

General Call for R&D Proposals – Fall 2019

1. Overview

The RAPID Manufacturing Institute is leading a national effort to address scientific knowledge and technology gaps in process intensification (PI) and modular process technology. To date, the RAPID manufacturing institute has released two calls for research and development (R&D) project proposals and has funded 33 R&D projects in the areas of process intensification and modular chemical processing that are advancing the following institutional goals:

- More than 20% Increase in energy efficiency in a process intensification technology
- Doubling of energy productivity through a process intensification technology
- Intensified process modules with 10x reduction in capital cost, 20% improvement in energy efficiency, and 20% lower emissions/waste related to commercial state of the art
- Approaches to reduce manufacturing costs of process intensified modules by 20% with each doubling of cumulative module production
- Tool to reduce cost of deploying modular chemical process intensification by 50%

Successful projects include collaborations among industry, academia, national laboratories, non-profit research institutes, industry consortia, and other stakeholders that advance technologies applicable to one or more of RAPID's focus areas: Chemical and Commodity Processing, Natural Gas Upgrading, Renewable Bioproducts, Intensified Process Fundamentals, Modeling and Simulation, and Module Manufacturing. Teams are encouraged to include at least one industry partner.

RAPID welcomes proposals in these focus areas to advance PI and modular technology development. Areas of emphasis for this call for proposals are described in Section 4 – Proposal Scoring and Review.

2. Award Information

Subject to available federal funds under RAPID's existing cooperative agreement DE-EE0007888, RAPID anticipates funding up to six (6) R&D projects with maximum 18 month period of performance and budgets of \$300,000 to \$500,000 (federal share).

3. Proposal Requirements

A timeline for RAPID's call for proposals is given in Section 5. Late proposals will not be accepted. The proposal process is open to all U.S. entities; however, applicants selected for award are required to join RAPID prior to receiving any project funds.

A proposal template is included in the following [LINK](#). Applicants should adhere to proposal section lengths and formatting included in the proposal template. Applicants can upload completed applications along with additional required information at the following [Application Page](#).

One scoring criteria for submitted projects will be the level of industrial support as demonstrated by cost share commitments. RAPID has an institute target of a 1.5:1 cost share ratio (partner:federal) for all projects. While projects with less than a 1.5:1 cost share ratio will be considered, a minimum cost share ratio of 1:1 is required.

4. Proposal Scoring and Review

All proposals must be submitted to one of the six RAPID focus areas: Chemical and Commodity Processing, Natural Gas Upgrading, Renewable Bioproducts, Intensified Process Fundamentals, Modeling and Simulation, and Module Manufacturing. The sub-committees of RAPID's technical advisory board (TAB) will be responsible for reviewing and rating all proposals submitted to their area based on a set of pre-defined metrics detailed in the additional information below. RAPID's CTO will work with the Institute's TAB to combine proposal recommendations from each focus area into a single set of recommended proposals for the Institute. These proposals will be reviewed with RAPID's governing board. Selected projects will subsequently be submitted to DOE for their concurrence. These projects will then enter negotiations with RAPID and the final project package will be sent to the DOE prior to the disbursement of funds.

Proposals will be scored based on 5 categories including: (1) fit with key PI and MCPI gaps identified during RAPID's initial roadmapping activities; (2) the ability of a successful project to meet RAPID metrics for project impact; (3) the technical merits of the project, including demonstrating a significant advancement in the basic scientific knowledge or technology in one or more application areas; (4) the background of the assembled team and their abilities to carry out the proposed work; and (5) the level of industrial support as demonstrated by cost share commitments.

Proposals should clearly articulate the equipment/module performance advantage, capital cost per unit of production capacity, and expected RAM (reliability, availability, maintenance).

RAPID continues to refine the details of each focus area through technology roadmapping and industry-specific problem discovery workshops. Through recent workshops and roadmap gap analysis, RAPID has identified areas of interest, and we encourage respondents to submit proposals that address one or more of the following areas:

Cross-Cutting Technologies:

- Methods and design practices that enable module standardization to: (1) reduce the non-recurring engineering (NRE) costs for development of modular chemical processes, (2) reduce incremental module unit manufacturing costs, and/or (3) allow for efficient customization or management of change. Standard elements may include (but are not limited to) process fluid interconnects, structural interconnects, electrical interconnects, sensing/control interconnects, and overall module form/fit/function. Novel methods that improve upon current practices are encouraged. Some examples of current practices include the use of templates and junction boxes.
- Low-cost sensors, controller hardware, and control strategies for monitoring and autonomous operation of distributed, modular chemical processes including (but not limited to): low-cost flowmeters, biomass moisture meters, multi-point (e.g., FOSS) temperature sensors, dispersive fiber-coupled spectrometers, telemetry, and process analytical technology (PAT).
- Novel intensified reactors and separation equipment to enhance heat and mass transfer, including but not limited to heat-exchange microchannel reactors, spinning disc reactors, catalytic

plate reactors, oscillating reactors, plasma-enhanced reactors, centrifugal contactors, and/or other novel alternatives.

Industry Verticals:

- Fixed-nitrogen value chain – novel thermo- or electrocatalytic chemistries for lower temperature, lower pressure, or higher per-pass yield production of fixed nitrogen chemicals (including but not limited to ammonia, urea, nitrate fertilizers, amines, etc.) incorporated as novel PI or modular process technology for lower energy and lower cost distributed production of fixed nitrogen chemicals.
- Carbon capture and utilization (CCU) – novel PI-enabled or modular process technologies for lower-energy and lower-cost capture of carbon, CO₂ and other waste carbon sources; and utilization (including but not limited to CO₂ reduction to higher value hydrocarbon or oxygenated products) scaled to match existing carbon source emissions. This topic includes point-source capture (from power generation or other chemical process, e.g. ammonia or refinery) and direct air capture, as well as key enabling technologies such as efficient air separation units.
- Pulp and paper—novel PI-enabled or modular technologies that: (1) reduce water and/or energy consumption in best-available wood pulping and papermaking operations, (2) provide more efficient cleaning and preparation of recycled wood/paper streams for incorporation into pulping and papermaking processes, and/or (3) enable lower-energy and lower-cost production or valorization of lignocellulosic co-products (including second-generation C5/C6 sugars, bio-oils, micro-/nano-cellulose, and lignin-derived chemicals and polymers).
- Post-use plastics—novel PI-enabled or modular technologies for lower-energy and lower-cost valorization of recycled/waste polymer streams to higher value, fungible chemical products.

5. Timeline

- Call for Proposals Released – October 28, 2019
- Call for Proposals Opens – December 10, 2019
- Call for Proposals Closes – January 16, 2020 (11:59 PM Eastern Time)
- Project Selections Endorsed by RAPID Technical Advisory & Governing Boards – March 31, 2020
- Project Negotiations Completed with Signed Sub-award Agreements – June 30, 2020

6. Additional information

Additional information about RAPID and the proposal review and scoring process can be found in the following:

- [RAPID Overview and membership information](#)
- [Overview of basic scientific knowledge and technology gaps from RAPID Roadmapping process](#)
- [Overview of proposal review process and scoring](#)
- [Proposal template](#)

General questions about this announcement can be directed to rapidcall2019@aiiche.org.