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#### Lessons Learned from the Regional Haze Second Planning Period in Arizona



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March 4, 2020 16<sup>th</sup> Annual EPAZ Conference

## **Overview & History**



#### What is Regional Haze?

- > Visibility impairment produced by sources and activities which emit fine particles and their precursors
- > "fine particles and their precursors" = PM,  $SO_2$ , and  $NO_x$



The Grand Canyon on a clear day and on a hazy day.



#### Superstition Mountains - Excellent vs. Poor







#### **Regional Haze - Timeline**

- > 1977: CAA Prevention of any future, and the remedying of any existing, impairment to visibility in Class I Areas
- > 1999: Regional Haze Rule (RHR) goal to reach natural conditions by 2064. Sources include major and minor stationary sources, mobile sources, and area sources.
- > 2005: RHR Amendments "Best Available Control Technology (BART) Rule"

- > 2007: State Implementation
  Plans (SIPs) due for First
  Planning Period (2004-2018)
- July 31, 2021: SIPs due for Second Planning Period (2018-2028)
- > Six planning periods total to get to 2064



#### **Regional Haze - In Arizona**

Area Name	Acreage
Chiricahua National Monument Wilderness	9,440
Chiricahua Wilderness Area	18,000
Galiuro Wilderness Area	52,717
Grand Canyon NP	1,176,913
Mazatzal Wilderness Area	205,137
Mount Baldy Wilderness Area	6,975
Petrified Forest NP	93,493
Pine Mountain Wilderness Area	20,061
Saguaro Wilderness Area	71,400
Sierra Ancha Wilderness Area	20,850
Superstition Wilderness Area	124,117
Sycamore Canyon Wilderness Area	47,757

#### Regional Haze Class I Areas and IMPROVE Monitors



#### **Categories of Haze**





#### **Associated Agencies**

- > Arizona Department of Environmental Quality
- > EPA Region 9
- > Western Regional Air Partnership (WRAP)





# **Ongoing Developments**



#### **Recent Activities in Arizona**

- > ADEQ identified and notified screened sources.
- > Four-factor analyses were due to ADEQ on Dec. 1<sup>st</sup>.
- > ADEQ is providing comments on four-factor analyses.
- > ADEQ will submit modeling information to WRAP sometime in March.
- > WRAP will model the results and make further determinations.



#### **Uniform Rate of Progress (URP)**



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## ADEQ Regional Haze - 2<sup>nd</sup> Planning Period Process





## Regional Haze - 2<sup>nd</sup> Planning Period Overview

> Targets = Sources with Q/d > 10

- Q = NO<sub>X</sub>, SO<sub>2</sub>, PM<sub>10</sub> emissions (including fugitive emissions) in tpy
- D = Distance to Class I area in km
- Emissions units for which "most/highly effective controls" have been installed in the last five years are deferred from any analysis.



#### **Regional Haze - Screened Sources**

#### Facility

- ASARCO Hayden Smelter
- **ASARCO Mission Complex**
- ASARCO Ray Complex
- CalPortland Rillito
- **Drake Cement**
- **EPNG Williams Compressor**
- **EPNG Willcox Compressor**
- FMMI Miami Smelter
- FMMI Morenci
- FMMI Sierrita Mine
- Phoenix Cement Clarkdale
- **TEP Springerville**
- TEP Sundt

\* Based on Q/d of > 10



#### **Regional Haze: Four-Factor Analysis**

- Sources that were screened into this round of regional haze must perform a four-factor analysis for the top 80% of their emission sources.
- > Emissions units that are "effectively controlled" in the past five years are not included in top 80%.
- > A four-factor analysis must be completed for all controls that are available and technically feasible.
- > Four factors:
  - 1. Costs of compliance
  - 2. Time necessary for compliance
  - 3. Energy and non-air quality environmental impacts
  - 4. Remaining useful life of the source

Note: This method does not specifically include visibility improvement as a factor, but EPA does allow for some degree of visibility consideration when analysis is performed.



### Four-Factor Analysis: Lessons Learned (1/4)

- > Defining technically feasible controls
  - Includes both add-on controls and retrofit technology
  - RACT/BACT/LAER Clearinghouse (RBLC)
  - Literature
  - WRAP guidance
  - Input from facility operators



### Four-Factor Analysis: Lessons Learned (2/4)

#### > 1. Cost of Compliance

- Includes CapEX and annual operating costs.
  - Labor/lost production
  - Installation/retrofit costs/O&M costs
  - Insurance/tax/administrative
  - Permitting/testing/engineering
  - Fuel/electricity
  - Contingency
  - Preproduction
- Interest rate
- Vendor quotes
- Control efficiency
- Final cost is in the form of "\$/ton of pollutant removed".
- Unknown what will be considered economically infeasible.
  - Suggestions that \$5,000 to \$7,000 per ton may be the threshold.



### Four-Factor Analysis: Lessons Learned (3/4)

- > 2. Time Necessary for Compliance
  - How long will it take to install controls and have them fully operational.
  - Based on EPA's 2019 guidance, if it is determined that a facility must install controls per 40 CFR § 51.308, these controls must be installed by 2028 and there is no requirement to install controls prior to December 31, 2028.



## Four-Factor Analysis: Lessons Learned (4/4)

- > 3. Energy and non-air quality environmental impacts
  - Other environmental impacts that should be considered.
    - Hazardous waste generated
  - Energy/fuel usage increase considered
- > 4. Remaining useful life of the source
  - Used when calculating the capital recovery factor (CRF)
    - CRF used to annualize CapEX
  - 20 years (EPA preferred) vs less than 20 years
  - Life of source or life of control?
    - Will control outlive emission source?

 $CRF = i(1+i)^n / ((1+i)^n - 1)$ 



#### Regional Haze - HYSPLIT (1/2)

- > National Oceanic and Atmospheric Administration (NOAA) tool
- > Uses Eulerian and Lagrangian models to estimate forward or backward wind trajectories.
- Models multiple wind trajectories over a given number of days.



#### Regional Haze - HYSPLIT (2/2)



UTM Easting (m) All Coordinates shown in UTM Coordinates, Zone 12, NAD 83 Datum



#### **HYSPLIT - Lessons Learned**

- > Location of the monitor vs starting point for the back trajectory
- > Geospatial Data Analysis Method and Challenge
  - More than 5,000 trajectories evaluated, so plan for data analysis and geographic information systems (GIS) use



#### **Overall Lessons Learned**

- Ensuring accurate emission inventories submittal to ADEQ will help reduce last minute four-factor analysis updates
  - Emission factors
  - Incorrect representations
  - Consistency from year to year
- Ensuring correct model parameters in El submittal affects WRAP modeling
- > Leverage correct resources
  - Getting correct resources within your facility involved (e.g., HR for labor cost, accounting for interest costs, operators for maintenance cost)



# **Questions?**



