Read the following statements carefully and indicate whether they are true or false. For partial credit (if your answers turn out to be wrong), summarize how exactly you arrived at your conclusions.

**F** The most reasonable air pollution control strategy in a location characterized by NOx-limited smog is the reduction of emissions of both nitrogen oxides and volatile organic compounds.

[Diagram: Yes! Not necessarily.]

**F** The minimum efficiency of a device which treats the exhaust gas from a combustor that emits 17 kg NO₂ per metric ton of 12,500 BTU/lb coal exceeds 50%. (Assume that the input-based legislated maximum is 0.7 lb NO₂/10⁶ BTU.)

\[
\begin{align*}
\frac{17 \text{ kg NO}_2}{\text{mt}} \times \frac{\text{lb}}{12,500 \text{ BTU/lb}} &= \frac{1.86 \times 10^6 \text{ lb NO}_2}{10^6 \text{ BTU (ch)}} \\
\text{Eff}_{\text{min}} &= \frac{1.36 - 0.7}{1.36} = 49\% \quad (<50\%)
\end{align*}
\]

**F** Output-based legislation of 130 ng SO₂ per joule of electricity exceeds 1.2 lb SO₂/MWh.

\[
\begin{align*}
\frac{130 \text{ ng SO}_2}{\text{J(e)}} \times \frac{1 \text{ g}}{10^9 \text{ ng}} \times \frac{1 \text{ lb}}{450 \text{ g}} \times \frac{3.6 \times 10^6 \text{ J(e)}}{1 \text{ MWh(e)}} &= 1.04 \frac{\text{lb SO}_2}{\text{MWh(e)}} \quad (<1.2)
\end{align*}
\]

**T** The surface-to-volume ratio of a spherical particle whose diameter is 2.5 micrometers exceeds 10 m²/m³.

\[
\frac{4\pi R^2}{\frac{4}{3}\pi R^3} = \frac{3}{6} = \frac{6}{2.5 \times 10^{-6} \text{ m}} = 2.4 \times 10^6 \frac{\text{m}^2}{\text{m}^3} \quad (\text{!}) \quad (>> 10)
\]

(Stay tuned...)

lrr3@psu.edu (last modified 04/05/2019)