



Estimating Residential and Commercial Climate Change Impacts

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Demand Analysis Working Group

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Background

- Residential and commercial sectors are weather sensitive; therefore, we include expected energy impacts from increasing temperatures due to climate change
- Climate change adjustments are made exogenously to the end use forecast models using econometric models
- Estimates of climate change impacts are then added incrementally to residential and commercial consumption forecasts
- We use the latest climate scenario data that is available from the Fourth Climate Change Assessment which is composed of daily maximum and minimum temperatures, 1950-2099 ([LOCA DOWNSCALED CMIP5 CLIMATE PROJECTIONS](#))
- Scripps Institution of Oceanography downscaled the climate change scenario data to the specific weather stations we use for our forecasts



Climate Change Data

- ▶ From the Fourth Climate Change Assessment, the CEC selected 2 scenarios to be used in demand forecasts:
 - MIROC 5 – Average / Mid Case
 - CanESM2 – Complement / High Case
 - Both assume RCP 8.5 – rising emissions

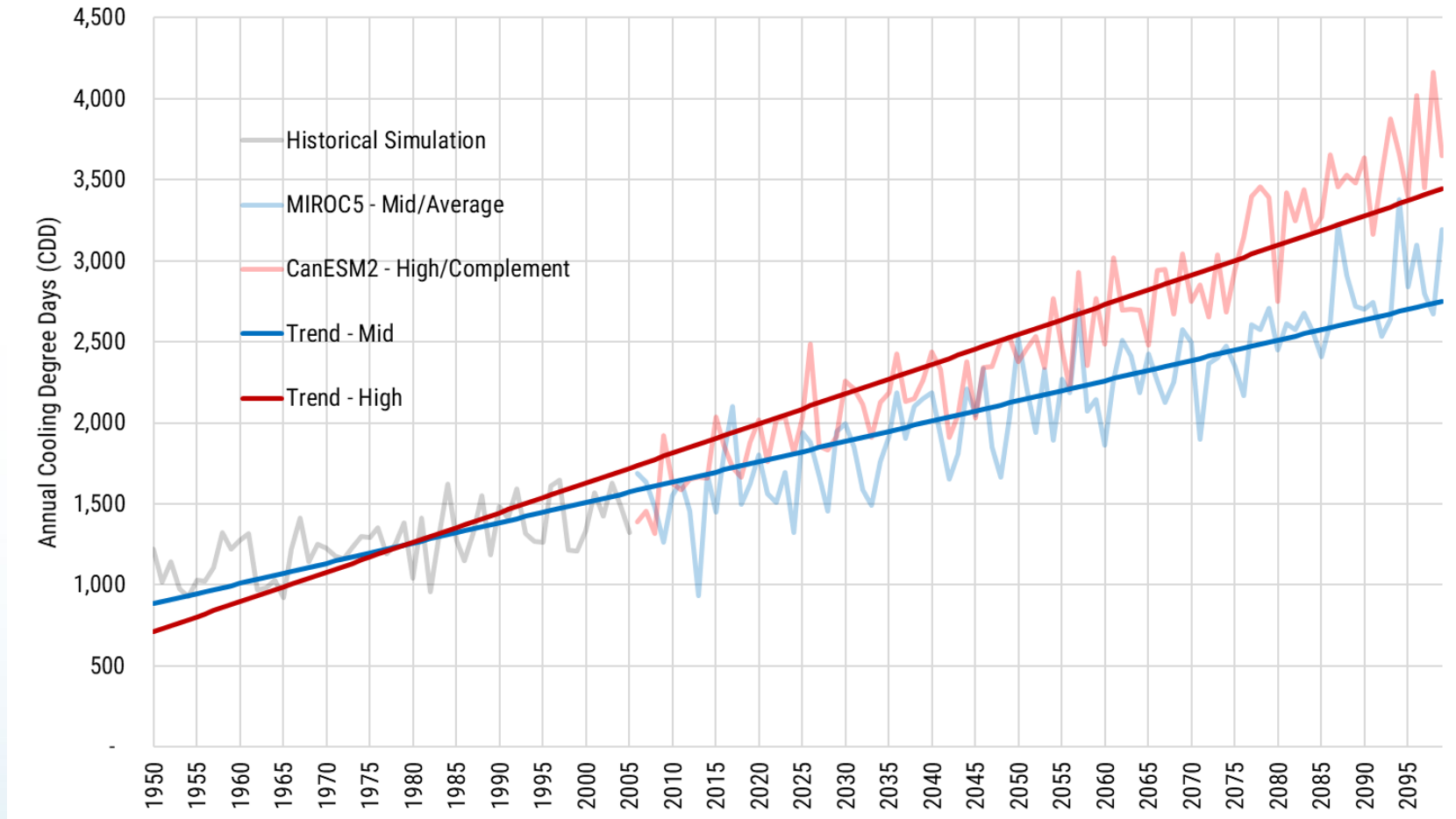
- ▶ The climate change data from the assessment contains a few “gaps”
 - Historic simulation ends in year 2005
 - Long-term projections of climate change rather than forecasts

- ▶ To resolve these gaps, staff identified the long-term trends implied by the climate change scenarios
 - Trends are estimated for annual CDD/HDD
 - The trends (or slopes) are then applied to the calculated normal weather to increase/decrease the future CDD/HDD



Trend Example – Annual CDD

Sacramento County CDD Trend by Scenario

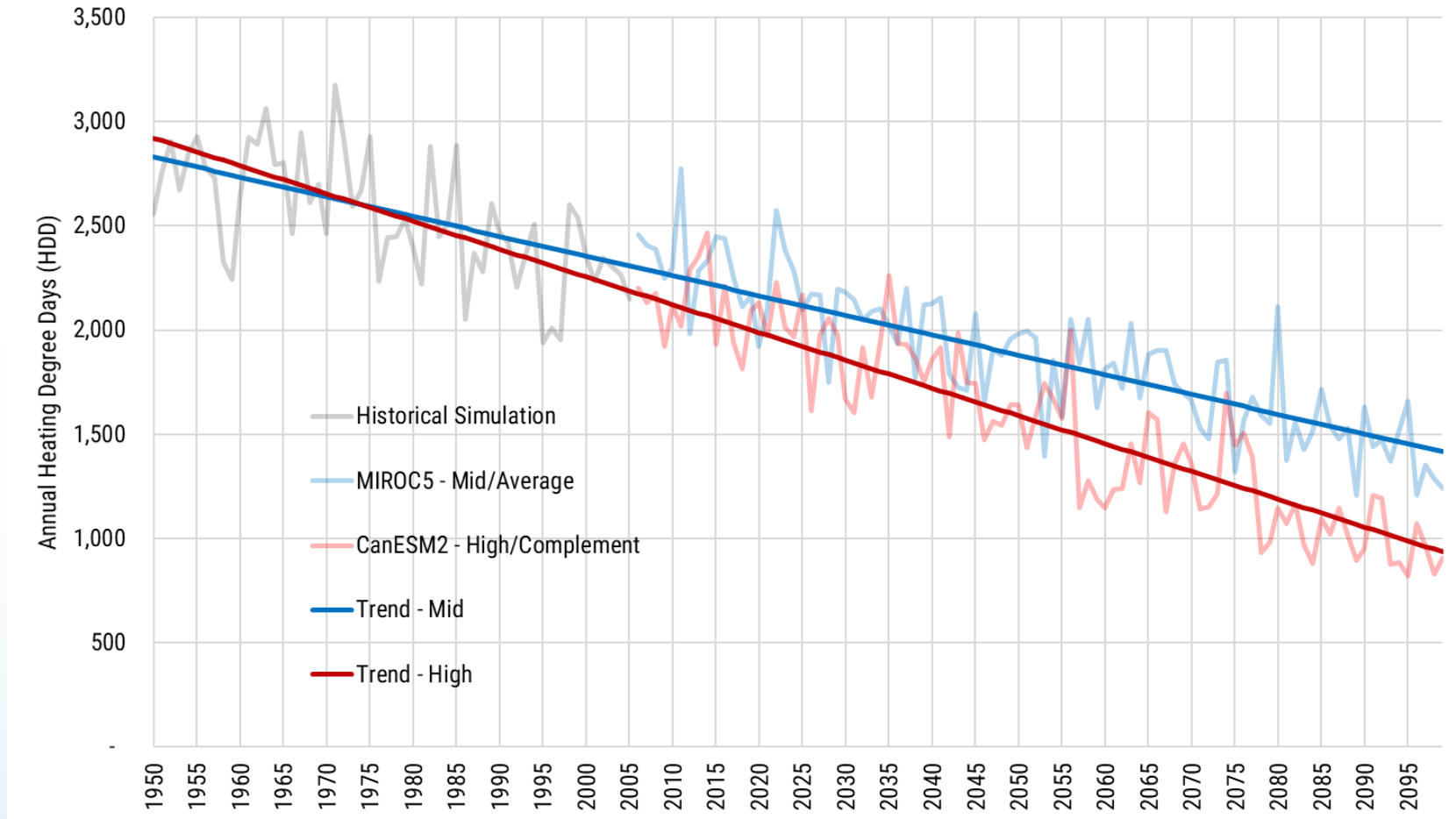


Data source: [Cal-Adapt Annual Degree Days Tool \(RCP 8.5\)](#)



Trend Example – Annual HDD

Sacramento County HDD Trend by Scenario



Data source: [Cal-Adapt Annual Degree Days Tool \(RCP 8.5\)](#)



Climate change adjustment

To estimate the residential and commercial sector climate change adjustments, staff rely on the existing econometric models of energy consumption for electricity and gas

- ▶ First, we run the models assuming “normal” CDD/HDD weather conditions (30 years)
- ▶ Second, we run the models after modifying the normal weather by applying the CDD/HDD trends identified in the downscaled climate change scenarios (high and mid)
- ▶ The difference between the two sets of model runs (with/without increasing temperatures) becomes our estimate of climate change impacts under each scenario/demand case

Electricity - consumption impacts include the effects of increasing annual CDD and decreasing HDD (residential heating and cooling, cooling only for commercial)

Gas - consumption impacts include only the effects of decreasing annual HDD



“Normal” weather assumption

- ▶ Feedback from stakeholders on changes to defining the CDD/HDD normal for the residential and commercial sector end use models is appreciated
- ▶ We currently use 30-year averages of CDD/HDD as our definition of normal for residential and commercial weather sensitive end use adjustments
- ▶ Using a shorter time window for the weather adjustment may better capture the more recent warming trend while the climate change adjustment can account for the long-term changes in weather
 - 20-year normal appears to capture the historical warming trend but difference is small compared to 30-year normal calculation
 - 10-year normal may be too small and would risk capturing decadal (short-term) trends
 - 15-year normal appears to capture the trend and may limit some of the risk of decadal trends



For the future...

5th Climate Assessment is planning to provide improved/enhanced sources of climate change data (2022/2023)

- ▶ Downscaled precipitation and hydrological models
 - ▶ Better accounting of uncertainty in climate models
 - ▶ Updated more frequently (resolve gap in historical data and projections)
- Additional data for hydrological/precipitation data could be used to develop climate change estimates for the agriculture and water pumping sector model



Questions/Comments?

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