

# **Life Cycle Analysis (LCA) and Techno Economic Analysis (TEA) of Hydrogen Production Pathways and End Use Applications**

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In this presentation, Dr. Elgowainy will present current methods and protocols of carbon emissions accounting and greenhouse gas emissions of hydrogen production, covering life cycle stages of primary energy recovery, hydrogen production and delivery, and end use applications. The presentation will focus on important factors affecting the carbon intensity (CI) of fuels, such as selected system boundary, regional and temporal factors, attributional vs. consequential approaches, byproduct allocation methods, and data quality (variability and uncertainties). The presentation will explain these factors through examples relevant to renewable fuels of interest under current and proposed regulatory schemes in the United States. Dr. Elgowainy will also cover the techno-economics of hydrogen delivery infrastructure and of end use applications that use clean hydrogen, such as ammonia, methanol, e-fuels, synthetic natural gas, and metal refining. The presentation will introduce Argonne National Laboratory's GREET®<sup>1</sup> life cycle analysis model as well as HDSAM<sup>2</sup>, the hydrogen infrastructure techno-economic model.

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<sup>1</sup> Greenhouse gases, Regulated Emissions and Energy use in Technologies, <https://greet.es.anl.gov/>

<sup>2</sup> Hydrogen Delivery Scenario Analysis Model, <https://hdsam.es.anl.gov/>