:	2021.1.0.1459
Project Name	**WSU Audits**		

AUDIT TEAM

Glumac
900 SW 5th Ave #1600
Portland, OR 97204
(503) 345-6337

DATA SUMMARY

This report was generated from data entered into the Building Energy Asset Score (Asset Score) tool, developed by the Pacific Northwest National Laboratory (PNNL) for the U.S. Department of Energy (DOE). Asset Score is a national standardized tool for assessing the physical and structural energy efficiency of commercial and multifamily residential buildings. It also facilitates building energy audit data collection and reporting.

This report follows the ASHRAE/ACCA Standard 211P, Standard for Commercial Building Energy Audits. It also includes additional data fields required by specific cities, where applicable. The icons below identify data categories.

- ASHRAE Level 2 inputs
- City specific inputs

If this report is used to comply with a local energy audit ordinance, the fields marked with * indicate the minimum data to be reported. The audit team listed above is responsible for any information entered and reported through Asset Score. DOE and PNNL do not warranty data accuracy, completeness, legality, and reliability.

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

CONTACT INFORMATION AND AUDIT DETAILS

Building Name: **SCUE**

Submission Information

Date of Submission	Never
Submission Version	None

Audit Details

Date of Completion for Level 1 Audit		☑ N/A
Date of Completion for Level 2 Audit	05/01/2021	
Date of Completion for Level 3 Audit		☑ N/A
Year of Last Renovation		☑ N/A
Year of Prior Energy Audit		☑ N/A
Year Last Commissioned		☑ N/A
Additional Comments		

Audit Team and Building Staff

Auditor

Name*	Mike Prier
Company Name or Organization*	Glumac
Street Address	900 SW 5th Ave #1600
City	Portland
State	OR
Postal Code	97204
Phone*	(503) 345-6337
Email*	mprier@glumac.com

Building Owner

Name*	Phil Johnson
Company Name or Organization*	WSU
Street Address	
City	
State	
Postal Code	
Phone*	(509) 335-9029
Email*	philrjohnson@wsu.edu

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **SCUE**

Building Characteristics

Gross Floor Area*	102050.0
Spaces Excluded from Gross Floor Area	
Conditioned Floor Area, Heated Only	0.0
Conditioned Floor Area, Cooled Only	0.0
Conditioned Floor Area, Heated and Cooled	102050.0
Total Conditioned Floor Area	102050.0
Number of Floors Above-Grade, Conditioned	4
Number of Floors Below-Grade, Conditioned	0
General Building Shape	Rectangular
Building Automation System?	Yes
Historic Building?*	No

Use Types

Office

Use Type / Space Function / Building Area Type*	Office	
Original Intended Use		
Gross Floor Area*	25513.0	
Percentage of Space Conditioned	100.0	
Number of Occupants*	250	
Use (hours/week)*	50.0	
Use (weeks/year)*	52.0	
Approximate Plug Loads	1.2	
Number of Dwelling Units		☑ N/A
Percentage of Dwelling Units Currently Occupied		☑ N/A
Principal HVAC Type	VAV with Hot Water Reheat	
Principal Lighting Type	Fluorescent T8	

College/University

Use Type / Space Function / Building Area Type*	College/University
Original Intended Use	
Gross Floor Area*	76538.0
Percentage of Space Conditioned	100.0
Number of Occupants*	750

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **SCUE**

Use (hours/week)*	60.0
Use (weeks/year)*	52.0
Approximate Plug Loads	1.0
Number of Dwelling Units	☑ N/A
Percentage of Dwelling Units Currently Occupied	☑ N/A
Principal HVAC Type	VAV with Hot Water Reheat
Principal Lighting Type	Fluorescent T8

Roofs

Built-Up with Concrete Deck

Roof Construction	Built-Up with Concrete Deck
Roof R Value	30.0
Roof Condition	Good
Cool Roof	No
Green Roof	No
Blue Roof	No
Roof Area	20400.0

Walls

Brick/Stone on Steel Frame

Wall Construction	Brick/Stone on Steel Frame
Above Grade Wall Insulation R Value	9.0
Below Grade Wall Insulation R Value	☑ N/A
Total Exposed Above Grade Wall Area	39704.0
Below Grade Wall Area	0.0
Above Grade Demising Wall Area	0.0
Overall Enclosure Tightness Assessment	3 (standard = normal rate of infiltration/exfiltration)
Type of Exterior Door Construction	Insulated metal

Windows

Metal, Double Pane

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **SCUE**

Framing Material	Metal
Window Glass Type	Double Pane
Fenestration Seal Condition	3 (standard = normal rate of infiltration/exfiltration)
Window Wall Ratio	0.33000001311302185

Foundation Types

Slab-On-Grade

Floor Construction Type	Slab-On-Grade
Ventilated Crawlspace	No
R Value	0.0

Exterior Floors

None given

Lighting

	Controls						
Fixture (^^^); *	**Manual**	**Photocell**	**Timer**	**Occupancy Sensor**	**Building Automation System**	**Advanced**	**Other**
Fixture 1: Fluorescent T8; ^^^3	Yes	No	No	No	No	No	No
Fixture 2: LED; ^^^3	Yes	No	No	No	No	No	No
Fixture 3: LED; ^^^3	Yes	No	No	No	No	No	No

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **SCUE**

Fixture Locations

Fixture (^^^); *	Location	Quantity Definition	Area Served (%)	Area Served (ft²)
Fixture 1: Fluorescent T8; ^^^3	Office	% Area Served	75.0	0.0
Fixture 2: LED; ^^^3	Office	% Area Served	25.0	0.0
Fixture 3: LED; ^^^3	College/University	% Area Served	100.0	0.0

*** Fixture Key**

^^^ *Ballast Type:*
1. Premium Electronic
2. Standard Electronic
3. Magnetic
4. N/A

Heating Plants

Utility District Steam, Utility District Steam

Heating Plant Type	Utility District Steam
Fuel Type	Utility District Steam
Controls	
Building Automation System (BAS)	Yes
Direct Digital (DDC)	Yes
Pneumatic	No

Cooling Plants

District Chilled Water, Chilled Water

Cooling Plant Type	District Chilled Water
Fuel Type	Chilled Water
Controls	
Building Automation System (BAS)	Yes
Direct Digital (DDC)	Yes
Pneumatic	No

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **SCUE**

Condenser Plants

None given

HVAC Systems

HVAC System 20524

Heating	
Heating Source	Plant
Heating Plant	Utility District Steam, Utility District Steam
Cooling	
Cooling Source	Plant
Cooling Plant	District Chilled Water, Chilled Water
Distribution Equipment	
Delivery Equipment Type	Central Fan
Other Delivery Equipment Type	
Central Distribution Type	Forced Air
Other Central Distribution Type	
Fan Control	Variable Volume
Energy Recovery Ventilation	None
Outdoor Air Control	Temperature Economizer
Zone Controls	
Direct Digital Controls (DDC)	Yes
Pneumatic Control	No
Manual Thermostat	No
Programmable Thermostat	No
None	No

HVAC System 20525

Heating	
Heating Source	Plant
Heating Plant	Utility District Steam, Utility District Steam
Cooling	
Cooling Source	Plant
Cooling Plant	District Chilled Water, Chilled Water
Distribution Equipment	
Delivery Equipment Type	Central Fan
Other Delivery Equipment Type	
Central Distribution Type	Forced Air

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **SCUE**

Other Central Distribution Type	
Fan Control	Variable Volume
Energy Recovery Ventilation	None
Outdoor Air Control	Temperature Economizer
Zone Controls	
Direct Digital Controls (DDC)	Yes
Pneumatic Control	No
Manual Thermostat	No
Programmable Thermostat	No
None	No

Service Hot Water Systems

Plant

System Type	Plant

Process Loads: Renewables

Solar Thermal System	No
Solar PV System	No
Wind System	No
None	No
Peak Generating Capacity	

Process Loads: Backup Generation

System Type	

Process Loads: Data Centers

Total Area	
Metered Space	No
Connected Load	

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **SCUE**

- UPS Capacity
- PUE

Process Loads: Commercial Kitchens

- Connected Load
- Total Area of Commercial Kitchen

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

UTILITY DATA AND BENCHMARKING

Building Name: **SCUE**

Metered Energy Supply Source Details

None given

Energy Reporting Years

Start Date	End Date	Metering entries	Delivery entries
07/01/2018	06/30/2019	2	0
07/01/2019	06/30/2020	0	0

Metered Energy

Energy Type: Electricity

Start Date	End Date	Days	Use (kWh)	Cost ($)	Peak (kW)	Load Factor	kWh / day	kBtu / day
07/01/2018	07/01/2019	366	183700.0	17000.0		0%	502	1713
		Average Annual Total	**1835700**	**282000**	**0**	**0%**		

Energy Type: Utility District Steam

Start Date	End Date	Days	Use (Mlbs)	Cost ($)	Mlbs / day	kBtu / day
07/01/2018	07/01/2019	366	4.06	42000.0	0	13245
		Average Annual Total	**4**	**42000**		

Note: fields displayed in green indicate values calculated by the tool and not directly entered by the user.

Delivered Energy

None given

Building Annual Summary for Energy Use and Energy Cost

Energy Type	Total Annual Use	Units	Conversion Multiplier	Thousands BTU	Total Annual Cost ($)
Electricity	1835700.0	kWh	3.412	6263408.291	282000.0
Chilled Water	103000.0	Ton-hour	12.0	1236000.0	12154.0
Utility District Steam	4.073	Mlbs	1194000.0	4863161.945	42000.0
			Total	**12362570**	**336154**

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

UTILITY DATA AND BENCHMARKING

Building Name: **SCUE**

Shared System Annual Summary for Energy Use and Energy Cost

No annual summary available.

Annual Summary for On-Site Renewable Energy Production

No annual summary available.

Annual Summary for Exported Energy

No annual summary available.

Existing Building EUI/ECI

Building Name	SCUE
Gross Conditioned Square Feet	102050.0
EUI_{BLD} (kBtu/ft²/yr)	121.142
EUI_{SITE} (kBtu/ft²/yr)	121.142
Site ECI (energy cost index or $/ft²/yr)	3.294

Benchmarking

Benchmarking Source	
Benchmarking Source (Other)	
Year Benchmarked	
Benchmark Site Energy Use Intensity	
Benchmark Site Energy Cost Intensity	0.0
Target Site Energy Intensity	0.0
Target Site Energy Cost	0.0
Annual Energy Savings to Reach Target	0
Annual Cost Savings to Reach Target	0.0
Additional Comments	

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

ENERGY USE BREAKDOWN AND QA/QC

Building Name: **SCUE**

Building Energy Use by End Use

Energy Type: Electricity

End Use	Electricity (kWh)	Electricity (kBtu)
Lighting	233000.0	794996
Plug Loads	193000.0	658516
Air Distribution	607000.0	2071084
Water Distribution	8000.0	27296
Other - Snow Melt	788000.0	2688656
Total	**1829000**	**6240548**
Total (from annual summary)	**1835700**	**6263408**
Difference	**-6700**	**-22860**
% Difference	**0%**	**0%**

Energy Type: Chilled Water

End Use	Chilled Water (Ton-hour)	Chilled Water (kBtu)
Space Cooling	103000.0	1236000
Total	**103000**	**1236000**
Total (from annual summary)	**103000**	**1236000**
Difference	**0**	**0**
% Difference	**0%**	**0%**

Energy Type: Utility District Steam

End Use	Utility District Steam (Mlbs)	Utility District Steam (kBtu)
Space Heating	4.045	4829730
Total	**4**	**4829730**
Total (from annual summary)	**4**	**4863162**
Difference	**0**	**-33432**
% Difference	**-1%**	**-1%**

Note: fields displayed in green indicate values calculated by the tool and not directly entered by the user.

Building End Use Summary

End Use	Total Energy Use (kBtu)	% of Total Energy Use (kBtu)
Lighting	794996	6%
Plug Loads	658516	5%
Air Distribution	2071084	17%
Water Distribution	27296	0%
Other	2688656	22%
Space Cooling	1236000	10%
Space Heating	4829730	39%

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

ENERGY USE BREAKDOWN AND QA/QC

Building Name: **SCUE**

Total	**12306278**	**100%**
Total (from annual summary)	**12362570**	
Difference	**-56292**	
% Difference	**0%**	

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

ENERGY SAVINGS OPPORTUNITIES

Building Name: **SCUE**

Annual Energy & Cost Savings

Package Name Measure; Status (^); Modeling / Calculation Approach (^^) *	**Measure Description**	**Total Cost Savings**	**Peak Demand Savings (kW)**	**Electricity Savings (kWh)**	**Chilled Water Savings (Ton-hour)**	**Utility District Steam Savings (Mlbs)**
Low Cost and No Cost Recommendations						
VFD Garage Fans + Controls Adjustement		17000.0		184000.0	1000.0	0.168
Other; ^1; ^^2	Parking Garage VFD Fans					
Upgrade operating protocols, calibration, and/or sequencing; ^1; ^^2	Economizer High Limit, Setbacks, SAT Reset					
Totals (recomm. measures)		***17000.0***	***0***	***184000.0***	***1000.0***	***0.168***

Payback with Incentives

Package Name Measure; Status (^); Modeling / Calculation Approach (^^) *	**Measure cost**	**Potential incentives**	**Measure life (years)**	***Net measure cost***	***Simple ROI (%)***	***Simple Payback (w/o incentives - years)***	***Simple Payback (w/ incentives - years)***
Low Cost and No Cost Recommendations							
VFD Garage Fans + Controls Adjustement				*86935*	*20%*	*5.1*	*5.1*
Other; ^1; ^^2	86935.0		20.0				
Upgrade operating protocols, calibration, and/or sequencing; ^1; ^^2			10.0				
Totals (recomm. measures)	***86935.0***	***0***		***86935.0***			

* Measure Key

^ *Status:*
1. Recommended
2. Further Study Recommended
3. Not Recommended
4. Implemented

^^ *Modeling/Calculation Approach:*
1. Spreadsheet Calculations
2. Energy Modeling Software

Note: fields displayed in italics indicate values calculated by the tool and not directly entered by the user.

French Admin

Target EUI =	**68**	
Current EUI[1] =	**203**	(Including chilled water energy use from energy modeling)
Annual Utility Cost =	**$ 298,279**	
Utility Cost $/sf =	**$ 2.71**	
Annual Carbon Emissions (Tons) =	**1,589**	
EEM $ =	**$ 2,259,230**	
Area SF =	**110,000**	
EEM $/SF =	**$ 20.54**	
Potential Rebates =	**$ 273,287**	
Potential Rebates/SF =	**$ 2.48**	
Audit $ =	**$ 18,810**	
Audit $/SF =	**$ 0.171**	

			Meets Payback Criteria?[7]	EUI			Cost Savings		Carbon			First Cost[2]		Cost per EUI Reduction	Simple Payback	Measure Lifespan	Potential Incentives	Payback w/Incentives
				New	Reduction	% Savings	Reduction	% Savings	Reduction (Tons)	% Savings	Annual Cars Off the Road	$	$/sf					
EEMs	EEM 1	SF1 CAV to VAV Conversion[3]	Yes	126	77	38%	$ 92,286	30.9%	655	41%	129	$ 1,370,371	$12.5	$ 17,815	14.8	20	$ 273,287	11.9
	EEM 2	SF2 CAV to VAV Conversion[4]	Yes	168	35	17%	$ 45,680	15.3%	296	19%	58	$ 878,011	$8.0	$ 25,078	19.2	20	$ -	19.2
	EEM 7	Coil and Filter Maintenance	Yes	200	3.0	1%	$ 7,385	2.5%	24	2%	5	$ 2,400	$0.0	$ 809	0.3	0.5	$ -	0.3
	EEM 10	Replace/Repair Steam Traps[6]	Yes	197	5.4	3%	$ 5,083	1.7%	49	3%	10	$ 8,448	$0.1	$ 1,576	1.7	10	$ -	1.7
	Does Not Meet Payback Criteria - Not Required for Compliance with Annex X																	
	EEM 3	VFD Pumps	No	202	1	0%	$ 2,138	0.7%	7	0%	1	$ 74,884	$0.7	$ 87,171	35.0	20	$ 4,200	33.1
	EEM 4	New LED Lighting System and Controls[8]	No	196	6.9	3%	$ 17,997	6.0%	50	3%	10	$ 560,460	$5.1	$ 80,781	31.1	20	$ 68,003	27.4
	EEM 6	SF2 VAV Plus Dual Fan Array[5]	No	157	45	22%	$ 63,898	21.4%	382	24%	75	$ 1,326,369	$12.1	$ 29,299	20.8	20	$ -	20.8
	EEM 11	Solar PV Array - 41 kW (3700 sf Roof Area)	No	201	1.6	1%	$ 3,860	1.3%	13	1%	3	$ 164,000	$1.5	$ 105,713	42.5	25	$ 114,800	12.7
Bundle	Bundled Measures																	
	Bundle 1	EEM1, EEM 2	Yes	91	112	55%	$ 137,966	46.3%	951	60%	188	$ 2,248,382	$20.4	$ 20,087	16.3	20	$ 273,287	14.3
	Bundle 2	EEM1, EEM2, EEM3, EEM4	Yes	83	120	59%	$ 158,101	53.0%	1,008	63%	199	$ 2,883,726	$26.2	$ 24,085	18.2	20	$ 345,490	16.1
	Bundle 3	EEM 1, EEM 3, EEM 4, EEM 6, EEM 7, EEM 10	Yes	68	134	66%	$ 165,452	55.5%	1,049	66%	207	$ 2,894,574	$26.3	$ 21,574	17.5	20	$ 335,125	15.5
	Bundle 4	Bundle 3 + PV	Yes	67	136	67%	$ 169,312	56.8%	1,062	67%	209	$ 3,058,574	$27.8	$ 22,536	18.1	20	$ 449,925	15.4

1. The French EUI includes the snow melt system as it is relatively small (EUI = 4) compared to other buildings. However, we still recommend submetering the system.
2. First cost includes:
   12% for General Conditions
   10% for Overhead/Profit
   10% for Contingency
3. Includes Induction unit replacements, new DDC controls, and demand controlled ventilation (DCV)
4. Includes terminal unit replacements, new DDC controls, and DCV
5. This is an alternate to EEM 2. This EEM replaces the existing air handler with a new custom unit with fan array.
6. We were unable to verify the number of steam traps per building and/or identify the number in need of repair. We assumed 7 traps for French with 20% needing repair/replacement now, and 5% annual maintenance moving forward. New installed steam traps typically cost $650-$1,750 depending on material.
7. "Payback criteria" refers to the Investment Criteria in Annex X. If a measure has a shorter payback than its lifespan, it must be implemented in order to comply with Annex X.
8. There are various LED lighting retrofit options - this one is shown since it has the highest first cost but also the lowest lifecycle cost due to lower maintenance and longer lifespan. The saved material and labor costs usually reduce the payback down to the 10-year range. This option also has the lowest energy use and is the best for meeting the EUI target. Other LED retrofit options would meet the Payback Criteria and be required for Annex X compliance.

French summary: French operates relatively poorly and requires large investments to the HVAC system. The proposed measures bring the EUI very close to the target EUI. French has a smaller snow melt system, so its energy use was not deducted for this study. If additional savings are needed, a PV array may be a viable option. If PV is not viable and additional savings are needed, the last resort would be an envelope measure. This is described in the table below.

Building	EEM #	Measure	Current Conditions	Proposed Changes
French	EEM 1	SF1 Constant Volume (CAV) to Variable Volume (VAV) Conversion	SF1 is a single duct air handler with a VFD installed but no downstream controls to allow for variable flow operation. EF1 serves as the return fan for SF1 and SF2. The perimeter induction units, which receive primary air from SF1, are original and function poorly. The pneumatic controls are original and function poorly; facility staff recieve numerous comfort complaints. Temperature setbacks during unoccupied hours are not implemented because the pnuematic controls have limited functionality. The supply air temperature resets up to 65F when the need for cooling is small. The Heat recovery run around loop no longer functions and is not used. Per discussions with the building mechanic, the outside air duct has been modified as a maintenance workaround, which results in the system providing significantly more outdoor air then is required for ventilation.	Replace the EF-1 motor with an inverter duty-rated motor and install a VFD. Replace the Induction units and replace the pneumatic controls with DDC. Newer induction units can turn down lower and have lower static pressure drops, resulting in fan energy savings. Add the controls and functionality necessary for variable flow operation. This includes one VAV box per exposure per floor being added to the primary air ductwork serving the induction units. Ensure that thermostats are set to 70F heating and 74F cooling. Implement a heating nighttime setback of 65F and a cooling nighttime setback of 80F. Per discussions with the Controls shop, the building has difficulty maintaining occupied setpoint during the day ; this measure will hopefully remedy that issue. Ensure that the supply air temperature resets up to 65F. Remove the heat recovery coil and piping to reduce the fan system static pressure. Remove the current OA intake system (including heat recovery coil) and replace with a typical single intake including an actuated damper to provide minimum OA and economizing. Add a CO2 sensor in the return duct and DCV controls. In addition to the energy savings, this measure will increase occupant comfort and reduce maintenance costs.
	EEM 2	SF2 Constant Volume (CAV) to Variable Volume (VAV) Conversion	SF2 is a single fan dual duct air handler with a VFD installed but no downstream controls to allow for variable flow operation. EF1 serves as the return fan for SF1 and SF2. The dual duct boxes are constant volume units with a single actuator controlling heating and cooling. The pneumatic controls are original and function poorly; facility staff recieve numerous comfort complaints. Temperature setbacks during unoccupied hours are not implemented because the pnuematic controls have limited functionality. The supply air temperature resets up to 60F when the need for cooling is small. The Heat recovery run around loop no longer functions and is not used. The OA damper allows more outside air in then is required for ventilation purposes.	If the SF1 measure above is not implemented, replace the EF-1 motor with an inverter duty-rated motor and install a VFD. Replace the terminal mixing boxes with variable volume dual actuator mixing boxes and replace the pneumatic controls with DDC. Add the controls and functionality necessary for variable flow operation. Ensure that thermostats are set to 70F heating and 74F cooling. Implement a heating nighttime setback of 65F and a cooling nighttime setback of 80F. Adjust the supply air temperature reset to 65F. Remove the heat recovery coil and piping to reduce the fan system static pressure. Remove the three OA intakes and replace with a single intake including an actuated damper to provide minimum OA and economizing. Add a CO2 sensor in the return duct and DCV controls.
	EEM 3	Pump VFDs	The primary chilled water pumps that serve the building and the secondary pumps which serve the AHUs are constant speed. The hot water pumps which serve the AHUs are also constant speed.	Replace the hot water pumps (H-19 and H-20) with variable speed pumps. Replace the secondary chilled water pumps (CCP-1 and CCP-2) with variable speed pumps. Include controls to allow the pumps to reduce the flowrate down to what is needed by the AHUs. This measure does not affect the primary chilled water pumps which serve the buildings.
	EEM 4	LED Lighting System Upgrade	Interior lighting in the building consists of flourescent T8 tube lighting controlled by manual switches. It is common for mechanical rooms to be lit 24/7.	Replace the flourescent fixtures with a new code-compliant LED lighting system. This includes daylighting and occupancy sensors where required. The first cost for this measure assumes the entire system is replaced - this has the highest first cost, lowest maintenance cost and longest system lifespan of LED upgrade options. Cheaper LED upgrade options are available (with lower energy savings) to reduce first cost.
	EEM 6	SF2 CAV to VAV Plus Air Handler with Fan Array	See SF2 measure above.	Implement the changes as described in the SF2 measure above. In addition, remove the existing single fan air handler and replace with a custom unit with a fan array. The fan array saves energy by allowing the fans to control to the hot deck and cold deck individually. It also allows for better fan pressure reset.
	EEM 7	Filter and Coil Maintenance	It was reported to the audit team that hydronic coils in AHUs are seldom cleaned. Some filters are changed out regularly, every 3-6 months, while others are not.	Clean hydronic coils annually. Replace the pre-filters every 3 months and the MERV 13 filters every 6 months.
	EEM 8	Potential Envelope Measures	French's building envelope is original construction. The exterior walls are red brick on the exterior with steel framing and 2 inches of rigid insulation on the interior. The membrane roof has 2 inches of rigid insulation with concrete below. It was reported that the perimeter spaces in the building get very cold, partially due to infiltration/leakage and a poorly insulated thermal envelope.	Envelope measures were not included in this study, as other viable measures are available to reach the Target EUI. In general, envelope measures have a very high first cost, are invasive, and do not have reasonable paybacks. They are more commonly implemented as a maintenance measure than an energy reduction measure. If envelope measures are to be explored, the most viable ones would be: 1) Reseal window framing to reduce infiltration/leakage
	EEM 10	Replace/Repair Steam Traps	Steam systems require frequent maintenance and should be inspected annually. While it was reported that the steam traps are in good condition and function relatively well, they don't receive regular scheduled maintenance.	Inspect and maintain the steam system annually to ensure optimal operation. Savings estimates for this measure are based on previous experience with steam traps and industry references.
	EEM 11	Solar Photovoltaic (PV) Array	No PV array currently exists.	This is an extra measure that could be implemented if needed to achieve the Target EUI. For demonstration purposes, a 50 kW array reduces the building EUI by 1.6 and requires approximately 3,700 sf of roof space. Roof structural and electrical system capacities need to be verified to ensure viability. If needed the array could most likely go on the roof of Lighty, which will most likely have more capacity in the roof structure and the electrical system. Both French and Lighty have roofs with good solar exposure and availability for solar panels.

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

OVERVIEW

BUILDING INFORMATION

French
1815 Wilson Rd
Pullman, WA 99164

Report Type	**WA Commerce Grants Report**	Report Status:	**In Progress**
		Report Date:	**05/27/2021**
Gross Floor Area:	**110,000.0 ft²**	Year Built:	**1967**
Building ID #:	**12396**	Software Release:	2021.1.0.1459
Project Name	**WSU Audits**		

AUDIT TEAM

Glumac
900 SW 5th Ave #1600
Portland, OR 97204
(503) 345-6337

DATA SUMMARY

This report was generated from data entered into the Building Energy Asset Score (Asset Score) tool, developed by the Pacific Northwest National Laboratory (PNNL) for the U.S. Department of Energy (DOE). Asset Score is a national standardized tool for assessing the physical and structural energy efficiency of commercial and multifamily residential buildings. It also facilitates building energy audit data collection and reporting.

This report follows the ASHRAE/ACCA Standard 211P, Standard for Commercial Building Energy Audits. It also includes additional data fields required by specific cities, where applicable. The icons below identify data categories.

- ASHRAE Level 2 inputs
- City specific inputs

If this report is used to comply with a local energy audit ordinance, the fields marked with * indicate the minimum data to be reported. The audit team listed above is responsible for any information entered and reported through Asset Score. DOE and PNNL do not warranty data accuracy, completeness, legality, and reliability.

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

CONTACT INFORMATION AND AUDIT DETAILS

Building Name: **French**

Submission Information

Date of Submission	Never
Submission Version	None

Audit Details

Date of Completion for Level 1 Audit		☑ N/A
Date of Completion for Level 2 Audit	05/01/2021	
Date of Completion for Level 3 Audit		☑ N/A
Year of Last Renovation		☑ N/A
Year of Prior Energy Audit		☑ N/A
Year Last Commissioned		☑ N/A
Additional Comments		

Audit Team and Building Staff

Auditor

Name*	Mike Prier
Company Name or Organization*	Glumac
Street Address	900 SW 5th Ave #1600
City	Portland
State	OR
Postal Code	97204
Phone*	(503) 345-6337
Email*	mprier@glumac.com

Building Owner

Name*	Phil Johnson
Company Name or Organization*	WSU
Street Address	
City	
State	
Postal Code	
Phone*	(509) 335-9029
Email*	philrjohnson@wsu.edu

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **French**

Building Characteristics

Gross Floor Area*	110000.0
Spaces Excluded from Gross Floor Area	
Conditioned Floor Area, Heated Only	0.0
Conditioned Floor Area, Cooled Only	0.0
Conditioned Floor Area, Heated and Cooled	110000.0
Total Conditioned Floor Area	110000.0
Number of Floors Above-Grade, Conditioned	4
Number of Floors Below-Grade, Conditioned	0
General Building Shape	Rectangular
Building Automation System?	Yes
Historic Building?*	No

Use Types

Office (Original: Office)

Use Type / Space Function / Building Area Type*	Office	
Original Intended Use	Office	
Gross Floor Area*	110000.0	
Percentage of Space Conditioned	100.0	
Number of Occupants*	500	
Use (hours/week)*	50.0	
Use (weeks/year)*	52.0	
Approximate Plug Loads	1.2	
Number of Dwelling Units		☑ N/A
Percentage of Dwelling Units Currently Occupied		☑ N/A
Principal HVAC Type	Other	
Principal Lighting Type	Fluorescent T8	

Roofs

Built-Up with Concrete Deck

Roof Construction	Built-Up with Concrete Deck
Roof R Value	4.0

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **French**

Roof Condition	Poor
Cool Roof	No
Green Roof	No
Blue Roof	No
Roof Area	25589.0

Walls

Brick/Stone on Steel Frame

Wall Construction	Brick/Stone on Steel Frame
Above Grade Wall Insulation R Value	4.0
Below Grade Wall Insulation R Value	☑ N/A
Total Exposed Above Grade Wall Area	47593.0
Below Grade Wall Area	5832.0
Above Grade Demising Wall Area	0.0
Overall Enclosure Tightness Assessment	1 (poor = high infiltration/exfiltration)
Type of Exterior Door Construction	Insulated metal

Windows

Metal, Single Pane

Framing Material	Metal
Window Glass Type	Single Pane
Fenestration Seal Condition	2 (bad = higher rate of infiltration/exfiltration)
Window Wall Ratio	0.17000000178813934

Foundation Types

Slab-On-Grade

Floor Construction Type	Slab-On-Grade
Ventilated Crawlspace	No
R Value	0.0

Exterior Floors

None given

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **French**

Lighting

	Controls						
Fixture (^^^); *	**Manual**	**Photocell**	**Timer**	**Occupancy Sensor**	**Building Automation System**	**Advanced**	**Other**
Fixture 1: Fluorescent T8; ^^^3	Yes	No	No	No	No	No	No

BUILDING ENERGY AUDIT TEMPLATE
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FACILITY DESCRIPTION

Building Name: **French**

Fixture Locations

Fixture (^^^); *	Location	Quantity Definition	Area Served (%)	Area Served (ft^2)
Fixture 1: Fluorescent T8; ^^^3	Office (Original: Office)	% Area Served	100.0	0.0

*** Fixture Key**

^^^ *Ballast Type:*
1. Premium Electronic
2. Standard Electronic
3. Magnetic
4. N/A

Heating Plants

Utility District Steam, Utility District Steam

Heating Plant Type	Utility District Steam
Fuel Type	Utility District Steam
Controls	
Building Automation System (BAS)	Yes
Direct Digital (DDC)	No
Pneumatic	Yes

Cooling Plants

District Chilled Water, Chilled Water

Cooling Plant Type	District Chilled Water
Fuel Type	Chilled Water
Controls	
Building Automation System (BAS)	Yes
Direct Digital (DDC)	No
Pneumatic	Yes

Condenser Plants

None given

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **French**

HVAC Systems

HVAC System 20520

Heating	
Heating Source	Plant
Heating Plant	Utility District Steam, Utility District Steam
Cooling	
Cooling Source	Plant
Cooling Plant	District Chilled Water, Chilled Water
Distribution Equipment	
Delivery Equipment Type	Central Fan
Other Delivery Equipment Type	
Central Distribution Type	Forced Air
Other Central Distribution Type	
Fan Control	Constant Volume
Energy Recovery Ventilation	None
Outdoor Air Control	Temperature Economizer
Zone Controls	
Direct Digital Controls (DDC)	No
Pneumatic Control	Yes
Manual Thermostat	Yes
Programmable Thermostat	No
None	No

HVAC System 20521

Heating	
Heating Source	Plant
Heating Plant	Utility District Steam, Utility District Steam
Cooling	
Cooling Source	Plant
Cooling Plant	District Chilled Water, Chilled Water
Distribution Equipment	
Delivery Equipment Type	Central Fan
Other Delivery Equipment Type	
Central Distribution Type	Forced Air
Other Central Distribution Type	
Fan Control	Constant Volume
Energy Recovery Ventilation	None

BUILDING ENERGY AUDIT TEMPLATE
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FACILITY DESCRIPTION

Building Name: **French**

Outdoor Air Control	Temperature Economizer
Zone Controls	
Direct Digital Controls (DDC)	No
Pneumatic Control	Yes
Manual Thermostat	Yes
Programmable Thermostat	No
None	No

Service Hot Water Systems

Plant

System Type	Plant

Process Loads: Renewables

Solar Thermal System	No
Solar PV System	No
Wind System	No
None	No
Peak Generating Capacity	

Process Loads: Backup Generation

System Type	

Process Loads: Data Centers

Total Area	
Metered Space	No
Connected Load	
UPS Capacity	
PUE	

BUILDING ENERGY AUDIT TEMPLATE
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FACILITY DESCRIPTION

Building Name: **French**

Process Loads: Commercial Kitchens

- Connected Load
- Total Area of Commercial Kitchen

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

UTILITY DATA AND BENCHMARKING

Building Name: **French**

Metered Energy Supply Source Details

None given

Energy Reporting Years

Start Date	End Date	Metering entries	Delivery entries
06/01/2018	05/31/2019	2	0
06/01/2018	05/31/2019	2	0

Metered Energy

Energy Type: Electricity

Start Date	End Date	Days	Use (kWh)	Cost ($)	Peak (kW)	Load Factor	kWh / day	kBtu / day
06/01/2018	06/01/2020	732	3984662.0	330704.0		0%	5444	18573
		Average Annual Total	**2141862**	**165352**	**0**	**0%**		

Energy Type: Utility District Steam

Start Date	End Date	Days	Use (Mlbs)	Cost ($)	Mlbs / day	kBtu / day
06/01/2018	06/01/2020	732	19.361	203318.0	0	31581
		Average Annual Total	**10**	**101659**		

Note: fields displayed in green indicate values calculated by the tool and not directly entered by the user.

Delivered Energy

None given

Building Annual Summary for Energy Use and Energy Cost

Energy Type	Total Annual Use	Units	Conversion Multiplier	Thousands BTU	Total Annual Cost ($)
Electricity	2141862.0	kWh	3.412	7308033.017	165352.0
Utility District Steam	9.879	Mlbs	1194000.0	11795525.654	101659.0
Chilled Water	264981.0	Ton-hour	12.0	3179772.0	31268.0
			Total	**22283331**	**298279**

BUILDING ENERGY AUDIT TEMPLATE
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UTILITY DATA AND BENCHMARKING

Building Name: **French**

Shared System Annual Summary for Energy Use and Energy Cost

No annual summary available.

Annual Summary for On-Site Renewable Energy Production

No annual summary available.

Annual Summary for Exported Energy

No annual summary available.

Existing Building EUI/ECI

Building Name	French
Gross Conditioned Square Feet	110000.0
EUI_{BLD} (kBtu/ft²/yr)	202.576
EUI_{SITE} (kBtu/ft²/yr)	202.576
Site ECI (energy cost index or $/ft²/yr)	2.712

Benchmarking

Benchmarking Source	
Benchmarking Source (Other)	
Year Benchmarked	
Benchmark Site Energy Use Intensity	
Benchmark Site Energy Cost Intensity	0.0
Target Site Energy Intensity	0.0
Target Site Energy Cost	0.0
Annual Energy Savings to Reach Target	0
Annual Cost Savings to Reach Target	0.0
Additional Comments	

BUILDING ENERGY AUDIT TEMPLATE
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ENERGY USE BREAKDOWN AND QA/QC

Building Name: **French**

Building Energy Use by End Use

Energy Type: Electricity

End Use	Electricity (kWh)	Electricity (kBtu)
Lighting	422083.0	1440147
Plug Loads	239700.0	817856
Air Distribution	1101768.0	3759232
Water Distribution	131418.0	448398
Process Loads	246893.0	842399
Total	**2141862**	**7308033**
Total (from annual summary)	**2141862**	**7308033**
Difference	**0**	**0**
% Difference	**0%**	**0%**

Energy Type: Chilled Water

End Use	Chilled Water (Ton-hour)	Chilled Water (kBtu)
Space Cooling	264981.0	3179772
Total	**264981**	**3179772**
Total (from annual summary)	**264981**	**3179772**
Difference	**0**	**0**
% Difference	**0%**	**0%**

Energy Type: Utility District Steam

End Use	Utility District Steam (Mlbs)	Utility District Steam (kBtu)
Space Heating	9.879	11795526
Total	**10**	**11795526**
Total (from annual summary)	**10**	**11795526**
Difference	**0**	**0**
% Difference	**0%**	**0%**

Note: fields displayed in green indicate values calculated by the tool and not directly entered by the user.

Building End Use Summary

End Use	Total Energy Use (kBtu)	% of Total Energy Use (kBtu)
Lighting	1440147	6%
Plug Loads	817856	4%
Air Distribution	3759232	17%
Water Distribution	448398	2%
Process Loads	842399	4%
Space Cooling	3179772	14%
Space Heating	11795526	53%

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

ENERGY USE BREAKDOWN AND QA/QC

Building Name: **French**

Total	**22283331**	**100%**
Total (from annual summary)	**22283331**	
Difference	**0**	
% Difference	**0%**	

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

ENERGY SAVINGS OPPORTUNITIES

Building Name: **French**

Annual Energy & Cost Savings

Package Name Measure; Status (^); Modeling / Calculation Approach (^^) *	Measure Description	Total Cost Savings	Peak Demand Savings (kW)	Electricity Savings (kWh)	Utility District Steam Savings (Mlbs)	Chilled Water Savings (Ton-hour)
Potential Capital Recommendations						
SF1 and SF2 Retrofit		146027.0		688653.0	8.124	78535.0
Replace or modify AHU; ^1; ^^2	SF1 Retrofit					
Replace or modify AHU; ^1; ^^2	SF2 Retrofit					
All HVAC Capital Measures		162673.0		954235.0	7.658	86478.0
Replace or modify AHU; ^1; ^^2	SF1 Retrofit					
Replace or modify AHU; ^1; ^^2	SF2 Retrofit					
Replace with variable speed pump; ^3; ^^2	Replace with VFD Pumps					
Retrofit with light emitting diode technologies; ^1; ^^2	LED Lighting + Occupancy Sensors					
Capital Measures + Maintenance		169887.0		1018403.0	7.907	83883.0
Replace or modify AHU; ^1; ^^2	SF1 Retrofit					
Replace or modify AHU; ^1; ^^2	SF2 Retrofit					
Replace with variable speed pump; ^3; ^^2	Replace with VFD Pumps					
Retrofit with light emitting diode technologies; ^1; ^^2	LED Lighting + Occupancy Sensors					
Clean and/or repair; ^1; ^^2	Filter Replacement and Coil Maintenance					
Clean and/or repair; ^1; ^^2	Steam Traps Maintenance					
Totals (recomm. measures)		***478587.0***	***0***	***2661291.0***	***23.689***	***248896.0***

Payback with Incentives

Package Name Measure; Status (^); Modeling / Calculation Approach (^^) *	Measure cost	Potential incentives	Measure life (years)	*Net measure cost*	*Simple ROI (%)*	*Simple Payback (w/o incentives - years)*	*Simple Payback (w/ incentives - years)*
Potential Capital Recommendations							
SF1 and SF2 Retrofit				*2248382*	*6%*	*15.4*	*15.4*
Replace or modify AHU; ^1; ^^2	1370371.0		25.0				
Replace or modify AHU; ^1; ^^2	878011.0		25.0				
All HVAC Capital Measures				*2883726*	*6%*	*17.7*	*17.7*
Replace or modify AHU; ^1; ^^2	1370371.0		25.0				
Replace or modify AHU; ^1; ^^2	878011.0		25.0				
Replace with variable speed pump; ^3; ^^2	74884.0		20.0				
Retrofit with light emitting diode technologies; ^1; ^^2	560460.0		20.0				
Capital Measures + Maintenance				*2886126*	*6%*	*17.0*	*17.0*
Replace or modify AHU; ^1; ^^2	1370371.0		25.0				
Replace or modify AHU; ^1; ^^2	878011.0		25.0				
Replace with variable speed pump; ^3; ^^2	74884.0		20.0				
Retrofit with light emitting diode technologies; ^1; ^^2	560460.0		20.0				
Clean and/or repair; ^1; ^^2	2400.0		0.5				
Clean and/or repair; ^1; ^^2			5.0				
Totals (recomm. measures)	***8018234.0***	***0***		***8018234.0***			

For more information on the input fields, calculation methods, and units of measure found in this report, please visit the Asset Score web site: https://buildingenergyscore.energy.gov

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

ENERGY SAVINGS OPPORTUNITIES

Building Name: **French**

*** Measure Key**

^ *Status:*
1. Recommended
2. Further Study Recommended
3. Not Recommended
4. Implemented

^^ *Modeling/Calculation Approach:*
1. Spreadsheet Calculations
2. Energy Modeling Software

Note: fields displayed in italics indicate values calculated by the tool and not directly entered by the user.

Lighty Student Services

Target EUI =	**68**	Target EUI prorated - See calculation below. This approach was approved by WA Commerce.
Current EUI =	**107**	(Including chilled water energy use from energy modeling)
Current EUI w/o Snow Melt[1] =	**79**	Snow melt EUI is estimated based on controls and metered energy data.
Annual Utility Cost =	**$ 135,243**	
Utility Cost $/sf =	**$ 1.42**	
Annual Carbon Emissions (Tons) =	**722**	
EEM $ =	**$ 123,225**	
Area SF =	**94,924**	
EEM $/SF =	**$ 1.30**	
Potential Rebates =	**$ 29,164**	
Potential Rebates/SF =	**$ 0.31**	
Audit $ =	**$ 17,086**	
Audit $/SF =	**$ 0.180**	

			Meets Payback Criteria?[7]	EUI			Cost Savings		Carbon			First Cost[2]		Cost per EUI Reduction	Simple Payback	Measure Lifespan	Potential Incentives	Payback w/Incentives
				New	Reduction	% Savings	Reduction	% Savings	Reduction (Tons)	% Savings	Annual Cars Off the Road	$	$/sf					
EEMs	EEM 5	Demand Controlled Ventilation[3]	Yes	82	11	10%	$ 9,216	6.8%	82	11%	416	$ 42,240	$ 0.44	$ 3,831	4.6	15	$ 29,164	1.4
	EEM 10	Replace/Repair Steam Traps[5]	Yes	92	1	1%	$ 1,191	0.9%	12	2%	59	$ 7,392	$ 0.08	$ 5,077	6.2	10	$ -	6.2
	EEM 9	Retro-Commissioning[4]	Yes	80	14	13%	$ 13,275	9.8%	99	14%	503	$ 71,193	$ 0.75	$ 5,170	5.4	10	$ -	5.4
	EEM 7	Coil and Filter Maintenance	Yes	92	1.2	1%	$ 2,471	1.8%	8	1%	41	$ 2,400	$ 0.03	$ 2,086	1.0	2	$ -	1.0
	Does Not Meet Payback Criteria - Not Required for Compliance with Annex X																	
	EEM 3	VFD Pumps	No	92	1	1%	$ 2,728	2.0%	9	1%	46	$ 101,336	$ 1.07	$ 79,779	37.1	20	$ 4,700	35.4
	EEM 4	New LED Lighting System and Controls[6]	No	85	8	8%	$ 16,420	12.1%	45	6%	226	$ 483,646	$ 5.10	$ 60,041	29.5	20	$ 68,003	25.3
Bundles	Bundled Measures																	
	Bundle 1	EEM 4, EEM 5, EEM 9, EEM 10	Yes	63	31	29%	$ 36,092	26.7%	214	30%	1,084	$ 604,471	$ 6.37	$ 19,576	16.7	20	$ 97,167	14.1
	Bundle 2	EEM 4, EEM 5, EEM 7, EEM 9, EEM 10	Yes	62	32	30%	$ 38,316	28.3%	221	31%	1,121	$ 606,871	$ 6.39	$ 19,016	15.8	20	$ 97,167	13.3

1. Commerce will allow energy use from the snow melt system to be deducted if it is properly submetered. The snow melt system has a large EUI for Lighty and we recommend submetering this system.
2. First cost includes:
   12% for General Conditions
   10% for Overhead/Profit
   10% for Contingency
3. This measure can be independent of EEM 9 but would ideally be implemented with it.
4. This assumes the entire building undergoes retro-commissioning. This measure is compatible with EEM 5 but would ideally be implemented before EEM 5.
5. We were unable to verify the number of steam traps per building and/or identify the number in need of repair. We assumed 7 traps for Lighty with 20% needing repair/replacement now, and 5% annual maintenance moving forward. New installed steam traps typically cost $650-$1,750 depending on material.
6. There are various LED lighting retrofit options - this one is shown since it has the highest first cost but also the lowest lifecycle cost due to lower maintenance and longer lifespan. It also has the lowest energy use and is the best for meeting the EUI target. Other LED retrofit options would meet the Payback Criteria and be required for Annex X compliance.
7. "Payback criteria" refers to the Investment Criteria in Annex X. If a measure has a shorter payback than its lifespan, it must be implemented in order to comply with Annex X.

Lighty summary:	Lighty operates relatively well compared to its EUI target. Similarly to SCUE, Lighty has a large snow melt system. Deducting this energy use (via proper metering) in tandem with implementing some energy efficiency measures should bring the building into compliance.

Building	EEM #	Measure	Current Conditions	Proposed Changes
Lighty	EEM 3	Pump VFDs	The primary chilled water pumps that serve the building and the secondary pumps which serve the AHUs are constant speed. The hot water pumps which serve the AHUs are also constant speed.	Replace the hot water pumps (Pumps 6, 7, 8, 9) with variable speed pumps. Replace the secondary chilled water pumps (Circ Pump - 1, 2, 3,4) with variable speed pumps. Include controls to allow the pumps to reduce the flowrate down to what is needed by the AHUs. This measure does not affect the primary chilled water pumps which serve the buildings.
	EEM 4	LED Lighting System Upgrade	Interior lighting in the building consists of flourescent T8 tube lighting controlled by manual switches. It is common for mechanical rooms to be lit 24/7. There is a centralized lighting controller which sweeps off ~75% of the lights in the common spaces and conference rooms.	Replace the flourescent fixtures with a new code-compliant LED lighting system. This includes daylighting and occupancy sensors where required. The first cost for this measure assumes the entire system is replaced - this has the highest first cost, lowest maintenance cost and longest system lifespan of LED upgrade options. Cheaper LED upgrade options are available (with lower energy savings) to reduce first cost.
	EEM 5	Demand Controlled Ventilation (DCV)	None of the four AHUs that serve Lighty have DCV functionality.	Install CO2 sensors in the return ducts of AHUs 1, 2, and 4. The units will modulate the amount of outdoor ventilation air based on a maximum allowable CO2 reading of 1200 parts per million (ppm).
	EEM 7	Filter and Coil Maintenance	It was reported to the audit team that hydronic coils in AHUs are seldom cleaned. Some filters are changed out regularly, every 3-6 months, while others are not.	Clean hydronic coils annually. Replace the pre-filters every 3 months and the MERV 13 filters every 6 months.
	EEM 9	Retro-Commissioning	Lighty is almost 20 years old and has DDC controls. It is likely that some controls components are no longer working as intended and some controls strategies are outdated. AHUs 2 and 3 run 24/7. The supply air temperature is 55F during the summer and resets up to 60F when there is minimal need for cooling.	Retro-commission the building to find equipment and controls that are not functioning properly and implement the necessary fixes. This would include turning off AHU 2 and 3 during the nighttime and reviewing the SAT reset strategy. It would also look at the OA dampers to make sure they are functioning properly. The first costs and energy savings from this measure include not just the actual retro-commissioning but also implementing the fixes.
	EEM 10	Replace/Repair Steam Traps	Steam systems require frequent maintenance and should be inspected annually. While it was reported that the steam traps are in good condition and function relatively well, they don't receive regular scheduled maintenance.	Inspect and maintain the steam system annually to ensure optimal operation. Savings estimates for this measure are based on previous experience with steam traps and industry references.

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

OVERVIEW

BUILDING INFORMATION

Lighty
1815 Wilson Rd
Pullman, WA 99164

Report Type	**WA Commerce Grants Report**	Report Status:	**In Progress**
		Report Date:	**05/27/2021**
Gross Floor Area:	**94,924.0 ft²**	Year Built:	**1996**
Building ID #:	**12401**	Software Release:	2021.1.0.1459
Project Name	**WSU Audits**		

AUDIT TEAM

Glumac
900 SW 5th Ave #1600
Portland, OR 97204
(503) 345-6337

DATA SUMMARY

This report was generated from data entered into the Building Energy Asset Score (Asset Score) tool, developed by the Pacific Northwest National Laboratory (PNNL) for the U.S. Department of Energy (DOE). Asset Score is a national standardized tool for assessing the physical and structural energy efficiency of commercial and multifamily residential buildings. It also facilitates building energy audit data collection and reporting.

This report follows the ASHRAE/ACCA Standard 211P, Standard for Commercial Building Energy Audits. It also includes additional data fields required by specific cities, where applicable. The icons below identify data categories.

- ASHRAE Level 2 inputs
- City specific inputs

If this report is used to comply with a local energy audit ordinance, the fields marked with * indicate the minimum data to be reported. The audit team listed above is responsible for any information entered and reported through Asset Score. DOE and PNNL do not warranty data accuracy, completeness, legality, and reliability.

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

CONTACT INFORMATION AND AUDIT DETAILS

Building Name: **Lighty**

Submission Information

Date of Submission	Never
Submission Version	None

Audit Details

Date of Completion for Level 1 Audit		☑ N/A
Date of Completion for Level 2 Audit	05/01/2021	
Date of Completion for Level 3 Audit		☑ N/A
Year of Last Renovation		☑ N/A
Year of Prior Energy Audit		☑ N/A
Year Last Commissioned		☑ N/A
Additional Comments		

Audit Team and Building Staff

Auditor

Name*	Mike Prier
Company Name or Organization*	Glumac
Street Address	900 SW 5th Ave #1600
City	Portland
State	OR
Postal Code	97204
Phone*	(503) 345-6337
Email*	mprier@glumac.com

Building Owner

Name*	Phil Johnson
Company Name or Organization*	WSU
Street Address	
City	
State	
Postal Code	
Phone*	(509) 335-9029
Email*	philrjohnson@wsu.edu

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **Lighty**

Building Characteristics

Gross Floor Area*	94924.0
Spaces Excluded from Gross Floor Area	
Conditioned Floor Area, Heated Only	0.0
Conditioned Floor Area, Cooled Only	0.0
Conditioned Floor Area, Heated and Cooled	94924.0
Total Conditioned Floor Area	94924.0
Number of Floors Above-Grade, Conditioned	4
Number of Floors Below-Grade, Conditioned	0
General Building Shape	Rectangular
Building Automation System?	Yes
Historic Building?*	No

Use Types

Office

Use Type / Space Function / Building Area Type*	Office	
Original Intended Use		
Gross Floor Area*	94924.0	
Percentage of Space Conditioned	100.0	
Number of Occupants*	800	
Use (hours/week)*	50.0	
Use (weeks/year)*	52.0	
Approximate Plug Loads	1.2	
Number of Dwelling Units		☑ N/A
Percentage of Dwelling Units Currently Occupied		☑ N/A
Principal HVAC Type	VAV with Hot Water Reheat	
Principal Lighting Type	Fluorescent T8	

Roofs

Built-Up with Concrete Deck

Roof Construction	Built-Up with Concrete Deck
Roof R Value	30.0

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **Lighty**

Roof Condition	Good
Cool Roof	No
Green Roof	No
Blue Roof	No
Roof Area	25692.0

Walls

Brick/Stone on Steel Frame

Wall Construction	Brick/Stone on Steel Frame
Above Grade Wall Insulation R Value	9.0
Below Grade Wall Insulation R Value	☑ N/A
Total Exposed Above Grade Wall Area	51151.0
Below Grade Wall Area	0.0
Above Grade Demising Wall Area	0.0
Overall Enclosure Tightness Assessment	3 (standard = normal rate of infiltration/exfiltration)
Type of Exterior Door Construction	Insulated metal

Windows

Metal, Double Pane

Framing Material	Metal
Window Glass Type	Double Pane
Fenestration Seal Condition	3 (standard = normal rate of infiltration/exfiltration)
Window Wall Ratio	0.25999999046325684

Foundation Types

Slab-On-Grade

Floor Construction Type	Slab-On-Grade
Ventilated Crawlspace	No
R Value	0.0

Exterior Floors

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **Lighty**

None given

Lighting

	Controls						
Fixture (^^^); *	**Manual**	**Photocell**	**Timer**	**Occupancy Sensor**	**Building Automation System**	**Advanced**	**Other**
Fixture 1: Fluorescent T8; ^^^3	Yes	No	No	No	No	No	No

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **Lighty**

Fixture Locations

Fixture (^^^); *	Location	Quantity Definition	Area Served (%)	Area Served (ft²)
Fixture 1: Fluorescent T8; ^^^3	Office	% Area Served	100.0	0.0

*** Fixture Key**

^^^ *Ballast Type:*
1. Premium Electronic
2. Standard Electronic
3. Magnetic
4. N/A

Heating Plants

Utility District Steam, Utility District Steam

Heating Plant Type	Utility District Steam
Fuel Type	Utility District Steam
Controls	
Building Automation System (BAS)	Yes
Direct Digital (DDC)	No
Pneumatic	Yes

Cooling Plants

District Chilled Water, Chilled Water

Cooling Plant Type	District Chilled Water
Fuel Type	Chilled Water
Controls	
Building Automation System (BAS)	Yes
Direct Digital (DDC)	No
Pneumatic	Yes

Condenser Plants

None given

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **Lighty**

HVAC Systems

HVAC System 20629

Heating	
Heating Source	Plant
Heating Plant	Utility District Steam, Utility District Steam
Cooling	
Cooling Source	Plant
Cooling Plant	District Chilled Water, Chilled Water
Distribution Equipment	
Delivery Equipment Type	Central Fan
Other Delivery Equipment Type	
Central Distribution Type	Forced Air
Other Central Distribution Type	
Fan Control	Variable Volume
Energy Recovery Ventilation	None
Outdoor Air Control	Temperature Economizer
Zone Controls	
Direct Digital Controls (DDC)	Yes
Pneumatic Control	No
Manual Thermostat	No
Programmable Thermostat	No
None	No

HVAC System 20630

Heating	
Heating Source	Plant
Heating Plant	Utility District Steam, Utility District Steam
Cooling	
Cooling Source	Plant
Cooling Plant	District Chilled Water, Chilled Water
Distribution Equipment	
Delivery Equipment Type	Central Fan
Other Delivery Equipment Type	
Central Distribution Type	Forced Air
Other Central Distribution Type	
Fan Control	Variable Volume
Energy Recovery Ventilation	None

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **Lighty**

Outdoor Air Control	Temperature Economizer
Zone Controls	
Direct Digital Controls (DDC)	Yes
Pneumatic Control	No
Manual Thermostat	No
Programmable Thermostat	No
None	No

HVAC System 20631

Heating	
Heating Source	Plant
Heating Plant	Utility District Steam, Utility District Steam
Cooling	
Cooling Source	Plant
Cooling Plant	District Chilled Water, Chilled Water
Distribution Equipment	
Delivery Equipment Type	Central Fan
Other Delivery Equipment Type	
Central Distribution Type	Forced Air
Other Central Distribution Type	
Fan Control	Variable Volume
Energy Recovery Ventilation	None
Outdoor Air Control	Temperature Economizer
Zone Controls	
Direct Digital Controls (DDC)	Yes
Pneumatic Control	No
Manual Thermostat	No
Programmable Thermostat	No
None	No

HVAC System 20632

Heating	
Heating Source	Plant
Heating Plant	Utility District Steam, Utility District Steam
Cooling	
Cooling Source	Plant
Cooling Plant	District Chilled Water, Chilled Water
Distribution Equipment	
Delivery Equipment Type	Central Fan

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **Lighty**

Other Delivery Equipment Type	
Central Distribution Type	Forced Air
Other Central Distribution Type	
Fan Control	Variable Volume
Energy Recovery Ventilation	None
Outdoor Air Control	Temperature Economizer
Zone Controls	
Direct Digital Controls (DDC)	Yes
Pneumatic Control	No
Manual Thermostat	No
Programmable Thermostat	No
None	No

Service Hot Water Systems

Plant

System Type	Plant

Process Loads: Renewables

Solar Thermal System	No
Solar PV System	No
Wind System	No
None	No
Peak Generating Capacity	

Process Loads: Backup Generation

- System Type

Process Loads: Data Centers

- Total Area

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **Lighty**

Metered Space	No
Connected Load	
UPS Capacity	
PUE	

Process Loads: Commercial Kitchens

- Connected Load
- Total Area of Commercial Kitchen

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

UTILITY DATA AND BENCHMARKING

Building Name: **Lighty**

Metered Energy Supply Source Details

None given

Energy Reporting Years

Start Date	End Date	Metering entries	Delivery entries
07/01/2018	06/30/2019	2	0
07/01/2019	06/30/2020	0	0

Metered Energy

Energy Type: Electricity

Start Date	End Date	Days	Use (kWh)	Cost ($)	Peak (kW)	Load Factor	kWh / day	kBtu / day
07/01/2018	07/01/2020	732	2009229.0	148700.0		0%	2745	9365
		Average Annual Total	**1008385**	**74350**	**0**	**0%**		

Energy Type: Utility District Steam

Start Date	End Date	Days	Use (Mlbs)	Cost ($)	Mlbs / day	kBtu / day
07/01/2018	07/01/2020	732	8.845	92760.0	0	14427
		Average Annual Total	**4**	**46380**		

Note: fields displayed in green indicate values calculated by the tool and not directly entered by the user.

Delivered Energy

None given

Building Annual Summary for Energy Use and Energy Cost

Energy Type	Total Annual Use	Units	Conversion Multiplier	Thousands BTU	Total Annual Cost ($)
Electricity	1008385.0	kWh	3.412	3440609.56	74350.0
Utility District Steam	4.433	Mlbs	1194000.0	5293002.105	46380.0
Chilled Water	122983.0	Ton-hour	12.0	1475796.0	14512.0
			Total	**10209408**	**135242**

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

UTILITY DATA AND BENCHMARKING

Building Name: **Lighty**

Shared System Annual Summary for Energy Use and Energy Cost

No annual summary available.

Annual Summary for On-Site Renewable Energy Production

No annual summary available.

Annual Summary for Exported Energy

No annual summary available.

Existing Building EUI/ECI

Building Name	Lighty
Gross Conditioned Square Feet	94924.0
EUI_{BLD} (kBtu/ft²/yr)	107.553
EUI_{SITE} (kBtu/ft²/yr)	107.553
Site ECI (energy cost index or $/ft²/yr)	1.425

Benchmarking

Benchmarking Source	
Benchmarking Source (Other)	
Year Benchmarked	
Benchmark Site Energy Use Intensity	
Benchmark Site Energy Cost Intensity	0.0
Target Site Energy Intensity	0.0
Target Site Energy Cost	0.0
Annual Energy Savings to Reach Target	0
Annual Cost Savings to Reach Target	0.0
Additional Comments	

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

ENERGY USE BREAKDOWN AND QA/QC

Building Name: **Lighty**

Building Energy Use by End Use

Energy Type: Electricity

End Use	Electricity (kWh)	Electricity (kBtu)
Lighting	318113.0	1085402
Plug Loads	188400.0	642821
Air Distribution	368650.0	1257834
Water Distribution	87922.0	299990
Total	**963085**	**3286046**
Total (from annual summary)	**1008385**	**3440610**
Difference	**-45300**	**-154564**
% Difference	**-4%**	**-4%**

Energy Type: Chilled Water

End Use	Chilled Water (Ton-hour)	Chilled Water (kBtu)
Space Cooling	122983.0	1475796
Total	**122983**	**1475796**
Total (from annual summary)	**122983**	**1475796**
Difference	**0**	**0**
% Difference	**0%**	**0%**

Energy Type: Utility District Steam

End Use	Utility District Steam (Mlbs)	Utility District Steam (kBtu)
Space Heating	2.315	2764110
Other - Snow Melt	2.192	2617248
Total	**5**	**5381358**
Total (from annual summary)	**4**	**5293002**
Difference	**0**	**88356**
% Difference	**2%**	**2%**

Note: fields displayed in green indicate values calculated by the tool and not directly entered by the user.

Building End Use Summary

End Use	Total Energy Use (kBtu)	% of Total Energy Use (kBtu)
Lighting	1085402	11%
Plug Loads	642821	6%
Air Distribution	1257834	12%
Water Distribution	299990	3%
Space Cooling	1475796	15%
Space Heating	2764110	27%
Other	2617248	26%

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

ENERGY USE BREAKDOWN AND QA/QC

Building Name: **Lighty**

Total	**10143200**	**100%**
Total (from annual summary)	**10209408**	
Difference	**-66208**	
% Difference	**-1%**	

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

ENERGY SAVINGS OPPORTUNITIES

Building Name: **Lighty**

Annual Energy & Cost Savings

Package Name Measure; Status (^); Modeling / Calculation Approach (^^) *	Measure Description	Total Cost Savings	Peak Demand Savings (kW)	Electricity Savings (kWh)	Utility District Steam Savings (Mlbs)	Chilled Water Savings (Ton-hour)
Potential Capital Recommendations						
Capital Measures		36264.0		248850.0	1.414	21165.0
Replace with variable speed pump; ^3; ^^2	VFD Pumps					
Retrofit with T-8; ^1; ^^2	LED Lighting + Occupancy Sensors					
Install demand control ventilation; ^1; ^^2	DCV for AHUs 1, 2, 4					
Capital Measures + RCx + Maintenance 1		43606.0		251755.0	1.988	31432.0
Retrofit with light emitting diode technologies; ^1; ^^2	LED Lighting + Occupancy Sensors					
Install demand control ventilation; ^1; ^^2	DCV for AHUs 1, 2, 4					
Other; ^1; ^^2	Retro-Commissioning					
Clean and/or repair; ^1; ^^2	Steam Trap Maintenance					
Capital Measures + Maintenance 2		45830.0		280564.0	1.988	31432.0
Retrofit with light emitting diode technologies; ^1; ^^2	LED Lighting + Occupancy Sensors					
Install demand control ventilation; ^1; ^^2	DCV for AHUs 1, 2, 4					
Other; ^1; ^^2	Retro-Commissioning					
; ^1; ^^2	Steam Trap Maintenance					
Other; ^1; ^^2	Filter Replacements					
Totals (recomm. measures)		***125700.0***	***0***	***781169.0***	***5.39***	***84029.0***

Payback with Incentives

Package Name Measure; Status (^); Modeling / Calculation Approach (^^) *	Measure cost	Potential incentives	Measure life (years)	*Net measure cost*	*Simple ROI (%)*	*Simple Payback (w/o incentives - years)*	*Simple Payback (w/ incentives - years)*
Potential Capital Recommendations							
Capital Measures				*616982*	*6%*	*17.0*	*17.0*
Replace with variable speed pump; ^3; ^^2	101336.0		20.0				
Retrofit with T-8; ^1; ^^2	483646.0		20.0				
Install demand control ventilation; ^1; ^^2	32000.0		20.0				
Capital Measures + RCx + Maintenance 1				*586839*	*7%*	*13.5*	*13.5*
Retrofit with light emitting diode technologies; ^1; ^^2	483646.0		20.0				
Install demand control ventilation; ^1; ^^2	32000.0		20.0				
Other; ^1; ^^2	71193.0		10.0				
Clean and/or repair; ^1; ^^2			5.0				
Capital Measures + Maintenance 2				*589239*	*8%*	*12.9*	*12.9*
Retrofit with light emitting diode technologies; ^1; ^^2	483646.0		20.0				
Install demand control ventilation; ^1; ^^2	32000.0		20.0				
Other; ^1; ^^2	71193.0		10.0				
; ^1; ^^2			5.0				
Other; ^1; ^^2	2400.0		0.5				
Totals (recomm. measures)	***1793060.0***	***0***		***1793060.0***			

For more information on the input fields, calculation methods, and units of measure found in this report, please visit the Asset Score web site: https://buildingenergyscore.energy.gov

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

ENERGY SAVINGS OPPORTUNITIES

Building Name: **Lighty**

*** Measure Key**

^ *Status:*
1. Recommended
2. Further Study Recommended
3. Not Recommended
4. Implemented

^^ *Modeling/Calculation Approach:*
1. Spreadsheet Calculations
2. Energy Modeling Software

Note: fields displayed in italics indicate values calculated by the tool and not directly entered by the user.

Eastlick Hall

Target EUI =	**183**
Current EUI =	**196**
Annual Utility Cost =	**$ 337,553**
Utility Cost $/sf =	**$ 2.74**
Annual Carbon Emissions (Tons) =	**1,723**
EEM $ =	**$ 2,334,705**
Area SF =	**123,241**
EEM $/SF =	**$ 18.94**
Potential Rebates =	**$ 90,811**
Potential Rebates/SF =	**$ 0.74**
Audit $ =	**$ 33,275**
Audit $/SF =	**$ 0.270**

Target EUI prorated - See calculation below. This approach was approved by WA Commerce.
(Including chilled water energy use from energy modeling)

			Meets Payback Criteria?[6]	EUI			Cost Savings		Carbon			First Cost[1]	Cost per EUI Reduction	Simple Payback	Measure Lifespan	Potential Incentives	Payback w/Incentives
				New	Reduction	% Savings	Reduction	% Savings	Reduction (Tons)	% Savings	Annual Cars Off the Road						
EEMs	EEM 1	Low Flow Fume Hoods[2]	Yes	184	13	6%	$ 19,731	5.8%	97	6%	19	$ 431,640	$ 34,227	21.9	30	$ -	21.9
	EEM 2	AHU 1 and Exhaust Fans Variable Flow Lab Conversion	Yes	146	50	25%	$ 75,721	22.4%	431	25%	85	$ 1,391,174	$ 27,847	18.4	20	$ -	18.4
	EEM 3	Replace / Repair Steam Traps[7]	Yes	192	4	2.1%	$ 4,299	1.3%	42	2%	8	$ 21,000	$ 5,189	4.9	10	$ -	4.9
	EEM 6a	AHU 4 VFD Retrofit[10]	Yes	195	0.9	0.5%	$ 2,547	0.8%	18	1%	3	$ 16,800	$ 18,389	6.6	20	$ 15,000	0.7
	EEM 7a	AHU 6 VFD Retrofit[10]	Yes	195	0.8	0.4%	$ 2,146	0.6%	52	3%	10	$ 16,800	$ 21,820	7.8	20	$ 15,000	0.8
	EEM 8	Retro - Commissioning[3]	Yes	182	14	7%	$ 21,360	6.3%	121	7%	24	$ 123,241	$ 8,706	5.8	10	$ -	5.8
	EEM 9	DDC Controls[8]	Yes	179	17	9%	$ 24,960	7.4%	54	3%	11	$ 331,650	$ 19,169	13.3	20	$ 60,811	10.9
	EEM 10	Filters Replacements and Coil Maintenance[5]	Yes	193	3	1.4%	$ 7,665	2.3%	25	1%	5	$ 2,400	$ 873	0.3	0.5	$ -	0.3
	EEM 12	Turn Off AHU7	Yes	193	3	1.7%	$ 3,726	1.1%	33	2%	7	$ -	$ -	-	-	-	-
	Does Not Meet Payback Criteria - Not Required for Compliance with Annex X																
	EEM 4	Convert All Non-Research Lab AHU's (3, 4, 6) to Full VAV	No	183	13	7%	$ 23,448	6.9%	97	6%	19	$ 1,580,964	$ 122,893	67.4	20	$ 50,000	65.3
	EEM 5	AHU 3 Full VAV Conversion[9]	No	194	3	1%	$ 3,347	1.0%	18	1%	3	$ 490,274	$ 187,453	146.5	20	$ 14,000	142.3
	EEM 6	AHU 4 Full VAV Conversion[9]	No	190	6	3%	$ 11,500	3.4%	52	3%	10	$ 420,301	$ 67,629	36.5	20	$ 18,000	35.0
	EEM 7	AHU 6 Full VAV Conversion[9]	No	190	6.5	3%	$ 11,120	3.3%	54	3%	11	$ 651,631	$ 99,793	58.6	20	$ 18,000	57.0
	EEM 11	LED Lighting System and Controls[4]	No	189	8	4%	$ 16,555	4.9%	54	3%	11	$ 367,525	$ 48,962	22.2	20	$ 32,580	20.2
Bundles	Bundled Measures																
	Bundle 1	EEM 3, EEM 10, EEM 11, EEM 12	Yes	179	18	9%	$ 32,244	9.6%	154	9%	30	$ 390,925	$ 22,184	12.1	20	$ 32,580	11.1
	Bundle 2	EEM 2, EEM 3, EEM 10, EEM 11, EEM 12	Yes	129	68	34%	$ 107,966	32.0%	585	34%	115	$ 1,782,099	$ 26,371	16.5	21	$ 32,580	16.2

1) First cost includes:
12% for General Conditions
10% for Overhead/Profit
10% for Contingency

2) This measure meets payback criteria for Annex X compliance, but could be deferred since existing fume hoods still have useful life

3) This assumes the entire building undergoes retro-commissioning. There is a phasing component to consider - it would not be done for systems that will be undergroing retrofits in the near future.

4) There are various LED lighting retrofit options - this one is shown since it has the highest first cost but also the lowest lifecycle cost due to lower maintenance and longer lifespan. The saved material and labor costs usually reduce the payback down to the 10-year range. This option also has the lowest energy use and is the best for meeting the EUI target. Other LED retrofit options would meet the Payback Criteria and be required for Annex X compliance.

5) This is a routine maintenance measure and is shown to highlight the potential energy savings of this low-cost/no-cost measure.

6) "Payback criteria" refers to the Investment Criteria in Annex X. If a measure has a shorter payback than its lifespan, it must be implemented in order to comply with Annex X

7) We were unable to verify the number of steam traps per building and/or identify the number in need of repair. We assumed 30 traps for Eastlick with 20% needing repair/replacement now, and 5% annual maintenance moving forward. New installed steam traps typically cost $650-$1,750 depending on material.

8) This measure is only applied to AHU 3, 4, and 6. It assumes the controls will be upgraded for the other air handlers as part of EEM 2.

9) This measure assumes zone boxes are replaced with variable volume boxes, in addition to VFDs being added to fans (except for AHU 3, which already has a VFD). Replacing the boxes is expensive, so this is often pursued as an "end of life" measure to replace failing systems.
Adding VFDs to these units without replacing zone boxes (similar to what was done for SF-1 in Clark Hall) is covered in EEM 6a and 7a.

10) This measure only includes adding a VFD to the AHU fans. This is similar to what was done for SF-1 in Clark Hall.

Level	% of Total Area	Use	Notes	Table 7-2a EUIt	Table 7-2a Type
Basement	20%	Vivarium (Animal lab)		249	Technology/Science - Laboratory
Ground Level	20%	Teaching Lab	Light lab classrooms - a couple fume hoods each	249	Technology/Science - Laboratory
Level 1	20%	Teaching Lab	Light lab classrooms - a couple fume hoods each	249	Technology/Science - Laboratory
Level 2	20%	Teaching Lab	Light lab classrooms - no fume hoods	102	Education - College/University
Level 3	20%	Faculty Office		68	Office - Other office
Weighted				**183.4**	

Eastlick Summary:	Eastlick operates ok compared to its Target EUI. The analysis shows it may be possible to reach the EUI target without a larger capital project, but it would be close. We recommend carrying one of the larger capital projects (e.g. EEM 1, EEM 2) to be conservative in capital requests.

Building	EEM #	Measure	Current Conditions	Proposed Changes
Eastlick	EEM 1	Low Flow Fume Hoods	Currently all fume hoods are constant volume and operate 24/7. Most hoods have face velocities of 100fpm	Replace the current hoods with low flow hoods with face velocities of 80fpm. SF1 and associated exhaust fans would need rebalancing.
	EEM 2	AHU 1 and Exhaust Fans Variable Flow Lab Conversion	AHU1 is a dual duct constant volume system. SF1 has a VFD, but there are no controls in the zone/fume hood systems to allow it to turn down. Currently all fume hoods are constant volume and operate 24/7. Most hoods have face velocities of 100fpm. All controls are original and pneumatic.	Lab Supply and General Lab Exhaust: Replace (19) constant volume terminal units with VAV boxes on the supply side and pressure-independent fast-acting lab control valves on the lab general exhaust. Fume Hood Exhaust: Convert (5) fume hoods to variable volume. This includes a pressure-independent fast-acting lab control valve (or Venturi valve), hood sash sensor, and blanking off the bypass above the hood. Exhaust Fans: Per discussions with EH+S, it is unclear whether the current exhaust fans can turndown while maintaining a safe plume height for the surrounding buildings. The first cost assumes the fans will need to be replaced, but further study will need to be done by a contractor to determine the best method for modification/replacement. Controls: Replace the pneumatic controls with DDC to allow SF1 to modulate. Maintain minimum 6 ACH during occupied hours in all lab spaces served by SF1 and turndown to a minimum 2 ACH during nighttime unoccupied hours. Fume hoods must maintain minimum flows at all times. Implement a temperature setpoint of 70F and a cooling setpoint of 76F. Implement temperature setbacks at night where allowed.
	EEM 3	Replace/Repair Steam Traps	Steam systems require frequent maintenance and should be inspected annually. The system in this building does not receive regular scheduled maintenance and the traps are known to be in poor condition.	Inspect and maintain the steam system annually to ensure optimal operation. The audit team was not able to confirm the number of traps in the building. Savings estimates for this measure are based on previous experience with steam traps and industry references.
	EEM 4	Convert All Non-Research Lab AHU's (3, 4, 6) to Full VAV	This is a combination of the AHU 3, 4, and 6 measures below. See below for description.	This is a combination of the AHU 3, 4, and 6 measures below. See below for description.
	EEM 5	AHU 3 Full VAV Conversion	AHU 3 is a dual duct constant volume system mostly serving classrooms and teaching laboratories. SF3 and RF3 have VFDs but there are no controls in the zones to allow them to turn down.	Lab Supply and General Lab Exhaust: Replace (29) constant volume terminal units with VAV boxes. Fume Hood Exhaust: This measure would not change the operation of the exhaust systems in the teaching labs/classrooms. Controls: Replace all pneumatic controls with DDC controls to allow for variable flow operation. The variable flow operation would be load driven, not exhaust driven.
	EEM 6	AHU 4 Full VAV Conversion	AHU 4 is a single duct constant volume system mostly serving classrooms and teaching laboratories.	Fans: Replace the motors for SF4 and RF2 with inverter duty-rated motors and add VFDs. Lab Supply and General Lab Exhaust: Replace (34) constant volume terminal units with VAV boxes. Fume Hood Exhaust: This measure would not change the operation of the exhaust systems in the teaching labs/classrooms. Controls: Replace all pneumatic controls with DDC controls to allow for variable flow operation. The variable flow operation would be load driven, not exhaust driven.
	EEM 7	AHU 6 Full VAV Conversion	AHU 6 is a dual duct constant volume system mostly serving offices and corridors.	Fans: Replace the motors for SF6 and RF1 with inverter duty-rated motors and add VFDs. Zone Systems: Replace (83) constant volume dual duct mixing boxes with variable volume dual actuator mixing boxes. Controls: Replace all pneumatic controls with DDC controls.
	EEM 6a	AHU 4 VFD Retrofit	AHU 4 is a dual duct constant volume system mostly serving classrooms and teaching laboratories.	Replace the motors for SF4 and RF2 with inverter duty-rated motors and add VFDs. Install a pressure sensor in the supply duct to allow for pressure reset. The supply fan will modulate slightly in order to maintain the pressure in the supply duct. This measure does not include modulating VAV operation, and is an energy saving measure with a much lower first cost than the full VAV conversion measure.
	EEM 7a	AHU 6 VFD Retrofit	AHU 6 is a dual duct constant volume system mostly serving offices and corridors.	Replace the motors for SF4 and RF2 with inverter duty-rated motors and add VFDs. Install a pressure sensor in the supply duct to allow for pressure reset. The supply fan will modulate slightly in order to maintain the pressure in the supply duct. This measure does not include modulating VAV operation, and is an energy saving measure with a much lower first cost than the full VAV conversion measure.
	EEM 8	Retro - Commissioning	Most of the HVAC system and pneumatic controls are original. The controls function poorly contributing to increased energy usage. There are no temperature setbacks at night because the pneumatic controls have limited functionality. The building gets very hot during the summer and cold during the winter.	Retro-commission the building to identify controls that are malfunctiong and scheduling that is no longer appropriate. This will help alleviate many of the comfort issues in the building while also decreasing the need for heating and cooling. This measure includes the implementation costs and energy savings for implementing the identified fixes. This assumes the entire building undergoes retro-commissioning. There is a phasing component to consider - it would not be done for systems that will be undergroing retrofits in the near future.
	EEM 9	DDC Controls	Most of the HVAC systems and pneumatic controls are original. It is expected that the controls function poorly contributing to increased energy usage. There are no temperature setbacks at night. The building gets very hot during the summer and cold during the winter.	Replace the pneumatic controls for AHUs 3,4, and 6 with new DDC to improve operation and occupant comfort. If the VAV conversion measures above are pursued, they will include DDC controls upgrades and this measure will be irrelevant.
	EEM 10	Filters Replacements and Coil Maintenance	It was reported to the audit team that hydronic coils in AHUs are seldom cleaned. Some filters are changed out regularly, every 3-6 months, while others are not.	Clean hydronic coils annually. Replace the pre-filters every 3 months and the MERV 13 filters every 6 months.
	EEM 11	LED Lighting System and Controls	Interior lighting in the building consists of a combination of incandescent and flourescent tube lights controlled by manual switches. The custodial staff sweep off the lights in corridors and common area at 9pm and sweep them on at 6am.	Replace the flourescent fixtures with a new code-compliant LED lighting system. This include daylighting and occupancy sensors where required. Connect the lab general exhaust to the occupancy sensors so the room exhaust may turn down to 3 ACH when the space is unoccupied during regular operational hours. The first cost for this measure assumes the entire system is replaced - this has the highest first cost, lowest maintenance cost and longest system lifespan of LED upgrade options. Cheaper LED upgrade options are available (with lower energy savings) to reduce first cost.
	EEM 12	Turn Off AHU7	AHU 7 conditions the workshop on the 1st floor which is not used. This unit was running during the inspection.	This unit should be either turned off or the heating setpoint should be reduced to 55F if freezing is a concern.

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

OVERVIEW

BUILDING INFORMATION

Eastlick
300 Veterans Way
Pullman, WA 99164

Report Type	**WA Commerce Grants Report**	Report Status:	**In Progress**
		Report Date:	**05/27/2021**
Gross Floor Area:	**123,241.0 ft²**	Year Built:	**1977**
Building ID #:	**12395**	Software Release:	2021.1.0.1459
Project Name	**WSU Audits**		

AUDIT TEAM

Glumac
900 SW 5th Ave #1600
Portland, OR 97204
(503) 345-6337

DATA SUMMARY

This report was generated from data entered into the Building Energy Asset Score (Asset Score) tool, developed by the Pacific Northwest National Laboratory (PNNL) for the U.S. Department of Energy (DOE). Asset Score is a national standardized tool for assessing the physical and structural energy efficiency of commercial and multifamily residential buildings. It also facilitates building energy audit data collection and reporting.

This report follows the ASHRAE/ACCA Standard 211P, Standard for Commercial Building Energy Audits. It also includes additional data fields required by specific cities, where applicable. The icons below identify data categories.

- ASHRAE Level 2 inputs
- City specific inputs

If this report is used to comply with a local energy audit ordinance, the fields marked with * indicate the minimum data to be reported. The audit team listed above is responsible for any information entered and reported through Asset Score. DOE and PNNL do not warranty data accuracy, completeness, legality, and reliability.

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

CONTACT INFORMATION AND AUDIT DETAILS

Building Name: **Eastlick**

Submission Information

Date of Submission	Never
Submission Version	None

Audit Details

Date of Completion for Level 1 Audit		☑ N/A
Date of Completion for Level 2 Audit	05/01/2021	
Date of Completion for Level 3 Audit		☑ N/A
Year of Last Renovation	2017	
Year of Prior Energy Audit		☑ N/A
Year Last Commissioned		☑ N/A
Additional Comments		

Audit Team and Building Staff

Auditor

Name*	Mike Prier
Company Name or Organization*	Glumac
Street Address	900 SW 5th Ave #1600
City	Portland
State	OR
Postal Code	97204
Phone*	(503) 345-6337
Email*	mprier@glumac.com

Building Owner

Name*	Phil Johnson
Company Name or Organization*	WSU
Street Address	
City	
State	
Postal Code	
Phone*	(509) 335-9029
Email*	philrjohnson@wsu.edu

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **Eastlick**

Building Characteristics

Gross Floor Area*	123241.0
Spaces Excluded from Gross Floor Area	
Conditioned Floor Area, Heated Only	0.0
Conditioned Floor Area, Cooled Only	0.0
Conditioned Floor Area, Heated and Cooled	92130.0
Total Conditioned Floor Area	92130.0
Number of Floors Above-Grade, Conditioned	5
Number of Floors Below-Grade, Conditioned	0
General Building Shape	Rectangular
Building Automation System?	Yes
Historic Building?*	No

Use Types

Other - Technology/Science (Original: Other - Technology/Science)

Use Type / Space Function / Building Area Type*	Other - Technology/Science	
Original Intended Use	Other - Technology/Science	
Gross Floor Area*	73945.0	
Percentage of Space Conditioned	100.0	
Number of Occupants*	720	
Use (hours/week)*	78.0	
Use (weeks/year)*	52.0	
Approximate Plug Loads	3.1	
Number of Dwelling Units		☑ N/A
Percentage of Dwelling Units Currently Occupied		☑ N/A
Principal HVAC Type	Other	
Principal Lighting Type	Fluorescent T8	

College/University (Original: College/University)

Use Type / Space Function / Building Area Type*	College/University
Original Intended Use	College/University
Gross Floor Area*	24648.0
Percentage of Space Conditioned	100.0
Number of Occupants*	240

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **Eastlick**

Use (hours/week)*	76.0	
Use (weeks/year)*	52.0	
Approximate Plug Loads	1.5	
Number of Dwelling Units		☑ N/A
Percentage of Dwelling Units Currently Occupied		☑ N/A
Principal HVAC Type	Other	
Principal Lighting Type	Fluorescent T8	

Office (Original: Office)

Use Type / Space Function / Building Area Type*	Office	
Original Intended Use	Office	
Gross Floor Area*	24648.0	
Percentage of Space Conditioned	100.0	
Number of Occupants*	240	
Use (hours/week)*	76.0	
Use (weeks/year)*	52.0	
Approximate Plug Loads	1.2	
Number of Dwelling Units		☑ N/A
Percentage of Dwelling Units Currently Occupied		☑ N/A
Principal HVAC Type	Other	
Principal Lighting Type	Fluorescent T8	

Roofs

Built-Up with Concrete Deck

Roof Construction	Built-Up with Concrete Deck
Roof R Value	4.0
Roof Condition	Average
Cool Roof	No
Green Roof	No
Blue Roof	No
Roof Area	26000.0

Walls

BUILDING ENERGY AUDIT TEMPLATE
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FACILITY DESCRIPTION

Building Name: **Eastlick**

Brick/Stone on Steel Frame

Wall Construction	Brick/Stone on Steel Frame
Above Grade Wall Insulation R Value	4.0
Below Grade Wall Insulation R Value	4.0
Total Exposed Above Grade Wall Area	50529.0
Below Grade Wall Area	15218.0
Above Grade Demising Wall Area	0.0
Overall Enclosure Tightness Assessment	2 (bad = higher rate of infiltration/exfiltration)
Type of Exterior Door Construction	Insulated metal

Windows

Metal, Single Pane

Framing Material	Metal
Window Glass Type	Single Pane
Fenestration Seal Condition	3 (standard = normal rate of infiltration/exfiltration)
Window Wall Ratio	0.07999999821186066

Foundation Types

Slab-On-Grade

Floor Construction Type	Slab-On-Grade
Ventilated Crawlspace	No
R Value	0.0

Exterior Floors

None given

Lighting

	Controls						
Fixture (^^^); *	Manual	Photocell	Timer	Occupancy Sensor	Building Automation System	Advanced	Other

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **Eastlick**

Fixture 1: Fluorescent T8; ^^^3	Yes	No	No	No	No	No	No
Fixture 2: Fluorescent T8; ^^^3	Yes	No	No	No	No	No	No
Fixture 3: Fluorescent T8; ^^^3	Yes	No	No	No	No	No	No

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **Eastlick**

Fixture Locations

Fixture (^^^); *	Location	Quantity Definition	Area Served (%)	Area Served (ft^2)
Fixture 1: Fluorescent T8; ^^^3	Other - Technology/Science (Original: Other - Technology/Science)	% Area Served	100.0	0.0
Fixture 2: Fluorescent T8; ^^^3	College/University (Original: College/University)	% Area Served	100.0	0.0
Fixture 3: Fluorescent T8; ^^^3	Office (Original: Office)	% Area Served	100.0	0.0

*** Fixture Key**

^^^ *Ballast Type:*
1. Premium Electronic
2. Standard Electronic
3. Magnetic
4. N/A

Heating Plants

Utility District Steam, Utility District Steam

Heating Plant Type	Utility District Steam
Fuel Type	Utility District Steam
Controls	
Building Automation System (BAS)	Yes
Direct Digital (DDC)	No
Pneumatic	Yes

Cooling Plants

District Chilled Water, Chilled Water

Cooling Plant Type	District Chilled Water
Fuel Type	Chilled Water
Controls	
Building Automation System (BAS)	Yes
Direct Digital (DDC)	No
Pneumatic	Yes

BUILDING ENERGY AUDIT TEMPLATE
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FACILITY DESCRIPTION

Building Name: **Eastlick**

Condenser Plants

None given

HVAC Systems

HVAC System 20518

Heating	
Heating Source	Plant
Heating Plant	Utility District Steam, Utility District Steam
Cooling	
Cooling Source	Plant
Cooling Plant	District Chilled Water, Chilled Water
Distribution Equipment	
Delivery Equipment Type	Central Fan
Other Delivery Equipment Type	
Central Distribution Type	Forced Air
Other Central Distribution Type	
Fan Control	Constant Volume
Energy Recovery Ventilation	Sensible Only
Outdoor Air Control	Temperature Economizer
Zone Controls	
Direct Digital Controls (DDC)	No
Pneumatic Control	Yes
Manual Thermostat	Yes
Programmable Thermostat	No
None	No

HVAC System 20519

Heating	
Heating Source	
Cooling	
Cooling Source	
Distribution Equipment	
Delivery Equipment Type	
Other Delivery Equipment Type	
Central Distribution Type	
Other Central Distribution Type	
Fan Control	

BUILDING ENERGY AUDIT TEMPLATE
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FACILITY DESCRIPTION

Building Name: **Eastlick**

- Energy Recovery Ventilation
- Outdoor Air Control

Zone Controls

Direct Digital Controls (DDC)	No
Pneumatic Control	No
Manual Thermostat	No
Programmable Thermostat	No
None	No

Service Hot Water Systems

Plant

System Type	Plant

Process Loads: Renewables

Solar Thermal System	No
Solar PV System	No
Wind System	No
None	No
Peak Generating Capacity	

Process Loads: Backup Generation

- System Type

Process Loads: Data Centers

Total Area	
Metered Space	No
Connected Load	
UPS Capacity	
PUE	

BUILDING ENERGY AUDIT TEMPLATE
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FACILITY DESCRIPTION

Building Name: **Eastlick**

Process Loads: Commercial Kitchens

- Connected Load
- Total Area of Commercial Kitchen

BUILDING ENERGY AUDIT TEMPLATE
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UTILITY DATA AND BENCHMARKING

Building Name: **Eastlick**

Metered Energy Supply Source Details

Energy Supply Source	Account #	Metering Type	Rate Schedule
Electricity			

Energy Reporting Years

Start Date	End Date	Metering entries	Delivery entries
07/01/2018	06/30/2019	2	0
07/01/2019	06/30/2020	0	0

Metered Energy

Energy Type: Electricity

Start Date	End Date	Days	Use (kWh)	Cost ($)	Peak (kW)	Load Factor	kWh / day	kBtu / day
07/01/2018	07/01/2020	732	4963680.0	382626.0		0%	6781	23137
	Average Annual Total		2478151	191313	0	0%		

Energy Type: Utility District Steam

Start Date	End Date	Days	Use (Mlbs)	Cost ($)	Mlbs / day	kBtu / day
07/01/2018	07/01/2020	732	17.406	209130.0	0	28392
	Average Annual Total		10	104565		

Note: fields displayed in green indicate values calculated by the tool and not directly entered by the user.

Delivered Energy

None given

Building Annual Summary for Energy Use and Energy Cost

Energy Type	Total Annual Use	Units	Conversion Multiplier	Thousands BTU	Total Annual Cost ($)
Electricity	2478151.0	kWh	3.412	8455451.065	191313.0
Utility District Steam	10.16	Mlbs	1194000.0	12131039.818	104565.0
Chilled Water	353183.0	Ton-hour	12.0	4238196.0	41676.0
			Total	24824687	337554

BUILDING ENERGY AUDIT TEMPLATE
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UTILITY DATA AND BENCHMARKING

Building Name: **Eastlick**

Shared System Annual Summary for Energy Use and Energy Cost

No annual summary available.

Annual Summary for On-Site Renewable Energy Production

No annual summary available.

Annual Summary for Exported Energy

No annual summary available.

Existing Building EUI/ECI

Building Name	Eastlick
Gross Conditioned Square Feet	123241.0
EUI_{BLD} (kBtu/ft²/yr)	201.432
EUI_{SITE} (kBtu/ft²/yr)	201.432
Site ECI (energy cost index or $/ft²/yr)	2.739

Benchmarking

Benchmarking Source	
Benchmarking Source (Other)	
Year Benchmarked	
Benchmark Site Energy Use Intensity	
Benchmark Site Energy Cost Intensity	0.0
Target Site Energy Intensity	0.0
Target Site Energy Cost	0.0
Annual Energy Savings to Reach Target	0
Annual Cost Savings to Reach Target	0.0
Additional Comments	

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

ENERGY USE BREAKDOWN AND QA/QC

Building Name: **Eastlick**

Building Energy Use by End Use

Energy Type: Electricity

End Use	Electricity (kWh)	Electricity (kBtu)
Lighting	350929.0	1197370
Plug Loads	531727.0	1814252
Air Distribution	1270464.0	4334823
Water Distribution	108542.0	370345
Process Loads	216490.0	738664
Total	**2478152**	**8455454**
Total (from annual summary)	**2478151**	**8455451**
Difference	**1**	**3**
% Difference	**0%**	**0%**

Energy Type: Chilled Water

End Use	Chilled Water (Ton-hour)	Chilled Water (kBtu)
Space Cooling	299536.0	3594432
Process Loads	52646.0	631752
Total	**352182**	**4226184**
Total (from annual summary)	**353183**	**4238196**
Difference	**-1001**	**-12012**
% Difference	**0%**	**0%**

Energy Type: Utility District Steam

End Use	Utility District Steam (Mlbs)	Utility District Steam (kBtu)
Space Heating	10.16	12131040
Total	**10**	**12131040**
Total (from annual summary)	**10**	**12131040**
Difference	**0**	**0**
% Difference	**0%**	**0%**

Note: fields displayed in green indicate values calculated by the tool and not directly entered by the user.

Building End Use Summary

End Use	Total Energy Use (kBtu)	% of Total Energy Use (kBtu)
Lighting	1197370	5%
Plug Loads	1814252	7%
Air Distribution	4334823	17%
Water Distribution	370345	1%
Process Loads	1370416	6%
Space Cooling	3594432	14%

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

ENERGY USE BREAKDOWN AND QA/QC

Building Name: **Eastlick**

Space Heating	12131040	49%
Total	**24812678**	**100%**
Total (from annual summary)	**24824687**	
Difference	**-12009**	
% Difference	**0%**	

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

ENERGY SAVINGS OPPORTUNITIES

Building Name: **Eastlick**

Annual Energy & Cost Savings

Package Name Measure; Status (^); Modeling / Calculation Approach (^^) *	Measure Description	Total Cost Savings	Peak Demand Savings (kW)	Electricity Savings (kWh)	Utility District Steam Savings (Mlbs)	Chilled Water Savings (Ton-hour)
Potential Capital Recommendations						
Variable Flow Exhaust		75721.0		446751.0	2.978	89764.0
Other ventilation; ^1; ^^2	Variable Flow Exhaust					
Minimal Measures + Lighting		32244.0		275368.0	0.791	23901.0
Retrofit with light emitting diode technologies; ^1; ^^2	LED Lighting + Occupancy Sensor					
Clean and/or repair; ^1; ^^2	Replace/Repair Steam Traps					
Clean and/or repair; ^1; ^^2	Filter Replacements and Coil Maintenance					
Other distribution; ^1; ^^2	Turn Off AHU 7					
Variable Flow Exhaust + Lighting + Maintenance		107966.0		722119.0	3.768	113666.0
Other ventilation; ^1; ^^2	Variable Flow Exhaust					
Retrofit with T-8; ^1; ^^2	LED Lighting + Occupancy Sensor					
Clean and/or repair; ^1; ^^2	Replace/Repair Steam Traps					
Clean and/or repair; ^1; ^^2	Filter Replacements and Coil Maintenance					
Other distribution; ^1; ^^2	Turn Off AHU 7					
Totals (recomm. measures)		***215931.0***	***0***	***1444238.0***	***7.537***	***227331.0***

Payback with Incentives

Package Name Measure; Status (^); Modeling / Calculation Approach (^^) *	Measure cost	Potential incentives	Measure life (years)	*Net measure cost*	*Simple ROI (%)*	*Simple Payback (w/o incentives - years)*	*Simple Payback (w/ incentives - years)*
Potential Capital Recommendations							
Variable Flow Exhaust				*879615*	*9%*	*14.2*	*11.6*
Other ventilation; ^1; ^^2	1075615.0	196000.0	20.0				
Minimal Measures + Lighting				*337345*	*10%*	*11.5*	*10.5*
Retrofit with light emitting diode technologies; ^1; ^^2	367525.0	32580.0	20.0				
Clean and/or repair; ^1; ^^2			5.0				
Clean and/or repair; ^1; ^^2	2400.0		0.5				
Other distribution; ^1; ^^2			20.0				
Variable Flow Exhaust + Lighting + Maintenance				*1216960*	*9%*	*13.4*	*11.3*
Other ventilation; ^1; ^^2	1075615.0	196000.0	20.0				
Retrofit with T-8; ^1; ^^2	367525.0	32580.0	20.0				
Clean and/or repair; ^1; ^^2							
Clean and/or repair; ^1; ^^2	2400.0		0.5				
Other distribution; ^1; ^^2			20.0				
Totals (recomm. measures)	***2891080.0***	***457160.0***		***2433920.0***			

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

ENERGY SAVINGS OPPORTUNITIES

Building Name: **Eastlick**

*** Measure Key**

^ *Status:*
1. Recommended
2. Further Study Recommended
3. Not Recommended
4. Implemented

^^ *Modeling/Calculation Approach:*
1. Spreadsheet Calculations
2. Energy Modeling Software

Note: fields displayed in italics indicate values calculated by the tool and not directly entered by the user.

Clark Hall

Target EUI =	**249**	(Laboratory - not prorated for office spaces)
Current EUI =	**416**	(Including chilled water energy use from energy modeling)
Annual Utility Cost =	**$ 547,000**	
Utility Cost $/sf =	**$ 5.25**	
Annual Carbon Emissions (Tons) =	**2,829**	
EEM $ =	**$ 4,709,400**	
Area SF =	**104,207**	
EEM $/SF =	**$ 45.19**	
Potential Rebates =	**$ 683,720**	
Potential Rebates/SF =	**$ 6.56**	
Audit $ =	**$ 26,573**	
Audit $/SF =	**$ 0.255**	

			Meets Payback Criteria?[7]	EUI			Carbon			Cost Savings		First Cost[1]	Simple Payback (Yrs)	Cost per EUI Reduction	Measure Lifespan	Potential Incentives	Payback w/ Incentives
				New	Reduction	% Savings	Reduction (Tons)	% Savings	Annual Cars Off the Road	Reduction	% Savings						
EEMs	EEM 1	Low Flow Fume Hoods[2]	Yes	378	39	9%	251	9%	50	$ 51,000	9%	$ 1,000,000	19.6	$ 25,951	30	$ -	19.6
	EEM 2	SF1 and Exhaust Fans Variable Flow Lab Conversion	Yes	231	186	45%	1,235	44%	244	$ 214,000	39%	$ 3,046,000	14.2	$ 16,391	20	$ 499,000	11.9
	EEM 3	Replace / Repair Steam Traps[3]	Yes	398	18	4%	156	6%	31	$ 16,000	3%	$ 60,000	-	$ 3,340	5	$ -	5.0
	EEM 7	Retro - Commissioning[4]	Yes	318	98	24%	496	18%	98	$ 93,000	17%	$ 104,000	1.1	$ 1,062	5	$ 137,800	-0.4
	EEM 8	LED Lighting System and Controls[5]	Yes	399	17	4%	75	3%	15	$ 27,000	5%	$ 495,000	18.3	$ 28,383	20	$ 46,920	16.6
	EEM 9	Filters Replacements and Coil Maintenance[6]	Yes	412	4	1%	31	1%	6	$ 9,000	2%	$ 2,400	0.3	$ 600	0.5	$ -	0.3
	EEM 10	Insulate Walk-In Cooler Refrigerant Lines	Yes	415	1.6	0%	5	0%	1	$ 2,000	0.4%	$ 2,000	1.0	$ 1,246	25	$ -	-
	Does Not Meet Payback Criteria - Not Required for Compliance with Annex X																
	EEM 4	VFD Pumps	No	414	2	1%	27	1%	5	$ 8,230	2%	$ 172,000	20.8	$ 75,859	20	$ 9,800	19.7
	EEM 5	VFD SF2 and RF1	No	390	27	6%	217	8%	43	$ 33,000	6%	$ 1,118,000	33.9	$ 41,879	25	$ 30,000	33.0
Bundles	Bundled Measures																
	Bundle 1	EEM 1 and 2	-	222	194	47%	1,294	46%	255	$ 222,000	41%	$ 4,046,000	18.2	$ 20,819	20		
	Bundle 2	EEMs 1, 2, 3, 8, 9, 10	-	207	209	50%	1,388	49%	274	$ 251,000	46%	$ 4,542,000	18.2	$ 21,700	20		

1) First cost includes:
12% for General Conditions
10% for Overhead/Profit
10% for Contingency

2) This measure meets payback criteria, but can be deferred since existing fume hoods still have useful life.
3) It was assumed that Clark has 30 steam traps of which 20% need to be replaced and that this maintenance would occur every year.
4) This assumes the entire building undergoes retro-commissioning. There is a phasing component to consider - it would not be done for systems that will be undergroing retrofits in the near future. Thus it is not included in the bundles.
5) There will be reduced maintenance associated with LED lighting compared to fluorescent, since the fixtures have much longer lifespans.
6) This is a routine maintenance measure and is shown to highlight the potential energy savings of this low-cost/no-cost measure.
7) "Payback criteria" refers to the Investment Criteria in Annex X. If a measure has a shorter payback than its lifespan, it must be implemented in order to comply with Annex X.

Clark Summary: Clark operates poorly compared to its target EUI and will require the largest capital investment. Major retrofits to most of the HVAC systems will be required.

Building	EEM #	Measure	Current Conditions	Proposed Changes
Clark	EEM 1	Low Flow Fume Hoods	Currently all fume hoods are constant volume and operate 24/7. Most hoods have face velocities of 100fpm	Replace the current hoods with low flow hoods with face velocities of 80fpm. SF1 and associated exhaust fans would need rebalancing.
	EEM 2	SF1 and Exhaust Fans Variable Flow Lab Conversion	AHU1 is a single duct constant volume system. SF1 has a VFD, but there are no controls in the zone/fume hood systems to allow it to turn down. Currently all fume hoods are constant volume and operate 24/7. Most hoods have face velocities of 100fpm. All controls are original pneumatic controls.	Lab Supply and General Lab Exhaust: Replace (135) constant volume terminal units with VAV boxes on the supply side and pressure-independent fast-acting lab control valves on the lab general exhaust. Fume Hood Exhaust: Convert (49) fume hoods to variable volume. This includes a pressure-independent fast-acting lab control valve (or Venturi valve), hood sash sensor, and blanking off the bypass above the hood. Exhaust Fans: Replace the motors for EF3, EF4, EF5, and EF6 with inverter duty-rated motors and add VFDs. Per discussions with EH+S, the fume hood exhaust fans (EF3 and EF4) may be able to be turned down without concerns of a reduced plume height affecting surrounding buildings. The first cost assumes this is the case and does not include the cost for replacing those fans. If this is not the case, further study by a contractor will be needed to determine viable options to turndown the exhaust fans and maintain a safe plume height. This may require a common plenum on the discharge side of the exhaust fans along with a bypass fan. Controls: Replace the pneumatic controls with DDC to allow SF1 to modulate. Maintain minimum 6 ACH during occupied hours in all lab spaces served by SF1 and turndown to a minimum 2 ACH during nighttime unoccupied hours. Fume hoods must maintain minimum flows at all times. Implement a temperature setpoint of 70F and a cooling setpoint of 76F. Implement temperature setbacks at night where allowed.
	EEM 3	Replace/Repair Steam Traps	Steam systems require frequent maintenance and should be inspected annually. The system in this building does not receive regular scheduled maintenance and the traps are known to be in poor condition.	Inspect and maintain the steam system annually to ensure optimal operation. The audit team was not able to confirm the number of traps in the building. Savings estimates for this measure are based on previous experience with steam traps and industry references.
	EEM 4	VFD Pumps	All pumps are constant speed.	Add VFDs and the necessary controls to all pumps including the chilled water pumps for the AHU coils, the reheat and radiator pumps, the heat recovery loop pump, and the condensate pump. (2 chilled water coil pumps, 1 heat recovery pump,1 terminal unit reheat pump, 2 perimeter radiator pumps, 1 condensate pump)
	EEM 5	VFD SF2 and RF1	AHU2 is a single duct constant volume system serving the perimeter offices spaces. Heating is provided by hot water radiators. SF2 and RF1 do not have VFDs.	Fans: Replace the motors for SF2 and RF1 with inverter duty-rated motors and add VFDs. Zone Systems: Replace (120) constant volume terminal units with VAV terminal units (units do not have hot water coils). Replace (120) control valves for hot water radiators. Controls: Replace all pneumatic controls with DDC controls.
	EEM 7	Retro - Commissioning	Most of the HVAC system and pneumatic controls are original. Controls function poorly contributing to increased energy usage. There are no temperature setbacks at night. The building gets very hot during the summer and cold during the winter.	Retro-commission all HVAC systems and controls to identify controls that are malfunctiong and scheduling that is no longer appropriate. This will help alleviate many of the comfort issues in the building while also decreasing the need for heating and cooling. This would not include temperature setbacks at night because the pneumatic controls have limited functionality. This measure includes not just retro-commissioning the systems but also implementing the fixes. There is a phasing component to consider - it would not be done for systems that will be undergroing retrofits in the near future.
	EEM 8	LED Lighting System Upgrade	Interior lighting mostly consists of flourescent fixtures with T8 bulbs. Lights are controlled by manual switches and are typically on from 5am - 11pm.	Replace the flourescent fixtures with a new code-compliant LED lighting system. This include daylighting and occupancy sensors where required. Connect the lab general exhaust to the occupancy sensors so the room exhaust may turn down to 3 ACH when the space is unoccupied during regular operational hours. The first cost for this measure assumes the entire system is replaced - this has the highest first cost, lowest maintenance cost and longest system lifespan of LED upgrade options. Cheaper LED upgrade options are available (with lower energy savings) to reduce first cost.
	EEM 9	Filters Replacements and Coil Maintenance	It was reported to the audit team that hydronic coils in AHUs are seldom cleaned. Some filters are changed out regularly, every 3-6 months, while others are not.	Clean hydronic coils annually. Replace the pre-filters every 3 months and the MERV 13 filters every 6 months.
	EEM 10	Insulate Walk-In Cooler Refrigerant Lines	It was reported that before COVID significant ice formed on the lines which supply refrigerant from the process water source heat pump to the walk-in coolers and freezers. These refrigerant lines are uninsulated in some areas.	Insulate the refrigerant lines.

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

OVERVIEW

BUILDING INFORMATION

Clark
2000 Wilson Rd
Pullman, WA 99164

Report Type	**WA Commerce Grants Report**	Report Status:	**In Progress**
		Report Date:	**05/27/2021**
Gross Floor Area:	**104,207.0 ft²**	Year Built:	**2021**
Building ID #:	**12384**	Software Release:	2021.1.0.1459
Project Name	**WSU Audits**		

AUDIT TEAM

Glumac
900 SW 5th Ave #1600
Portland, OR 97204
(503) 345-6337

DATA SUMMARY

This report was generated from data entered into the Building Energy Asset Score (Asset Score) tool, developed by the Pacific Northwest National Laboratory (PNNL) for the U.S. Department of Energy (DOE). Asset Score is a national standardized tool for assessing the physical and structural energy efficiency of commercial and multifamily residential buildings. It also facilitates building energy audit data collection and reporting.

This report follows the ASHRAE/ACCA Standard 211P, Standard for Commercial Building Energy Audits. It also includes additional data fields required by specific cities, where applicable. The icons below identify data categories.

- ASHRAE Level 2 inputs
- City specific inputs

If this report is used to comply with a local energy audit ordinance, the fields marked with * indicate the minimum data to be reported. The audit team listed above is responsible for any information entered and reported through Asset Score. DOE and PNNL do not warranty data accuracy, completeness, legality, and reliability.

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

CONTACT INFORMATION AND AUDIT DETAILS

Building Name: **Clark**

Submission Information

Date of Submission	Never
Submission Version	None

Audit Details

Date of Completion for Level 1 Audit		☑ N/A
Date of Completion for Level 2 Audit	05/01/2021	
Date of Completion for Level 3 Audit		☑ N/A
Year of Last Renovation	2005	
Year of Prior Energy Audit		☑ N/A
Year Last Commissioned		☑ N/A
Additional Comments		

Audit Team and Building Staff

Auditor

Name*	Mike Prier
Company Name or Organization*	Glumac
Street Address	900 SW 5th Ave #1600
City	Portland
State	OR
Postal Code	97204
Phone*	(503) 345-6337
Email*	mprier@glumac.com

Building Owner

Name*	Phil Johnson
Company Name or Organization*	WSU
Street Address	
City	
State	
Postal Code	
Phone*	(509) 335-9029
Email*	philrjohnson@wsu.edu

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **Clark**

Building Characteristics

Gross Floor Area*	104207.0
Spaces Excluded from Gross Floor Area	
Conditioned Floor Area, Heated Only	0.0
Conditioned Floor Area, Cooled Only	0.0
Conditioned Floor Area, Heated and Cooled	104027.0
Total Conditioned Floor Area	104027.0
Number of Floors Above-Grade, Conditioned	4
Number of Floors Below-Grade, Conditioned	0
General Building Shape	Rectangular
Building Automation System?	Yes
Historic Building?*	No

Use Types

Other - Technology/Science (Original: Other - Technology/Science)

Use Type / Space Function / Building Area Type*	Other - Technology/Science
Original Intended Use	Other - Technology/Science
Gross Floor Area*	104207.0
Percentage of Space Conditioned	100.0
Number of Occupants*	1200
Use (hours/week)*	78.0
Use (weeks/year)*	52.0
Approximate Plug Loads	1.83
Number of Dwelling Units	☑ N/A
Percentage of Dwelling Units Currently Occupied	☑ N/A
Principal HVAC Type	VAV with Hot Water Reheat
Principal Lighting Type	Fluorescent T8

Roofs

Built-Up with Concrete Deck

Roof Construction	Built-Up with Concrete Deck
Roof R Value	4.0

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **Clark**

Roof Condition	Average
Cool Roof	No
Green Roof	No
Blue Roof	No
Roof Area	22585.0

Walls

Brick/Stone on Steel Frame

Wall Construction	Brick/Stone on Steel Frame
Above Grade Wall Insulation R Value	4.0
Below Grade Wall Insulation R Value	4.0
Total Exposed Above Grade Wall Area	51000.0
Below Grade Wall Area	8394.0
Above Grade Demising Wall Area	0.0
Overall Enclosure Tightness Assessment	1 (poor = high infiltration/exfiltration)
Type of Exterior Door Construction	Insulated metal

Windows

Metal, Single Pane

Framing Material	Metal
Window Glass Type	Single Pane
Fenestration Seal Condition	3 (standard = normal rate of infiltration/exfiltration)
Window Wall Ratio	0.05999999865889549

Foundation Types

Slab-On-Grade

Floor Construction Type	Slab-On-Grade
Ventilated Crawlspace	No
R Value	0.0

Exterior Floors

None given

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **Clark**

Lighting

	Controls						
Fixture (^^^); *	**Manual**	**Photocell**	**Timer**	**Occupancy Sensor**	**Building Automation System**	**Advanced**	**Other**
Fixture 1: Fluorescent T8; ^^^3	Yes	No	No	No	No	No	No

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **Clark**

Fixture Locations

Fixture (^^^); *	Location	Quantity Definition	Area Served (%)	Area Served (ft^2)
Fixture 1: Fluorescent T8; ^^^3	Other - Technology/Science (Original: Other - Technology/Science)	% Area Served	100.0	0.0

*** Fixture Key**

^^^ *Ballast Type:*
1. Premium Electronic
2. Standard Electronic
3. Magnetic
4. N/A

Heating Plants

Utility District Steam, Utility District Steam

Heating Plant Type	Utility District Steam
Fuel Type	Utility District Steam
Controls	
Building Automation System (BAS)	Yes
Direct Digital (DDC)	No
Pneumatic	Yes

Cooling Plants

District Chilled Water, Chilled Water

Cooling Plant Type	District Chilled Water
Fuel Type	Chilled Water
Controls	
Building Automation System (BAS)	Yes
Direct Digital (DDC)	No
Pneumatic	Yes

Condenser Plants

None given

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **Clark**

HVAC Systems

HVAC System 20516

Heating	
Heating Source	Plant
Heating Plant	Utility District Steam, Utility District Steam
Cooling	
Cooling Source	Plant
Cooling Plant	District Chilled Water, Chilled Water
Distribution Equipment	
Delivery Equipment Type	Central Fan
Other Delivery Equipment Type	
Central Distribution Type	Forced Air
Other Central Distribution Type	
Fan Control	Constant Volume
Energy Recovery Ventilation	Sensible Only
Outdoor Air Control	Dedicated Outdoor Air System
Zone Controls	
Direct Digital Controls (DDC)	No
Pneumatic Control	Yes
Manual Thermostat	Yes
Programmable Thermostat	No
None	No

HVAC System 20517

Heating	
Heating Source	Plant
Heating Plant	Utility District Steam, Utility District Steam
Cooling	
Cooling Source	Plant
Cooling Plant	District Chilled Water, Chilled Water
Distribution Equipment	
Delivery Equipment Type	Central Fan
Other Delivery Equipment Type	
Central Distribution Type	Forced Air
Other Central Distribution Type	
Fan Control	Constant Volume
Energy Recovery Ventilation	None

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **Clark**

Outdoor Air Control	Temperature Economizer
Zone Controls	
Direct Digital Controls (DDC)	No
Pneumatic Control	Yes
Manual Thermostat	Yes
Programmable Thermostat	No
None	No

Service Hot Water Systems

Plant

System Type	Plant

Process Loads: Renewables

Solar Thermal System	No
Solar PV System	No
Wind System	No
None	No
Peak Generating Capacity	

Process Loads: Backup Generation

System Type	

Process Loads: Data Centers

Total Area	
Metered Space	No
Connected Load	
UPS Capacity	
PUE	

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

FACILITY DESCRIPTION

Building Name: **Clark**

Process Loads: Commercial Kitchens

- Connected Load
- Total Area of Commercial Kitchen

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

UTILITY DATA AND BENCHMARKING

Building Name: **Clark**

Metered Energy Supply Source Details

None given

Energy Reporting Years

Start Date	End Date	Metering entries	Delivery entries
07/01/2018	06/30/2019	2	0

Metered Energy

Energy Type: Utility District Steam

Start Date	End Date	Days	Use (Mlbs)	Cost ($)	Mlbs / day	kBtu / day
07/01/2018	06/30/2019	365	18.034	184000.0	0	58993
		Average Annual Total	18	184000		

Energy Type: Electricity

Start Date	End Date	Days	Use (kWh)	Cost ($)	Peak (kW)	Load Factor	kWh / day	kBtu / day
07/01/2018	06/30/2019	365	3515884.0	259000.0	2081.0	19%	9633	32866
	Average Annual Total		3515884	259000	0	0%		

Note: fields displayed in green indicate values calculated by the tool and not directly entered by the user.

Delivered Energy

None given

Building Annual Summary for Energy Use and Energy Cost

Energy Type	Total Annual Use	Units	Conversion Multiplier	Thousands BTU	Total Annual Cost ($)
Utility District Steam	18.034	Mlbs	1194000.0	21532596.474	184000.0
Chilled Water	890000.0	Ton-hour	12.0	10680000.0	105000.0
Electricity	3515884.0	kWh	3.412	11996196.0	259000.0
			Total	44208792	548000

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

UTILITY DATA AND BENCHMARKING

Building Name: **Clark**

Shared System Annual Summary for Energy Use and Energy Cost

No annual summary available.

Annual Summary for On-Site Renewable Energy Production

No annual summary available.

Annual Summary for Exported Energy

No annual summary available.

Existing Building EUI/ECI

Building Name	Clark
Gross Conditioned Square Feet	104207.0
EUI_{BLD} (kBtu/ft²/yr)	424.24
EUI_{SITE} (kBtu/ft²/yr)	424.24
Site ECI (energy cost index or $/ft²/yr)	5.259

Benchmarking

Benchmarking Source	
Benchmarking Source (Other)	
Year Benchmarked	
Benchmark Site Energy Use Intensity	
Benchmark Site Energy Cost Intensity	0.0
Target Site Energy Intensity	0.0
Target Site Energy Cost	0.0
Annual Energy Savings to Reach Target	0
Annual Cost Savings to Reach Target	0.0
Additional Comments	

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

ENERGY USE BREAKDOWN AND QA/QC

Building Name: **Clark**

Building Energy Use by End Use

Energy Type: Electricity

End Use	Electricity (kWh)	Electricity (kBtu)
Lighting	420000.0	1433040
Plug Loads	959000.0	3272108
Air Distribution	1407000.0	4800684
Water Distribution	176000.0	600512
Process Loads	392000.0	1337504
Total	**3354000**	**11443848**
Total (from annual summary)	**3515884**	**11996196**
Difference	**-161884**	**-552348**
% Difference	**-5%**	**-5%**

Energy Type: Chilled Water

End Use	Chilled Water (Ton-hour)	Chilled Water (kBtu)
Space Cooling	890000.0	10680000
Total	**890000**	**10680000**
Total (from annual summary)	**890000**	**10680000**
Difference	**0**	**0**
% Difference	**0%**	**0%**

Energy Type: Utility District Steam

End Use	Utility District Steam (Mlbs)	Utility District Steam (kBtu)
Space Heating	16.92	20202480
Process Loads	0.921	1099996
Total	**18**	**21302476**
Total (from annual summary)	**18**	**21532596**
Difference	**0**	**-230120**
% Difference	**-1%**	**-1%**

Note: fields displayed in green indicate values calculated by the tool and not directly entered by the user.

Building End Use Summary

End Use	Total Energy Use (kBtu)	% of Total Energy Use (kBtu)
Lighting	1433040	3%
Plug Loads	3272108	8%
Air Distribution	4800684	11%
Water Distribution	600512	1%
Process Loads	2437500	6%
Space Cooling	10680000	25%

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

ENERGY USE BREAKDOWN AND QA/QC

Building Name: **Clark**

Space Heating	20202480	47%
Total	**43426324**	**100%**
Total (from annual summary)	**44208792**	
Difference	**-782468**	
% Difference	**-2%**	

BUILDING ENERGY AUDIT TEMPLATE
U.S. DEPARTMENT OF ENERGY

ENERGY SAVINGS OPPORTUNITIES

Building Name: **Clark**

Annual Energy & Cost Savings

Package Name Measure; Status (^); Modeling / Calculation Approach (^^) *	Measure Description	Total Cost Savings	Peak Demand Savings (kW)	Utility District Steam Savings (Mlbs)	Chilled Water Savings (Ton-hour)	Electricity Savings (kWh)
Potential Capital Recommendations						
Low Flow Fume Hoods and Variable Flow Exhaust		222000.0		9.715	477000.0	313000.0
Other ventilation; ^1; ^^2	Low Flow Fume Hoods					
Other ventilation; ^1; ^^2	Variable Flow Exhaust					
All Economical Measures		251000.0		9.76	512000.0	1178144.0
Other ventilation; ^1; ^^2	Low Flow Fume Hoods					
Other ventilation; ^1; ^^2	Variable Flow Exhaust					
Clean and/or repair; ^1; ^^2	Replace/Repair Steam Traps					
Retrofit with light emitting diode technologies; ^1; ^^2	LED Lighting + Occupancy Sensors					
Other; ^1; ^^2	Filters Replacement and Coil Maintenance					
Other; ^1; ^^2	Insulate WSHP Refrigerant Lines					
Totals (recomm. measures)		***473000.0***	***0***	***19.475***	***989000.0***	***1491144.0***

Payback with Incentives

Package Name Measure; Status (^); Modeling / Calculation Approach (^^) *	Measure cost	Potential incentives	Measure life (years)	*Net measure cost*	*Simple ROI (%)*	*Simple Payback (w/o incentives - years)*	*Simple Payback (w/ incentives - years)*
Potential Capital Recommendations							
Low Flow Fume Hoods and Variable Flow Exhaust				*4045727*	*5%*	*18.2*	*18.2*
Other ventilation; ^1; ^^2	4045727.0	0.0	30.0				
Other ventilation; ^1; ^^2							
All Economical Measures				*4545400*	*6%*	*18.1*	*18.1*
Other ventilation; ^1; ^^2	1000000.0		30.0				
Other ventilation; ^1; ^^2	3046000.0						
Clean and/or repair; ^1; ^^2							
Retrofit with light emitting diode technologies; ^1; ^^2	495000.0						
Other; ^1; ^^2	2400.0						
Other; ^1; ^^2	2000.0						
Totals (recomm. measures)	***8591127.0***	***0.0***		***8591127.0***			

* Measure Key

^ *Status:*
1. Recommended
2. Further Study Recommended
3. Not Recommended
4. Implemented

^^ *Modeling/Calculation Approach:*
1. Spreadsheet Calculations
2. Energy Modeling Software

Note: fields displayed in italics indicate values calculated by the tool and not directly entered by the user.