Global Change Analysis Model: Tradeoff Scenarios for Decarbonization and Climate Resilient Energy, Water, Food, and Infrastructure Futures

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Background/Objectives. Integrated human and earth system models, such as the Global Change Analysis Model (GCAM), enable strategic simulations of the intricate connections between energy, economic, and environmental systems. These simulations are used to evaluate future pathways of these interconnected systems in the face of changing climate conditions, the evolution of technology and socioeconomic conditions, and policy solutions to respond to climate change. GCAM is a partial equilibrium model of the world with 32 regions. GCAM operates in 5-year time steps from 1990 to 2100 and is designed to examine long-term changes in the coupled energy, agriculture/land-use, water and climate systems. GCAM includes 235 water basins, a 384-region agriculture land-use module and a reduced form carbon cycle and climate module (Hector) in addition to its incorporation of demographics, resources, energy production and consumption.

Approach/Activities. Building future scenarios and using these models translates cutting-edge science into information relevant to decision-makers and communities, enabling them to evaluate options and determine strategies for a broad range of decisions about technology, investments, and policy. The model has been used extensively in a number of assessment and modeling activities such as the Energy Modeling Forum (EMF), the U.S. Climate Change Technology Program, the U.S. Climate Change Science Program and Intergovernmental Panel on Climate Change (IPCC) assessment reports.

Results/Lessons Learned. This presentation will explore the ways that GCAM, which is a integrated human and earth system model, has been used to evaluate decision options including impacts of future carbon policies on energy, water, and food; energy technologies transitions needed to meet the new Executive Order 14057 Federal Sustainability Goals; and informing the U.S. Government on the potential achievements Paris Accord ambitions might have on our global temperature.