ERTAC EGU Projection Tool Training Class

CMAS April 13, 2015

Julie McDill, PE

Class Focus

- **Provide Information on ERTAC**
  - What is ERTAC?
  - Why did ERTAC develop the EGU Tool?
  - How is the EGU Tool being used?
- **Learn how to run the EGU Tool**
  - GOAL: Each person runs the EGU Tool from start to finish three times
    - Preprocessor->projection processor->criteria pollutant post processor = One Run
    - Two training cases and one actual region
  - GOAL: Each person has a basic understanding of the input files so that he or she is able to develop specific trial runs answering questions that are of interest to their organization

Class Housekeeping

- Ask as many questions as you want!
- Take as many breaks as you need!
- Excessive use of cell phones may hurt your instructors' feelings…..

Instructors

- **Julie McDill**, PE: Senior Environmental Engineer, Mid-Atlantic Regional Air Management Association (MARAMA)
  - (443) 901-1882
  - jmcdill@marama.org
- **Byeong-Uk Kim**, Ph.D.: Environmental Modeler, Georgia Department of Natural Resources
  - (404) 362-2526
  - byeong.kim@dnr.state.ga.us
- **Doris McLeod**: Air Quality Planner, Department of Environmental Quality
  - (804) 698-4197
  - doris.mcleod@deq.virginia.gov
- **Jin-Sheng Lin**, Ph.D.: Senior Photochemical Modeler, Virginia Department of Environmental Quality
  - (804) 698-4412
  - jin-sheng.lin@deq.virginia.gov
- **Mark Janssen**: Lake Michigan Air Directors Consortium (LADCO) Emissions Modeler/System Administrator,
  - (847) 720-7882
  - janssen@ladco.org
- **Joseph Jakuta**: Environmental Associate, Ozone Transport Commission (OTC)
  - (202) 508-3839
  - jjakuta@otcair.org

Who Has Not Loaded the Necessary Files on their Machines?

- *{FILENAME HERE}*

- *If you haven't done this yet, let one of the instructors know.*
- *They will help you get set up during the next few presentations.*

ERTAC EGU: Background

Eastern Regional Technical Advisory Committee (ERTAC)

ERTAC convenes ad-hoc groups to solve inventory problems

Collaboration:

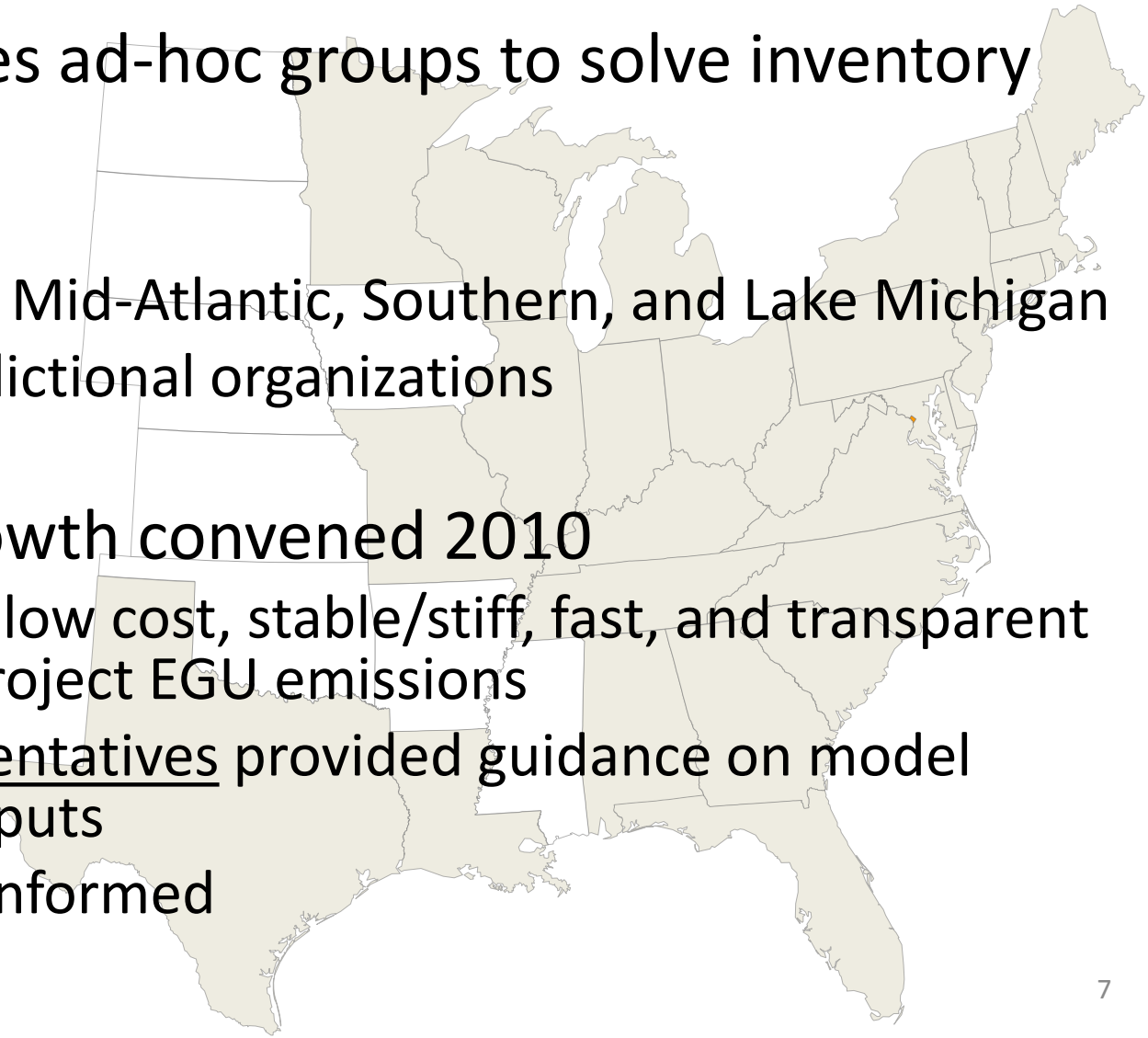
- States - NE, Mid-Atlantic, Southern, and Lake Michigan
- Multi-jurisdictional organizations
- Industry

ERTAC EGU growth convened 2010

Goal: Build a low cost, stable/stiff, fast, and transparent model to project EGU emissions

Utility representatives provided guidance on model design & inputs

USEPA: Kept informed



Why Was Such a Tool Needed?

- EGU Inventories Important for a Variety of Clean Air Act Requirements
  - Inventories needed for SIP and CAA mandates such as:
    - Reasonable Further Progress
    - Contingency Development
    - Maintenance Plan Out Year Development
  - Inventories needed for air quality modeling
    - Visibility analyses under Regional Haze
    - Ozone/$PM_{2.5}$ analyses for NAAQS Compliance and Transport Obligations
- Base Year and Future Years May Vary
  - Base years:
    - 2002 for the 1990 Ozone NAAQS
    - 2007 for the 1997 Ozone NAAQS, 1997 $PM_{2.5}$ NAAQS
    - 2011 for the 2006 $PM_{2.5}$ NAAQS, 2008 Ozone NAAQS
    - 2012 for the proposed 111(d) CO_2 rule
    - 2014??? for the 2015 Ozone NAAQS?
  - Future years:
    - 2008, 2009, 2010 needed for the 1997 Ozone NAAQS and 1997 $PM_{2.5}$ NAAQS
    - 2017, 2018 needed for the 2008 Ozone NAAQS and first Regional Haze SIP
    - 2015, 2018, 2020, 2025 needed for various maintenance plans
    - 2028 needed for second Regional Haze SIP
- Projection Tool Needed that is Flexible, Inexpensive, and Acceptable to State IT departments!

ERTAC EGU Subcommittees & Co-Chairs

Committee Co-chairs

Laura Mae Crowder, WV DEP
Bob Lopez, WI DE
Danny Wong, NJ DEP

Subcommittees and Leads

Implementation/Doris McLeod VA, Mark Janssen, LADCO
Create logic for software

Growth/Bob Lopez, WI & Laura Mae Crowder, WV
Regional specific growth rates for peak and off peak

Data Tracking/Wendy Jacobs, CT
Improve default data to reflect state specific information

Renewables & Conservation Programs/Danny Wong, NJ
Characterize programs not already included in growth factors

Resources For ERTAC EGU Tool Development

- There weren't many….
  - A LOT of state staff time
  - A LOT of multi-jurisdictional organizations' (MJOs) staff time (MARAMA/LADCO mainly)
  - About $65,000 total for programming expenses, contributed by LADCO, MARAMA & SESARM
- Don't expect cool GUI interfaces
  - (no money for that)
- Don't expect GIS mapped outputs
  - (no money for that either)

Attributes of ERTAC Projection Tool

- Region specific growth rates for peak/off-peak
- Unit-specific fossil fuels (e.g., coal, gas, oil)
  - RE/EE and nuclear considered in growth factors
- Calculates future hourly estimates on unit-specific basis.
- Tests hourly reserve capacity.
- Quickly evaluates various scenarios (e.g., unit retirements, demand growth, fuel switching, and control measures)
- Data intensive – depends on state-supplied data.
- Code is not proprietary; available at no cost.

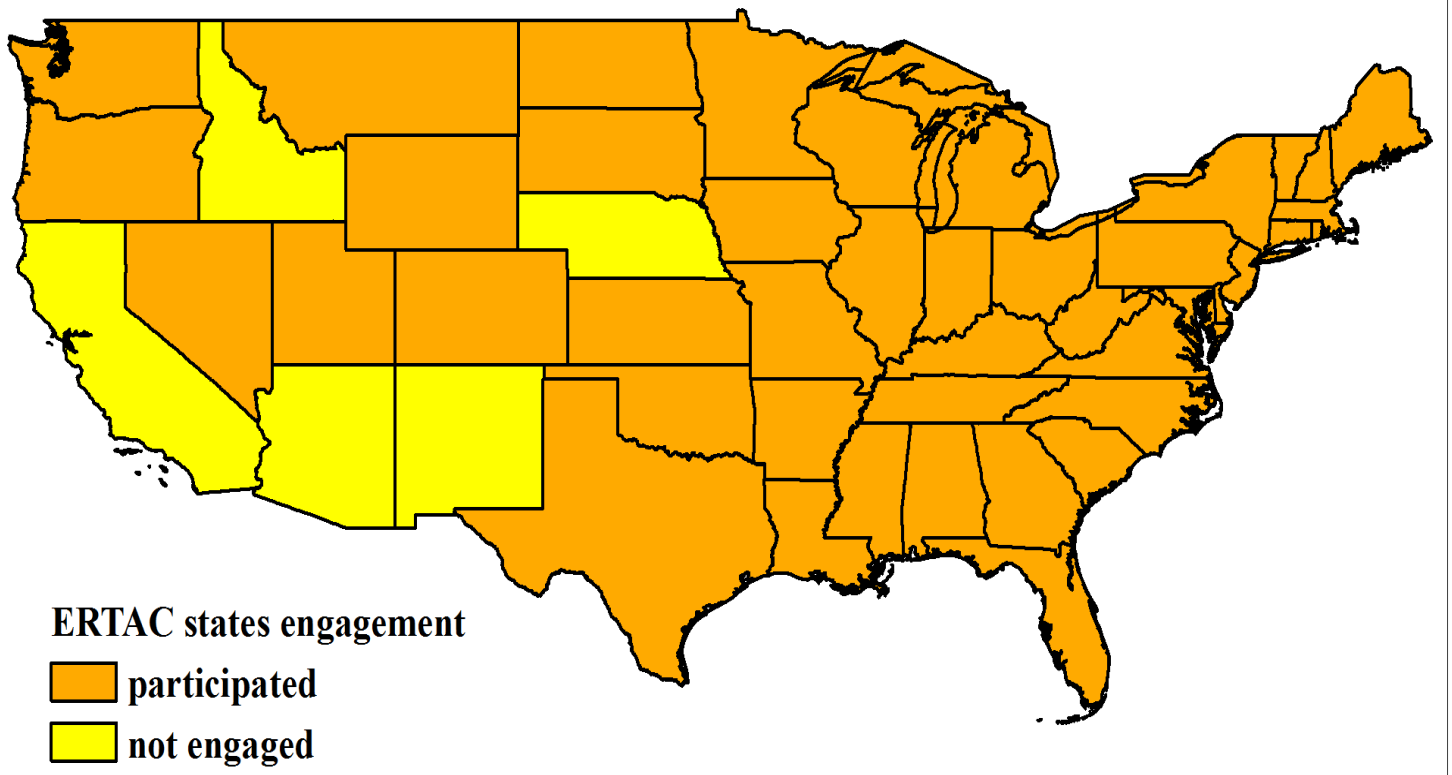
ERTAC Inputs

- Emission Unit Start Point: Base Year CAMD activity data
  - Gross load hourly data, unit fuel, unit type, location
  - Units categorized by:
    - Fuel Type [Boiler Gas, Oil, Simple Cycle, Combined Cycle, Coal]
    - Region [AEO regions (e.g. MACE, LILC, WUMS)]
- States review provides known new units, controls, retirements, fuel switches, etc
- Energy Information Agency (EIA) Annual Energy Output (AEO) growth factors
- National Energy Reliability Corporation (NERC) peak growth factors

Q: Where Does ERTAC Get the Input Data?
A: States, mainly

- **Regional Lead** identified to coordinate state review of model and inputs
  - Unit specific information like size, fuel type, and controls
  - Future expectations
- **State Lead** identified to QA the input files
  - Review input & output to provide guidance
  - If future year (FY) emission goals are not met with known controls, states select the strategy to meet the goal
- **Current review cycle** completed in March 2015. v2.4 will be prepared this summer using that input.

STATES PROVIDING INPUT DATA TO ERTAC PROCESS



How does the ERTAC EGU Tool work?

- Starting Points
  - Base Year Hourly CEM Data from CAMD
    - Current base year is 2011
    - Base year hourly activity is the basis for future year hourly estimates- generally will coincide with base year meteorology
  - Regional Growth Rates (GR)
    - Annual: Department of Energy (EIA) Annual Energy Outlook (AEO)
    - Peak: North American Electric Reliability Corporation (NERC)
- State-Provided Information
  - New , planned units & retirements
  - Controls, fuel-switches, other
- Tool Generates Future Year Hourly Estimates
  - Available capacity is matched to projected demand
  - Unit capacity is never exceeded
    - Excess generation applied to other available units
    - Generation deficit units may be created if demand exceeds system capacity
- Emissions estimates can be converted to SMOKE format

Regional Boundaries in Version 2.X

Fuel/Unit Types:

***Coal**

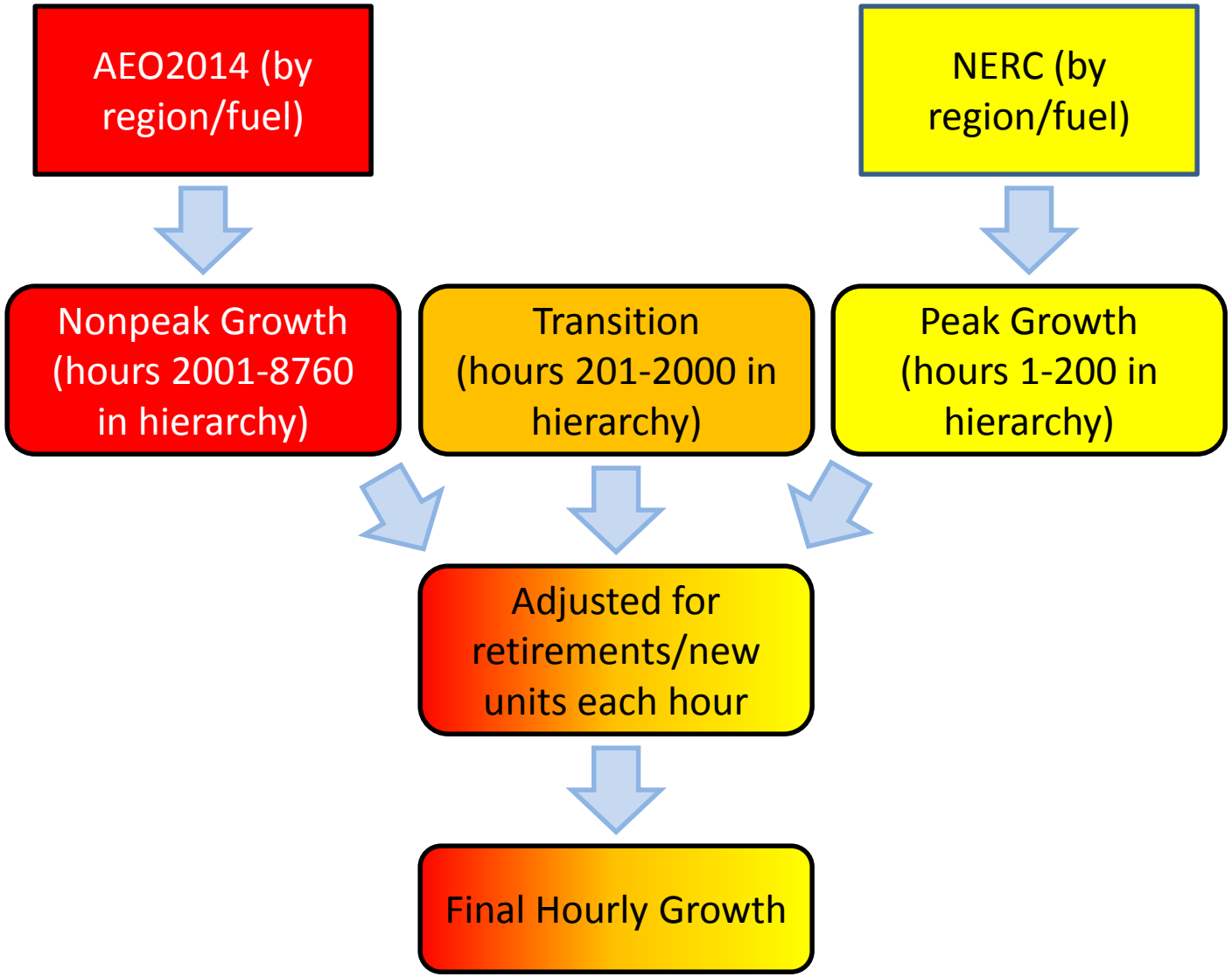
***Oil**

***Simple Cycle Gas**

***Combined Cycle Gas**

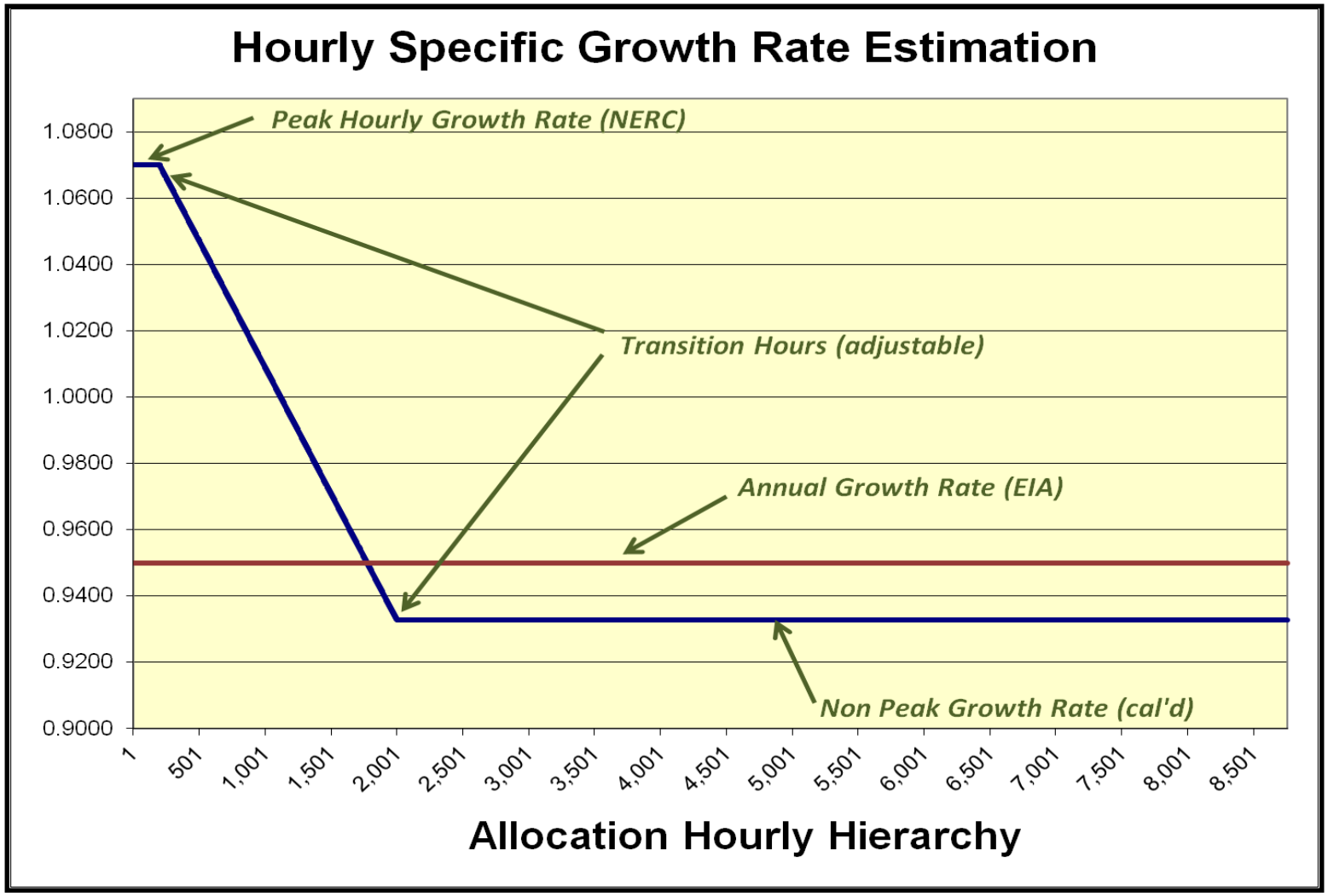
***Boiler Gas**

The evolution of growth rates from annual to hourly

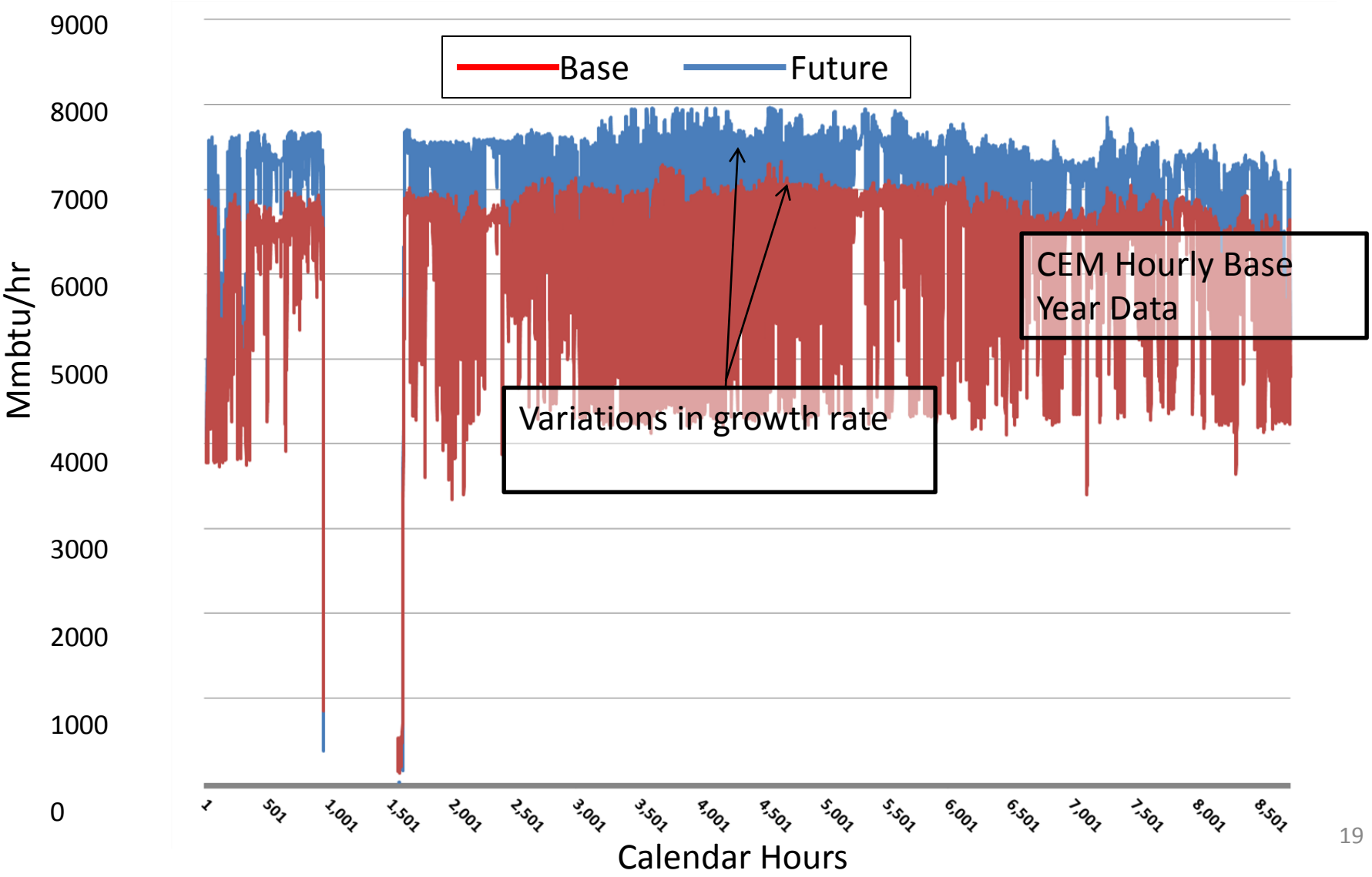


Growth Rate (GR) Example

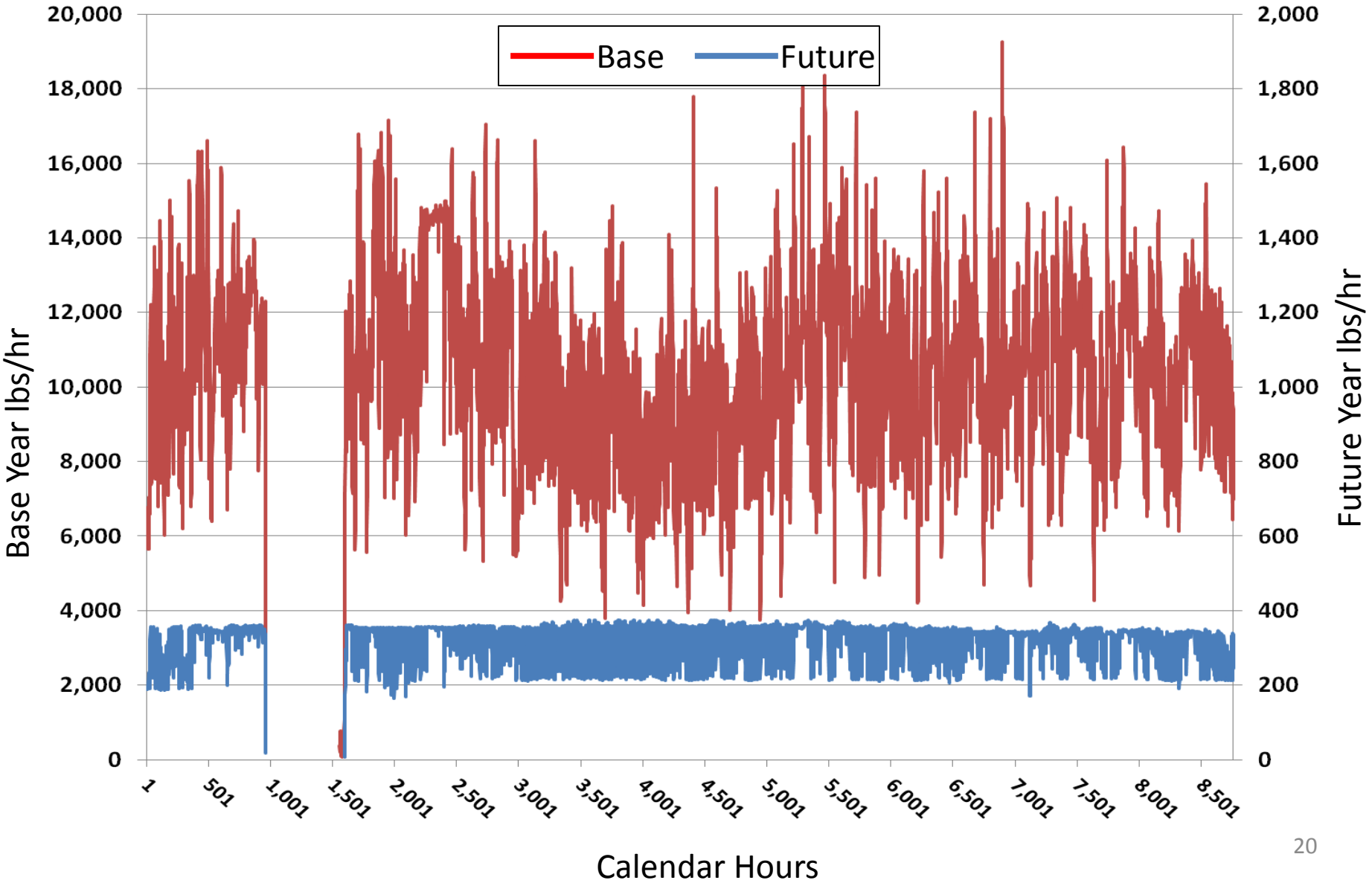
- Peak GR = 1.07
- Annual GR = 0.95
- Transition hours of 200 & 2,000
- Non Peak GR = 0.9328 (calculated)



Unit Level Hypothetical Example
Coal Fired Existing Unit, 800 MW



Hypothetical Unit Level Example
Coal Fired Existing Unit, 800 MW – SO2 Control



Benefits of ERTAC EGU Growth Tool

Conservative predictions

- No big swings in generation
- No unexpected unit shutdowns

Inputs completely transparent

Software not proprietary

Hourly output files reflect base year meteorology

- Addresses High Electricity Demand Day (HEDD) concerns

Quickly evaluates scenarios

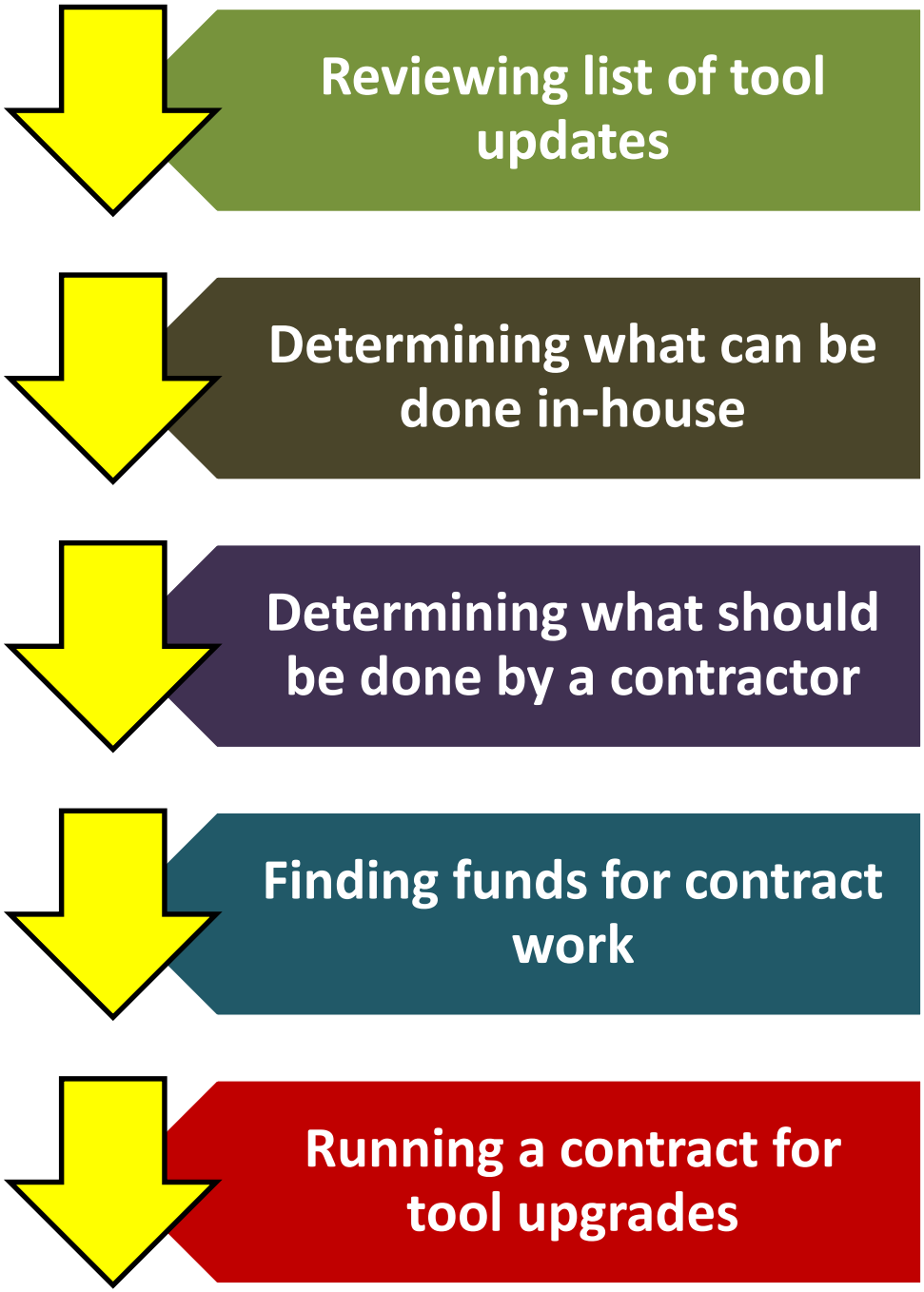
- High and low natural gas penetration
- Different ways that sources might comply with a new rule (MATS, 2010 SO2 NAAQS)
- Retirements, growth, and controls

What is Going On Now?
2.4 Reference Case Development

Timeframe	Milestone
January => March, 2015	States and other stakeholders reviewed outputs from ERTAC EGU 2.3 reference runs-presentations hosted by LADCO/MARAMA/SESARM for states and other stakeholders
March, 2015	ERTAC opened the comment period for the next reference run (ERTACEGUFeedback@gmail.com)
April, 2015	State supported comments and edits added to input files
May, 2015	Preliminary runs of 2.4 for internal review
June, 2015	Final reference runs of 2.4 published
July-August, 2015	• SMOKE Ready outputs for use in MARAMA/LADCO/SESARM air quality modeling efforts. • 2.4 results presented to states and stakeholders
October, 2015	Tentatively, next comment period for Reference Case 2.5.

What is Going on Now?

Tool Improvement in 2015-2016



Agenda for Training

- **Agenda**
- Introduction (8:30-10:00)
  - Background (**Julie**)
  - Tool Overview (**Mark**)
  - Example Applications (**Doris**)
- 20-min break (10:00-10:20)
- Installation and basic operations (10:20-12:00)
  - System Requirement and Recommendation (**Byeong**)
  - Installation of the Tool (**Joseph**)
  - Input file preparation (**Doris**)
  - Operation (**Byeong**)
- Lunch (12:00-1:30)
- Hands-on exercise (1:30-5:30) with break from 3:00 to 3:20
  - Pre-processing & Review Log Files
  - Running projection & Review Log Files
  - Post-processing & Review post-processed Outputs with MS Excel (Pivot Table/Chart)
  - Prepare and run sensitivity runs
  - Prepare and run regional runs

Questions?