NCAB MEETING

March 10, 2023

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Municipal Wastewater
Bureau of Water Protection and Land Reuse

NITROGEN CREDIT EXCHANGE PROGRAM – BASICS

- Governed by the **Connecticut General Statutes (CGS) Sec. 22a-521 through 527**
  - 22a-521 – Nitrogen reduction in state waters: Definitions
  - 22a-522 – General permit establishing effluent units for nitrogen
  - 22a-523 – Nitrogen Credit Advisory Board
  - 22a-524 – Nitrogen Credit Exchange Program
  - 22a-525 – Audit of annual operating data
  - 22a-527 – Annual value of equivalent nitrogen credits
- Incentive Based – NOT FREE MARKET
- Managed by the **Nitrogen Credit Advisory Board (NCAB)** in conjunction with DEEP
- NCAB sets Credit Prices in accordance with CGS
- Scheduled Annual Exchange
  - By **July 31st annually**, facilities that did not meet their limit must purchase the amount of credits necessary to be in compliance with their limit
  - On or after **August 15th annually**, the state buys credits from facilities that did meet their limits, and the money collected from buyers is distributed proportionally amongst sellers based on how many credits each has for sale
- Transaction through the State "Bank"

NITROGEN CREDIT EXCHANGE PROGRAM – PURPOSE/GOALS

Why a Nitrogen Credit Exchange Program?

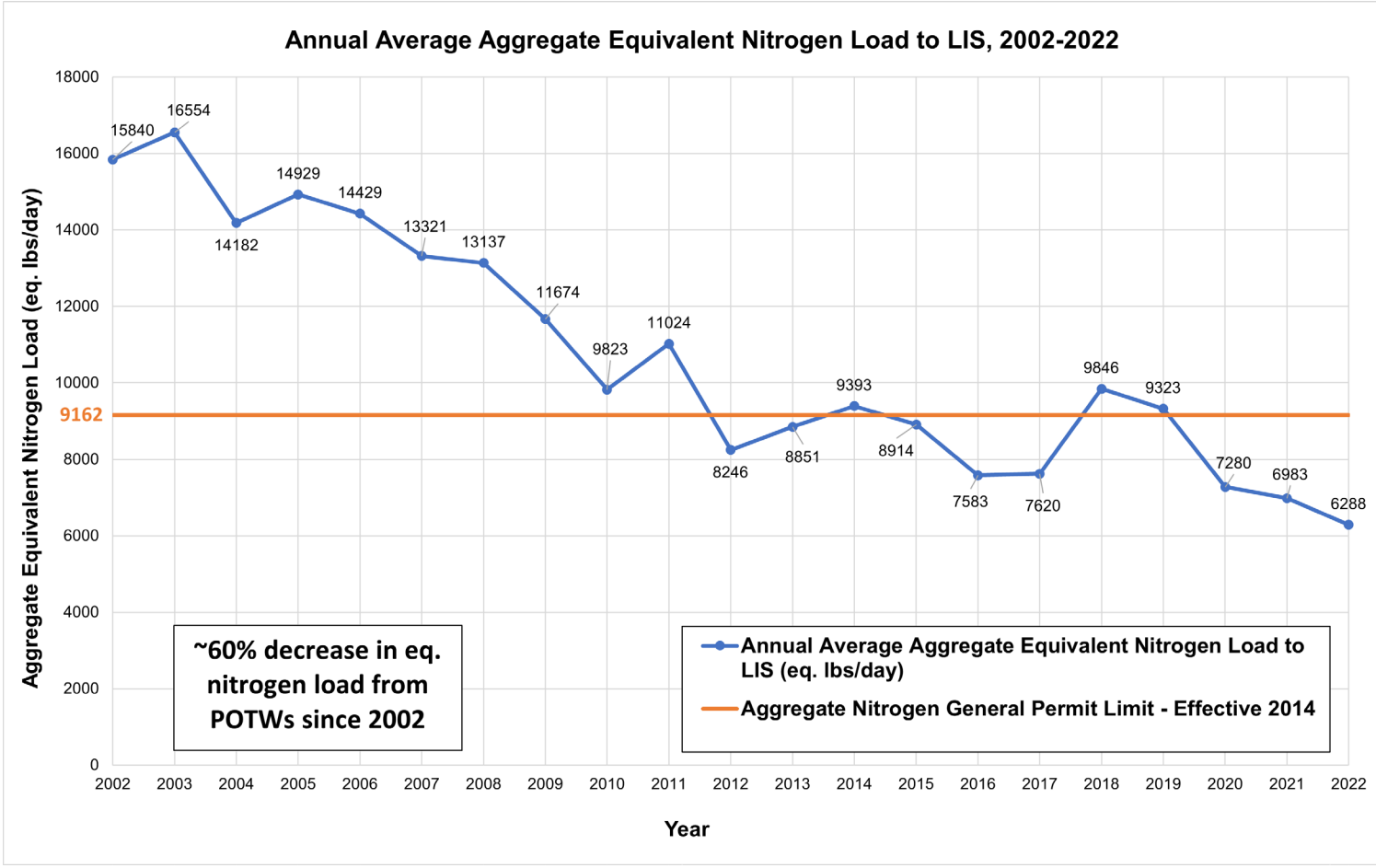
- Allowed facilities to meet the aggregate TMDL cost-effectively by 2014
- All facilities were not required to upgrade at the same time, reducing the burden on the CWF
- Facilities that upgraded earlier and had a surplus of credits to sell were subsidized by the credit buyers who hadn't upgraded their facilities

The Goals of the Nitrogen Credit Exchange Program in 2022 and beyond:

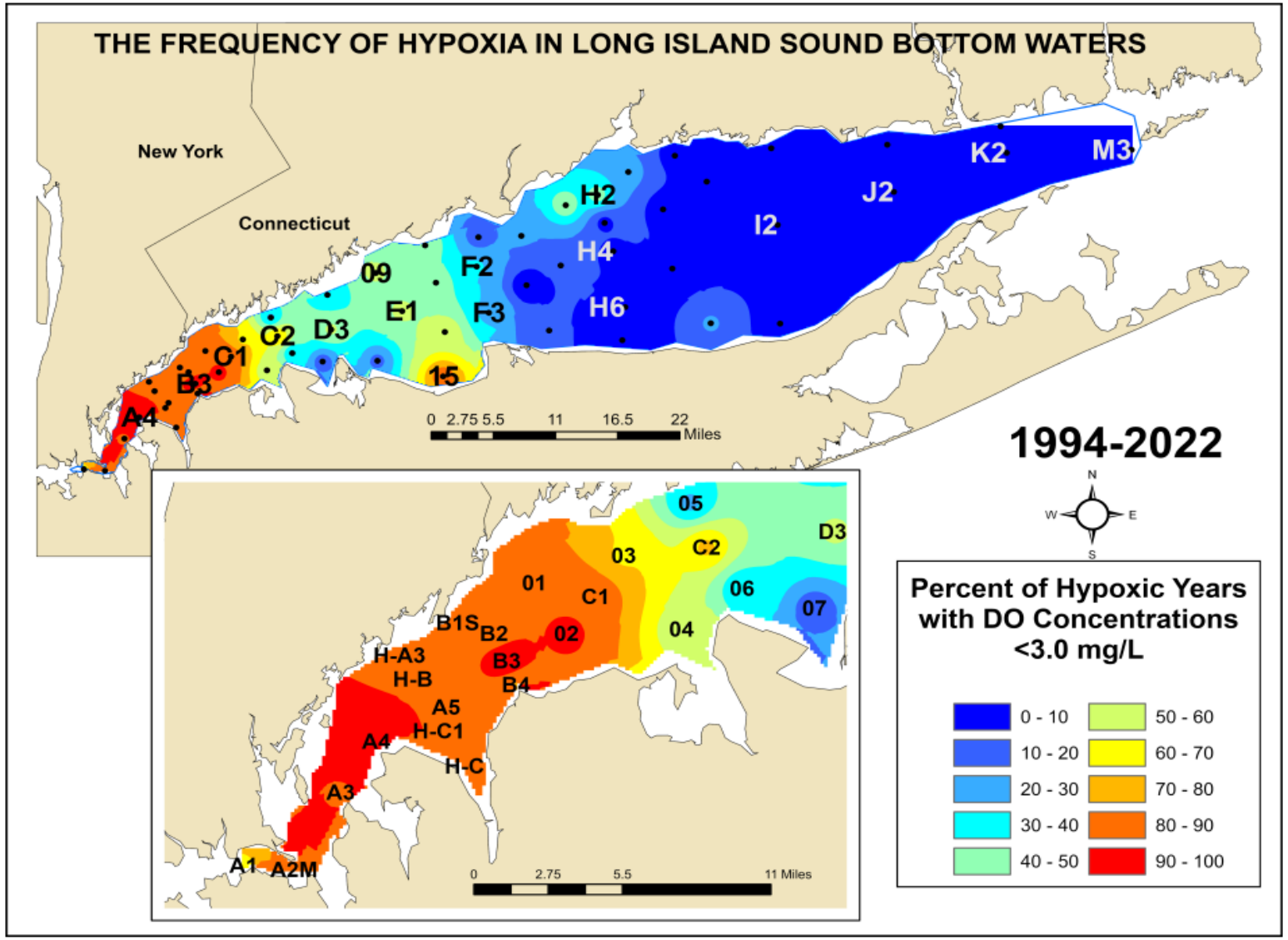
- Comply with the aggregate equivalent permit limit of **9,148 eq. lbs/day**

NITROGEN CREDIT EXCHANGE PROGRAM – ACCOMPLISHMENTS

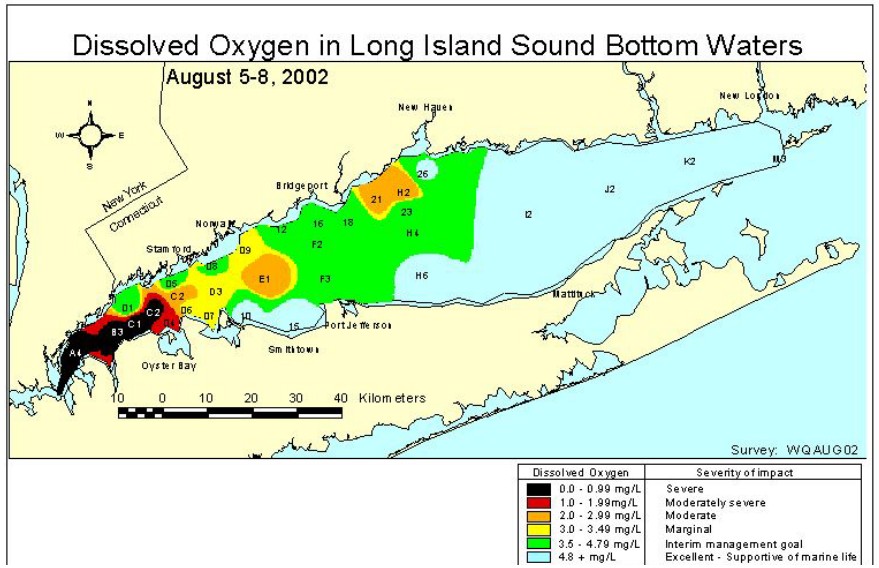
- **Upgrade projects completed by 64 POTWs** to enhance nitrogen removal out of 78 participating in the program
- **Compliance with the final TMDL** limit has been achieved in **6 out of 9 years** since 2014 (when the final limit went into effect)
- **Record-low aggregate equivalent nitrogen loads** in each of the last 3 years

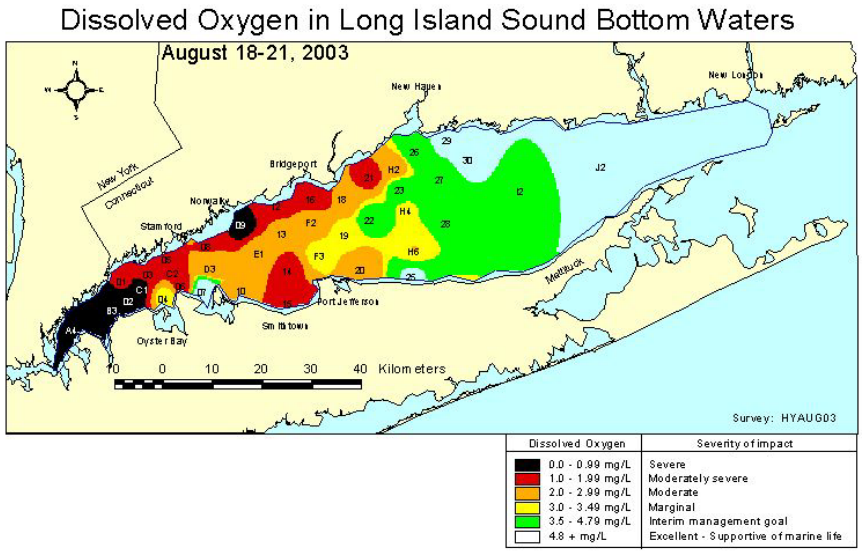


HYPOXIA FREQUENCY IN LONG ISLAND SOUND



DISSOLVED OXYGEN IN LIS BOTTOM WATERS

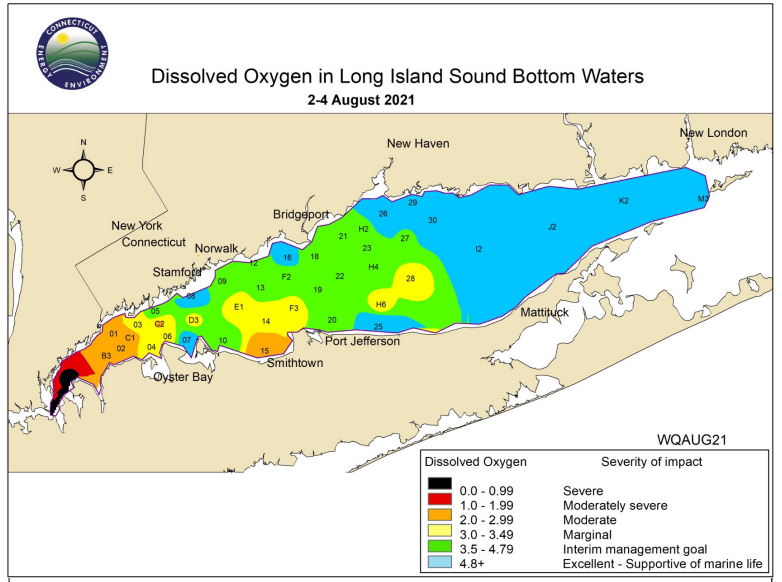


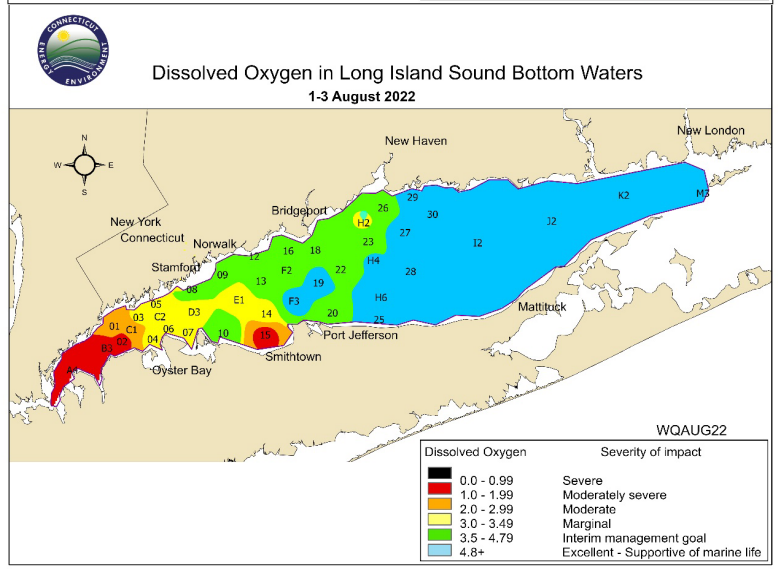


2002 and 2003

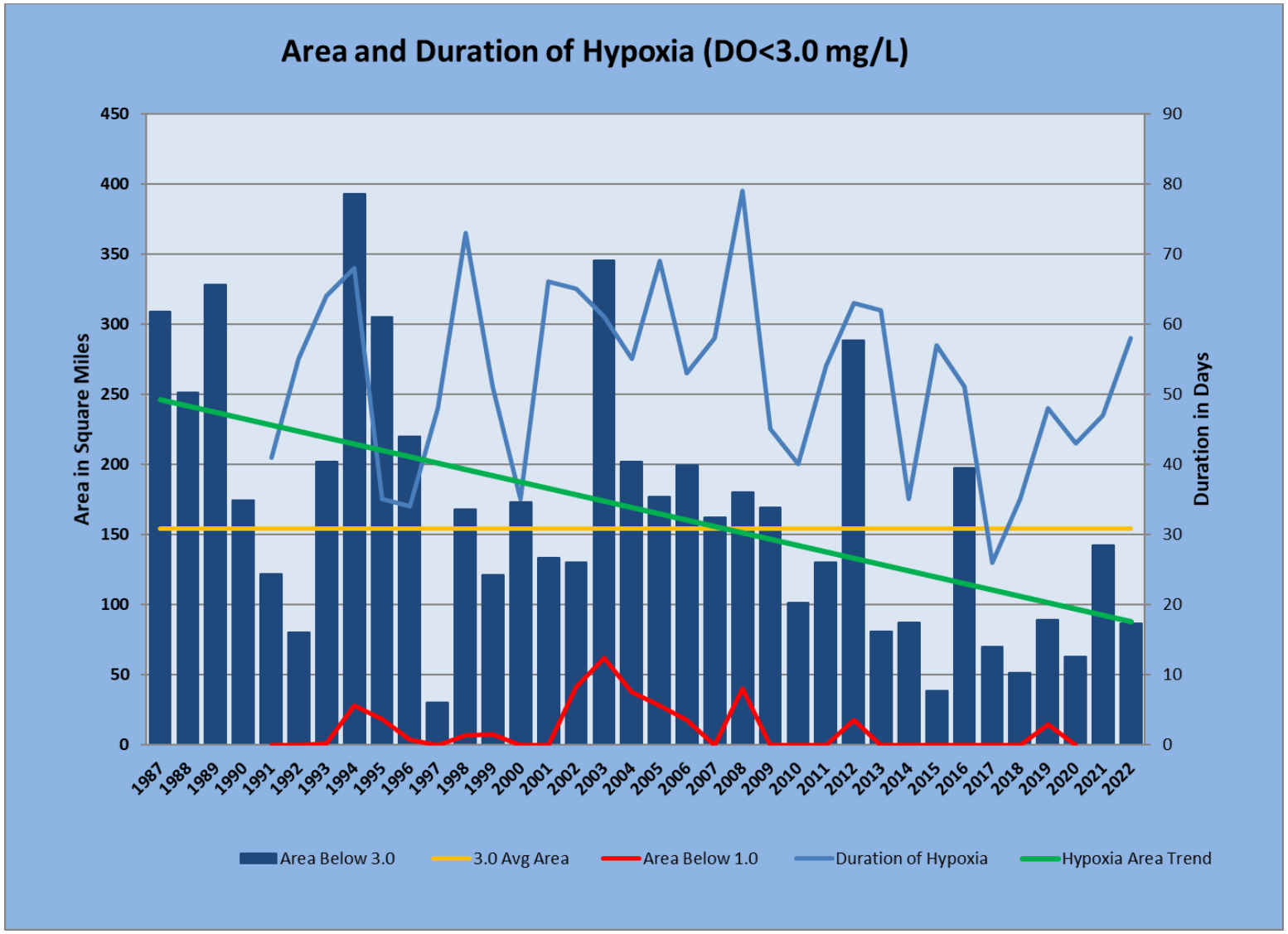
vs.

2021 and 2022

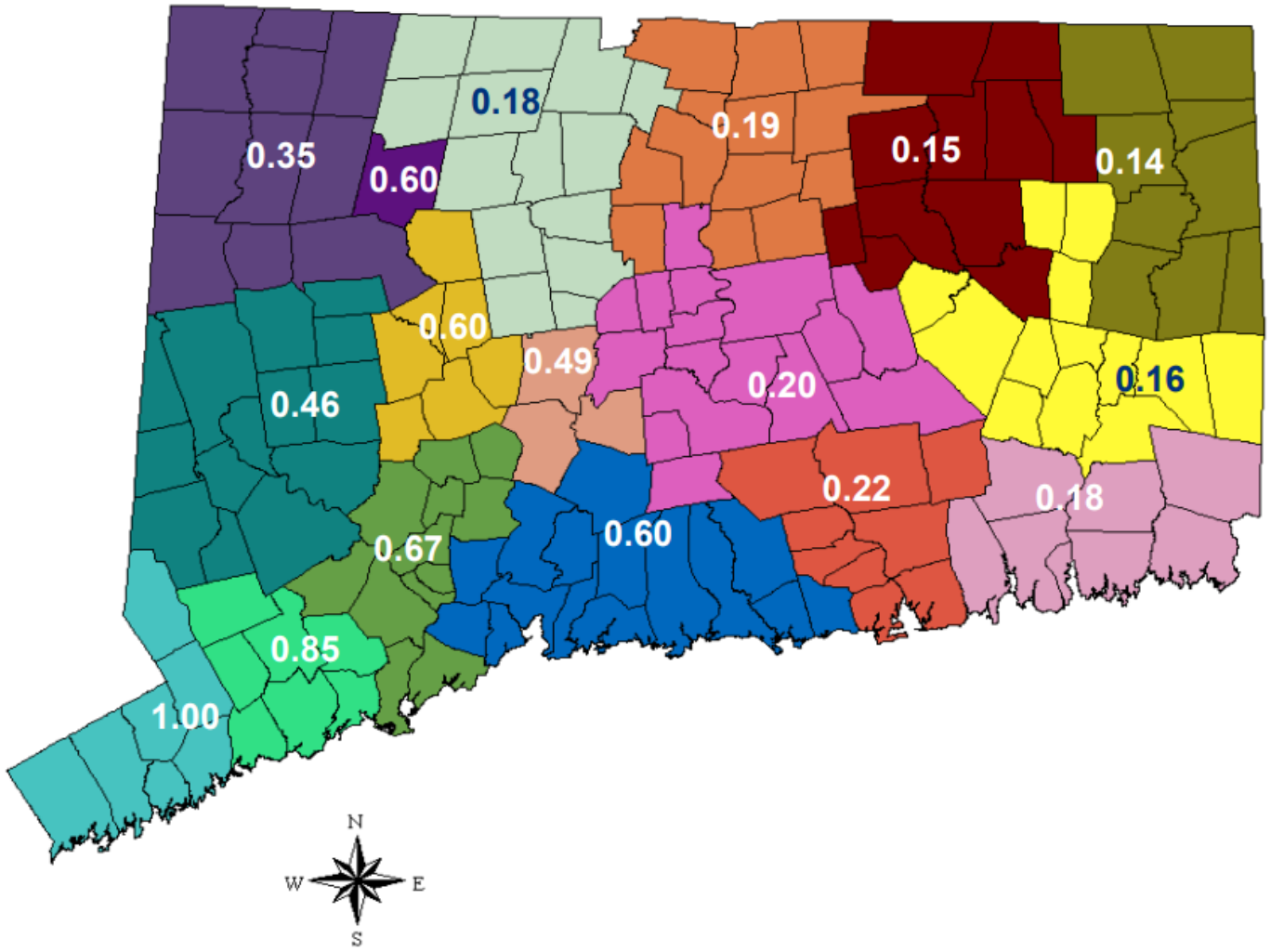




AREA AND DURATION OF HYPOXIA IN LIS



EQUIVALENCY FACTORS



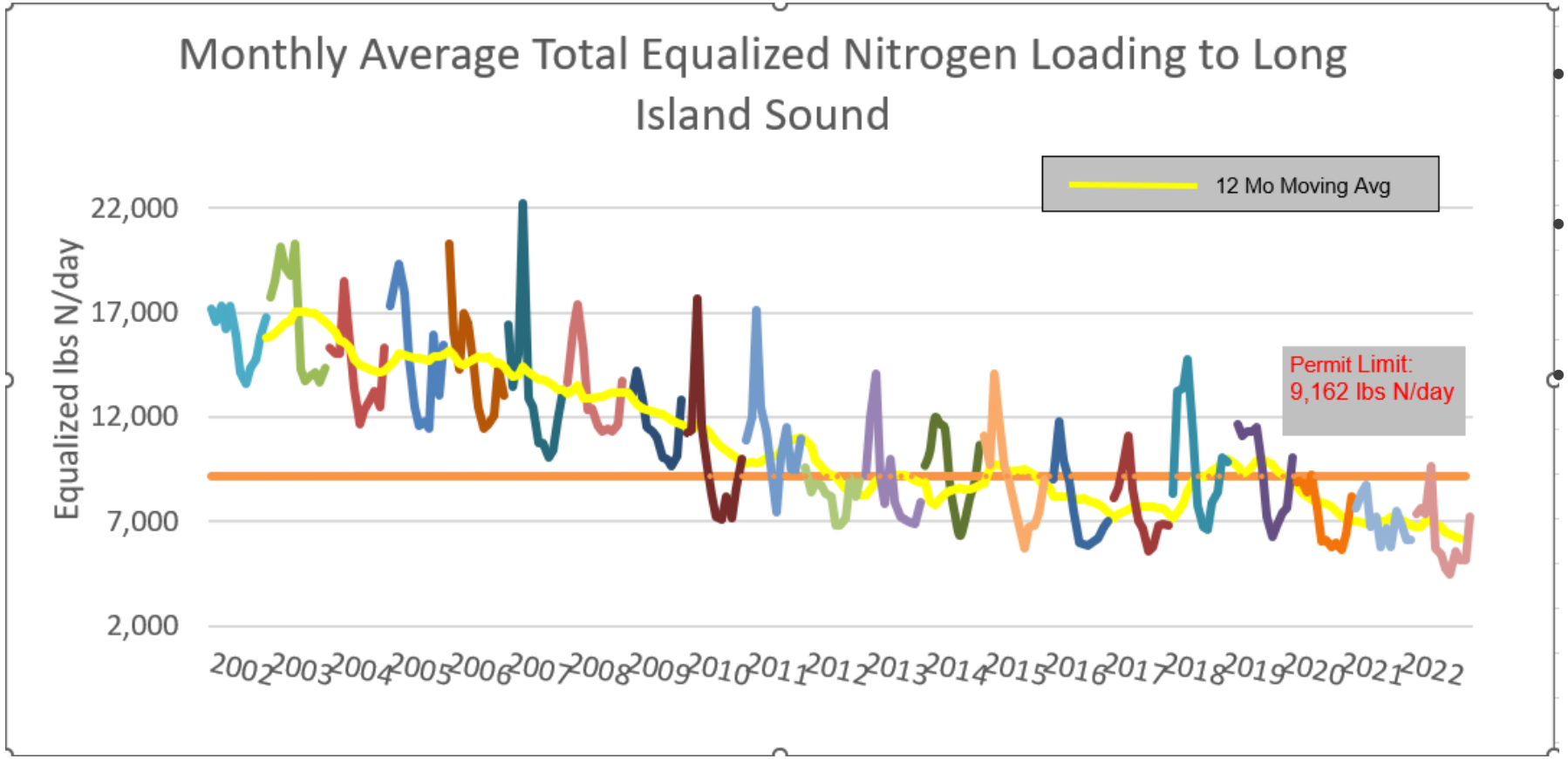
“Equivalent” or “Equalized” Nitrogen Credits

Equivalency factors or “e factors” were established by DEEP following the completion of the Long Island Sound TMDL for Nitrogen in 2000

- They represent how much a facility’s discharge contributes to the hypoxia problem in LIS

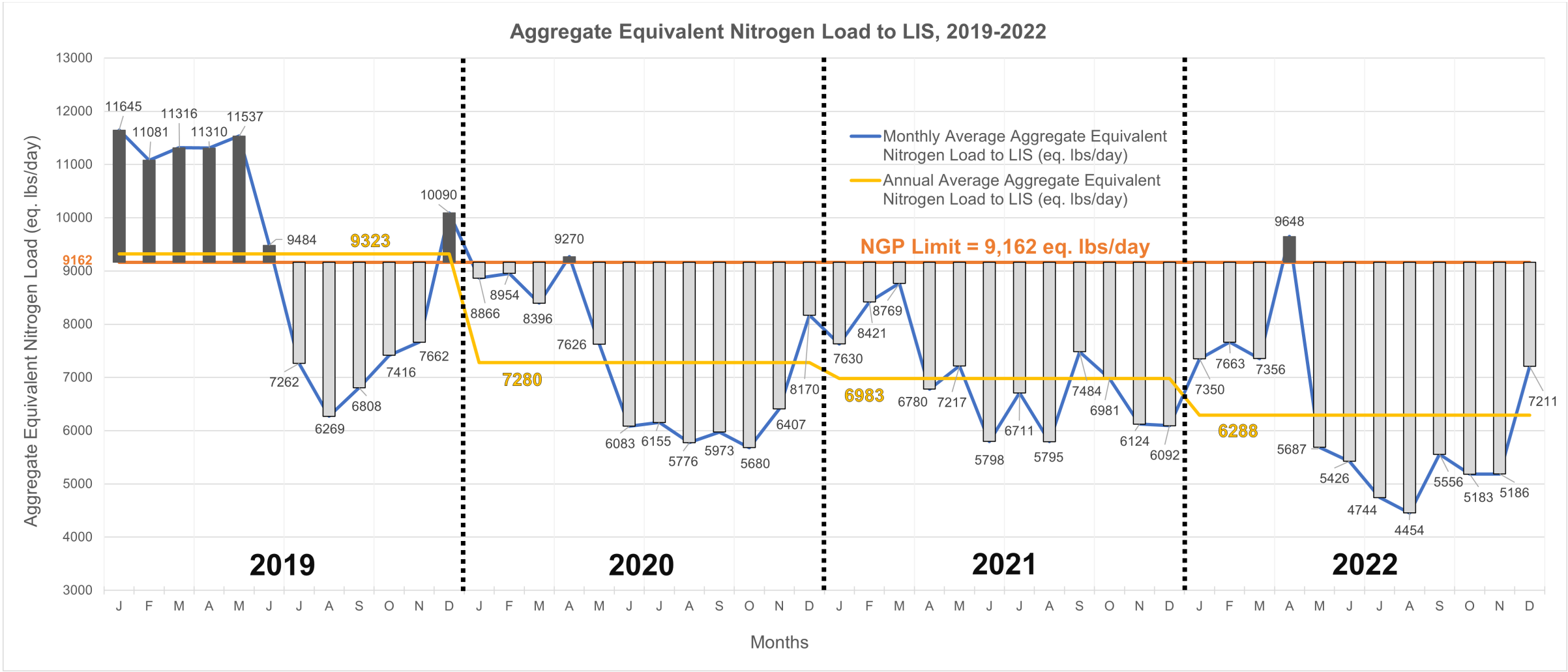
E factors have remained the same for all facilities throughout the duration of the program

2002-2022 MONTHLY PERFORMANCE



- Monthly aggregate data shows the **seasonal variation**
- **Warmer weather** is more conducive to nitrogen removal
- Monthly aggregate equalized nitrogen load discharged to LIS is:
  - **higher** during cooler months
  - **lower** during warmer months

2019-2022 MONTHLY PERFORMANCE



2022 DRAFT CREDIT PRICE

- Total Capital Cost: $14,542,281
- Total O&M Cost: $16,657,608
- **Total Project Cost: $31,199,889**

- **Aggregate Equivalent Nitrogen Reduction** from TMDL baseline load by Project Facilities: **18,744.57 eq. lbs/day**
- **2022 Total: 6,841,768.05 eq. lbs**

- **Price of a credit for buyers: $4.56**
- # of facilities buying credits: **19**
- # of credits bought: 132,042.4 credits

- **Value of a credit for sellers: $0.509691**
- # of facilities selling credits: **58**
- # of credits for sale: 1,181,329.8 credits

*1 facility met their limit exactly and neither bought nor sold credits (Stonington Borough)

Total Project Cost ($) = Total Capital Cost + Total O&M Cost

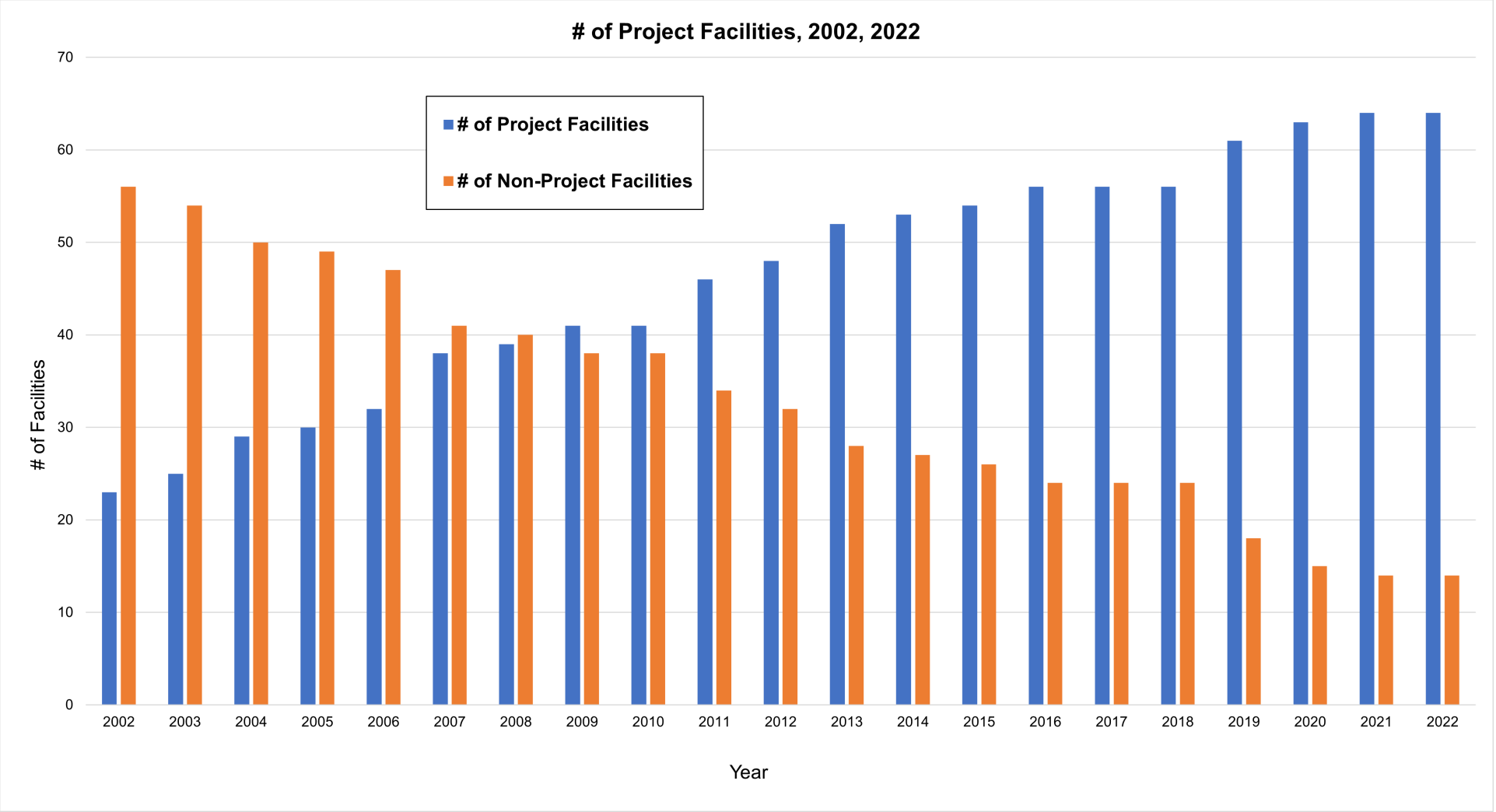
Equivalent Nitrogen Reduction from TMDL baseline load, calculated for each Project Facility (lbs/day)
= (TMDL baseline load – Annual Avg. TN) * Eq. Factor

Sum together Equivalent Nitrogen Reductions calculated for all Project Facilities to get the daily average **Aggregate Equivalent Nitrogen Reduction** and multiply by 365 days to get the annual total

Price of Buyer's Credit
= Total Project Cost / Aggregate Equivalent Nitrogen Reduction

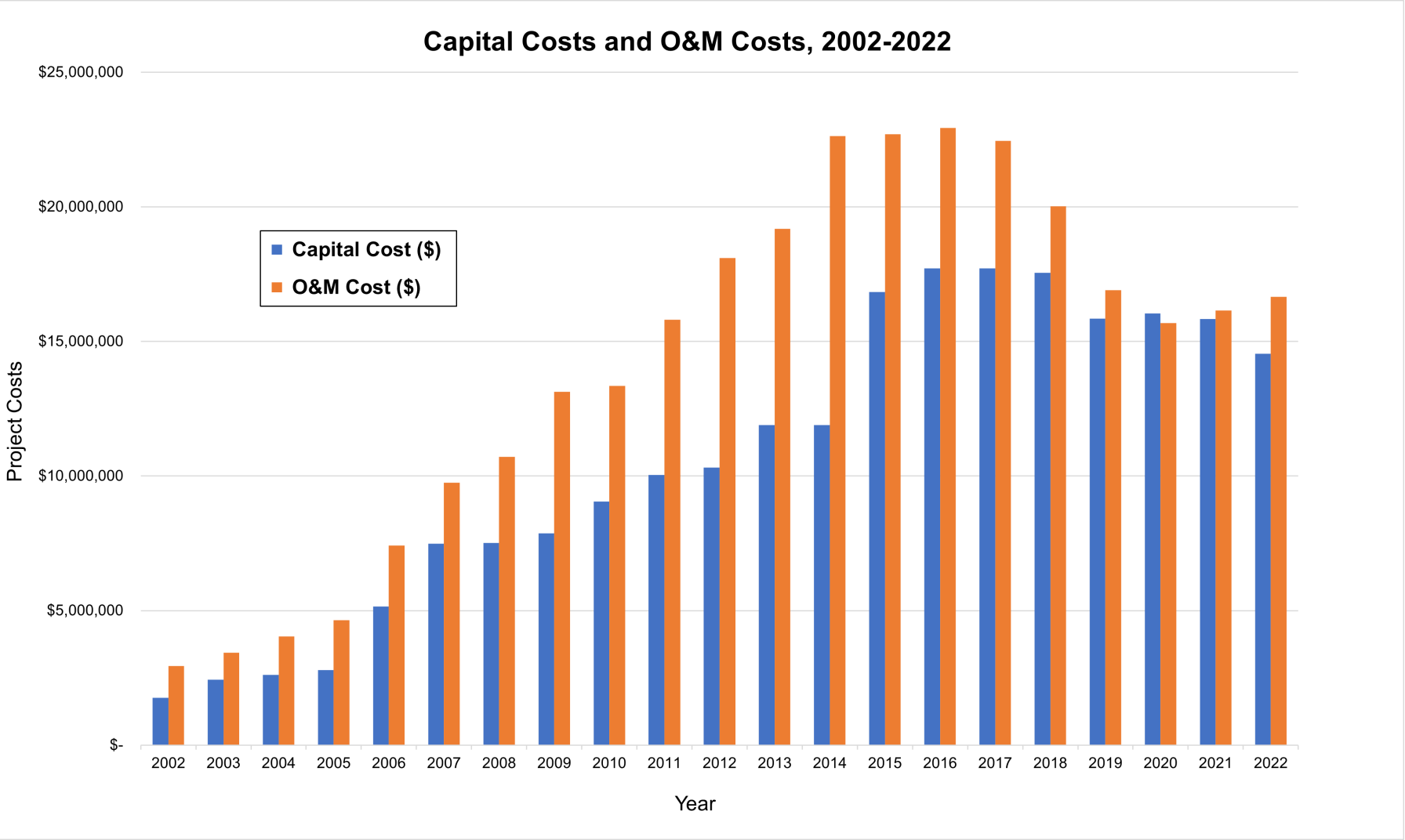
Price of Seller's Credit
= Price of Buyer's Credit * (# credits bought/# credits for sale)

OF PROJECT FACILITIES OVER TIME



- No new Project Facilities in 2022
- 64 Project Facilities out of 78 facilities participating in the NGP

PROJECT COSTS OVER TIME

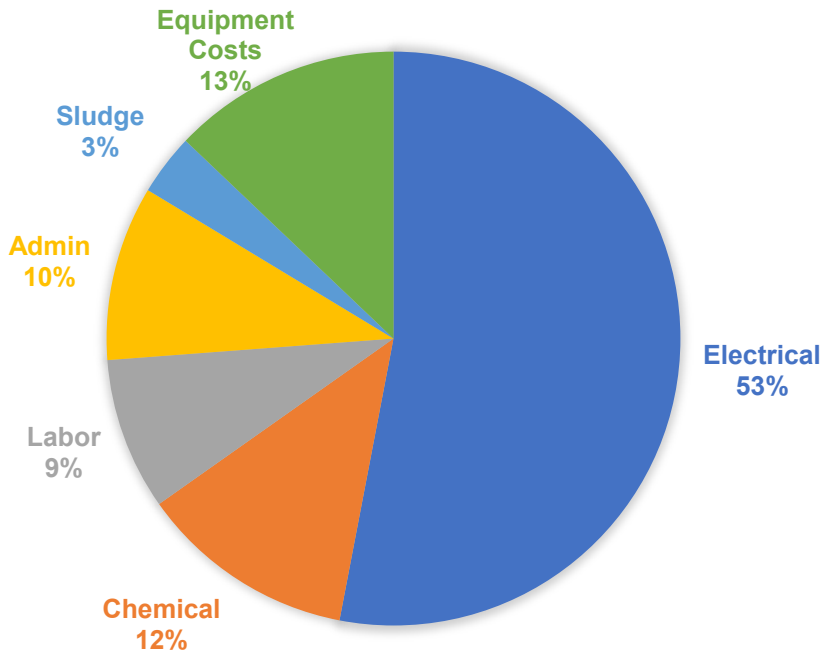


Capital Costs are **<u>decreasing</u>**

- 20 years into the program, we're at the point where many facilities are finishing paying off loans
- We expect this trend to continue for the foreseeable future as # facilities paying off their loans > # facilities completing new nitrogen projects
- The O&M Survey has been refined over the last few years and the Total O&M Cost has been fairly consistent for several years now

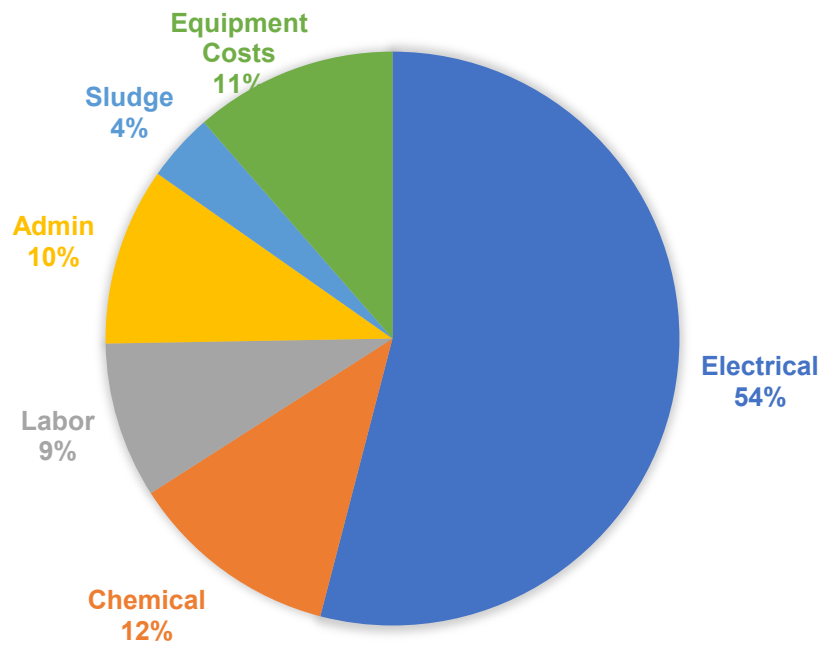
O&M COSTS BREAKDOWN – 2021 & 2022

2021
TOTAL O&M COSTS: $16,260,137



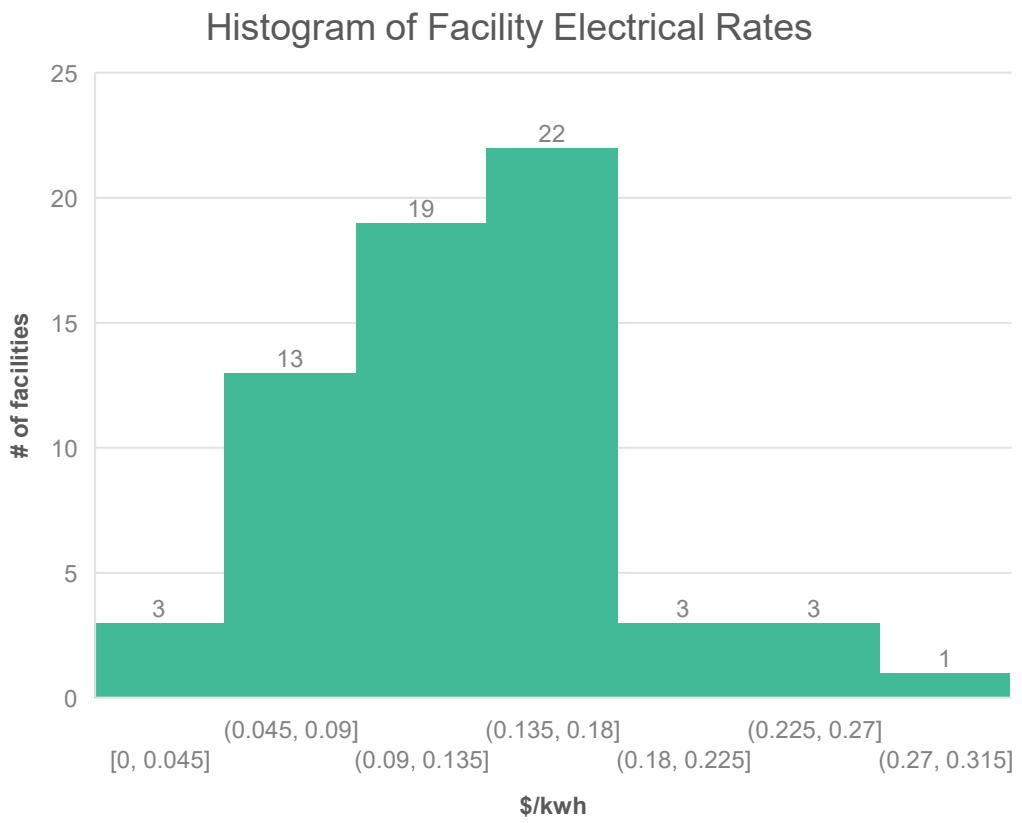
361 MGD
Equalized Monthly Nitrogen Avg: 6,978 lbs

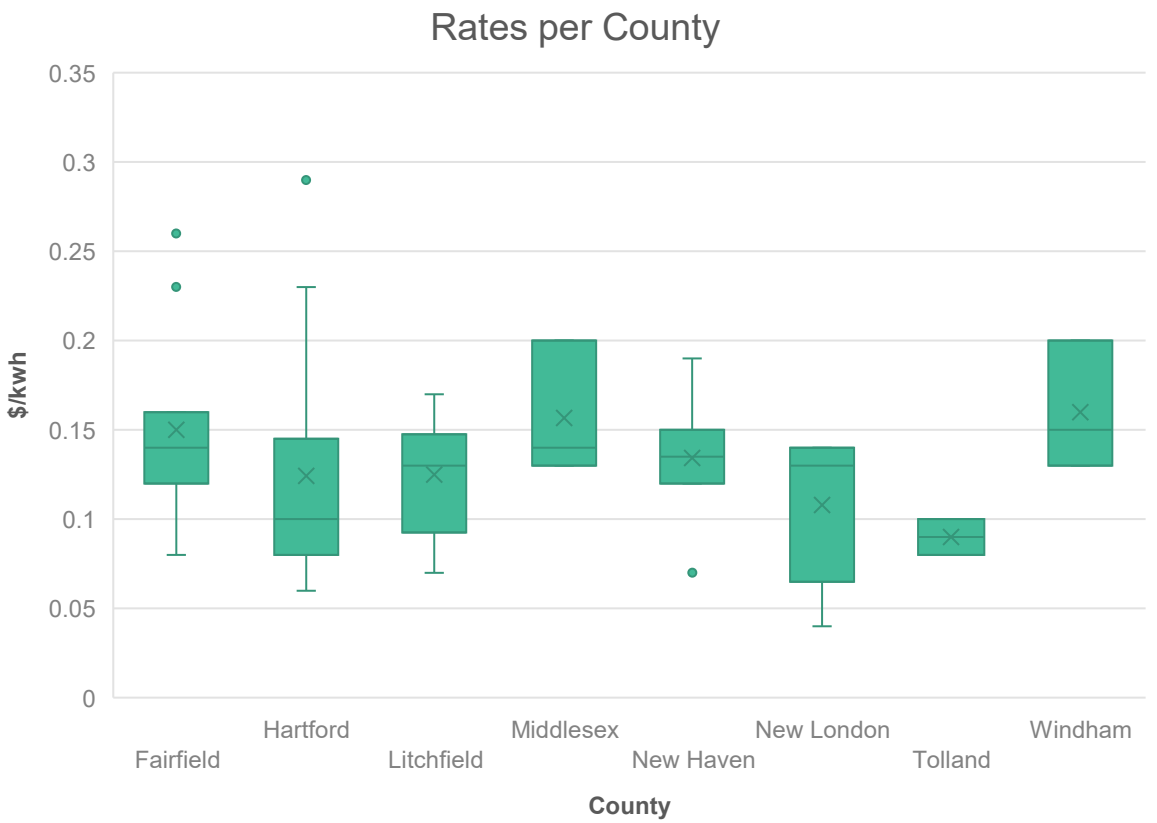
2022
TOTAL O&M COSTS: $16,657,609



377 MGD
Equalized Monthly Nitrogen Avg: 6,288 lbs

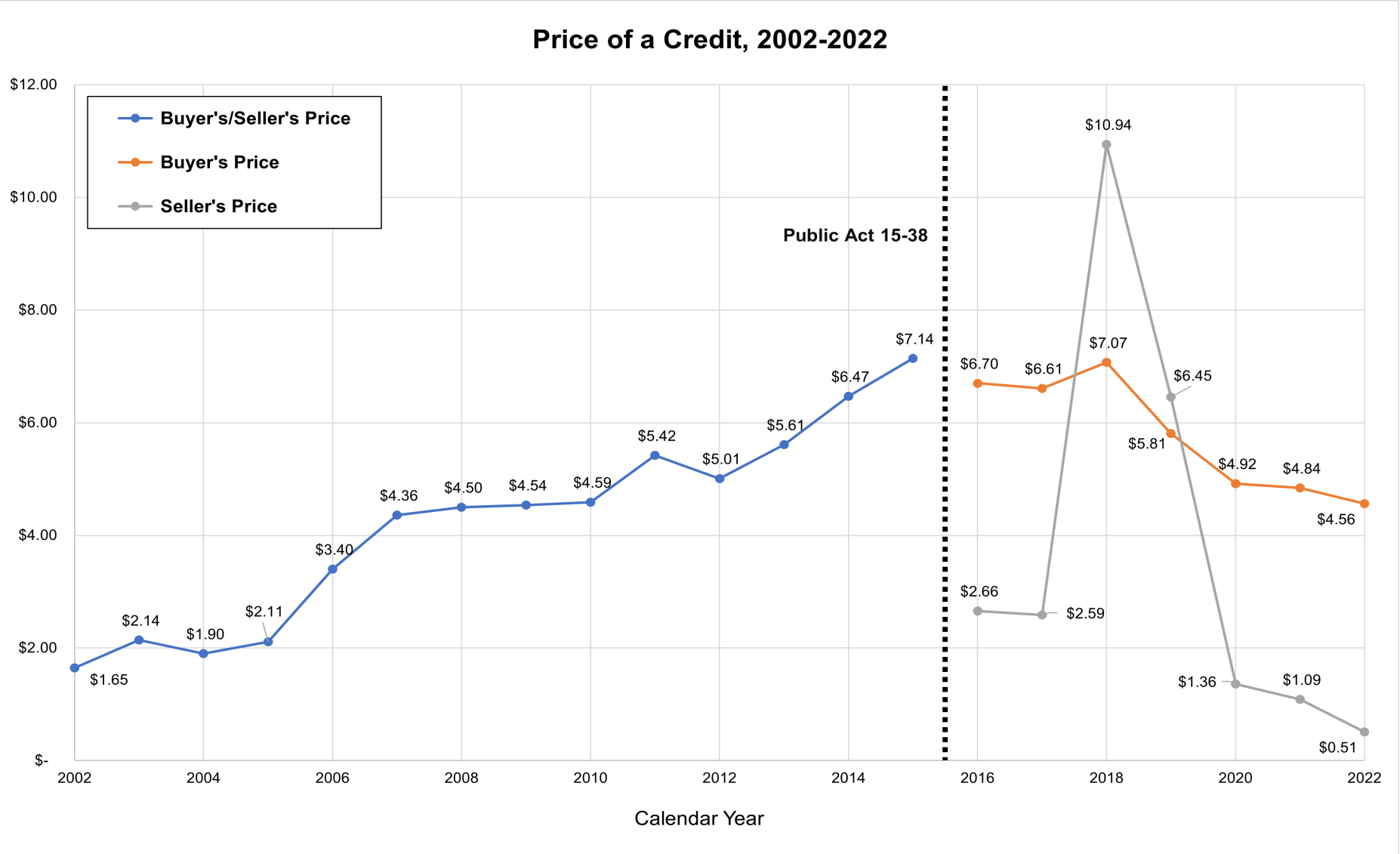
COSTS OF ELECTRICITY IN 2022





Nitrogen Credit Price Trends

HISTORY OF NITROGEN CREDIT PRICE



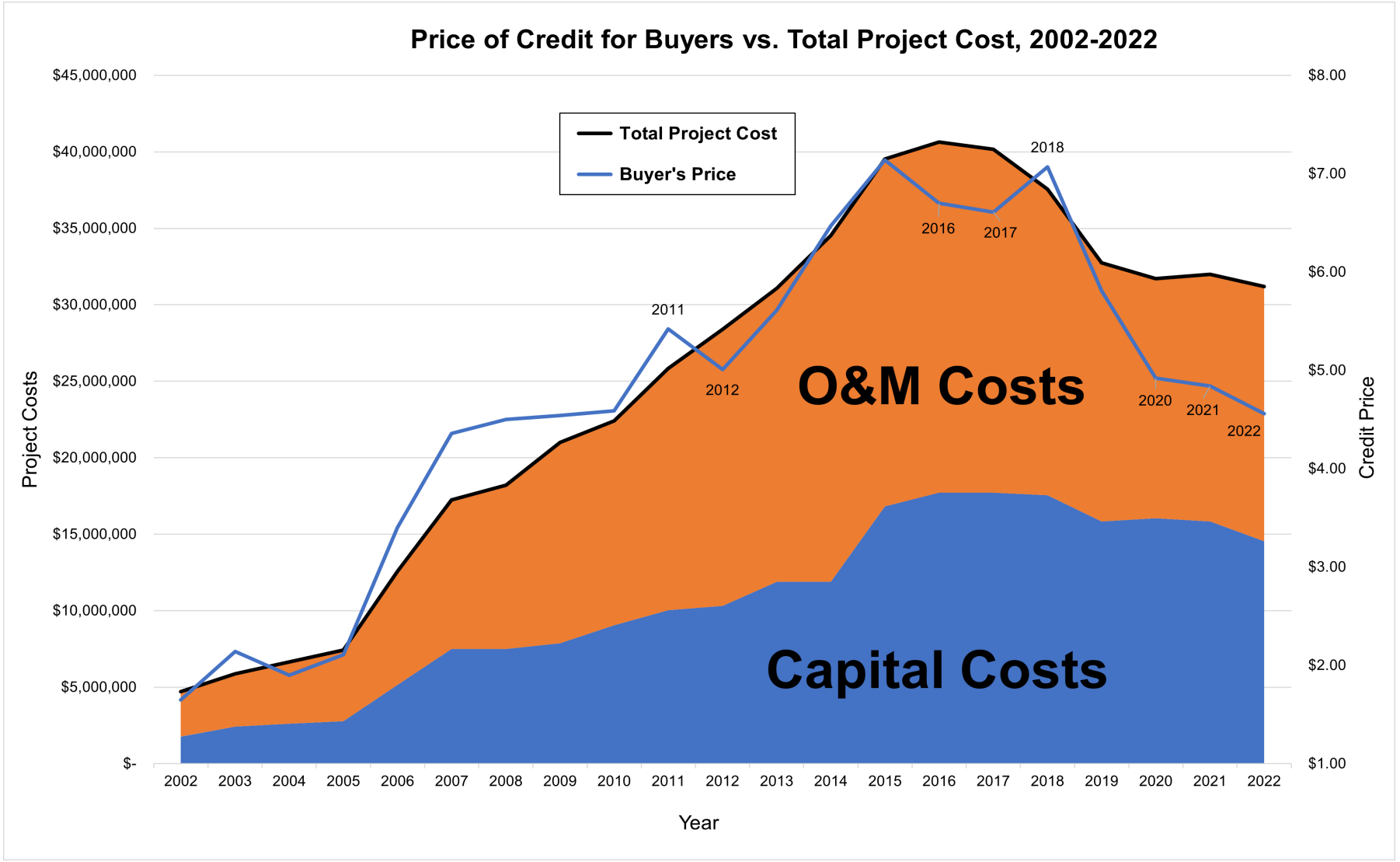
Prior to **Public Act 15-38**, only one credit price was calculated and credits were both bought and sold at that price.

Following **Public Act 15-38,** the sum of money collected from facilities that are required to buy credits to meet their limits is distributed proportionally amongst all facilities selling credits based on how many credits each facility has for sale.

Total money collected from buyers = total money distributed to sellers

BUYER'S PRICE TREND

$$Buyer's\ Price = \frac{Total\ Project\ Cost}{Nitrogen\ Reduction\ by\ Project\ Facilities}$$



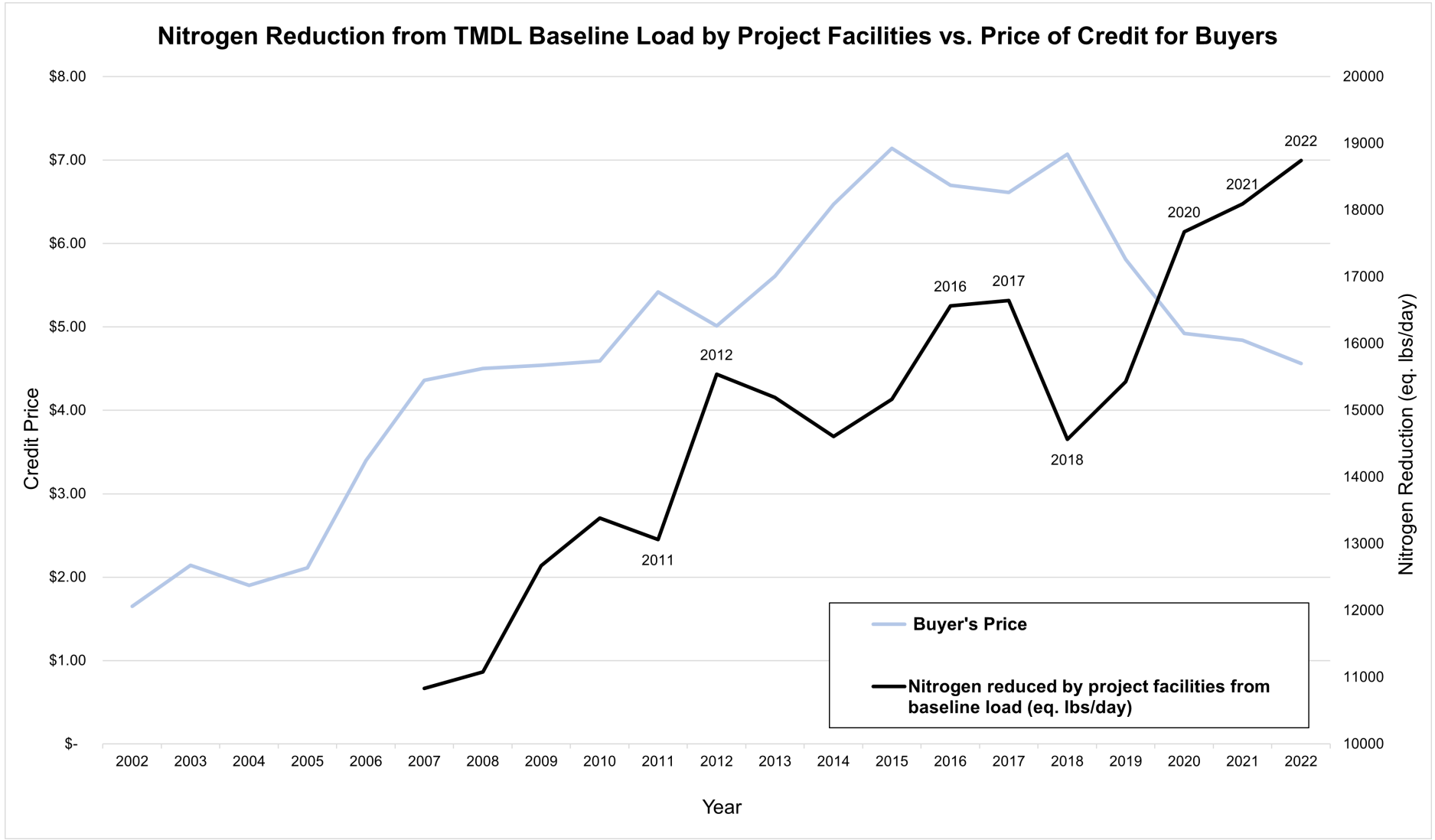
POSITIVE CORRELATION between **Total Project Cost** and **Buyer's Price**

Total Project Cost ↑

Buyer's Price ↑

BUYER'S PRICE TREND

$$Buyer's\ Price = \frac{Total\ Project\ Cost}{Nitrogen\ Reduction\ by\ Project\ Facilities}$$

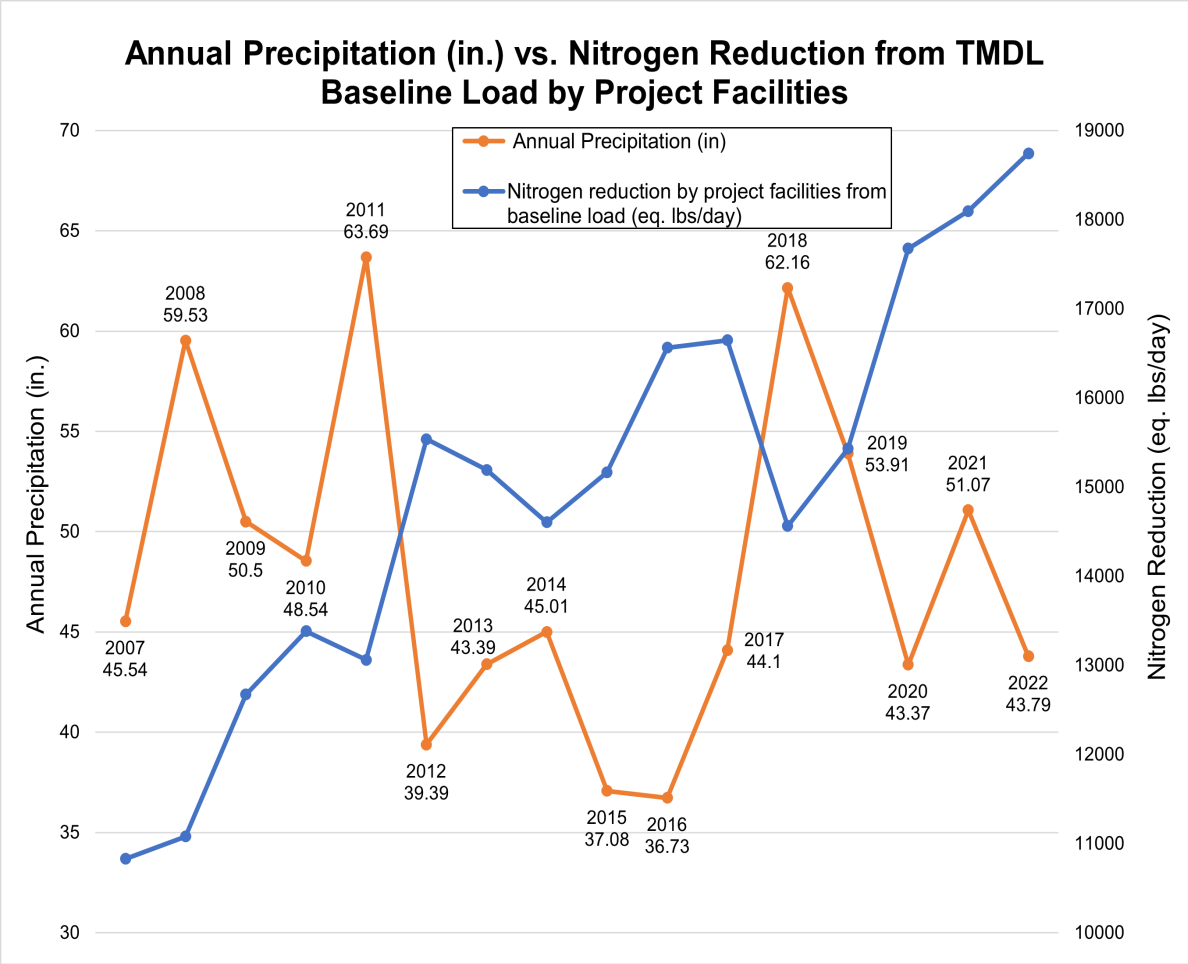


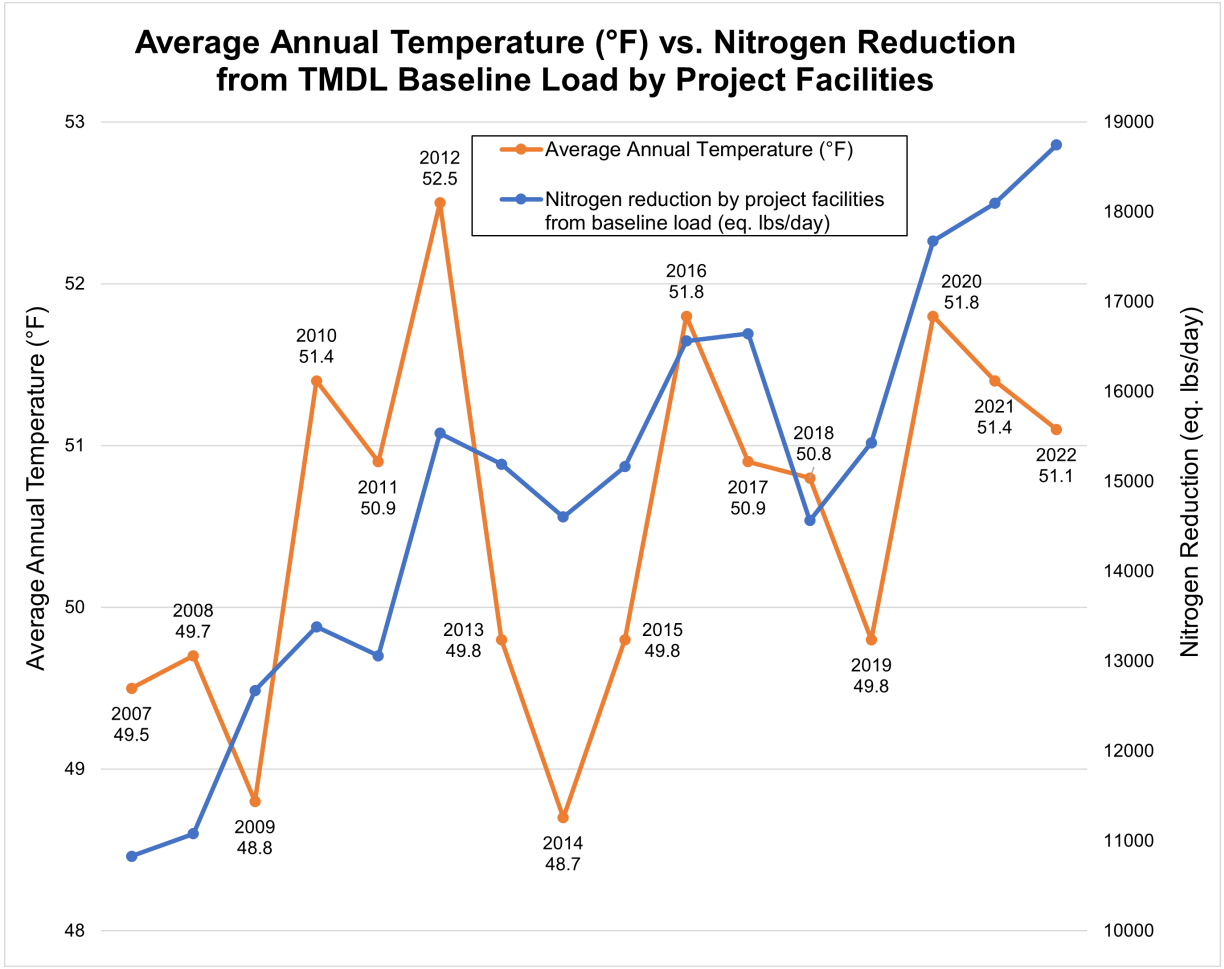
NEGATIVE CORRELATION between **Nitrogen Reduction by Project Facilities** and **Buyer's Price**

Nitrogen Reduction from Project Facilities ↑

Buyer's Price ↓

EFFECT OF WEATHER ON NITROGEN REMOVAL

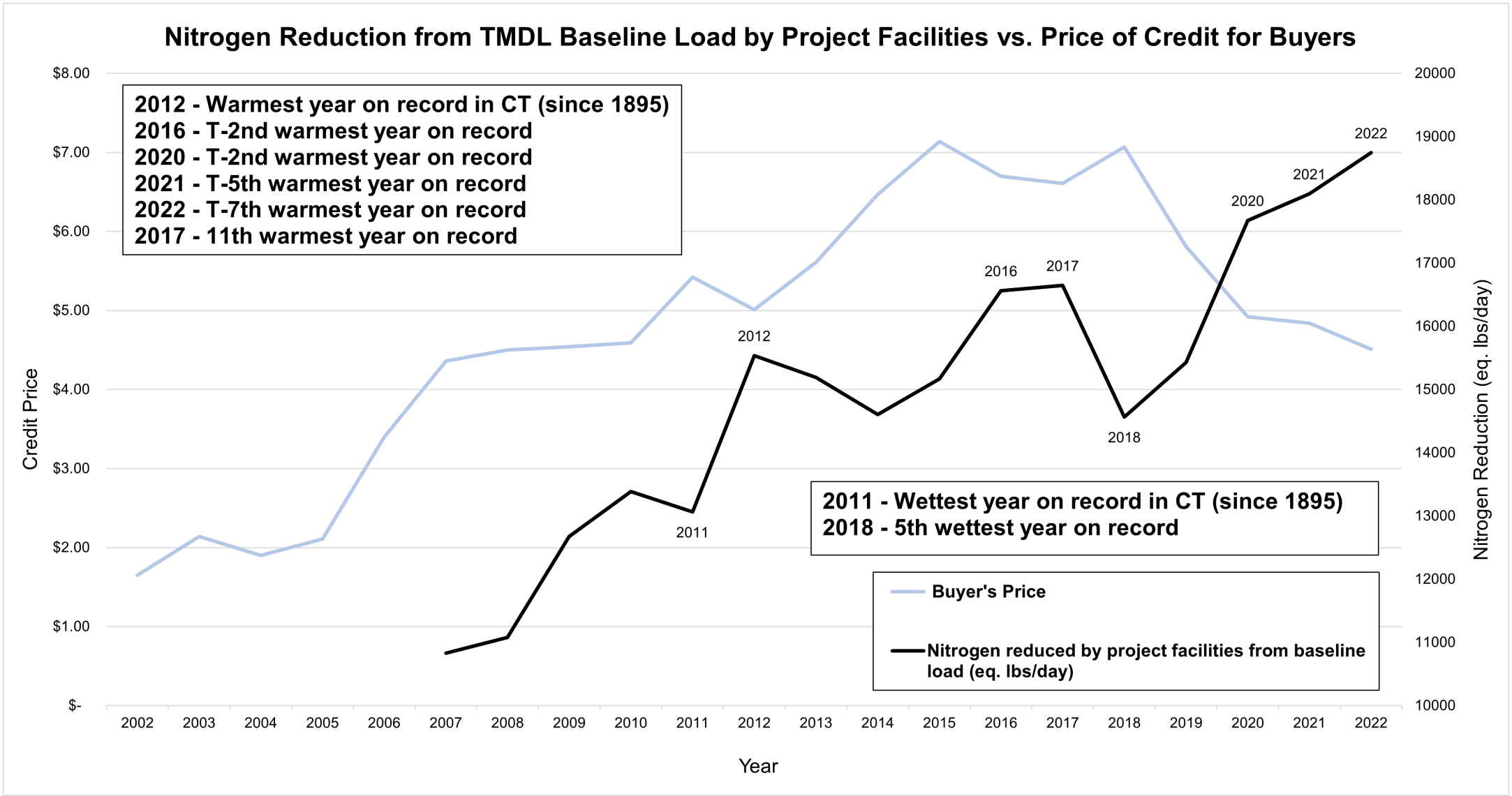




NEGATIVE CORRELATION between
Annual Precipitation and **Nitrogen Reduction**

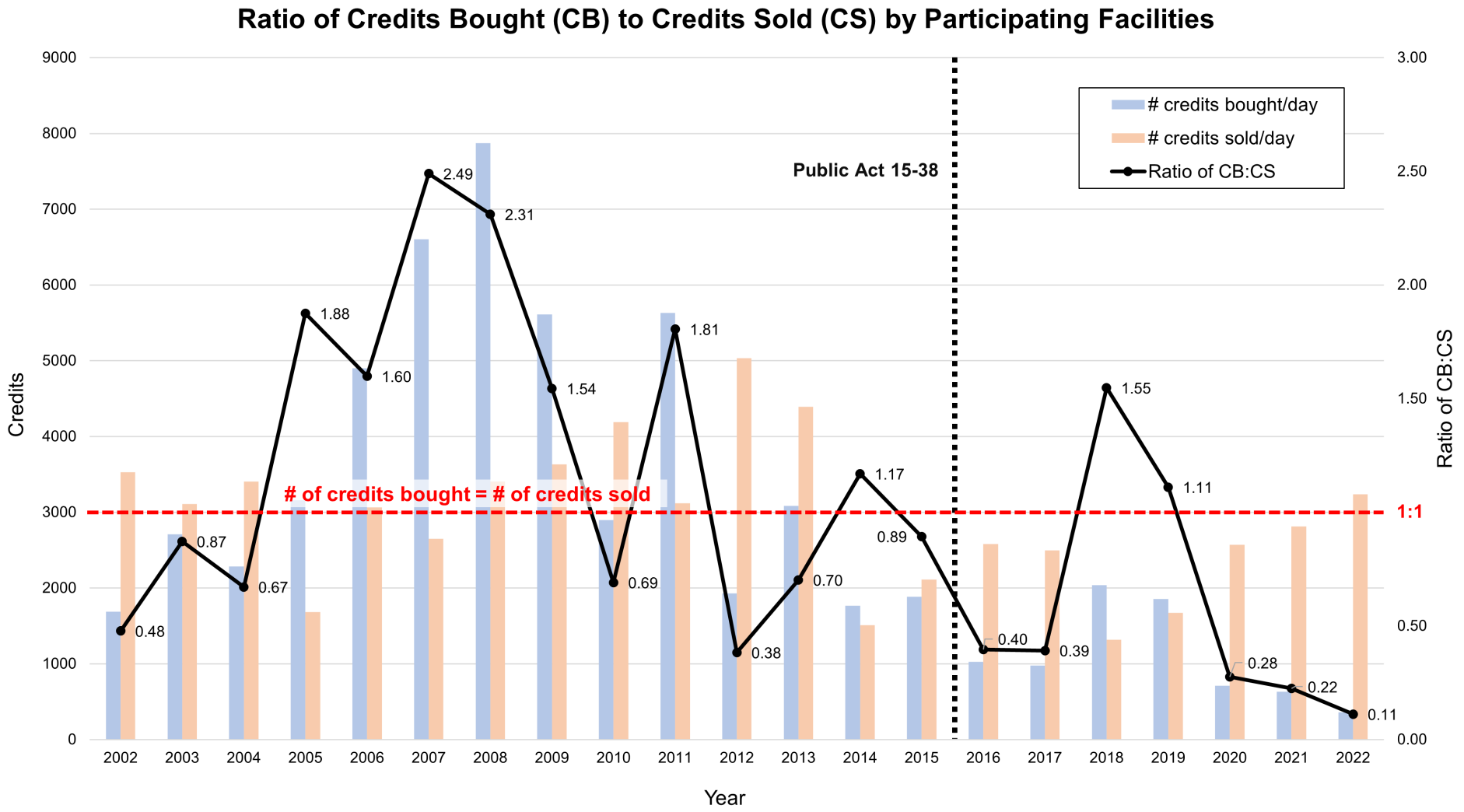
POSITIVE CORRELATION between
Avg. Annual Temperature and **Nitrogen Reduction**

EFFECT OF WEATHER ON NITROGEN REMOVAL



SELLER'S PRICE TREND

$$Seller's\ Price = Buyer's\ Price \times \frac{\#\ credits\ bought\ by\ POTWs}{\#\ credits\ for\ sale\ by\ POTWs}$$



Following the passage of **Public Act 15-38**, the value of each credit for sellers is determined by the ratio of:

# of credits required to be bought by facilities that didn't meet their limits

vs.

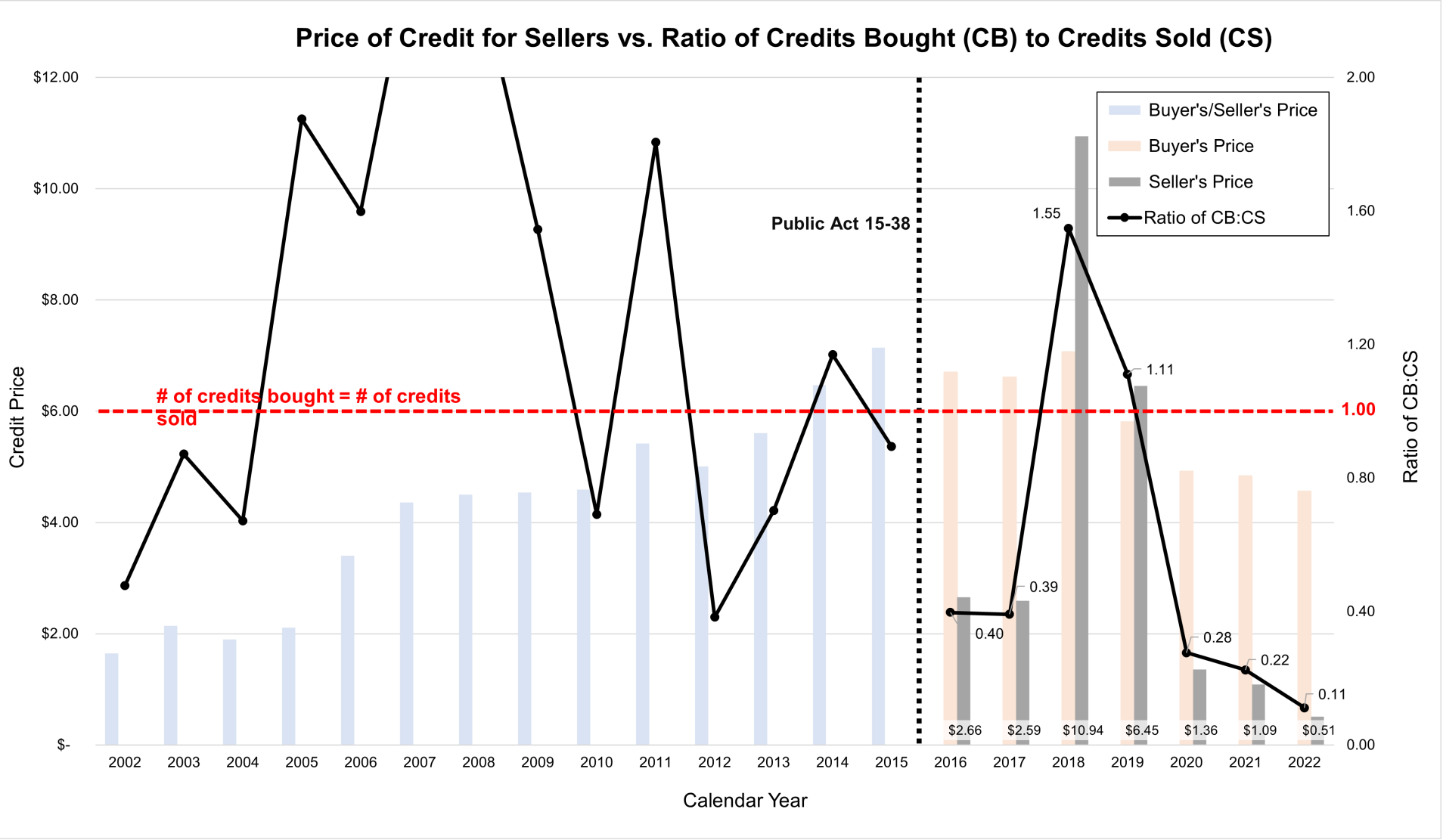
# of credits for sale by facilities that met their limits

Prior to PA 15-38:

- The program ran a surplus when the **CB:CS ratio > 1**
- The program was subsidized using surplus funds when the **CB:CS ratio < 1**

SELLER'S PRICE TREND

$$Seller's\ Price = Buyer's\ Price \times \frac{\#\ credits\ bought\ by\ POTWs}{\#\ credits\ for\ sale\ by\ POTWs}$$



	Buyer's Price	Ratio	Seller's Price
2016	$6.70	0.40	$2.66
2017	$6.61	0.39	$2.59
2018	$7.07	1.55	$10.94
2019	$5.81	1.11	$6.45
2020	$4.92	0.28	$1.36
2021	$4.84	0.22	$1.09
2022	$4.51	0.11	$0.50

MOVING FORWARD

Price of a Credit:

- **Buyer's Price** is expected to continue to decrease slightly over time as Capital Costs decrease
  - Large number of facilities who are finishing paying off their loans
  - Fewer facilities are completing nitrogen reduction projects
- **Seller's Price** is very much dependent on weather
  - Warm, dry weather → low ratio of CB:CS → lower seller's price
  - Cool, wet weather → high ratio of CB:CS → higher seller's price

Nitrogen General Permit

- Expires December 31, 2023 – will work to issue a new NGP by the end of the year

What's next for the Nitrogen Credit Exchange Program?

- Revisions to the TMDL?
- Embayment-specific TMDLs?