



REQUEST FOR PROPOSALS (RFP)

Intensifying Anaerobic Digestion: Downstream Impacts and Thermal Treatment Compatibility (RFP 5421)

Date Posted

Monday, July 27, 2026

Due Date

Proposals must be received by 3:00 pm Mountain Time on Monday, September 14, 2026.

WRF Project Contact

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Project Sponsors

This project is funded by The Water Research Foundation (WRF) as part of WRF's Research Priority Program.

Project Objectives

- Identify effective methods for intensifying anaerobic digestion (AD) to maximize methane production, volatile solids destruction, and biogas yield, while minimizing footprint and expansion needs.
- Characterize impacts of intensification on digester kinetics and stability, the physical/chemical properties of the digested biosolids, and their implications for downstream solids processing, sidestream treatment including dewatering, thermal drying, and resource recovery pathways. Define parameters for acceptable biosolids feed for downstream processes.
- Assess regulatory considerations associated with intensified digestion processes, including potential effects on biosolids classification and compliance requirements.
- Provide guidance for utilities evaluating intensification projects, including operational and design considerations, economic impacts, risk factors, and implementation frameworks.

Budget

Applicants may request up to \$350,000 in WRF funds for this project.

Background and Project Rationale

Water resource recovery facilities (WRRFs) continue to face increasing wastewater organic loads or more stringent regulatory requirements that may, under current operating conditions, require significant additional infrastructure. Process intensification refers to methods for increasing treatment capacity within existing processes, i.e., without costly and footprint-

intensive capital projects. Anaerobic digestion (AD) of sewage sludge, which stabilizes organic matter and reduces the pathogen load and volume of the resulting biosolids, can be intensified through technologies that improve the performance of existing digesters, allowing increased organic loading and resulting in greater biogas production. Thus, AD intensification technologies may be of interest to WRRFs as a means for increasing capacity.

Some AD intensification technologies (e.g., thermal hydrolysis, temperature-phased AD, acid-phase digestion) are currently implemented at full-scale at multiple facilities, while others (e.g., high-solids AD, thermal-alkaline treatment, microbial hydrolysis) are just beginning to be implemented at full scale. There are also innovations at the pilot scale, such as micro-aeration and anaerobic membrane bioreactors. Utilities considering digester intensification technologies will need to anticipate resulting impacts on downstream processes like digester process stability, sidestream treatment, and dewatering. The resulting solids may not have the same characteristics, leading to different considerations for down-the-line processing (e.g., dryers); this may even impact regulatory requirements for Class A and B biosolids generation. Furthermore, with the adoption of back-end thermal processing technologies for biosolids management, operational limits of these intensified digesters may no longer be constrained by regulatory time and temperature requirements.

All of these factors impact whether an AD intensification technology is a good investment for a given utility. This project will provide utilities with valuable data and guidance to assist in decision making related to adoption of AD intensification technologies by assessing both established technologies and newer innovations in digester intensification.

Research Approach

The proposal must present a methodology for comprehensively evaluating AD intensification technologies at WRRFs and assessing the associated impacts on digestion performance, process stability, sidestream treatment, dewatering, biosolids management options, and state and federal regulatory considerations. Proposers may leverage existing demonstrations or full-scale installations to gather data. If appropriate, proposers may also perform limited bench-scale testing to compare digestion performance, establish kinetics and digestion stability parameters, or assess the effects of intensification on sidestream treatment, dewatering, and drying.

The exact research approach is left flexible, allowing proposers to choose to focus on screening a broader range of technologies **or** focus on testing a smaller number of technologies in-depth, as long as all project objectives are met. A successful project will include the following tasks:

1. Conduct a comprehensive evaluation of digestion intensification methods (demonstration scale and/or full scale):
 - a. Develop evaluation criteria and use these criteria to review AD intensification technologies, process modifications, configurations, and optimization strategies based on technical performance, process stability, footprint reduction potential, operational complexity, scalability, and compatibility with existing infrastructure.

Where feasible, evaluate technologies under a common set of boundary conditions so that results can be compared and transferred between facilities.

- b. Quantify impacts of the technologies on AD performance, including methane yield, biogas production, digestion kinetics, volatile solids destruction, pathogen reduction, process stability, and digester loading capacity. Address known stability pressure points, such as ammonia accumulation at elevated loading.
2. Evaluate the impacts of different AD intensification methods on downstream processes for sidestream and solids management using bench-scale, pilot-scale, and full-scale operational data:
 - a. Characterize changes in biosolids properties resulting from digestion intensification, including dewaterability, polymer demand, cake solids concentration, moisture content, fiber content, calorific value, nutrient composition, and other physicochemical and biological characteristics that influence downstream processing and end-use opportunities.
 - b. Assess impacts on sidestream treatment performance by evaluating changes in centrate quality and loading. This includes ammonia concentrations, nutrient release, soluble and refractory organics, and other constituents that may affect treatment capacity, process performance, or compliance requirements, including downstream receiving processes such as deammonification.
 - c. Evaluate implications for downstream biosolids processing, handling, and resource recovery pathways, including thermal drying, composting, land application, energy recovery, and nutrient recovery. Assess impacts on process performance, energy consumption, equipment loading, product quality, and operational requirements, and identify acceptable dewatered biosolids feed characteristics for downstream processes.
3. Assess regulatory considerations associated with intensified anaerobic digestion processes:
 - a. Review U.S. federal and state regulatory requirements, as well as applicable Canadian Provincial regulations, including 40 CFR Part 503 and British Columbia's Organic Matter Recycling Regulation, permitting requirements, and regulations governing Class A and Class B biosolids production.
 - b. Evaluate the impacts of digestion intensification on biosolids classification, pathogen and vector attraction reduction requirements, beneficial-use options, and ongoing compliance obligations.
 - c. Examine whether downstream thermal treatment that achieves pathogen reduction independently changes the digester operating envelope by decoupling stabilization from the digester's own time-and-temperature requirements.
 - d. Identify regulatory barriers, approval requirements, and opportunities for alternative compliance pathways or greater flexibility in meeting regulatory requirements while maintaining environmental and public health protections.

- e. Develop regulatory guidance for utilities, including permitting considerations, compliance strategies, monitoring requirements, and pathways for implementation and regulatory approval.
4. Develop guidance to support utilities in making data-driven decisions about digestion intensification. This may include the following:
- Technology selection framework
 - Design and operational considerations
 - Economic evaluation framework
 - Regulatory considerations (downstream process impacts and regulatory implications)
 - Risk assessment checklist
 - Implementation planning for retrofit

Expected Deliverables

- Research report (must use WRF's [Research Report Template](#)) that includes a comprehensive evaluation of digester intensification technologies.
- Utility-facing communication products that summarize the findings of the technology evaluation. The nature and content of these products is left flexible to encourage creativity on the part of the proposer.
- Additional deliverables will depend on the specifics of the proposal scope and research approach, but may include:
 - Process and cost models for digestion intensification technology screening and selection considering footprint, operational requirements, configurations, impacts on downstream processes, and regulatory considerations.
 - Decision-support tools and/or design guidance for intensified processes considering cost, design, impacts, risk, and full-scale implementation, based on demonstration- or full-scale plant data.
 - Peer-reviewed publications.
 - A WRF webcast detailing research conducted and information on methods of anaerobic digestion intensification and downstream solids processing impacts.

Communication Plan

Please review WRF's [Project Deliverable Guidelines](#) for information on preparing a communication plan. Conference presentations, webcasts, peer-reviewed publication submissions, and other forms of project information dissemination are typically encouraged.

Project Duration

The anticipated period of performance for this project is 24-36 months from the contract start date.

References and Resources

The following list includes examples of research reports, tools, and other resources that may be helpful to proposers. It is not intended to be comprehensive, nor is it a required list for consideration.

Riffat, R., A. Al-Omari, H. De Clippelier, and C. Debarbadillo. 2019. *Intensified Hydrolysis for High Solids Destruction – Testing the Limits of Advanced Digestion*. Project 4883. Alexandria, VA: The Water Research Foundation. <https://www.waterrf.org/research/projects/intensified-hydrolysis-high-solids-destruction-testing-limits-advanced-digestion>

Sandino, J. and D. Whitlock. 2010. *Evaluation of Processes to Reduce Activated Sludge Solids Generation and Disposal*. Project 1190. Alexandria, VA: The Water Research Foundation. <https://www.waterrf.org/research/projects/evaluation-processes-reduce-activated-sludge-solids-generation-and-disposal>

Proposal Evaluation Criteria

The following criteria will be used to evaluate proposals:

- Understanding the Problem and Responsiveness to RFP (maximum 20 points)
- Technical and Scientific Merit (maximum 30 points)
- Qualifications, Capabilities, and Management (maximum 20 points)
- Communication Plan, Deliverables, and Applicability (maximum 15 points)
- Budget and Schedule (maximum 15 points)

PROPOSAL PREPARATION INSTRUCTIONS

Proposals submitted in response to this RFP must be prepared in accordance with WRF's [Guidelines for Research Priority Program Proposals](#). The guidelines include instructions on technical aspects, financial statements, indirect costs, and administrative requirements that the applicant must follow when preparing a proposal.

Proposals that include the production of web- or software-based tools, such as websites, spreadsheets, databases, etc., must follow the criteria outlined for web tools presented in the [Technology Deliverables Guidance](#).

Eligibility to Submit Proposals

Proposals will be accepted from both U.S.-based and non-U.S.-based entities, including educational institutions, research organizations, governmental agencies, consultants, or other for-profit entities.

WRF's Board of Directors has established a [Timeliness Policy](#) that addresses researchers' adherence to the project schedule. Researchers who are late on any ongoing WRF-sponsored studies without approved no-cost extensions are not eligible to be named participants in any proposals. Direct any questions about eligibility to the WRF Project Contact listed at the top of this RFP.

Administrative, Cost, and Audit Standards

WRF's research program standards for administrative, cost, and audit compliance are based upon, and comply with, Office of Management and Budget (OMB) Uniform Grants Guidance (UGG), 2 CFR Part 200 Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards, and 48 CFR 31.2 Contracts with Commercial Organizations. These standards are referenced in WRF's [Guidelines for Research Priority Program Proposals](#) and include specific guidelines outlining the requirements for indirect cost negotiation agreements, financial statements and the Statement of Direct Labor, Fringe Benefits, and General Overhead. Well in advance of preparing the proposal, your research and financial staff should review the detailed instructions included in WRF's [Guidelines for Research Priority Program Proposals](#).

Budget and Funding Information

The maximum funding available from WRF for this project is \$350,000. The applicant must contribute additional resources equivalent to at least 33% of the project award. For example, if an applicant requests \$100,000 from WRF, an additional \$33,000 or more must be contributed by the applicant. Acceptable forms of applicant contribution include cost share, applicant in-kind, or third-party in-kind that comply with 2 CFR Part 200.306 cost sharing or matching. The applicant may elect to contribute more than 33% to the project, but the maximum WRF funding available remains fixed at \$350,000. Proposals that do not meet the minimum 33% of the project award will not be accepted. Consult the *Instructions for Budget Preparation* on the [Outbound Grants page](#) for more information and definitions of terms.

Period of Performance

It is WRF's policy to negotiate a reasonable schedule for each research project. Once this schedule is established, WRF and its sub-recipients are contractually obligated to adhere to it. Under WRF's [No-Cost Extension Policy](#), a project schedule cannot be extended more than nine months beyond the original contracted schedule, regardless of the number of extensions granted.

Utility and Organization Participation

WRF encourages participation from water utilities and other organizations in WRF research. Participation can occur in a variety of ways, including direct participation, in-kind contributions, or in-kind services. To facilitate their participation, WRF has provided contact information for utilities and other organizations that have indicated an interest in this research. Proposers are responsible for negotiating utility and organization participation in their proposals. The listed utilities and organizations are under no obligation to participate, and the proposer is not obligated to include them in their proposal.

Application Procedure and Deadline

Proposals are accepted exclusively through WRF's Portal, and they must be fully submitted before 3:00 pm Mountain Time on Monday, September 14, 2026.

To learn how to submit a proposal for this RFP, please visit www.waterrf.org/proposals and follow the instructions on the page.

Questions to clarify the intent of this RFP and WRF's administrative, cost, and financial requirements may be addressed to the WRF project contact, Maitreyi Nagarkar, PhD, at 571.384.2117 or mnagarkar@waterrf.org. Questions about how to submit proposals through WRF's Portal should be directed to [WRF's Customer Care Form](#).