EPA's New Tool: AVERT Webinar

US Environmental Protection Agency
State Climate and Energy Program
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United States Environmental Protection Agency

Enhancing EPA's Energy Efficiency and Renewable Energy (EE/RE) Resources

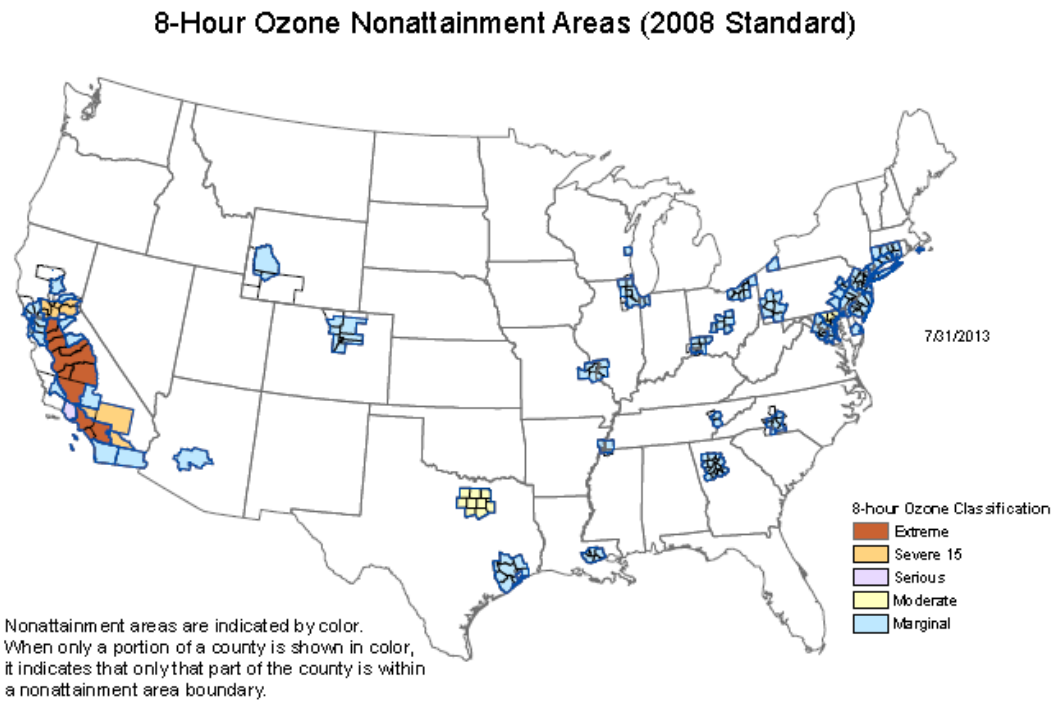
In 2009, EPA:

- Began to renew our effort to encourage and remove barriers to EE/RE programs
  - Initial effort started early 2000's
- Looked for ways to make it easier to include emission benefits of EE/RE programs to meet clean air goals
- Wanted to send a signal that these are viable, cost effective emission reduction strategies
  - Focused our efforts on air quality plans (e.g., State Implementation Plans (SIPs) for National Ambient Air Quality Standards (NAAQS))

Many States Required to Develop State Implementation Plans

State Air Quality Planning

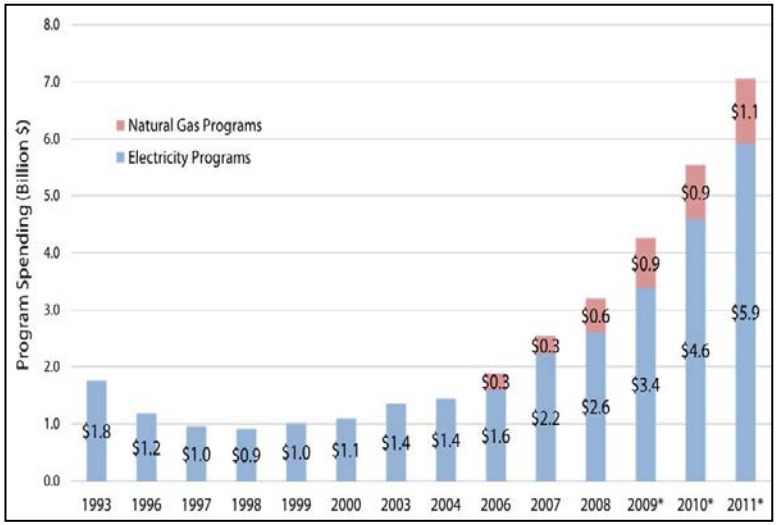
- EPA sets National Ambient Air Quality Standards (NAAQS)
- States in nonattainment have to prepare State Implementation Plans (SIPs), to show how they'll meet each standard



Capturing the AQ Benefits of Energy Efficiency and Renewable Energy (EE/RE)

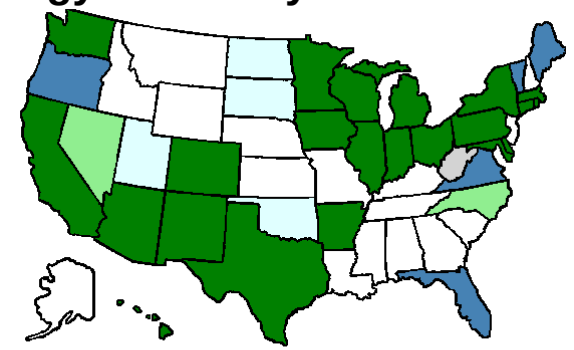
- State air regulators looking for new ways to lower emissions, improve air quality
- Meanwhile, PUCs and SEOs advancing proven EE/RE policies and programs
- Opportunity for states to include the emissions benefits in air quality plans
- In 2012, EPA released the EE/RE SIP Roadmap and began developing AVERT and state energy impacts.

Energy Efficiency Program Spending



Source: ACEEE, 2012 “2012 State EE Scorecard”

Energy Efficiency Resource Standards



Source: C2ES

Overview of AVERT Development for Energy Efficiency and Renewable Energy (EE/RE) Programs

- AVERT (AVoided Emissions and geneRation Tool) translates the energy impacts of EE/RE policies and programs into emission reductions (NO_x, SO_2, and CO_2)
  - It aims to address a key reason states have not implemented previous EE/RE State Implementation Plan (SIP) guidance
- AVERT has been thoroughly reviewed, well documented and tested. EPA has:
  - Conducted external and internal peer reviews
  - Benchmarked AVERT against industry standard electric power sector model – PROSYM
  - Worked with states to beta-tested tool for functionality, appropriate uses, and clarity of user manual
- AVERT was built to be:
  - user friendly
  - transparent
  - credible

For more information on EPA's Roadmap for Incorporating EE/RE Policies and Programs in SIPs visit: http://www.epa.gov/airquality/eere/manual.html

Emission Quantification Methods
Basic to Sophisticated

Basic Method

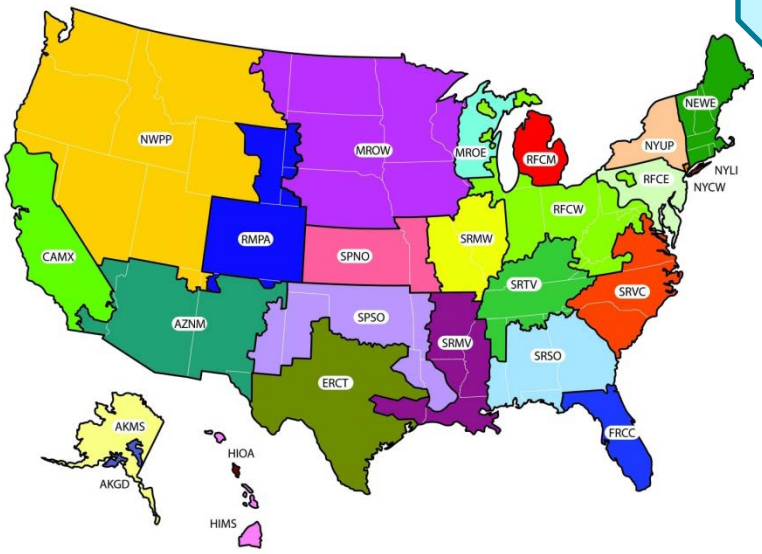
eGRID region non-baseload emission rates

Intermediate Method

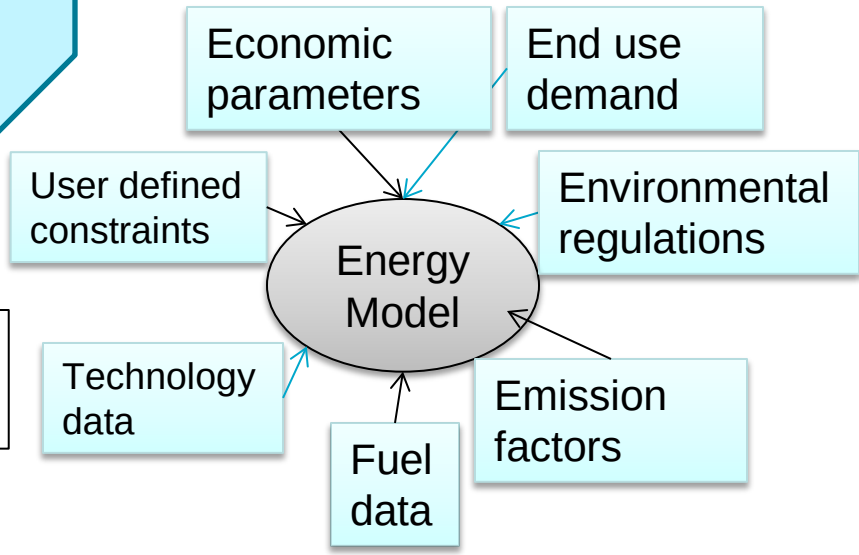
Historical hourly emission rates

Sophisticated Method

Energy Modeling



AVERT
AVoided Emissions and geneRation Tool
www.epa.gov/avert



Applications for AVERT-Calculated Emissions

- SIP credit in a state's National Ambient Air Quality Standard Clean Air Act Plan*
- Analyze emission impacts of an EE/RE program portfolio
- Understand emission reductions during High Electric Demand Days
- Identify location of emission reductions at the regional, state and county levels
- This is not a projection tool, not intended for analysis more than 5 yrs from baseline

* With the concurrence of the appropriate EPA regional office

What is AVERT?

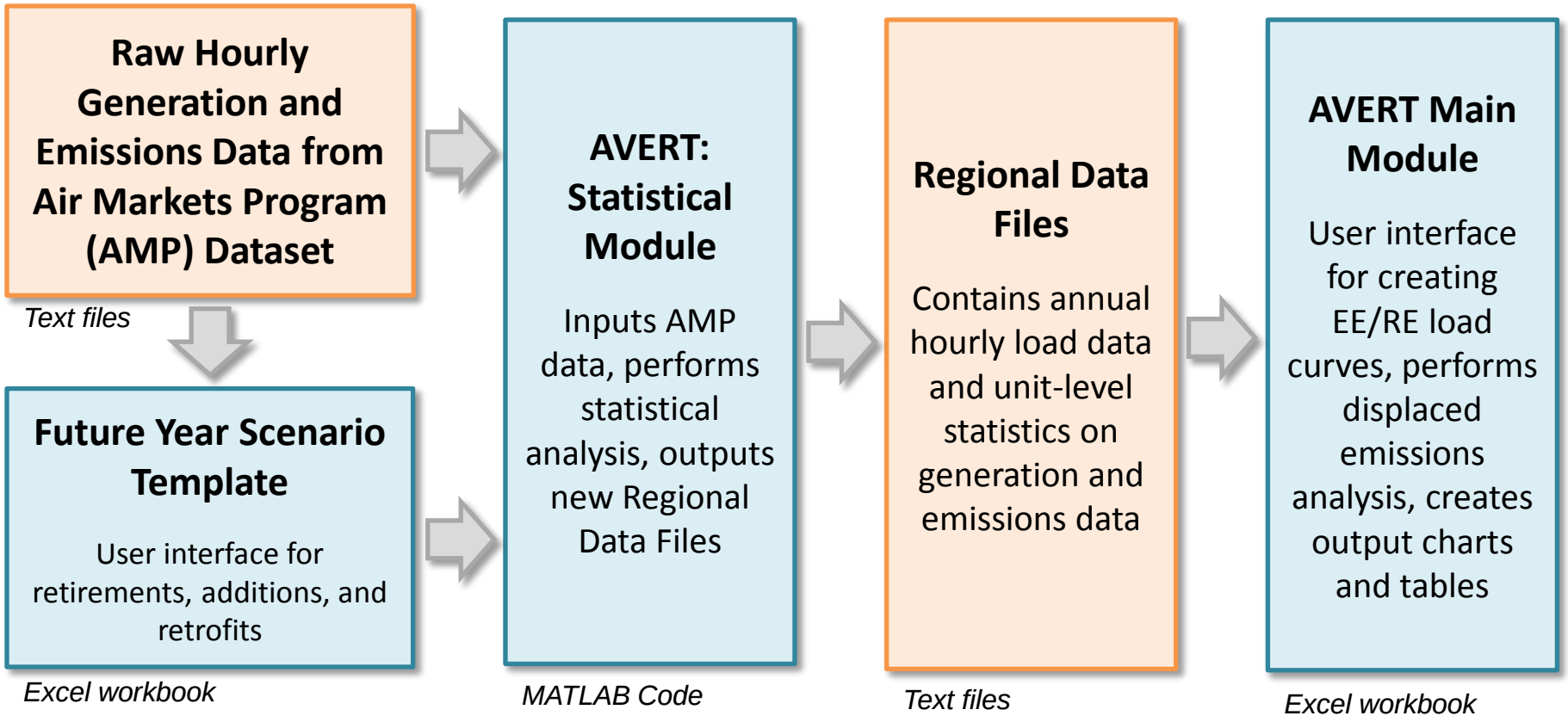
- Using data-driven analysis, how do we distinguish *which* generators respond to marginal changes in load reduction?
  - Rich dataset from EPA Clean Air Markets division (hourly, unit-by-unit generation & emissions)
  - Gather statistics on unit operations under specific load conditions, and then replicate changes through a Monte Carlo analysis

What is AVERT?

- AVERT's simulates the hourly changes in generation and air emissions (NO_x, SO_2, and CO_2) at EGU resulting from EE/RE policies and programs.
- User input: MWhs saved from EE programs, or wind and solar generation (MW)
  - Multiple options are built into the tool
  - EPA provides hourly profiles for some states with on-the-books EE programs not included in Energy Information Administration's Annual Energy Outlook (2013)
- User can retire, add and change emission rates of EGU and re-run simulation using AVERT's Future Year Scenario Template and Statistical Module.

For information on state EE on-the-books hourly profiles visit:
http://www.epa.gov/statelocalclimate/state/statepolicies.html

AVERT's Modules and Data Files

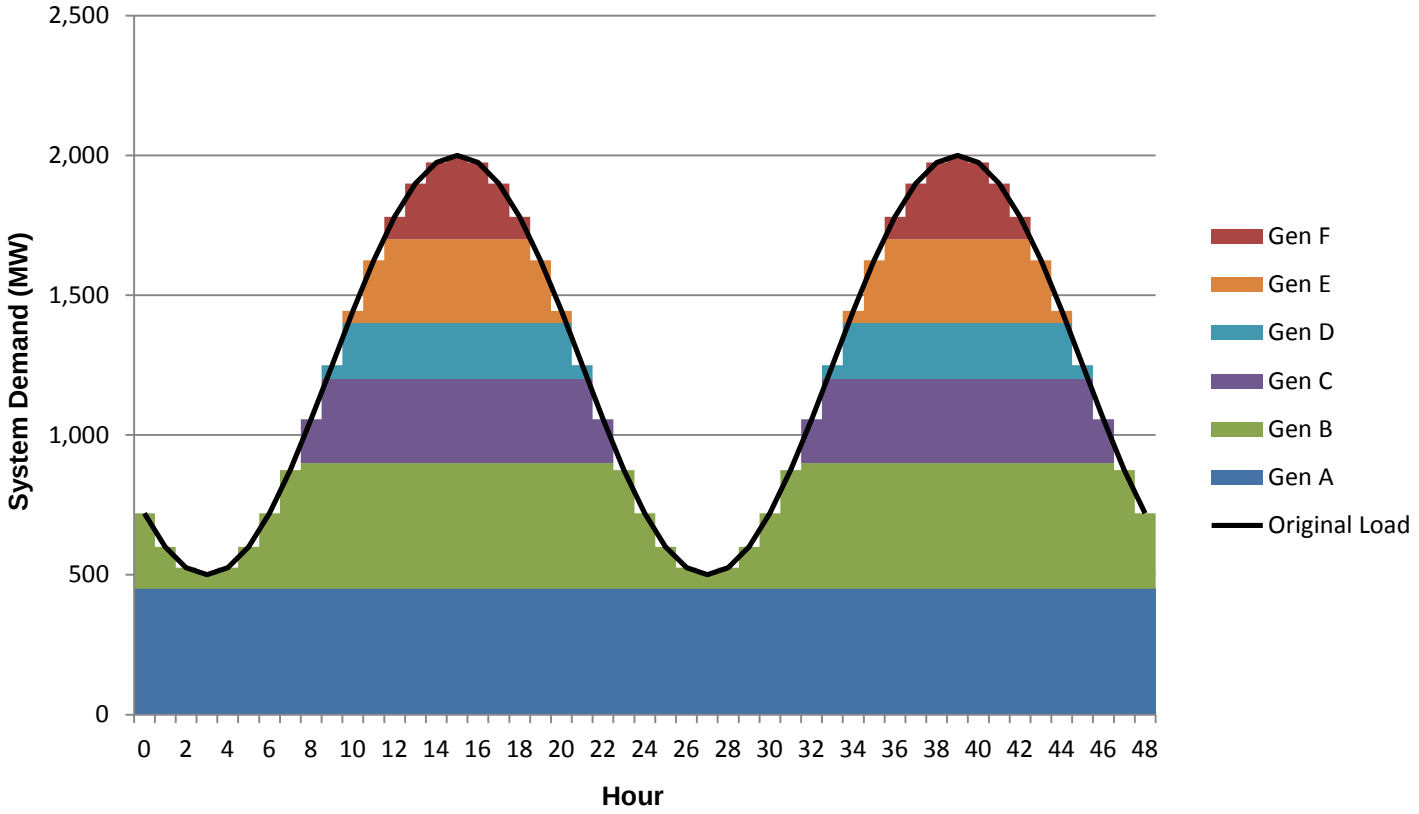


Most users will only need to use the Regional Data Files and AVERT Main Module to calculate emissions

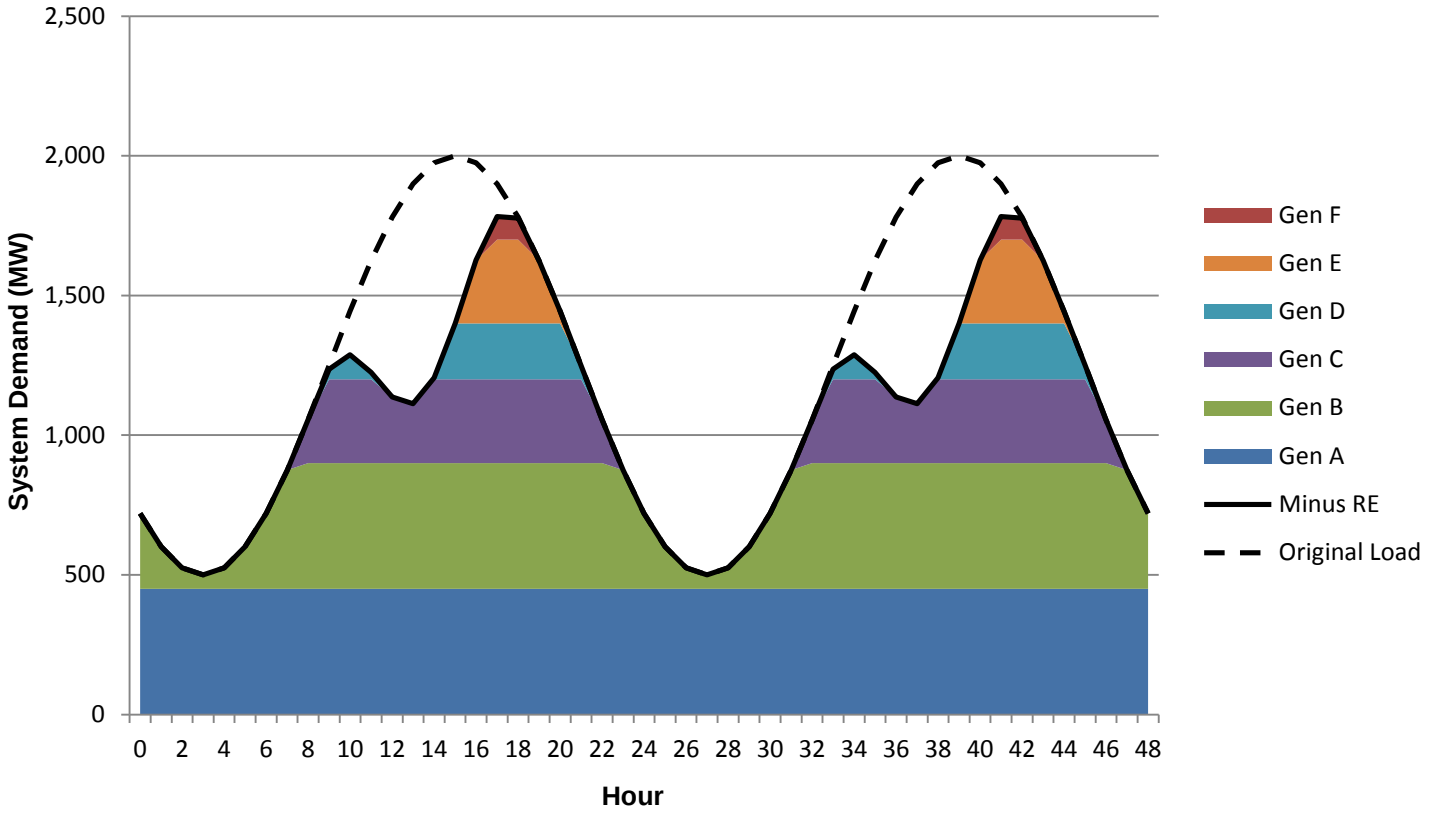
AVERT's Data Driven Analysis

- AVERT uses a data-driven analysis to distinguish which EGU respond to marginal changes in load reduction.
  - AVERT analyzes EGU datasets from EPA's Air Markets and Program Data (hourly, unit-by-unit generation & emissions)
    - Dataset includes EGUs with capacity of 25 MWs or greater
  - AVERT's Statistical Module gathers statistics on EGU operations under specific load conditions, and then replicates changes through a Monte Carlo analysis
  - AVERT's Regional Data Files contain hourly and unit-level emissions and generation data

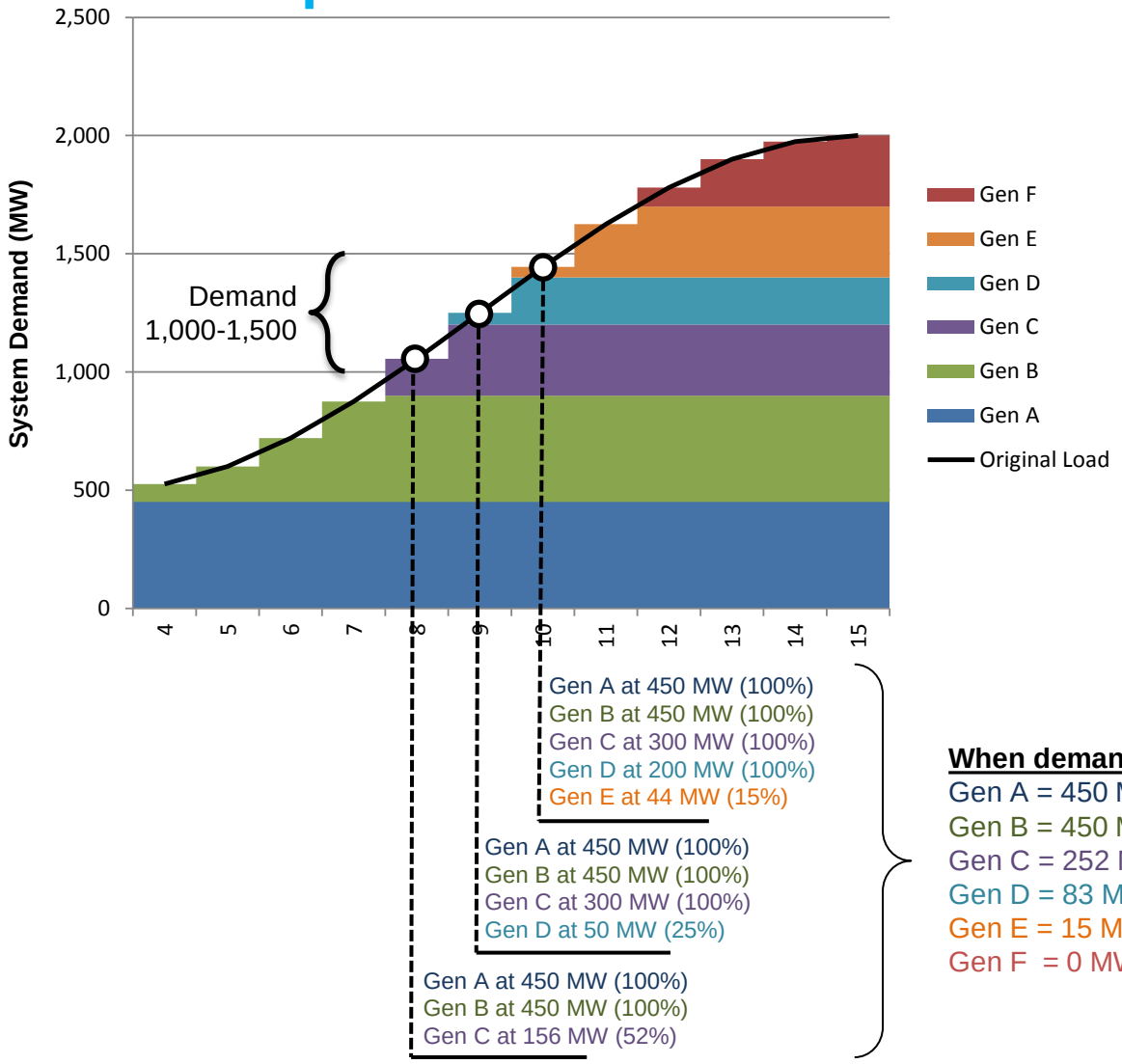
AVERT Overview
Example: Loading order



AVERT Overview
Example: Loading order



AVERT Overview
Example: Generation Statistics



When demand = 1,000-1,500 MW:
Gen A = 450 MW (100%)
Gen B = 450 MW (100%)
Gen C = 252 MW (84%)
Gen D = 83 MW (42%)
Gen E = 15 MW (5%)
Gen F = 0 MW (0%)

AVERT Main Module
Step-by-Step Overview

- Step 1. Load Regional Data File for historic baseline year
- Step 2. Set energy efficiency and renewable energy data
- Step 3. Run displacement
- Step 4. Display outputs

AVERT Statistical Module Overview

- Purpose
  - Basis of AVERT analysis
  - Processes raw CAMD data to determine behavioral characteristics of fossil-fired EGU
  - Returns expected generation and emissions behavior to AVERT Main Module
  - Allows users to alter EGU characteristics, retire and add EGU with Future Year Template
- Advanced use of AVERT
  - Most users will not require the Statistical Module
  - Based in MATLAB
  - Executable version available for public use
  - Requires MATLAB Compiler Runtime (MCR) to be installed (free from Mathworks)
- **Output file can be used directly in Main Module**

AVERT Future Year Scenario Overview

- Purpose
  - AVERT is not forward-looking: cannot predict EGU retirements, new additions, or emissions modifications
  - Future Year Scenarios allow users to
    - Remove EGU from analysis
    - Include additional proxy EGU
    - Modify emissions characteristics
- Advanced use of AVERT
  - Excel spreadsheet
  - Read into AVERT Statistical Module
- Each spreadsheet becomes a scenario
  - Spreadsheet becomes input file for AVERT Statistical Module
  - Each future year scenario template is specifically designed to match the same historic base year

AVERT DEMONSTRATION

For More Information

- Visit the AVERT website at www.epa.gov/avert.
  - Online training will be available Spring 2014
- Questions about AVERT?
  - Contact EPA's State and Local Climate and Energy Program at avert@epa.gov.