

CARBON CREDITS

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iSEE

Institute for Sustainability,
Energy, and Environment

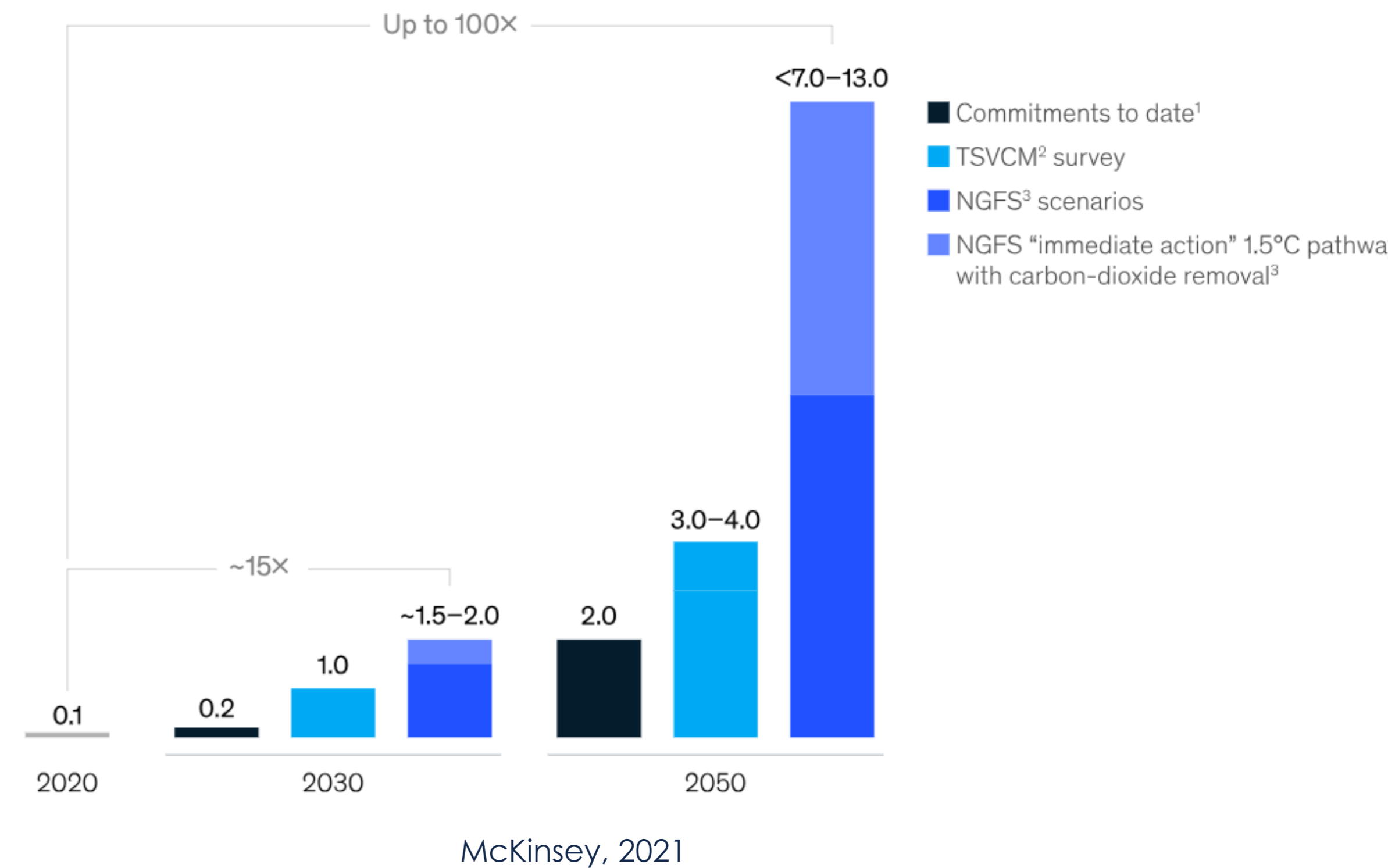


Rationale for Carbon Credit Markets:

- Carbon credits are certificates representing quantities of greenhouse gases that have been kept out of the air or removed from it.
- Carbon credit markets have emerged as businesses seek to reduce their carbon footprint
 - Generate a market price for CO₂ that allow a buyer and seller to trade carbon
- Purchasing carbon credits is one way for a company to address emissions it is unable to eliminate
- Leads to increased financing for activities to reduce GHG emissions

Global demand for voluntary carbon credits could increase by a factor of 15 by 2030 and a factor of 100 by 2050.

Voluntary demand scenarios for carbon credits, gigatons per year





Types of carbon credit markets

Mandatory markets in the US

- California cap-and-trade and the Regional Greenhouse Gas Inventory in 11 NE states
- Provide tradeable allowances to entities for carbon emissions
 - trading among entities with surplus or deficit allowances to meet their cap

Carbon credits

- Tradeable instruments that give companies the right to emit 1 tonne of greenhouse gas, traded on the mandatory market

Voluntary market

- Allows individuals and organizations to purchase carbon credits to offset their emissions on a voluntary basis

Carbon offsets

- Tradeable instruments that represent the reduction/removal of 1 tonne of greenhouse gas, traded on the voluntary market

Live Carbon Prices

CarbonCredits.com Live Carbon Prices	Last	Change	YTD
Compliance Markets			
European Union	€82.90	-	+3.63 %
California	\$29.41	-	+1.17 %
Australia (AUD)	\$30.00	-	-11.24 %
New Zealand (NZD)	\$72.60	-	-5.00 %
South Korea	\$9.54	-	-19.38 %
China	\$8.36	+3.45 %	+3.81 %
Voluntary Markets			
Aviation Industry Offset	\$0.77	+2.67 %	-79.95 %
Nature Based Offset	\$1.82	-	-60.43 %
Tech Based Offset	\$0.78	-6.02 %	-31.58 %

<https://carboncredits.com/carbon-prices-today/>



University of Illinois Context

- **Illinois Climate Action Plan (iCAP) Goal**

- Net-zero GHG emissions by 2050
- Committed to this goal in 2008 when Chancellor Richard Herman signed the American College and University Presidents' Climate Commitment (ACUPCC)

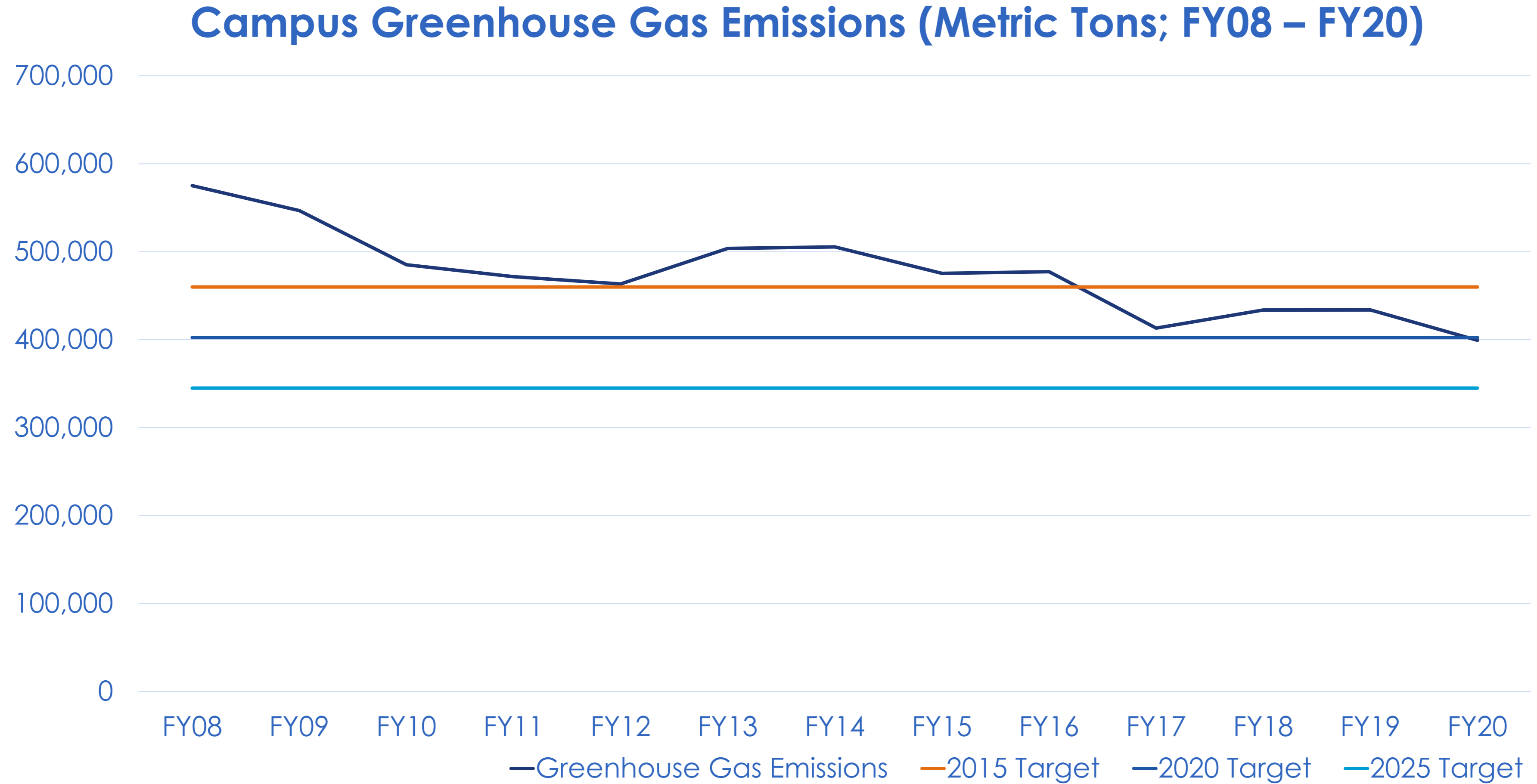
- **Second Nature Climate Commitment (2018-2023)**

- UIUC participated in Carbon Capture and Purchasing Program (C2P2)
- Second Nature served as broker to identify buyers, negotiate prices, and facilitate sale of carbon credits
- Second Nature coordinated with VCS to certify UIUC's carbon credits





Greenhouse Gas Emission Trends



The campus did not achieve its 2015 emissions targets on time but did achieve its 2020 targets on time.



Carbon Credits Generated

- Total carbon credits sold since 2015:
- Total revenue generated
- Average price of a carbon credit sold
- C2P2 projects provide a number of benefits
- All proceeds from carbon sales are reinvested into energy reduction projects on campus, allowing schools to reach their carbon neutrality goals and interim targets at a faster rate.
- They offer research opportunities for students and faculty, provide extracurricular engagement opportunities for the campus community, and drive innovation in clean energy and energy efficiency.
- \$832,885 worth of carbon credits sold to Chevy were retired for the good of the planet in 2015
- 371,634 carbon credits sold to various buyers from 2016-present (raising over \$2M)
- 103,000 replacement carbon credits purchased



How Reductions Have Been Achieved

Energy conservation

- Retrocommissioning to optimize heating, ventilation, and cooling in buildings
- Energy performance contracts
- Heat recovery chillers
- Installation of occupancy sensors for lighting and HVAC equipment
- Testing new technology
- Net zero space growth policy
- Behavior change programs such as Illini Lights Out and the Freezer Challenge





How Reductions Have Been Achieved, cont'd

Renewable energy

- Multiple rooftop solar installations
- Two large scale solar farms on campus totaling 75 acres
- Off campus wind power purchase agreement
- Biomass boiler
- Solar thermal energy to heat the pools at ARC
- Geothermal installations





Use of Carbon Credit Revenue

- Biomass boiler
- Grind to energy



Opportunities and Challenges with Offsets

- Provides a pathway for organizations to achieve carbon neutrality in the short term
- Unlocks financing for innovative activities that reduce GHG emissions
- Difficult to quantify impacts of projects and to determine if projects are “additional,” e.g. result in emissions reductions or removals that would not have occurred without the sale of offsets
- Recent negative media coverage and public perception



Future Opportunities to Generate Credits

- Solar Farm 3
- Nuclear microreactor
- Accelerating energy conservation efforts
- Direct air carbon capture
- Net zero building like ECE and CIF
- Sustainable land management
 - Improved agricultural land management, including cover crops and no-till farming
 - Improved forest management

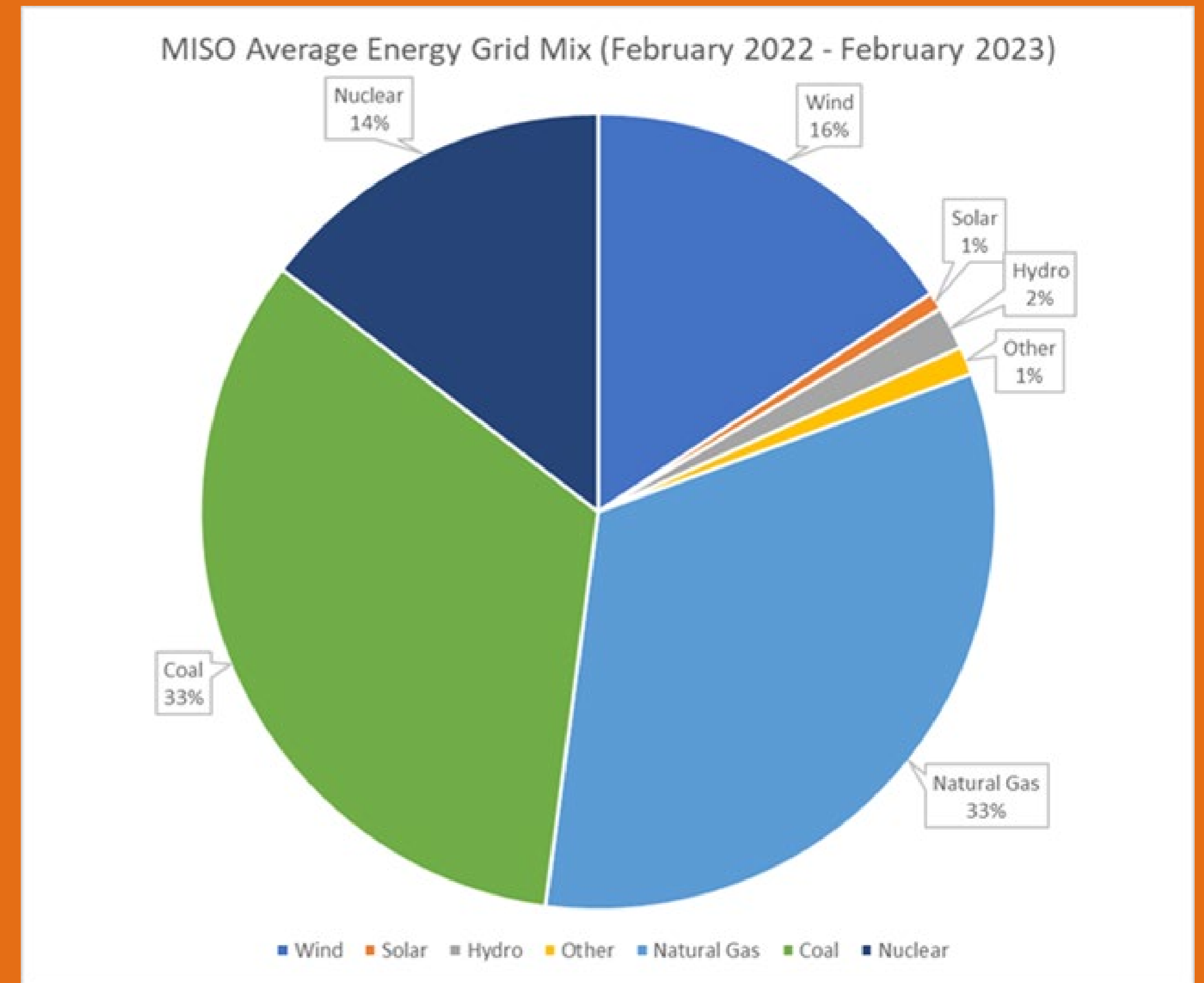
POSSIBLE EXTRA SLIDES AND DATA FOLLOW



Campus Power Sources

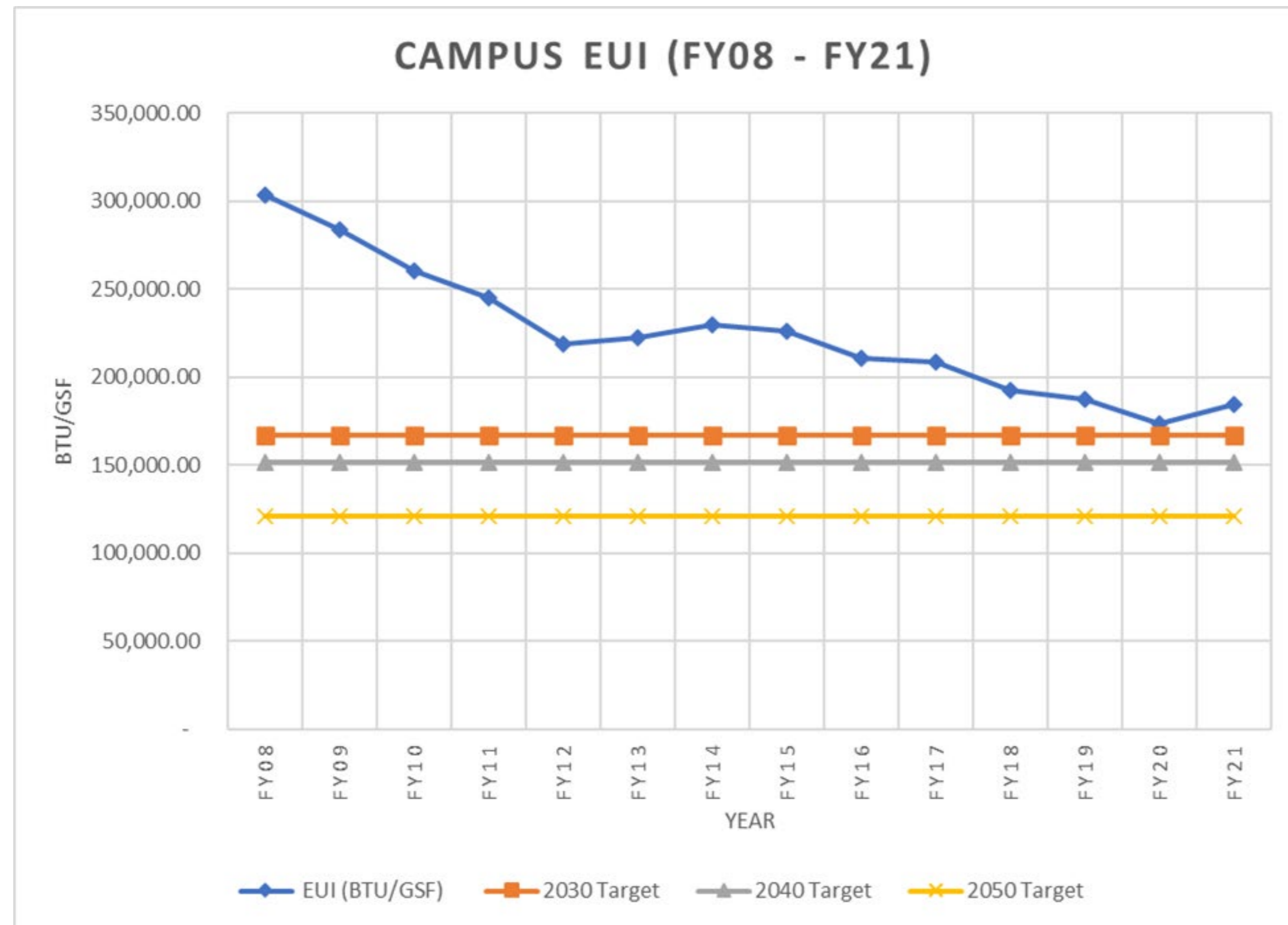
- As of 2019, renewables comprised a little over 7% of campus power sources.
- This has grown since Solar Farm 2.0 came online
- Campus remains largely dependent on Abbott Power Plant and the MISO energy grid for power, which is largely comprised of electricity generated from coal and natural gas.

Source	Share of Energy
Grid-Purchased Power	51.22%
Abbott-Generated Power	41.5%
Rail Splitter Wind Farm	5.65%
Solar Farm 1.0	1.61%
Small-Scale Solar	0.02%





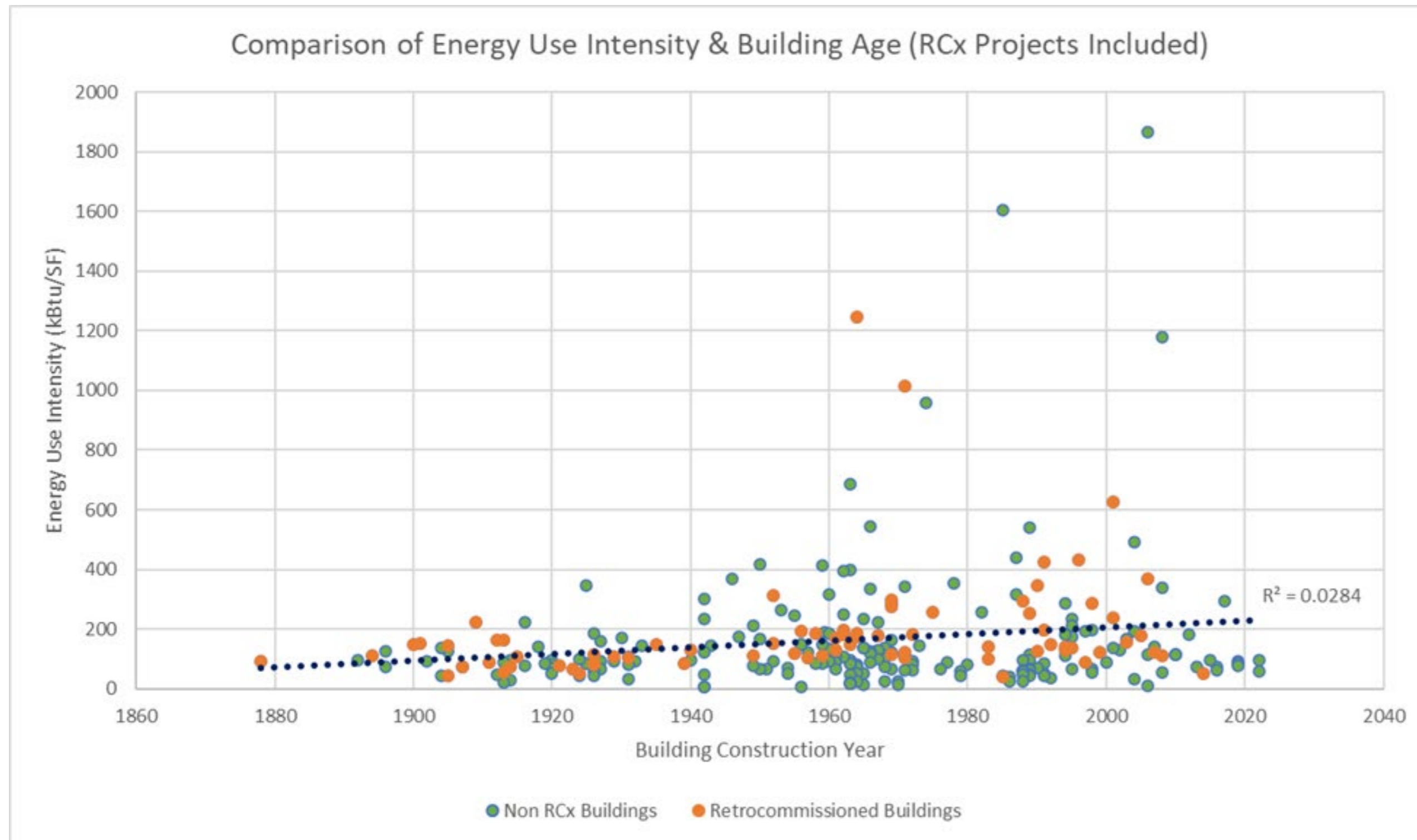
Campus Energy Use Intensity (FY08-21)



- Energy Use Intensity (EUI) measures energy used per square foot of building space per year.
- The University has a target of achieving an EUI of 167,000 BTU/GSF by 2040, which is close to being achieved.
- The campus is home to 273 buildings with an EUI range of 6 to 1865 kBTU/sf.



Campus Energy Use Intensity (FY08-21)



- There is no correlation between a building's age and its energy use intensity.
- Buildings that underwent retrocommissioning to improve their energy usage are highlighted in orange.



LEED Certified Campus Space

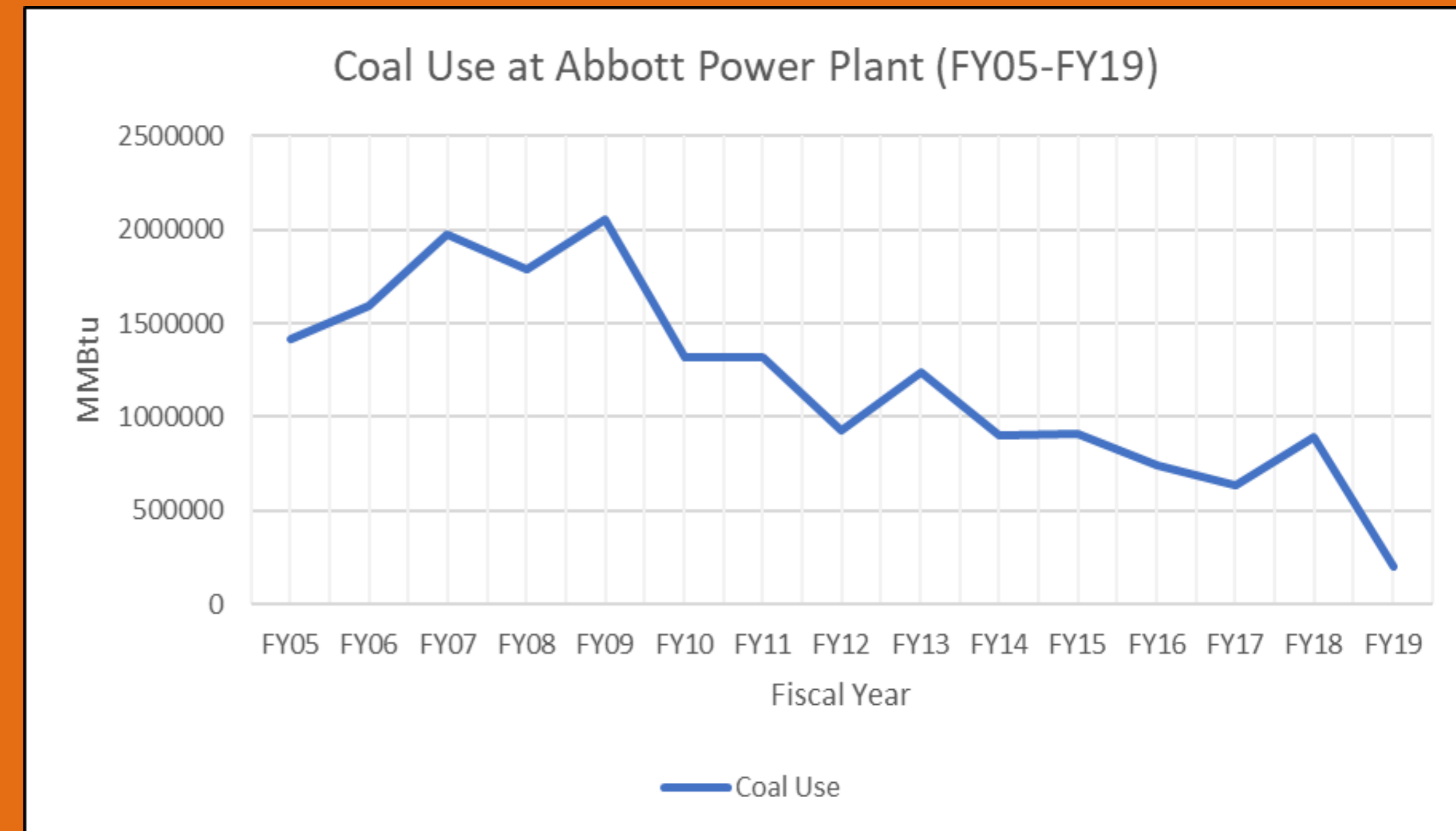
LEED Certification	2013	2015	2017	2019	2022
Platinum	160,000	524,199	361,949	361,949	738,252
Gold	90,000	94,377	155,000	155,000	1,055,802
Silver	197,297	414,016	101,202	101,202	21,032,816.64

- As of 2023, the campus hosts 26 LEED Certified Buildings: 4 Platinum buildings, 9 Gold buildings, and 13 Silver buildings.
- Certification is promoted by Illinois State Law, which states that any new building and major renovation of 10,000 contiguous square feet or more must obtain a minimum LEED Silver or equivalent certification.



Abbott Power Plant

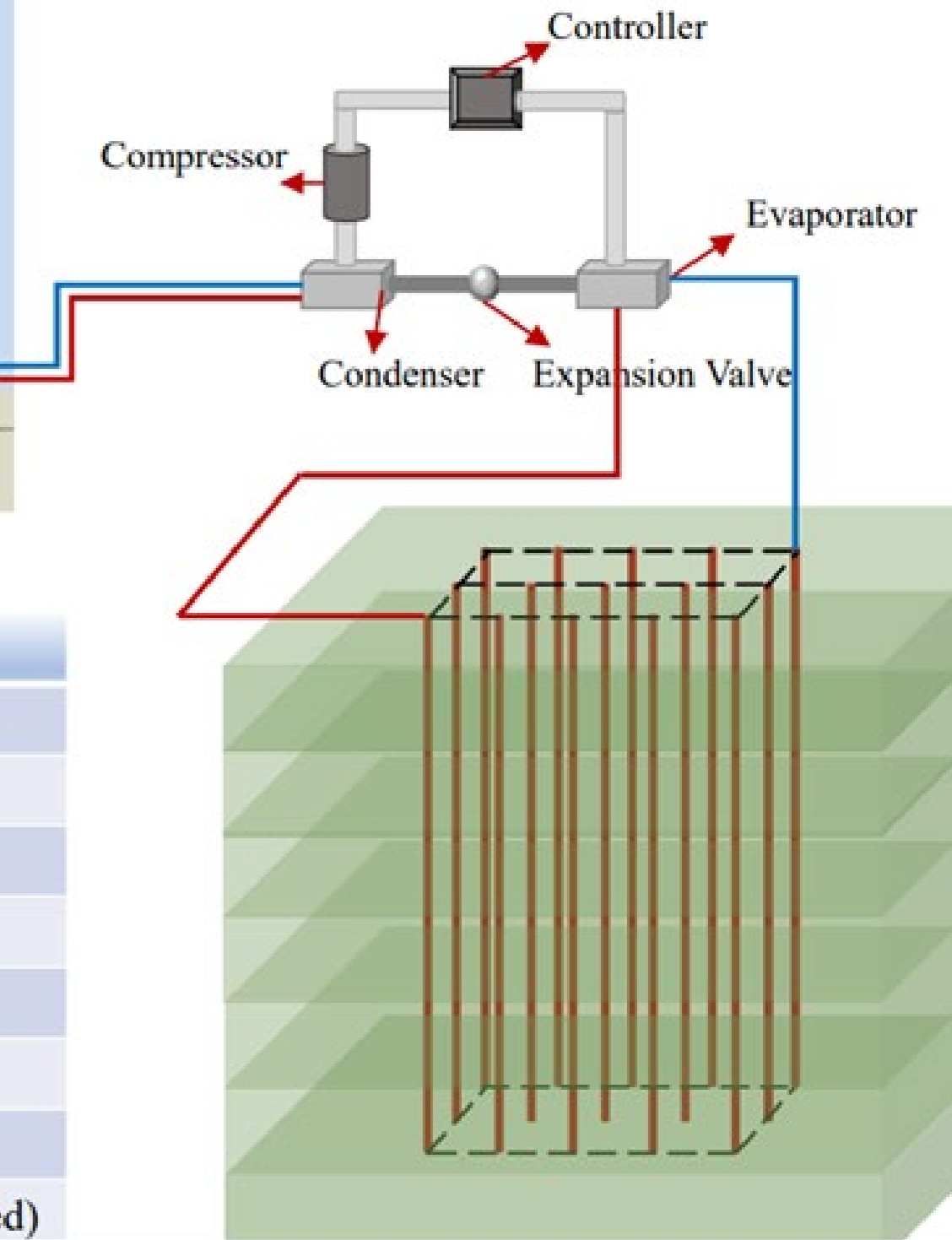
- The 2010 iCAP called for ceasing all investment in coal-fueled systems that extend the life of coal assets at Abbott Power Plant beyond operating expenses.
- Summer coal use ended in 2011.
- Coal use has declined 90% from FY09.
- Previous analysis tested the feasibility of replacing 10% of coal intake with wood chips, found to be economically infeasible.





Geothermal Energy

- Six buildings with geothermal energy, with five more proposed.
- The Campus Instructional Facility (CIF), built in 2021, was constructed with a geothermal energy system that can supply 65% of the building energy demand.
- Energy sourced from a 40-well borefield constructed under the Bardeen Quad reaching 450 feet into the ground.
- System saves \$45,000/year and is projected to save \$1.35 million in heating and cooling costs over the next 30 years.



Feature	Values
Number of wells	40 (3×5+5×5)
Depth of wells	450 ft
Distance apart	20 ft
Heating capacity	185 tons
Cooling capacity	141 tons
Annual operational cost-saving	\$45000
Pay-back period	28 years
Carbon emission reduction	(To be determined)



Geothermal Energy

- Geothermal energy at Allerton Park saves roughly \$10,000/year while achieving significant decreases in energy use and carbon dioxide emissions.
- A grant application from the student sustainability committee is in development to implement geothermal heat exchange systems in university steam tunnels to be used as a heat source for buildings.





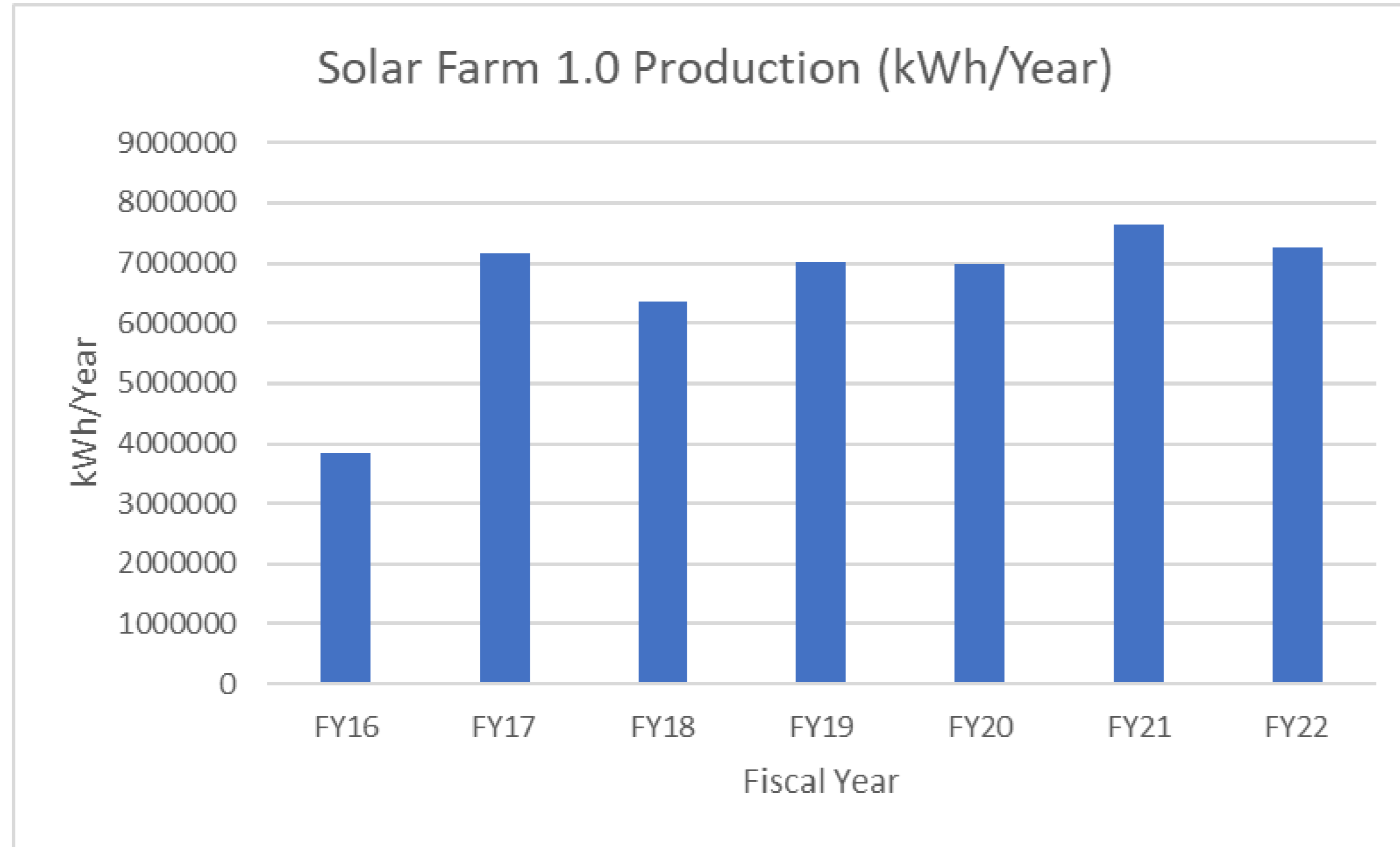
Solar Energy

- Campus solar energy has three main sources:
 - Solar Farm 1.0: A 20.8-acre, 4.68 MW fixed-tilt solar farm located in the South Farms.
 - Solar Farm 2.0: A 54-acre, 12.32 MW tracking axis solar farm located in the South Farms.
 - Rooftop solar installations located on several buildings across campus.
- Currently, UIUC is planning “Solar Farm 3.0” which would meet the iCAP 2015 objective of achieving 140,000 MWh of clean energy usage per year.
 - Possible Power-Purchase Agreement with an off-campus solar developer.
 - University of Illinois Chicago has expressed interest in joining UIUC in a PPA for Solar Farm 3.0.





Solar Farm 1.0

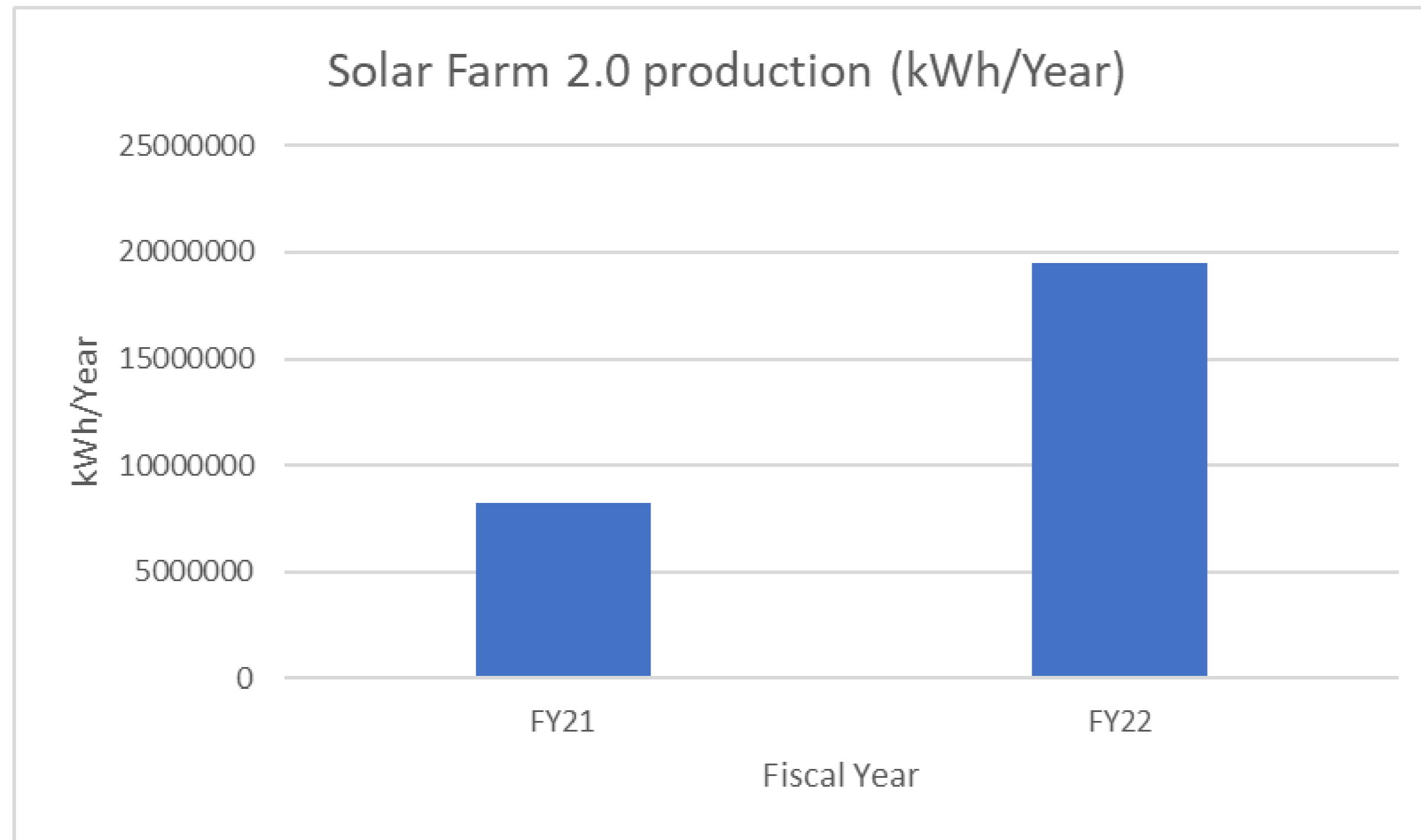


Solar Farm 1.0 has produced nearly 50 GWh of energy for campus since construction.





Solar Farm 2.0

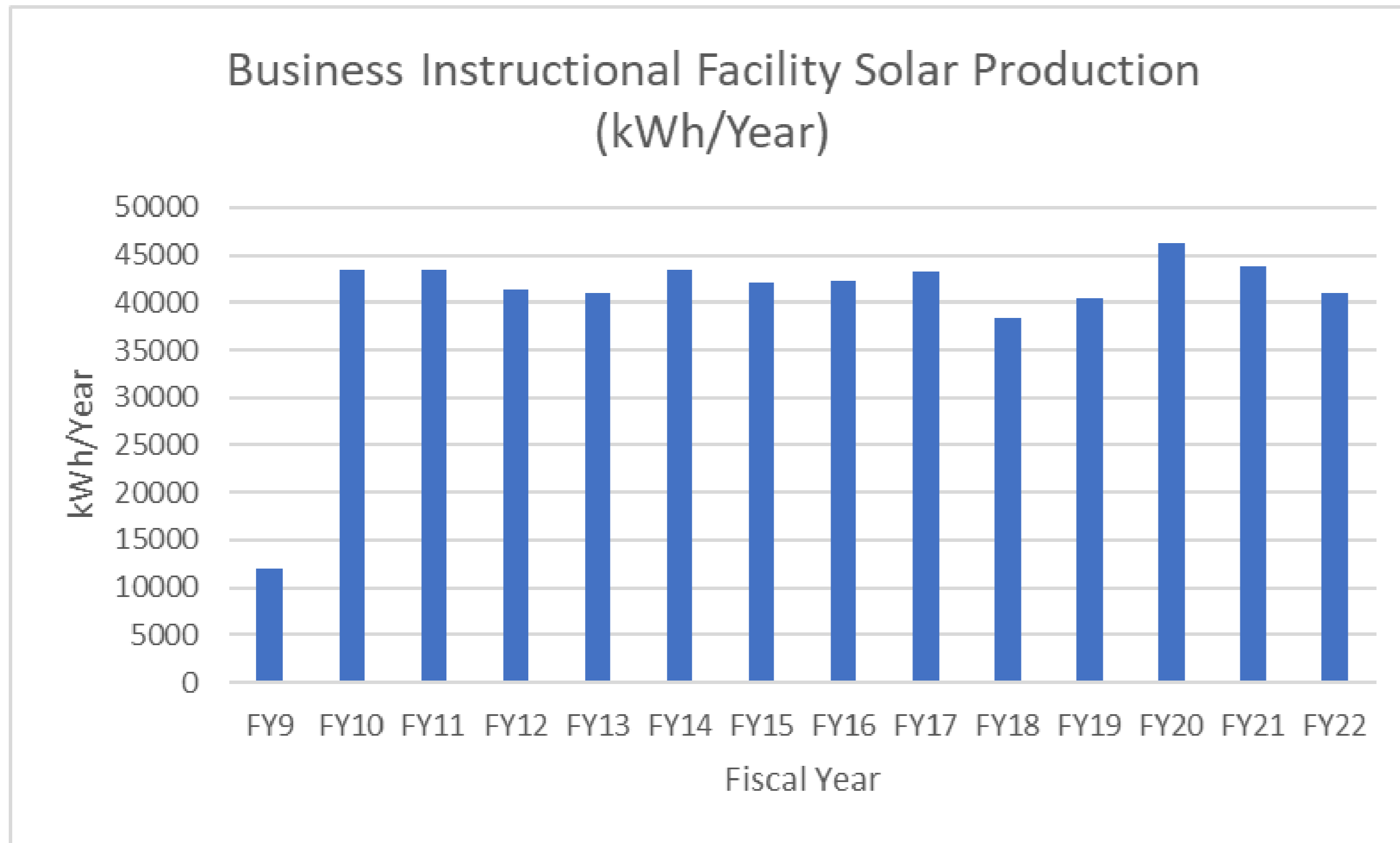


Solar Farm 2.0 incorporates bifacial panels, single-axis tracking, pollinator-friendly habitat, and zero-waste construction practices.





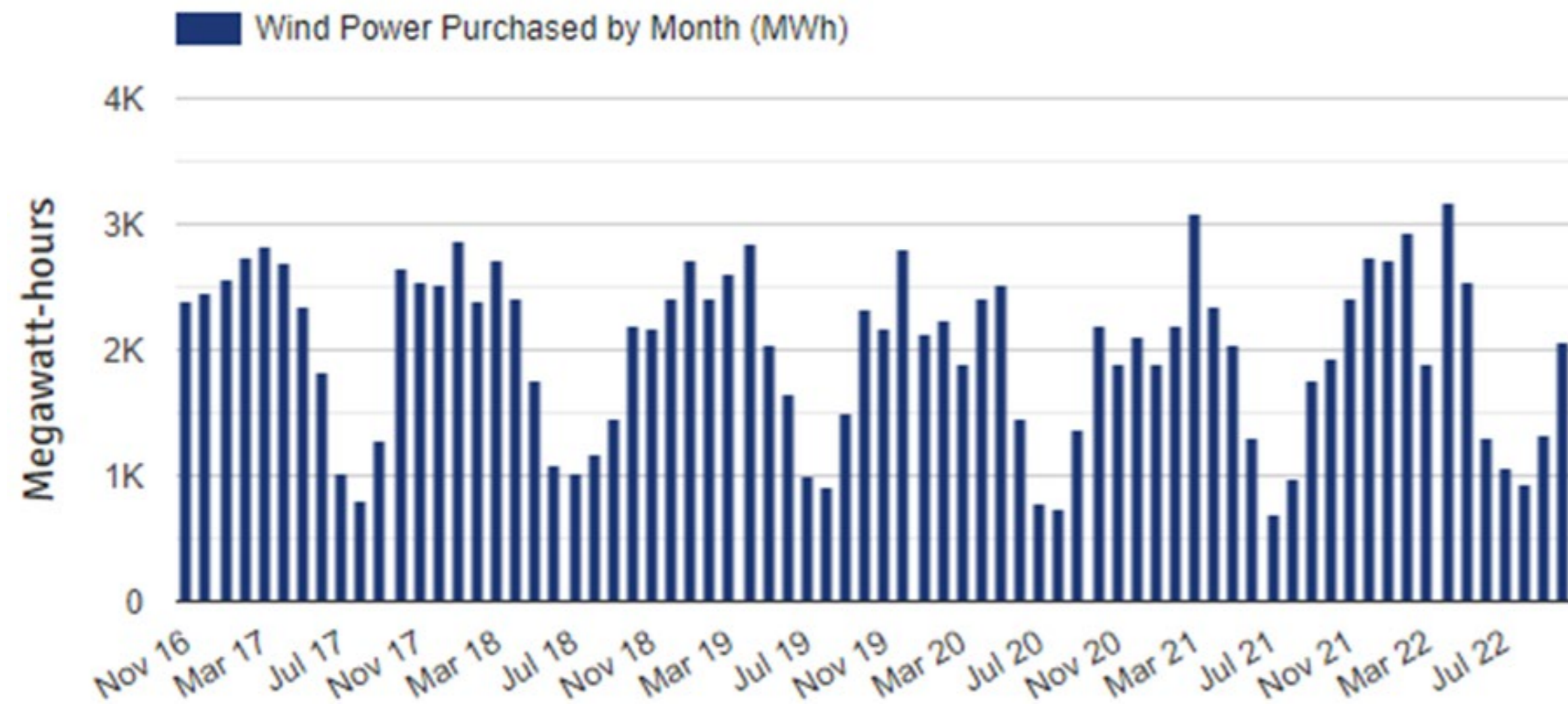
Rooftop Solar at Business Instructional Facility



BIF has the oldest rooftop solar installation on campus and was used to help the building achieve LEED Platinum in 2009. The installation features 44.5 kW of capacity.



Wind Energy: Railsplitter Power Purchase Agreement



UIUC entered a 10-year PPA with EDP Renewables in 2016 to provide the university with roughly 25,000 MWh of wind energy through 2026.

The energy is not supplied directly to the campus grid but does supply the regional MISO energy grid of which UIUC is a part.





Biomass Energy: Grind2Energy

- Deployed at the beginning of the 2019-2020 academic year, Grind2Energy systems convert food waste from university dining halls into electricity at the Urbana-Champaign Sanitary District.
- Currently located at several dining halls on campus:
 - Florida Avenue Residence
 - Illinois Street Residence
 - Pennsylvania Avenue Residence
 - Lincoln Avenue Residence
 - Ikenberry Commons





THANK YOU!



Agenda for Today

➤ Updates

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➤ Discussion

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