

Modeling Considerations for Intermittent Sources and the 1-hr NO₂ standard

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Background Information

- The Clean Air Act requires EPA to set and **revise** National Ambient Air Quality Standards (NAAQS) for certain common and widespread pollutants (criteria pollutants).
- **Every five years**, the Act requires EPA to review scientific data, and determine whether to revise the standards for a pollutant.
- Implementation of these standards are a **joint responsibility** of states and EPA.

Portion of NAC 445B.22097 :

		NEVADA STANDARDS	NATIONAL STANDARDS	
POLLUTANT	AVERAGING TIME	CONCENTRATION	PRIMARY	SECONDARY
Nitrogen dioxide	Annual arithmetic mean	0.053 ppm (100 µg/m ³)	53 ppb	Same as primary
	1 hour	100 ppb	100 ppb	None
Sulfur dioxide	Annual arithmetic mean	0.030 ppm (80 µg/m ³)	0.03 ppm (1971 standard)	None
	24 hours	0.14 ppm (365 µg/m ³)	0.14 ppm (1971 standard)	
	3 hours	0.5 ppm (1,300 µg/m ³)	None	0.5 ppm
	1 hour	75 ppb	75 ppb	None
Particulate matter as PM _{2.5}	Annual arithmetic mean	15.0 µg/m ³	15.0 µg/m ³	Same as primary
	24 hours	35 µg/m ³	35 µg/m ³	Same as primary

Intermittent Sources...

- What are they?
 - *Emergency Generators*
 - *Intermittent Emission Scenarios, e.g., startup/shutdown operations, infrequent emissions*

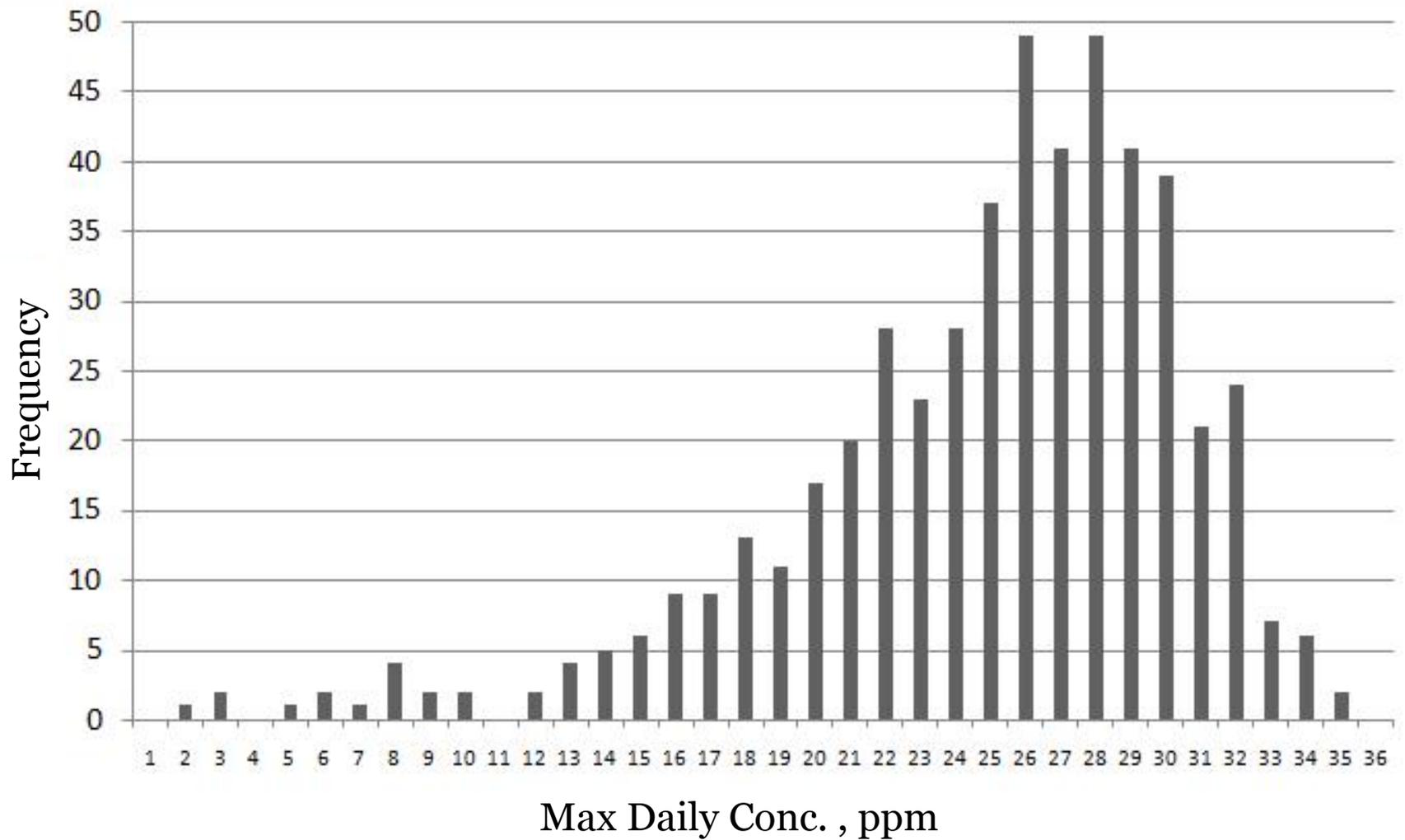
Two Fundamental Questions:

- To model, or not to model?
- If we model, then how?

To model, or not to model?

- EPA recommends that compliance demonstrations for the 1-hour NO₂ NAAQS address emission scenarios that can logically be assumed to be relatively continuous or which occur frequently enough to contribute significantly to the annual distribution of daily maximum 1-hour concentrations based on existing modeling guidelines, which provide sufficient discretion for reviewing authorities to not include intermittent emissions from emergency generators or startup/shutdown operations from compliance demonstrations for the 1-hour NO₂ standard under appropriate circumstances.

- EPA NO₂ memo, 3/1/2011, page 2



To model, or not to model?

- If intermittent engines are the only source of NO₂ emissions at the facility, modeling NO₂ will not be required if the following conditions are met:
 - Engines are tested 7 or fewer times each calendar year; there is no restriction on the hours of testing per day.

AND

- If the facility has multiple engines, all engines will be tested on the same day.

To model, or not to model?

- If intermittent engines are the NOT the only source of NO₂ emissions at the facility, modeling NO₂ will not be required if the following conditions are met:
 - Engines are tested no more frequently than once every 3 months; there is no restriction on the hours of testing per day. *AND*,
 - If the facility has multiple engines, all engines will be tested on the same day. *AND*,
 - Engines are rated at less than 300 horsepower, or less than 500 horsepower if they are EPA-certified Tier II or greater. *AND*,
 - Engine exhaust is greater than 100 feet from boundary of the facility.

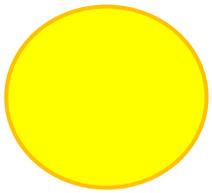
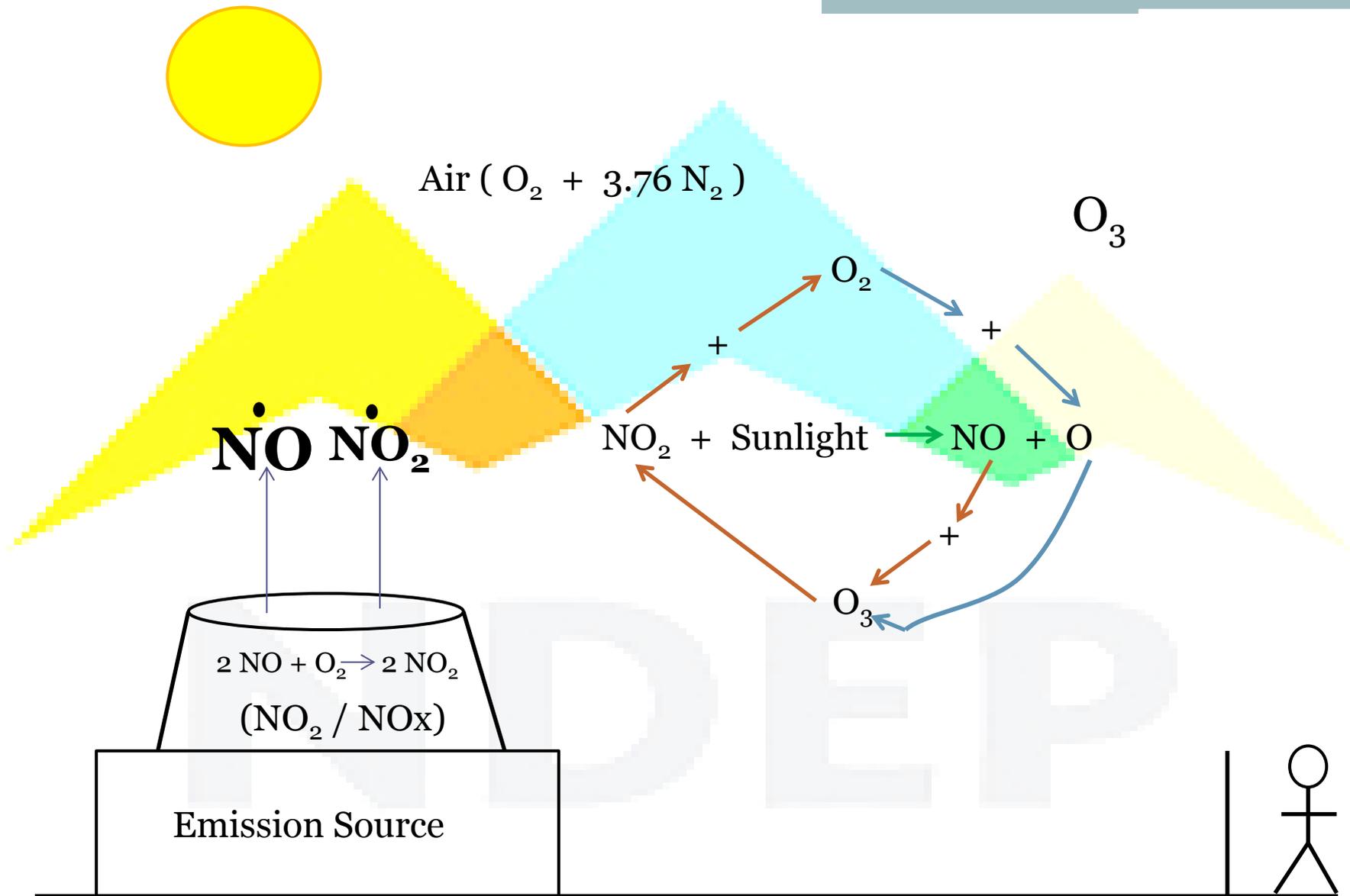
If we model, then how? First, Emission Rate

- EPA -> using the average hourly emission rate represents “a simple approach to account for the probability of the emergency generator [intermittent source] actually operating for a given hour.”
- EPA -> for cases where the operational frequency of the intermittent source is uncertain, assume continuous operation and model impacts based on annualized hourly emission rate rather than the maximum hourly emission rate.
- Therefore, if a proposed intermittent source had a limit of 500 hour/year or less, a modeling analysis could be based on assuming continuous operation at the average hourly rate, i.e., the maximum hour rate times 500 / 8,760. For example,

$$1 \text{ lb/hr} \times (500/8,760) = 0.057 \text{ lb/hr}$$

Next, Dispersion Model Settings

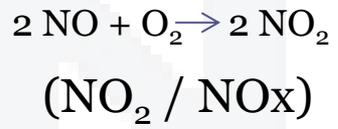
- NO₂ – EPA has proposed a three-tiered evaluation process for quantifying NO₂ mass emission rates for air dispersion modeling.
 - **Tier 1** assumes full conversion of NO_x to NO₂. That is, the applicant assumes all NO_x is emitted in the form of NO₂.
 - **Tier 2** employs an empirically-derived conversion ratio (NO₂/ NO_x), whereby the result from the Tier 1 value is multiplied by 0.80 for the ambient air (known as the ‘Ambient Ratio Method’). This tier (2) is available to a source when low-level releases occur with limited plume rise and ozone concentrations are likely to be relatively low. When using a ratio value other than 0.80, the analysis would be considered a Tier 3 evaluation.
 - **Tier 3** represents a general category of “detailed screening methods” which may be considered on a case-by-case basis.



Air (O₂ + 3.76 N₂)



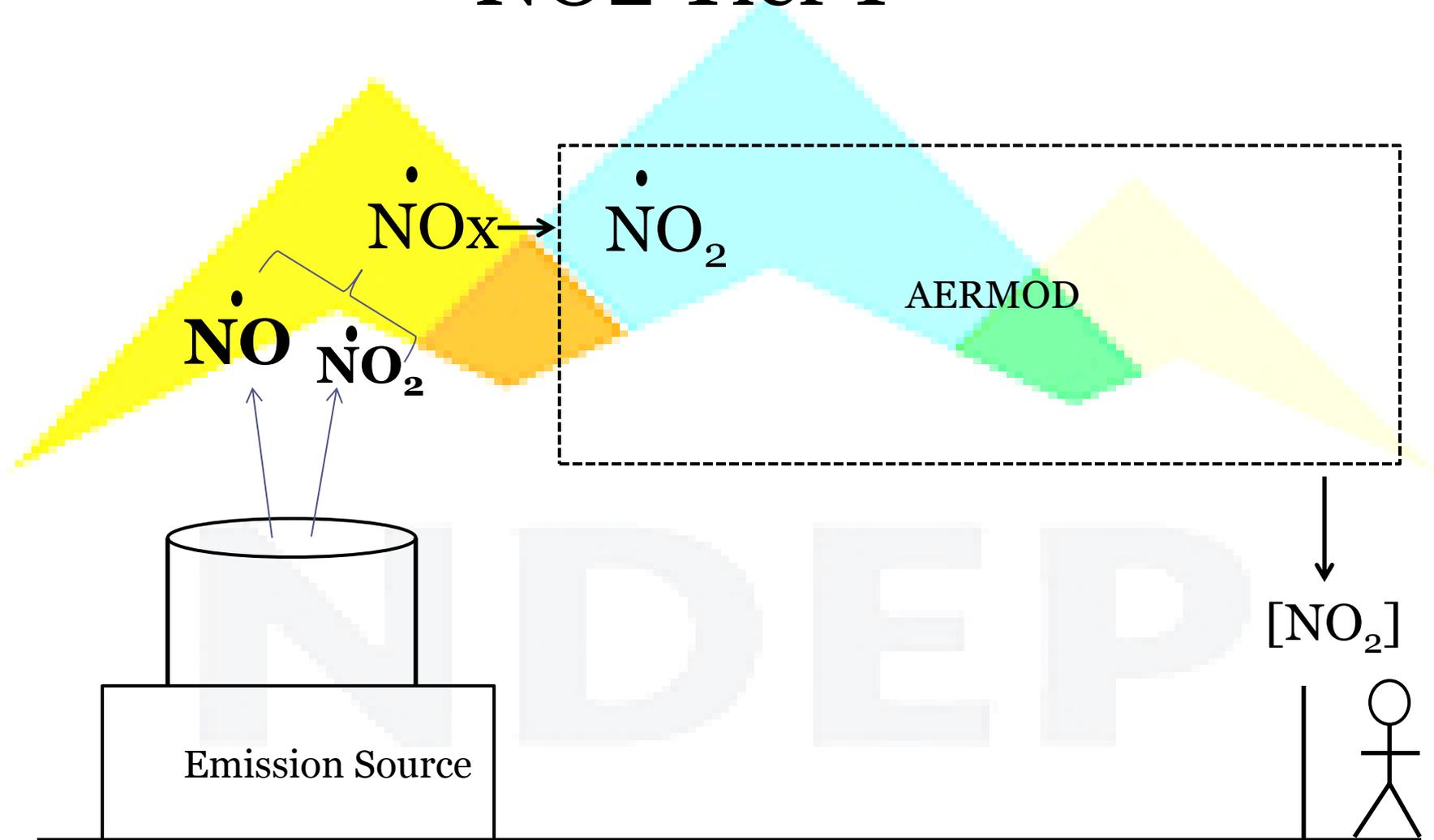
O₃



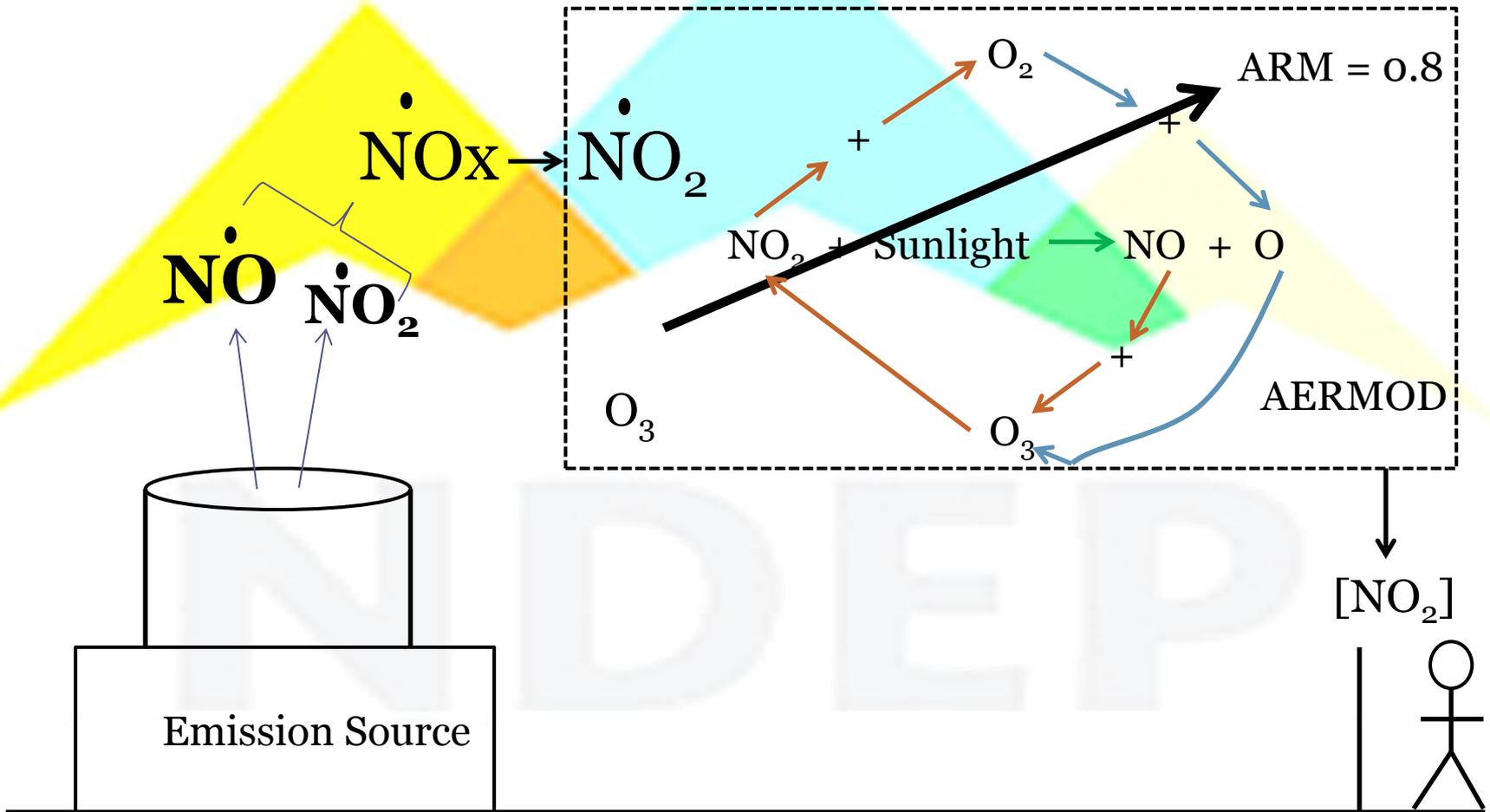
Emission Source

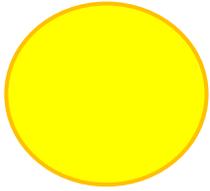
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NO₂ Tier I

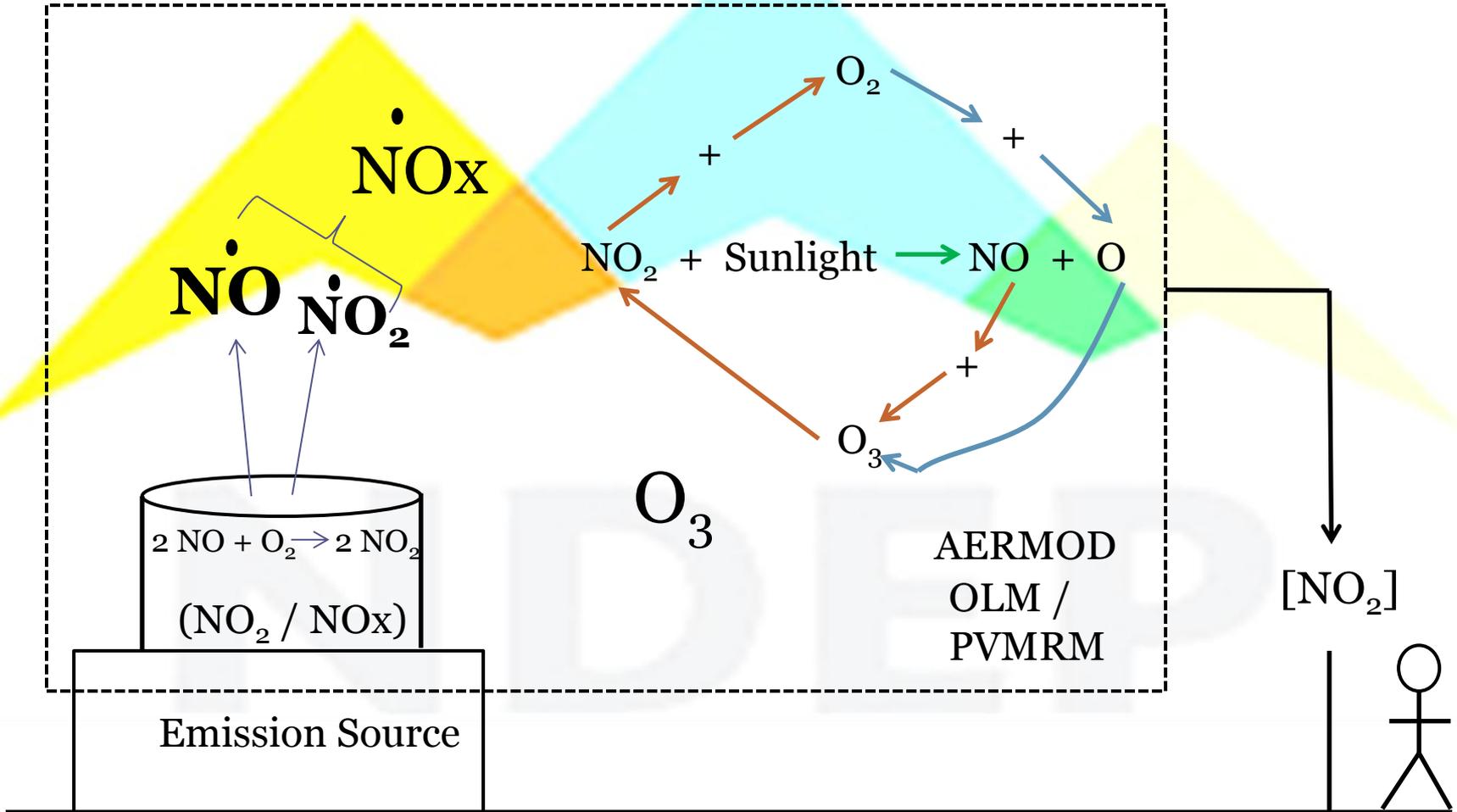


NO₂ Tier II





NO₂ Tier III



Modeling Requirements

- **Tier 1** approach may be used for all permit applications without additional support documentation with default AERMOD settings.
- **Tier 2** approach will require additional support documentation for all applications. Documentation would include acknowledgement of source-surrounding characteristics that meet applicable assumptions (as noted by the EPA in their June, 2010 memo).
- **Tier 3** approach will require substantial background information, and pre-approval via a model protocol is required.



Questions?

NDEP