

ADVANCED DECENTRALIZED WATER/ENERGY NETWORK DESIGN FOR SUSTAINABLE INFRASTRUCTURE



IMPACT STATEMENT

In order to provide a water infrastructure that is more sustainable into and beyond the 21st century, drinking water distribution systems and wastewater collection systems must account for our diminishing water supply, increasing demands, climate change, energy cost and

availability. Water efficiency must be equally addressed with energy efficiency going far beyond simply adding low flow toilets and faucets in new buildings and retro-fits. Thus, it is the goal of this research project is to address these water-related issues as they relate to the U.S. Environmental Protection Agency's (EPA) mission to safeguard human health and the environment.

BACKGROUND:

Aging and deteriorating water infrastructure is a priority issue for EPA. Over the last several years, energy consumption by the water and wastewater sector has considerably increased as a result of the implementation of new technologies and approaches to safeguard water quality and to meet new regulations. Also, the price of energy has substantially increased in the same period. It is imperative that optimization of energy use, more efficient equipment and treatment technologies, energy recovery, and even energy production must become a part of the services and activities being undertaken by drinking water and wastewater utilities.

DESCRIPTION:

The Office of Research and Development's (ORD) National Risk Management Research Laboratory (NRMRL) has funded this research project in support of its Aging Water Infrastructure (AWI) Research Program. The objective of this research effort is to produce, evaluate, and summarize the cost, performance, and long-term reliability of coupling energy and water conservation technologies, modeling capabilities, and decision-support tools to reduce and optimize energy consumption in the treatment, conveyance, and use of water while utilizing water in the most efficient manner possible and in turn, increasing water supplies by virtue of reusing wastewater, stormwater, and preventing excess runoff.

This project will provide financial assistance to a recipient organization to evaluate innovative water and energy design and application of the design using advanced Leadership in Energy and Environmental Design (LEED) certification. This project seeks to develop a total water management approach by incorporating water efficiency into "green" certification programs such as LEED. In order to provide a water infrastructure that is more sustainable into and beyond the 21st century, drinking water distribution systems and wastewater collection systems must account for our diminishing water supply, increasing demands, climate change, energy cost and availability. Water efficiency must be equally addressed with energy efficiency going far beyond simply adding low flow toilets and faucets in new buildings and retro-fits. Therefore, it is the goal of this project is to provide detailed cost-benefit analysis of LEED and sustainable design elements in terms of a detailed analysis of both water and energy systems utilizing Low Impact Development and conduct post-occupancy monitoring of building comfort, cost, energy, CO2 emission impact, and water conservation.

This project will focus on the methods and the capability of new construction to achieve water and energy independence in a sustainable approach. This project should result in the ability to evaluate the impacts of water

conservation and integration into LEED ratings also making recommendations for future rating criteria fully considering sustainable water activities when compared to traditional building designs in similar settings. Although this project should take place in a temperate region with variable precipitation and temperature, it should also result in recommendations for various other eco-regions within the United States. Recommendations should also include guidance on how existing built environments (brownfields) in various eco-regions can be retro-fitted or rehabilitated cost-effectively.

Thus, it is the goal of this research project is to address these water-related issues as they relate to EPA's mission to safeguard human health and the environment. This project will focus on the methods and the capability of new construction to achieve water and energy independence in a sustainable approach. As part of the AWI Research Program, this research project, not only supports EPA's Office of Water's Sustainable Water Infrastructure Initiative, but also must fulfill its responsibilities toward the Global Climate Change, Water Quality, and Drinking Water Program Offices.

EPA GOAL: Goal #2 - *Clean & Safe Water*; Objective 2.1.1- *Water Safe to Drink*

ORD MULTI YEAR PLAN: Drinking Water (DW), Long Term Goal (LTG) - DW-1 *characterize risks associated with DW sources, distribution, treatment, and use*; Water Quality (WQ) LTG - WQ-3 *Source Control*

AWARDEE: University of Nebraska at Lincoln

EXPECTED OUTCOMES AND IMPACTS:

Outcomes may be environmental, behavioral, health-related, or programmatic in nature, but must be quantitative. Projects to be funded under this announcement are expected to contribute to the attainment of the desired primary outcome of this program, which is to assist the user community, such as water utilities, to more effectively meet their Clean Water Act and Safe Drinking Water Act requirements and conserve energy in the production of drinking water, wastewater, improve water efficiency, reduce the carbon footprint of the water industry, and improve water infrastructure sustainability. This desired outcome will be achieved by providing the user community with technical data, guidance, and decision support tools that will improve their capability to identify, select, and implement appropriate innovative approaches for optimizing energy and water resources.

OUTPUTS:

The outputs of this project will assist users to more effectively meet Clean Water Act and Safe Drinking Water Act requirements. This agreement is expected to result in technical guidance documents, published research papers, and other technical reference material.

RESOURCES:

Aging Water Infrastructure Research Program: <http://www.epa.gov/awi/>

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Drinking Water



Water Quality



Aging Water Infrastructure