

# FEDERAL UTILITY PARTNERSHIP WORKING GROUP SEMINAR

April 12-13, 2017  
Savannah, Georgia

## **Underutilized Water-Efficient Technologies to Incorporate Into Your UESCs**

Kate McMordie Stoughton  
with contributions from Susan Loper and Brian Boyd  
**Pacific Northwest National Laboratory**

Hosted by:



# FEMP Water Efficient Technology Opportunities

- Multi-stream rotational sprinkler heads
- Sprinkler automatic shut-off devices
- Advanced cooling tower controls
- Steam sterilizer condensate retrofit kit
- Connectionless food steamers
- Acoustic leak noise loggers
- Alternative water systems

# Criteria for Consideration

- Underutilized in the federal sector
- Broad applicability across the federal sector
- Proven water and cost savings potential
- Market availability
- Produced by multiple manufacturers
- Suitable as a retrofit

# Multi-Stream Rotational Sprinkler Heads

## Technology Description

- Applies water in rotating trajectories with reduced flow rate
- Applies water more evenly over landscape



# Multi-Stream Rotational Sprinkler Heads

## Benefits

- Nozzle design has:
  - Better coverage of landscape (called “distribution uniformity”)
  - Larger droplets and less misting, which decreases evaporative losses
  - Reduced runoff because water is spread more slowly onto landscape



# Multi-Stream Rotational Sprinkler Heads

## Considerations

- Easy retrofit on existing pop-up spray heads
- Best suited for smaller landscape

## Proven Savings

- Southern Nevada Water Authority study:
  - Precipitation rate fell from 2 inches per hour to 1 inch per hour
  - Distribution uniformity improved by 45%



**Additional technology to consider:  
Advanced irrigation controls that use real-time data**

Photo: <http://www.rainbird.com/homeowner/products/sprays/RNnozzles.htm>

# Automatic Sprinkler Shut-Off Devices

## Technology Description

- Internal valve that automatically closes when a sprinkler head breaks
- Drop in water pressure triggers valve to close

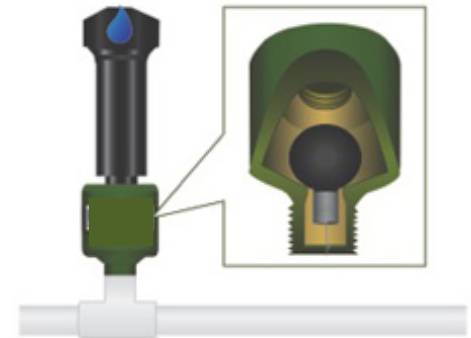


Photo: <http://www.hydroknot.com/>

# Automatic Sprinkler Shut-Off Devices

## Benefits

- Prevents water geysers resulting from sprinkler head breaks, which reduces:
  - water losses
  - erosion and runoff
  - property damage



Photo: PNNL



# Automatic Sprinkler Shut-Off Devices

## Considerations

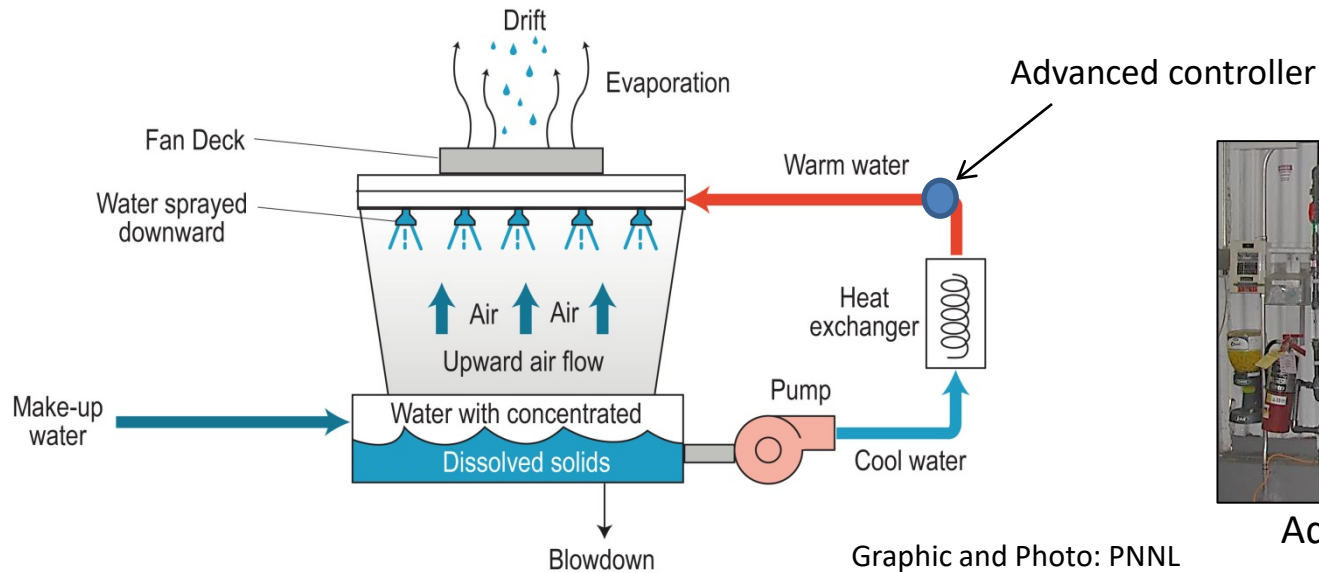
- Can be retrofitted on existing systems, small trench has to be dug around each riser
- Can be used for any sprinkler types including rotors and pop-up spray

## Proven Savings

- California study resulted in 39% water use reduction

<http://www.nomoregeysers.com/downloads/Water%20Savings%20Report%20-%20NMG.pdf>

# Advanced Cooling Tower Controls



Advanced Controller at Fort Riley, KS

## Technology Description

- Monitors multiple control parameters of recirculating water: conductivity, pH, corrosion rates, chemical residual
- Provides real-time monitoring in cooling tower systems
- Manages cycles of concentration and chemical feed
- Reacts dynamically to changing operational conditions

# Advanced Cooling Tower Controls

## Benefits

- Reduces energy use as a result of cleaner heat-exchange surfaces
- Reduces water use by running optimal cycles of concentration
- Reduces chemical use by eliminating needless overfeeding of treatment products

# Advanced Cooling Tower Controls

## Considerations

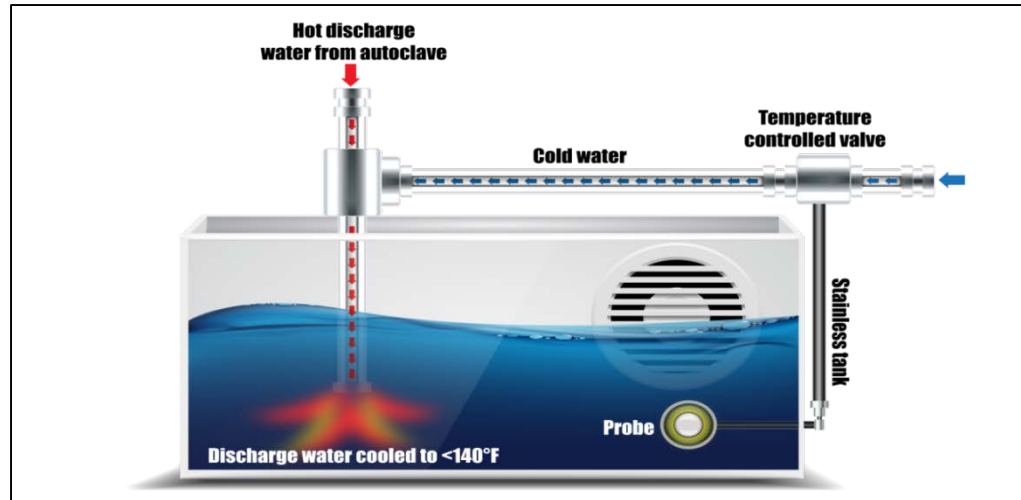
- Easily retrofitted on existing systems
- Requires proper programming of set-points with water specialist
- Consider water quality, treatment program, and operating conditions

## Proven Savings

- State of California study found an average savings of 86,000 gallons per year for 350 ton cooling tower

[http://www.energy.ca.gov/title24/2013standards/prerulemaking/documents/current/Reports/Nonresidential/HVAC/2013\\_CASE\\_WS4-CTWS\\_10.5.2011.pdf](http://www.energy.ca.gov/title24/2013standards/prerulemaking/documents/current/Reports/Nonresidential/HVAC/2013_CASE_WS4-CTWS_10.5.2011.pdf)

# Steam Sterilizer Condensate Retrofit Kit



Graphic: PNNL

## Technology Description

- Tank captures condensate during ready/standby mode and dissipates heat before discharging the cooled condensate
- Thermostatically controlled valve allows cool tap water to enter the chamber to meet discharge water temperature code requirements

## Benefits

- Greatly reduces need for tempering water

# Steam Sterilizer Condensate Retrofit Kit

## Considerations

- Easily retrofitted on existing systems
- Most applicable for large, freestanding sterilizers
- Space constraints are generally not an issue

## Proven Savings

- Stanford University Study found 90% reduction of tempering water

[https://suwater.stanford.edu/sites/default/files/sem\\_steamsterilizers\\_stanford\\_2013.pdf](https://suwater.stanford.edu/sites/default/files/sem_steamsterilizers_stanford_2013.pdf)

**Additional laboratory technology to consider: Vacuum pump optimization**

# Connectionless Food Steamers

## (Boilerless Food Steamers)

### Technology Description

- Closed loop system that operates without a boiler or drain connection
- Has a heated water reservoir that is manually filled
- Very little steam leaves the cooking cavity and is reused

### Benefits

- Uses on average 1 to 2 gallons of water per hour; traditional boiler-based steamers consume an average of 40 gallons per hour
- Reduces maintenance costs by eliminating the need to de-scale/de-lime the boiler

# Connectionless Food Steamers

## Proven Savings

- Food Service Technology Center study found that boiler-based steamers used approximately 407 gallons per day compared to connectionless steamers that used on average 14 gallons per day.

Karas, Angelo; Kong, Victor; Fisher, Don. 2005. Evaluating the Water Savings Potential of Commercial “Connectionless” Food Steamers. Final Report. Fisher-Nickel, Inc. Food Service Technology Center



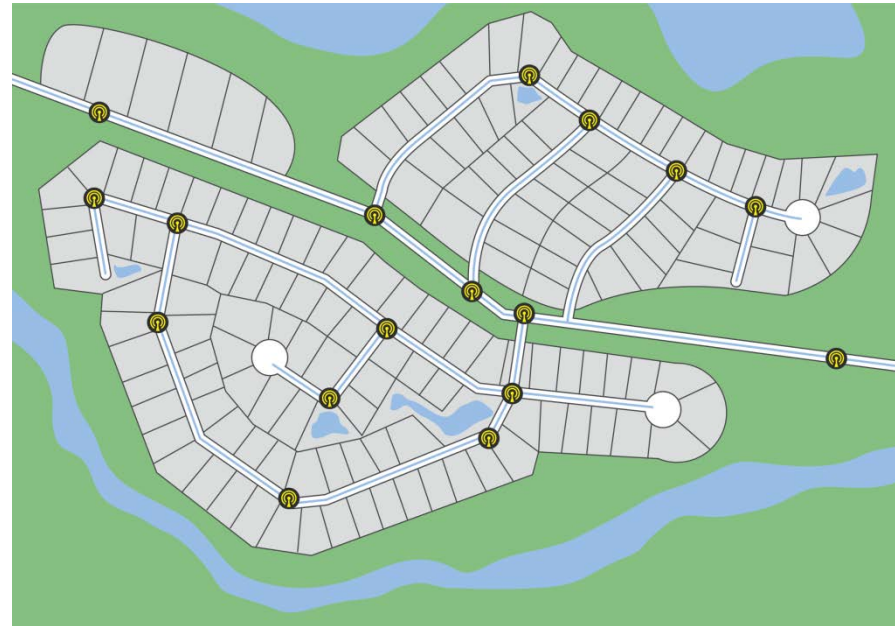
# Acoustic Leak Noise Loggers

## Technology Description

- Wireless acoustic sensors are located throughout the distribution system
- Sensors “listen” for leaking water from pipes
- Data is recorded by a centralized system that provides leak alerts

## Benefits

- Continually listens to identify leaks as they arise
- Small leaks are caught early which reduces water losses and labor time



Graphic: PNNL

# Acoustic Leak Noise Loggers

## Considerations

- Can be attached to the system and left in place for an extended period of time or moved to different areas
- Sampling frequency can be set by user
- Works better on metal pipes
- More suitable for pipes that are 16 inches or less in diameter

## Proven Savings

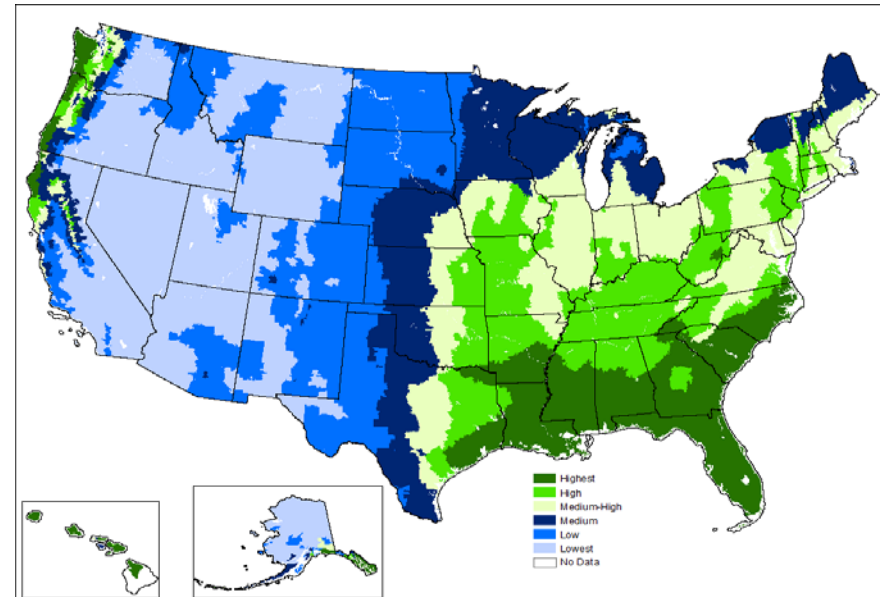
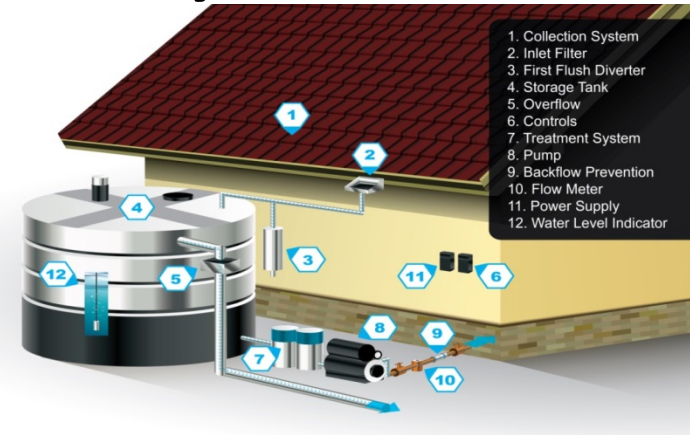
- Tobyhanna Army Depot identified 6 leaks responsible for an estimated 90,000 gallons of water per day



Photo: Tom Wildoner of Tobyhanna Army Depot

# Alternative Water Systems

- Investigate alternative water systems:
  - Rainwater harvesting
  - Onsite wastewater treatment



FEMP Resources:

<https://energy.gov/eere/femp/alternative-water-sources-maps>

Graphics: PNNL

**FEMP**  
Federal Energy Management Program

  
Southern Company

# FEMP Water Efficient Technology Opportunities

Visit the FEMP Website to learn more!

<https://energy.gov/eere/femp/water-efficient-technology-opportunities>

- Multi-stream rotational sprinkler heads
- Sprinkler automatic shut-off devices
- Advanced cooling tower controls
- Steam sterilizer condensate retrofit kit

## Coming Soon:

- Connectionless food steamers
- Acoustic leak noise loggers
- Alternative water systems

# Thank you!

Contact information:

Kate McMordie Stoughton

[kate.stoughton@pnnl.gov](mailto:kate.stoughton@pnnl.gov)

509-371-7258