

This presentation premiered at WaterSmart Innovations

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GEORGIA STATE-WIDE THERMOELECTRIC WATER DEMAND FORECAST

CDM



Photo courtesy of Georgia Power

WaterSmart Innovations 2011
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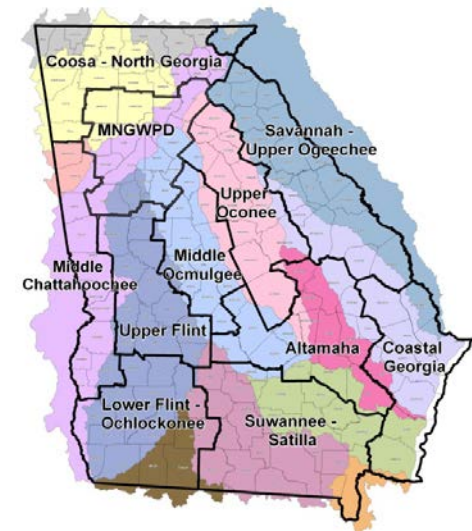
Outline

- Background
 - Preliminary Issues
 - Key Questions
 - Thermoelectric Water Use Characteristics
- Forecast Methodology
 - Future Energy Needs
 - Scenarios
- Results
- Lessons Learned



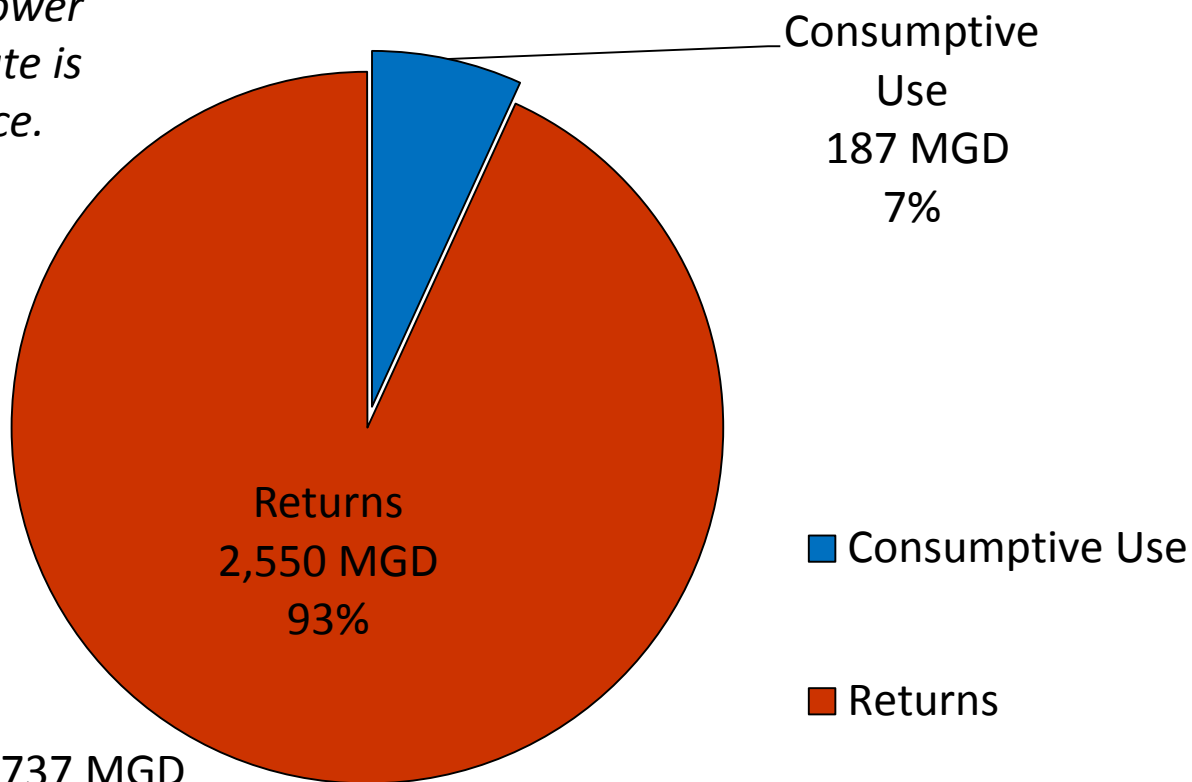
Background

- Georgia State-wide Comprehensive Water Plan
 - Regional Water Councils
- Thermoelectric energy production
 - 50% of total water withdrawals
 - 63% of surface water withdrawals
- 16 large facilities throughout the state



Current State-wide Thermoelectric Water Demand Characteristics

93% of water withdrawn for thermoelectric power production in the state is returned to the source.



Total Withdrawals = 2,737 MGD

Background

- Collaboration with an energy sector ad hoc group helped guide the forecast
 - Representatives from:
 - Major energy companies in the state
 - Georgia Environmental Finance Authority
 - Georgia Environmental Protection Division



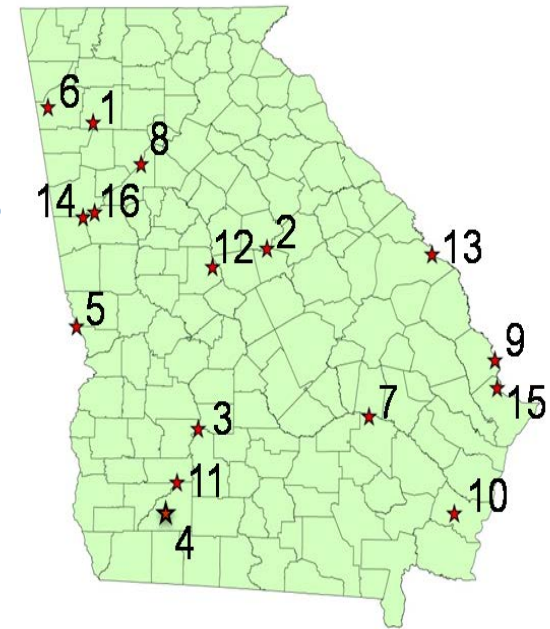
Preliminary Issues

- Designed as a state-wide forecast (i.e., focus not on regional or source water demands)
- Characterize state-wide thermoelectric energy water demands
 - What is the relationship between power produced and water used?
 - What factors can help to understand power and water demands in Georgia?

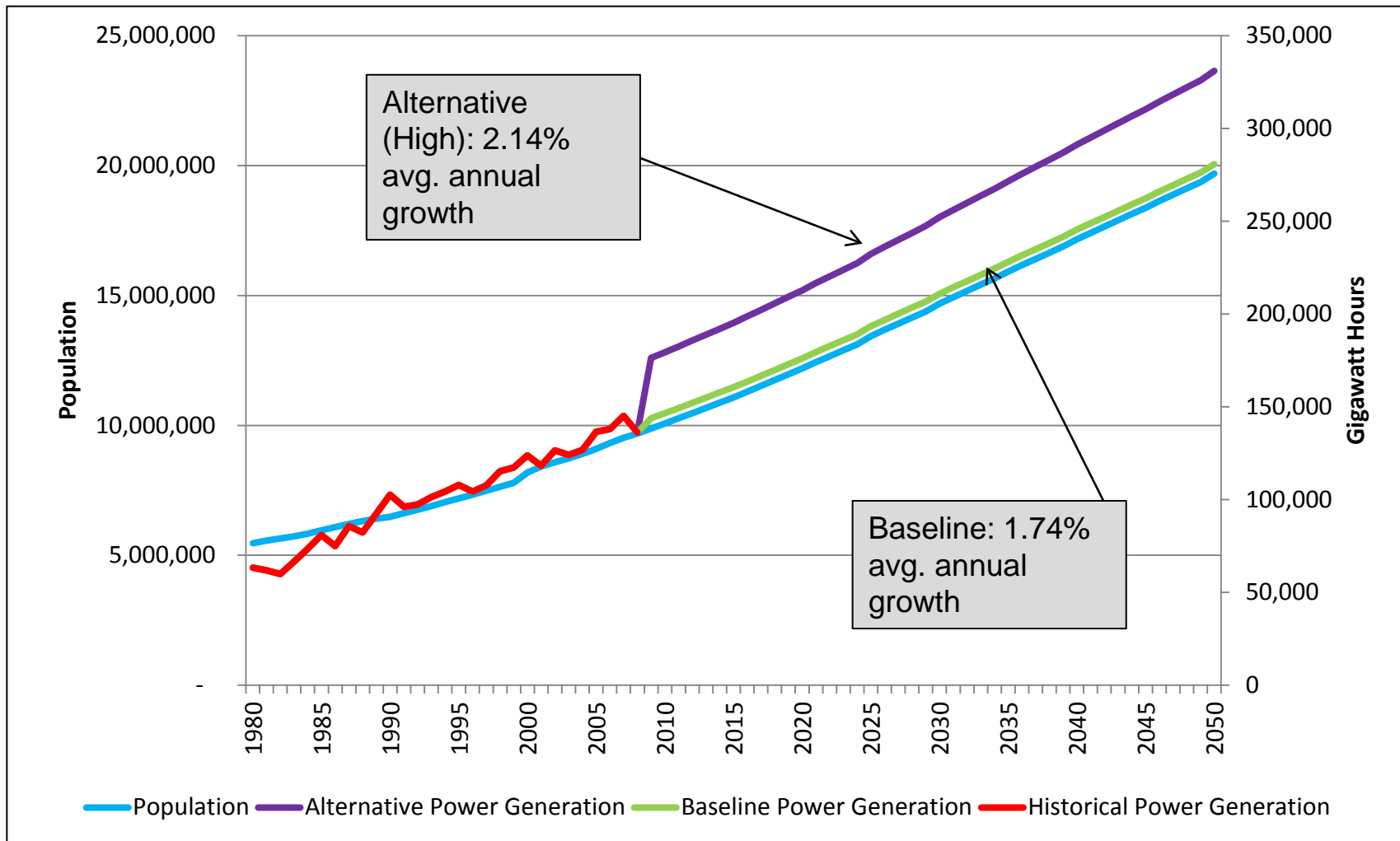


Key Questions

- How much power will be needed in the state in the future?
 - Will recent trends continue?
 - Will per capita energy demands increase/decrease?
- How will future power needs be met?
 - Plans for expansion of existing facilities?
 - Plans for new sites?
 - Potential for renewable energy sources?



Historical & Projected State-wide Population & Power Generation



Demands by Power Generation Process

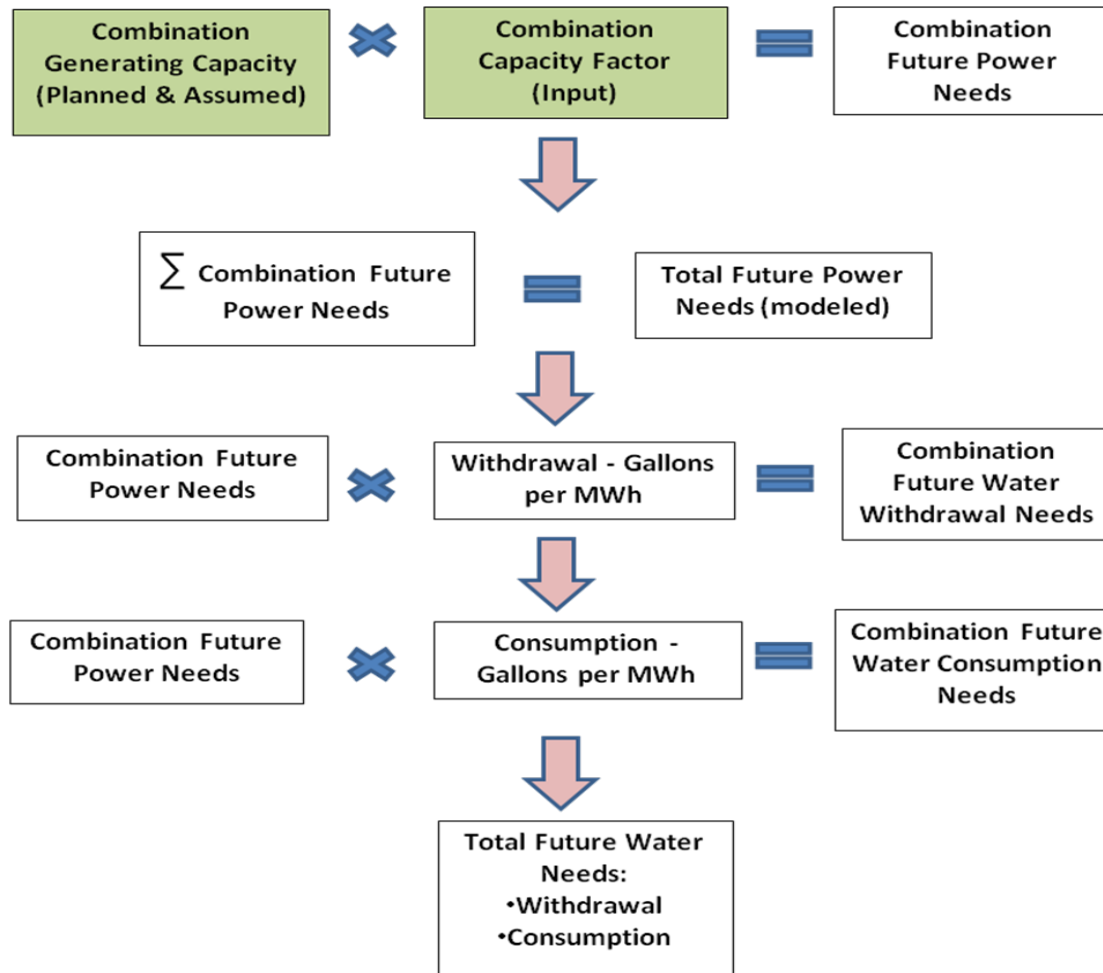
- State-wide metrics of water demands per unit of power produced:
 1. Natural Gas/ Combined-Cycle/ Cooling Tower
 2. Fossil or Biomass/ Steam Turbine/ Once-Through
 3. Fossil or Biomass/ Steam Turbine/ Cooling Tower
 4. Nuclear/ Steam Turbine/ Cooling Tower
- Five years of data: 2003-2007
 - EIA power generation data
 - Georgia EPD withdrawal permit database



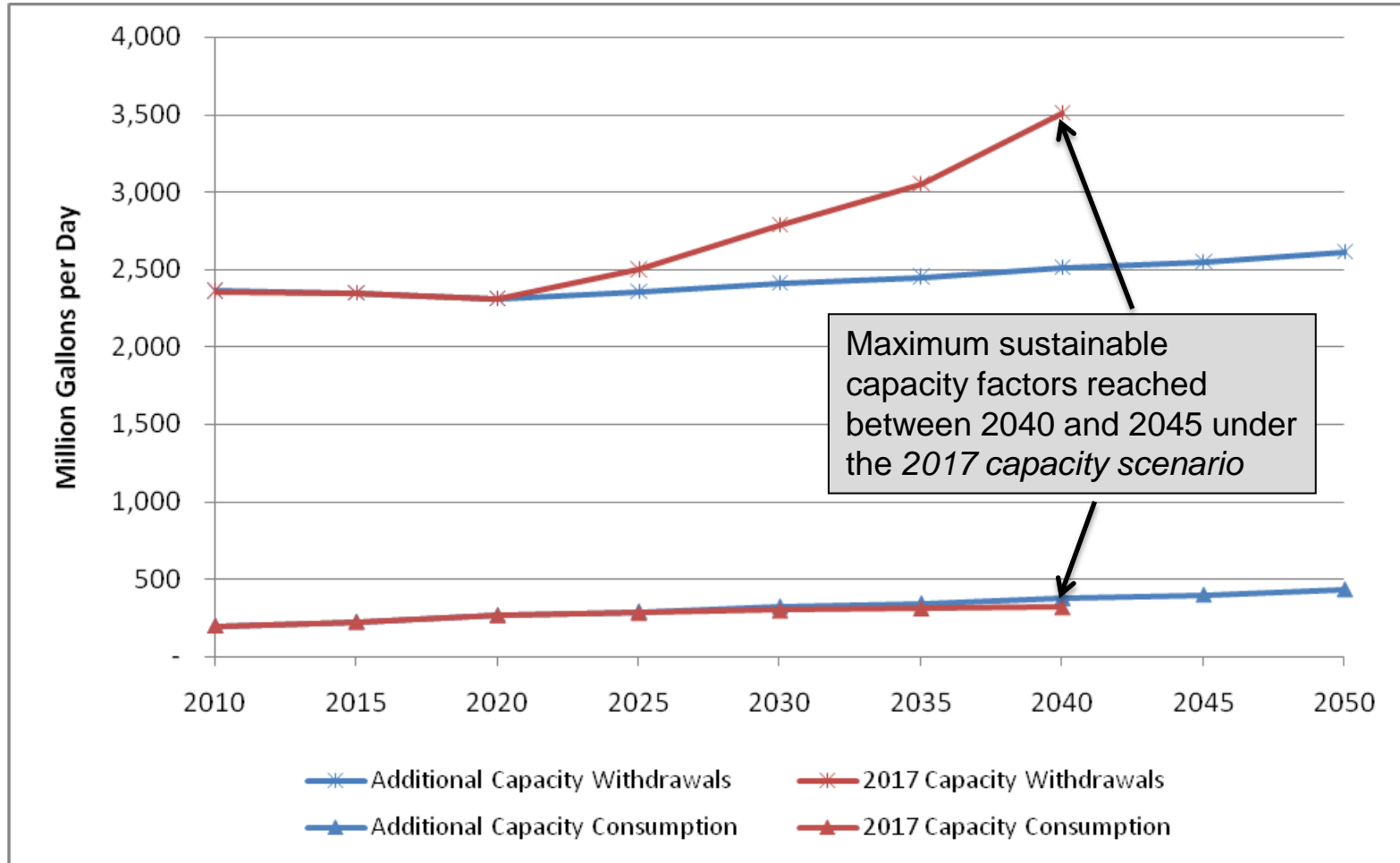
Withdrawal & Consumption Rates

Power Generation Combination	Gallons/MWh
Withdrawals	
Natural Gas/Combined-Cycle/Cooling Tower	225
Fossil or Biomass/Steam Turbine/Once-Through	41,005
Fossil or Biomass/Steam Turbine/Cooling Tower	1,153
Nuclear/Steam Turbine/Cooling Tower	1,372
Consumption	
Natural Gas/Combined-Cycle/Cooling Tower	198
Fossil or Biomass/Steam Turbine/Once-Through	N/A
Fossil or Biomass/Steam Turbine/Cooling Tower	567
Nuclear/Steam Turbine/Cooling Tower	880

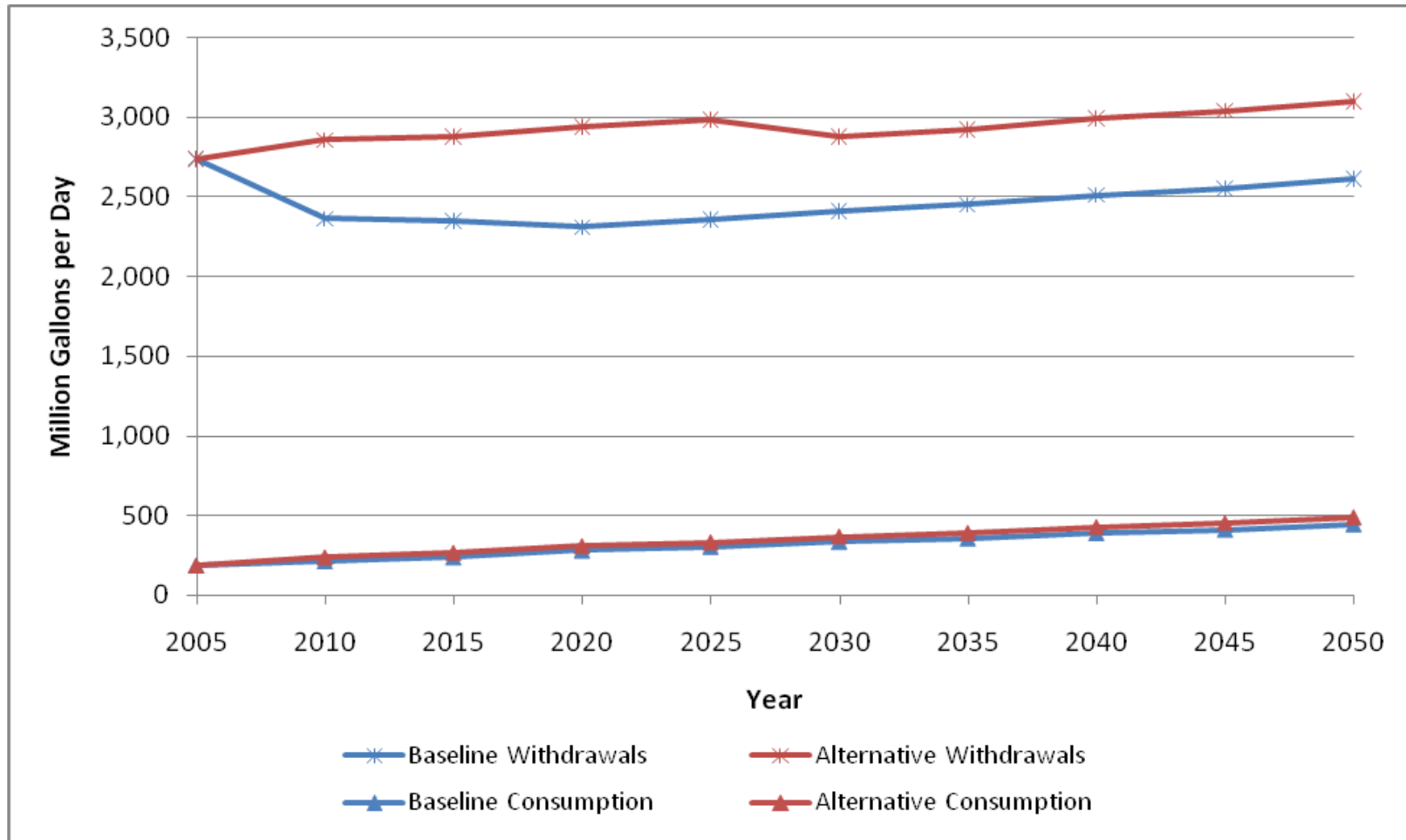
Forecast Model Design



Thermoelectric Sector Withdrawals and Consumption: Baseline Power Needs Scenario

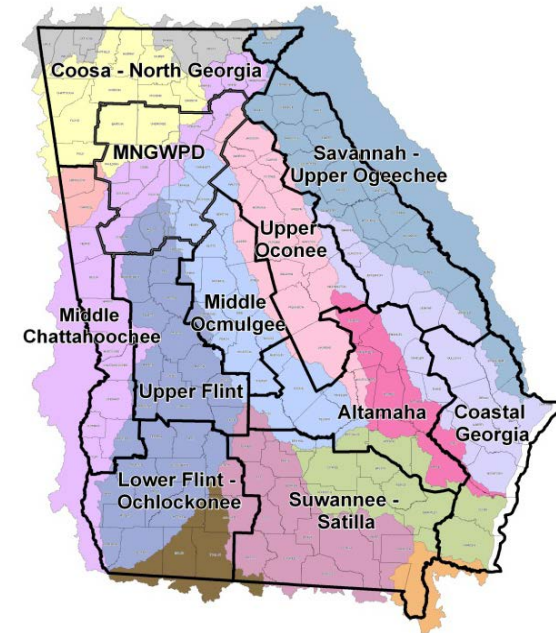


Additional Capacity Scenario Water Demand Forecast: Baseline & Alternative Power Needs

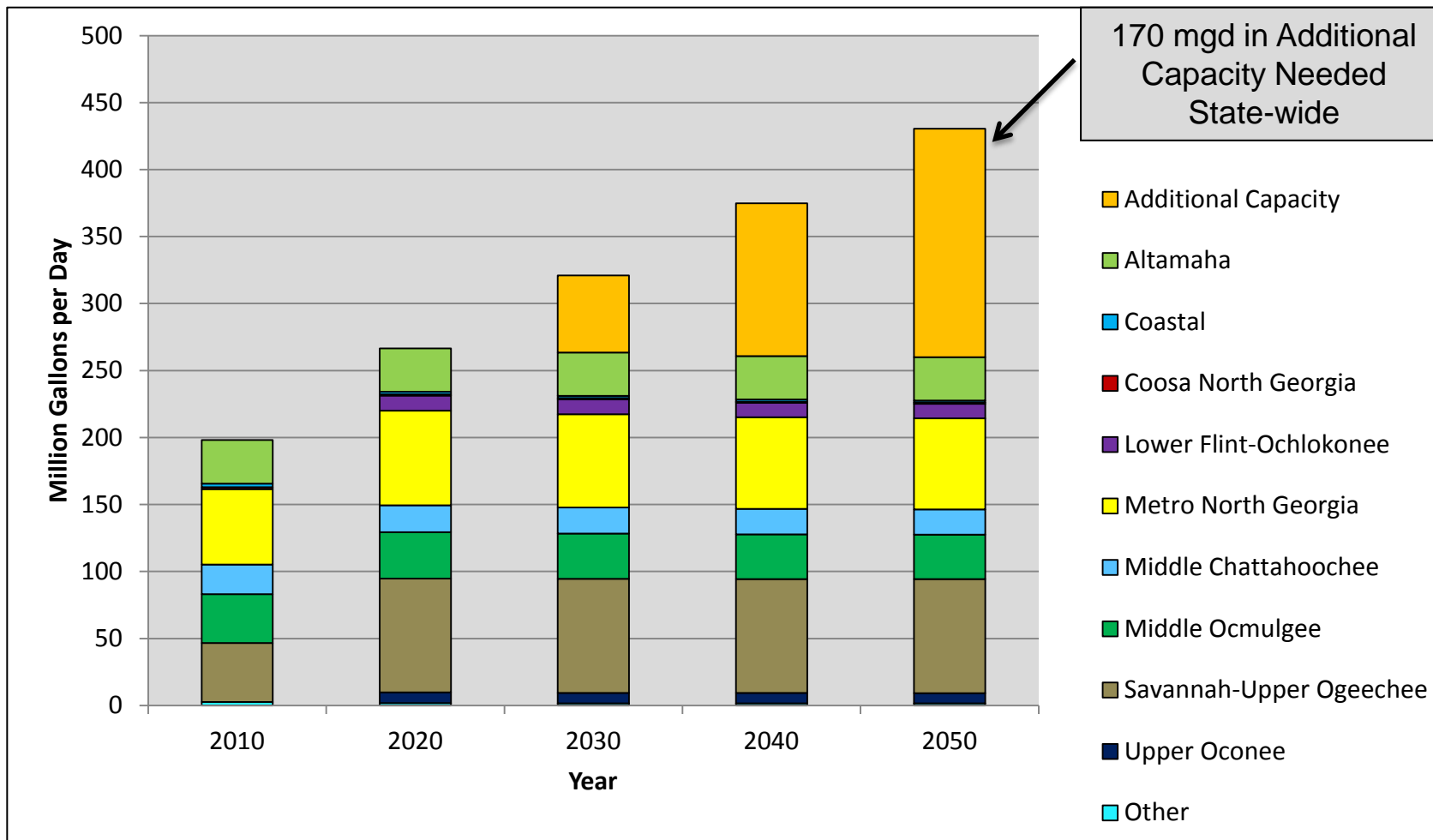


Geographic Disaggregation of Demands

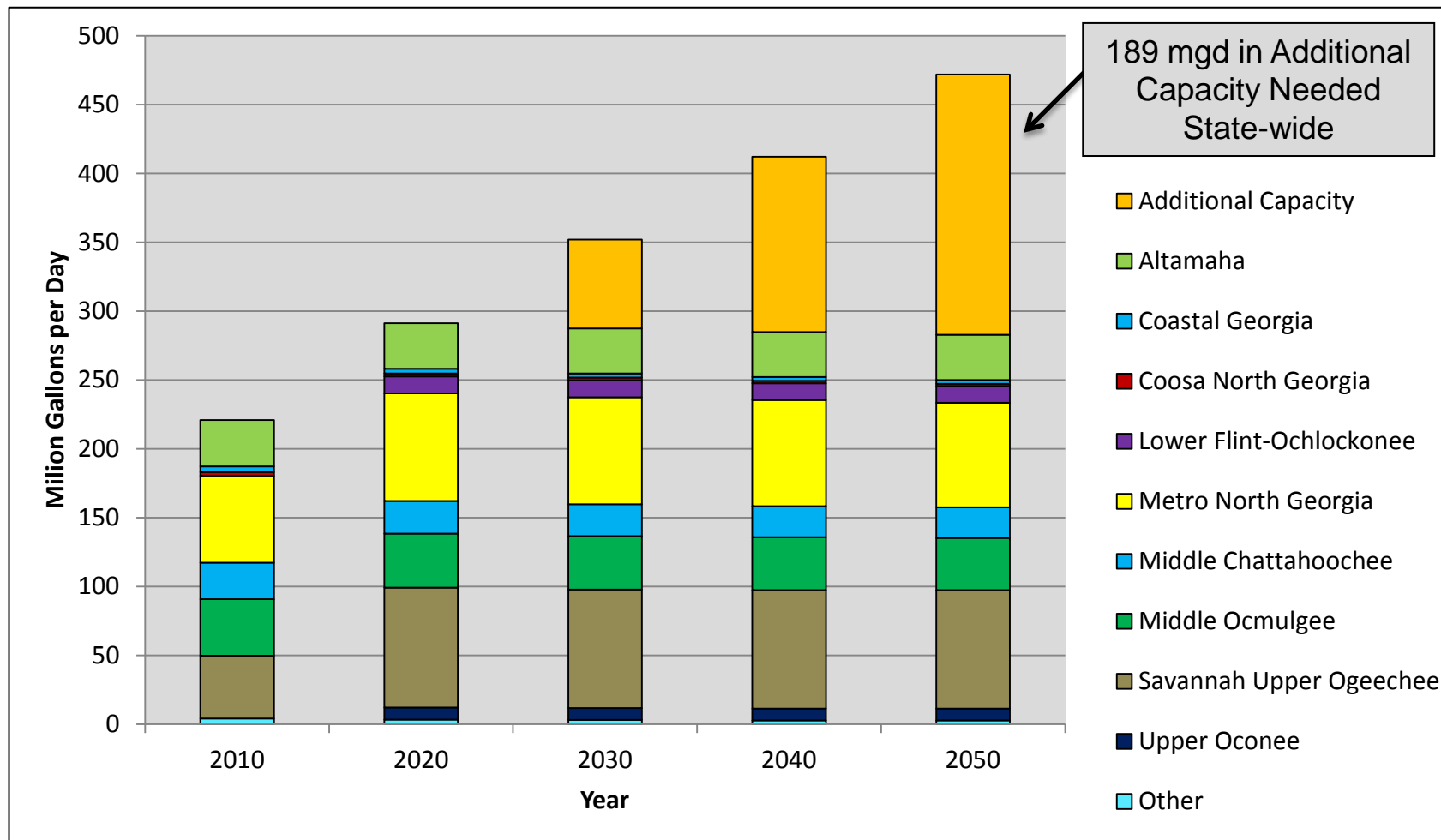
- Regional distribution based on location and capacity of existing and planned facilities
- Assume facilities of the same power generation combination operate at identical capacity factors
- Location of additional capacity (assumed beyond 2020) is not speculated



Regional Water Consumption Baseline Power Needs Scenario



Regional Water Consumption Alternative Power Needs Scenario



Conclusions

- **Consumptive use forecast:**
 - Steady increase through 2050
 - Cooling tower technologies
- **Withdrawal forecast:**
 - Relatively stable through 2050
 - Less water withdrawal intensive processes comprise a greater portion of the available state-wide generating capacity
- **Consumption & withdrawal rates could vary with the adoption of future technologies and regulations**
 - Significant uncertainty

Lessons Learned

- Significant uncertainty regarding future adoption of renewable energy technology in Georgia
 - Biomass is already being introduced
 - Water use characteristics are similar to fossil fuel power production
 - Wind energy represents a 1% contribution to meeting statewide power needs after 2030
- Location of future water needs are difficult to project for long-range forecasting (beyond 2020)
- For planning purposes, EPD elected to allow regional councils to consider the portion of additional capacity demands that may occur in their region

Future Opportunities for Efficiency

- EPA proposed Section 316(b) of the CWA
 - Driven largely by protection of aquatic life
 - Significant decrease in withdrawals
 - Greater consumptive use
- Retirement of older once-through cooling facilities
- Non-consumptive renewable energy sources
- Not all energy efficient technologies are water efficient
 - Carbon capture and sequestration
- Iterative planning process will improve data and process
 - This study was the first step

THANK YOU!

QUESTIONS?

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