Goal #1: Remove barriers to biointermediate refining and upgrading via existing infrastructure.

Specific approaches to achieve this goal:

• Study and identify key chemical and biochemical technologies to advance biorefining efficiencies.

• Address barriers to generating intermediates and products at relevant scales
  – Develop new and effective biomass handling and pretreatment technologies
  – Study how inhibitors impact the metabolisms’ of biochemical conversion organisms
  – Develop strategies to avoid toxicity and/or increase resiliency to it
    • Crosscutting strategies to avoid toxicity may include interfacing with feedstock genetics researchers to inform them of inherent feedstock constituents that are inhibitors
    • Conversion-only strategies to increase resiliency include pretreatment processing to remove the inhibitors, and increasing the tolerance of the conversion system (organism or catalyst/solvent)

• Focus on new chemical and biochemical reaction engineering and genetic pathway engineering strategies to improve overall system reaction kinetics and conversion product yield
  – Establish meaningful performance targets in titer, rate, and yield
Goal #2: Address critical risks and uncertainties to improve the prospects for capital investments in the bioeconomy

Specific approaches to achieve this goal:
• Inform a technical communications strategy to better characterize the advantages and value proposition of a robust bioeconomy
• Develop and provide technical advice to relevant agencies on the emerging bioeconomy to help inform appropriate policymaking and regulatory frameworks
• Promote R&D in valorizing residual side streams produced in biomass conversion processes
Progress Toward FY18 Deliverables

Goal #1: Remove barriers to biointermediate refining and upgrading via existing infrastructure.

- Using system modeling tools and corresponding process data to identify key processing parameters (chemical and biochemical) for optimizing refining efficiency
- Addressing barriers to generating intermediates and products at relevant scales through new catalyst development and biochemical pathway engineering

Goal #2: Address critical risks and uncertainties to improve the prospects for capital investments in the bioeconomy

- Reported on successful verification case for biomass to jet fuel via gasification, gas fermentation, and ethanol upgrading.
- Assessments on the value proposition for new efficiency measures, waste minimization, and carbon utilization have been initiated and reported outcomes expected by the end of the year.
FY18-19 Path Forward

• Continued efforts to improve efficiencies for intermediate upgrading with improved refining efficiencies
• Continued efforts to develop and report on relevant technologies that have been derisked.
• New carbon utilization, carbon efficiency, and carbon management goals to be established
  – CO2 reduction and upgrading
  – Pathway and reactor engineering strategies for avoiding CO2 evolution during fermentation
  – Implications for pathway carbon efficiency as a function of carbon source (carbon efficiency versus biomass efficiency)