

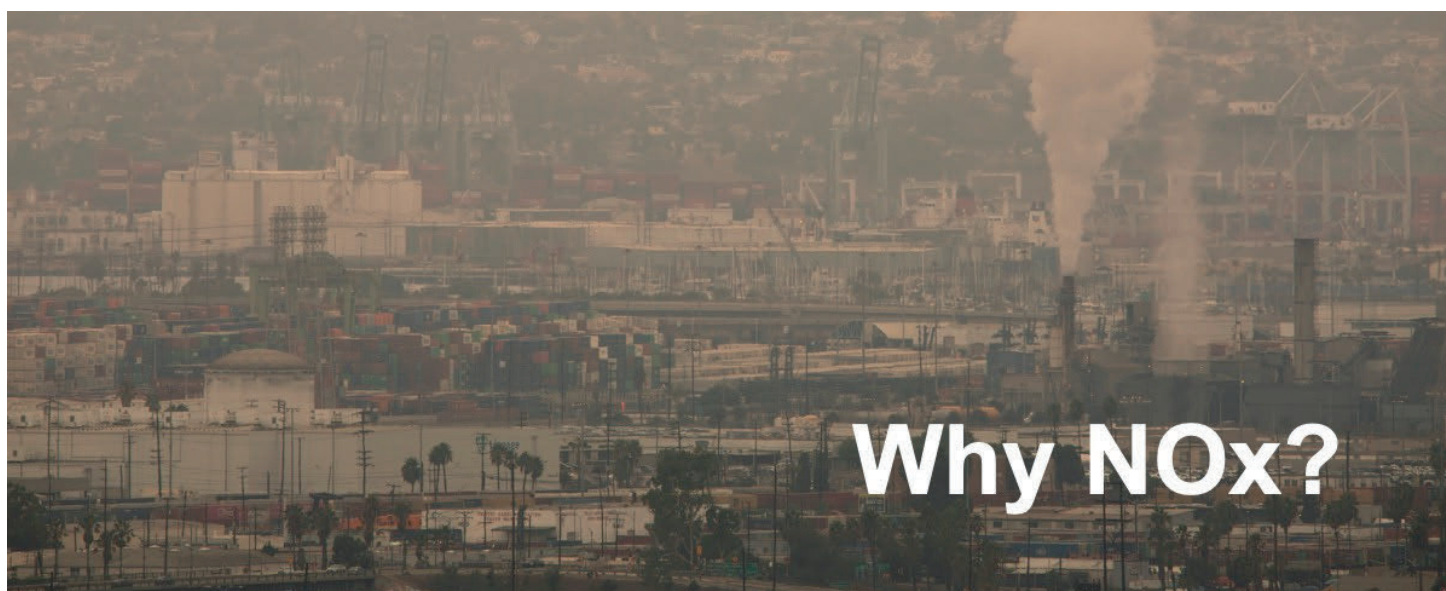


NOx, NOx — Who's There?

Decarbonizing Buildings Through Nitrogen Oxides Emissions Standards

Reducing emissions of nitrogen oxides (NOx) is key to attaining a variety of Clean Air Act standards that remain elusive. An innovative approach to regulating a particular source of NOx emissions — fossil-fueled water heaters — could help drive market transformation via the widespread adoption of cleaner and more energy-efficient electric heat pump models (like the one pictured at right).

RAP is developing a model rule that takes a dynamic approach to capping appliance NOx emissions, using existing water heater emission limits as a starting point and ramping down over time based on a schedule or formula. The emission limits would become tighter over time without requiring new rulemaking.

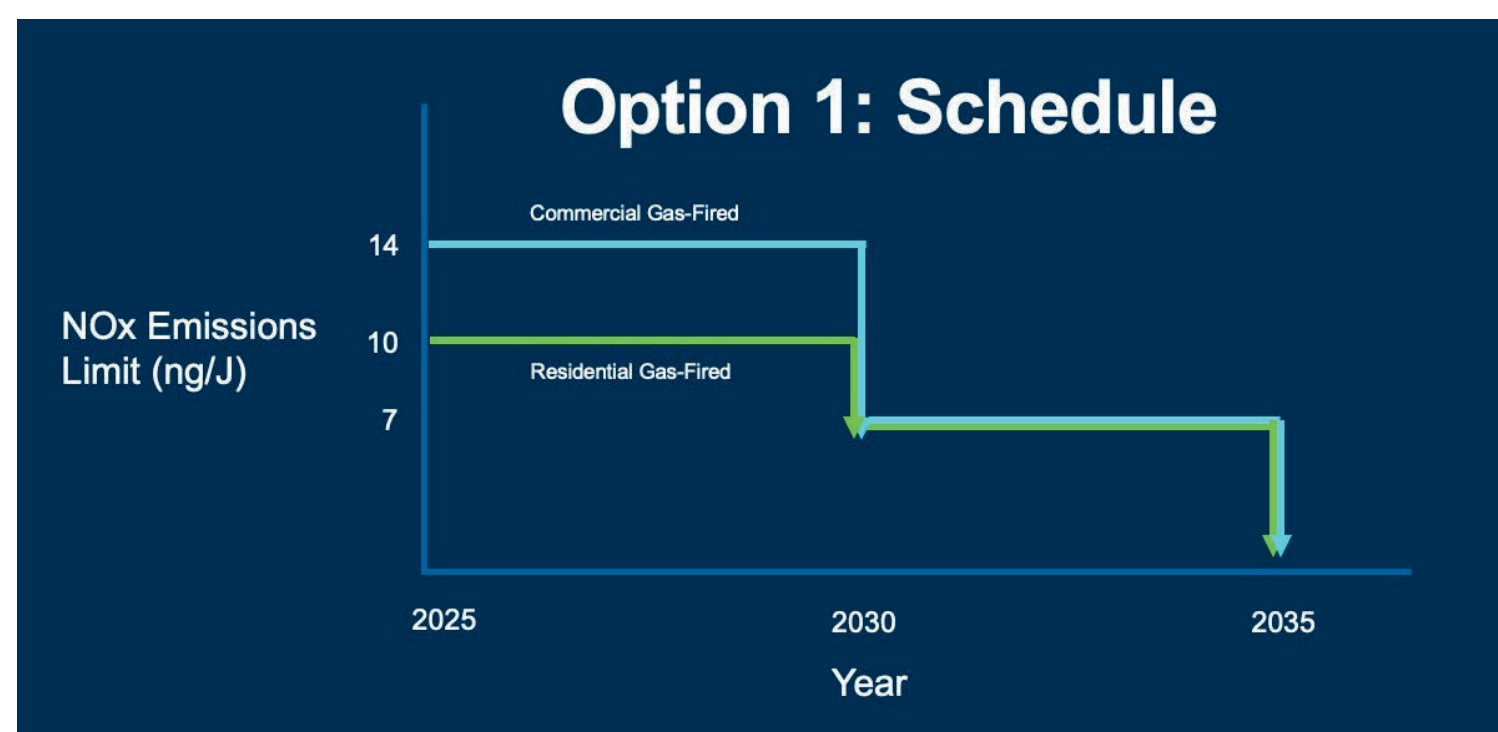


- Among the harmful effects of nitrogen oxides:
 - Summer smog
 - Reduced visibility in our national parks
 - "Eutrophication," an increase in nutrients in water bodies leading to algae blooms and fish kills



- 7 to 8 million water heaters are installed in the United States annually.
- Several states and regional air quality districts already regulate NOx from gas-fired water heaters.

Designing a Rule: Two Options



Limits for different categories of water heaters (including oil-fired and propane-fired water heaters, not shown) would decline at scheduled intervals

Option 2: Formula

$$EL_{\text{category, yearx}} = EL_{\text{category, [year1]}} \times \frac{EF_{\text{yearx}}}{EF_{\text{[year1]}}}$$

Limits would fall in proportion with reductions in power sector emissions

Considerations for Rulemaking

Access and affordability:

- Regulators must consider not just the cost of installation, but the lifetime cost of running the appliance.
- Rule design should accommodate barriers relating to housing type.

Manufacturers' role:

- Verify compliance through independent testing, as is currently done in California air districts.
- Manufacturer input is needed to design rules that work.