

ESP 2.0: Improved method for projecting U.S. GHG and air pollution emissions through 2055

D. H. Loughlin¹, L. Ran², D. Yang², Z. Adelman², B. H. Baek² and C. G. Nolte¹

¹US Environmental Protection Agency, Office of Research and Development, 109 T.W. Alexander Drive, Research Triangle Park, NC 27711, USA

²University of North Carolina at Chapel Hill, Institute for the Environment, 137 E. Franklin St., Chapel Hill, NC 27514, USA

The Emission Scenario Projection (ESP) method is used to develop multi-decadal projections of U.S. Greenhouse Gas (GHG) and criteria pollutant emissions. The resulting future-year emissions can then be translated into an emissions inventory and applied in climate and air quality modeling. ESP projections accommodate different assumptions about a wide range of emission drivers, including population growth and migration, economic growth and transformation, technological change, land use change, and current and potential policies (e.g., air quality, energy, and climate). At the heart of the ESP method is the MARKet ALlocation (MARKAL) energy system optimization model. Optimization allows the option of prescriptive application, identifying least cost technological and fuel choices that meet air quality and climate management goals simultaneously. The method (ESP 1.0) was first described in a 2011 publication. Since then, it has continued to undergo improvements, including expanded pollutant coverage and a new MARKAL database that reflects recent energy system developments (e.g., increased natural gas supplies and successful commercial introduction of electric vehicles). In addition, ESP 2.0 includes the ability to update the spatial distribution of emission projections to account for population and land use changes, as predicted by the Integrated Climate and Land Use Scenarios (ICLUS) model. In this presentation, we provide an overview of ESP 2.0 and present an illustrative emission projection for 2050, with a particular focus on evaluating the effects of spatially redistributing emissions.