

ELEMENT 3 RESOURCES

INFRASTRUCTURE PROTECTION AND RESILIENCE PLANNING

STEP 1: Energy and Utility Installations

[CHP Deployment](#)

U.S. Department of Energy

Combined heat and power (CHP) provides a cost-effective, near-term opportunity to improve our nation's energy, environmental, and economic future. CHP is an efficient and clean approach to generating on-site electric power and useful thermal energy from a single fuel source. The CHP Deployment Program provides stakeholders with the resources necessary to identify CHP market opportunities and support implementation of CHP systems.

[Combined Heat and Power: Enabling Resilient Energy Infrastructure for Critical Facilities](#)

ICF International (2013)

This report provides information on the design and use of combined heat and power (CHP) for reliability purposes, as well as state and local policies designed to promote CHP in critical infrastructure applications.

[Distributed Energy Resources: Whole Building Design Guide](#)

Whole Building Design Guide, a program of the National Institute of Building Sciences

This section of the Whole Building Design Guide focuses on distributed energy system and renewable energy options. Increased demands on the nation's electrical power systems and incidences of electricity shortages, power quality problems, rolling blackouts, and electricity price spikes have caused many utility customers to seek other sources of high-quality, reliable electricity. Distributed Energy Resources (DER), small-scale power generation sources located close to where electricity is used (e.g., a home or business), provide an alternative to or an enhancement of the traditional electric power grid.

[Guide to Using Combined Heat and Power for Enhancing Reliability and Resiliency in Buildings](#)

U.S. Department of Energy, U.S. Department of Housing and Urban Development, and U.S. Environmental Protection Agency (2013)

During and after Hurricane Sandy, combined heat and power (CHP) enabled a number of critical infrastructure and other facilities to continue their operations when the electric grid went down. Time and again, CHP has proved its value as an alternative source of power and thermal energy (heating and cooling) during emergencies, and demonstrated how it can be a sound choice in making energy infrastructure more resilient in the face of extreme weather events. This report provides practical guidance on CHP and steps involved in a typical CHP project development process.

[Powering the Future of Health Care: Financial and Operational Resilience – A Combined Heat and Power Guide for Massachusetts Hospital Decision Makers](#)

Health Care Without Harm (2013)

Combined Heat and Power (CHP) generation is a well-established technology for producing both electricity and thermal energy directly on-site instead of relying on power from the electricity grid. A well-designed CHP system can significantly lower greenhouse gas emissions, reduce energy costs, and improve the passive survivability of health care facilities during emergencies. These important benefits have led to an increased interest in CHP amongst hospitals, state and federal regulators as well as utilities.

[Protecting Building Utilities from Flood Damage: Principles and Practices for the Design and Construction of Flood Resistant Building Utility Systems](#)

Federal Emergency Management Agency (1999)

Floodplains are home to nearly 10 million households. Floods result in killing on average 150 per year and causing over \$3 billion in property damage. This report provides principles and practices for the design and construction of flood resistant building utility systems.

STEP 2: Energy Conservation and Renewable Energy

[*ASHRAE Advanced Energy Design Guide for Large Hospitals*](#)

[*ASHRAE Advanced Energy Design Guide for Small Hospitals and Healthcare Facilities \(30%\)*](#)

American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

This series provides a sensible approach to easily achieve advanced levels of energy savings without having to resort to detailed calculations or analysis. The Guides offer contractors and designers the tools, including recommendations for practical products and off-the-shelf technology, needed for achieving a 50% energy savings compared to buildings that meet the minimum requirements of ANSI/ASHRAE/IESNA Standard 90.1-2004. The energy savings target of 50% is the first step in the process toward achieving a net-zero energy building, which is defined as a building that, on an annual basis, draws from outside resources equal or less energy than it provides using on-site renewable energy sources.

[*Disaster Resiliency and Recovery*](#)

National Renewable Energy Laboratory (NREL)

This fact sheet describes NREL's capabilities in the areas of disaster planning, response, and rebuilding.

[*Disaster Resilience and Recovery*](#)

National Renewable Energy Laboratory (NREL)

NREL's energy disaster recovery program offers a broad range of services, including whole-community energy planning, on-site technical assistance, energy-efficient design and rebuilding strategies, and clear information for decision makers. Their website has a range of success stories and publications, including their work with Greensburg, KS.

[*Energy Star Portfolio Manager*](#)

Energy Star

ENERGY STAR Portfolio Manager® is an online tool you can use to measure and track energy and water consumption, as well as greenhouse gas emissions. Use it to benchmark the performance of one building or a whole portfolio of buildings, all in a secure online environment.

[*Federal Green Challenge*](#)

U.S. Environmental Protection Agency

The Federal Green Challenge is a national effort under U.S. EPA's ***Sustainable Materials Management Program***, challenging EPA and other federal agencies throughout the country to lead by example in reducing the Federal Government's environmental impact. Federal offices or facilities can select six target areas: waste, electronics, purchasing, energy, water, or transportation.

[*Federal Green Challenge – Energy*](#)

U.S. Environmental Protection Agency

The goals of this challenge are to reduce electricity, natural gas, and/or fuel oil used per year and to increase renewable energy use.

[*National Renewable Energy Lab Renewable Energy Atlas*](#)

National Renewable Energy Laboratory

Maps renewable energy resources in the United States and illustrates the geographic distribution of wind, solar, geothermal, and biomass resources, as well as other pertinent information.

[*Realizing a Clean Energy Future: Highlights of NREL Analysis*](#)

National Renewable Energy Laboratory (NREL) (2013)

This article discusses the movement from a carbon-centric, inefficient energy system to one that emphasizes efficiency and draws from diverse energy sources – including the sun. It summarizes how NREL's analyses will help reach a clean energy future.

[*Renewables Make a Powerful Case as Hospital Energy Source*](#)

U.S. Department of Energy

Rapidly rising energy costs and tightening regulations on carbon emissions are making renewable energy, or “renewables,” increasingly compelling to hospitals. Renewables were once viewed as niche technologies, but improved funding, incentives, and technology have positioned renewable energy to enter the mainstream.

[*Targeting 100! Envisioning the High Performance Hospital: Implications for a New, Low Energy, High Performance Prototype*](#)

University of Washington Integrated Design Lab (2010)

This research provides a conceptual framework and decision-making structure at a schematic design level of precision for hospital owners, architects, and engineers. It offers access to design strategies and the cost implications of those strategies for new hospitals to utilize 60% less energy.

STEP 3 & 4: Water Supply and Usage

[*Best Practices in Water Conservation*](#)

Practice Greenhealth

This website explains the steps to establish a water conservation program as well as where to look for water conservation opportunities.

[*Disaster Preparedness: Before an Event*](#)

Centers for Disease Control and Prevention (CDC)

In this website, CDC outlines steps we should take to prepare ourselves for future disastrous events. This includes drinking water, water use, hygiene and sanitation, water security, and water-related diseases and illnesses.

[*Drinking Water Advisory Communication Toolbox*](#)

Centers for Disease Control and Prevention, U.S. Environmental Protection Agency, American Water Works Association (2013)

This toolbox, which is available as a comprehensive website and a PDF document, provides information on how to plan for, develop, implement, and evaluate drinking water advisories. It includes instructions on how to prepare before an event, what to do during an event, templates and tools to use, and recommendations for follow-up actions and assessments after an event to enable water systems to communicate effectively with partners and the public in order to protect public health.

[*Emergency Water Supply Planning Guide for Hospitals and Health Care Facilities*](#)

U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, and American Water Works Association (2012)

In order to maintain daily operations and patient care services, health care facilities need to develop an Emergency Water Supply Plan (EWSP) to prepare for, respond to, and recover from a total or partial interruption of the facilities' normal water supply. Because water supplies can and do fail, it is imperative to understand and address how patient safety, quality of care, and the operations of your facility will be impacted.

[*Federal Green Challenge – Water*](#)

U.S. Environmental Protection Agency

This website discusses water goals to reduce the amount of water consumed as well as ways to protect water resources. It also discusses how to reduce the amount of stormwater runoff from existing sites.

[*How Healthcare Uses Water*](#)

Practice Greenhealth

This website explains how healthcare facilities use water. Healthcare facilities fall within the top ten consumers of water in the community.

[*Planning for an Emergency Drinking Water Supply*](#)

U.S. EPA National Homeland Security Research Center (June 2011)

Five workshops were convened with about 60 technical experts to review alternative means of providing drinking water in the event of destruction, impairment, or contamination of the public water supply.

[*Planning for Water Supply Interruptions: A Guide for Hospitals and Healthcare Facilities*](#)

Healthcare & Public Health Sector Coordinating Councils

This 2-page primer highlights tools and resources for assisting hospitals and health facilities in preparing for water supply interruptions. Water is necessary not only for drinking and sanitation, but also heating and cooling, patient care, and emergency response efforts.

[*Water: Sustainable Infrastructure*](#)

U.S. Environmental Protection Agency

This website addresses our water infrastructure needs and how to select the right solutions to meet each need. It gives examples of alternatives that should be considered and links to resources with more information on the possibilities.

[*When Every Drop Counts: Protecting Public Health During Drought Conditions: A Guide for Public Health Professionals*](#)

Centers for Disease Control and Prevention (CDC), U.S. Environmental Protection Agency, National Oceanic and Atmospheric Administration, and American Water Works Association (2010)

CDC's National Center for Environmental Health (NCEH) developed this guide to assist public health officials, practitioners, and other stakeholders in their efforts first to understand and then to prepare for drought in their communities. It provides information about how drought affects public health, recommends steps to help mitigate the health effects of drought, identifies future needs for research and other drought-related activities, and provides a list of helpful resources and tools.

STEP 5: Sewage and Wastewater

American Water Works Association

American Water Works Association (AWWA) website includes a range of resources on backflow prevention, emergency preparedness and sewage/wastewater systems, and storage options. This AWWA Resource Community is intended to keep the water industry informed about resources, tools, issues, and developments related to collection systems.

Cross-Connection Control: A Best Practices Guide

U.S. Environmental Protection Agency

This Guide discusses the importance of controlling cross-connections and preventing backflow occurrences from unprotected cross connections in the water system.