



Clear the Air
Path to Attainment

FNSB
Conference and Expo

IMPACTS OF AIR QUALITY NON-ATTAINMENT ON LOCAL INDUSTRY

September 26, 2016



Presenters



Doyon Utilities

Kathleen Hook

Director of Environmental Affairs



University of Alaska

Frances M. Isgrigg

*Director Environmental, Health,
Safety and Risk Management*



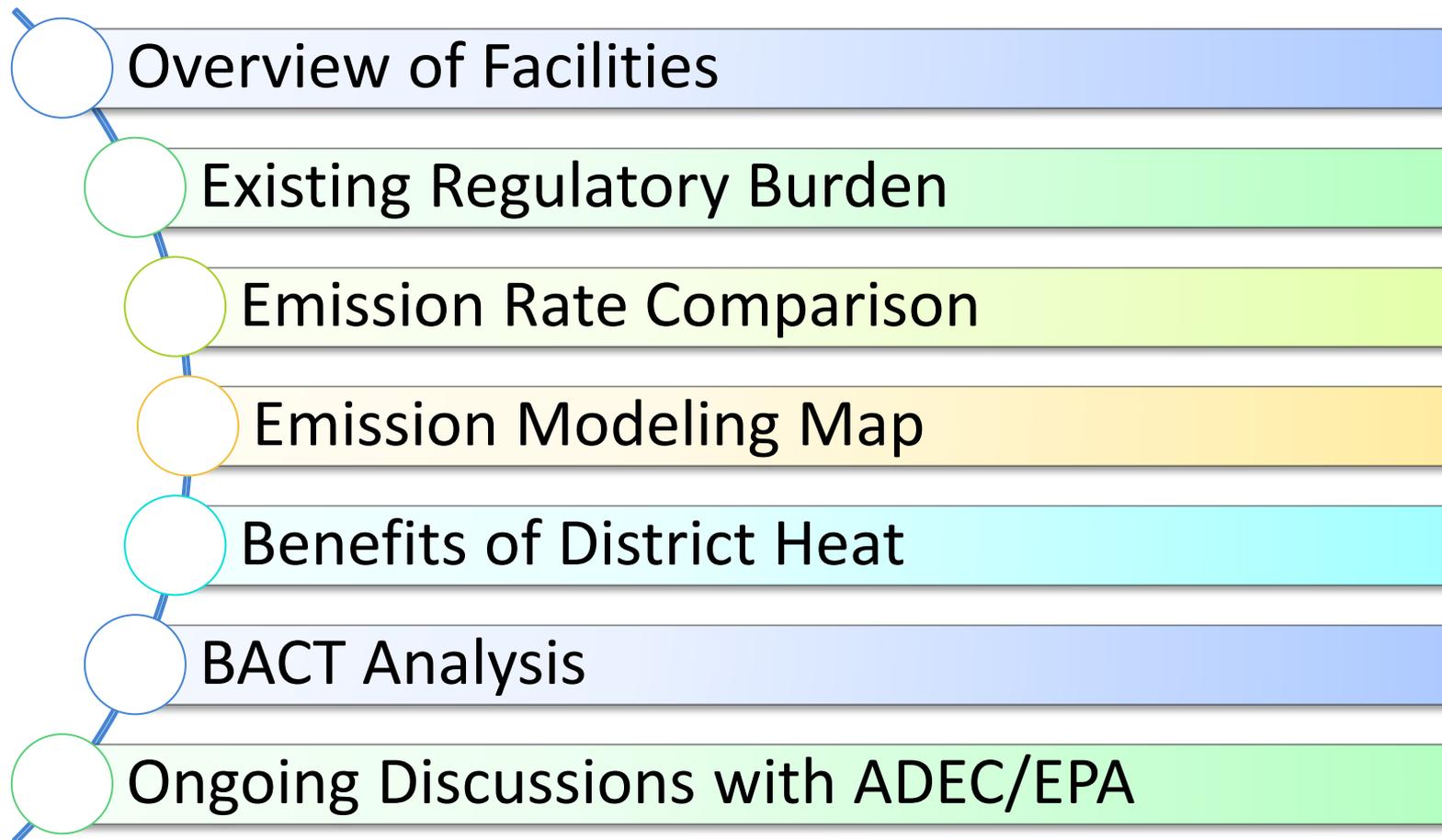
Aurora Energy

David Fish

Environmental Manager



Discussion Outline





Wainwright Overview



- The cantonment area covers approximately 13,500 acres
- Supports 20,000 DOD residents, employees, and contractors
- Family housing on the post totals approximately 1,400 units
- 2008 Utilities Privatization
- 20 MW coal fired Central Heat and Power Plant
- Six identical 150,000 lb/hr steam generators
- Operates to meet the heating and electricity demands of the post

Air Program Tracking – Wainwright



1 Minute
Stack Opacity Data

Monthly
Fuel consumption and engine hours

Annually
5 reports certified by DU responsible official including Emission Estimates, Operating Reports, Compliance Reports

UAF Overview

*Founded in 1917; 9,900 students, 3,400 faculty/staff;
9 colleges/schools; principal research center for UA*

- Fairbanks Campus Heat and Power - Existing
 - 180 buildings w/3.1M square feet of area to heat
 - Two 84 MMBTU/hr coal-fired boilers
 - Two 180.9 MMBTU/hr diesel/NG-fired boilers
 - Annual coal usage: 66.6K TPY
 - Annual diesel usage: 79.8K GPY
 - Annual NG usage: 65.1K MCF



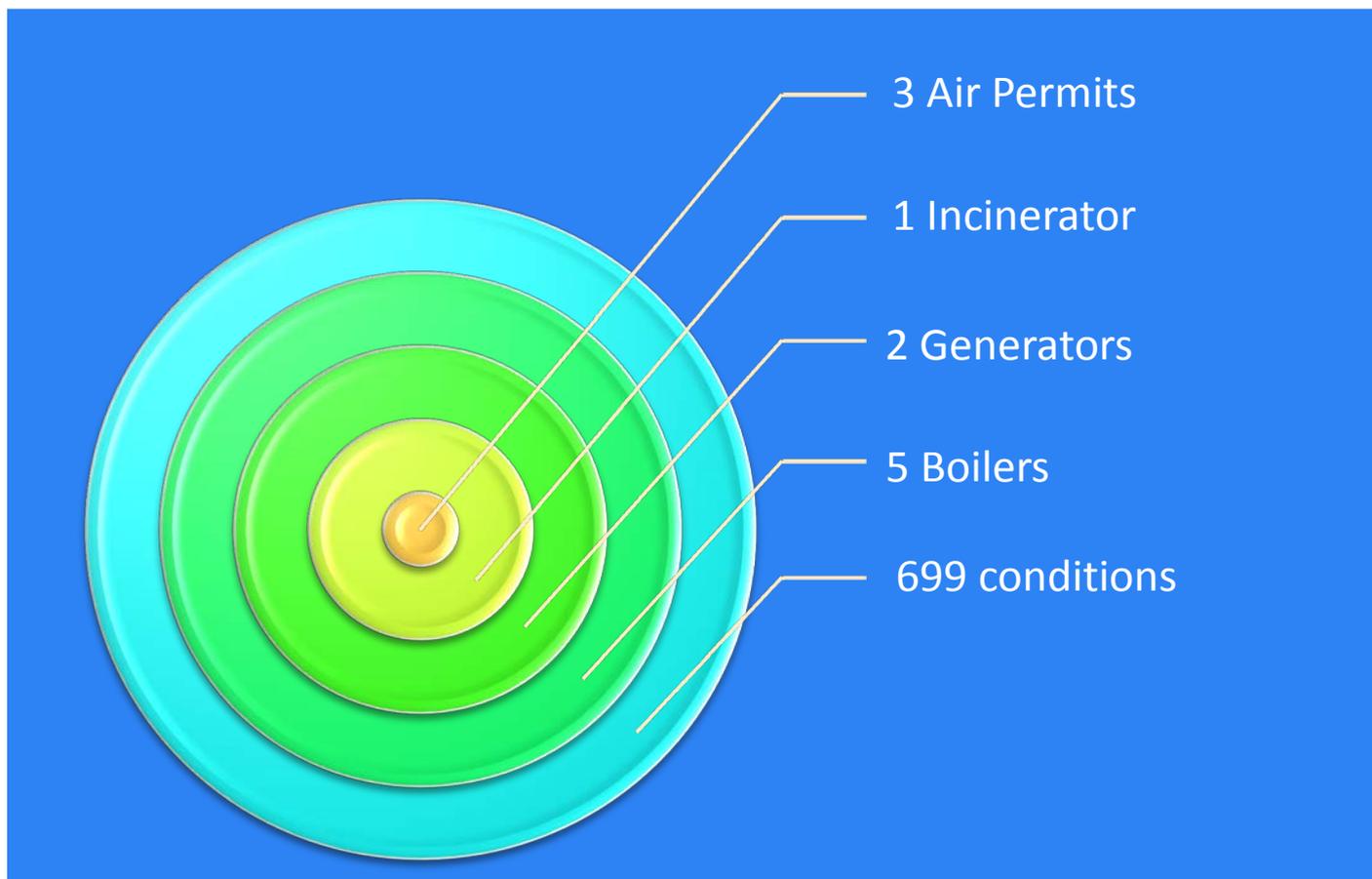
UAF Overview

Six Rural Campuses; Community and Technical College; elearning and Distance Ed; we enroll students from most AK communities, 49 states, & 48 foreign countries

- Fairbanks Campus – New Coal Fired Boiler
 - One 295.6 MMBTU/hr coal-fired boilers
 - 1 Ash handling system
 - 12 Coal handling sources
 - 1 Crusher
 - 3 Coal Silos
 - Draft Permit: 492 conditions



Air Permit Program Tracking (Existing) – UAF



Daily Reviews
Opacity
BH Temp and Pressure

Monthly Calcs
Fuel consumption on
all permitted units

1 Minute Data
Stack Opacity Data
BH Temp and Pressure

Annually
5 reports certified by
UAF responsible official
including Emission
Estimates, Operating
Reports, Compliance
Reports



Aurora Overview



Air Program Tracking – Aurora



Monthly
 Fuel consumption
 Constituents loading
 Compliance Reviews

Continuous Monitoring
 Stack Opacity Data
 Oxygen Data
 Steam flow
 Differential Pressure

Annually
 Emission Estimates
 Operating Reports
 Compliance Reports

PM 2.5 Emission Factors in lbs/ton

Wainwright	0.632
Aurora	0.632
UAF Existing	0.284
UAF New	0.181
Wood Stoves non-EPA	11.600
Wood Stoves EPA Certified	7.570
Hydronic Heater	10.550
Residential Oil	0.457

Note: Wood stove, hydronic heater and residential oil number are from the Moderate Area SIP; 0 added for formatting



Pollution Control – PM/Coal-Fired Boilers

Wainwright

Existing

Baghouse

COMS

Good Maintenance

Practices

Low Sulfur Coal

Aurora

Existing

Baghouse

COMS

Good Maintenance

Practices

Low Sulfur Coal

UAF

Existing

Baghouse

COMS

Good Maintenance

Practices

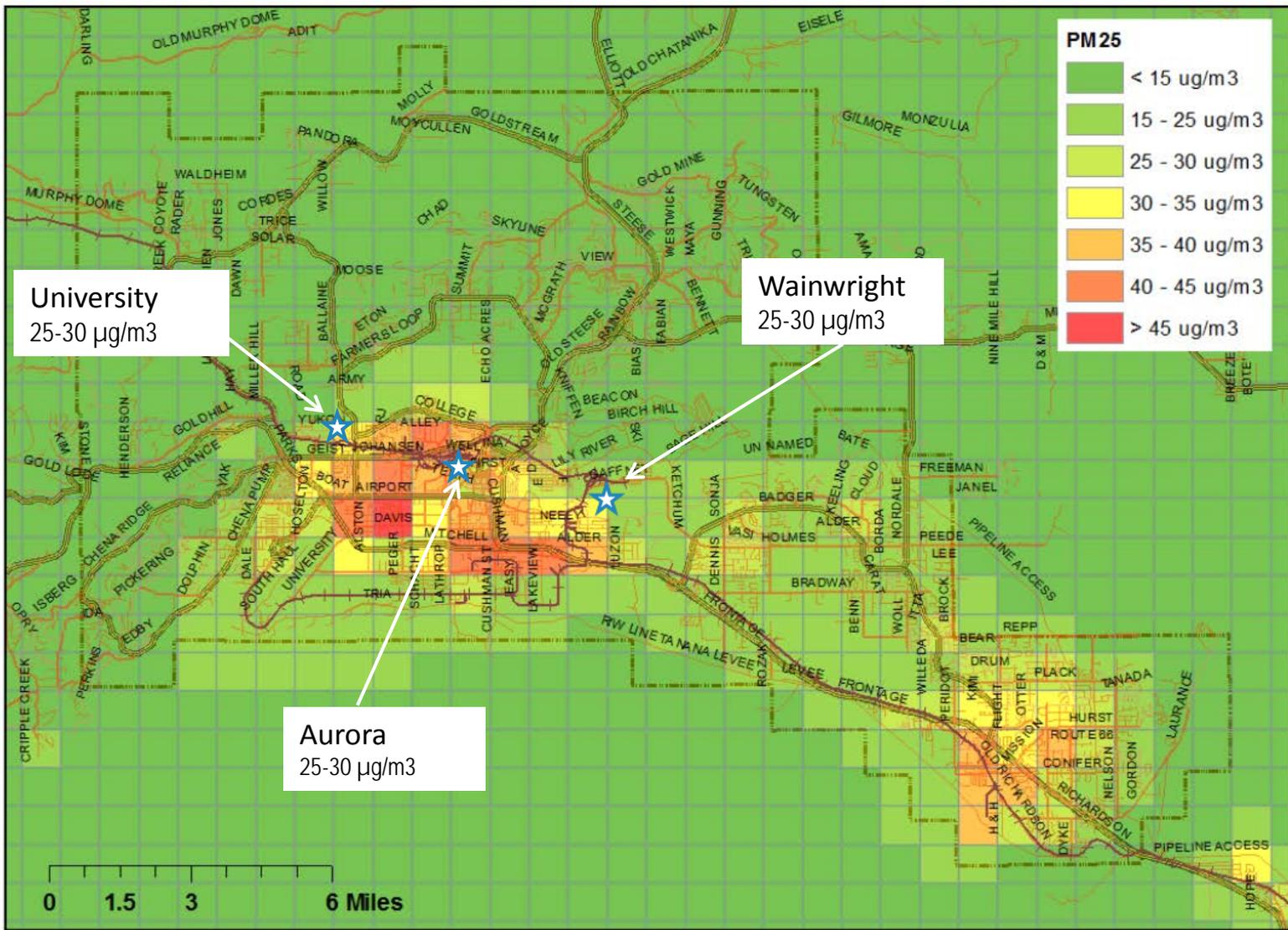
Low Sulfur Coal

New

All the above

Limestone

CEMS – SO₂, NO_x





CALPUFF Model Output

Table 5.8-1. Summary of Six Major Fairbanks Point Source Plumes from CALPUFF for the Episode (Jan. 23rd to Feb. 9th, 2008) Average Surface Concentrations at the State Office Building of PM_{2.5} and SO₂ in $\mu\text{g}/\text{m}^3$

Power Plant	Episode average SO ₂ ($\mu\text{g}/\text{m}^3$)	Episode average PM _{2.5} ($\mu\text{g}/\text{m}^3$)
UAF- 316	2.75	0.16
Aurora- 315	0.75	0.02
Zehnder-109	0.48	0.19
Flint Hills-071	0.016	0.38
GVEA NP-110	3.8	1.45
Ft. WW- 1121	14	1.6
Total surface concentration	21.8	3.8



Summary PM 2.5 Concentration during Episode (Jan. 23 – Feb. 9, 2008)

Table 5.3-1

Summary of Fairbanks PM_{2.5} Concentrations* and Daily Temperatures During January/February 2008 Design Episode

Average PM_{2.5} concentration, FRM data: 25.3 ug/m³

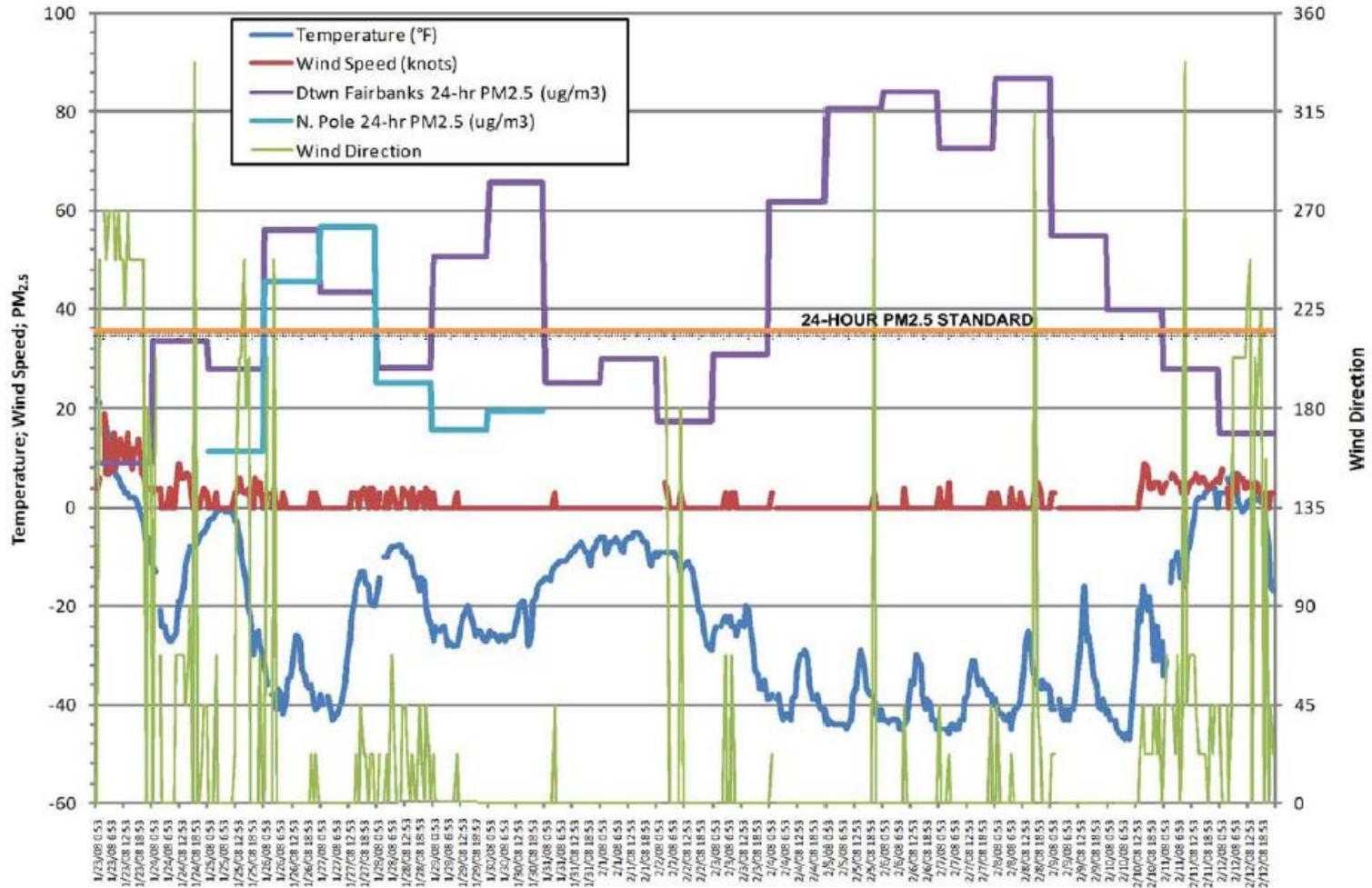
Average PM 2.5 Concentration, BAM data: 39.1 ug/m³

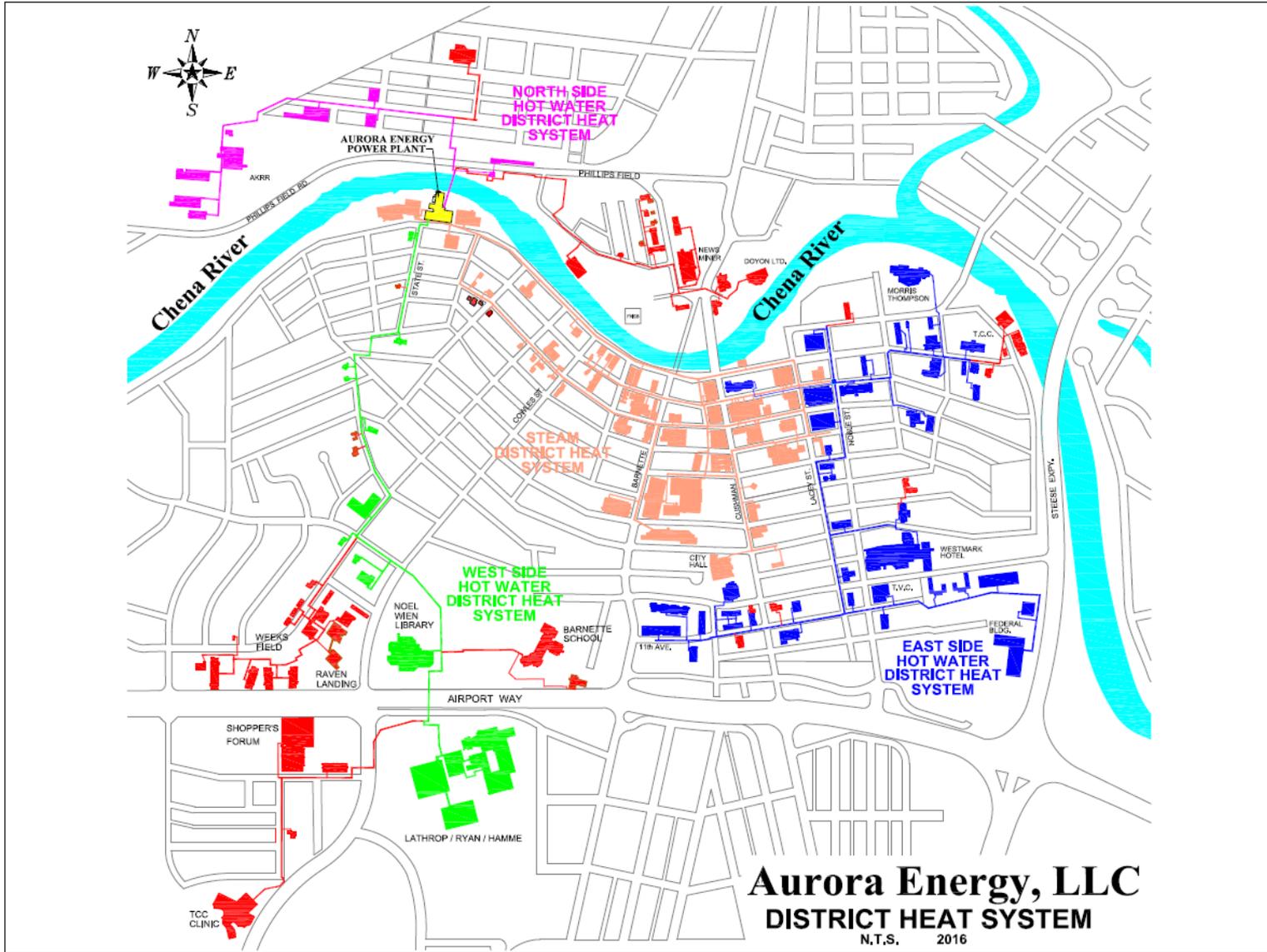
Average PM 2.5 Concentration, Modeled Point Source Total Contribution: 3.8 ug/m³

Date	24-hour Concentrations (ug/m ³)			Daily Temperatures (°F)		
	FRM	BAM	Speciation Data Available	Max	Min	Average
01/23/08		5.9		23	-11	6
01/24/08		27.2		-4	-30	-17
01/25/08	17.5	22.2	Yes	0	-31	-15
01/26/08		46.8		-25	-44	-34
01/27/08		35.8		-12	-43	-27
01/28/08	19.6	22.2	Yes	-6	-24	-15
01/29/08		42.0		-20	-31	-25
01/30/08		55.1		-15	-28	-21
01/31/08	No Data	19.9	Yes	-6	-15	-10
02/01/08		24.0		-5	-14	-9
02/02/08		13.2		-8	-30	-19
02/03/08	23.5	24.8	Yes	-19	-40	-29
02/04/08		51.7		-29	-44	-36
02/05/08		68.2		-29	-46	-37
02/06/08	No Data	71.0	Yes	-30	-47	-38
02/07/08		61.1		-29	-47	-38
02/08/08		73.4		-24	-46	-35
02/09/08	40.5	45.7	Yes	-15	-44	-29
02/10/08		32.7		-12	-48	-30

* FRMs are operated once every three days; BAMs collect hourly values, which are used to calculate 24-hour averages.

Figure 5
Meteorological and PM_{2.5} data for Fairbanks International Airport
Fairbanks Airport Meteorological Data (Jan 23 - Feb 12, 2008)





Aurora Energy, LLC
DISTRICT HEAT SYSTEM
 N.T.S. 2016



Aurora Energy District Heating

- Provides Steam and Hot Water Heating to approximately 165 customers.
- Supplies approximately 280,000 MMBtu/year to District Heating customers.
- Equivalent to approximately 2,000,000 gallons of heating oil.

Potential low level annual emissions¹ in the downtown area from residential heating in place of District Heating

Potential Heat Source	Heat provided by DH	SO ₂ ⁴	NOx	PM _{2.5} ²
Units	MMBtu	lbs	lbs	lbs
Wood ²	280,000	6,474	32,370	317,225
Oil ^{3,4}	280,000	1,420	36,000	2,600
NG	280,000	165	25,804	2,086

1 - Emission Factors based on AP-42

2 - Wood PM Emission is for PM₁₀

3 - 140 MMBtu/10³ gallon, No. 2 Heating oil

4 - Oil Sulfur content for No.2 Heating oil, 0.005%



UAF BACT Analysis

- Completed for Serious PM2.5 Non-Attainment Area Classification
- In Draft Final Form and submitted to ADEC
- Review included permitted units - including new boiler
- Currently reviewing Draft Final BACT
 - Due to EPA's 8/24/2016 Federal Register Final Rule for 40 CFR Parts 50, 51, and 93 Fine Particulate Matter National Ambient Air Quality Standards: SIP Requirements
- BACT for the new coal-fired boiler includes
 - CFB with staged combustion
 - Fabric filter
 - Limestone injection and low sulfur fuel



Best Available Control Technology Analysis

Table 1. NO_x Control Techniques^a

Source Category	Control Technique	Cost Effectiveness (\$/ton of NO _x removed) ^b	Additional Information
Coal-Fired Boilers (and Dual Fuel-Fired Boilers)^c			
Industrial Boilers firing coal (stoker)	Low NO _x burner	\$1,526	<250 MMBtu/hr
Industrial Boilers firing coal (stoker)	Low NO _x burner and overfire air	\$1,077	
EGU boiler firing coal	SCR	\$1,550	
EGU Boilers firing coal	SNCR	\$1,370	
Liquid Fuel-Fired Process Heaters^d			
Industrial Fuel Oil Combustion	Low NO _x Burner	\$1,894	
Process Heaters	Low NO _x burner and FGR	\$915	
Oil combustion in Process Heaters	Low NO _x burner retrofit & SNCR	\$3,691	
Gas Turbines^e			
Turbines, oil fired	Water Injection & SCR	\$3,691	
Turbines, oil fired	Water Injection	\$2,070	

^aData from *EPA Menu of Control Options* (Updated 4/12/2012). The values shown are the bottom of the range, if a range was provided.

^b2006 dollars

^cFort Wainwright Boilers 3-8; Chena Power Plant Boilers 1,2,3,5; UofA Fairbanks Boiler 1-2.

^dNorth Pole Refinery Crude Heaters and Steam Generation.

^eNorth Pole Power Plant GT1-3; Zehnder GT 1-2.

Table 2. Cost of SO₂ Scrubbers

Scrubber Type	Unit Size (MW)	Cost per Ton of Pollutant Removed (\$ ₂₀₀₁ /ton)
Wet	>400	200-500
	<400	500-5000
Spray Dry	>200	150-300
	<200	500-4000
Dry Scrubbers	All	Not Available

Source: EPA, *Air Pollution Control Technology Fact Sheet: Flue Gas Desulfurization (FGD) - Wet, Spray Dry, and Dry Scrubbers*, EPA-452/F-03-034. EPA does not provide cost information for dry scrubbers.

Table 4

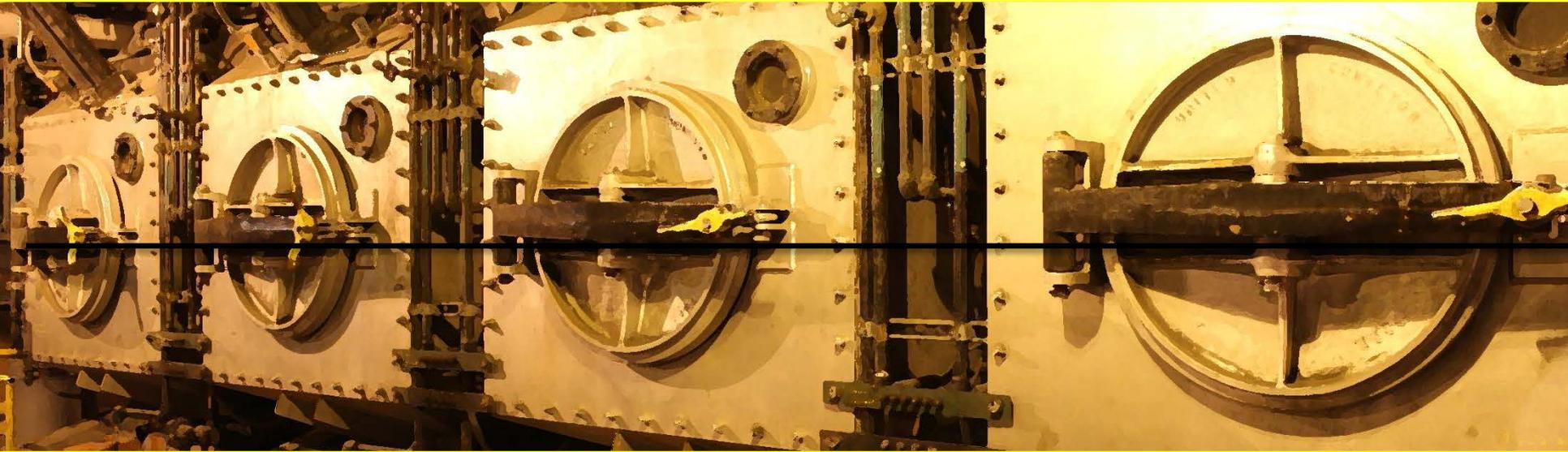
CUECost Estimate of Cost of Sulfur Scrubbers for 100 MW Coal-fired Boiler—Output

Description	Units	Limestone Forced Oxidation ^a	Lime Spray Dryer ^b
Total Capital Requirements	\$ ₂₀₁₂	\$77-176 million	\$57-131 million
Levelized Constant Dollars			
Fixed O&M	\$ ₂₀₁₂ /year	\$4.0 million/year	\$3.0 million/year
Variable O&M	\$ ₂₀₁₂ /year	\$0.6 million/year	\$0.8 million/year
Fixed Charges	\$ ₂₀₁₂ /year	\$9.0-20.6 million/year	\$6.7-15.3 million/year
Total	\$ ₂₀₁₂ /year	\$13.6-25.0 million/year	\$10.4-19.1 million/year
Total	\$ ₂₀₁₂ /ton SO ₂	\$29,600-57,600/ton	\$23,900-46,100/ton

^aLimestone Forced Oxidation is a type of wet scrubber.

^bLime Spray Dryer is a type of spray dryer.

- Based on ADEC's control technology evaluation, sources that emit >100 tons of NO_x, SO₂, and PM 2.5 must consider control technologies for source emissions.
- Costly controls may not significantly reduce pollutant contribution to the area.



QUESTIONS AND COMMENTS