University of MN
Monthly Metrics
April 2024

Energy Management oversees the operation of mechanical, electrical, and civil utilities systems for the Twin Cities campus. This set of monthly metrics provides measurement of the group's three core principles:

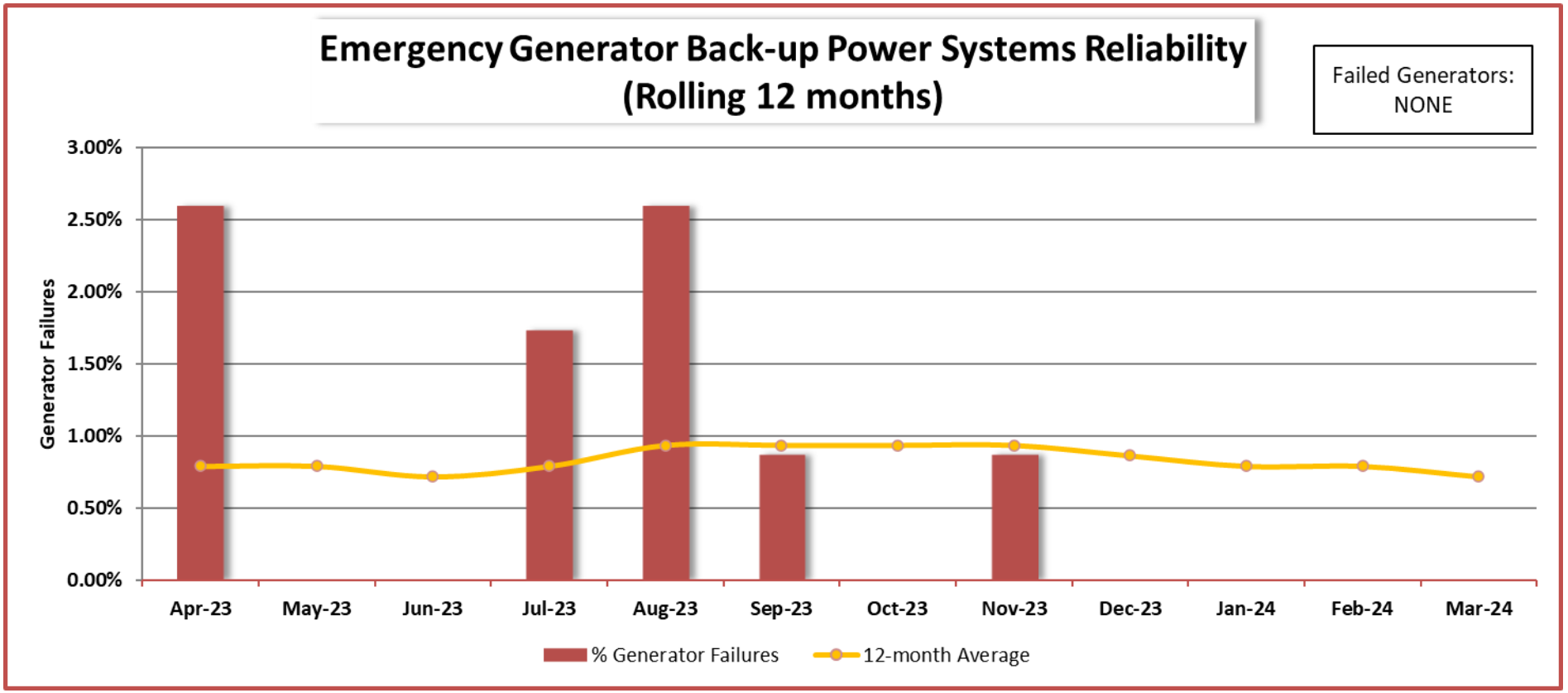
1) Reliability
2) Sustainability
3) Cost-effectiveness

Unplanned Service Loss Events

	FY18	FY19	FY20	FY21	FY22	FY23	FY24 @ 9 of 12	FY24 Target
CHILLED WATER								
Total	1	0	0	0	0	0	0	
Root-Caused to UMN	1	0	0	0	0	0	0	**2**
ELECTRIC								
Total	6	10	6	6	9	12	3	
Root-Caused to UMN	2	5	4	2	3	3	3	**3**
STEAM								
Total	3	6	2	3	1	0	0	
Root-Caused to UMN	2	1	2	3	0	0	0	**2**
WATER								
Total	1	1	1	1	1	0	0	
Root-Caused to UMN	0	0	1	1	0	0	0	**1**

This chart shows the number of unplanned utility outages on campus each year. Some outages are out of University control, such as actions of our utility provider or acts of nature. Energy Management sets targets each year for number of outages that are caused by our work.

RELIABILITY

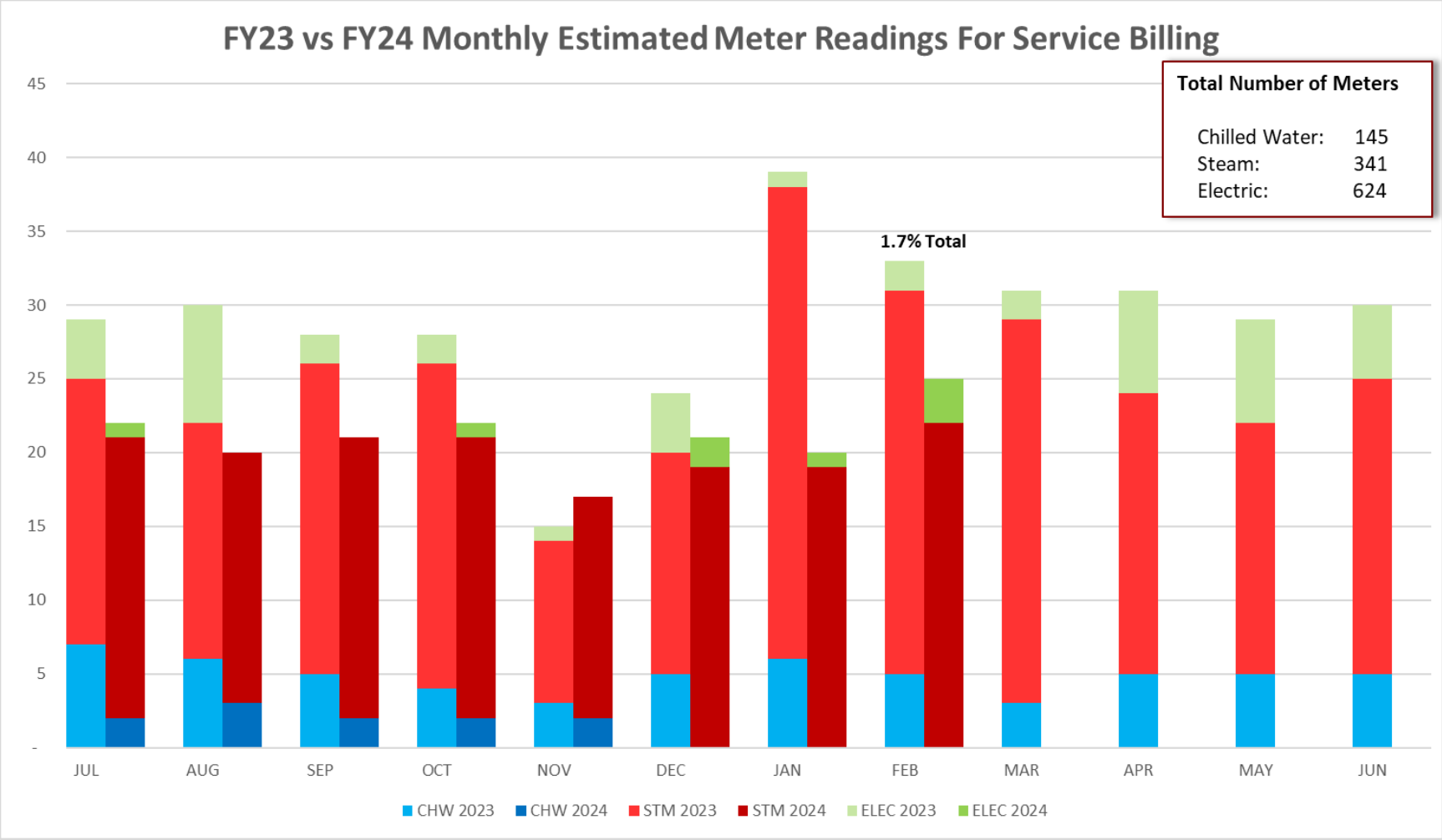


	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Feb-24
Monthly Failures	0.00%	0.86%	2.59%	0.00%	0.00%	1.72%	2.59%	0.86%	0.00%	0.86%	0.00%	0.00%
12-month Average	0.65%	0.57%	0.79%	0.79%	0.72%	0.79%	0.93%	0.93%	0.93%	0.93%	0.86%	0.79%

In the event of a power outage, the campus has a number of emergency generators standing by to power essential systems. Energy Management tests them monthly to ensure they are properly maintained and ready for service.

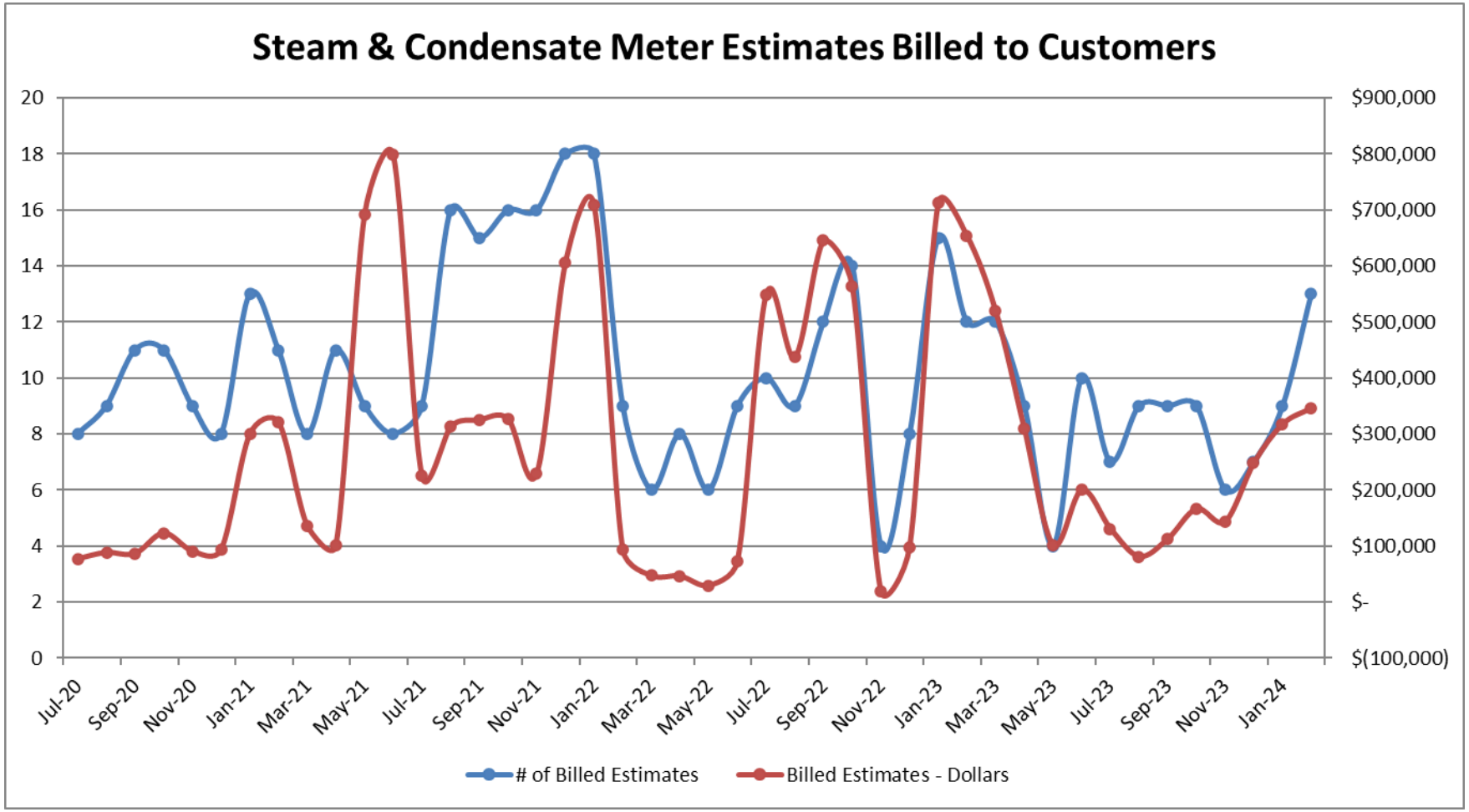
RELIABILITY

EM maintains nearly 1200 energy meters throughout campus, which are used to collect building energy consumption data. This measure of the metering system's health shows how many meters are malfunctioning compared to the previous year.



Period:	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24
Meter Read Inventory:	1466	1466	1466	1466	1466	1469	1469	1469	1469	1469	1469	1469
Estimated Readings:	25	23	23	23	18	22	21	25	0	0	0	0
% Monthly Estimates:	1.7%	1.6%	1.6%	1.6%	1.2%	1.5%	1.4%	1.7%	0.0%	0.0%	0.0%	0.0%

RELIABILITY



Steam and condensate meters are more likely to malfunction than other types of utility meters, since they have mechanical parts and operate in extreme environments. Where possible, EM employs additional meters to achieve metering redundancy. This graph shows the percentage of buildings where there is no redundancy for a malfunctioning meter and we are forced to bill using estimated usage.

RELIABILITY

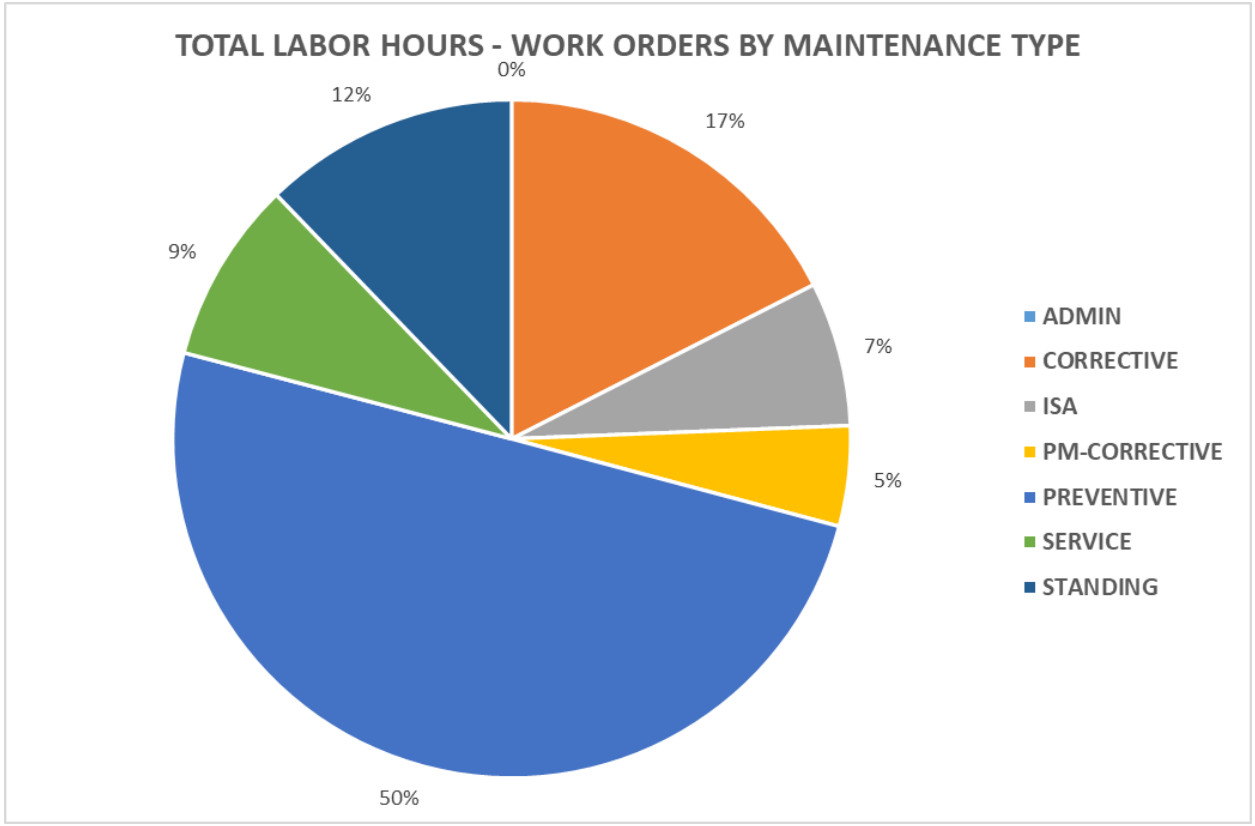
MARCH 2024

TOTAL MONTHLY LABOR HOURS BY CREW AND MAINTENANCE TYPE

Energy Management crews play a number of different roles in the operation and maintenance of campus utility system.

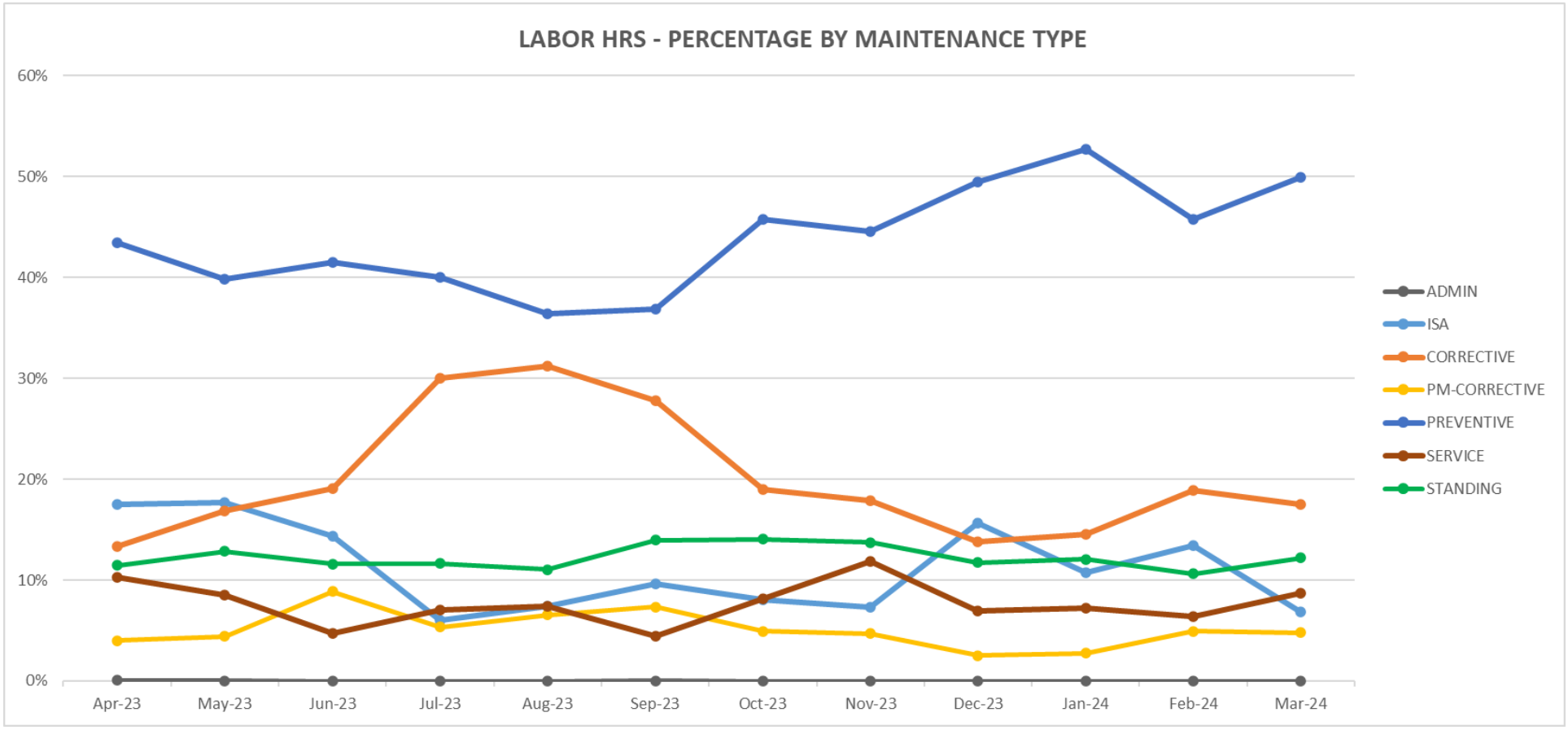
These charts show the total labor hours worked by each crew for the month and which types of work they performed.

	CHILLED WATER	ELECTRIC	EMELEC	EMTECH	STEAM	WATER & SEWER	TOTAL	TOTAL
ADMIN							0	0%
CORRECTIVE	376	469	6	5	782	50	1,687	17%
ISA	35	351	122	127	30		664	7%
PM-CORRECTIVE	343	73				45	461	5%
PREVENTIVE	985	1,811		26	1,666	329	4,815	50%
SERVICE	133	21	163	401	16	107	839	9%
STANDING		117		1,057	4		1,178	12%
TOTAL	1,870	2,840	290	1,616	2,497	531	9,644	100%



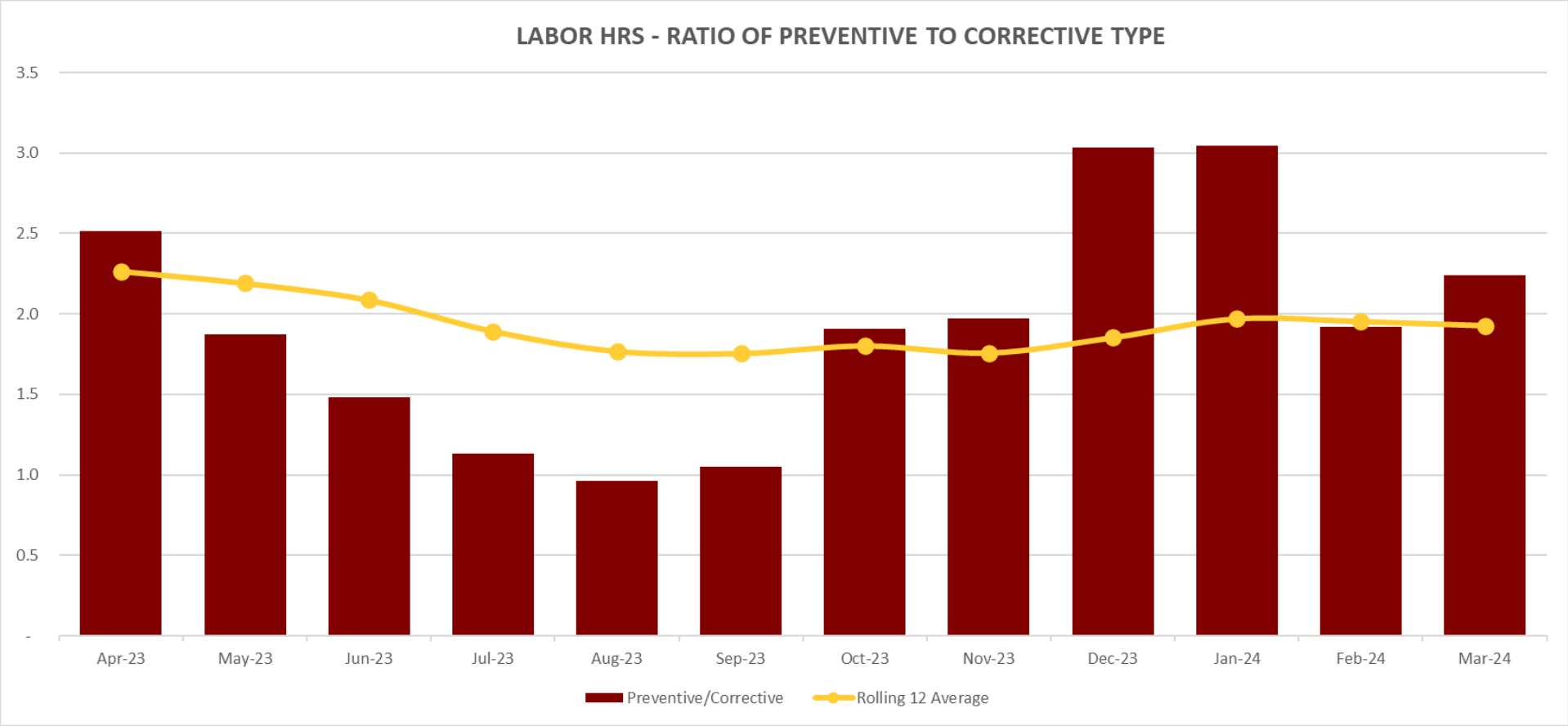
RELIABILITY

Different work happens at different times of the year. This graph shows the ebb and flow of work devoted to each maintenance type over the most recent 12-month period.



RELIABILITY

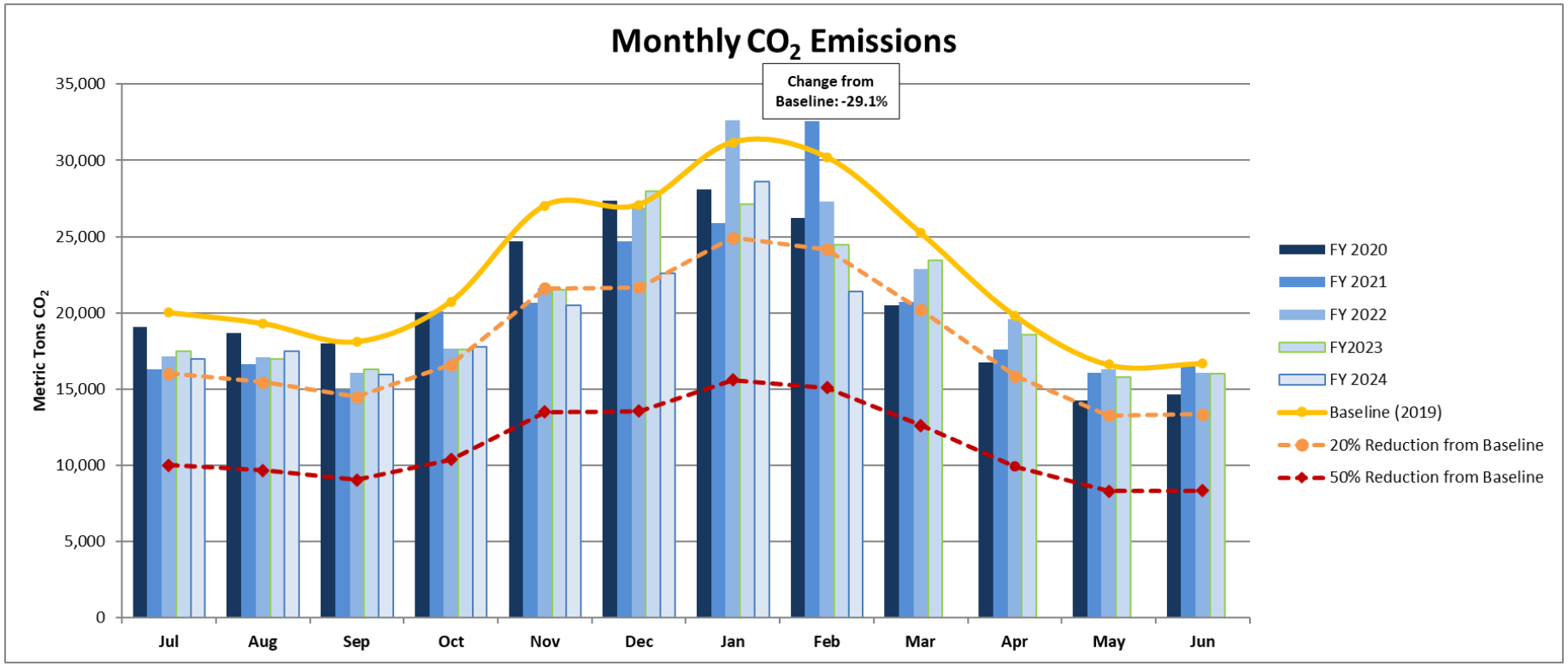
When operating and maintaining equipment, a good rule of thumb is to have a ratio of preventive labor hours to corrective maintenance hours equal to 2. This indicates that you are taking care of your equipment in a robust way, catching small problems during maintenance before they become big ones that cost more time and money to resolve.



LABOR HRS - CORRECTIVE vs PREVENTIVE

	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
Preventive/Corrective	2.5	1.9	1.5	1.1	1.0	1.0	1.9	2.0	3.0	3.0	1.9	2.2
Rolling 12 Average	2.3	2.2	2.1	1.9	1.8	1.8	1.8	1.8	1.9	2.0	2.0	1.9

SUSTAINABILITY



Monthly Emissions (Metric Tons CO_2):

FY	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Baseline	20,028	19,326	18,127	20,743	27,030	27,098	31,182	30,204	25,248	19,833	16,610	16,701
2020	19,093	18,688	18,009	20,029	24,667	27,357	28,101	26,235	20,485	16,771	14,262	14,630
2021	16,282	16,618	14,999	20,092	20,668	24,682	25,878	32,580	20,714	17,573	16,089	16,639
2022	17,170	17,077	16,062	17,635	21,622	26,930	32,618	27,321	22,880	19,566	16,286	16,091
2023	17,482	16,953	16,321	17,586	21,521	27,986	27,113	24,473	23,433	18,551	15,811	15,988
2024	17,003	17,484	15,955	17,797	20,476	22,601	28,595	21,408				

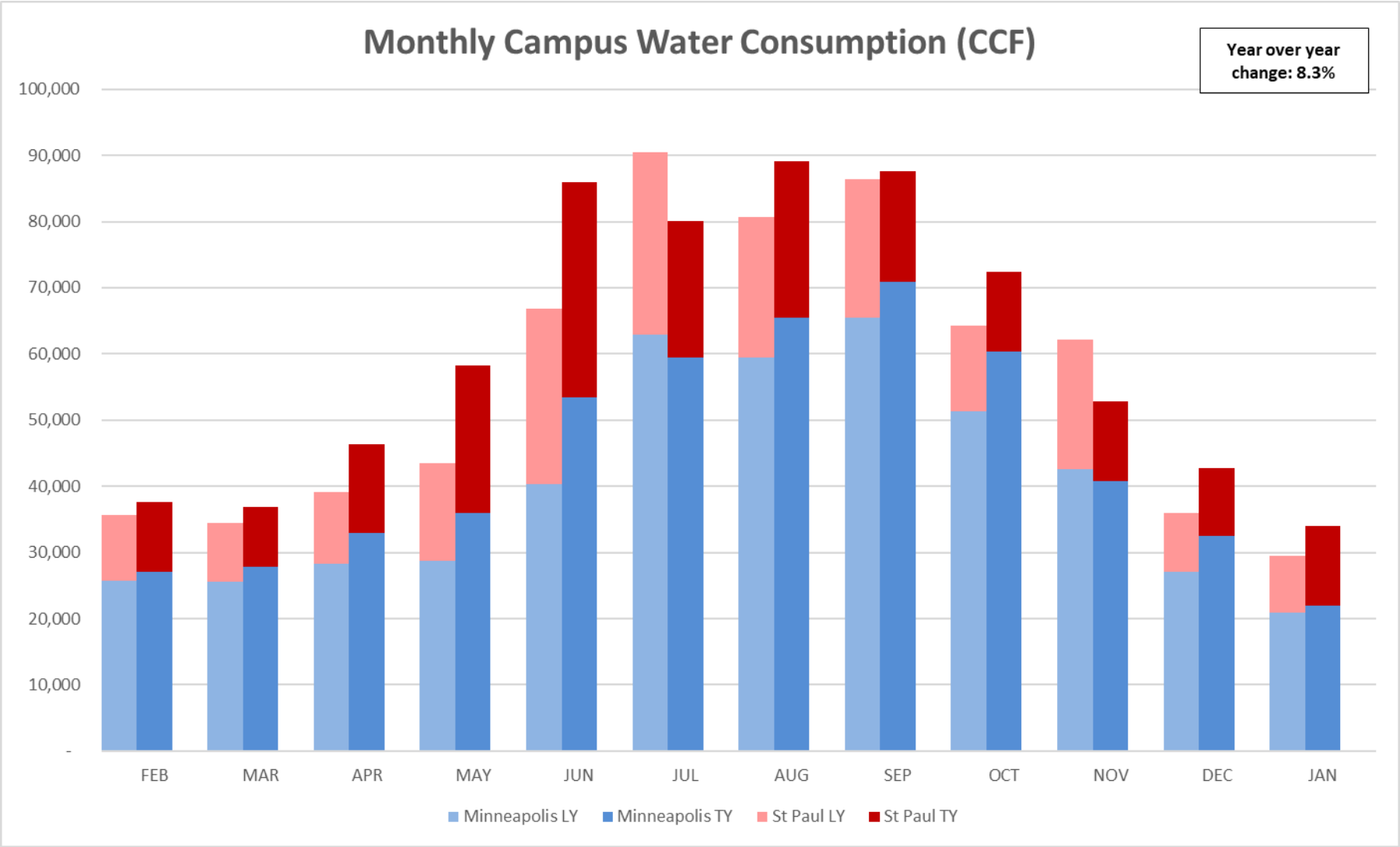
Change from Baseline:

FY	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
2020	-4.67%	-3.30%	-0.65%	-3.44%	-8.74%	0.95%	-9.88%	-13.14%	-18.86%	-15.44%	-14.14%	-12.40%
2021	-18.70%	-14.01%	-17.26%	-3.14%	-23.54%	-8.92%	-17.01%	7.87%	-17.96%	-11.39%	-3.14%	-0.37%
2022	-14.27%	-11.63%	-11.39%	-14.98%	-20.01%	-0.62%	4.61%	-9.55%	-9.38%	-1.35%	-1.95%	-3.65%
2023	-12.71%	-12.28%	-9.96%	-15.22%	-20.38%	3.27%	-13.05%	-18.97%	-7.19%	-6.46%	-4.81%	-4.26%
2024	-15.10%	-9.53%	-11.98%	-14.20%	-24.25%	-16.60%	-8.29%	-29.12%				

EM actively works to reduce emissions and meet University targets for carbon reduction. This chart shows monthly carbon emissions and how they have changed since the baseline year of 2019.

SUSTAINABILITY

We seek to be good stewards of our natural resources and use them wisely. This shows monthly water consumption for the Minneapolis and St Paul campuses vs the previous year.



Change from LY:

	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
Minneapolis	5.16%	8.87%	16.16%	24.96%	32.18%	-5.49%	10.19%	8.43%	17.65%	-4.05%	19.71%	5.26%
St Paul	5.57%	1.71%	25.13%	51.90%	23.30%	-24.83%	11.06%	-20.12%	-6.57%	-38.71%	16.39%	40.42%
Total	**5.28%**	**7.02%**	**18.63%**	**34.10%**	**28.67%**	**-11.38%**	**10.42%**	**1.52%**	**12.75%**	**-14.99%**	**18.89%**	**15.43%**

SUSTAINABILITY

This shows total campus energy usage, separated by utility type, compared to the baseline year of 2009. It is weather-normalized to remove variations due to weather fluctuations.

All Organizations / Higher Ed

University of Minnesota - Twin Cities

26,951,196 gross bldg sf

Dashboard | Data | Metrics | **Visualizations** | Improvements | Reports

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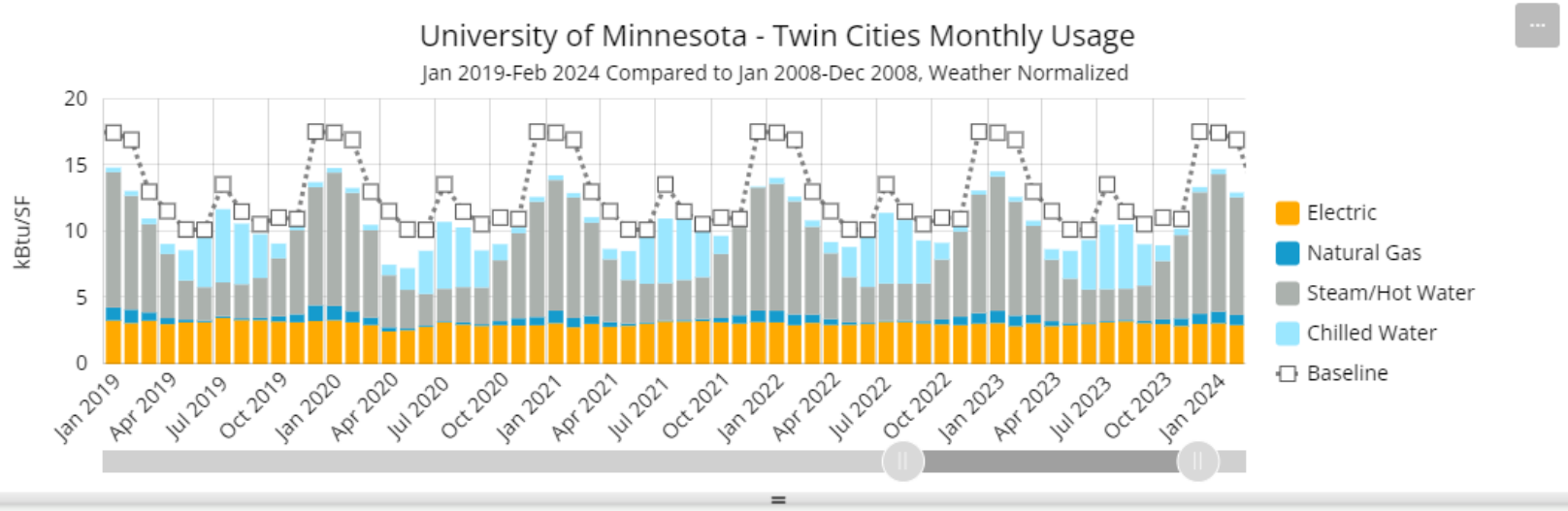
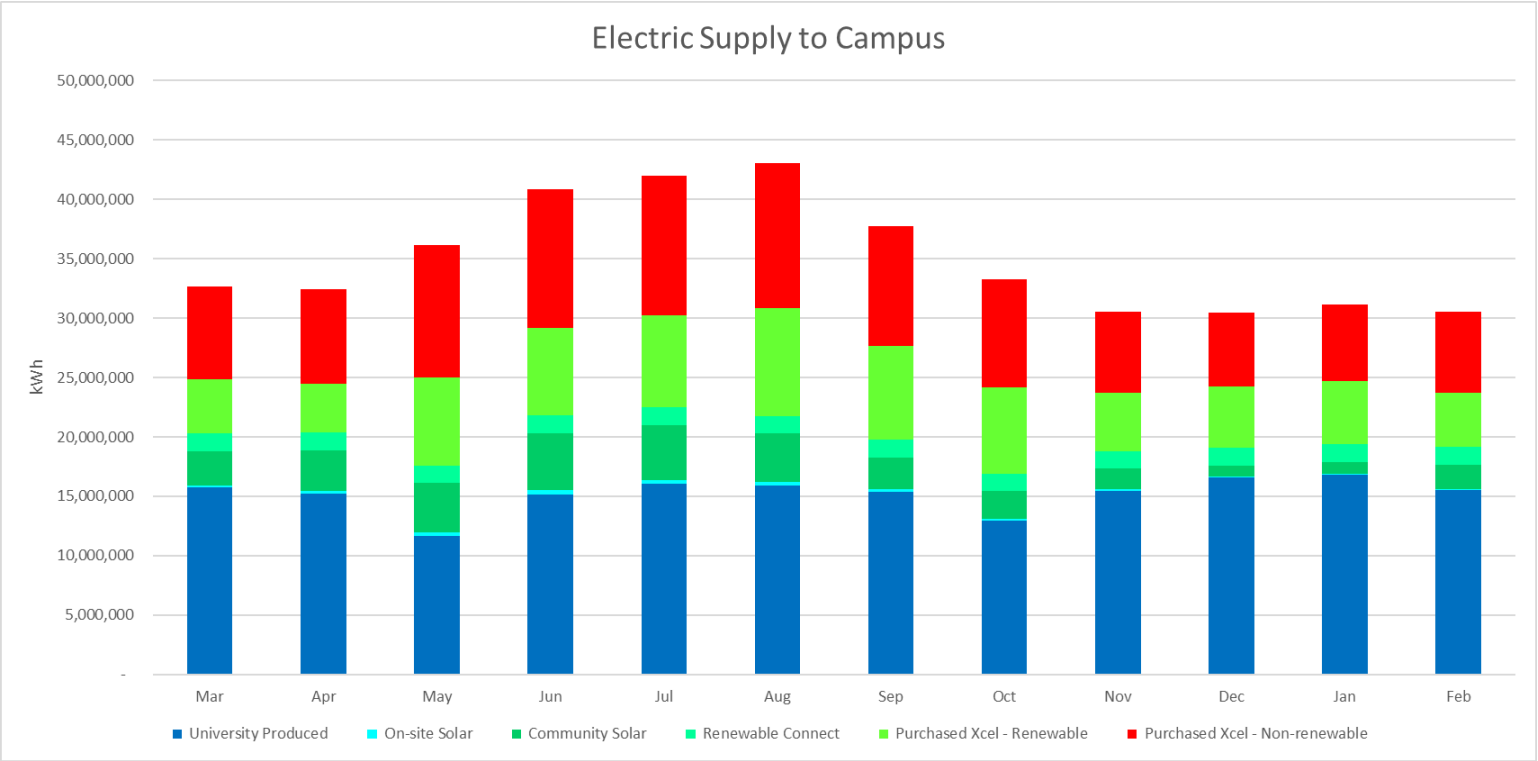


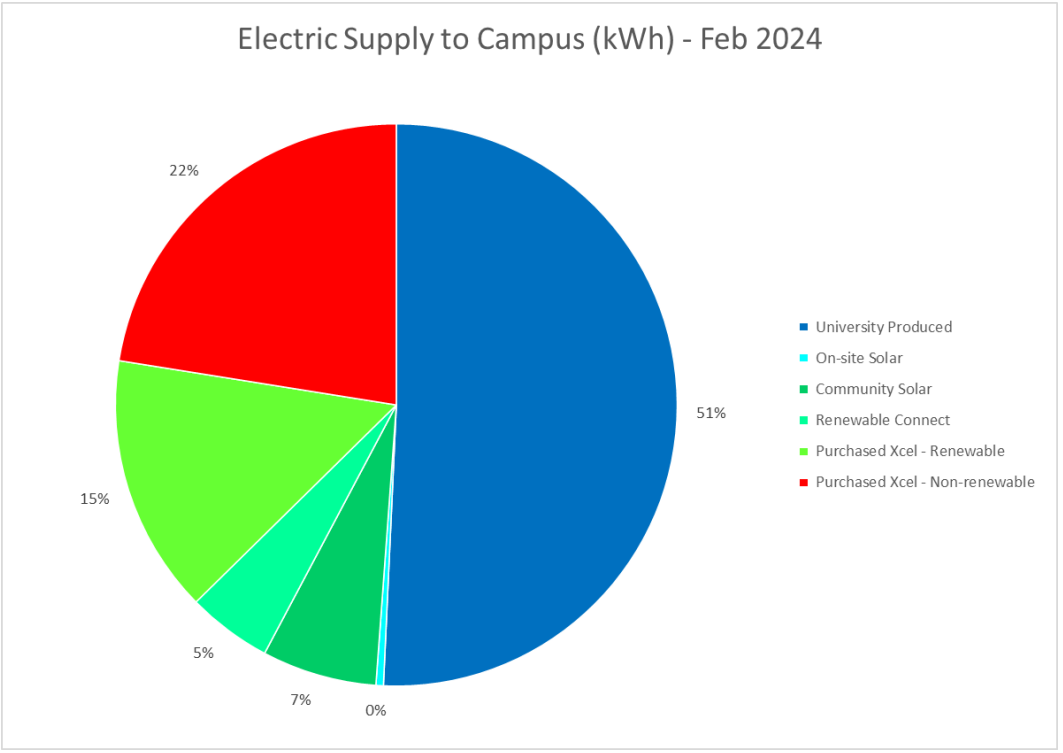
Annual Summary

Period	Days	% Complete	SF	*Actual (kBtu/SF)	*Baseline (kBtu/SF)	Change	% Change
Jan 2019-Dec 2019	365	99.8%	26,761,275	131.77	154.74	-22.96	-14.84%
Jan 2020-Dec 2020	366	100%	26,879,883	123.72	154.74	-31.01	-20.04%
Jan 2021-Dec 2021	365	100%	26,958,123	131.36	154.74	-23.38	-15.11%
Jan 2022-Dec 2022	365	100%	26,951,196	130.20	154.74	-24.53	-15.85%
Jan 2023-Dec 2023	365	100%	26,951,196	127.47	154.74	-27.27	-17.62%
Jan 2024-Feb 2024	60	99.8%	26,951,196	27.72	34.46	-6.74	-19.57%

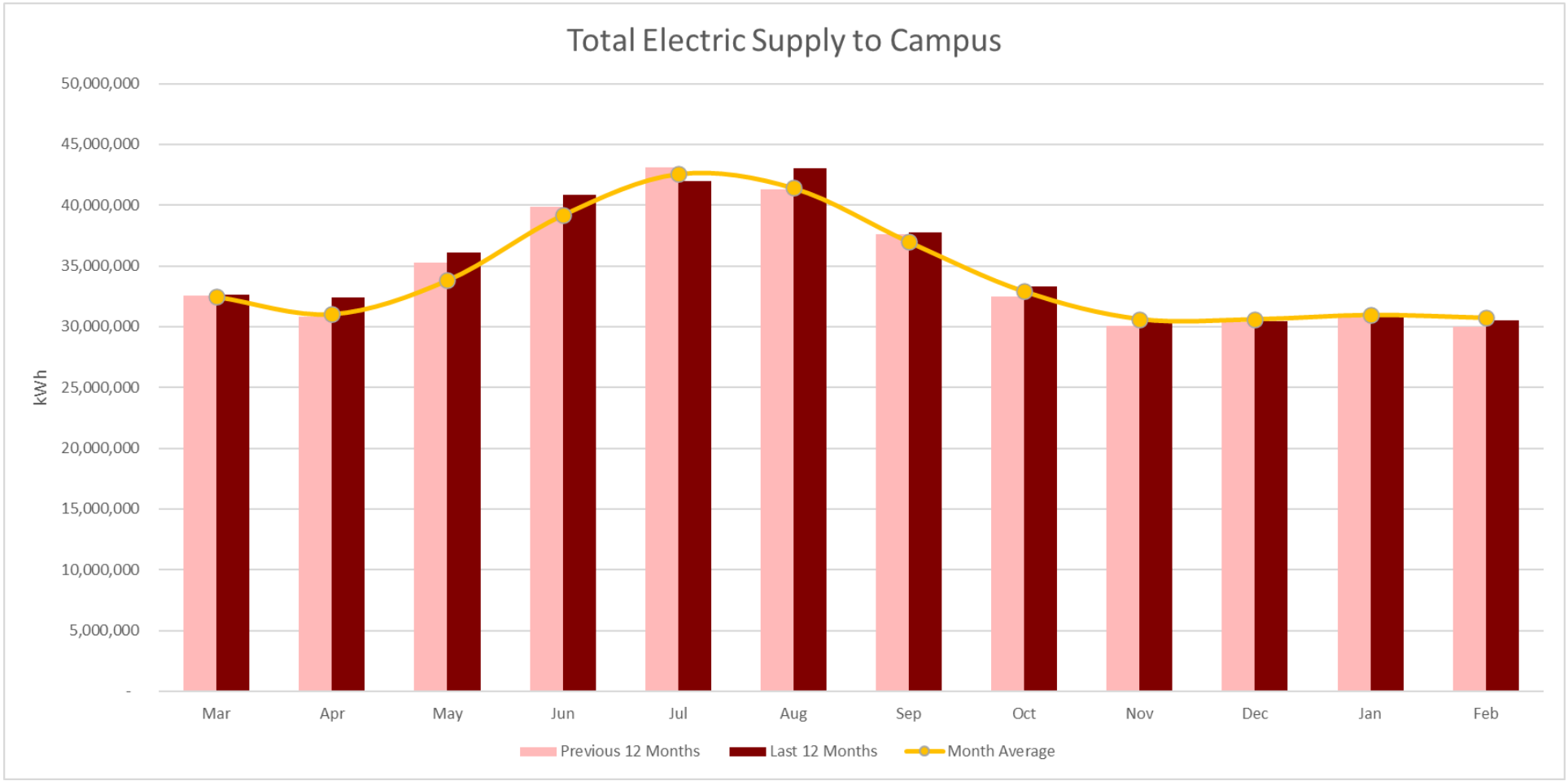
SUSTAINABILITY



The University continually explores new ways to provide energy using sustainable methods. These charts show monthly electricity supplied to campus, broken out by its manner of production.



COST EFFECTIVENESS



The cheapest and most sustainable energy is that which isn't used! This chart shows the total amount of electricity supplied to campus over the past 12 months, compared to the previous year.

COST EFFECTIVENESS

Chilled Water Production Utilities by Fiscal Year

	FY18	FY19	FY20	FY21	FY22	FY23	FY24 @8 of 12
CHW PRODUCTION (TON-HRS)	**53,674,555**	**50,462,692**	**53,449,008**	**60,759,336**	**62,643,652**	**63,124,518**	**41,085,864**
ELECTRIC (KWH)	**32,227,851**	**30,366,204**	**29,371,048**	**32,606,006**	**36,581,795**	**36,126,272**	**23,457,329**
ELECTRIC (kW/Ton)	0.600	0.602	0.550	0.537	0.584	0.572	0.571
STEAM (KLB)	**88,632**	**67,873**	**78,530**	**93,967**	**85,629**	**85,503**	**72,526,009**
STEAM (kLb/Ton)	0.0017	0.0013	0.0015	0.0015	0.0014	0.0014	1.7652
WATER (CCF)	**111,443**	**113,830**	**103,774**	**95,975**	**128,293**	**122,790**	**110,437**
WATER (CCF/Ton)	0.00208	0.00226	0.00194	0.00158	0.00205	0.00195	0.00269
CHW CONSUMPTION (TON-HRS)	**47,050,240**	**45,653,168**	**46,478,654**	**49,132,181**	**55,760,246**	**56,130,182**	**36,564,574**
% Billed Through	**87.7%**	**90.5%**	**87.0%**	**80.9%**	**89.0%**	**88.9%**	**89.0%**

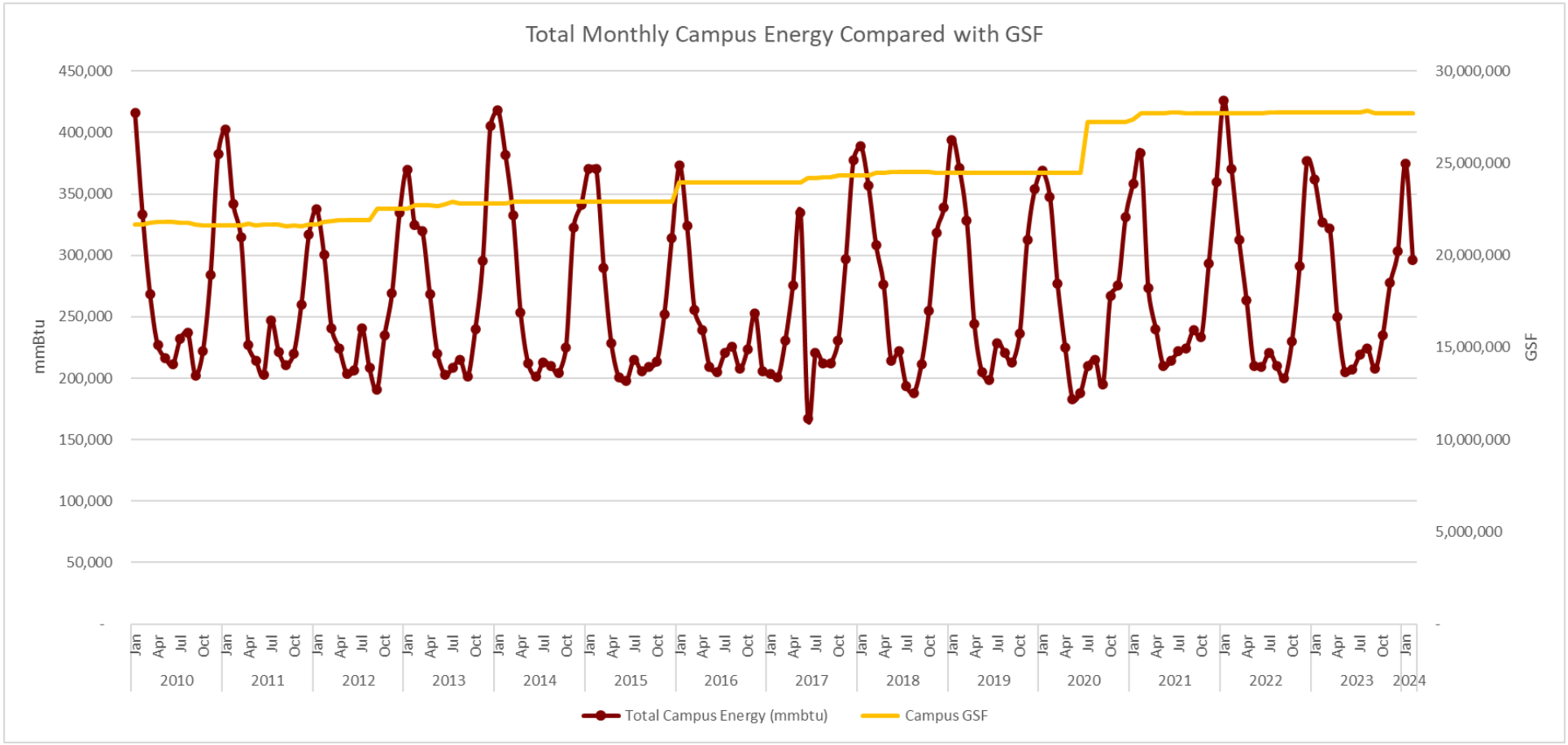
Twin Cities Utility Plant Production by Fiscal Year

	FY18	FY19	FY20	FY21	FY22	FY23	FY24 @8 of 12
FUEL (mmBtu)	3,423,722	3,412,151	3,125,091	3,401,086	3,525,578	3,409,177	2,273,463
STEAM OUTPUT (kLbs)	1,852,760	1,844,541	1,785,216	1,837,425	1,903,993	1,781,511	1,186,854
METERED CONSUMPTION (kLbs)	1,708,061	1,723,162	1,626,020	1,736,174	1,806,859	1,739,295	1,119,739
% BILLED THROUGH	**92.2%**	**93.4%**	**91.1%**	**94.5%**	**94.9%**	**97.6%**	**94.3%**
COGEN GROSS (mWh)	172,417	165,435	135,566	173,988	180,902	184,007	124,941

EM produces all of the chilled water for cooling and steam for heating the campus, as well as a sizeable portion of the electricity used. These tables show the utilities used to do this, as well as measures of the efficiency of the systems.

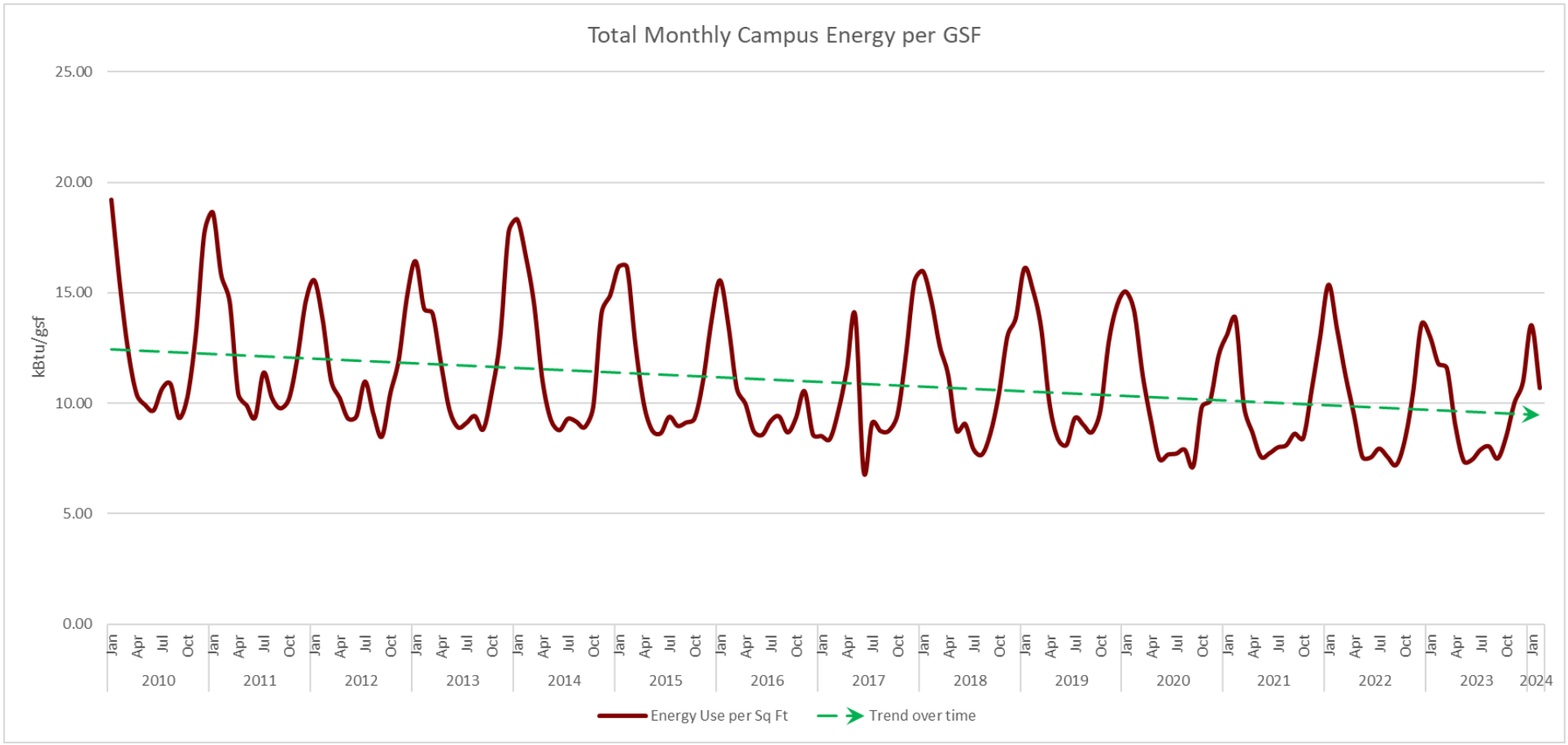
COST EFFECTIVENESS

Energy Management's efforts to conserve energy are complicated by the continued growth of the University. With new buildings being erected and old ones experiencing extensive renovation, it is useful to see the trend in energy usage in concert with the increasing square footage of campus.



COST EFFECTIVENESS

This similar chart shows the ratio of campus energy usage to square footage. It shows clearly that, even though the campus is growing, Energy Management continues to find ways to reduce energy consumption.



COST EFFECTIVENESS

Rolling 12 Month Energy Use Intensity (EUI) - Top and Bottom Performing Outliers per District

District	Bldg #	Building	GSF	Actual EUI (kbtu/ft2/yr)	Expected EUI (kbtu/ft2/yr)	Actual as a Percent of Expected	Code EUI (kbtu/ft2/yr)	Actual as a Percent of Code
East Bank	191	MAST Laboratory	9,537	104	369	28%	63	166%
	003	Pattee Hall	28,991	48	163	30%	69	70%
	019	Campbell Hall	80,495	71	163	43%	79	89%
	197	Wallin Medical Biosciences	119,872	354	304	116%	230	154%
	149	Microbiology Research Facility	89,936	259	203	128%	886	29%
	049	Tate Laboratory Of Physics	260,608	163	116	140%	196	83%
Health Sciences	115	Children's Rehabilitation Center	70,851	89	196	46%	105	85%
	193	717 Delaware St SE	201,333	125	231	54%	159	79%
	143	Dwan Variety / Masonic Cancer Research Centers	190,038	244	403	61%	238	103%
	178	Hasselmo Hall	285,963	209	226	93%	223	94%
	147	Weaver-Densford Hall	195,438	216	229	94%	186	116%
	144	Phillips-Wangensteen Building	580,141	258	237	108%	152	169%
HRA	067	Field House	89,186	21	73	28%	72	29%
	169	Recreation and Wellness Center	307,048	44	118	37%	122	36%
	181	Ridder Arena/Baseline Tennis	367,813	41	106	38%	98	41%
	098	University Stores South	55,183	95	85	113%	215	44%
	052	Pioneer Hall	316,336	88	77	114%	141	62%
	126	Keeler Apartments	98,900	24	18	137%	95	26%
St Paul	415	Plant Growth Facilities-West (415)	13,092	210	614	34%	172	122%
	463	Poultry Teaching and Research	27,648	119	332	36%	212	56%
	432	Plant Growth Facilities-West (432)	9,244	120	330	36%	566	21%
	411	Biological Sciences	207,115	202	139	146%	225	90%
	455	Swine Research Facility	10,559	328	85	385%	31	1,056%
	409	Veterinary Isolation Facility	31,843	368	63	582%	270	136%
West Bank	207	Willey Hall	120,464	40	132	30%	116	34%
	209	Rarig Center	173,139	78	193	40%	92	85%
	241	Regis Center for Art - East	102,035	113	260	43%	242	47%
	058	St Anthony Falls Laboratory	65,342	153	160	96%	295	52%
	201	Heller Hall	103,926	81	74	110%	84	97%
	135	Urban Research & Outreach Center	22,528	71	28	256%	100	71%

Note 1 - Actual based on MAR 23 - FEB 24 meter readings

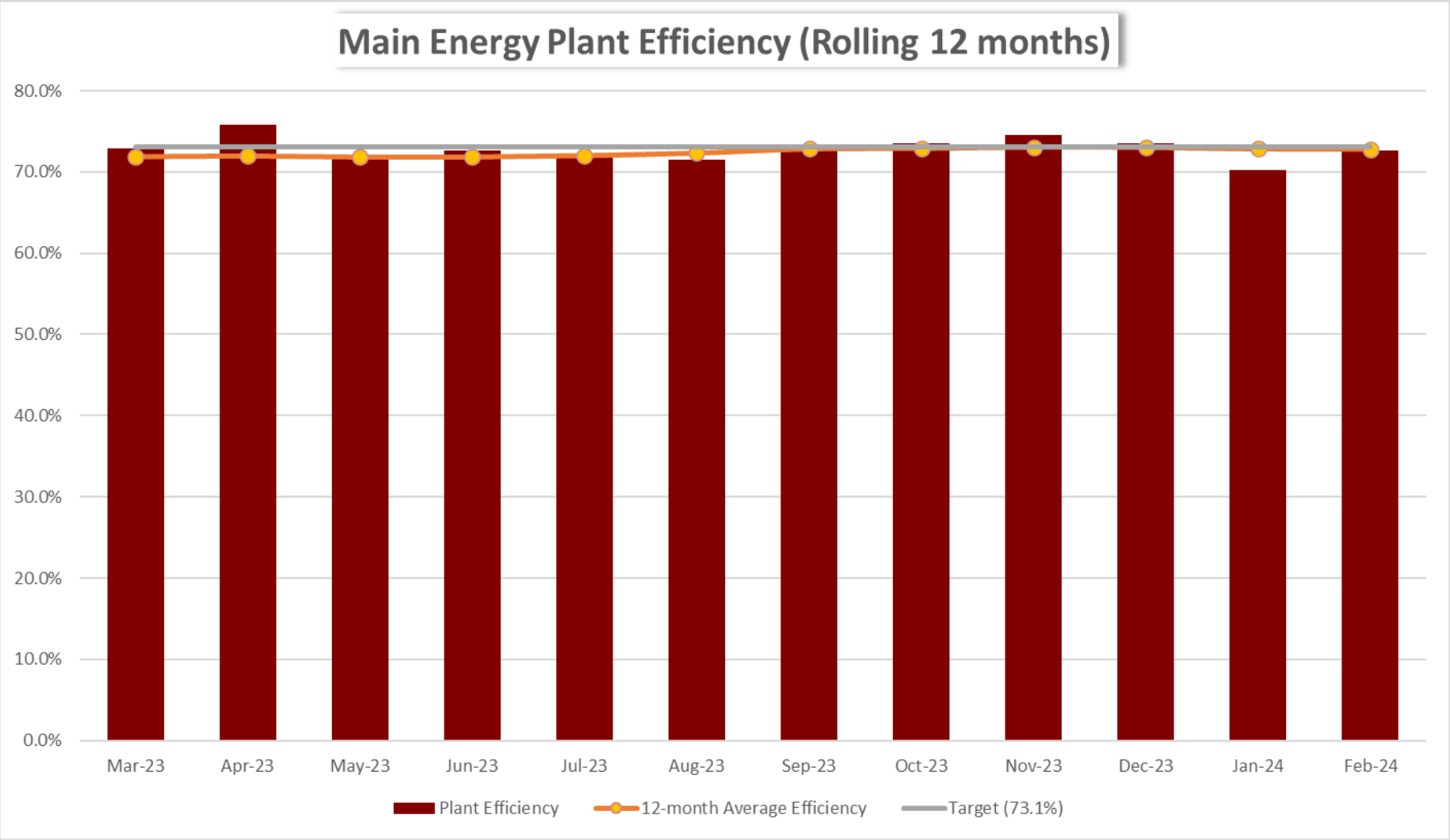
Note 2 - Expected based on JAN 09 - DEC 09 weather and energy data

Note 3 - Code based on current State Energy Code

<95%	<95%
96-110%	96-110%
>110%	>110%

Each building has challenges to conserving energy and using our resources effectively. This table shows how much energy an individual building uses, how much we expect it to use based on the type of building it is, and how much it should use, were it built to current energy standards. We showcase six buildings per District, three that perform well, given what we expect, and three that do not.

COST EFFECTIVENESS

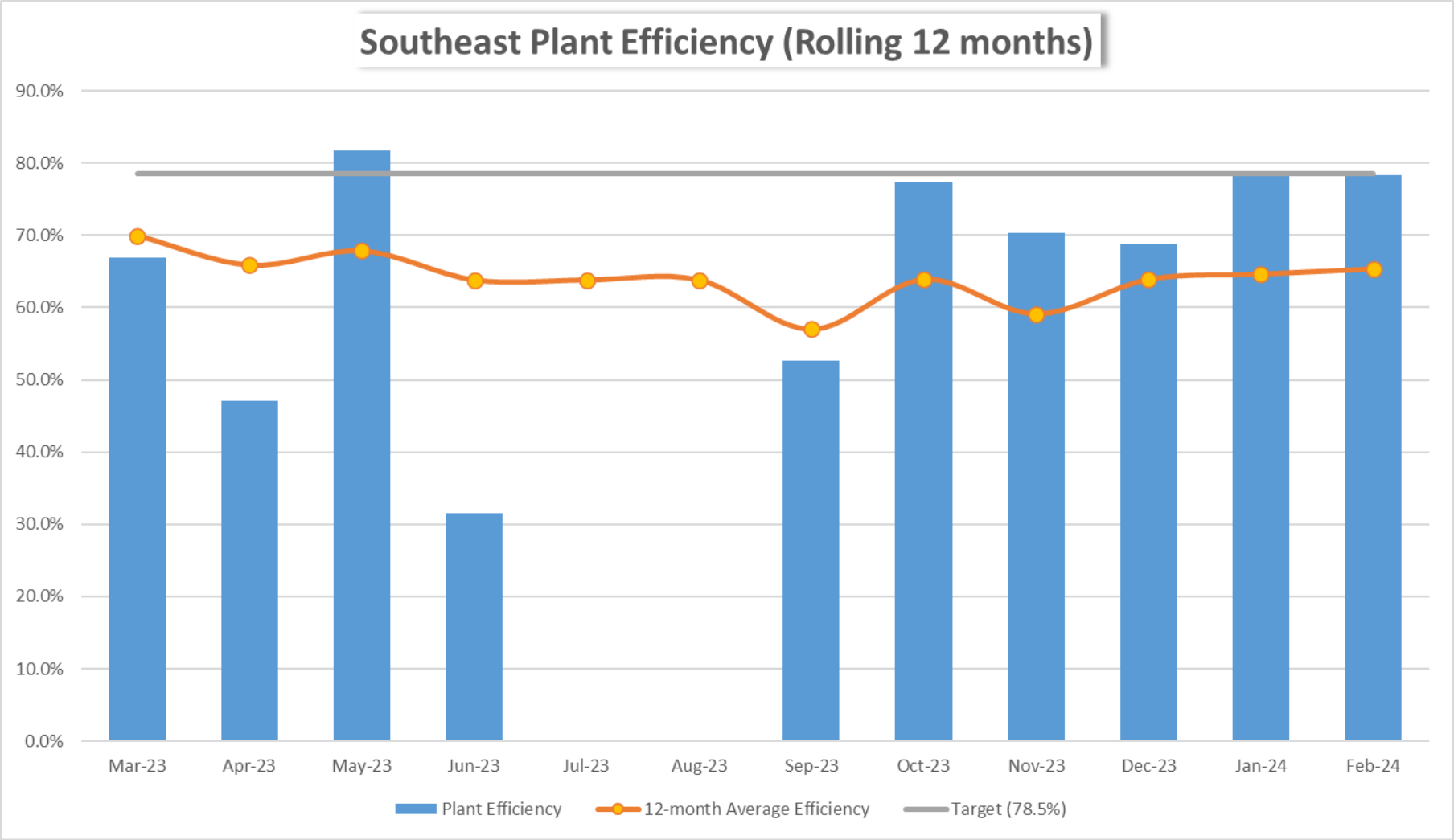


MAIN ENERGY PLANT EFFICIENCY

	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24
Plant Efficiency	72.9%	75.8%	71.7%	72.7%	72.2%	71.5%	74.0%	73.6%	74.5%	73.5%	70.2%	72.6%
Rolling 12 Average	71.9%	72.0%	71.9%	71.9%	72.1%	72.4%	73.0%	72.9%	73.1%	73.0%	72.9%	72.8%

It is important to run our utility plants as efficiently as possible. This chart measures how much energy on a monthly basis was brought into the Main Energy Plant, and how much flowed out, expressed as a percentage.

COST EFFECTIVENESS

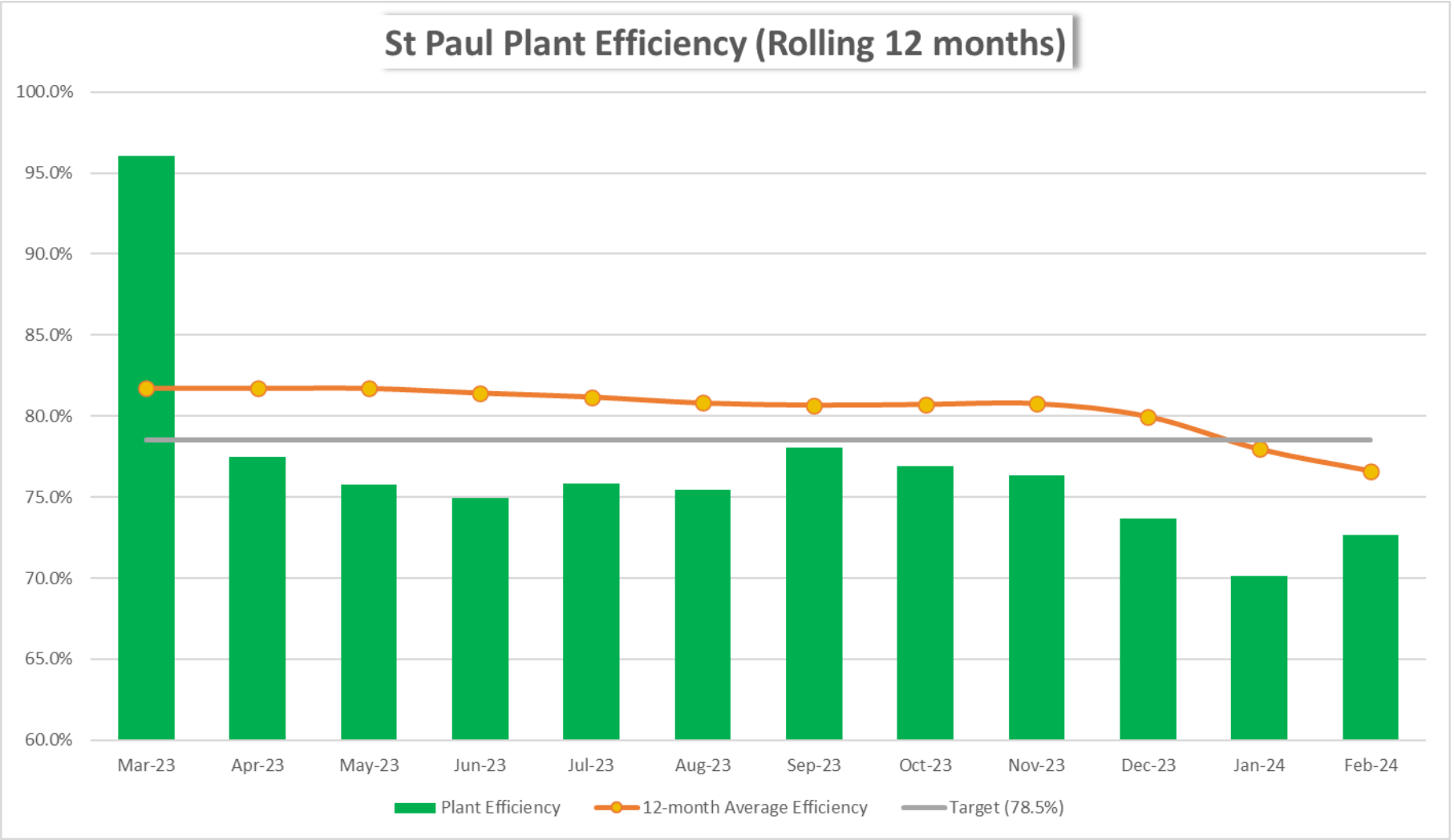


SOUTHEAST PLANT EFFICIENCY

	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24
Plant Efficiency	66.8%	47.1%	81.7%	31.6%	0.0%	0.0%	52.7%	77.3%	70.3%	68.8%	78.8%	78.3%
Rolling 12 Average	70.0%	65.9%	67.8%	63.8%	63.8%	63.8%	57.0%	63.6%	59.1%	63.9%	64.6%	65.3%

It is important to run our utility plants as efficiently as possible. This chart measures how much energy on a monthly basis was brought into the Southeast Steam Plant, and how much flowed out, expressed as a percentage.

COST EFFECTIVENESS

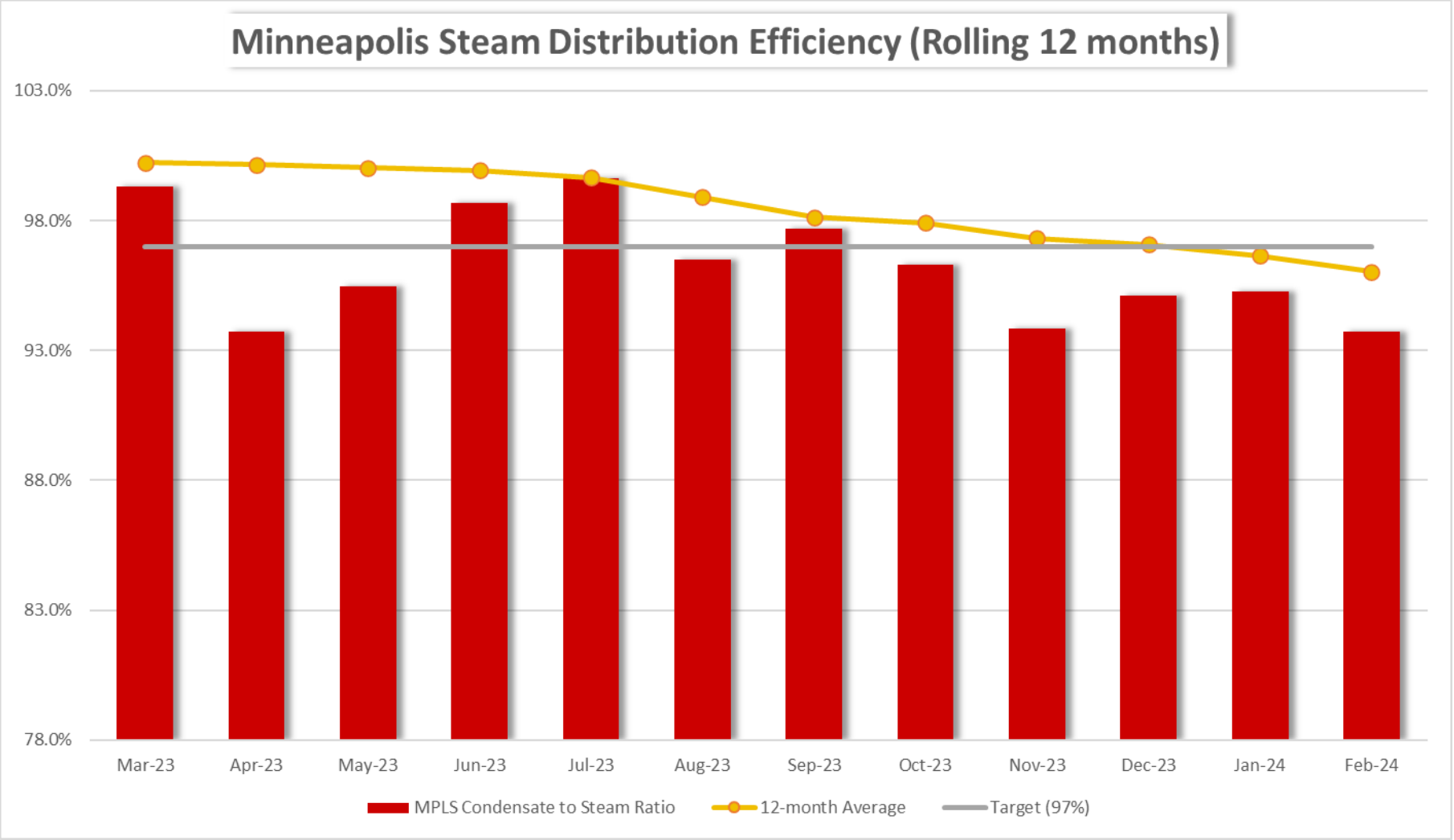


ST PAUL PLANT EFFICIENCY

	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24
Plant Efficiency	96.1%	77.5%	75.8%	74.9%	75.9%	75.4%	78.0%	76.9%	76.4%	73.7%	70.1%	72.7%
Rolling 12 Average	81.7%	81.7%	81.7%	81.4%	81.2%	80.8%	80.7%	80.7%	80.8%	80.0%	78.0%	76.6%

It is important to run our utility plants as efficiently as possible. This chart measures how much energy on a monthly basis was brought into the St Paul Steam Plant, and how much flowed out, expressed as a percentage.

COST EFFECTIVENESS

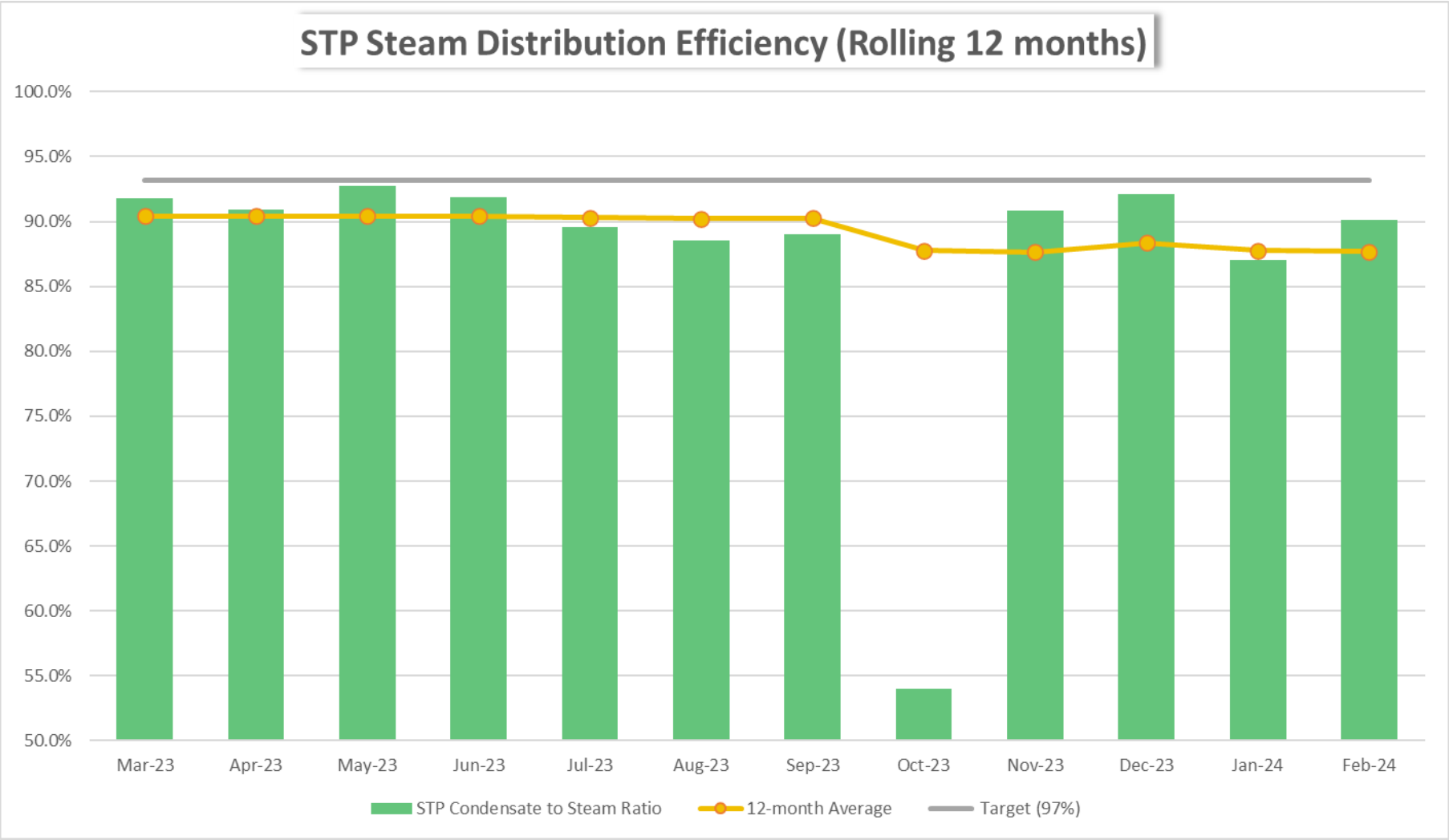


MINNEAPOLIS STEAM DISTRIBUTION EFFICIENCY

	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24
COND to STM Ratio	99.3%	93.7%	95.5%	98.7%	99.6%	96.5%	97.7%	96.3%	93.8%	95.1%	95.3%	93.7%
Rolling 12 Average	100.2%	100.2%	100.0%	99.9%	99.7%	98.9%	98.1%	97.9%	97.3%	97.1%	96.6%	96.0%

It is important to run our distribution systems as efficiently as possible. This chart measures how much condensate was returned vs how much steam left the Minneapolis energy plants.

COST EFFECTIVENESS



ST PAUL STEAM DISTRIBUTION EFFICIENCY

	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24
COND to STM Ratio	91.8%	90.9%	92.8%	91.9%	89.6%	88.5%	89.0%	54.0%	90.8%	92.1%	87.0%	90.1%
Rolling 12 Average	90.4%	90.4%	90.4%	90.4%	90.3%	90.2%	90.3%	87.8%	87.7%	88.4%	87.8%	87.7%

It is important to run our distribution systems as efficiently as possible. This chart measures how much condensate was returned vs how much steam left the St Paul energy plant.