Systems Analysis for PET and Olefin Polymers in a Global Circular Economy – Michigan Technological University, Idaho National Lab, American Chemistry Council

Node Alignment: Systems Analysis & Integration
Project Type: Exploratory

- PET and polyolefin plastics (such HDPE #2, LDPE, and PP) comprise a significant fraction of MSW that ends up in landfills. Although the reuse of these polymeric materials can be optimized through systems analysis, prior studies have addressed the economic risks to organizations that produce and use plastics, or have compared energy/environmental benefits of using plastic versus other materials (glass, aluminum, etc.), but no prior work has attempted to integrate circular economy (CE) concepts for plastics w/the monitoring & assessment tools (MFA, TEA, LCA, regional economic impacts) required to conduct sustainability analysis that consider material use efficiency, energy intensity, secondary FS production cost, econ. impacts & LC emissions.
- REMADE Technical Performance Metrics (TPMs) Being Addressed:
    - Reduce primary feedstock consumption & increase secondary materials consumption.
    - Improve embodied energy efficiency 25% in 5 yrs.
    - Decrease energy required to process secondary FS and reduce GHG emissions for primary feedstocks.
    - Achieve cost parity for plastics.
- Technology/Knowledge Gaps Being Addressed:
    - Few conceptual models exist for the evolving plastics circular economy. Attempts to envision/assess impacts of a future plastics circular economy are lacking. A comprehensive compilation of current and likely future process tech. supporting plastics mech. & chem. recycling are incomplete. Effects of waste plastics properties on selection of recycling processes is insufficient to allow for good decision-making.