RAPID
Transforming The Process Industries

RAPID Proposal and Award Process

PHASE I: Call for Proposals and Proposal Submission

- **Opportunity Announced.** RAPID issued a call for project proposals on March 29, 2018 with a closing date of 12:00AM EST on May 22nd, 2018.
    - The call has been communicated broadly through our member base, and posted on the publically accessible AIChE and RAPID websites.
    - Deadlines, needed information, and procedures for submitting proposals are included in the announcement.
    - Any member can submit a proposal. RAPID will actively work with non-members to complete a RAPID membership application prior to May 22 2018 so that they can participate in this call for projects.
- **Proposal Submission.** Project proposals must be submitted electronically – submission instructions are located on the RAPID website.
    - Interested parties may submit a proposal describing their potential project. A template with details on required information is available as part of the proposal call.
    - Proposals must be submitted to only one of the six focus areas.
- **Proposal Submission Acknowledgement.** Proposal submitter will receive an email confirmation that their proposal was received
    - Project proposals will be assigned to a technical advisory board (TAB) sub-committee based on the focus area selected by the proposal submitter.
    - A compliance review will be performed for all proposals to insure they meet minimum cost share requirements and formatting as called out in the proposal template. A proposal may be returned without review if it does not comply.

PHASE II: Proposal Review and Processing

The TAB Sub-Committees will review the project proposals submitted to their respective areas. Each TAB Sub-Committee is led by the Focus Area (FA) Lead and consists of RAPID members nominated by TAB members. The TAB Sub-Committees will be governed by the Conflict of Interest (COI) Policy for RAPID and will follow a recusal process for those with an apparent or real COI.

- **Peer Review.** Once a proposal is received, the Focus Area Lead will lead his/her TAB Sub-Committee in evaluating project proposals.
    - The FA lead will assign each project proposal to a set of reviewers (including one Lead Reviewer who will present the findings to the entire FA TAB Sub-Committee)

within the FA TAB Sub-Committee.

- The Reviewers will evaluate their assigned projects using the criteria in the Scorecard (below) by assigning a score of Excellent (E), Very Good (VG), Good (G), Fair (F), and Poor (P) for each category and then providing an overall assessment of the project based on the criteria scores. Descriptions of what is meant by E, G, and P are provided to help calibrate scoring. Particular emphasis will be given to the technical merits of the proposal and the fit with RAPID objectives.

	Description	**Excellent (E)**	**Good (G)**	**Poor (P)**
Fit	The fit of the project subject to RAPID focus areas and gaps identified in the RAPID roadmapping process. The ability to address multiple gaps is seen as a significant positive.	Project addresses multiple themes deemed important to RAPID via roadmapping workshop. Impact crosses focus areas at appropriate technology readiness level (TRL).	Project addresses at least one major FA gap identified during the roadmapping workshop. Majority of project work lies within the scope of RAPID (i.e. MCPI).	Project focus is unrelated to process intensification or modular manufacturing (e.g. new product focus) or fails to address any major gaps identified in roadmapping.
Impact	The ability of the project to reach RAPID's performance metrics and the level of potential benefit vs level of technical risk. The project will need to benefit the RAPID member companies generally, as well as the team proposing the project.	Preliminary results demonstrate ability to address one or more RAPID metrics. Industrial support for potential impact on CAPEX/OPEX. Significant potential for benefits beyond the project proposed.	Convincing argument to impact a key energy/CAPEX driver. Potential to have derivative value to other projects done within a similar industry or FA.	No analysis or supporting claims to link project performance to RAPID metrics. Limit scope of impact to specific technology area or set of users.
Technical Merit	Demonstrated technical merit. Novelty of the proposed content.	Project proposes to do first of its kind work in a field of relevance to RAPID. Potential to significantly reduce barriers to MCPI implementation by advancing a novel technology approach.	Well organized plan to extend existing work in MCPI areas to new feeds/applications. Potenti al to increase confidence in applying emerging technologies in MCPI space through deeper understanding of a specific approach.	Work plan that is poorly defined or clearly unachievable based on time/funding requested. Work that is repetitive of existing, publically available results.
Project Team	The skills sets of the proposing team vs the technical scope of the project. The level of industrial/academic support.	Cross disciplinary team with appropriate skill sets. Industrial and non-industrial team members actively supporting the project.	Team with potentially small skills gaps - addressable via consultation with others. Industrial support missing in an area that would be considered industrially relevant.	Individual or team working entirely outside of their area of expertise. Limited to no formal collaboration outside of the submitting institute.

- The FA TAB Sub-Committee will participate in a formal review meeting to rank all project proposals submitted to their respective FA. The meeting will be run by an AIChE Facilitator.
- The FA Lead will create a Rank-Ordered List of projects reviewed by the FA TAB Sub-

Committee, sorted based on project score. All projects will be included in the list regardless of score.

- **Aggregation of the TAB Sub-Committee results.** The FA Lead will provide the RAPID CTO with a Rank-Ordered List of projects.
    - The CTO will aggregate Rank-Ordered Lists from all 6 FAs and make a recommendation to the TAB on the projects that should be funded. This aggregation and recommendation will take into account recommendations made by the sub-committees along with the need to generate a portfolio of projects that balances project durations and risk, accurately reflects the technical priorities of the institute, creates a path to meeting the broad set of institute metrics, and allows the RAPID institute to meet its cost share commitments.
    - The TAB will evaluate this portfolio of projects and make a final recommendation on funding.
- **Final approval of RAPID recommended portfolio of projects.** Once the portfolio of projects is recommended by the TAB, with CTO will present this to the CEO and governing board for endorsement. The technical package is then sent to the DOE Technology Manager for concurrence

PHASE III: Award Processing

Selected projects will then enter negotiations with RAPID and the final project package will be sent to the DOE prior to the final awarding of funds

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RAPID Metrics

The RAPID manufacturing institute has established several metrics to measure project progress toward our overall goal of transforming the process industries. These goals should be explicitly address in project proposals submitted to the institute.

1. **Demonstrate Energy Efficiency in Process Intensification Technology**
   Research, develop and demonstrate intensification in a modular chemical process intensification process at a 20 percent or greater (>20%) improvement in energy efficiency. This technology should be on the path toward a potential order of magnitude improvement in energy productivity as in subsequent years of further development

2. **Demonstrate Energy Productivity improvement through Process Intensification Technology**
   Research, develop, and demonstrate intensification in a modular chemical process through a doubling of energy productivity by a combination of both improvement in capital equipment capacity cost ($/kg per day) and operating cost related to improved feedstock and fuel efficiencies.

3. **Demonstrate Intensification in Individual Chemical Process Modules**
   Research, develop and demonstrate at representative pilot scale with 1,000 hours of operating time, at least one (or more) modular and intensified process that has all of 10x reduced capacity cost ($/(kg per day)), with 20% improved energy efficiency, and 20% lower emissions/environmental waste (kg/kg) relative to commercial state-of-the art at the relevant production rate (kg per day).

4. **Demonstrate Approaches to Cost-Effective Manufacturing of Process Intensified Modules**
   Applied research, development and demonstration of technologies to scale-out manufacturing of intensified process modules, with a modeled cost based on technical advances that reduce by over 20% the cost/unit of intensified process modules with each doubling in cumulative module manufacturing production up to a total capacity equivalent to baseline current typical large-scale process.

5. **Demonstrate Potential for Cost Effective Deployment of Modular Chemical Process Intensification**
   Develop tools and technologies to reduce the cost of deploying modular chemical process intensification in existing processes by fifty percent (50%) relative to the existing state of the art within five years, and be on a pathway to achieve at least installed and operating cost parity for the adoption of modular chemical process intensification technologies at full scale in one or more application areas.

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TRL level definitions – From DOE EERE 200.5

Technology Readiness Levels (TRLs): Identify the readiness level of the technology associated with the project as well as the planned progression during the course of project execution. A detailed explanation of the rationale for the estimated technology readiness level should be provided. Specific entry criteria for the next higher technology readiness level should be identified. The following definitions apply:

TRL-1. Basic principles observed and reported: Scientific problem or phenomenon identified. Essential characteristics and behaviors of systems and architectures are identified using mathematical formulations or algorithms. The observation of basic scientific principles or phenomena has been validated through peer-reviewed research. Technology is ready to transition from scientific research to applied research.

TRL-2. Technology concept and/or application formulated: Applied research activity. Theory and scientific principles are focused on specific application areas to define the concept. Characteristics of the application are described. Analytical tools are developed for simulation or analysis of the application.

TRL-3. Analytical and experimental critical function and/or characteristic proof of concept: Proof of concept validation has been achieved at this level. Experimental research and development is initiated with analytical and laboratory studies. System/integrated process requirements for the overall system application are well known. Demonstration of technical feasibility using immature prototype implementations are exercised with representative interface inputs to include electrical, mechanical, or controlling elements to validate predictions.

TRL-4. Component and/or process validation in laboratory environment- Alpha prototype (component): Standalone prototyping implementation and testing in laboratory environment demonstrates the concept. Integration and testing of component technology elements are sufficient to validate feasibility.

TRL-5. Component and/or process validation in relevant environment- Beta prototype (component): Thorough prototype testing of the component/process in relevant environment to the end user is performed. Basic technology elements are integrated with reasonably realistic supporting elements based on available technologies. Prototyping implementations conform to the target environment and interfaces.

TRL-6. System/process model or prototype demonstration in a relevant environment- Beta prototype (system): Prototyping implementations are partially integrated with existing systems. Engineering feasibility fully demonstrated in actual or high fidelity system applications in an environment relevant to the end user.

TRL-7. System/process prototype demonstration in an operational environment- Integrated pilot

(system): System prototyping demonstration in operational environment. System is at or near full scale (pilot or engineering scale) of the operational system, with most functions available for demonstration and test. The system, component, or process is integrated with collateral and ancillary systems in a near production quality prototype.

TRL-8. Actual system/process completed and qualified through test and demonstration- Pre-commercial demonstration: End of system development. Full-scale system is fully integrated into operational environment with fully operational hardware and software systems. All functionality is tested in simulated and operational scenarios with demonstrated achievement of end-user specifications. Technology is ready to move from development to commercialization.

TRL-9. Actual system proven through successful commercial operation