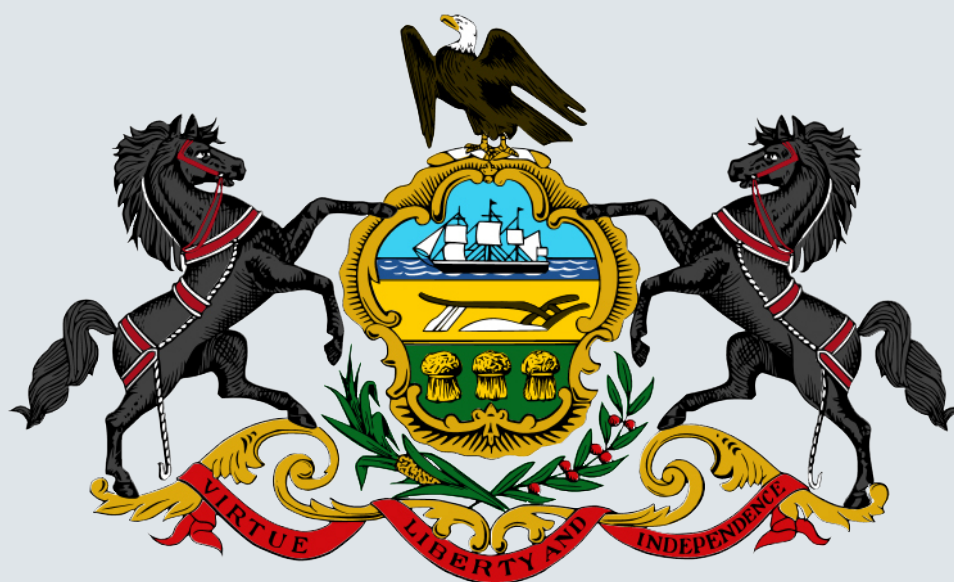


ENERGY AND UTILITY USAGE REPORT

Fiscal Year 2020–2021



Commonwealth of Pennsylvania

Department of General Services



FACILITIES
ENGINEERING
INSTITUTE



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PENN STATE FACILITIES ENGINEERING INSTITUTE

Our Vision

To lead the quest for optimized facilities.

Our Mission

PSFEI fulfills the land grant mission of The Pennsylvania State University by providing the highest quality engineering, energy, and education services leading to the most efficient, reliable, safe, sustainable, and innovative facilities for the citizens of the Commonwealth and beyond.

Our Services to the Department of General Services

The Penn State Facilities Engineering Institute provides the Pennsylvania Department of General Services with essential energy and engineering services. Energy services include electricity and natural gas procurement and demand-side energy management. In support of these services, the Institute performs database development and management, and marketplace research and tracking. We educate consumers and assist with virtually all energy and utility issues. Since 1998, our energy procurement services have saved the Commonwealth of Pennsylvania over \$256 million in energy costs compared to utility rates. The Institute's engineering services cover surveys, studies, testing, and investigations at the Capitol Complex.

Director

Mark A. Bodenschatz, PE, ProFM

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EXECUTIVE SUMMARY

The Penn State Facilities Engineering Institute (PSFEI) supports a Commonwealth of Pennsylvania (Commonwealth) energy portfolio that covers 8,372 electric and 926 natural gas accounts. During fiscal year 2020–2021 (July 1, 2020 to June 30, 2021), PSFEI supported the Commonwealth’s web-based energy procurement activities by conducting electricity and natural gas commodity procurement events under the direction of the Department of General Services (DGS) Bureau of Procurement.

Electricity procurement efforts were split between the successful completion of the Pennsylvania Project to Utilize Light and Solar Energy (PA PULSE) and the strategic management of the Commonwealth and COSTARS electricity portfolios. Through the PA PULSE award, 431 Commonwealth accounts representing 50% of the Commonwealth's electricity consumption will be served with solar energy from 191.5 megawatts (MW) of newly constructed solar generation facilities across the Commonwealth for the next fifteen years beginning January 1, 2023. Traditional electricity procurement and risk management activities for Commonwealth and COSTARS accounts spanned four electricity bidding events that included 1,939 accounts resulting in an estimated cost reduction over the prior contract rates of almost \$150,000 and more than \$677,000 in projected annual avoided costs versus the utility-issued price to compare.

Two natural gas procurement events were held for 22 accounts resulting in an estimated cost reduction of approximately \$21,000 from prior contract rates and projected annual avoided costs of \$1.88 million when compared to natural gas utility sales service tariff rates.

In addition to the energy procurement services provided by PSFEI, other notable accomplishments during the fiscal year included:

- Enhancing the PSFEI proprietary Energy Risk Management Application's (ERMA) functionality to improve the Commonwealth’s energy procurement and account management capabilities.
- Assisting the Commonwealth with the proliferation of the EnergyCAP utility bill management software and training of Commonwealth personnel in its use. Efforts included meter and account identification, user permission assignments, resolution and reconciliation of unknown meters, and hosting numerous training sessions for Commonwealth agencies.
- Supporting the reporting requirements of Executive Order 2019-01 whereby Commonwealth executive agencies are required to reduce energy consumption by 3% per year and by 21% in totality by 2025 from 2017 levels. Through the analytics available in the EnergyCAP software, 7,919 total meters have been verified as meeting the requirements for reporting, revealing a 3.2% reduction in energy consumption for the third fiscal year of reporting.
- Assisting the Commonwealth with fulfilling the renewable energy goals and provisions of Executive Order 2019-01 through the procurement of solar energy sourced within Pennsylvania. The Commonwealth currently satisfies this commitment through the purchase of Green-e certified Renewable Energy Certificates (RECs) and holds the number two position for state governments on the U.S. Environmental Protection Agency's (EPA) Green Power Partnership National Top 100 list.
- Supporting the DGS Guaranteed Energy Savings Act (GESA) program by participating in scoping site visits, preparing reports identifying energy-saving project opportunities, and providing

review and comment regarding proposed energy conservation measures. To date, three projects have been completed, four projects are under construction, and four projects are in the Investment Grade Audit (IGA) solicitation phase. According to DGS, total project investment is projected to be \$218.4 million with projected annual savings of \$6.88 million. This equates to 58,589 trees planted or 5,580 cars mitigated.

- Providing the DGS Capitol Complex with vital engineering services to enhance the operation, maintenance, reliability, and safety of its buildings. Six testing reports and one electrical report were issued to document these efforts.

Energy and utility costs for DGS facilities decreased by \$609 from the previous fiscal year. Overall energy use decreased by 16,877 million British thermal units (MMBtu), down 2.9%. Continued favorable natural gas market pricing coupled with reduced usage due to the COVID-19 pandemic provided a 9.3% decrease in natural gas expenditures while electrical energy cost remained essentially the same. Purchased steam energy increased by 7,038 thousand pounds (mlb), up 4.6% while the unit cost of steam decreased by roughly \$0.72 per mlb, down 3.0%.

During fiscal year 2020–2021, it should be noted that facility operations continued under the assumption that buildings would be occupied in the relatively near future. Despite low occupancy in buildings as a result of the COVID-19 pandemic and the telework arrangements of many work units, numerous essential employees with vital in-person work reported to Commonwealth workplaces on an intermittent or full-time basis. As a result, many buildings were fully operational in terms of temperature and humidity controls and air circulation. Commonwealth facilities also operated in accordance with Centers for Disease Control and Prevention (CDC) recommendations with respect to air filtration, ventilation, and outdoor air exchange, requiring the Commonwealth to continuously operate building systems to reduce the likelihood of COVID-19 transmission. Operational details specific to COVID-19 are provided in the Engineering Services section under the *HVAC Steps Taken for Building Occupant Protection During COVID-19* subheading.

PSFEI compared DGS buildings to industry averages using the Commercial Buildings Energy Consumption Survey (revised in December 2012). The average site Energy Use Intensity (EUI) for an office building in the U.S. Northeast region was 93,900 British thermal units per square foot (Btu/sqft). For fiscal year 2020–2021, the average DGS building site EUI was 74,145 Btu/sqft, 21.0% below the national average and 2.6% below the previous fiscal year.

The 2020–2021 *Energy and Utility Usage Report* is divided into five sections. The Utility Summary section provides summary information about utility usage and costs. Detailed utility usage and cost information by building is presented in the DGS Energy and Utility Usage section. Both sections have graphical and tabular comparisons of facilities and narrative descriptions. The Energy Procurement section presents electricity and natural gas procurement activities and market commentaries and analyses. The Summary of Energy and Engineering Services section provides information about Executive Order 2019-01, ERMA, Act 129, PSFEI engineering and electrical testing services, and the GESA program. The Summary of Education Services section presents the education opportunities offered by PSFEI and attendance by DGS personnel.

UTILITY SUMMARY

The Utility Summary section presents utility usage by fuel, provides six-year historical information (unless otherwise stated), compares overall use by building using a site-based Energy Use Intensity (EUI) indicator, and benchmarks buildings by their utility cost per square foot.

CONSUMPTION AND COSTS

In fiscal year 2020–2021, the Department of General Services (DGS) energy and water/sewer cumulative costs totaled \$13.99 million, a decrease of 1.3% from the previous fiscal year. Electricity use decreased by 5.6%, natural gas use decreased by 5.9%, purchased steam use increased by 4.6%, and water/sewer use decreased by 16.4%.

Thermal energy unit pricing decreased from the prior fiscal year. Natural gas unit cost per thousand cubic feet (mcf) decreased by 3.7% and purchased steam per one thousand pounds (mlb) by 3.0%. Electricity cost per kilowatt-hour (kWh) increased by 5.9%.

Table 1. Consumption and Costs 2020–2021

Utility	Annual Consumption	Unit Cost	Annual Cost
Electricity	92,887,236 kWh	8.139 c/kWh	\$7,560,341
Natural Gas	87,299 mcf	\$6.27 /mcf	\$547,099
Steam	168,188 mlbs	\$23.09 /mlbs	\$3,883,881
Water/Sewer	63,088 mgal	\$31.76 /mgal	\$2,003,584
Total			\$13,994,905

AVOIDED COSTS

During the fiscal year, the Penn State Facilities Engineering Institute (PSFEI) assisted DGS and other Commonwealth of Pennsylvania (Commonwealth) agencies with reducing future energy supply costs by over \$171,000 compared to current contract rates and avoiding over \$2.5 million in projected annual electricity and natural gas expenditures compared to utility-issued, price-to-compare costs.

Table 2. Energy Procurement Results 2020–2021

Energy Events	Cost Reduction	Cost Avoidance
Electric Procurement	\$149,986	\$677,247
Natural Gas Procurement	\$21,522	\$1,882,083
Total	\$171,508	\$2,559,331

DGS SIX-YEAR ENERGY CONSUMPTION AND COSTS

Charts 1 and 2 illustrate energy costs and consumption trends for electricity, steam, and natural gas for DGS facilities over the past six fiscal years (July 1, 2015 through June 30, 2021). During fiscal year 2020–2021, energy costs decreased by a negligible \$609, down 0.0% from the previous year. Overall energy use, measured in one million British thermal units (MMBtu), decreased from the previous year by 16,877 MMBtu, down 2.9%.

Chart 1. Annual Energy Costs Trend

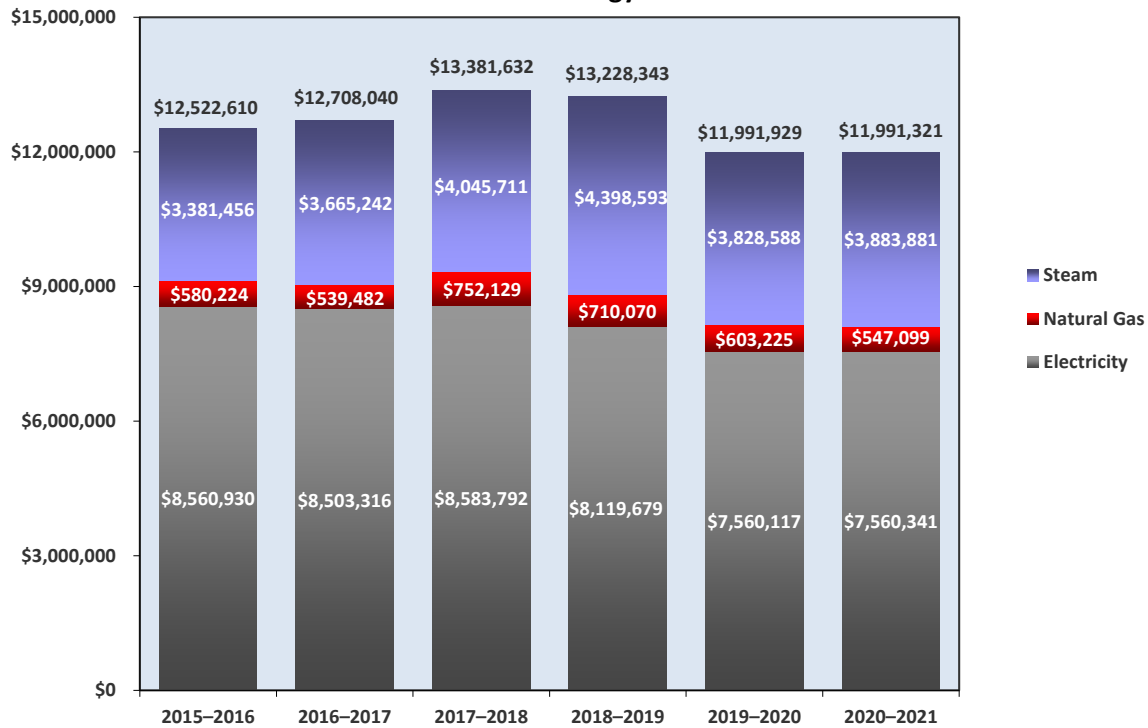


Chart 2. Annual Energy Consumption Trend

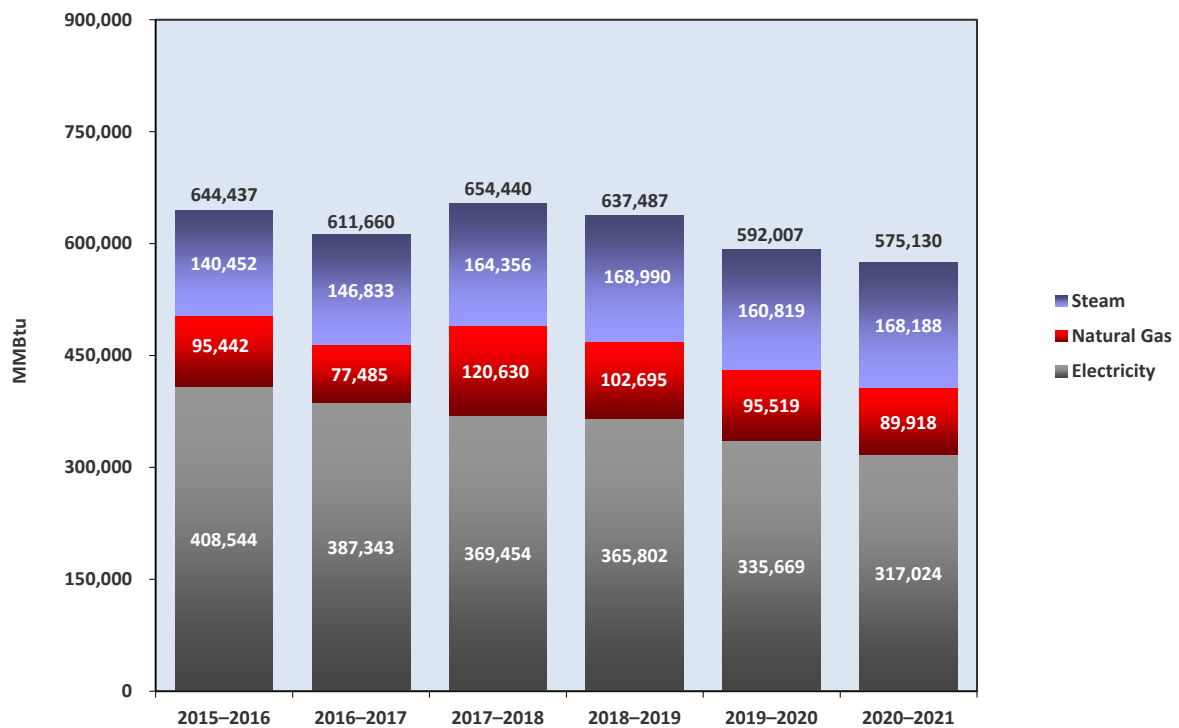


Table 3 provides a detailed view of energy use and cost information for the past six fiscal years. DGS facilities experienced an 5.6% decrease in use and a nominal increase in cost for electricity consumed during the fiscal year. This equates to 5,462,881 less kWh and a cost increase of \$224. Due to escalations built into the Lancaster County Solid Waste Management Authority (LCSWMA) Power Purchase Agreement (PPA), a decrease in zonal capacity charges, and an increase in transmission pricing, the unit cost per kWh increased by 5.9%. Additional details about the LCSWMA PPA are provided in the Summary of Energy and Engineering Services section under the *Intergovernmental Power Purchase Agreement* subheading.

Purchased steam consumption increased by 7,369 mlb, up 4.6% and costs, accordingly, increased by \$55,293, up 1.4%. Overall steam unit cost decreased by \$0.72 per mlb, down 3.0%.

Natural gas consumption decreased 5,438 mcf, down 5.9%; costs decreased by \$56,126, down 9.3%. The average natural gas unit cost decreased by 3.7%, from \$6.50 to \$6.27 per mcf.

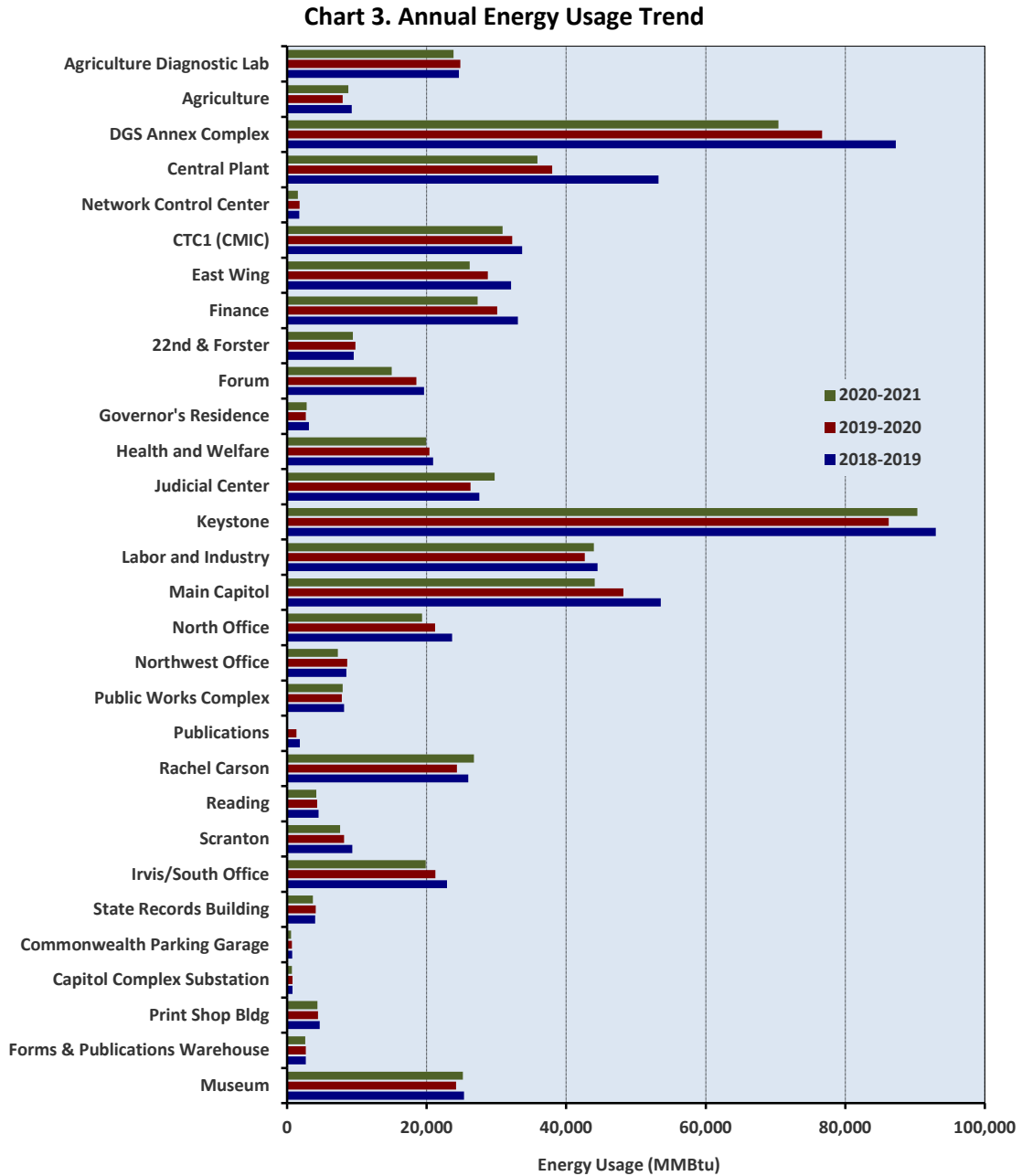
Table 3. Annual Energy Consumption and Costs Trend

Energy Cost	Units	2015–2016	2016–2017	2017–2018	2018–2019	2019–2020	2020–2021
Electricity	\$	\$8,560,930	\$8,503,316	\$8,583,792	\$8,119,679	\$7,560,117	\$7,560,341
Natural Gas	\$	\$580,224	\$539,482	\$752,129	\$710,070	\$603,225	\$547,099
Steam	\$	\$3,381,456	\$3,665,242	\$4,045,711	\$4,398,593	\$3,828,588	\$3,883,881
Total	\$	\$12,522,610	\$12,708,040	\$13,381,632	\$13,228,343	\$11,991,929	\$11,991,321
Unit Energy Cost/MMBtu							
Electricity	\$/MMBtu	\$20.95	\$21.95	\$21.95	\$22.20	\$22.52	\$23.85
Natural Gas	\$/MMBtu	\$6.08	\$6.96	\$6.23	\$6.91	\$6.32	\$6.08
Steam	\$/MMBtu	\$24.08	\$24.96	\$24.62	\$26.03	\$23.81	\$23.09
Weighted Average	\$/MMBtu	\$19.43	\$20.78	\$20.45	\$20.75	\$20.26	\$20.85
Energy Consumption							
Electricity	MMBtu	408,544	387,343	369,454	365,802	335,669	317,024
Natural Gas	MMBtu	95,442	77,485	120,630	102,695	95,519	89,918
Steam	MMBtu	140,452	146,833	164,356	168,990	160,819	168,188
Total	MMBtu	644,437	611,660	654,440	637,487	592,007	575,130
Unit Fuel Cost							
Electricity	\$/kWh	\$0.0715	\$0.0749	\$0.0793	\$0.0758	\$0.0769	\$0.0814
Natural Gas	\$/mcf	\$6.26	\$7.17	\$6.42	\$7.12	\$6.50	\$6.27
Steam	\$/mlb	\$24.08	\$24.96	\$24.62	\$26.03	\$23.81	\$23.09
Fuel Consumption							
Electricity	kWh	119,702,221	113,490,410	108,249,179	107,179,027	98,350,117	92,887,236
Natural Gas	mcf	92,662	75,228	117,117	99,704	92,737	87,299
Steam	mlbs	140,452	146,833	164,356	168,990	160,819	168,188

Note: The historical data for fiscal years 2015–2016, and 2016–2017 was updated to reflect the removal of the Altoona Office Building.

ENERGY USAGE

Chart 3 shows the total energy usage in MMBtu for each DGS facility for the past three fiscal years (July 1, 2018 through June 30, 2021). The largest users continue to be the DGS Annex Complex and the Keystone Building. Energy consumption decreased from the previous year at almost all DGS facilities.



ENERGY USE INTENSITY

Table 4 and Charts 4A and 4B show the EUI for each building for the past three fiscal years. The EUI is measured in British thermal units per square foot per year (Btu/sqft); this provides a normalized method to compare building energy use. The EUI is used throughout the energy industry to portray a facility's energy use per unit area. Chart 4B shows the Agriculture Diagnostic Lab and CTC1 (CMIC) exhibited the highest energy use intensities because of their concentrated end-use equipment and heating, ventilating, and air conditioning (HVAC) loads dictated by building operations. The energy use for both the CTC1 (CMIC) Building and the Agriculture Diagnostic Lab decreased slightly.

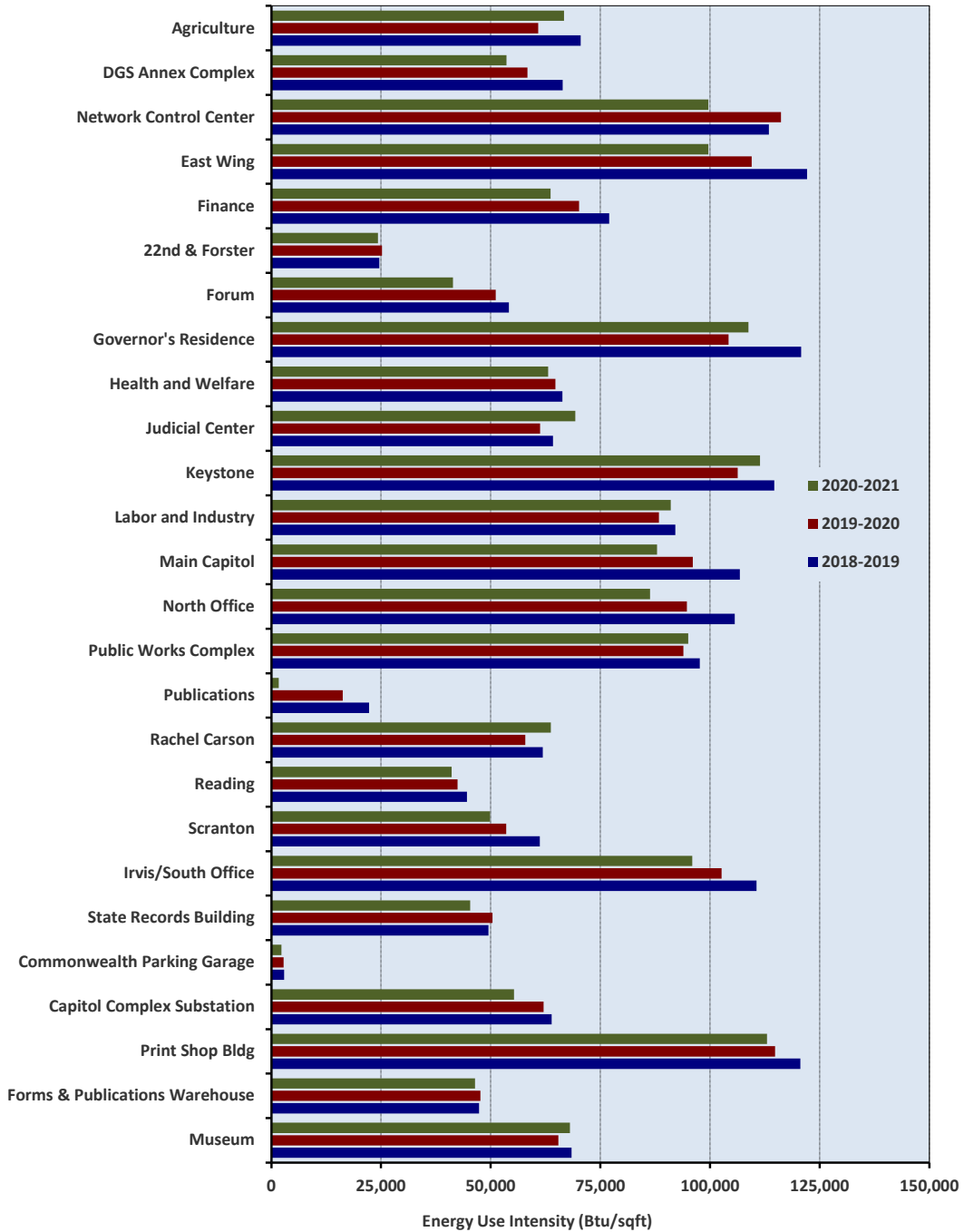
During fiscal year 2020–2021, total EUI decreased by 2.6% to 74,145 Btu/sqft. The most significant changes in the EUI occurred at the Publications Building (due to closure and decommissioning of the building) and the Forum Building.

Table 4. Annual Usage and Energy Use Intensity Trend

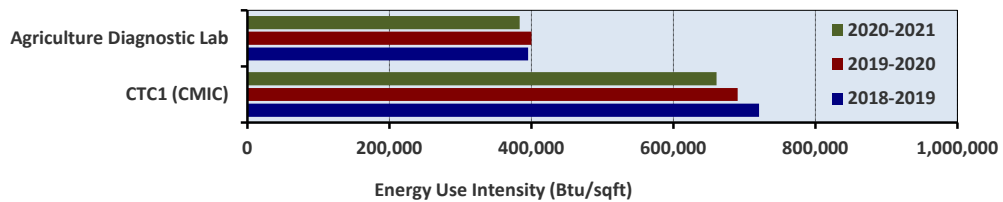
Facility	Total Space (sqft)	2018–2019		2019–2020		2020–2021	
		Btu Usage (MMBtu)	EUI (Btu/sqft)	Btu Usage (MMBtu)	EUI (Btu/sqft)	Btu Usage (MMBtu)	EUI (Btu/sqft)
Publications	81,948	1,827	22,292	1,334	16,275	138	1,686
22nd & Forster	388,544	9,553	24,586	9,806	25,238	9,434	24,281
Agriculture	131,391	9,260	70,479	7,991	60,815	8,766	66,717
Agriculture Diagnostic Lab	62,230	24,619	395,608	24,832	399,035	23,863	383,465
CTC1 (CMIC)	46,736	33,671	720,450	32,271	690,491	30,891	660,969
DGS Annex Complex	1,313,571	87,251	66,422	76,696	58,387	70,440	53,625
Fisher Plaza	---	474	---	456	---	472	---
Forms & Publications Warehouse	56,560	2,677	47,325	2,696	47,660	2,627	46,446
Governor's Residence	25,878	3,125	120,741	2,697	104,221	2,815	108,765
Network Control Center	15,400	1,747	113,427	1,789	116,175	1,534	99,642
Print Shop Bldg	38,688	4,664	120,551	4,443	114,849	4,370	112,958
Public Works Complex	83,670	8,171	97,663	7,858	93,916	7,952	95,046
Rachel Carson	420,125	25,987	61,854	24,327	57,903	26,774	63,730
Reading	101,626	4,533	44,603	4,311	42,418	4,179	41,122
Scranton	152,800	9,351	61,199	8,184	53,562	7,614	49,832
State Records Building	81,565	4,038	49,510	4,112	50,416	3,695	45,300
Capitol Complex Buildings¹							
Capitol Complex Substation	12,500	799	63,903	776	62,041	691	55,288
Commonwealth Parking Garage	248,188	728	2,933	694	2,796	572	2,306
East Wing	262,950	32,115	122,134	28,783	109,461	26,191	99,606
Finance	429,521	33,066	76,983	30,123	70,133	27,326	63,620
Forum	362,395	19,625	54,154	18,529	51,128	15,003	41,399
Health and Welfare	315,462	20,934	66,360	20,421	64,735	19,911	63,116
Irvis/South Office	207,138	22,911	110,606	21,261	102,640	19,871	95,931
Judicial Center	429,355	27,572	64,217	26,296	61,245	29,760	69,312
Keystone	811,147	92,984	114,633	86,219	106,292	90,342	111,375
Labor and Industry	483,161	44,480	92,060	42,674	88,323	43,985	91,036
Main Capitol	501,543	53,570	106,811	48,195	96,094	44,081	87,890
Museum	370,442	25,343	68,412	24,238	65,430	25,215	68,067
North Office	223,946	23,652	105,613	21,207	94,697	19,329	86,311
Complex Buildings Total	4,657,748	397,778		369,415		362,276	
Total	7,658,480	628,724		583,217		567,842	
Weighted Average			82,095		76,153		74,145

¹PPL serves the Capitol Complex with one main account. DGS submeters the individual buildings. Central plant electric energy is distributed to Capitol Complex buildings served by central chilled water on a per square-foot basis. The Main Capitol steam metered use and cost is distributed to the Main Capitol, East Wing, Irvis/South Office, and North Office Buildings on a per square-foot basis.

Chart 4A. Annual Energy Use Intensity Trend



**Chart 4B. Annual Energy Use Intensity Trend
Agriculture Diagnostic Lab and CTCI (CMIC)**



UTILITY COST PER SQUARE FOOT

Employing a utility cost per square foot metric provides an additional benchmark to compare energy cost for buildings of varying sizes and purposes. Components of the total cost include electricity, natural gas, steam, and water/sewer. Compared to the previous fiscal year, the average utility cost per square foot for DGS buildings fell by 1.2%, with the most significant reductions occurring at the Publications Building and the Forms & Publications Warehouse as well as the Governor's Residence.

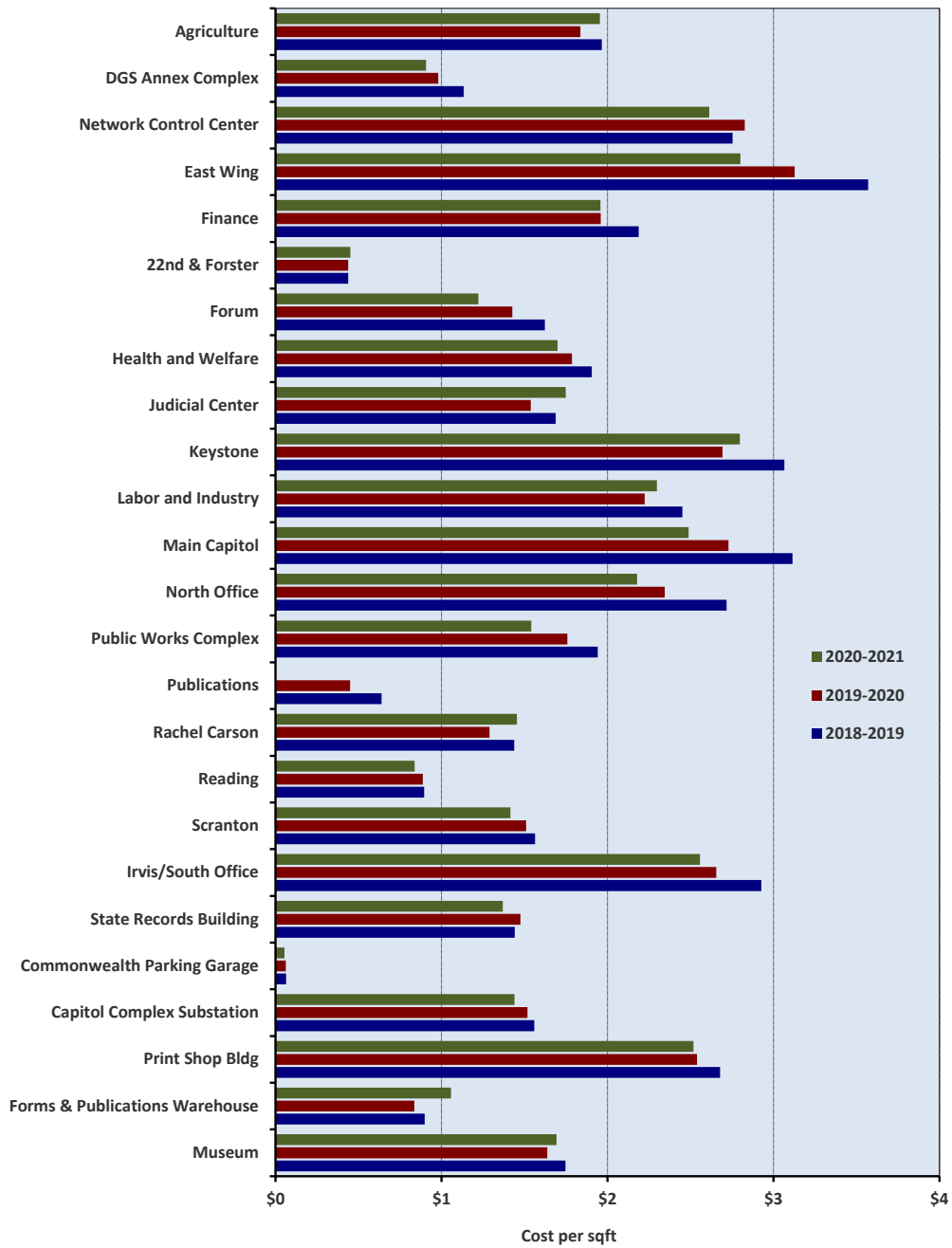
Table 5. Annual Utility Cost per Square Foot Trend

Facility	Total Space (sqft)	2018–2019		2019–2020		2020–2021	
		Cost	\$/sqft	Cost	\$/sqft	Cost	\$/sqft
Publications	81,948	\$52,248	\$0.64	\$36,810	\$0.45	---	---
22nd & Forster	388,544	\$170,135	\$0.44	\$170,098	\$0.44	\$175,023	\$0.45
Agriculture	131,391	\$258,276	\$1.97	\$241,220	\$1.84	\$256,787	\$1.95
Agriculture Diagnostic Lab	62,230	\$352,817	\$5.67	\$353,115	\$5.67	\$366,829	\$5.89
CTC1 (CMIC)	46,736	\$721,270	\$15.43	\$710,054	\$15.19	\$722,374	\$15.46
DGS Annex Complex	1,313,571	\$1,489,050	\$1.13	\$1,287,495	\$0.98	\$1,190,395	\$0.91
Fisher Plaza	---	\$28,861	---	\$26,866	---	\$26,300	---
Forms & Publications Warehouse	56,560	\$50,765	\$0.90	\$47,245	\$0.84	\$59,782	\$1.06
Governor's Residence	25,878	\$114,516	\$4.43	\$106,330	\$4.11	\$130,623	\$5.05
Network Control Center	15,400	\$42,398	\$2.75	\$43,532	\$2.83	\$40,242	\$2.61
Print Shop Bldg	38,688	\$103,590	\$2.68	\$98,228	\$2.54	\$97,424	\$2.52
Public Works Complex	83,670	\$162,348	\$1.94	\$147,125	\$1.76	\$128,855	\$1.54
Rachel Carson	420,125	\$603,829	\$1.44	\$541,710	\$1.29	\$610,772	\$1.45
Reading	101,626	\$90,972	\$0.90	\$90,078	\$0.89	\$85,067	\$0.84
Scranton	152,800	\$238,761	\$1.56	\$230,595	\$1.51	\$216,265	\$1.42
State Records Building	81,565	\$117,461	\$1.44	\$120,348	\$1.48	\$111,678	\$1.37
Capitol Complex Buildings¹							
Capitol Complex Substation	12,500	\$19,481	\$1.56	\$18,972	\$1.52	\$17,992	\$1.44
Commonwealth Parking Garage	248,188	\$15,832	\$0.06	\$15,166	\$0.06	\$13,244	\$0.05
East Wing	262,950	\$938,612	\$3.57	\$822,204	\$3.13	\$736,316	\$2.80
Finance	429,521	\$939,749	\$2.19	\$841,081	\$1.96	\$840,313	\$1.96
Forum	362,395	\$587,917	\$1.62	\$516,753	\$1.43	\$442,886	\$1.22
Health and Welfare	315,462	\$600,827	\$1.90	\$563,517	\$1.79	\$535,783	\$1.70
Irvis/South Office	207,138	\$606,083	\$2.93	\$549,872	\$2.65	\$529,604	\$2.56
Judicial Center	429,355	\$724,755	\$1.69	\$659,918	\$1.54	\$750,464	\$1.75
Keystone	811,147	\$2,486,066	\$3.06	\$2,184,284	\$2.69	\$2,268,897	\$2.80
Labor and Industry	483,161	\$1,183,987	\$2.45	\$1,074,194	\$2.22	\$1,109,502	\$2.30
Main Capitol	501,543	\$1,562,105	\$3.11	\$1,368,773	\$2.73	\$1,248,135	\$2.49
Museum	370,442	\$647,081	\$1.75	\$606,577	\$1.64	\$627,089	\$1.69
North Office	223,946	\$608,403	\$2.72	\$525,021	\$2.34	\$487,889	\$2.18
Complex Buildings Total²	4,657,748	\$10,920,897		\$9,746,332		\$9,608,114	
Total	7,658,480	\$15,518,194		\$13,997,180		\$13,826,530	
Weighted Average			\$2.03		\$1.83		\$1.81

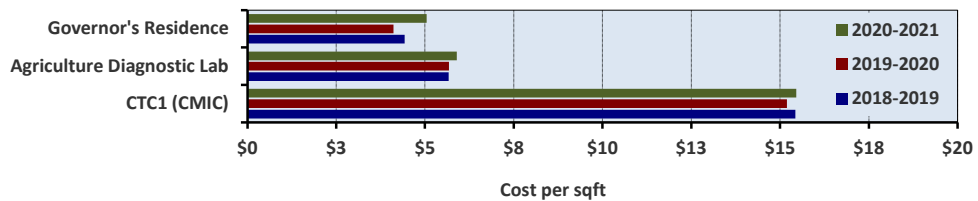
¹PPL serves the Capitol Complex with one main account. DGS submeters the individual buildings. Central plant electric energy is distributed to the Capitol Complex buildings served by central chilled water on a per square foot basis. The Main Capitol steam metered use and cost is distributed to the Capitol, East Wing, Irvis/South Office, and North Office Buildings on a per square foot basis.

²The Northwest Office Building is not included in this table because only electricity costs are known. The difference between the total fiscal year costs shown in this table and in Tables 1 and 3 represent the Northwest Office Building's annual electric cost.

Chart 5A. Annual Utility Cost per Square Foot Trend



**Chart 5B. Annual Utility Cost per Square Foot Trend
Agriculture Diagnostic Lab and CTCI (CMIC)**



DGS ENERGY AND UTILITY USAGE

Detailed energy consumption information by building for DGS facilities is presented in this section.

ELECTRICITY USAGE

During fiscal year 2020–2021, DGS facilities consumed 92,887,236 kWh of electricity at a cost of \$7,560,341, with an average unit cost of \$0.08139 per kWh. This represented a usage decrease of 5,462,881 kWh, down 5.6% from the previous fiscal year, and a nominal cost increase of \$609.

Table 6. Electricity Usage and Costs 2020–2021

Facility	Account	Utility	Total Space (sqft)	Annual Electricity Consumption					Annual Electricity Costs		
				kWh	kWh/sqft	Peak Demand KW	Peak Demand W/sqft	Average Monthly Load Factor	Cost	¢/kWh	\$/sqft
Publications	1326068018	PPL Utilities	81,948	40,480	0.5	31.0	0.38	0.51	\$3,274	8.087	\$0.04
22nd & Forster	6392068009	PPL Utilities	388,544	1,147,200	3.0	261.0	0.67	0.61	\$99,546	8.677	\$0.26
Agriculture	7499086008	PPL Utilities	131,391	2,536,000	19.3	899.0	6.84	0.47	\$227,352	8.965	\$1.73
Agriculture Diagnostic Lab	4559086014	PPL Utilities	62,230	2,599,800	41.8	592.0	9.51	0.66	\$225,287	8.666	\$3.62
CTC1 (CMIC)	5149982011	PPL Utilities	46,736	9,051,000	193.7	1,192.0	25.50	0.89	\$722,374	7.981	\$15.46
DGS Annex Complex	3690471029	PPL Utilities	---	1,456	---	---	---	---	\$429	29.435	---
DGS Annex Complex	7459086015	PPL Utilities	1,313,571	5,925,600	4.5	1,212.0	0.92	0.80	\$498,957	8.420	\$0.38
DGS Annex Complex	9949200005	PPL Utilities	---	225,076	---	---	---	---	\$70,231	31.203	---
Fisher Plaza	0540120009	PPL Utilities	---	138,234	---	---	---	---	\$26,300	19.026	---
Forms & Publications Warehouse	0442069007	PPL Utilities	56,560	96,720	1.7	40.0	0.71	0.37	\$10,076	10.418	\$0.18
Governor's Residence	7819078000	PPL Utilities	25,878	787,800	30.4	---	---	---	\$88,936	11.289	\$3.44
Network Control Center	7479086002	PPL Utilities	15,400	449,600	29.2	108.0	7.01	0.53	\$40,242	8.951	\$2.61
Print Shop Bldg	7791062048	PPL Utilities	38,688	1,042,560	26.9	231.0	5.97	0.60	\$90,955	8.724	\$2.35
Public Works Complex	6372068003	PPL Utilities	83,670	779,700	9.3	247.0	2.95	0.52	\$74,857	9.601	\$0.89
Public Works Complex	8860119006	PPL Utilities	---	370	---	---	---	---	\$303	81.957	---
Rachel Carson	6088070004	PPL Utilities	420,125	4,957,200	11.8	1,342.0	3.19	0.54	\$436,819	8.812	\$1.04
Reading	100013480650	MetEd	101,626	699,964	6.9	253.8	2.50	0.41	\$53,690	7.670	\$0.53
Scranton	7299129004	PPL Utilities	152,800	2,214,000	14.5	558.0	3.65	0.57	\$197,050	8.900	\$1.29
Scranton	7319129002	PPL Utilities	---	4,940	---	1.0	---	0.57	\$713	14.426	---
Scranton	8863773002	PPL Utilities	---	10,847	---	2.0	---	0.63	\$1,101	10.151	---
State Records Center	7235127006	PPL Utilities	81,565	386,400	4.7	126.0	1.54	0.43	\$38,033	9.843	\$0.47
Capitol Complex Buildings¹	4484815085	PPL Utilities									
Capitol Complex Substation	4484815085355	---	12,500	202,490	16.2	---	---	---	\$15,970	7.887	\$1.28
Central Plant	4484815085320	---	3,664,223	10,517,574	2.9	---	---	---	\$793,555	7.545	\$0.22
Commonwealth Parking Garage	4484815085352	---	248,188	167,658	0.7	---	---	---	\$13,244	7.899	\$0.05
East Wing	4484815085312	---	262,950	3,874,346	14.7	---	---	---	\$301,718	7.788	\$1.15
Finance	4484815085307	---	429,521	2,662,576	6.2	---	---	---	\$208,455	7.829	\$0.49
Forum	4484815085305	---	362,395	1,642,933	4.5	---	---	---	\$129,415	7.877	\$0.36
Health and Welfare	4484815085308	---	315,462	2,078,052	6.6	---	---	---	\$164,125	7.898	\$0.52
Ivis/South Office	4484815085304	---	207,138	2,829,003	13.7	---	---	---	\$221,452	7.828	\$1.07
Judicial Center	4484815085000	---	429,355	3,955,601	9.2	---	---	---	\$310,877	7.859	\$0.72
Keystone	4484815085337	---	811,147	11,834,901	14.6	---	---	---	\$929,259	7.852	\$1.15
Labor and Industry	4484815085309	---	483,161	7,097,622	14.7	---	---	---	\$555,818	7.831	\$1.15
Main Capitol	4484815085301	---	501,543	5,668,163	11.3	---	---	---	\$445,170	7.854	\$0.89
Museum	4484815085311	---	370,442	2,694,758	7.3	---	---	---	\$208,927	7.753	\$0.56
North Office	4484815085303	---	223,946	2,427,338	10.8	---	---	---	\$190,217	7.836	\$0.85
Northwest Office	4484815085101	---	188,819	2,139,275	11.3	---	---	---	\$165,616	7.742	\$0.88
Complex Buildings Total			4,846,567	59,792,289	12.3	13,522	2.79	0.50	\$4,653,818	7.783	\$0.96
Total			7,847,299	92,887,236					\$7,560,341		
Weighted Average					11.8			0.58		8.139	\$0.96

¹PPL serves the Capitol Complex with one main account. DGS submeters the individual buildings.

Compared to the previous fiscal year, electricity consumption remained relatively consistent except for notable reductions at the Publications Building, down 48.2%; Finance Building, down 18.3%; and the Reading Office Building, down 18.2%. Peak demand changes ranged from a decrease of 21.4% at the Scranton Office Building to an increase of 5.7% at the Reading Office Building.

Charts 6 and 7 compare electricity consumption and cost for the previous three fiscal years.

Chart 6. Annual Electricity Consumption Trend

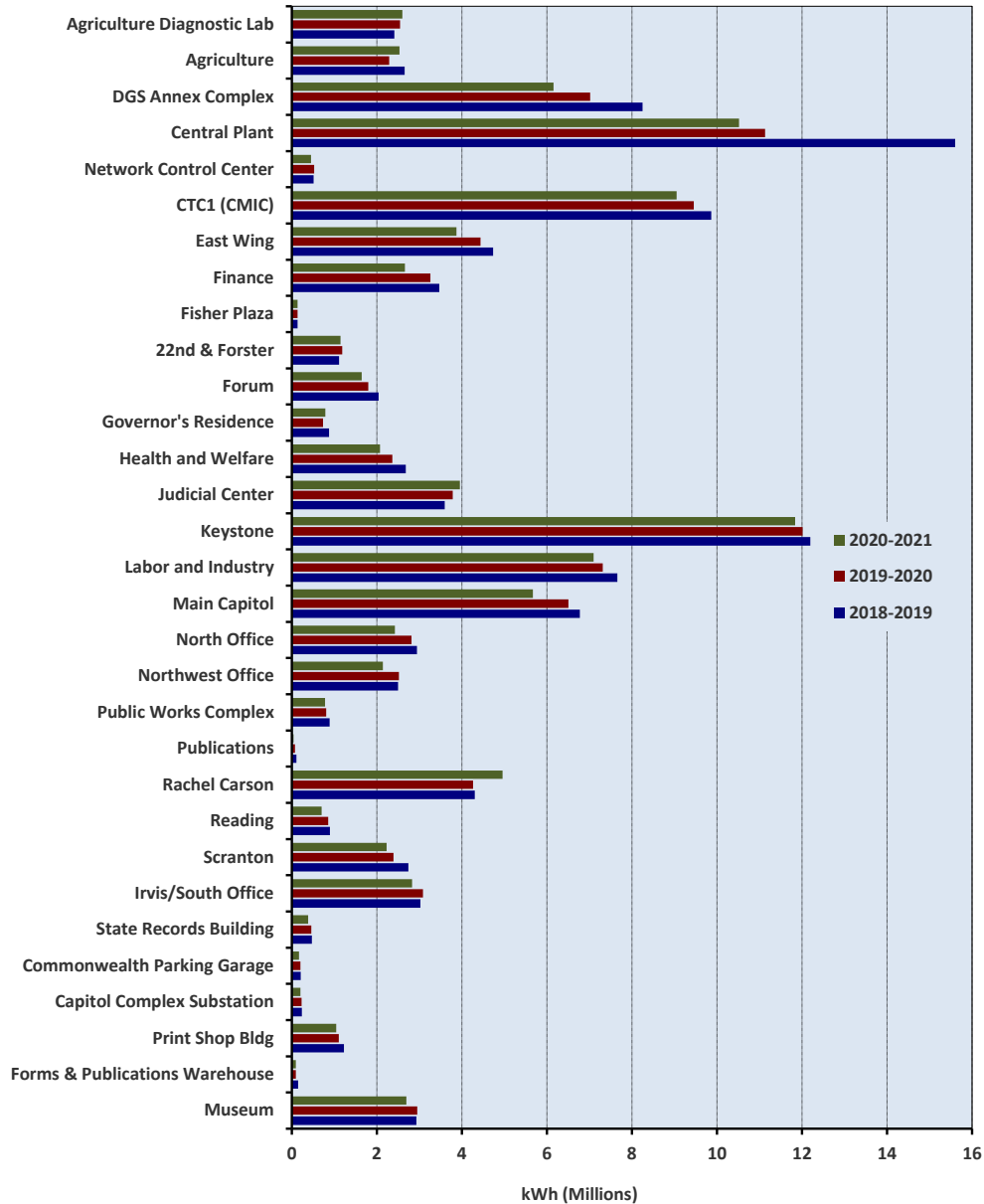
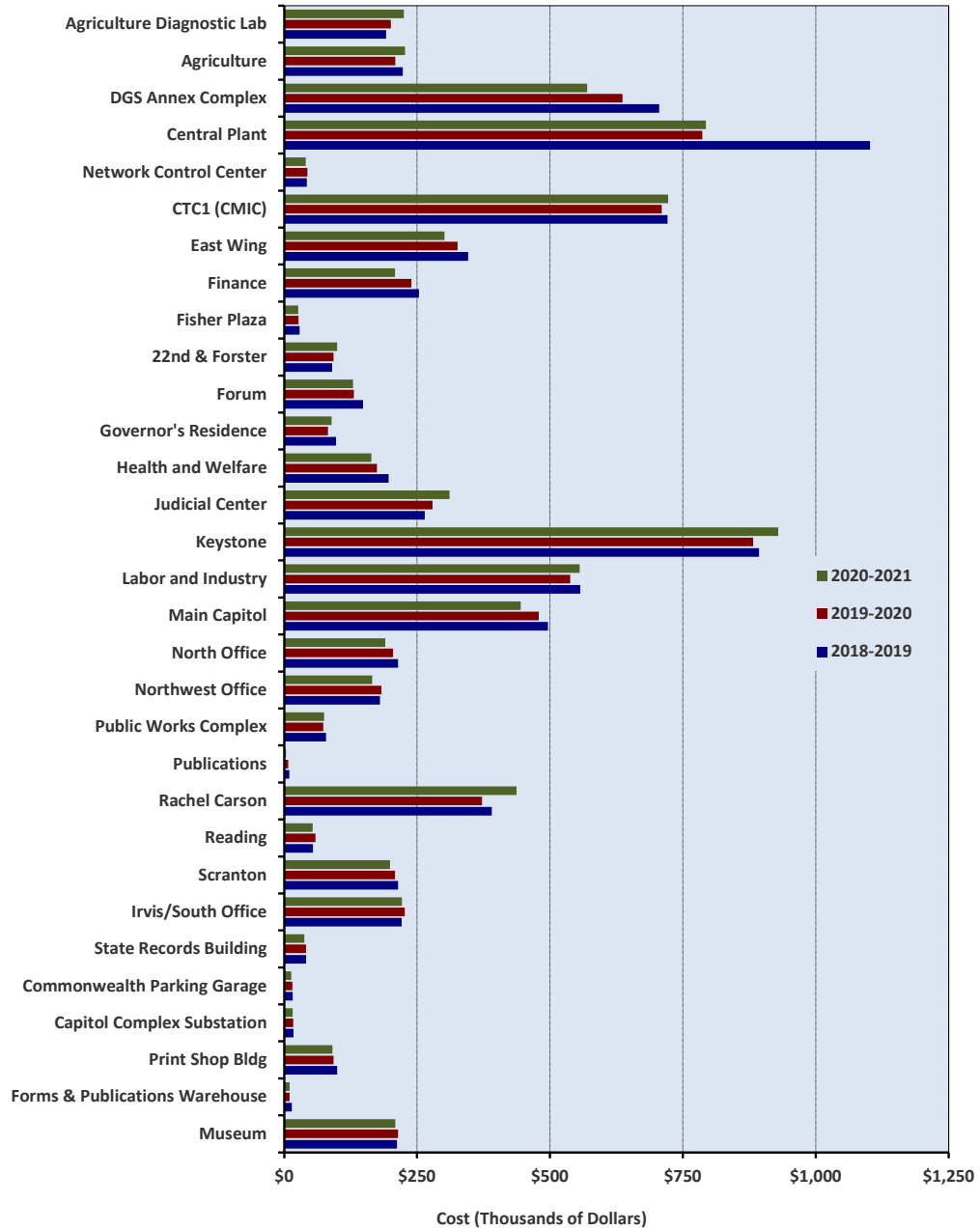


Chart 7. Annual Electricity Costs Trend



NATURAL GAS USAGE

In fiscal year 2020–2021, DGS facilities consumed 87,299 mcf of natural gas, 5.9% less than the previous year. The DGS Annex Complex, at 55% of the overall agency usage, remains the largest consumer of natural gas of all DGS buildings. Table 7 provides a breakdown of natural gas consumption by facility.

Table 7. Natural Gas Consumption and Costs 2020–2021

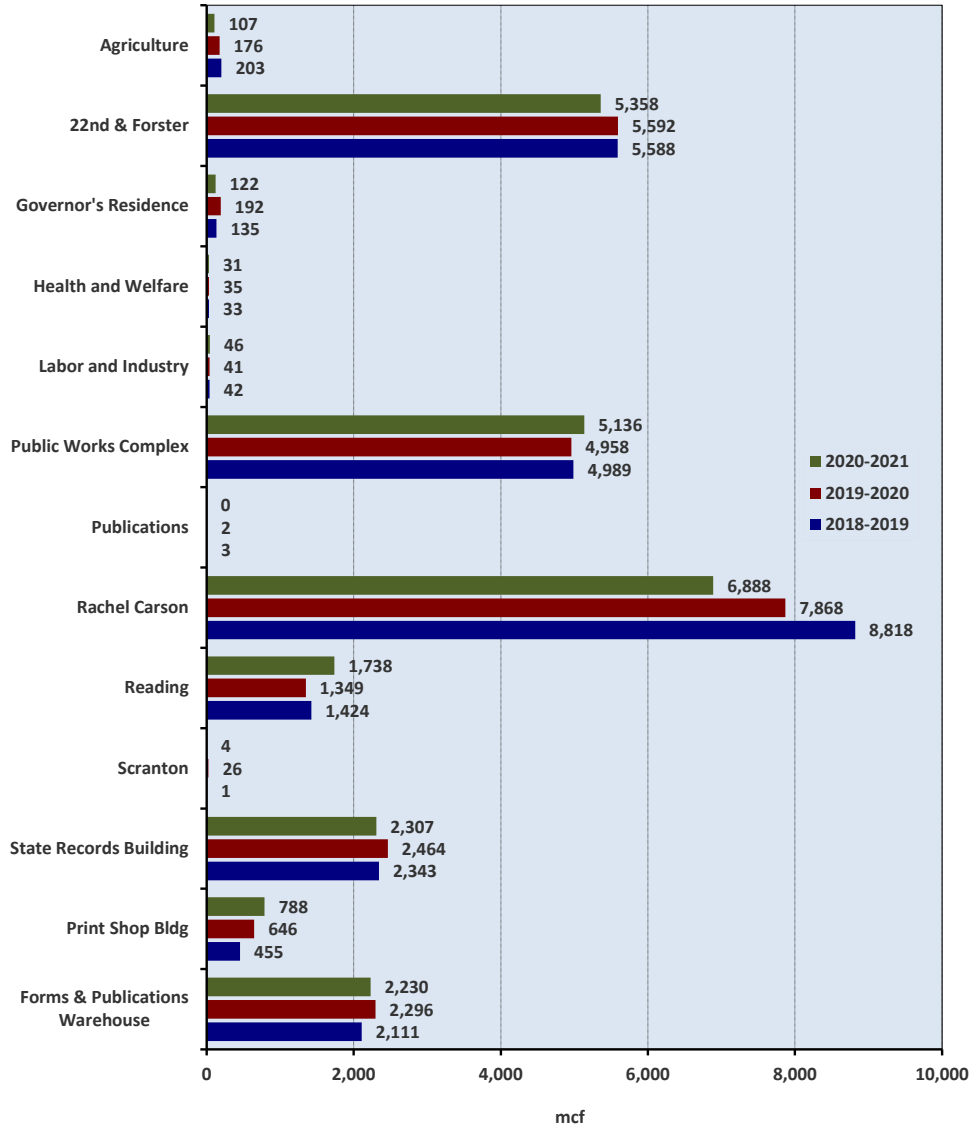
Facility	Utility	mcf	Cost	\$/mcf
Ag Diagnostic Lab	UGI Utilities, Inc.	6,478	\$47,705	\$7.36
	UGI Utilities, Inc.	8,075	\$59,525	\$7.37
Agriculture	UGI Utilities, Inc.	107	\$1,164	\$10.84
DGS Annex Complex	UGI Utilities, Inc.	47,990	\$233,780	\$4.87
22nd & Forster	UGI Utilities, Inc.	2,595	\$20,717	\$7.98
	UGI Utilities, Inc.	2,763	\$22,008	\$7.96
Governor's Residence	UGI Utilities, Inc.	122	\$1,282	\$10.49
Public Works Complex	UGI Utilities, Inc.	5,136	\$40,004	\$7.79
Rachel Carson	UGI Utilities, Inc.	6,888	\$62,694	\$9.10
Reading	UGI Utilities, Inc.	1,738	\$13,963	\$8.03
Scranton	UGI PNG	4	\$305	\$78.19
State Records Center	UGI Utilities, Inc.	2,307	\$18,464	\$8.00
Forms & Publications Warehouse	UGI Utilities, Inc.	2,230	\$17,832	\$8.00
Print Shop Bldg	UGI Utilities, Inc.	788	\$6,469	\$8.21
Capitol Complex Buildings				
Health and Welfare	UGI Utilities, Inc.	31	\$535	\$17.25
Labor and Industry	UGI Utilities, Inc.	46	\$651	\$14.15
Complex Buildings Total		77	\$1,186	\$15.40
Total		87,299	\$547,099	
Weighted Average				\$6.27

Charts 8A, 8B, 9A, and 9B compare the previous three fiscal years of annual natural gas consumption and cost. Following are notable changes observed during fiscal year 2020–2021:

- The Rachel Carson Office Building consumption decreased by 980 mcf, down 12.5%.
- The DGS Annex Complex gas usage was 6.3% lower than fiscal year 2019–2020, representing a decrease of 3,230 mcf.
- The closure of the Publications Building and removal of the Lieutenant Governor’s Residence from the report indicate a total reduction of 212 mcf and \$2,181 from fiscal year 2019–2020.

Overall, natural gas cost for DGS facilities decreased by \$56,126, down 9.3%, as a result of lower consumption toward the end of the heating season coupled with excellent natural gas pricing from price risk management decisions resulting from natural gas procurement activities.

Chart 8A. Annual Natural Gas Consumption Trend



**Chart 8B. Annual Natural Gas Consumption Trend
Agriculture Diagnostic Lab and DGS Annex Complex**

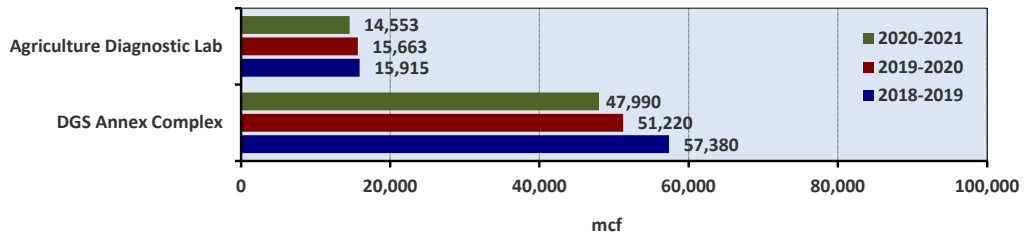
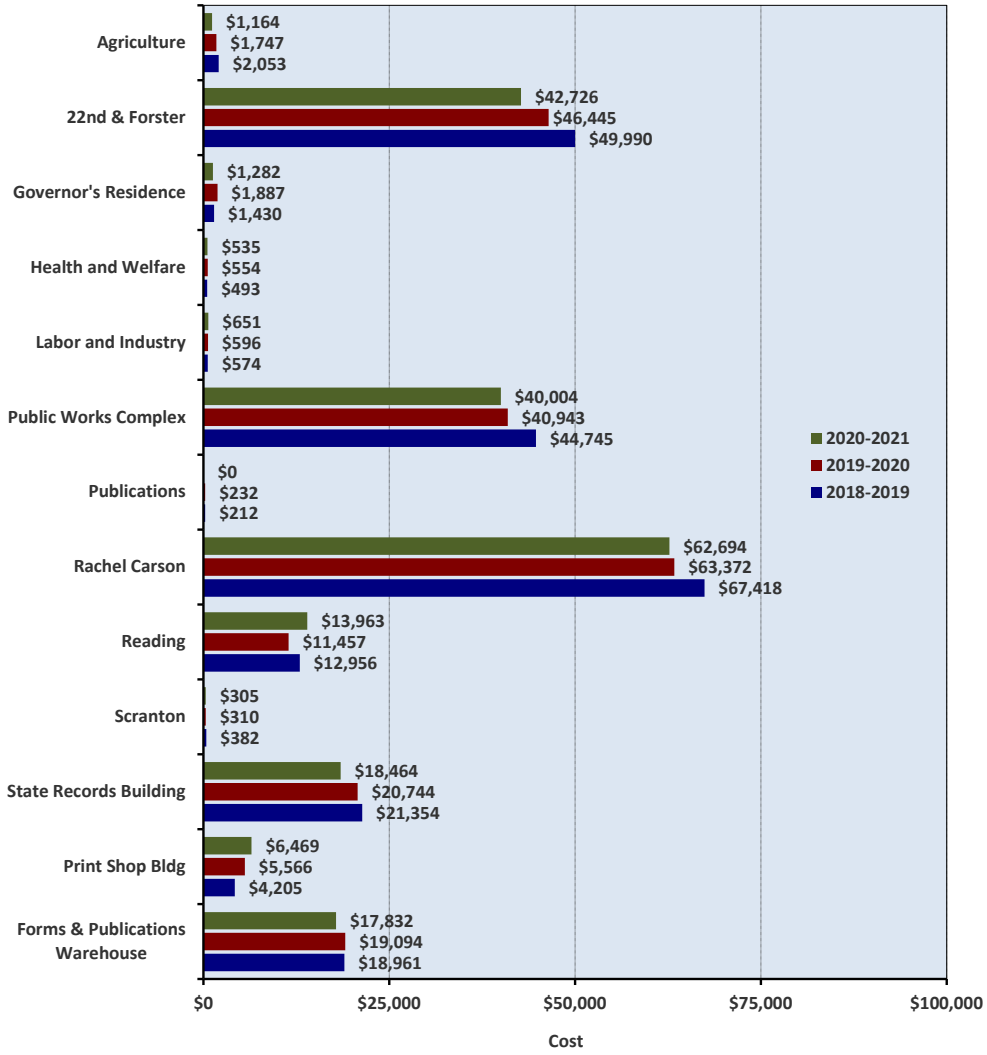
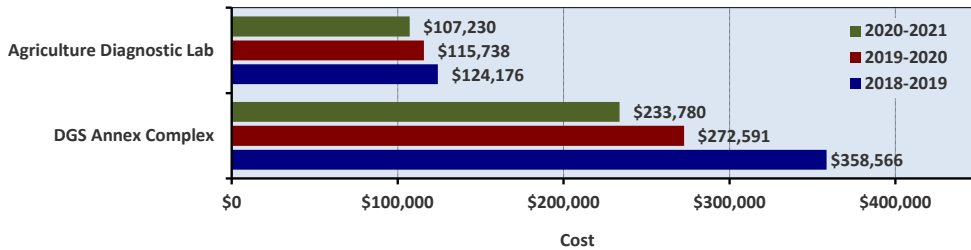


Chart 9A. Annual Natural Gas Costs Trend



**Chart 9B. Annual Natural Gas Costs Trend
Agriculture Diagnostic Lab and DGS Annex Complex**



STEAM USAGE

Table 8 details steam usage by facility. The Main Capitol remains the largest purchaser of steam. This account serves the Main Capitol, East Wing, Irvis/South Office Building, and North Office Building. The Keystone Building is the second largest user of purchased steam.

Overall, steam use increased by 7,368 mlb, up 4.6% from the previous fiscal year while costs increased by \$55,293, up 1.4%. The unit cost of purchased steam decreased 3.0%, from \$23.81 to \$23.09 per mlb.

Table 8. Steam Consumption and Costs 2020–2021

Facility ¹	Utility	mlbs	Cost	\$/mlb
Rachel Carson	NRG	2,761	\$62,247	\$22.55
Capitol Complex Buildings				
Forum	NRG	9,395	\$216,083	\$23.00
Finance	NRG	14,031	\$325,057	\$23.17
Health and Welfare	NRG	9,696	\$223,322	\$23.03
Judicial Center	NRG	12,053	\$277,708	\$23.04
Keystone	NRG	42,003	\$971,213	\$23.12
Labor and Industry	NRG	14,981	\$344,546	\$23.00
Main Capitol ²	NRG	47,251	\$1,094,630	\$23.17
Museum	NRG	16,018	\$369,074	\$23.04
Complex Buildings Total		165,427	\$3,821,634	\$23.10
Total		168,188	\$3,883,881	
Weighted Average				\$23.09

¹Note that the Publications Building has been removed from the table due to closure and demolition.

²Includes Main Capitol, East Wing, Irvis/South Office, and North Office Buildings.

Charts 10 and 11 show annual steam consumption and cost for each applicable DGS facility for the past three fiscal years (July 1, 2018 to June 30, 2021). The winter of fiscal year 2020–2021 was 1.3% less severe than the previous winter heating season. Despite that, steam use across DGS buildings increased when compared to the previous fiscal year. Notable increases were observed at the Judicial Center at 35.1% and the Rachel Carson Office Building at 66.0% while a decrease of 24.2% was observed at the Forum Building. No steam usage was recorded for the Publications Building due to building closure and decommissioning.

Chart 10. Annual Steam Consumption Trend

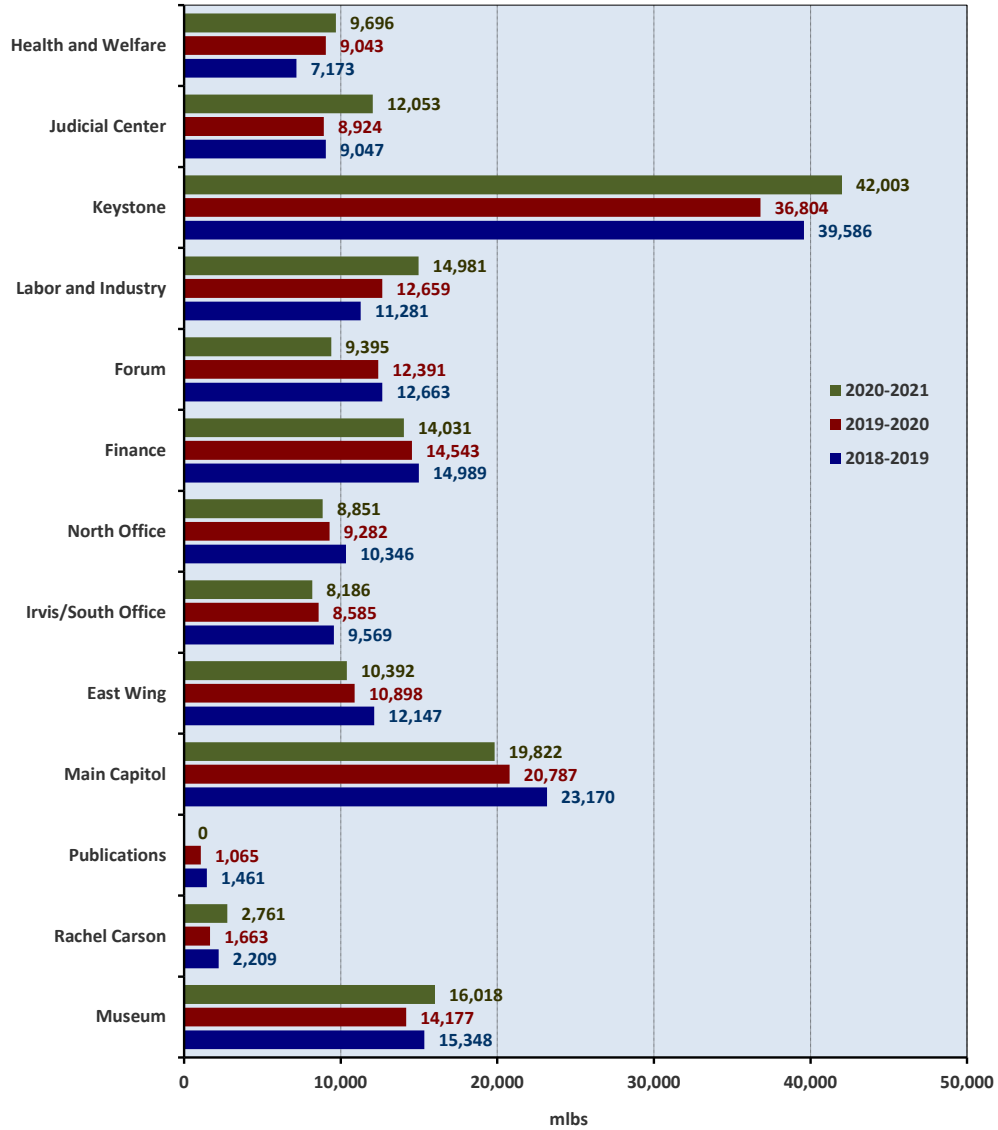
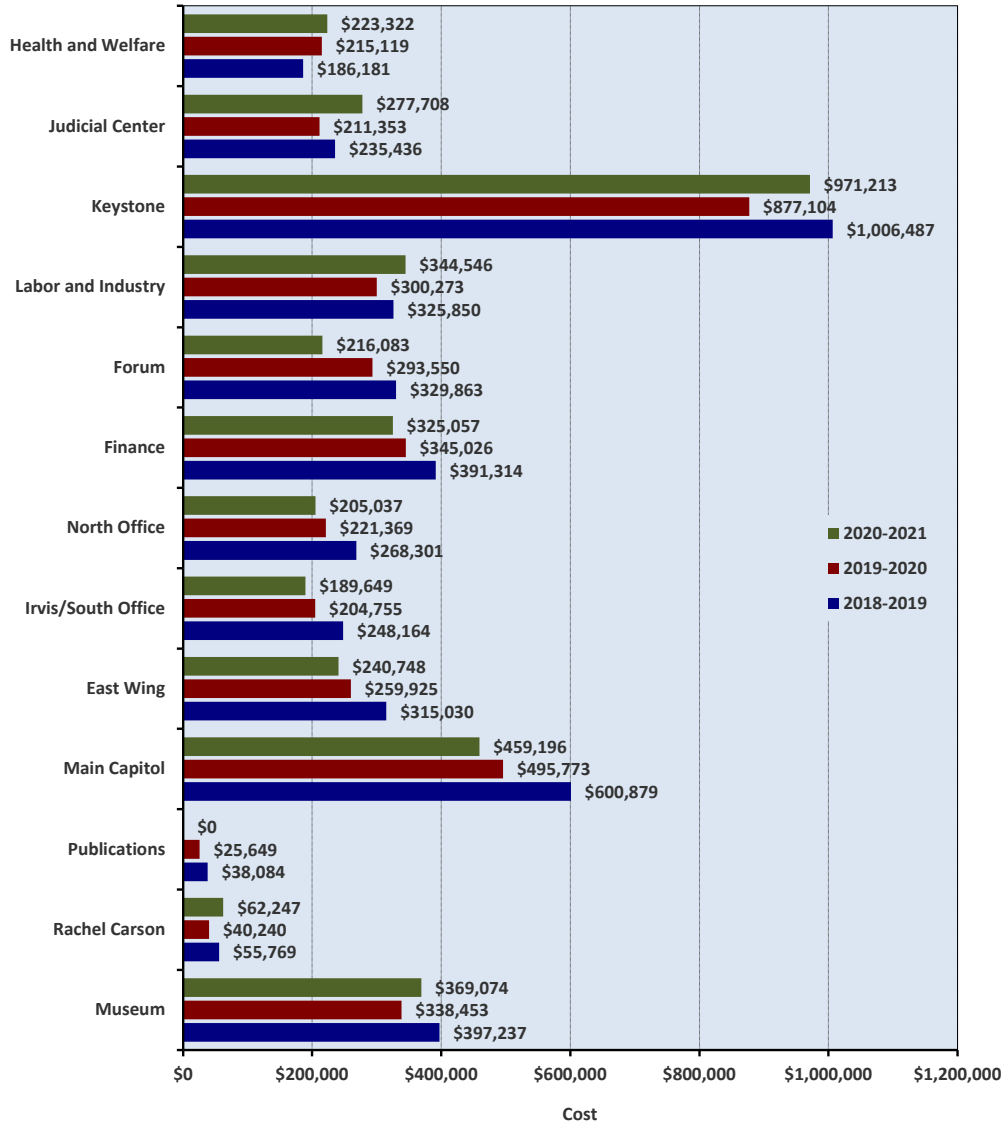


Chart 11. Annual Steam Costs Trend



WATER/SEWER USAGE

Water/sewer consumption, measured in thousand gallon units (mgal), for DGS facilities during fiscal year was 63,088 mgal at a cost of \$2,003,584. Compared to the previous fiscal year, consumption decreased by 12,381 mgal, down 16.4% while costs decreased by \$185,440, down 8.5%. Unit cost, at \$31.76 per mgal, was higher by 9.5% than the previous year. Thirteen accounts serve fire suppression systems, which are classified as ready-to-serve accounts; they have little or no usage but have very high unit costs as shown in the Table 9 “\$/mgal” column

Table 9. Water/Sewer Consumption and Costs 2020–2021

Facility	Account	Utility	mgal	Cost	\$/mgal
22nd & Forster	6204113200002	Capital Region Water	1,118	\$32,751	\$29.29
Agriculture	6202602200004	Capital Region Water	665	\$28,272	\$42.51
Agriculture Diagnostic Lab	1590031700009	Capital Region Water	702	\$34,312	\$48.87
DGS Annex Complex	1570002200006	Capital Region Water	5,000	\$176,658	\$35.33
DGS Annex Complex	1570202200004	Capital Region Water	11,640	\$209,826	\$18.03
Forms & Publications Warehouse	1601105300003	Capital Region Water	2,941	\$31,874	\$10.84
Governor's Residence	1100103400005	Capital Region Water	1,015	\$40,404	\$39.82
Public Works Complex	0708600200000	Capital Region Water	----	\$21,684	----
Public Works Complex ¹	0709000300002	Capital Region Water	(1,328)	-\$7,993	\$6.02
Rachel Carson	0900105000006	Capital Region Water	1,300	\$49,012	\$37.70
Reading	1250301	Reading Area Water Authority	603	\$17,414	\$28.90
Scranton	2405407533	Pennsylvania-American Water Company	625	\$17,096	\$27.38
State Records Building	1590017400003	Capital Region Water	34	\$546	\$15.96
State Records Building	6202603300001	Capital Region Water	9	\$54,635	\$5,835.24
Capitol Complex Buildings					
Capitol Complex Substation	1570050900004	Capital Region Water	23	\$2,022	\$87.90
Central Plant	1570002900002	Capital Region Water	17,861	\$290,567	\$16.27
East Wing	1570003800003	Capital Region Water	1,003	\$56,564	\$56.42
East Wing	1570003900001	Capital Region Water	859	\$59,488	\$69.25
Finance	0803600200008	Capital Region Water	20	\$55,324	\$2,766.19
Finance	0803610200006	Capital Region Water	6,866	\$124,396	\$18.12
Forum	0803600300006	Capital Region Water	3	\$55,155	\$18,608.31
Forum	0803610300004	Capital Region Water	2,338	\$42,233	\$18.06
Health and Welfare	1570002600008	Capital Region Water	520	\$31,070	\$59.75
Health and Welfare	1570002700006	Capital Region Water	95	\$23,396	\$246.27
Irvis/South Office	0404200700008	Capital Region Water	1,561	\$57,218	\$36.65
Judicial Center	1600060100000	Capital Region Water	730	\$34,847	\$47.74
Keystone	1570003000009	Capital Region Water	----	\$38,562	----
Keystone	1570003100007	Capital Region Water	----	\$21,684	----
Keystone	1570028800004	Capital Region Water	1,530	\$68,189	\$44.57
Labor and Industry	0710202500001	Capital Region Water	680	\$36,093	\$53.08
Labor and Industry	1570002400002	Capital Region Water	430	\$29,443	\$68.47
Main Capitol	0404200200008	Capital Region Water	2,025	\$38,786	\$19.15
Main Capitol	0803600100000	Capital Region Water	----	\$21,684	----
Main Capitol	1570002300004	Capital Region Water	----	\$32	----
Main Capitol	1570002800004	Capital Region Water	10	\$54,667	\$5,466.65
Main Capitol	1570004000008	Capital Region Water	45	\$55,374	\$1,234.54
Main Capitol	1570004100006	Capital Region Water	5	\$21,775	\$4,355.07
Main Capitol	1570102800000	Capital Region Water	152	\$3,062	\$20.15
Museum	0404201100009	Capital Region Water	1,540	\$45,330	\$29.43
Museum	1570102300000	Capital Region Water	208	\$3,757	\$18.03
North Office	0404200600000	Capital Region Water	260	\$26,376	\$101.45
Complex Buildings Total			38,764	\$1,297,093	\$33.46
Total			63,088	\$2,003,584	
Weighted Average					\$31.76

Note: No water/sewer consumption or costs reported for Northwest Office Building, Communications Network, or CTC1 (CMIC).

¹ Negative consumption and cost for this account were due to the identification and resolution of a billing error.

Charts 12 and 13 depict a three-year trend of water/sewer consumption and costs for each facility. Consumption for most facilities decreased significantly from the previous fiscal year. Notable usage changes occurred at the East Wing, down 74.2%; Keystone Building, down 63.5%; Rachel Carson Office Building, down 51.7%; Labor and Industry Building, down 51.7%; Forms & Publications Warehouse, up 83.5%, and Finance Building, up 73.9%. The negative usage reported for the Public Works Complex is indicative of a metering correction by Capital Region Water.

Chart 12. Annual Water/Sewer Consumption Trend

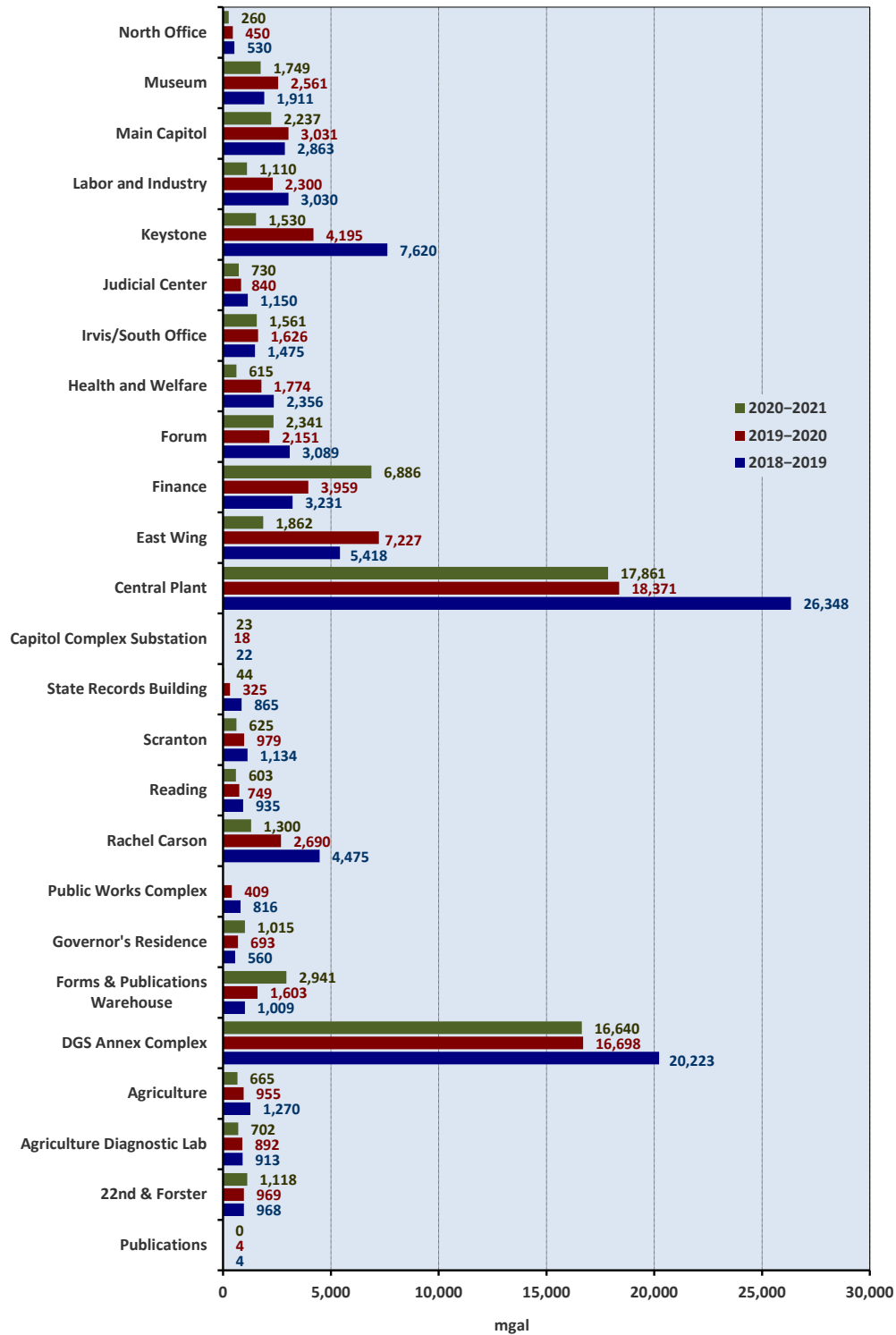


Chart 13. Annual Water/Sewer Costs Trend

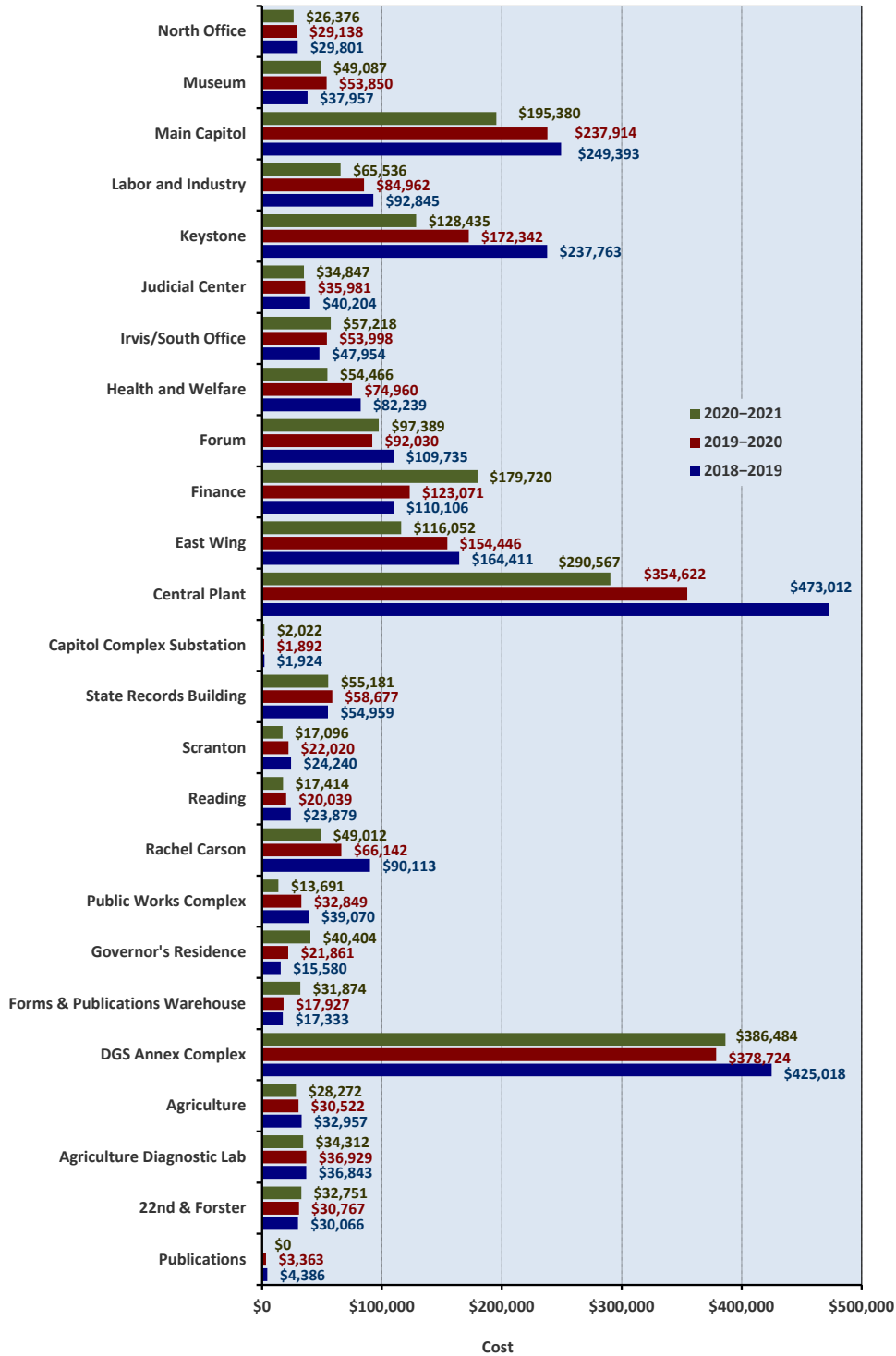


Table 10 shows a four-year history (July 1, 2017 through June 30, 2021) of water/sewer use and cost for each facility. Fiscal year 2020–2021 usage and cost reflect 22.9% and 9.2% decreases, respectively, from fiscal year 2017–2018. Across the four-year period, notable usage deviations have occurred at the State Records Center, where usage decreased 96.0%; the Keystone Building, where usage decreased 78.0%; the Forms and Publications Warehouse, where usage increased 499.2%, and the Finance Building where usage increased 135.7% from fiscal year 2016–2017. The average unit cost of water/sewer increased from \$26.98 to \$31.76 per mgal, resulting in a 17.7% increase over the four-year period.

Table 10. Annual Water/Sewer Consumption and Costs Trend

Facility	2017–2018		2018–2019		2019–2020		2020–2021	
	Cost	mgal	Cost	mgal	Cost	mgal	Cost	mgal
Publications	\$4,142	1	\$4,386	4	\$3,363	4	---	---
22nd & Forster	\$27,522	842	\$30,066	968	\$30,767	969	\$32,751	1,118
Agriculture Diagnostic Lab	\$28,282	524	\$36,843	913	\$36,929	892	\$34,312	702
Agriculture	\$30,390	1,155	\$32,957	1,270	\$30,522	955	\$28,272	665
DGS Annex Complex	\$390,480	18,351	\$425,018	20,223	\$378,724	16,698	\$386,484	16,640
Forms & Publications Warehouse	\$11,248	491	\$17,333	1,009	\$17,927	1,603	\$31,874	2,941
Governor's Residence	\$16,804	622	\$15,580	560	\$21,861	693	\$40,404	1,015
Public Works Complex	\$29,200	341	\$39,070	816	\$32,849	409	\$13,691	-1,328
Rachel Carson	\$70,470	3,046	\$90,113	4,475	\$66,142	2,690	\$49,012	1,300
Reading	\$17,695	593	\$23,879	935	\$20,039	749	\$17,414	603
Scranton	\$22,435	1,031	\$24,240	1,134	\$22,020	979	\$17,096	625
State Records Building	\$66,787	1,092	\$54,959	865	\$58,677	325	\$55,181	44
Capitol Complex Buildings								
Capitol Complex Substation	\$1,809	22	\$1,924	22	\$1,892	18	\$2,022	23
Central Plant	\$387,110	23,046	\$473,012	26,348	\$354,622	18,371	\$290,567	17,861
East Wing	\$153,680	5,160	\$164,411	5,418	\$154,446	7,227	\$116,052	1,862
Finance	\$96,344	2,921	\$110,106	3,231	\$123,071	3,959	\$179,720	6,886
Forum	\$96,039	2,873	\$109,735	3,089	\$92,030	2,151	\$97,389	2,341
Health and Welfare	\$76,773	2,320	\$82,239	2,356	\$74,960	1,774	\$54,466	615
Iris/South Office	\$42,265	1,176	\$47,954	1,475	\$53,998	1,626	\$57,218	1,561
Judicial Center	\$37,521	1,105	\$40,204	1,150	\$35,981	840	\$34,847	730
Keystone	\$203,941	6,950	\$237,763	7,620	\$172,342	4,195	\$128,435	1,530
Labor and Industry	\$88,034	2,820	\$92,845	3,030	\$84,962	2,300	\$65,536	1,110
Main Capitol	\$241,168	2,978	\$249,393	2,863	\$237,914	3,031	\$195,380	2,237
Museum	\$38,813	1,817	\$37,957	1,911	\$53,850	2,561	\$49,087	1,749
North Office	\$28,597	540	\$29,801	530	\$29,138	450	\$26,376	260
Complex Buildings Total	\$1,492,095	53,728	\$1,677,343	59,044	\$1,469,206	48,503	\$1,297,093	38,764
Total	\$2,207,550	81,816	\$2,471,786	92,216	\$2,189,025	75,469	\$2,003,584	63,088
Percent Change			12.0%	12.7%	-11.4%	-18.2%	-8.5%	-16.4%

ENERGY PROCUREMENT

PSFEI is the primary technical adviser to the Commonwealth for the procurement of electricity, natural gas, and coal. The Energy Procurement section provides information about PSFEI's activities and its partnership with the DGS Bureau of Procurement.

KEEPING PACE WITH THE ENERGY MARKETS

PSFEI keeps abreast of energy market trends through research and regular interactions and meetings with Pennsylvania utilities and national energy suppliers. PSFEI monitors regulatory developments at state, regional, and federal levels via Pennsylvania Public Utility Commission (PUC) rulings, PJM Interconnection policies, and Federal Energy Regulatory Commission (FERC) rulings. PSFEI continually monitors various energy markets to identify trends and opportunities for market-based savings.

Trends and developments that affected Commonwealth budgets and energy planning were reported to the DGS Bureau of Procurement at regularly scheduled meetings to establish energy and procurement policies and direction. These trends, combined with existing and future supply contracts, were considered when preparing and submitting requested utility budget projections to the DGS Bureau of Financial and Management Services.

The DGS Bureau of Procurement and PSFEI used the following energy price-risk management strategies to extend flexibility and ensure maximum cost avoidance in volatile energy markets:

- Employed an array of electricity and natural gas procurement product types to balance price stability with cost reduction opportunities while retaining a measure of flexibility.
- Strategically balanced the Commonwealth standard 10% swing with a new full-plant-requirements solicitation type for natural gas accounts. A swing tolerance requires suppliers to apply the contract price to a specified percentage (typically 10%) above or below the monthly contract quantities. For accounts with unpredictable future usage, a full-plant-requirements solicitation type offers price protection for all volumes consumed and eliminates the risk of market exposure due to large variations in expected monthly contract quantities.
- Examined electricity and natural gas bills for proper utility rate classification, energy consumption, demand charges, taxes, and opportunities for tariff savings.
- Monitored energy sector economic, legislative, and regulatory developments. PSFEI uses this information and knowledge to advise the Commonwealth about legislative actions, utility rate increases or decreases, market movements, and emerging technologies.
- Advised applicable Commonwealth agencies regarding potential economic impacts as central heating plants transitioned from coal to utility pipeline natural gas or mobile compressed natural gas (CNG) as a primary fuel.

ELECTRICITY

TAKING ADVANTAGE OF CURRENT ENERGY MARKETS

During fiscal year 2020–2021, PSFEI and the DGS Bureau of Procurement continued to engage a balanced strategy to maximize overall savings potential while providing budget certainty through stable, long-term energy pricing.

Throughout the year, the electricity futures market continued to exhibit a backwardated¹ pattern, where the market prices for each successive year in the future are progressively lower than the year before. In a backwardated market, the lower-priced future years have a positive effect for the consumer by lowering the overall average price. In order to take advantage of this market condition, 36- and 48-month contract terms were solicited by the Commonwealth in addition to 12- and 24-month terms.

ELECTRICITY PROCUREMENT

A number of smaller and unmetered Commonwealth electricity accounts were solicited and awarded during the fiscal year. Due to long-term contracts secured in fiscal year 2018–2019 for the vast majority of the Commonwealth electricity portfolio, PSFEI and the DGS Bureau of Procurement were able to focus electricity procurement efforts on the COSTARS electricity procurement program and the successful conclusion and award of the Request for Quote (RFQ) DGS SOLAR 19-01 for retail solar electricity supply.

RFQ DGS SOLAR 19-01 was the culmination of a multi-fiscal year effort to fulfill the renewable energy goals in Governor Wolf’s Executive Order 2019-01, *Commonwealth Leadership in Addressing Climate Change and Promoting Energy Conservation and Sustainable Governance*. Under Executive Order 2019-01, Commonwealth agencies are required to source a minimum of 40% of their annual electricity consumption from renewable sources sited within Pennsylvania. On March 22, 2021, the Governor’s Office announced that the DGS Bureau of Procurement awarded a contract to Constellation Energy for 361,000 megawatt-hours (MWh) of Pennsylvania-generated solar electricity. Dubbed the Pennsylvania Project to Utilize Light and Solar Energy (PA PULSE), the award serves 431 accounts that comprise 50% of the Commonwealth’s electricity consumption for fifteen years beginning January 1, 2023.

In addition, under the direction of the DGS Bureau of Procurement, PSFEI administered four procurement events during the fiscal year and awarded 1,939 Commonwealth and COSTARS electricity accounts using the Energy Risk Management Application (ERMA), PSFEI’s web-based procurement platform. The net result was over \$677,000 in projected annual avoided costs versus utility-issued price to compare (where available) and almost \$150,000 in cost reduction from previous contracts. Procurement result details are provided in Table 11 on the following page.

¹ When a near-month futures contract is trading at a premium to more distant contracts, that commodity’s futures curve is in “backwardation,” or the commodity is “backwardated.” This occurs when inventories of commodities are tight, so market participants are willing to pay a premium to buy the immediate deliverable commodity. Theoretically, there is no value to carrying costs such as storage, insurance, and interest costs since there is a scarcity of the commodities.

Table 11. Avoided Cost for Electricity Procurement 2020–2021

Agency	Number of Accounts	Cost Reduction (Annual)	Cost Avoidance (Annual)	Cost Avoidance (Total) ¹
COSTARS	1,569	(\$284,067)	\$571,048	\$1,759,198
Department of Conservation and Natural Resources	47	---	\$1,353	\$2,706
Department of Corrections	5	\$401,496	\$4,394	\$29,613
Department of Environmental Protection	9	\$7,179	\$11,008	\$22,017
Department of Human Services ²	3	---	---	---
Department of Military and Veterans Affairs	5	(\$16,345)	\$18,922	\$37,844
Fish and Boat Commission	3	\$2	\$7	\$14
Pennsylvania Department of Transportation	164	\$657	\$1,834	\$3,673
Pennsylvania Game Commission	5	---	\$149	\$298
Pennsylvania Liquor Control Board	23	---	\$5,715	\$11,416
Pennsylvania State Police	8	(\$5,005)	\$6,180	\$12,367
Pennsylvania State System of Higher Education	7	(\$21,932)	\$14,753	\$29,508
Pennsylvania Turnpike Commission	7	\$68,000	\$37,206	\$111,618
Unidentified Accounts	84	---	\$4,678	\$9,138
Grand Total	1,939	\$149,986	\$677,247	\$2,029,411

¹Some contracts awarded were less than or greater than one year.

²Accounts awarded were unmetered and reported no usage, therefore cost avoidance could not be calculated

NATURAL GAS

NATURAL GAS PROCUREMENT

Two natural gas commodity procurement events were held during the fiscal year for Commonwealth accounts. PSFEI collected billing data, developed and confirmed monthly contract quantities with facility managers, analyzed utility rate class structures, facilitated rate class changes where economically advantageous, and conducted competitive bidding events with prequalified suppliers for each of the accounts. Twenty-two contracts were awarded resulting in a projected annual avoided cost of over \$1.88 million when compared to utility retail tariff rates. Anticipated price reductions in comparison to previous contracts are estimated to be over \$21,000 annually. Projected avoided costs by agency are shown in Table 12 on the following page.

Both fixed-price and index-price (basis price plus variable New York Mercantile Exchange [NYMEX] natural gas commodity price) supply contracts were solicited, allowing the DGS Bureau of Procurement to manage price risk and maximize cost-avoidance opportunities.

Table 12. Avoided Costs for Natural Gas Procurement 2020–2021

Agency	Number of Accounts	Cost Reduction (Annual)	Cost Avoidance (Annual)	Cost Avoidance (Total) ¹
Department of Corrections	8	(\$15,699)	\$1,205,078	\$2,523,317
Department of General Services	3	(\$2,992)	\$17,842	\$53,525
Department of Human Services	3	\$18,624	\$585,532	\$1,474,479
Department of Military and Veterans Affairs	1	\$2,431	\$11,547	\$46,189
Pennsylvania Department of Transportation	1	\$7,398	\$52,642	\$157,925
Pennsylvania Turnpike Commission	6	\$11,760	\$9,443	\$28,329
Total	22	\$21,522	\$1,882,083	\$4,283,765

¹Accounts for multi-year contracts.

RENEWABLE ENERGY CREDITS

RENEWABLE ENERGY CREDIT PROCUREMENT

Through calendar year 2021, the Commonwealth continued to offset approximately 40% of its electricity load via the purchase of Green-e certified Renewable Energy Certificates (RECs).

To qualify as a Green-e certified resource, providers must meet criteria set forth by the Center for Resource Solutions in the Green-e National Standard document.

Fulfilling the 40% renewable energy mandate in Executive Order 2019-01, *Commonwealth Leadership in Addressing Climate Change and Promoting Energy Conservation and Sustainable Governance*, for calendar years 2020 and 2021, the total annual quantity of RECs was distributed to each agency by weighting that agency’s electricity usage in proportion to the Commonwealth’s overall usage. Information by agency for calendar years 2019, 2020, and 2021 is shown in Table 13 on the following page.

The Commonwealth’s annual REC purchase places Pennsylvania in the number two position for state governments (behind California) on the U.S. Environmental Protection Agency’s (EPA) Green Power Partnership National Top 100 list. At the time of report publication, the Commonwealth ranked 49th among the Top 100.

According to the EPA’s Greenhouse Gas Equivalencies Calculator, the Commonwealth’s purchase led to an annual offset of approximately 218,460 metric tons of carbon dioxide or the electricity use of roughly 36,987 average American homes for one year. The annual carbon sequestered by this purchase is approximately equivalent to 285,298 acres of U.S. forestland, i.e., a parcel of forested land slightly larger than Mifflin County or approximately 1% of the land area of the Commonwealth.

Table 13. REC Apportionment by Agency

Agency	CY 2019 Total		CY 2020 Total		CY 2021 Total	
	MWh Credits	Annual Cost	MWh Credits	Annual Cost	MWh Credits	Annual Cost
Department of Agriculture	3,194	\$2,591	3,194	\$2,591	3,194	\$2,364
Department of Conservation and Natural Resources	8,750	\$7,098	8,750	\$7,098	8,750	\$6,475
Department of Corrections	99,297	\$80,555	99,297	\$80,555	99,297	\$73,480
Department of Education	158	\$128	158	\$128	158	\$117
Department of Environmental Protection	2,749	\$2,230	2,749	\$2,230	2,749	\$2,034
Department of General Services	49,514	\$40,169	49,514	\$40,169	49,514	\$36,641
Department of Health	913	\$741	913	\$741	913	\$676
Department of Human Services	27,716	\$22,485	27,716	\$22,485	27,716	\$20,510
Department of Labor and Industry	2,003	\$1,625	2,003	\$1,625	2,003	\$1,482
Department of Military and Veterans Affairs	38,702	\$31,397	38,702	\$31,397	38,702	\$28,639
Department of Revenue	1,768	\$1,434	1,768	\$1,434	1,768	\$1,308
Department of Transportation	36,047	\$29,243	36,047	\$29,243	36,047	\$26,674
Pennsylvania Fish and Boat Commission	3,529	\$2,863	3,529	\$2,863	3,529	\$2,612
Pennsylvania Game Commission	1,275	\$1,034	1,275	\$1,034	1,275	\$944
Pennsylvania Historical and Museum Commission	3,019	\$2,449	3,019	\$2,449	3,019	\$2,234
Pennsylvania Liquor Control Board	15,971	\$12,957	15,971	\$12,957	15,971	\$11,819
Pennsylvania State Police	13,352	\$10,832	13,352	\$10,832	13,352	\$9,880
Pennsylvania Emergency Management Agency	1,021	\$828	1,021	\$828	1,021	\$755
Total	308,978	\$250,658	308,978	\$228,644	308,978	\$228,644

SUMMARY OF ENERGY AND ENGINEERING SERVICES

GENERAL

With a sharp focus on operational efficiency and cost-control objectives, PSFEI assisted DGS and DGS-supported agencies with the following services:

- Energy information updates
- Energy market trends and regulatory policy updates
- Energy procurement services
- Energy and utility database development and support
- Review and resolution of utility billing, rates, and service issues
- Engineering advisory services
- Research and education

PSFEI conducted meetings with DGS to ensure proper communication and project prioritization. The meetings included topics such as energy-data management, energy procurement, facility systems issues, regulatory issues, and strategic planning.

EXECUTIVE ORDER 2019-01 UPDATE

YEAR 3 REPORT OF ENERGY SAVINGS

On January 8, 2019, Pennsylvania Governor Tom Wolf issued Executive Order 2019-01, *Commonwealth Leadership in Addressing Climate Change and Promoting Energy Conservation and Sustainable Governance*. A primary goal of the executive order is to reduce overall Commonwealth energy consumption by 3% per year and 21% by 2025 from 2017 levels.

















The Year 3 report of energy savings includes only those meters where a fair comparison of baseline fiscal year 2019–2020 usage with fiscal year 2020–2021 usage is possible. A “precinct reporting” methodology was chosen, defined as only those metered accounts that have two bills or less missing in the 24-month evaluation period. Year 3 details by agency are provided in Table 14 on page 31.

The result of the analysis for Year 3 indicates a combined 3.2% decrease in energy consumption from Commonwealth agencies. A total of 7,919, or 92%, of the 8,556 known meters passed the validation criteria previously mentioned to produce these results. From those 7,919 meters, normalized energy consumption for the 2019–2020 baseline fiscal year was calculated to be 4,853,886 MMBtu. Actual energy consumption for fiscal year 2020–2021 was down 156,059 MMBtu, or 3.2%, just exceeding the 3% yearly reduction goal.

Weather normalization measures the impact of weather on energy consumption. The process of normalization incorporates weather sensitivity and calculated heating and cooling degree days to provide a year-over-year, commensurable comparison of utility consumption. Weather normalization

adjusts energy usage so it can be compared to energy usage in other years over a longer period, eliminating weather as a factor in energy consumption to present a fair comparison.

Table 14. Year 3 Report of Energy Savings

Known Electric Meters	Known N. Gas & Steam Meters	State Reporting Agency	Normalized Use (MMBtu)	FY 2019 Baseline MMBtus	FY 2020 Current MMBtus	Percent Change	Metric Tons CO2 Reduction	Number of Known Meters	% of Meters Reported
206	124	Dept of Corrections		2,097,334	2,110,846	0.6%	(4,071)	330	88%
64	36	Dept of Human Services		1,016,872	941,300	-7.4%	3,945	100	96%
152	661	Dept of Military and Veterans Affairs		509,064	537,922	5.7%	(24)	813	96%
3,343	147	Dept of Transportation		413,410	391,531	-5.3%	1,501	3,490	99%
39	28	Dept of General Services		397,980	309,267	-22.3%	6,888	67	96%
1,063	82	PA State Police		118,625	113,393	-4.4%	388	1,145	87%
1,943	44	Dept of Conservation and Natural Resources		92,536	95,073	2.7%	(295)	1,987	86%
76	17	PA Fish and Boat Commission		43,434	44,358	2.1%	(103)	93	92%
8	7	Dept of Agriculture		38,952	43,735	12.3%	(243)	15	60%
7	6	PA Emergency Management Agency		26,573	18,435	-30.6%	696	13	77%
112	9	Dept of Environmental Protection		25,416	23,062	-9.3%	199	121	84%
125	14	PA Historical and Museum Commission		19,240	17,587	-8.6%	133	139	68%
7	3	Dept of Labor and Industry		18,295	17,306	-5.4%	113	10	80%
2	3	Dept of Revenue		13,181	11,708	-11.2%	144	5	80%
224	11	PA Game Commission		13,172	12,822	-2.6%	32	235	91%
2	1	Dept of Health		9,803	9,481	-3.3%	(32)	3	100%
7,373	1,193			4,853,886	4,697,827	-3.2%	9,274	8,566	92%

ENERGY SERVICES

GENERAL

Since 1998, PSFEI has helped Commonwealth facilities avoid over \$256 million in energy expenditures via competitive bidding in the electricity and natural gas commodity markets. During fiscal year 2020–2021, avoided contract costs totaled over \$2.5 million.

ENERGY RISK MANAGEMENT APPLICATION

PSFEI continued development efforts to improve ERMA, its proprietary, advanced, multifunction, web-based application that provides online access to detailed procurement and utility billing information allowing facility management personnel to make informed utility and commodity decisions. Efforts during the fiscal year focused on minor adjustments while the majority of work was dedicated to developing a next-generation platform.

PJM DEMAND RESPONSE PROGRAM AND PLC MANAGEMENT SERVICES

PSFEI supported Commonwealth agencies with the PJM Emergency Demand Response Program by soliciting Curtailment Service Providers (CSPs) for new and expiring contracts, facilitating communication during scheduled test events, and collecting and reporting facility-specific program information.

Instead of participating in the demand response program, DGS facilities opted to focus resources on a Peak Load Contribution (PLC) management strategy. Because the LCSWMA agreement utilizes a pass-through structure with regard to capacity costs, any PLC reductions that DGS facilities can obtain will result in avoided capacity costs in the subsequent energy year. Reductions in usage at DGS facilities on potential coincident peak days are achieved using building automation control systems.

INTERGOVERNMENTAL POWER PURCHASE AGREEMENT

In late 2013, a twenty-year PPA was executed between the Commonwealth and the Borough of Columbia (Borough) in Pennsylvania. The PPA enabled the sale of the Harrisburg incinerator to the LCSWMA. The incinerator generates steam that is used to generate electricity. The LCSWMA leases the electric generation plant to the Borough. The Borough sells electricity to the Commonwealth under specific contract terms and pricing that includes annual escalation factors and discounts. The PPA contains a clawback provision to protect the Commonwealth from making electricity payments in excess of market rates during the PPA's final ten years.

There are nineteen electric accounts assigned to the PPA; seventeen accounts are DGS-operated facilities, one account is a Department of Corrections (DOC) facility, and one account is a Pennsylvania Emergency Management Agency (PEMA) facility. Over 90% of the entire electric load for these accounts was provided by the Borough in fiscal year 2020–2021. The remaining power was purchased from the market via competitively procured blocks or the day-ahead energy market.

Table 15 includes the total electric usage and cost in fiscal year 2020–2021 for the Commonwealth accounts assigned to this contract.

Table 15. Purchased LCSWMA Electricity Summary 2020–2021

Month	Usage (kWh)	Cost (excluding GRT ¹)	Unit Cost (\$/kWh) (excluding GRT)	Cost (including GRT)	Unit Cost (\$/kWh) (including GRT)
July 2020	11,613,140	\$747,234	\$0.06434	\$793,618	\$0.06834
August 2020	11,161,171	\$660,864	\$0.05921	\$701,772	\$0.06288
September 2020	9,571,983	\$579,346	\$0.06053	\$615,130	\$0.06426
October 2020	8,148,658	\$618,748	\$0.07593	\$656,068	\$0.08051
November 2020	8,214,444	\$598,345	\$0.07284	\$635,382	\$0.07735
December 2020	8,256,148	\$603,316	\$0.07307	\$640,689	\$0.07760
January 2021	8,595,866	\$673,173	\$0.07831	\$716,702	\$0.08338
February 2021	8,182,975	\$633,078	\$0.07737	\$672,322	\$0.08216
March 2021	8,270,021	\$655,800	\$0.07930	\$696,361	\$0.08420
April 2021	8,150,366	\$588,101	\$0.07216	\$624,511	\$0.07662
May 2021	8,639,075	\$721,793	\$0.08355	\$766,563	\$0.08873
June 2021	10,026,879	\$779,767	\$0.07777	\$828,060	\$0.08258
Total / Average	108,830,726	\$7,859,564	\$0.07222	\$8,347,179	\$0.07670

¹ GRT = Gross Receipts Tax

The unit cost for electricity, excluding utility distribution charges, averaged 7.670 cents per kWh. For comparative purposes, a procurement event held in June 2019 for large accounts in the PPL territory secured a rate of 4.972 cents per kWh for a term beginning January 2021 through December 2022. The divergence in pricing between competitively procured PPL accounts and PPL accounts served under the PPA is primarily the result of escalating PPA pricing significantly outpacing actual electricity futures prices.

ENGINEERING SERVICES

ELECTRICAL TESTING

During fiscal year 2020–2021, PSFEI staff continued to support DGS with the operation and maintenance of the electrical systems at the Capitol Complex. The support included testing for medium-voltage relays, medium-voltage air and vacuum circuit breakers, low- and medium-voltage cables, and low-voltage circuit breakers. PSFEI supplied DGS with resulting testing reports; calibration and inspection stickers for installation on equipment; and infrared scanning of circuit breakers, bus ducts, distribution panels, and similar power system equipment. A list of reports issued to document these efforts is provided in Table 16 on the following page.

Table 16. Engineering Services Reports 2020–2021

Report No.	Report Date	Location	Comments or Noted Deficiencies
TR 20/21-7	11/17/20	DGS Forum Building	Circuit No. 5 electrical maintenance and testing
TR 20/21-8	11/18/20	DGS Keystone Building	Spare transformers electrical testing
TR 20/21-10	01/07/21	DGS Labor and Industry Building	Substation 2 fault path electrical testing
TR 20/21-12	02/01/21	DGS	Surge arrestors acceptance testing
ER-F-20/21-10	02/04/21	DGS Annex Complex	Fault 0121
TR 20/21-17	03/10/21	DGS Annex Complex	Cable and overcurrent relay electrical testing
TR 20/21-24	04/26/21	DGS Labor and Industry and Liquor Control Board Buildings	Electrical testing

Note: ER-F = Electric Field Report, TR = Testing Report

GUARANTEED ENERGY SAVINGS ACT PROGRAM

Over the past several years, the Commonwealth’s Guaranteed Energy Savings Act (GESA) program has grown in the quantity of projects and the quality of services. Seventeen projects totaling over \$218 million have resulted in almost \$6.88 million in annual energy savings. Charts 14 and 15 show breakouts of GESA project annual savings and investments by each Commonwealth agency.

As shown in Chart 16, three GESA projects are complete and fourteen GESA projects are in various stages of development. In addition to creating Pennsylvania jobs that support the economy, there are resulting environmental benefits from GESA project implementation. Using the total estimated project savings, Chart 17 shows examples of the environmental impacts using total emissions reductions. Table 17 provides an overview of the seventeen GESA projects used to develop Charts 14 through 17.

Note: Charts 14 through 17 and the information in Table 17 were provided by DGS.

Chart 14. GESA Project Annual Savings

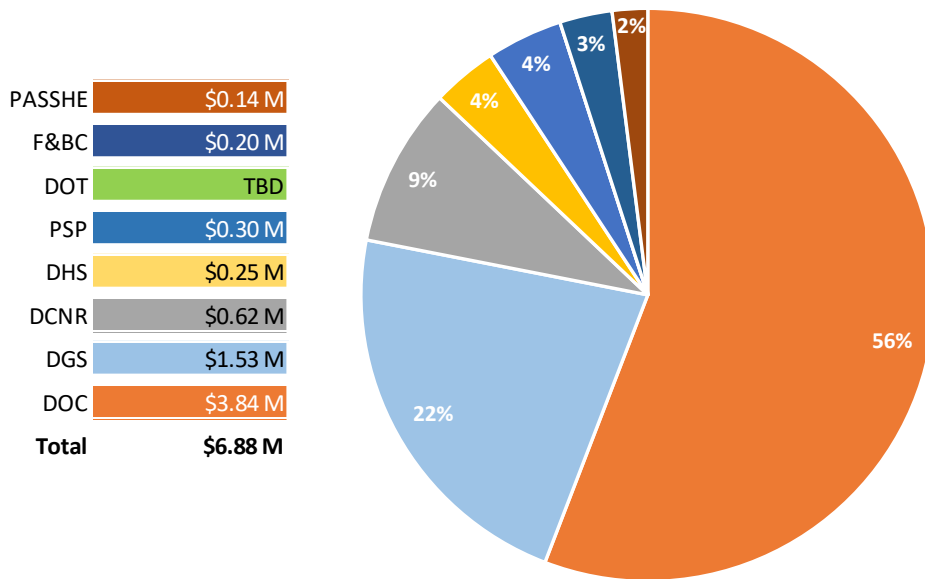


Chart 15. GESA Project Investment

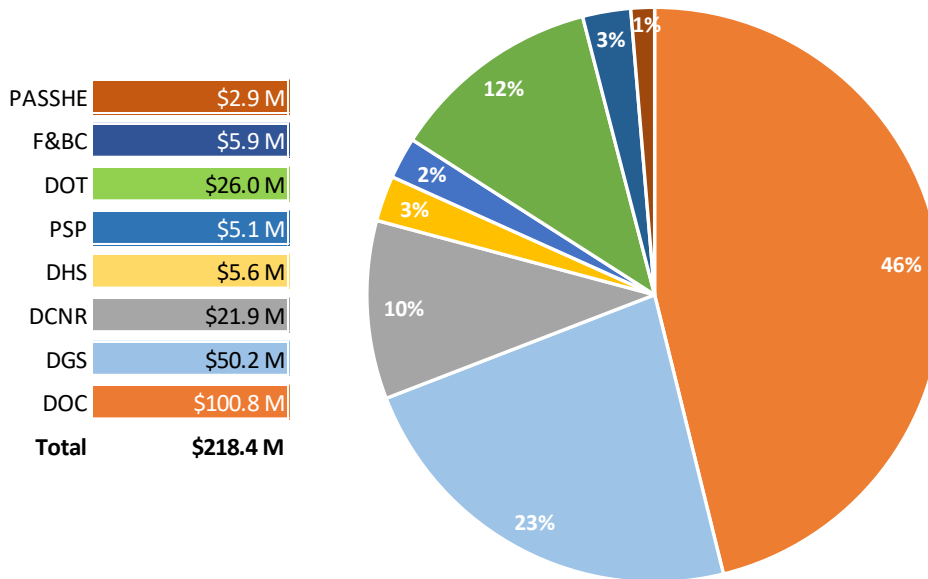


Chart 16. GESA Project Development Status

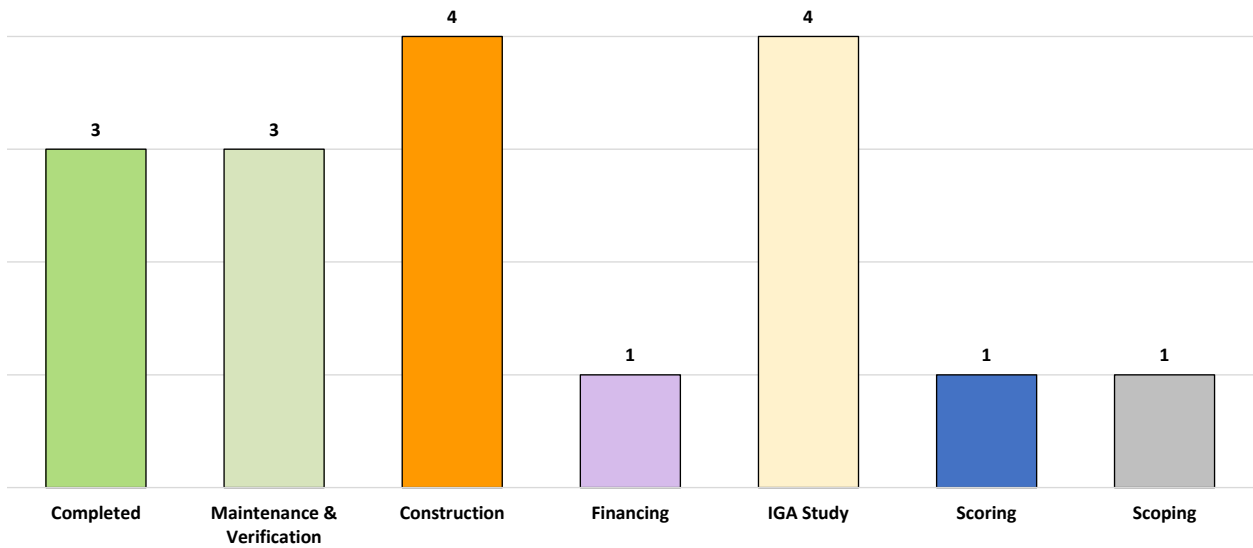


Chart 17. GESA Project Environmental Benefit Examples

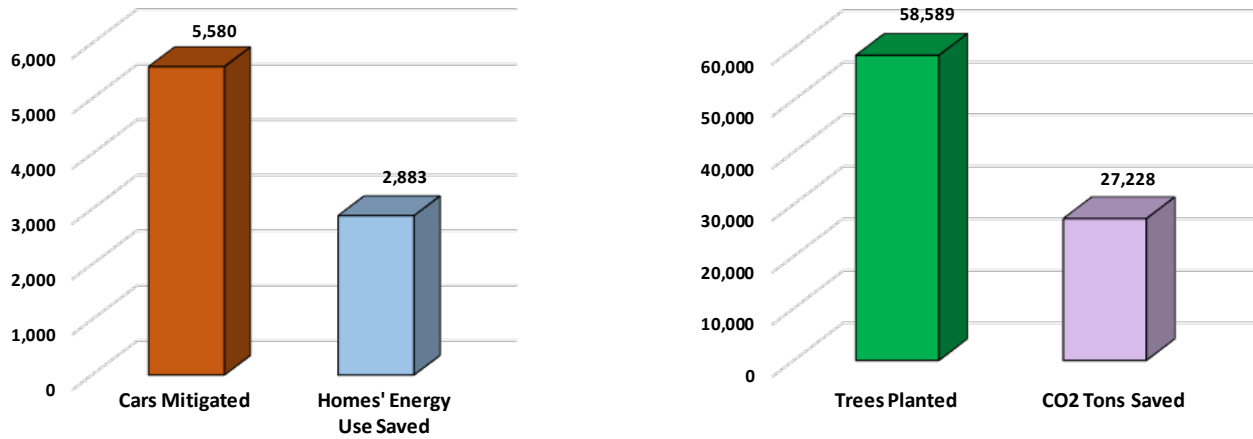


Table 17. GESA Projects—Delivery and Savings Summary

Agency	Location	Energy Conservation Measures (ECMs)	Status	Value (M)	Annual Energy Cost Savings ¹	Cars Mitigated	Trees Planted	Homes Energy Use Saved	CO2 Tons Saved
DOC	SCI Dallas	Lighting, water, boiler, and sewage	Completed	\$20.0	\$2,200,000	341	4,123	172	1,757
PSP	Harrisburg Headquarters	Lighting, water, and boiler	Completed	\$5.1	\$295,097	454	5,378	224	2,339
DGS	Keystone Building	Lighting and controls	Completed	\$3.0	\$329,677	383	4,635	193	1,789
PASSHE	Thaddeus Stevens College	Lighting, controls, steam	Measurement & Verification	\$2.7	\$137,305	190	2,301	96	979
DCNR	West Region, Parks & Forests	Lighting, HVAC systems, and building envelope	Measurement & Verification	\$5.5	\$375,182	436	5,282	220	2,247
DHS	Selinsgrove Center	Lighting, water, boilers, and weatherization	Measurement & Verification	\$5.6	\$253,415	395	4,784	199	2,035
DGS	Capitol Complex	Lighting, window film, water systems, chillers	Construction	\$18.2	\$1,200,000	1,390	16,826	701	6,368
DOC	SCI Muncy	Lighting, solar, steam traps, windows, AC, EMS	Construction	\$18.3	\$469,904	424	3,242	226	2,162
DOC	SCI Houtzdale	Lighting, water, HVAC	Construction	\$30.5	\$1,170,814	970	7,427	518	4,492
DCNR	Central Region, Parks & Forests	Lighting, solar, sludge, BMS, electric to gas, geothermal	Construction	\$16.4	\$243,361	321	2,496	181	1,664
F&BC	Hatchery Facilities (Statewide)	Lighting, weatherization, HVAC upgrades/fuel switches, water filtration and recovery	Financing	\$5.9	\$203,523	276	2,095	153	1,396
DOT	District 8 Facility	Lighting, weatherization, water conservation, BAS upgrades, fuel switches on HWH, steam traps	Investment Grade Audit	\$26.0	TBD	TBD	TBD	TBD	TBD
DGS	DGS Capitol Complex 2	Lighting, weatherization, BAS upgrades, HVAC upgrades/fuel switches, geothermal	Investment Grade Audit	\$29.0	TBD	TBD	TBD	TBD	TBD
DOC	SCI Fayette	Lighting, BAS, chiller, boiler, water conservation	Investment Grade Audit	\$32.0	TBD	TBD	TBD	TBD	TBD
DOC	SCI Frackville	Steam, steam traps, lighting, BAS, chiller, water conservation	Investment Grade Audit	TBD	TBD	TBD	TBD	TBD	TBD
DHS	Wernersville State Hospital	Lighting, controls, weatherization, steam traps, condensate, windows, boiler fuel switch	Scoring	TBD	TBD	TBD	TBD	TBD	TBD
DCNR	Eastern Region, State Parks & Forests	TBD	RFQ	TBD	TBD	TBD	TBD	TBD	TBD
Total				\$218.20	\$6,878,278	5,580	58,589	2,883	27,228

¹Annual Energy Cost Savings and the Environmental Benefits are estimated

In concert with the DGS Energy Resource Management Office and Pennsylvania Department of Environmental Protection's (PADEP) Energy Programs Office, PSFEI participated on numerous GESA projects, which included the following services:

- Participating in scoping site visits to determine if project opportunities exist.
- Assisting with preparation of initial lists of core energy conservation measures (ECMs).
- Providing utility data and reviewing and providing comments on preliminary proposals submitted by competing Energy Service Companies (ESCOs).
- Participating in formal interviews of the firms submitting proposals.
- Supporting the Investment Grade Audit (IGA) process by attending meetings, answering questions, and providing advisory services.
- Performing detailed, in-depth reviews of IGAs and submitting questions and comments to DGS and the participating agency.
- Attending project implementation job conferences and reviewing design submissions and product submittals as needed throughout construction.
- Providing review and comment on post-construction energy savings reports submitted by the ESCO.

PSFEI services are provided to support DGS and the participating agency to ensure there is a clear understanding of the project opportunities, the impact on a facility's operations and maintenance requirements, and the risk of actual energy and cost savings that will result from the project.

During the fiscal year, PSFEI provided support services for the following nine active GESA projects:

- DGS Capitol Complex 2
- Department of Conservation and Natural Resources (DCNR) Central Region parks and forests
- Pennsylvania Department of Transportation (PennDOT)—District 8
- Pennsylvania Fish and Boat Commission (PFBC)—hatchery facilities statewide
- State Correctional Institute (SCI) Fayette
- SCI Frackville
- SCI Houtzdale
- SCI Muncy
- Wernersville State Hospital

PSFEI supported DGS with continuous program improvements through meetings and discussions to evaluate the program's effectiveness and make adjustments to better serve the participating Commonwealth agencies. Specific project activities for the referenced GESA projects are listed throughout the Summary of Services by Quarter section.

HVAC STEPS TAKEN FOR BUILDING OCCUPANT PROTECTION DURING COVID-19

Due to the ongoing threat of the COVID-19 pandemic, DGS continued to implement important procedures within the buildings that comprise the Capitol Complex to maximize building occupant health and safety.

Note: The following information was provided by DGS.

Ensured Availability of Supplies and Services

- Established relationships with vendors that supplied products such as coil cleaners, air filters, and other HVAC maintenance materials.
- Ensured there were multiple vendors of each of these items to account for supply chain disruptions.
- Reviewed service contracts to ensure suppliers adhered to safety protocols and identified any impact the COVID-19 pandemic had on the service level provided by the supplier.

Increased Ventilation and Maintained Exhaust Fan Operations

- Increased ventilation duration and airflow percentage to effectively aid in the dilution of organisms within a given space.
- Increased ventilation in many cases to replace the air within a space with outdoor air quicker and reduce the amount of recirculation of space air.
- Focused on not sacrificing indoor air quality specifically related to temperature and humidity. Sacrificing indoor temperature and humidity can result in many other health risks.

Improved Central Air Filtration to Minimum Efficiency Reporting Value (MERV) 13 or Highest Compatible Filter

- Considered the use of high-efficiency particulate air (HEPA) filters; however, these filters are intended for use in a health care atmosphere and require equipment specifically designed to handle the added pressure drop and filter frame thickness associated with the increased MERV filter rating.
- Used MERV 13 bag filters in the primary air handlers across the entire Capital Complex campus and MERV 13 pleated filters in many other units.

Reduced Bypass Around Filter Racks (this effort is ongoing)

- Purchased bag filters for equipment with gaskets located on the filter frame to eliminate or decrease the amount of air that could bypass the filter media.
- Installed gasketed material on the filter rack or frame for units that use pleated filters; gasketing will be inspected each time the filters are replaced.

Increased Run Hours of Equipment to 24/5

- Extended the operation time of equipment from 10 hours to 24 hours per day, 5 days per week to aid in diluting contagions in the space by extending increased filtered ventilation air after individuals leave at the end of the day and before they arrive the following day.

Explored Ultraviolet Germicidal Irradiation (UVGI) Technology

- Committed to exploring UVGI technology for use in equipment. UVGI systems have proven effective to sanitize stationary surfaces such as the coils within an air handler. Further consideration for applications to address moving air are being studied for effectiveness, cost, and installation feasibility for new and existing equipment or distribution systems. This emerging technology application is being carefully watched.

SUMMARY OF SERVICES BY QUARTER

This section summarizes the services provided by PSFEI throughout the fiscal year; it is organized by quarter and type of service: procurement efforts, solar energy procurement, engineering services, GreenGov Council support, EnergyCAP support, and GESA support.

FIRST QUARTER

PROCUREMENT

Participated in a virtual meeting with DGS personnel regarding solar energy procurement and the LCSWMA PPA contract on July 7, 2020.

Hosted a virtual meeting with DGS personnel regarding natural gas procurement strategies on August 3, 2020.

Prepared and submitted the fiscal year 2019–2020 fourth quarter report on August 6, 2020.

Hosted a virtual procurement event on August 11, 2020, to administer natural gas RFQ DGS 20-01. In total, twenty accounts were awarded with a projected contract savings of over \$147,000 in comparison to previous rates and just under \$4 million in comparison to the utility rates.

Prepared for and hosted a virtual DGS/PSFEI bi-monthly meeting on August 27, 2020.

Hosted a virtual meeting with DGS personnel to discuss natural gas price risk management strategies for contracts with variable commodity pricing on September 3, 2020.

Hosted a virtual procurement event on September 23, 2020, to administer natural gas RFQ DGS 20-02. Despite a projected increase of approximately \$21,000 in comparison to previous contract rates, a projected cost savings in comparison to the utility rates of \$885,000 was achieved. It should be noted that SCI Phoenix (DOC) did not exhibit any savings over previous contract rates due to the account being served by the utility since the facility opened. For SCI Phoenix, the savings of over \$500,000 in comparison to the utility rate effectively represents the projected cost reduction.

Hosted a virtual procurement event on September 24, 2020, to administer electricity RFQ DGS 20-03. In total, seventy-four accounts were awarded with a projected contract savings of over \$714,000 in comparison to previous contract rates and over \$30,000 in comparison to the utility rates.

Supported the DGS Bureau of Procurement with ongoing, day-to-day account management services for Commonwealth agencies including fuel-price risk management, tariff rate change issues, and billing and metering discrepancies.

Continued tracking LCSWMA's monthly electricity generation and the Commonwealth's accounts' electricity consumption to help ensure contract compliance. No notable errors were observed in the billings received during this quarter. Analyses and potential resolutions were provided to address the contract volume shortfall for the 2019–2020 contract year.

Addressed miscellaneous natural gas billing issues between utilities, suppliers, and Commonwealth facilities.

Continued supporting the growth of the COSTARS electric procurement program through participation in targeted events, individual one-to-one consultations, and utility bill reviews with prospective clients. Continued to review utility bills for incorrect charges, which to date has resulted in identifying over \$539,000 in refundable charges to COSTARS members.

SOLAR ENERGY PROCUREMENT

Participated in virtual meetings with DGS personnel regarding solar energy procurement on July 9, 17, 21, 22, 27, and 29, and September 8, 2020.

Participated in virtual meetings with DGS personnel and Constellation Energy on September 2, 10, and 30, 2020.

Participated in a virtual meeting on August 5, 2020, with DGS personnel to evaluate solar electricity pricing.

ENGINEERING SERVICES

Discussed electrical testing and maintenance and HVAC training requirements with DGS staff via virtual meetings on July 2 and July 9, 2020. Participated in numerous follow-up communications with DGS staff, and based on their input, developed and submitted a proposal on August 13, 2020, for an HVAC training curriculum that would meet the needs of the DGS HVAC technical staff.

Discussed and reviewed existing SKM Systems Analysis data files with DGS staff on July 8, 2020.

GREENGOV COUNCIL SUPPORT

Participated in a virtual GreenGov Council Utility Management Focus Group meetings on July 7 and September 17, 2020.

Participated in virtual EnergyCAP validation report meetings with DGS personnel on July 9 and September 20, 2020. Supported follow-up efforts to achieve DGS meter validation goals. Discussed and determined needs for custom meter fields. Participated in various meetings and discussions with EnergyCAP and DGS to help specify a new validation report and custom GreenGov Council report, both of which were to be built by EnergyCAP.

Participated in a virtual meeting hosted by EnergyCAP regarding the GreenGov Council annual report custom field setup for the meter validation report on July 30, 2020.

Communicated with various contract agencies as requested by DGS, encouraging them to plan, prepare, and submit their GreenGov checklist forms in advance of the October 2020 deadline.

ENERGYCAP SUPPORT

Participated in a virtual meeting with DGS personnel regarding EnergyCAP Phase 2 implementation on July 23, 2020.

Hosted a virtual meeting with DGS personnel regarding EnergyCAP meter validation on September 25, 2020.

Provided the following extensive support for Commonwealth EnergyCAP implementation and on-going monthly training:

July

- Participated in three conference calls with the GreenGov Council.
- Assisted the Department of Military and Veterans Affairs (DMVA) and EnergyCAP with moving meters into the correct cost center.
- Hosted virtual training sessions for DCNR (two sessions) and DOC (two sessions).

August

- Participated in five conference calls with the GreenGov Council.
- Hosted virtual training sessions for DCNR (four sessions), DMVA veterans' homes (two sessions), and DOC (one session).

September

- Hosted virtual training sessions for DCNR (nine sessions), DGS (two sessions), PADEP (one session), and the Pennsylvania Historical and Museum Commission (PHMC) (one session).
- Participated in three conference calls with the GreenGov Council.
- Ran missing bill reports for each agency and began to validate meters for inclusion in the GreenGov Annual Report.
- Processed electronic data interchange (EDI) and Bill CAPture kickouts on an ongoing basis and updated EnergyCAP configuration including meter and account creation for new accounts.

GUARANTEED ENERGY SAVINGS ACT (GESA) SUPPORT

Participated in the GESA 2019 rebid interview with SitelogIQ on July 1, 2020.

Attended virtual PennDOT GESA project meetings on July 2, 2020, and every other week thereafter. Continued to research and locate missing utility data using information provided by PennDOT and the GESA contractor.

Participated in virtual SCI Houtzdale final design phase project meetings on July 7, 2020, and every other week thereafter. Performed a final design review and submitted review comments to DGS and DOC personnel on July 30, 2020 (30% design review complete) and on September 17, 2020 (96% design review complete). Reviewed and provided comments on numerous product submittals throughout the reporting period; this effort is ongoing.

Participated in virtual SCI Muncy GESA project meetings on July 16, 2020, and every other week thereafter. Reviewed and provided comments on 75% complete design submittal documents received on August 19 and September 4, 2020.

Participated in a virtual PFBC GESA kickoff meeting on July 27, 2020, and all subsequent bi-weekly project meetings occurring thereafter and attended a utility workshop on September 25, 2020. Provided utility data as requested via EnergyCAP through researching and identifying missing meter information.

Researched NRG Harrisburg, now known as Clearway Energy, for steam tariff related information on September 24, 2020, and provided the information to DGS and the GESA contractor.

SECOND QUARTER

PROCUREMENT

Hosted a virtual procurement event on October 15, 2020, to administer COSTARS electricity RFQ DGS 20-04. No contracts were awarded during this event; all bids were above the utility's price to compare.

Hosted a virtual meeting on October 23, 2020, with DGS and DOC personnel to discuss the energy management contract at SCI Laurel Highlands.

Hosted the DGS/PSFEI bi-monthly virtual meeting on October 28, 2020.

Submitted the DGS Energy & Utility Usage Report 2019–2020 on December 18, 2020.

Hosted a virtual electricity procurement event on December 29, 2020, for RFQ DGS 20-06. Through this solicitation, 296 accounts were awarded resulting in a total contract cost reduction of over \$132,000 when compared to current contracts and a total contract avoided cost of over \$239,000 when compared to the utility rates.

Supported the DGS Bureau of Procurement with ongoing, day-to-day account management services for Commonwealth agencies including fuel-price risk management, tariff rate change issues, and billing and metering discrepancies.

Continued tracking the LCSWMA monthly electricity generation and Commonwealth accounts' electricity consumption to help ensure contract compliance. No notable errors were observed in the billings received during this quarter.

Addressed miscellaneous natural gas billing issues between utilities, suppliers, and Commonwealth facilities.

Continued supporting the growth of the COSTARS electric procurement program through participation in targeted events, individual one-to-one consultations, and utility bill reviews with prospective clients. Continued to review utility bills for incorrect charges, which to date has resulted in identifying over \$539,000 in refundable charges to COSTARS members.

Reviewed the final estimated payments submitted by all CSPs for participants in the 2020–2021 Capacity Performance Program. Total estimated revenues generated to date are \$172,957.

SOLAR ENERGY PROCUREMENT

Hosted and participated in virtual meetings with DGS personnel on October 21 and 29, and November 12, 2020, to discuss solar electricity procurement.

Participated in virtual meetings on October 22 and 23, and November 18, 2020, with DGS and Constellation Energy to discuss solar electricity procurement.

Participated in virtual meetings on November 6 and 10, 2020, with DGS and The Nature Conservancy regarding solar electricity procurement.

Attended a virtual meeting on December 16, 2020, to review bids submitted in response to RFQ DGS 20-05 for the sale of solar renewable energy certificates (SRECs) associated with projects located throughout Pennsylvania that were financed by the Commonwealth Financing Authority (CFA) and the Pennsylvania Department of Community and Economic Development (DCED). A total of 3,474 MWh of SRECs were awarded at an offer of \$19 per SREC.

ENGINEERING SERVICES

Contract No Cost Change of Scope

- Worked with the DGS Energy and Resource Management Director to create a proposal for a no cost change of scope to the existing contract to provide alternative electrical services in lieu of preventative maintenance and testing services due to scheduling difficulties. Efforts throughout November and December 2020 included proposal development; review of DGS SKM files; update of PSFEI's SKM software from a single license to a server license to support power and arc flash studies; virtual meetings with DGS and PSFEI personnel to review and discuss the scope of work details; and email communications to address questions, comments, and concerns.

HVAC Technician Training

- Finalized the proposal for the DGS HVAC Technician Training under the existing contract. Efforts throughout December 2020 focused on coordinating training topics and dates with the DGS HVAC Systems Chief through email and virtual meetings, holding virtual meetings with potential contract instructors, researching intellectual property rights for course development, and engaging in internal discussions with PSFEI staff regarding the various courses and content development needs.

Testing and Maintenance

- Forum Building: Electrical testing of the medium voltage switchgear for Circuit No. 5 including cables and compartment stabs and retesting of the step-up transformer on November 12, 2020. Testing results were provided in PSFEI Report TR 20/21-7 issued November 17, 2020.
- Keystone Building: Completed on-site testing of the spare transformers on November 12, 2020. Testing results were provided in PSFEI Report TR 20/21-8 issued November 18, 2020.
- Surge Arrestors: Began electrical acceptance testing on the surge arrestors on December 21, 2020, to verify the integrity of the surge arrestors prior to being installed. This effort is ongoing.

GREENGOV COUNCIL SUPPORT

Hosted a virtual meeting with DGS personnel on October 16, 2020, to discuss the status of the GreenGov Annual Report meter validation efforts.

Participated in the following virtual meetings:

- October 27, 2020, with DGS and EnergyCAP to discuss the GreenGov Annual Report specifications.
- November 5, 2020, with DGS regarding the GreenGov Annual Report software development requirements.
- November 9, 2020, with the GreenGov Council to discuss the GreenGov Agency Checklist and Year 2 status.
- November 13, 2020, with EnergyCAP regarding the GreenGov Annual Report software development specifications.
- December 4, 2020, with DGS and EnergyCAP to review the GreenGov Annual Report software development results.
- December 10, 2020, with DGS and the GreenGov Council to present and discuss the results of PSFEI's evaluation for the Year 2 evaluation of energy consumption in the Commonwealth. The pre-final results indicated a year-over-year energy consumption reduction of 4.9%. Additionally, the percentage of eligible meters that passed the criteria for validation increased from 61% to 84% compared to the prior fiscal year.

ENERGYCAP SUPPORT

Processed EDI and Bill CAPture kickouts on an ongoing basis and updated EnergyCAP configuration including meter and account creation for new accounts.

Provided the following extensive support for Commonwealth EnergyCAP implementation and on-going monthly training:

October

- Participated in four conference calls with the GreenGov Council.
- Assisted DMVA and EnergyCAP with placement of accounts. Three months of water/sewer bills were uploaded.
- Hosted seven virtual training sessions for DCNR and one virtual training session for PHMC.
- Resolved over fifty kickouts for all agencies.
- Commenced the meter validation process for the GreenGov Annual Report.

November

- Participated in six conference calls regarding the GreenGov Annual Report.
- Hosted virtual training sessions for DCNR (six sessions), Labor & Industry (one session), DMVA veterans homes (one session), and DOC (one session).

- Completed the meter validation process for the GreenGov Annual Report.

December

- Hosted four virtual training sessions for DCNR and one virtual training session for the DMVA Air National Guard.
- Participated in two conference calls with the GreenGov Council.
- Resolved kickouts and created applicable accounts and meters for all agencies.

GUARANTEED ENERGY SAVINGS ACT (GESA) SUPPORT

Capitol Complex Phase 2

- Participated in a virtual meeting on October 7, 2020.
- Participated in a virtual meeting with GESA contractor McClure Company and DGS personnel on November 18, 2020.

Department of Conservation and Natural Resources

- Participated in GESA scoping visits at Lackawanna State Park and Loyalsock State Forest on November 9, 2020; developed and submitted site visit notes and ECM recommendations via email on November 11, 2020.
- Participated in GESA scoping visits at Beltsville State Park and Nescopeck State Park on November 19, 2020; developed and submitted site visit notes and ECM recommendations via email on November 22, 2020.

Department of Corrections

- Reviewed multiple design submissions for the SCI Muncy GESA project regarding the HVAC and boiler plant decentralization documents. Provided submission review comments on October 27 and December 4, 2020.
- Reviewed six GESA proposals for SCI Fayette and submitted review comments to DGS and DOC personnel via email on November 25, 2020.
- Participated in bi-weekly SCI Houtzdale GESA project meetings. Reviewed 96% and 100% design submission documents and provided review comments on December 16, 2020, on numerous project submittals.

Pennsylvania Department of Transportation

- Participated in a virtual PennDOT GESA team bi-weekly meetings and supported the project with input as required.

Pennsylvania Fish and Boat Commission

- Participated in virtual bi-weekly GESA 2019-3 project progress meetings on October 14, 23, 28, and November 10, 2020.
- Participated in a virtual utility baseline meeting with Entech on October 22, 2020; followed up by collecting and providing utility data on October 26, 2020, for a baseline determination.
- Participated in a virtual meeting October 23, 2020, to discuss a project scope of work and measurement and verification planning.
- Participated in a virtual meeting with Entech on December 9, 2020.

THIRD QUARTER

PROCUREMENT

Submitted the revised DGS Energy & Utility Usage Report 2019–2020 Revision 1 on January 28, 2021.

Attended a virtual meeting with DGS personnel on January 21, 2021, regarding a letter received from the Borough of Columbia and the LCSWMA pursuant to the existing PPA.

Hosted a virtual meeting with American PowerNet and DGS personnel on January 28, 2021, to discuss SCI Laurel Highlands and the Energy Manager contract.

Hosted a virtual meeting with DGS personnel on January 29, 2021, to discuss a 2021 energy procurement schedule and strategy.

Hosted a virtual procurement event on February 26, 2021, to administer RFQ DGS 20-07 for the sale of RECs from SCI Laurel Highlands. The event resulted in the sale of 29,786 RECs for projected revenue of \$378,279.36.

Hosted DGS/PSFEI bi-monthly virtual meetings on February 5 and March 31, 2021.

Participated in a COSTARS webinar on March 16, 2021, to discuss the benefits of the COSTARS electricity procurement program.

Hosted a virtual meeting with DGS personnel on March 29, 2021, regarding the COSTARS electricity procurement program.

Supported the DGS Bureau of Procurement with ongoing, day-to-day account management services for Commonwealth agencies including fuel-price risk management, tariff rate change issues, and billing and metering discrepancies.

Continued tracking the LCSWMA monthly electricity generation and Commonwealth accounts' electricity consumption to help ensure contract compliance. No notable errors were observed in the billings received during this quarter.

Addressed miscellaneous natural gas billing issues between utilities, suppliers, and Commonwealth facilities.

Continued supporting the growth of the COSTARS electric procurement program through participation in targeted events, individual one-to-one consultations, and utility bill reviews with prospective clients. Continued to review utility bills for incorrect charges, which to date has resulted in identifying over \$539,000 in refundable charges to COSTARS members.

SOLAR ENERGY PROCUREMENT

Participated in virtual meetings on January 7, January 12, and February 19, 2021, with DGS and Constellation Energy to discuss solar electricity procurement.

Hosted a virtual meeting with DGS personnel on January 28, 2021, to discuss on-site solar energy generation.

Hosted a virtual meeting with DGS and Pennsylvania's State System of Higher Education (PASSHE) personnel on February 9, 2021, to discuss solar energy procurement.

Hosted and participated in virtual meetings with DGS personnel on March 11 and 23, 2021, to discuss solar electricity procurement.

Attended a virtual press conference on March 22, 2021, announcing the Pennsylvania PULSE Project.

Attended a virtual meeting with DGS and Mazer Consulting on March 23, 2021, to discuss on-site solar project development.

ENGINEERING SERVICES

Contract No Cost Change of Scope

- Worked with DGS Energy and Resource Management Director to update a proposal for a no cost change of scope to the existing contract to provide alternative electrical services in lieu of preventative maintenance and testing services. Efforts throughout January and early February 2021 included review and revised proposal development. During the DGS bi-monthly meeting on February 5, 2021, the DGS HVAC Systems Chief indicated DGS was in the process of trying to secure SKM data files before approving the no cost change of scope.

HVAC Technician Training

- Focused efforts throughout January, February, and March 2021 on meeting with the DGS HVAC Systems Chief to approve agendas for course outlines; generating content for the first two courses, HVAC Fundamentals (1) and Electrical Fundamentals (2); coordinating schedules and dates for all courses for instructor commitment with DGS's desired offerings; reviewing content for courses 1 and 2 with the DGS HVAC Systems Chief; and adding specifics to the content to enhance course participant needs.
- Formatted presentations for uniformity and visual clarity. Held practice runs with PSFEI instructors.

- Purchased HVAC books for course participants and coordinated delivery with DGS for distribution to attendees in preparation of the HVAC Fundamentals course to be held on April 7 and 8.
- Coordinated with the DGS HVAC Systems Chief and PSFEI instructors regarding course preparation and delivery, instructor zoom trainings, and DGS room communications testing, and transmitted attendees' course invitations and materials via email.
- Began outlining course content and reviewing Judicial Building construction drawing set in preparation for course 3, which will be held July 14 and 15, 2021; conducted zoom meetings with the DGS HVAC Systems Chief and the course instructors to discuss the outline and content.

Testing and Maintenance

- **L&I Building**
 Researched and assisted DGS personnel January 4 through 18, 2021, with fault cable testing procedures using VLF Tan Delta equipment to verify the integrity of surge arresters prior to being installed. Testing results were provided in PSFEI Report TR 20/21–10 issued January 18, 2021.
- **Capitol Complex**
 Completed on-site testing of surge arrestors. Testing results were provided in PSFEI Report TR 20/21–12 issued February 1, 2021.
- **DGS Annex Complex**
 Processed an emergency travel request to assist in locating an electrical fault at the DGS Annex Complex on January 21, 2021. Returned on January 22, 2021, with testing equipment to assist DGS personnel with on-site troubleshooting. PSFEI Report ER-F-20/21–10 issued February 4, 2021, documented the results of this field visit.
 Completed electrical testing on March 4, 2021, for the newly repaired Feeder 1-3 cable that experienced the fault. Testing results were provided in PSFEI Report TR 20/21–17 issued March 10, 2021.

GREENGOV COUNCIL SUPPORT

Participated in the following virtual meetings:

- January 15, 2021, hosted by the GreenGov Council revealing the results of an EnergyCAP agency survey.
- January 20, 2021, hosted by the GreenGov Council regarding utility management.
- March 4, 2021, hosted by the GreenGov Council regarding the EnergyCAP Agency Work Plan.
- Regular status and update meetings with the GreenGov Council regarding EnergyCAP training and data quality progress.

ENERGYCAP SUPPORT

Processed EDI and Bill CAPture kickouts on an ongoing basis and updated EnergyCAP configuration including meter and account creation for new accounts.

Provided the following extensive support for Commonwealth EnergyCAP implementation and on-going monthly training:

January

- Participated in three conference calls and conducted six EnergyCAP training sessions.
- Assisted DMVA with kickouts and creating a new meter reading sheet. This project is ongoing.
- Hosted three virtual training sessions for PennDOT and one session for DGS.

February

- Hosted six virtual training sessions for DCNR, one session for DGS, and one session for the Department of Revenue.
- Assisted DOC with entering bills into EnergyCAP.
- Participated in a virtual conference call with DGS and DMVA personnel on February 16, 2021, regarding EnergyCAP cost disbursement across Commonwealth agencies.
- Attended multiple virtual meetings with DMVA to address missing bills and data gaps.

March

- Hosted three virtual training sessions for DCNR and one virtual training sessions for PADEP.
- Participated in a webinar hosted by DCNR regarding EnergyCAP proliferation in the agency.
- Attended a webinar hosted by EnergyCAP for power users to provide input regarding the software and processes.
- Ran missing bill reports to identify data gaps across the Commonwealth's entire dataset and reported results.

GUARANTEED ENERGY SAVINGS ACT SUPPORT

Capitol Complex Phase 2

- Participated in virtual meetings on January 13 and 27, February 10 and 24, and March 10 and 24, 2021.
- Participated in a virtual meeting on January 29, 2021 with GESA contractor McClure Company and DGS personnel regarding selection of ECMs; provided meeting notes to DGS on February 1, 2021.

Department of Conservation and Natural Resources

- Participated in GESA scoping visits at Ridley Mansion and Tyler State Park on March 22, 2021; site visit notes and ECM recommendations were developed and will be submitted in the next reporting period.

Department of Corrections

SCI Fayette

- Participated in five GESA proposal interviews during the week of January 11, 2021, posing questions related to PSFEI's proposal review that was submitted November 25, 2020.
- Participated in GESA project meetings on March 23 and 30, 2021. Supported the project with input as required.

SCI Frackville

- Attended a GESA project scoping site visit on February 23, 2021.

SCI Houtzdale

- Reviewed building automation system (BAS) design submissions for the GESA project on February 19 and 24, 2021.
- Participated in bi-weekly GESA project meetings on January 5 and 19, February 2 and 19, and March 2, 16, and 30, 2021. Reviewed numerous project submittals. Supported the project with input as required.

SCI Muncy

- Participated in bi-weekly GESA project meetings on February 18 and March 4 and 18, 2021. Reviewed numerous project submittals. Supported the project with input as required.

Pennsylvania Department of Transportation

- Participated in virtual GESA bi-weekly meetings on January 14 and 28, and February 4, 11, and 25, 2021. Supported the project with input as required.

Pennsylvania Fish and Boat Commission

- Participated in virtual bi-weekly progress meetings for the GESA 2019-3 project on January 27, February 10, and March 10 and 27, 2021. Supported the project with input as required.

FOURTH QUARTER

PROCUREMENT

Participated in a virtual meeting on April 14, 2021, with DGS personnel regarding electric vehicle charging in the Commonwealth Parking Garage.

Hosted a virtual meeting on May 12, 2021, with DGS personnel to discuss contract renewal for 2022 through 2027.

Participated in a virtual meeting on May 18, 2021, with DGS and DMVA personnel to discuss utility billing with EnergyCAP.

Hosted the DGS/PSFEI bi-monthly virtual meeting on June 2, 2021.

Prepared and submitted the fiscal year 2020–2021 third quarter report on June 3, 2021.

Prepared and submitted a draft scope of work for the fiscal year 2022 through 2027 DGS–PSFEI Intergovernmental Agreement on June 18, 2021.

Hosted a virtual electricity procurement event on June 22, 2021, for COSTARS RFQ DGS 20-08. Through this solicitation, 16 bid packages containing 1,569 accounts were awarded resulting in a total contract cost increase of \$808,000 when compared to current contracts and a total contract avoided cost of just under \$1.76 million when compared to the utility rates.

Assisted DGS with the release of *RFQ DGS 20-09 – Renewable Energy Certificates (RECs)* for the Commonwealth on June 30, 2021. Bids will be opened in the following fiscal year on July 14, 2021.

Supported the DGS Bureau of Procurement with ongoing, day-to-day account management services for COPA agencies including fuel-price risk management, tariff rate change issues, and billing and metering discrepancies.

Continued tracking the LCSWMA's monthly electricity generation and Commonwealth accounts' electricity consumption to help ensure contract compliance. No notable errors were observed in the billings received during this quarter.

Addressed miscellaneous natural gas billing issues between utilities, suppliers, and Commonwealth facilities.

Continued supporting the growth of the COSTARS electric procurement program through participation in targeted events, individual one-to-one consultations, and utility bill reviews with prospective clients. Continued to review utility bills for incorrect charges, which to date has resulted in identifying over \$578,000 in refundable charges to COSTARS members.

Initiated a PLC Strategy for the 2021 season including predicting coincident peak hours and providing notice to facility staff.

SOLAR ENERGY PROCUREMENT

Participated in virtual meetings with DGS personnel and Mazer Consulting on April 7, April 28, May 26, and June 23, 2021, to discuss Commonwealth agency-level, on-site solar electricity procurement.

Participated in a virtual meeting on April 8, 2021, with DGS and the PASSHE Sustainability Development Task Force to discuss the Commonwealth's PULSE project and potential application to PASSHE universities.

Participated in a virtual meeting on June 17, 2021, with DGS and Constellation Energy to discuss solar electricity procurement.

ENGINEERING SERVICES

HVAC Technician Training

- Preparation and delivery on April 7 and 8, 2021, of Course 1, HVAC Fundamentals—Heat Transfer and the Refrigeration Cycle.

- Preparation and delivery on May 25 and 26, 2021, of Course 2, Electrical Fundamentals.
- Development of modules and materials for Course 3, Construction Drawings and Troubleshooting Using Architectural, Electrical, Mechanical, and Structural Drawings, specific to the Judicial Building; this course is scheduled for delivery July 14 and 15, 2021.

Testing and Maintenance

- Researched voltage-drop requirements for electric motors and standard electrical voltages and communicated findings to DGS staff in April 2021.
- Completed on-site electrical acceptance testing of Labor & Industry’s repaired medium voltage switch. Testing results were provided in PSFEI Report TR 20/21–24 issued June 10, 2021.
- Completed electrical acceptance testing of new surge arrestors for the Liquor Control Board Building on May 24, 2021. Testing results were provided in PSFEI Report TR 20/21–24 issued June 10, 2021.
- Provided remote assistance with an electrical fault for the DGS Annex Complex on June 23, 2021.

GREENGOV COUNCIL SUPPORT

Participated in the GreenGov and Penn State Sustainability Institute Webinar Series on Solar Electricity and REC Procurement webinar on June 11, 2021. Attended a practice session on June 8, 2021.

Participated in the following virtual meetings:

- Weekly status meetings regarding EnergyCAP education and outreach efforts, kickout resolution, data integrity efforts, and process improvements.
- April 2, 2021, with the GreenGov Council and agency liaisons for the Utility Management Focus Group.
- May 25, 2021, with the GreenGov Council to discuss the executive-level quarterly reports and issues surrounding report production.

ENERGYCAP SUPPORT

Participated in a webinar hosted by EnergyCAP titled *Energy Analytics for Sustainability—How a Large State Went from Zero to Hero* on June 9, 2021, with practice sessions and pre-webinar planning sessions on April 21 and June 8, 2021.

Processed EDI and Bill CAPture kickouts on an ongoing basis and updated EnergyCAP configuration including meter and account creation for new accounts from all agencies.

Provided the following extensive support for the Commonwealth EnergyCAP implementation and ongoing monthly training:

April

- Hosted three virtual training sessions for DCNR, four virtual training sessions for PennDOT, and one virtual training session for PEMA.
- Attended an EnergyCAP Webinar for power users.
- Worked with DOC to enter missing utility bills into various accounts.

May

- Hosted six virtual training sessions for DCNR, one virtual training session for the Department of Human Services (DHS), and one virtual training session for PEMA.
- Assisted PADEP with the refund of up to \$40,000 through the identification of a billing error on an electricity account.
- Assisted DMVA in the reformat and import of new meter reading spreadsheets for Fort Indiantown Gap.
- Met with EnergyCAP personnel to address problems with DMVA bill splits.

June

- Hosted two virtual training sessions for DCNR.
- Assisted the Pennsylvania Turnpike Commission (PTC) with the resolution of over 300 Bill CAPture kickouts for water and sewer accounts.
- Began meter validation process in preparation of the GreenGov Annual Report.

GUARANTEED ENERGY SAVINGS ACT (GESA) SUPPORT

Capitol Complex Phase 2

- Obtained and provided electrical utility data for the Capitol Complex Central Chiller Plant as requested by the ESCO, McClure, on June 24, 2021.
- Reviewed Capitol Complex main steam loads included in the PSFEI 2013 report and provided feedback to McClure.

Department of Conservation and Natural Resources

- Prepared and submitted site visit scoping reports for Ridley and Tyler State Parks on April 1, 2021.
- Prepared and submitted EnergyCAP utility data for Nolde and Jacobsburg State Parks on April 8, 2021.
- Participated in site visits of both Nolde and Jacobsburg State Parks to develop initial project scoping lists on April 9. A scoping report was provided via email on April 26, 2021 (PSFEI Report GN-F-20/21-1).
- Met with DGS on June 29, 2021, to review the DCNR ECM scoping list and plan for future site visits.

Department of Corrections

- Hosted a discussion with Entech on April 6, 2021, regarding SCI Fayette's heating load calculations provided by ESG.
- Reviewed 95% specifications submitted by ESG for SCI Fayette. The review comments will be included in the next reporting period.
- Performed construction submittal reviews and provided comments on a total of 34 submittals for SCI Houtzdale and SCI Muncy over the course of the reporting quarter.

Pennsylvania Department of Transportation

- Participated in virtual PennDOT GESA team bi-weekly meetings and supported the project with input as required.

Pennsylvania Fish and Boat Commission

- Prepared and submitted follow-up review comments for the PFBC GESA 2019-3 IGA on April 7, 2021.

Department of Human Services

- Attended Wernersville State Hospital GESA re-start virtual meeting on June 10, 2021, and provided review comments on June 14, 2021, regarding the scoping list of initial projects provided by DHS.

SUMMARY OF EDUCATION SERVICES

EDUCATION OPPORTUNITIES

PSFEI provided numerous educational opportunities in support of our services to DGS. However, due to ongoing restrictions imposed by the COVID-19 pandemic, all education offerings were provided virtually via Zoom.

The following PSFEI short course opportunities were provided in fiscal year 2020–2021:

- Effective Facility Management—Year 3, July 22–24, 2020. Topics of instruction focused on capital planning, scheduling, and budgeting; asset management in a sustainable environment; prioritizing the maintenance management backlog; new sustainable technologies; and contract management.
- Central Plant Heating Systems and Equipment, May 18–20, 2021. This course provided instruction on central plant fuel sources, outputs, and heat plant types; steam systems; hot water system pumps, equipment and operations, and maintenance checklists; troubleshooting techniques and methodology; and water chemistry requirements for steam and hot water systems.
- Facility Electrical Loads, June 9–11, 2021. Sessions taught during this course included lighting fundamentals, electrical fundamentals for elevators, motors and motor starters, pairing variable frequency drives with motors, controllers and metering principles, wiring 101, system troubleshooting, surge arrestor fundamentals, and hands-on metering applications.
- HVAC Equipment Troubleshooting and Procedures, June 22–24, 2021. This course provided instruction on ventilation, technology versus fundamentals, refrigerants and net refrigerant effect, refrigerant application and engineered function of sealed system components, benchmarking equipment performance, subcooling and superheat, compressor issues, chiller calculations and log sheets, and fossil fuels combustion efficiency testing and procedures.

The following workshops were provided in fiscal year 2020–2021:

- Electrical Workshop—NFPA70E Electrical Safety Training, April 13, 2021. Workshop topics included an overview of National Fire Protection Association (NFPA) standards, electrically safe work condition, energized work, hazards of electricity, power system studies, electrical personal protective equipment (PPE), emergency response, arc flash mitigation, and electrical maintenance and testing.
- There were no regional boiler or HVAC workshops offered during the fiscal year.

The following HVAC Technician Training courses were offered in fiscal year 2020–2021:

- HVAC Fundamentals, April 7–8, 2021. Topics covered included HVAC and thermodynamics of heat at work and the vapor compression refrigerant cycle.
- Electrical Fundamentals, May 25–26, 2021. Topics covered included basic electrical theory, electrical safety, schematic reading, transformers, overcurrent protection, motors, variable frequency drives, and troubleshooting.

DGS attendance at PSFEI educational training events is detailed in Table 18 on the following page.

**Table 18. DGS Attendance at Short Courses, Workshops,
and DGS HVAC Technician Training 2020–2021**

Education Event	DGS Attendance
Short Courses	
Central Plant Heating Systems and Equipment	
Effective Facility Management—Year 3	1
Facility Electrical Loads	2
HVAC Equipment Troubleshooting and Procedures	5
Workshops	
NFPA70E Electrical Safety Training	18
DGS HVAC Technician Training	
HVAC Fundamentals	35
Electrical Fundamentals	44
Total	105

ACRONYMS AND ABBREVIATIONS

\$/dth	Dollars per dekatherm
\$/gal	Dollars per gallon
\$/mcf	Dollars per thousand cubic feet
\$/mgal	Dollars per thousand gallons
\$/mlb	Dollars per thousand pounds
\$/MMBtu	Dollars per million British thermal units
\$/sq-ft	Dollars per square foot
¢/kWh	Cents per kilowatt hour
Btu	British thermal unit
Btu/sqft	British thermal units per square foot
BAS	Building automation system
CFA	Commonwealth Financing Authority
CNG	Compressed natural gas
CSP	Curtailment Service Provider
DCED	Pennsylvania Department of Community and Economic Development
DCNR	Department of Conservation and Natural Resources
DGS	Department of General Services
DHS	Department of Human Services
DMVA	Department of Military and Veterans Affairs
DOC	Department of Corrections
ECM	Energy conservation measure
EDC	Electric distribution company
EDI	Electronic data interchange
EPA	U.S. Environmental Protection Agency
ERMA	Energy Risk Management Application
ESCO	Energy Service Company
EUI	Energy Use Intensity
FERC	Federal Energy Regulatory Commission
gal	Gallon
GESA	Guaranteed Energy Savings Act
HVAC	Heating, ventilating, and air conditioning
IGA	Investment Grade Audit
kW	Kilowatt
kWh	Kilowatt-hour
kWh/sq-ft	Kilowatt hours per square foot

lbs/hr	Pounds per hour
lbs/MMBtu	Pounds per million British thermal units
LCSWMA	Lancaster County Solid Waste Management Authority
mcf	One thousand cubic feet
mgal	One thousand gallons
mlb	One thousand pounds
MMBtu	One million British thermal units
MWh	Megawatts
NYMEX	New York Mercantile Exchange
PADEP	Pennsylvania Department of Environmental Protection
PA PULSE	Pennsylvania Project to Utilize Light and Solar Energy
PASSHE	Pennsylvania's State System of Higher Education
PEMA	Pennsylvania Emergency Management Agency
PennDOT	Pennsylvania Department of Transportation
PFBC	Pennsylvania Fish and Boat Commission
PHMC	Pennsylvania Historical and Museum Commission
PLC	Peak load contribution
PPA	Power Purchase Agreement
PSFEI	Penn State Facilities Engineering Institute
PTC	Pennsylvania Turnpike Commission
PUC	Pennsylvania Public Utility Commission
RECs	Renewable Energy Credits
RFI	Request for Information
RFQ	Request for Quote
SCI	State Correctional Institute
SRECs	Solar Renewable Energy Certificates
sqft	Square feet
W/sqft	Watts per square foot