PM2.5 Implementation

AAPCA 2024 Spring Meeting

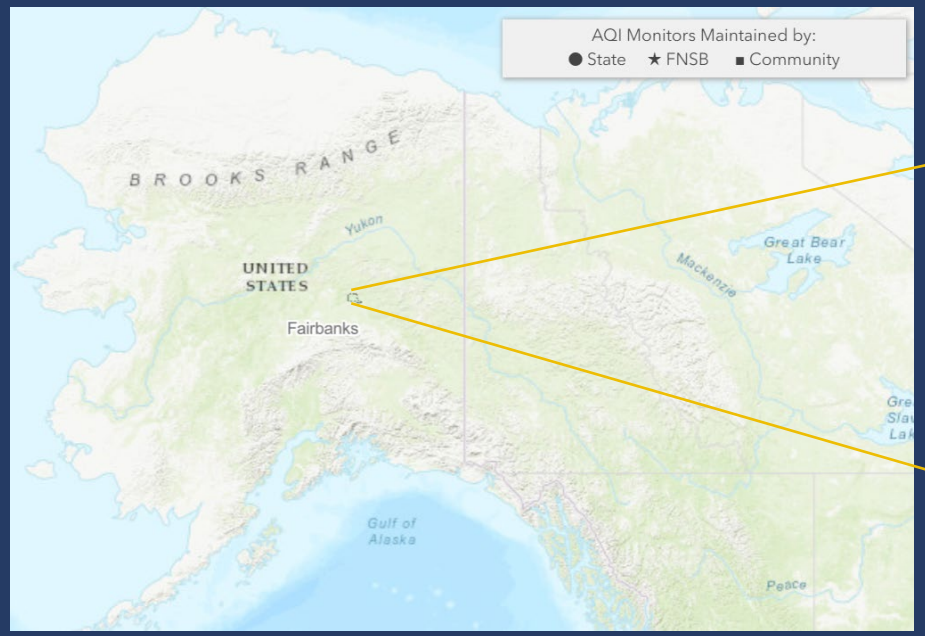
April 25, 2024

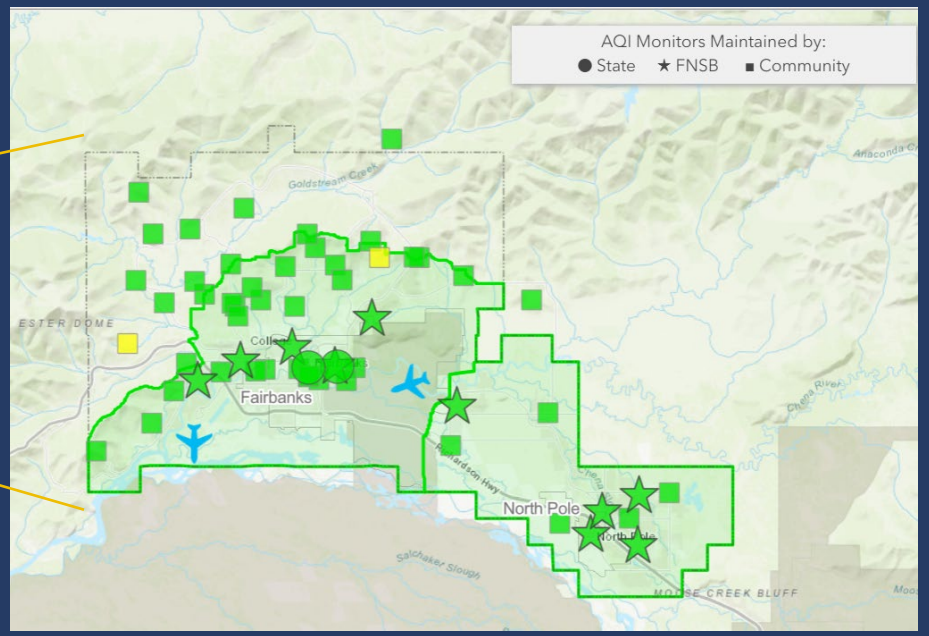
Nick Czarnecki, ADEC Program Manager

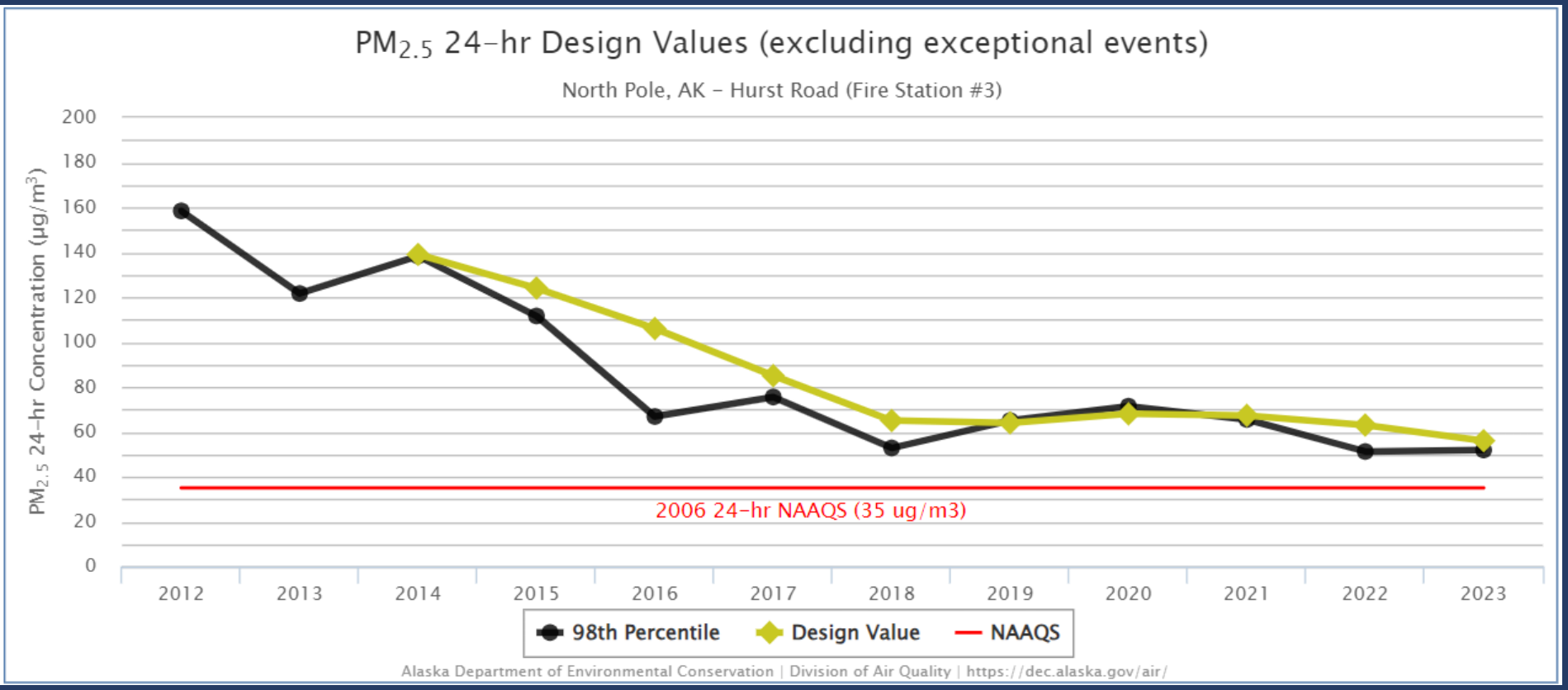
PM2.5 Implementation Rule

- Complex, nuanced, and every area has unique challenges
- Discuss a few points within the context of Fairbanks

Fairbanks nonattainment area







Fairbanks, AK Background

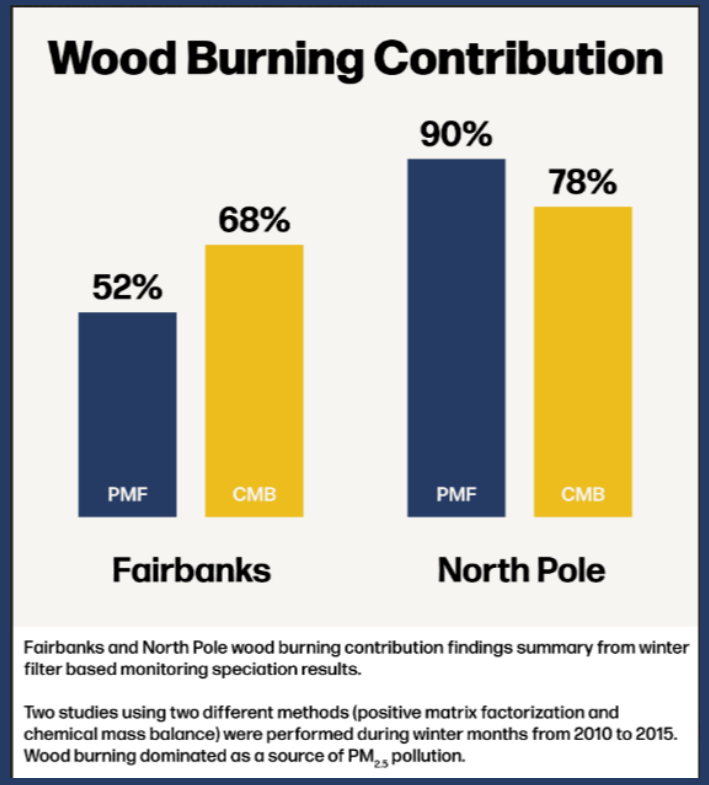
- Great Progress
- Room for Improvement

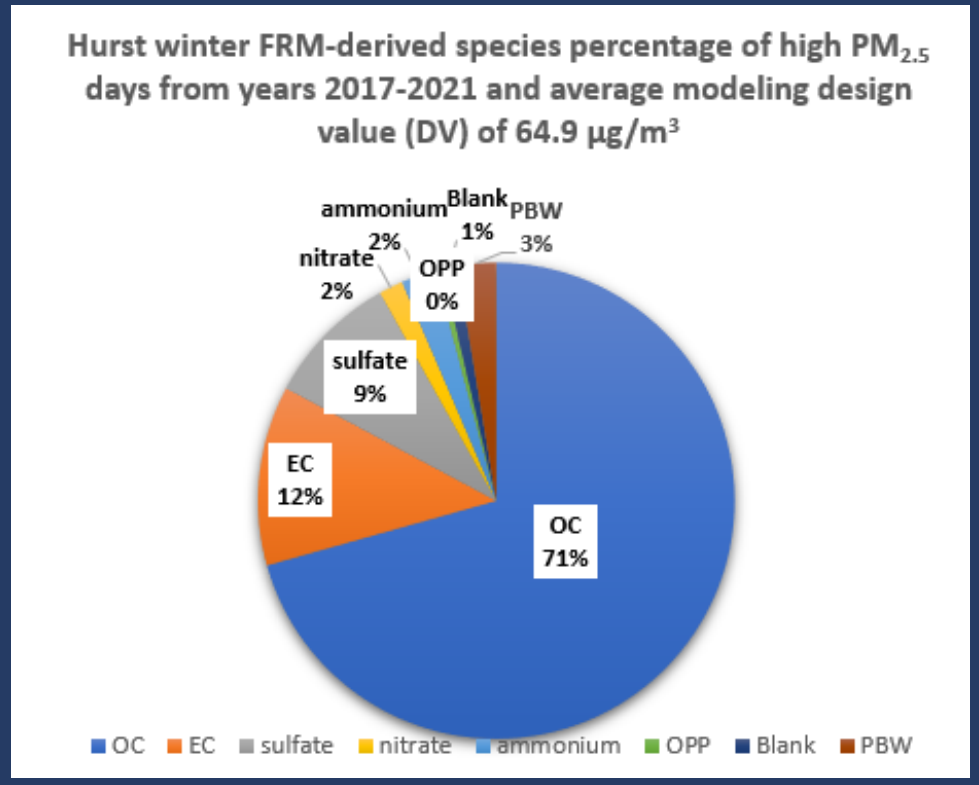
Design Values 2012-2023

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
NORTH POLE 98TH PERCENTILE	158.4	121.6	138.5	111.6	66.8	75.5	52.8	78.3 (65[1])	71.4	65.5	72.5 (51.2[1])	62.5 (51.9[1])
NORTH POLE DESIGN VALUE	--	--	139	124	106	85	65	69 (64[1])	68 (63[1])	72 (67[1])	70 (63[1])	67 (56[1])

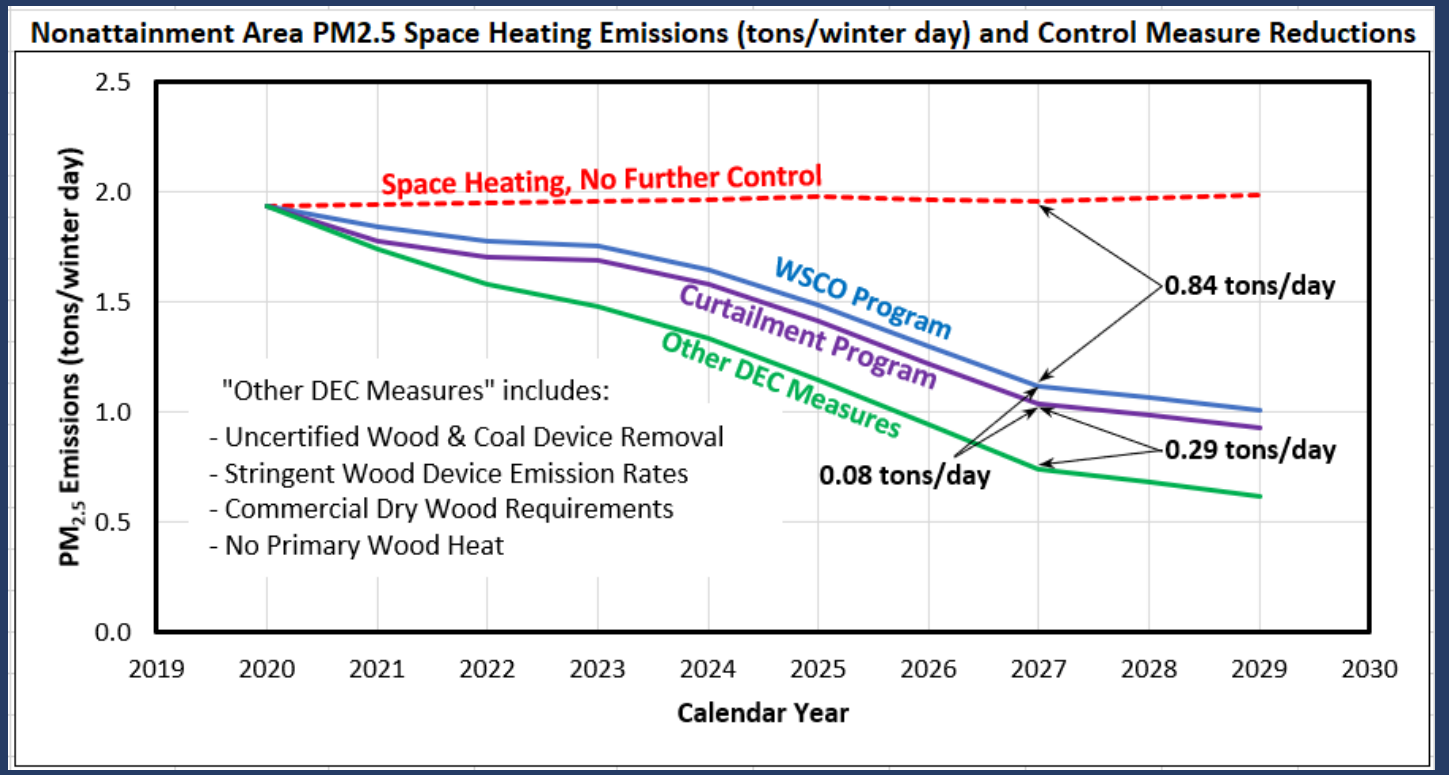
Fairbanks Background

- Home heating sector
  - Wood Smoke is largest contributor
  - Home heating oil second largest contributor
- Approximately 38,000 residential heated structures
- Approximately 14,000 solid fuel appliances





Fairbanks Control Strategy



CONTROL MEASURE IMPLEMENTATION/PHASE-IN SCHEDULE FOR REVISED 5% SIP

(DRAFT FINAL - 01/12/2024)

Measure Abbrev	Measure Description	Phase-In Schedule by Calendar Year									
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
WSCO	WSCO Program	2,791	3,055	3,267	3,576	3,974	4,524	5,078	5,628	5,778	5,937
CURT	Curtailment Program	30%	33%	38%	38%	38%	38%	38%	38%	38%	38%
STF-12	Shift #2 to #1 Oil	n/a	n/a	n/a	72%	95%	95%	95%	95%	95%	95%
STF-13	Commercial Dry Wood	n/a	n/a	40%	40%	45%	45%	45%	50%	50%	50%
STF-17	Wood Device Removal	0%	5%	15%	30%	30%	30%	30%	30%	30%	30%
BACM-R8	Wood Emission Rates	22%	25%	30%	35%	35%	35%	35%	35%	35%	35%
BACM-48	Remove Coal Devices	n/a	n/a	n/a	n/a	25%	25%	25%	25%	25%	25%
STF-22	No Primary Wood Heat	0%/0%	0%/0%	0%/0%	0%/0%	20%/40%	20%/40%	20%/40%	20%/40%	20%/40%	20%/40%
STF-23	NOASH/Exmptn Rqmts	0%	10%	10%	30%	30%	30%	50%	50%	50%	50%

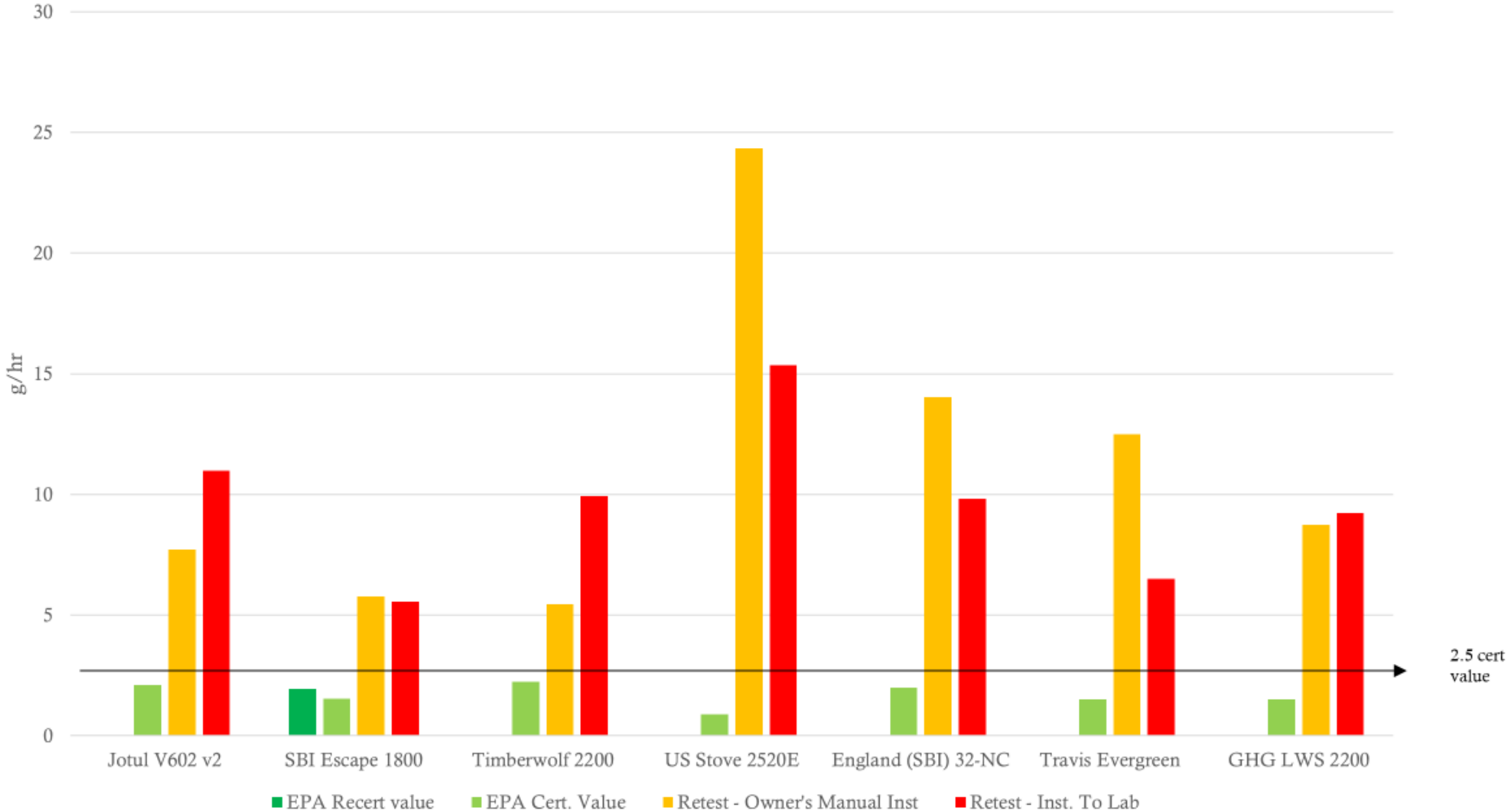
Notes:

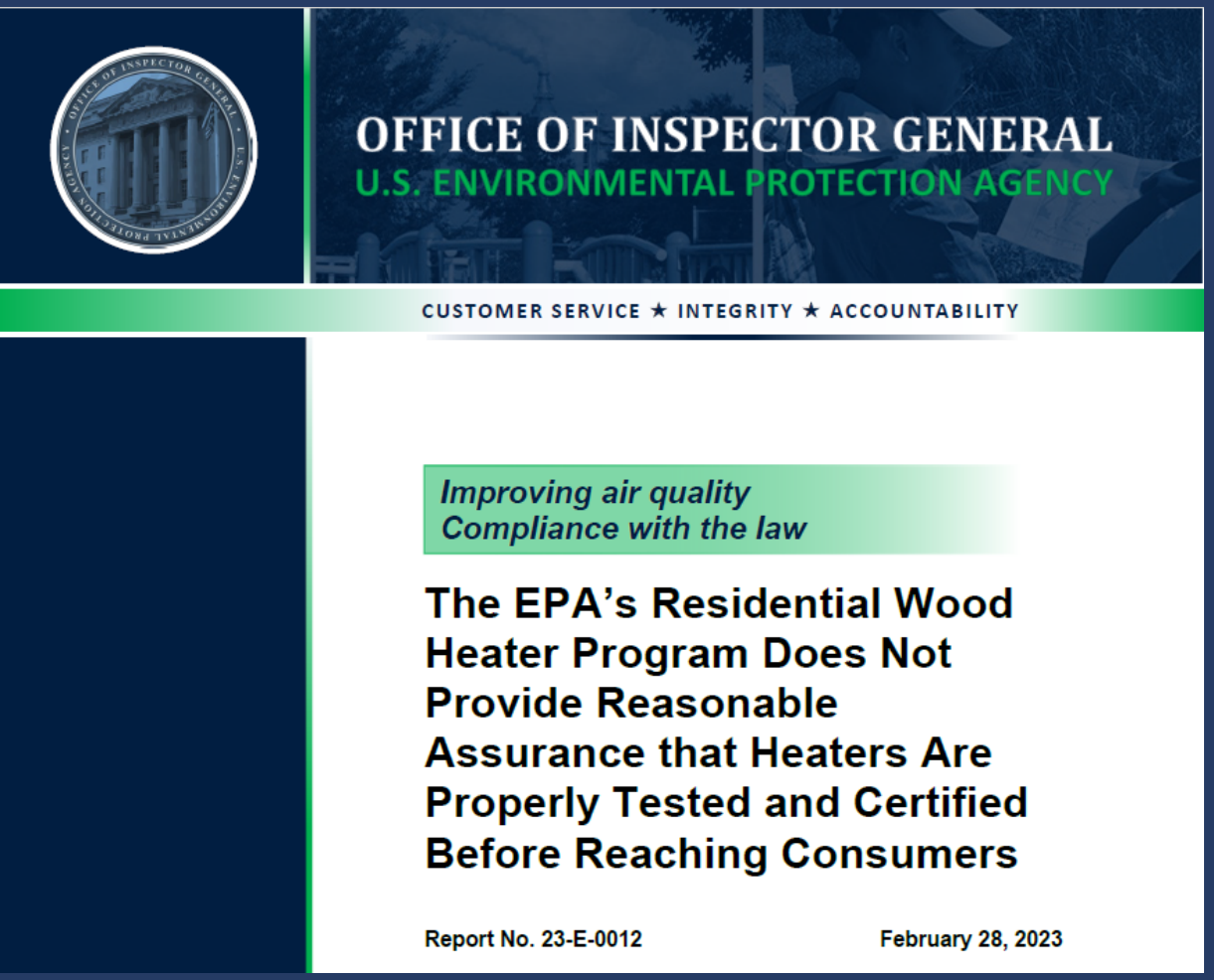
1) WSCO Program phase-in schedule shows cumulative change outs (all types) by year

2) Phase-In percentages reflect compliance/penetration rates estimated as of January 1 of the indicated year

EPA CERTIFICATION EMISSIONS – ASTM 3053-BASED NOT REPEATABLE OR RELIABLE

- All appliances tested exceeded the allowable range for compliance audits. Values would trigger mandatory suspension of sales under NSPS.
- Emissions results 3.6 to 17.4 times higher when comparing certification values to replicate certification test.
- Emissions results 2.4 to 27.7 times higher when comparing certification test values to test values using owner's manual instructions.
- Estimated Certification Expiration Date
  - Jotul 4/2024
  - SBI 3/2027
  - Wolf Steel 7/2024
  - US Stove 7/2024
  - England Stove 5/2025
  - Travis Industries 11/2023
  - GHB Group 8/2025



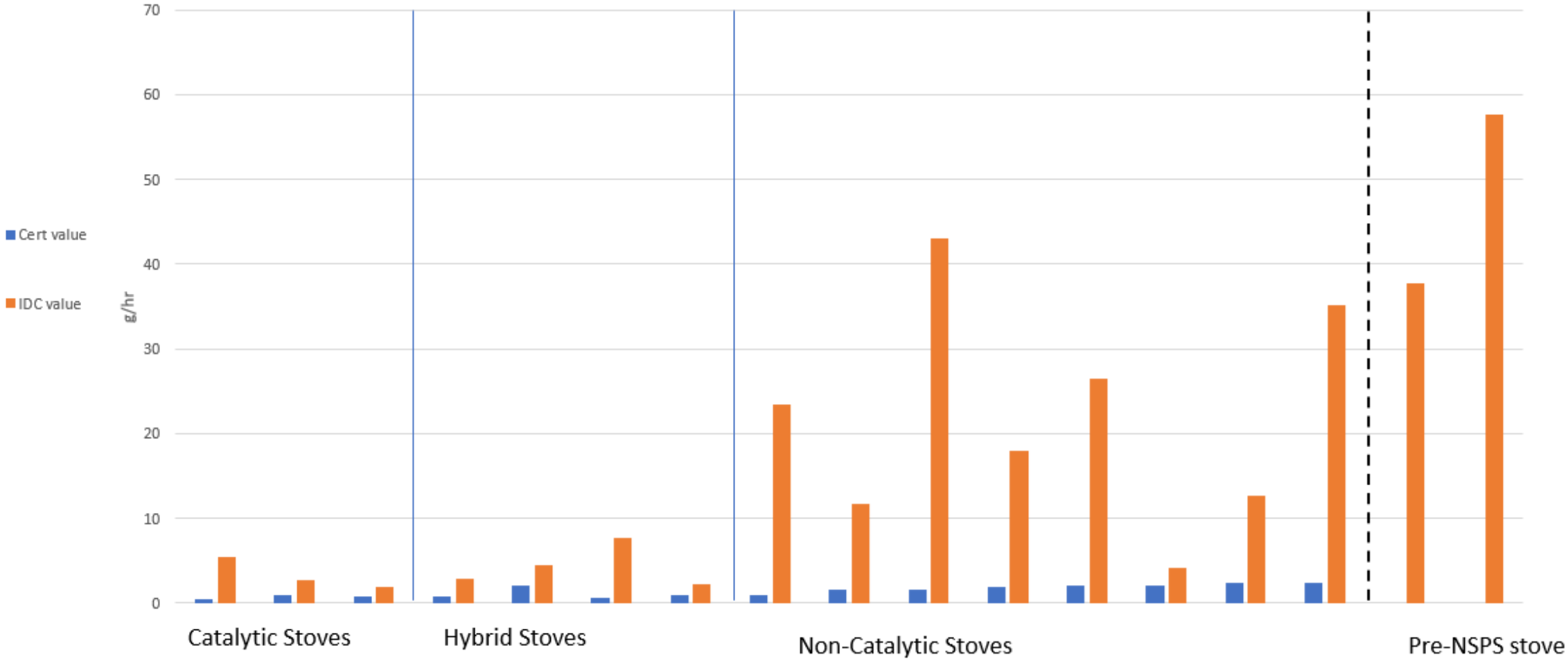


Office of Inspector General Report issued February 28, 2023

https://www.epaoig.gov/reports/inspection-evaluation/epas-residential-wood-heater-program-does-not-provide-reasonable

- One of several recommendations
  - Developing policies and procedures that detail how to conduct in-depth reviews of certification test reports.
- EPA committed to
  - Review test reports with additional staffing to assess the identified deficiencies
  - Post a corrective action list developed to clarify EPA expectations with respect to conducting certification testing
  - Rigorously reviewing certification test reports, not only for wood heaters already certified but also for heaters seeking certification

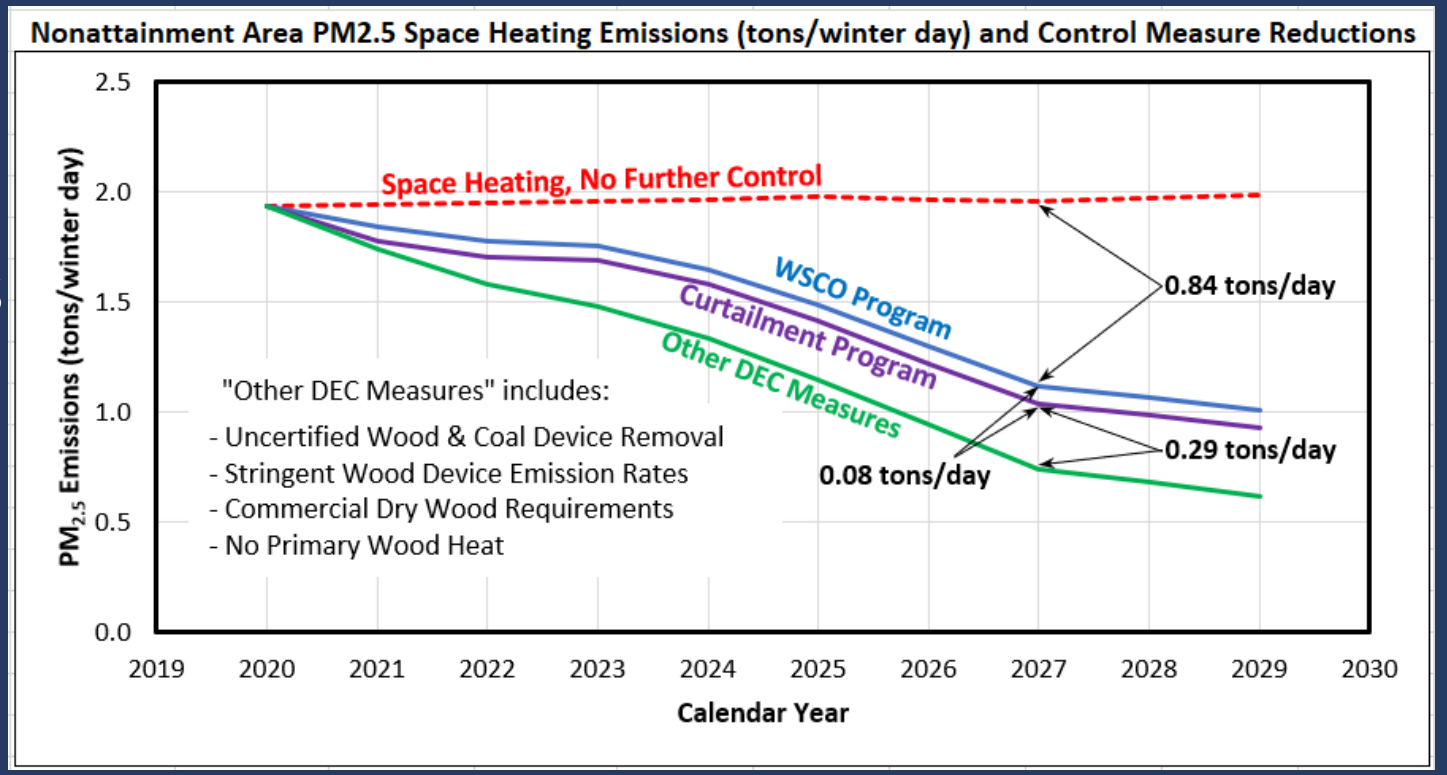
Certification vs. IDC Results



Step 2 Certified Stoves

NEW YORK STATE OF OPPORTUNITY. NYSERDA Supported

- What does this mean for implementation?
  - EI, Control Strategy, and Modeling based certified values
    - Underestimating
  - Regulatory requirements
    - Attainment demonstration
    - Contingency Measures
      - OYW of Progress



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Wood Heaters Moving Forward

Long Term

- Need a functional federal program
  - New test methods
  - New NSPS
  - Sell through provisions
  - 2032 before new cleaner stoves are in the market?

Mid Term

- Multi-state/local task force
- Independent testing, results in 2026

Near Term

- Alaska List

Timeline

Statutory Dates in PM Rule

- Initial designation for new annual standard: 2026
- Moderate Area Attainment date 6 years from designation: 2032
- Serious Area Attainment date 10 years from designation: 2036
  - 5-year extension with MSMs Attainment date15 years from designation – 2041
- CAA 189(d) or 5% plan Attainment date 5 – 10 years from failure to meet Serious Area Attainment date: 2041 to 2051

TIMELINE

Jan. 2023
EPA Proposes partial approval and partial disapproval of Fairbanks SIP

Dec. 2023
EPA publishes final partial approval and partial disapproval.

Jan. 2024
Sanction clock starts:18 months to 2:1 offsets, 24 months to highway sanctions

FIP clock starts: 24 months until FIP

Transportation Conformity Freeze starts

May 2024
ADEC publishes draft SIP Amendment out for public comment

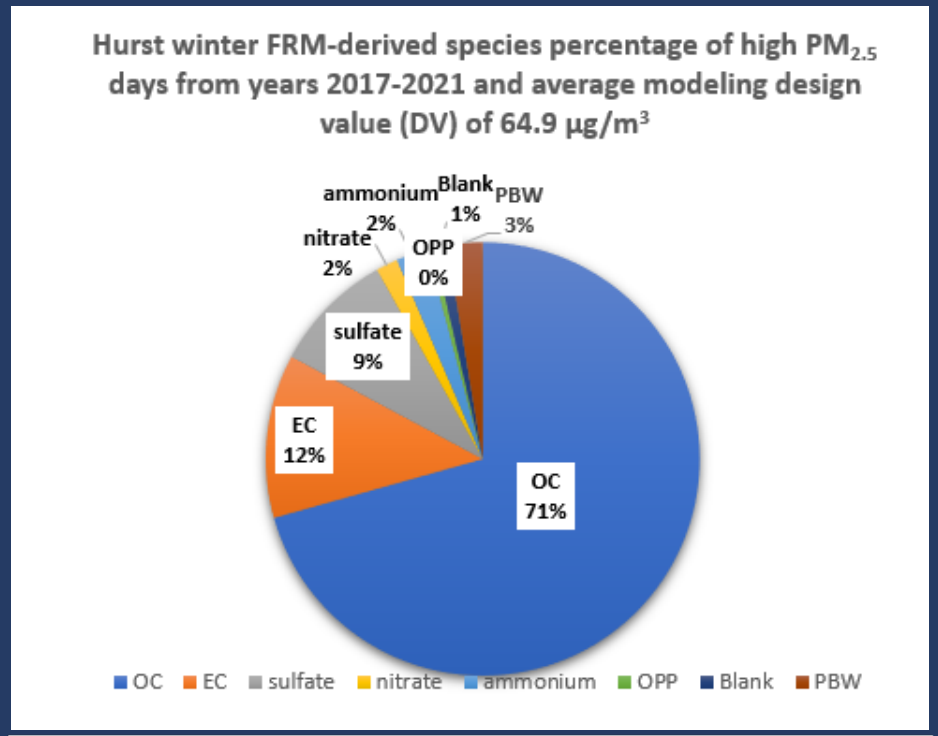
Sept 2024
ADEC Submits SIP Amendment with defensible SO2 precursor, BACM, and all other required SIP elements.

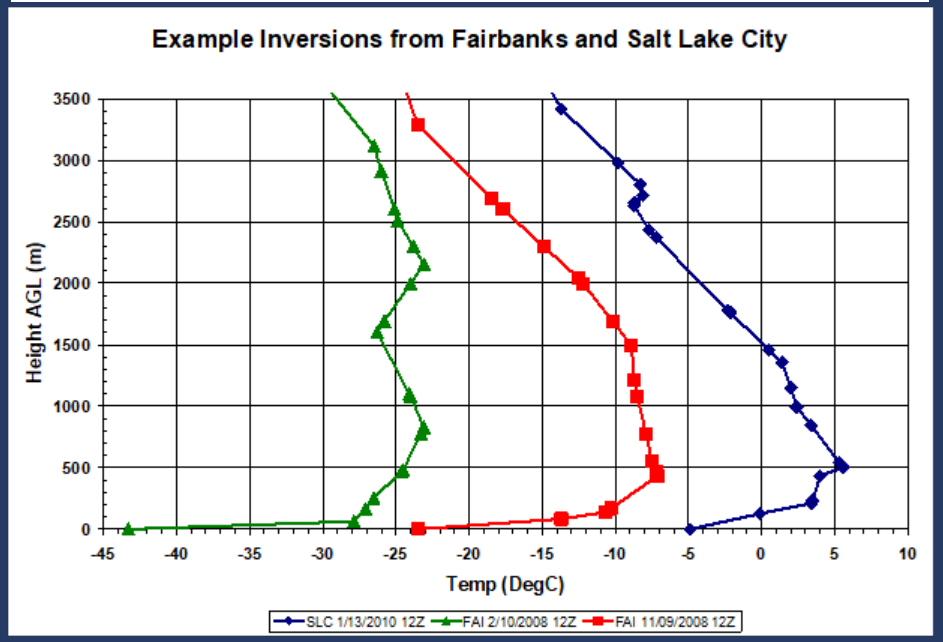
June 2025
Sanctions – 2:1 Offsets imposed

Dec. 2025
EPA issues final approval for all SIP elements

Sanction clock and FIP clock STOP

Jan. 2026
Highway Sanctions and FIP





Extremely Brief History on CMAQ modeling:

SIP development from the Moderate Area SIP to the current SIP required a complete new updated modeling platform

CMAQ 4.7.1 was an old version of the model and had limited sulfate chemistry appropriate to winter-time high latitude conditions (dark and cold conditions)

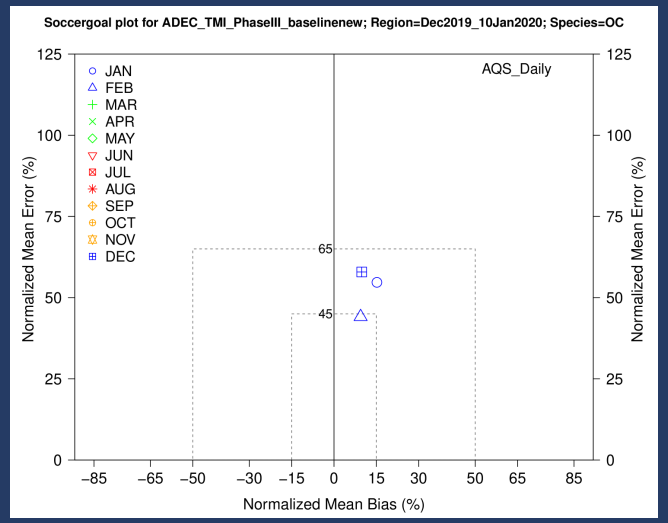
Led to ALPACA field study headed up by Bill Simpson at UAF and 50 scientists from all over the world studied the wintertime dark and cold chemistry in Fairbanks Alaska.

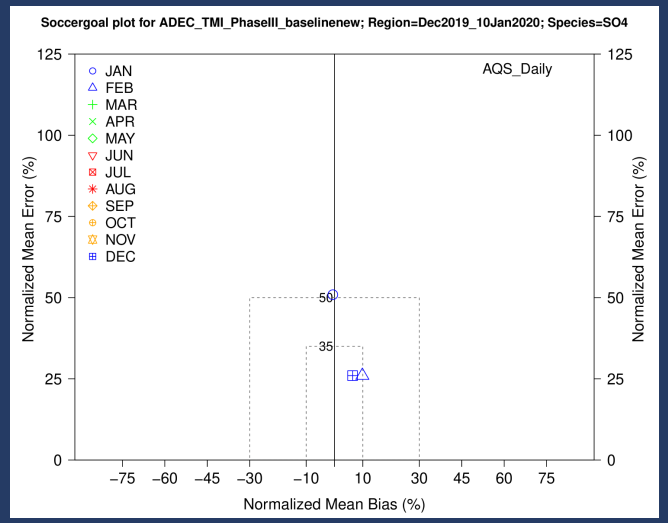
Two major elements of this study for Alaska modeling came from EPA-ORD for new WRF modeling for extreme stable boundary layers and CMAQ updated sulfur chemistry

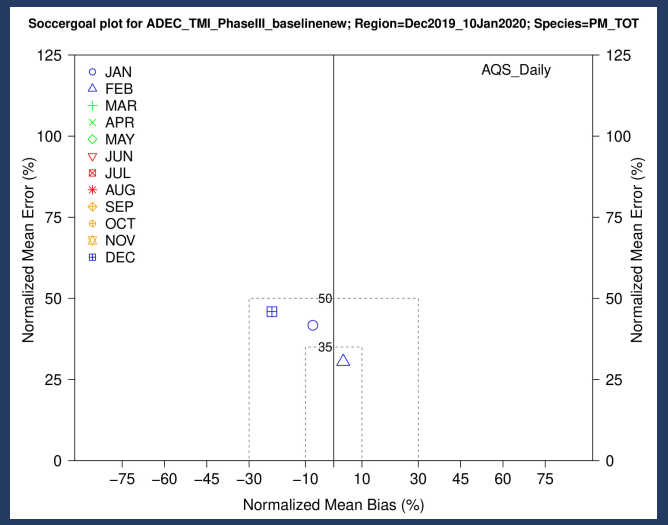
These two developments created a model appropriate for wintertime conditions in Fairbanks

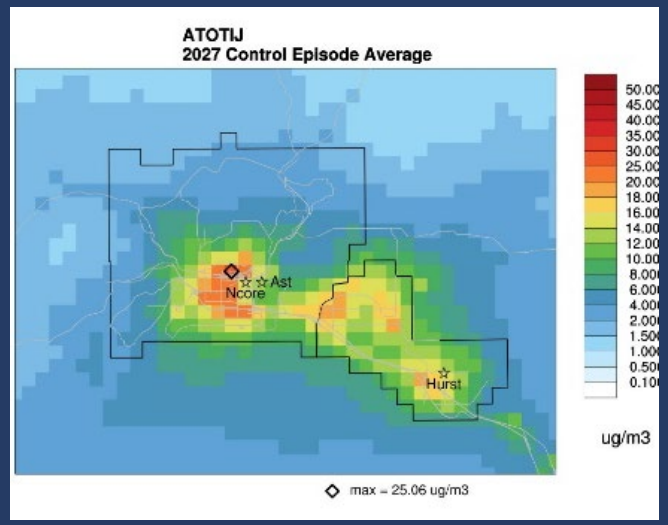
New monitoring and speciation data in North Pole (current PM 2.5 species in pie chart)

Stable boundary layer conditions in Fairbanks are extreme at 26C/100m change in our current WRF episode (2010 example from EPA –Rob Elleman to the left compared to Salt Lake City)









Model performance Evaluation for Current Best Configuration

Included changes are Science version (V533het) + meteorology

- Updates from EPA-ORD ALPACA project led to sulfate MPE that is appropriate for SIP modeling analysis.
- Largest components of $PM_{2.5}$ in Fairbanks are with the soccer goals set in the EPA guidance (Organic Carbon and Sulfate).
- Moderate area SIP modeling sulfate was missing 89% of the sulfate in the observations at the state office building (only monitor at the time).
- As wood stove control strategies reduce the 70% of organic carbon at the violating monitor in North Pole, sulfate is increasing in observations as a % of $PM_{2.5}$ from 6% in 2011-205 DV to 9% in the 2017-2021 (absolute concentrations have decreased from 131 to 64.9 ug/m3 of PM 2.5)
- Evaluation of sulfur controls is now possible with the updated version of the model, including information for the North Pole area.
- 2027 projected attainment year complete for SIP amendment (spatial gridded plot to left)

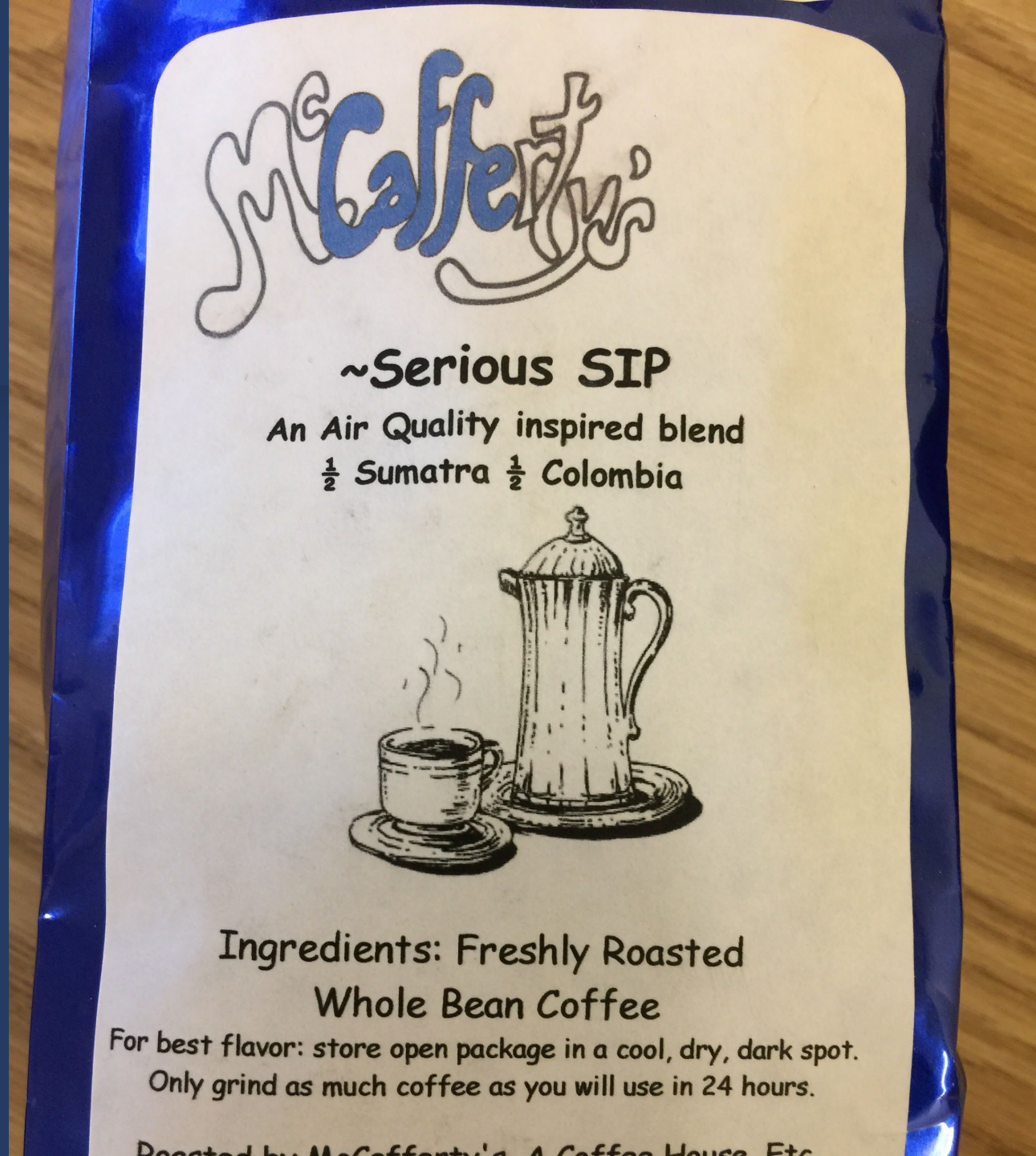
Control Strategy

- Relying on:
  - Accelerating device turnover
    - Change Out Programs (no new wood stoves)
    - Removal of appliances
    - Limits on what can backfill
  - Curtailment program

  - Largely behavioral changes

Control Strategy

- BACM
  - No source category de minimis exemption
  - Control analysis independent of attainment needs
  - Requires controls that have no impact on attaining the standard
    - Coffee Roasters
    - Light duty idling
  - Causes loss in credibility – need to establish behavioral change as an issue before this slide
    - When relying on behavioral change



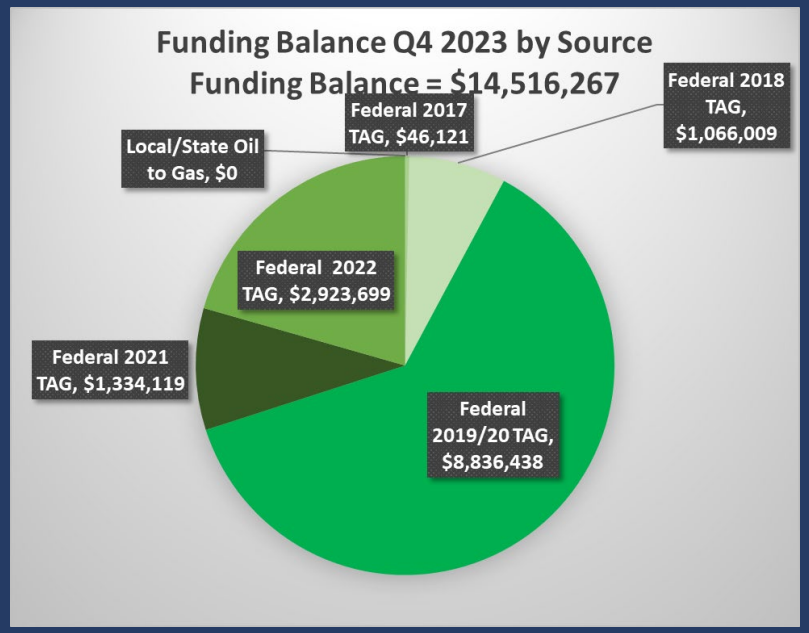
Funding – Alaska's SIP Development Costs

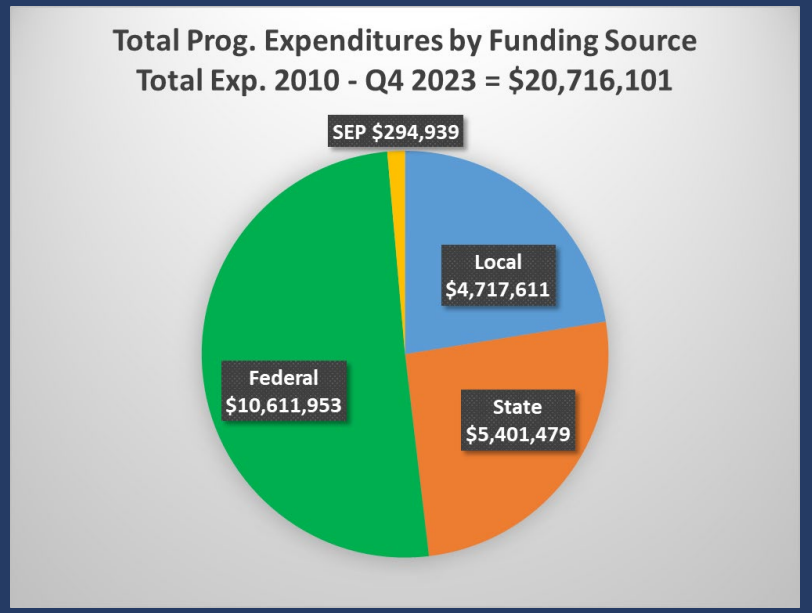
Averages $1.4 million per year

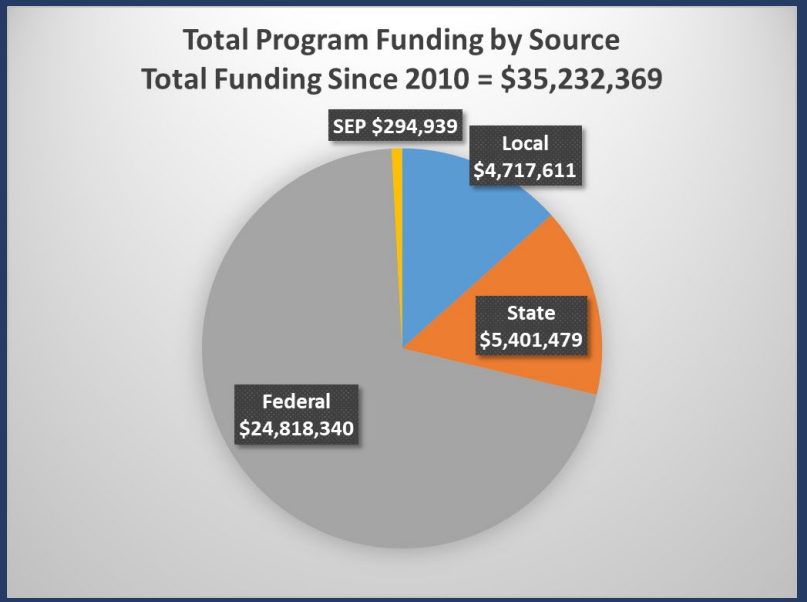
State staff: Approximately $900,000/yr.

Contracting: Approximately $500,000/yr.

Funding - Implementation







Questions?

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