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Climate Change VS. Smog

The Story

- California Dairy Farmer, John Fiscalini, has installed a methane capturing system that generates enough energy to sustain his farm.
- Methane capturing dairy farms in San Joaquin Valley being shut down.
- The combustion engine used to generate the electricity contributes to smog.
- The Federal air quality regulations in California over their limits, making the cut back of smog more important than reduction of climate change.
- NOx is associated with combustion engines like the methane generated engines on the dairy farm.
- NOx regulations are 11ppm
- NOx makes PM and ozone
- Animal Husbandry produces CH4 and Ammonia a precursor to particulate matter
- According to a news source Methane generators potentially:
    - Reduce H2S, VOC, and PM (How?)
    - Reduces Odor
- Point source Vs. Nonpoint source issue
- The installation of the generators on Fiscalini's farm costs 4 million dollars.
- The additional pollution controls on Fiscalini's farm cost 200,000 dollars.
- 2009 six generators shut down
- Produce less NOx than coal power plants, but no coal power plants are in the San Valley Air Pollution Control District
- San Joaquin Valley rules say need Best Available Control Technology for the area
- San Joaquin Valley Air Pollution Control district is targeting reduction in VOC and NOx

Textbook Chemistry

- Troposphere:
    - Oxidation of CH4
        - O'D +H2O->OH +OH
        - OH +CH4->CH3+H2O
        - CH3+O2+M-> CH3O2+M
        - CH3O2 +HO2-> CH4O2+O2 (dissolves in rain)
        - CH3O2 + NO-> CH3O + NO2 (preserves radical while also a source for NO2)
        - CH3O+O2-> CH2O + HO2
        - CH2O+ hv-> H+ HCO
        - HCO+ O2-> CO + HO2
    - NOx production of Ozone
        - NO2+hv-> O +NO
        - O + O2+ M -> O3 + M

        - OH + CO-> H + CO2
        - H + O2 + M -> HO2 + M
        - HO2 + NO -> OH + NO2 (production of ozone and source for NO2)
        - NO2 + O3-> NO3 + O2 (sink for ozone, but NO3 photolysis during day)
    - Peroxyacetyl nitrate (PAN)
        - CH3COO2(water soluble) +NO2 -> CH3COO2NO2 (PAN found in photochemical smog)
        - PAN can cause asthma, chest pain, headaches, coughing, asthma attacks
    - Heterogeneous Nox chemistry
        - NH3(g) + HNO3 (g) -> NH4NO3(s)
        - NaCl + HNO3 -> HCl(g) + NaNO3 (condensation)
- CH4 a Green House Gas
    - Long wavelength energy absorbed by CH4 increasing global temperature

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