



REQUEST FOR PROPOSALS

PRACTICAL FRAMEWORK FOR WATER INFRASTRUCTURE RESILIENCE (RFP 5014)

Objective

This project will develop a practical framework for utilities that operate drinking water, wastewater, and stormwater systems to use as a tool in developing resilience plans for their infrastructure, to help meet the America's Water Infrastructure Act (AWIA) requirements, and to achieve the ultimate goal of increasing water infrastructure resilience.

Budget

\$100,000

Background

Secure and resilient water (drinking water, wastewater, and stormwater) infrastructure is essential to daily life and to ensure the economic vitality of the community and public confidence in the nation's water services. In the water sector, resilience focuses on protecting human health, property, and the environment by minimizing drinking water and wastewater service outages, providing flood protection, and enhancing recovery of all systems as soon as possible following a disruption. A utility's risk-management priorities depend on many factors, including utility size, location, assets, and, perhaps most importantly, the resources and capabilities the utility can access. According to the project, *Resilient Water Infrastructure: Improving Understanding and Assessing Needs* ([project 4707](#)), "there is no agreed upon definition of, or approach to, resilience across the sector" and "no consensus as to whether the development of a standard definition would be helpful."¹ Presidential Policy Directive (PPD) 21 defines the term resilience as "the ability to prepare for and adapt to changing conditions and withstand and recover rapidly from disruptions. Resilience includes the ability to withstand and recover from deliberate attacks, accidents, or naturally occurring threats or incidents."² Long-term threats to water infrastructure, including infrequent/uncertain hazards and extreme weather events, limited funding and flexibility, and deteriorating infrastructure, complicate the water sector's resilience planning efforts.

¹ <http://www.waterrf.org/Pages/Projects.aspx?PID=4707>

² <https://obamawhitehouse.archives.gov/the-press-office/2013/02/12/presidential-policy-directive-critical-infrastructure-security-and-resil>

The current practice is often to patch and repair infrastructure as incidents occur, at the expense of smart investments in resilient systems that have the potential to improve services at a cost below that of the current practice in the long term. Additionally, the patch and repair approach does not allow for leveraging new technologies.

A variety of resilience-related studies, guidance, and other information has been developed by governmental agencies, research organizations, and industries across the world (e.g., Department of Homeland Security – National Infrastructure Advisory Council, Environmental Protection Agency, American Water Works Association [AWWA], etc.). In the last 20 years, regulations and standards have been created for promoting risk assessment and resilience at water utilities. Vulnerability assessments (VAs) and emergency response plans (ERPs) were required post September 11, 2001, and were strengthened in more recent years by the AWWA J100 Standard, which emphasizes to a greater degree the need for resilience. Unfortunately, while the application of these requirements and methodologies has resulted in the preparation of plans and reports, many of these remain plans only. The principles and approaches underlying these methodologies have not been embraced by the utilities as a new way of considering risk assessment and resilience requirements. For example, according to a study by the National Academies of Sciences, Engineering, and Medicine, *Building and Measuring Community Resilience: Actions for Communities and the Gulf Research Program* (2019), many methods have been developed or suggested to measure resilience (including the AWWA Standard J100, Appendix H), but few are being used. This is despite the fact that an objective measure of the degree of resilience at a utility could be extremely valuable in identifying the costs and benefits associated with changes related to increased infrastructure resilience.

The America's Water Infrastructure Act (AWIA) was signed into law in October 2018. The AWIA requires, amongst other things, that large water systems—those serving 100,000+ customers—conduct, and certify completion of, risk and resilience reviews of their systems by March 31, 2020. The utilities are also to review and revise their emergency response plans within six months of the March 31, 2020 deadline. These AWIA requirements are important drivers in achieving improved resilience at utilities on an ongoing basis. In the process of meeting the AWIA requirements, many utilities encounter challenges such as a lack of clear guidance, lack of practical tools for quantification of resilience, etc.

Among the resilience-related projects funded by WRF, the ongoing project, *Real-Life Enterprise Resilience* ([project 4734](#)), is developing an i-book, which will be a “one stop” resource containing research-informed guidance to assist water utilities in developing their resilience, including building organizational culture and processes (e.g., improved communication and engagement on resilience). While this project will provide valuable information, it is an international effort and focuses more on the enterprise level. Therefore, there is a need to synthesize available standards, manuals, frameworks, and tools on water infrastructure resilience, and to provide a practical framework for the United States water sector to meet the AWIA requirements and to develop long-term resilience plans for their infrastructure.

Research Approach

The purpose of this project is to construct a practical framework that water utilities can use to help improve their overall resilience. To accomplish this, the researcher will review and synthesize recent related literature and deconstruct water utilities' experiences of recent disaster events, (e.g., earthquakes, wildfires, flooding, etc.) and provide insights and suggestions for a practical framework for

water utilities, including drinking water, wastewater, and stormwater utilities, to use in developing infrastructure resilience plans.

To accomplish the project objectives, the project should:

- Specify the definition and scope of infrastructure resilience to be employed in this study.
- Develop a white paper to include:
 - Literature review of available tools, frameworks, standards, and manuals for water infrastructure resilience and the strengths, weaknesses, and focus of each tool. Literature shall include relevant industry documents, in particular those developed for compliance with AWIA requirements.
 - Analysis of data generated from practical applications used by utilities to determine resilience.
 - Consideration of approaches and attempts to quantify the degree of resilience at water utilities.
 - A list of key findings for each of the documents reviewed, such as focus, key steps, similarities and differences in approaches, and merits or drawbacks thereof.
- Hold a workshop for utilities to share project findings to date and utility experiences, provide insights, and identify gaps on infrastructure resilience, in particular those related to the AWIA requirements, including challenges, progress, and lessons learned.
 - Note: considering budget and timing, a workshop in the fall, possibly around the AWWA Water Infrastructure Conference to be held in late October in St. Louis, is recommended.
 - Provide the above white paper as a preparation material for the workshop, and outline a proposed initial practical framework for utilities at the workshop.
 - Engage with the utilities about the potential for developing a resilience certification process.
- Develop a practical framework for water utilities.
 - The framework should cover major events (e.g., earthquakes, wildfires, flooding, etc.)
 - The framework should address different needs of water systems of various sizes.
 - The framework should provide guidance on how to quantify costs and benefits of flexibility and adaptability in design, construction, and maintenance (i.e., developing the business case for resilient design, construction, and maintenance of water infrastructure).
 - The framework should prepare a matrix to help different utilities determine the best tools to assess and enhance their resilience under various scenarios.
- The results of this project will be based on relevant industry literature and the experience of water utilities in preparing for, and responding to, actual disaster events, focusing on those activities most likely to prove valuable to a utility impacted by such events.

The final product should be an organic combination of the white paper and the framework, so that water utilities in different geographic locations and of various sizes can readily find practical tools and information applicable to their respective situations to help them meet the AWIA requirements and achieve the ultimate goal of increasing infrastructure resilience.

Proposal Submittal Instructions

Proposals should be submitted to EOpportunities@waterrf.org by 3PM MT on **June 18, 2019**. For proposal submittal questions please contact Caroline Bruck, Senior Administrative Assistant, at cbruck@waterrf.org or 303-347-6118. For technical questions about the RFP, please contact Jian Zhang at jzhang@waterrf.org or 303-347-6114. Proposals must be submitted in Adobe Acrobat (.pdf) format in one file. The Emerging Opportunities Program has unique proposal requirements. Please follow the submission instructions below and do not reference requirements of other research programs. Proposals not adhering to the guidelines below will not be accepted.

The entire proposal, excluding the proposal cover worksheet, resumes, budget form, budget narrative, co-funding support form (when applicable), schedule, and references, should **not exceed fifteen (15) pages in length**. Proposals must include the following components.

- **Proposal Cover Worksheet** – See the Emerging Opportunity Program Worksheets section at: <http://www.waterrf.org/funding/Pages/proposal-guidelines.aspx>
- **Background and Statement of Need** – Provide a brief summary of the current state of knowledge for the issue that the proposed research will help address, and the drivers for the proposed research. This section should clearly articulate:
 - 1) How this work compares to past or ongoing related research.
 - 2) If the proposed work is duplicative of past research efforts, why this additional work is needed.
- **Objectives** – The proposed research objectives should be clearly identified in one or two sentences.
- **Technical Approach** – Describe how the proposed research will be conducted and the tasks necessary to accomplish the objectives.
- **Benefit to WRF Subscribers** – Identify the practical benefits of the proposed research to water utilities and the water community.
- **Research Team and Other Participants** – Identify the key members of the research team and provide brief statements of their qualifications to conduct the proposed research. Identify any other organizations that have committed to collaborate on the proposed research. Curriculum vitae or resumes for research team members are required.
- **Budget** – A detailed budget is required. The researcher should identify the amount of WRF funds requested and any other cost-share, in-kind, or cash support for the proposed research. The following items will need to be included with the budget. Related instructions and forms can be found in the Emerging Opportunities Research Program Worksheets section at <http://www.waterrf.org/funding/Pages/proposal-guidelines.aspx>
 - Proposal Budget Form
 - Budget Narrative
 - Emerging Opportunities Co-Funding Support Form (when applicable): Each co-funding organization providing cash to the project payable directly to WRF must complete a separate Emerging Opportunities Co-Funding Support Form and include it with the proposal package.
- **Schedule** – A detailed schedule is required.
- **References** (optional) – Detailed citations are not required in the proposal, but may be provided at the discretion of the researcher.

Proposal Review and Funding Decision

WRF will form a Project Advisory Committee (PAC) composed of volunteer professionals with expertise in the research subject area to oversee the project(s) funded through this solicitation. Proposals will be reviewed by WRF staff and the PAC against established evaluation criteria. WRF may request additional information from the researcher based on this review, and interviews may be conducted for the top three proposals. Proposals are treated confidentially and will not be shared outside of WRF.

The proposal review and selection process, from initial submittal through final decision, generally will not exceed 3-4 weeks.

5014 UTILITY AND ORGANIZATION PARTICIPANTS

The following utilities have indicated an interest in possible participation in this research. This information is updated within 24 business hours when a utility submits a volunteer form and this RFP will be re-posted with the new information. **(Depending upon your settings, you may need to click refresh on your browser to load the latest file.)**

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