MOVES Fleet & Activity Inputs 1999 Base Year

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MOVES

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What is "Fleet & Activity Data?"

- **Vehicle Populations & Characteristics**
- **Vehicle Activity Descriptions**

  – Essential to any emissions inventory model
  – NOT data EPA typically collects directly
  – Often based on projections and allocations
  – Important source of uncertainty in emission inventory estimates

Characterizing the Fleet

- **Current difference in how activity and emission data sources characterize vehicles**
  - e.g. HPMS VMT Classes & EPA Certification Classes
  - MOBILE guidance includes external HPMS/EPA mapping

- **MOVES integrates activity and emission data:**
  - Source Types
    - defined by unique activity patterns, based on HPMS classes
  - Source Bins
    - defined by unique emission characteristics
  - MOVES maps between the two classification schemes by model year.

MOVES Source Types

HPMS Vehicle Type	MOVES Source Type
Motorcycle	Motorcycle
Passenger Car	Passenger Car
Other 4-tire, 2 axle	Passenger Truck Light Commercial Truck
Buses	Intercity Bus Transit Bus School Bus
Single Unit Trucks	Refuse Trucks Short-haul Single Unit Long-haul Single Unit Motorhomes
Combination Trucks	Short-haul Combination Long-haul Combination

Source Bins

- **Discriminators by "Pollutant"**
  - Energy:
    - Fuel Type, Engine Technology, Model Year Group, Loaded Weight, Engine Size
  - CH4 & N20:
    - Fuel Type, Engine Technology, Model Year Group, Regulatory Class

Characterizing Activity

- **Total Activity**
  - Population * per-vehicle activity
  - Defined on time basis (activity per hour)

- **Operating Mode**
  - Division of total activity into sub-categories that differentiate emissions
  - Defined by Speed and Vehicle Specific Power
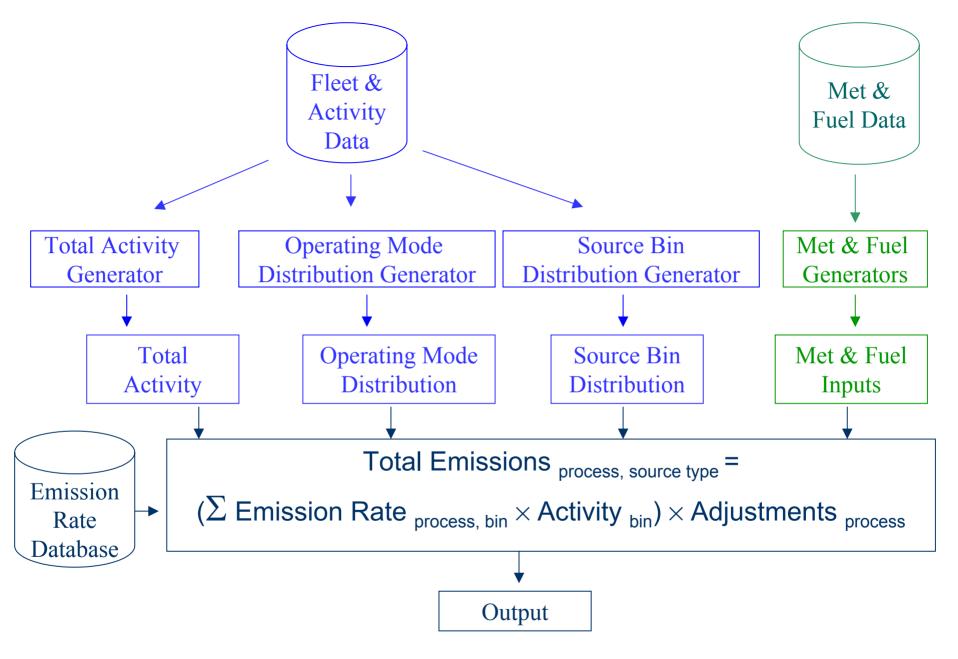
Structure of Fleet & Activity Data in MOVES

- **Default database stores implementation-specific data**
  - In this case -- national macroscale data for MOVES2004
  - Format similar to data sources so relatively easy to obtain & update.
- **Generators convert default data into Core Model Inputs**
  - Highly detailed data in MOVES-specific format
  - Format consistent across implementations

```
                        ┌─────────┐                              ┌─────────┐
                        │ Fleet & │                              │  Met &  │
                        │Activity │                              │Fuel Data│
                        │  Data   │                              │         │
                        └─────────┘                              └─────────┘
            ┌───────────────┼───────────────┐                         │
            ▼               ▼               ▼                         ▼
┌────────────────┐ ┌──────────────────┐ ┌──────────────────┐ ┌──────────────┐
│ Total Activity │ │ Operating Mode   │ │   Source Bin     │ │ Met & Fuel   │
│   Generator    │ │Distribution      │ │Distribution      │ │ Generators   │
│                │ │   Generator      │ │   Generator      │ │              │
└────────────────┘ └──────────────────┘ └──────────────────┘ └──────────────┘
        │                  │                    │                   │
        ▼                  ▼                    ▼                   ▼
  ┌──────────┐      ┌──────────────┐     ┌──────────────┐   ┌──────────────┐
  │  Total   │      │Operating Mode│     │  Source Bin  │   │  Met & Fuel  │
  │ Activity │      │ Distribution │     │ Distribution │   │   Inputs     │
  └──────────┘      └──────────────┘     └──────────────┘   └──────────────┘
```

$$\text{Total Emissions}_{process,\ source\ type} =$$

$$\left(\sum \text{Emission Rate}_{process,\ bin} \times \text{Activity}_{bin} \right) \times \text{Adjustments}_{process}$$

Emission Rate Database

Output

Structure of Fleet & Activity Inputs in MOVES

Total Activity Generator Inputs

- **Generating Analysis Year Populations by Source Type & Age**
  - Base year vehicle populations
  - Scrappage rates
  - Sales growth rates
  - Age distributions

Total Activity Generator Inputs

- **Estimating Travel by Source Type, Age, & Road Type**
  - Base Year VMT by Vehicle Type
  - VMT Growth Rates by Vehicle Type
  - Relative Mileage Accumulation Rates
  - Road type VMT fractions by Source Type

Total Activity Generator Inputs

- **Converting to time basis & allocating activity in time & space**
  - Temporal VMT distributions (Month, Day, Hour)
  - Distribution of Roadway VMT by county
  - Allocations of starts in time & space
  - Allocation of HD extended idle in time & space
  - Average speed distributions

Source Bin Generator Inputs

- **Allocating Source Types to Source Bins by Source Type and Model Year**

  – Fuel/Engine Technology Distributions

  – Regulatory Class Distributions

  – Size/Weight Distributions

  – Model Year Groups

Operating Mode Distribution Generator Inputs

- **Allocating Source Hours Operating to Operating Modes**
  - Average Speed Distributions
  - Driving Schedules
  - VSP coefficients by Source Type
    - average weight
    - rolling, rotating & drag coefficients

Speed & Drive Schedules

- **Average Speed Distributions**
  - By hour, day & roadway type
  - Currently based on MOBILE6
- **Driving Schedules**
  - By source types, roadway type & average speeds
  - Defaults
    - New MHDV and HHDV schedules developed by ERG based on heavy-duty driving surveys
    - MOBILE6 facility cycles used for LD, with new high-speed schedules
    - WVU cycles for urban bus, refuse truck

Where do we get default national data?

- **Polk-- Registration data, especially used for light duty**

- **VIUS97 -- Census survey of truck data**

- **FHWA-- VMT data and registration data**

- **NEMS-- VMT projections**

- **Specialized sources:**
  - Federal Transit Administration
  - Recreational Vehicle Industry Assoc.
  - Motorcycle Industry Council
  - School Bus Fleet Magazine
  - etc.

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Final Notes

- **Fleet & Activity data are critical inputs to total emission inventory**

- **Like MOBILE6, most data compiled from non-EPA sources**

- **Unlike MOBILE, MOVES is designed to take available data and transform into needed core model inputs**

- **Fleet & Activity Report provides details**