High Emitter Characterization

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MOVES GHG

- **The issue of high emitter characterization will not be addressed in MOVES GHG**
  - Primarily an issue with non-greenhouse pollutants
  - Will either assume that the effect of I/M programs is negligible or assign nominal benefit
- **Options presented today pertain to full MOVES implementation**
  - Seeking early input on different options
- **Initial focus is on accurate characterization of high emitters, keeping in mind how MOVES would model I/M**

Issues

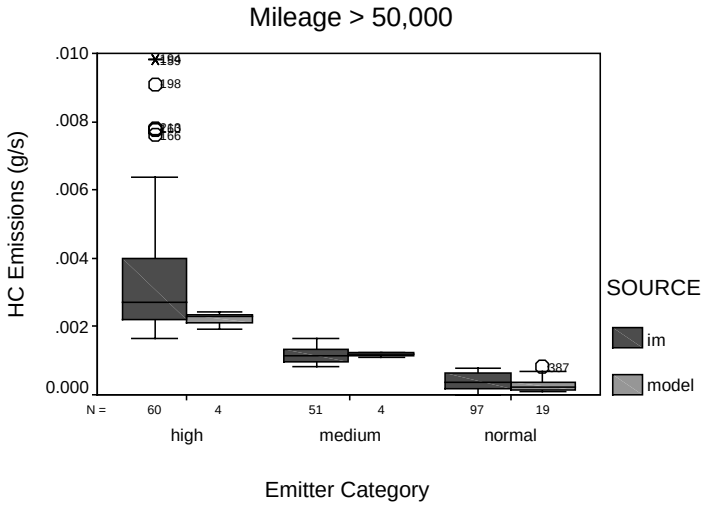
- **How can full range of high emitters be represented?**
- **How could local data be taken into account?**
- **How would I/M be modeled?**

Representing High Emitters

- **Traditional Approach**
  - Discrete emitter categories (e.g. “high” & “normal”)
  - Emission level = average within each category
  - Category weightings based on age
- **Proposed MOVES Approach**
  - Emissions expressed as parametric distributions instead of averages
  - Several options for implementing this

Why Distributions Matter

Box Plot of IM240 HC emissions by category



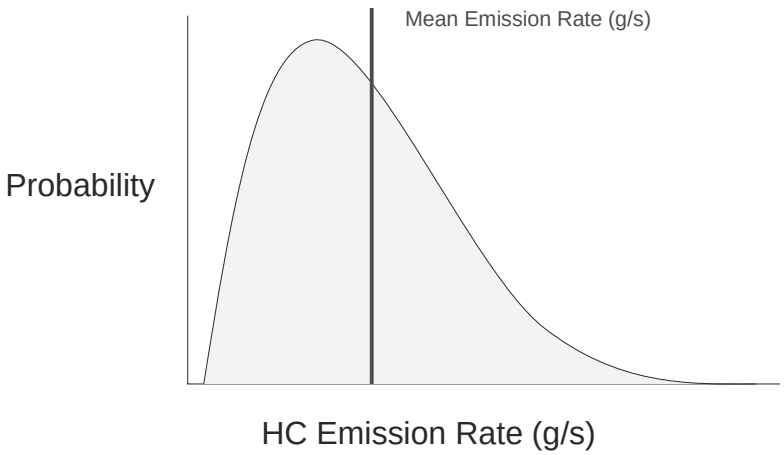
Representing Distributions

- **Single Distribution**
- **Discrete Categories**
  - Options:
    - Emitter categories
    - Malfunction categories
    - "Represented" and "Unrepresented" categories
- **Distributions could be used to help quantify uncertainty, via bootstrap/Monte Carlo**

Single Distribution

- **One parametric distribution per Source and Operating Mode Bin**
  - Primary method assessed in the NCSU work
- **Pros:**
  - Simplest framework
- **Cons:**
  - More difficult to link to specific repair effects
- **I/M modeling:**
  - Modify distribution to reflect repair, recompute average

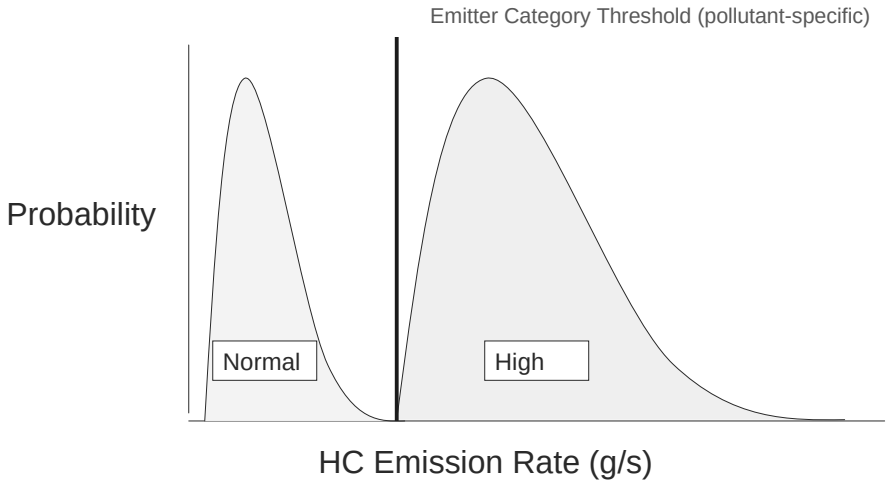
Single Distribution Illustration



Emitter Categories

- **Define category by emission level based on predetermined threshold, e.g:**
  - High
  - Normal
  - Medium
- **Fit parametric distribution within each category**
- **Emitter categories would be new "source bins"**
- **I/M modeling:**
  - Change weighting between emitter categories
  - Modify distributions within categories

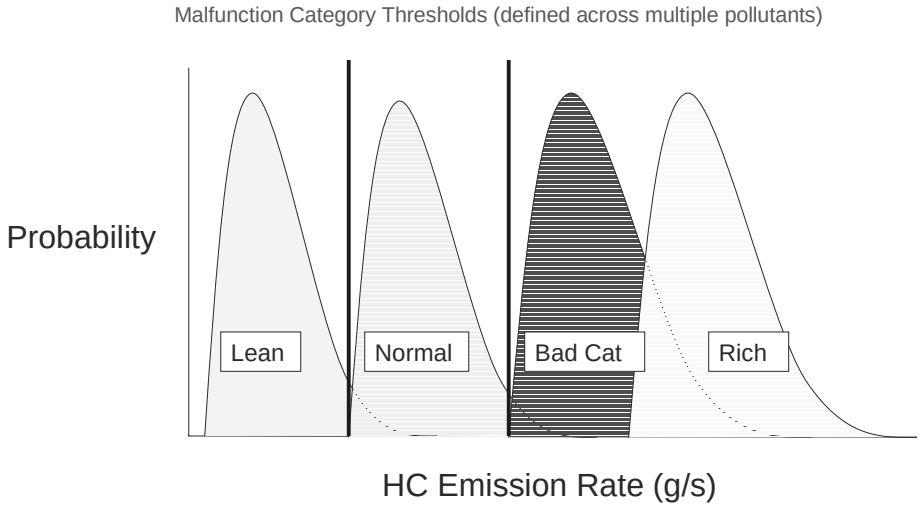
Emitter Category Illustration



Malfunction Categories

- **Used by UC Riverside's CMEM**
- **Define malfunction category based on multiple pollutant thresholds, e.g:**
  - Runs lean: (NOx high, HC/CO low)
  - Runs rich (HC/CO high, NOx low)
  - Bad catalyst (HC/CO/NOx high)
- **Could be linked more specifically to OBD malfunction/repair data**
- **I/M modeling:**
  - Change weighting between emitter categories
  - Modify distributions within categories

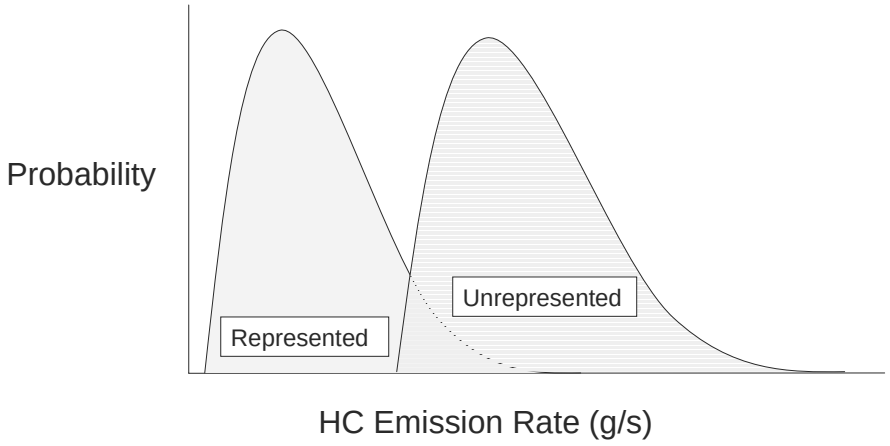
Malfunction Category Illustration



Unrepresented Category

- **Create new emitter category for data not represented in default model**
- **Would employ "mixture" distributions**
- **Would allow calibration to local data**
- **I/M modeling:**
  1. Calibrate to area with an I/M program (empirical)
  2. Change weighting between emitter categories, Modify distributions within categories

Unrepresented Category Illustration



Summary

- **Parametric distributions proposed to describe emission levels for non-GHG pollutants**
- **Three options for applying distributions:**
  - Emitter categories
  - Malfunction categories
  - Unrepresented category
- **Seeking input on these or other methods**