Wastewater Energy Efficiency

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Tennessee Renewable Energy Economic Council

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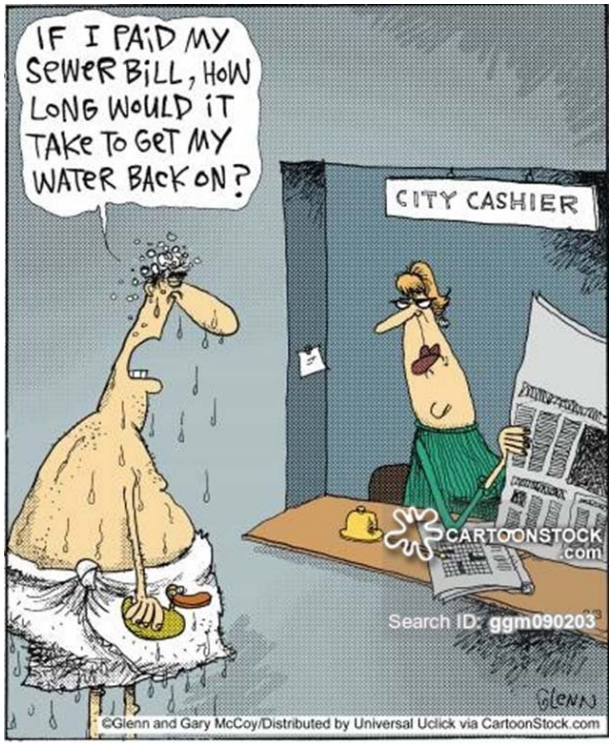
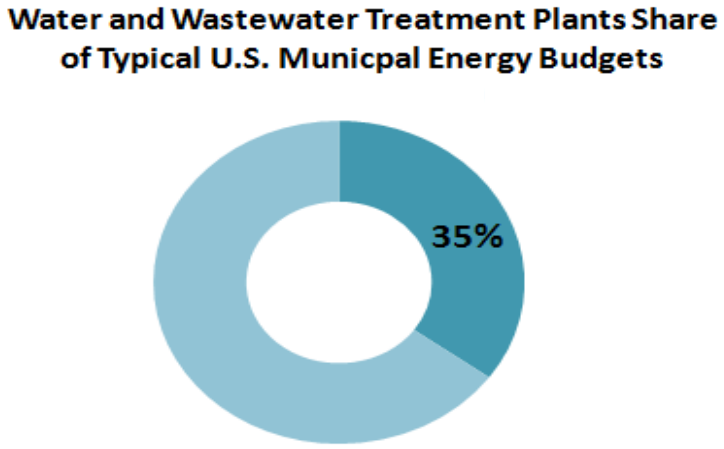
Why we should care

- Environmental stewardship
- We spend people's money.
  - Tax dollars, public bonds, utility rates

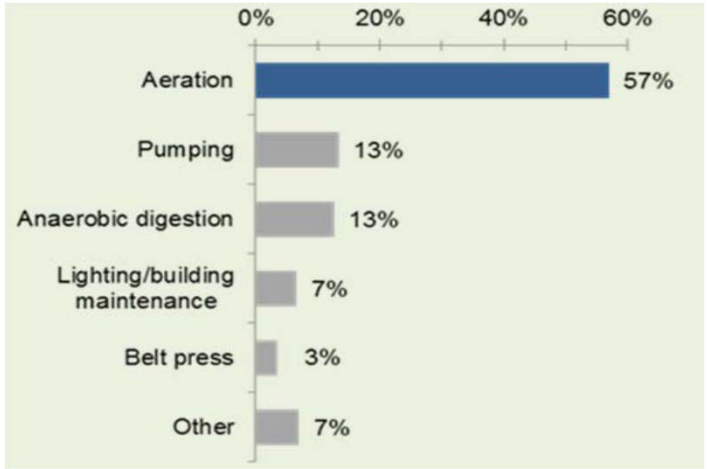


Energy Use for Wastewater Treatment

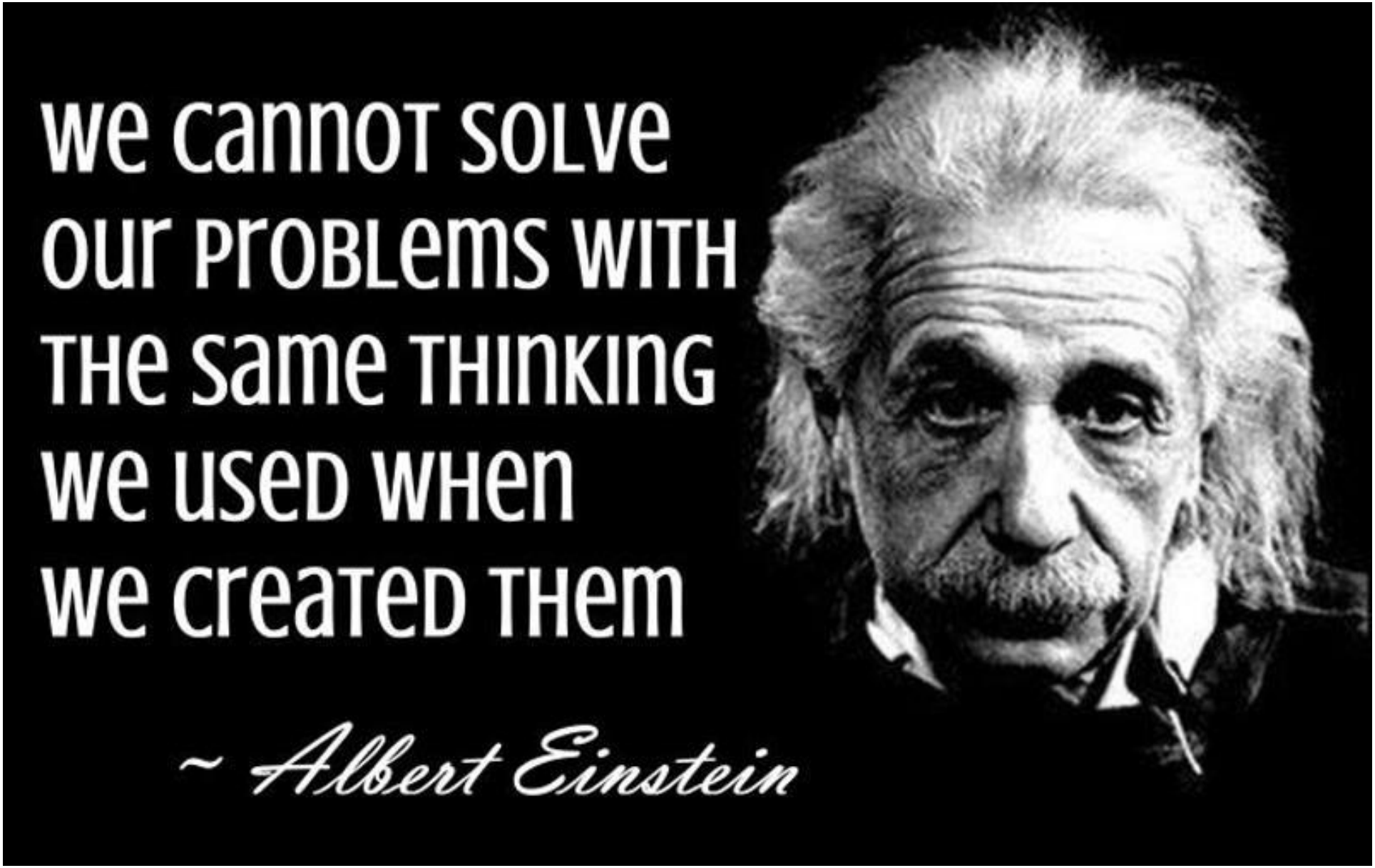
- Water and wastewater plants use 3-4% total energy in U.S.
- Largest energy consumer of municipal governments:
  - 30-40% of total utility bills
- Energy use expected to grow 20% in next 15 years



Source: Energy Efficiency in Water & Wastewater Facilities, U.S. EPA, 2013



Source: Energy-Positive Water Resource Recovery Workshop Report, National Science Foundation, U.S. DOE, U.S. EPA, April 2015


we cannot solve
our problems with
the same thinking
we used when
we created them
~ Albert Einstein

Partnership

Department of Environment & Conservation

THE UNIVERSITY OF MEMPHIS.

TVA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Region 4

THE UNIVERSITY of TENNESSEE

INSTITUTE for PUBLIC SERVICE

Water & Wastewater Participants

Carthage WWTP

Caryville-Jacksboro UC WWTP

Church Hill WWTP

Cleveland Utilities

Clifton WTP

Columbia WWTP

Dayton WWTP

Dickson WWTP

Dunlap WWTP

Dyersburg WWTP

Fayetteville WWTP

First Utility District Knox County WWTP

Franklin WWTP

Greeneville WTP

Harriman UB WWTP

Humboldt WTP

Jamestown WTP & WWTP

Johnson City WTP & WWTP

Knoxville UB WTP & WWTP

Lenoir City UB WWTP

Lawrenceburg WWTP

Lewisburg WWTP

Lexington WWTP

Loudon WWTP

Millington WWTP

Murfreesboro WTP & WWTP

Nashville Dry Creek

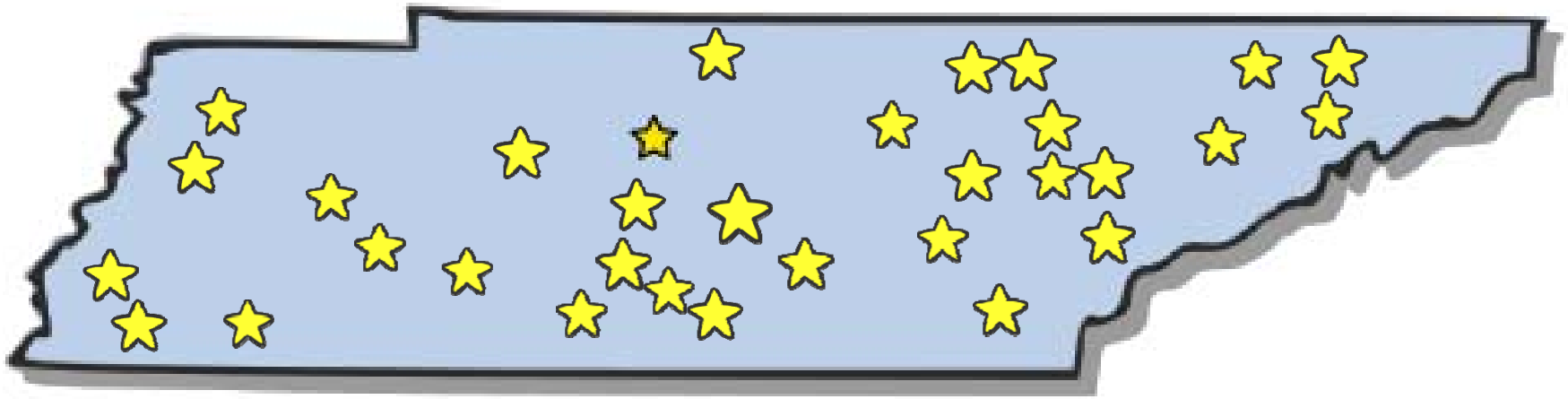
Newbern WWTP

Oak Ridge WTP & WWTP

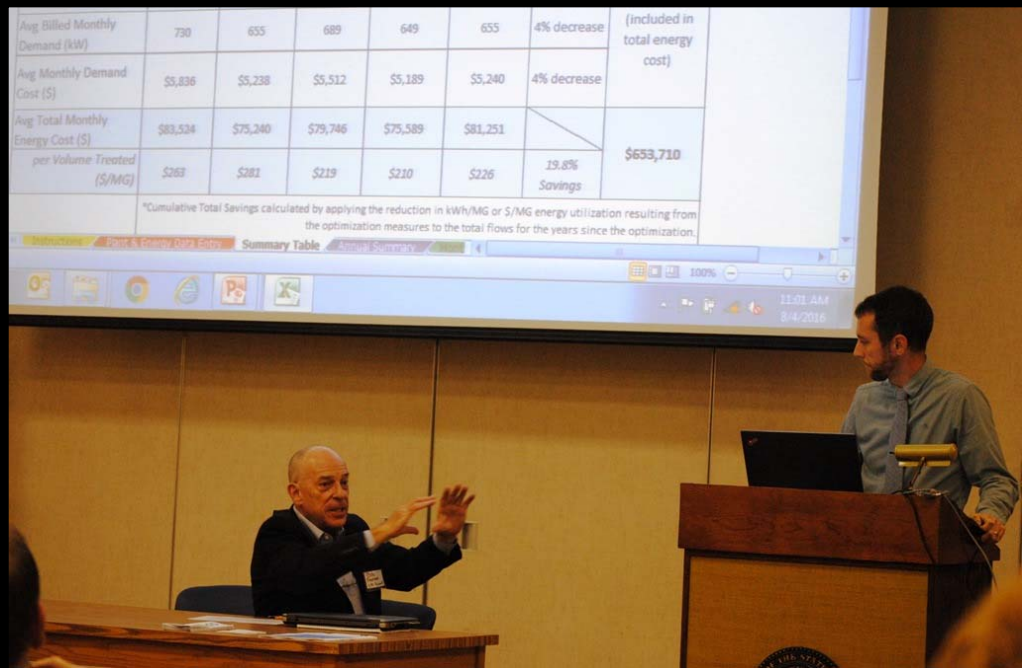
Portland WWTP

West TN Correctional Facility WWTP

Winchester WTP & WWTP




OPERATOR TRAINING CENTER


Avg Billed Monthly Demand (kW) 730 655 689 649 655 4% decrease (included in total energy cost)
Avg Monthly Demand Cost ($) $5,836 $5,238 $5,512 $5,189 $5,240 4% decrease
Avg Total Monthly Energy Cost ($) $83,524 $75,240 $79,746 $75,589 $81,251
per Volume Treated ($/MG) $263 $281 $219 $210 $226 19.8% Savings
$653,710
*Cumulative Total Savings calculated by applying the reduction in kWh/MG or $/MG energy utilization resulting from the optimization measures to the total flows for the years since the optimization.
Summary Table
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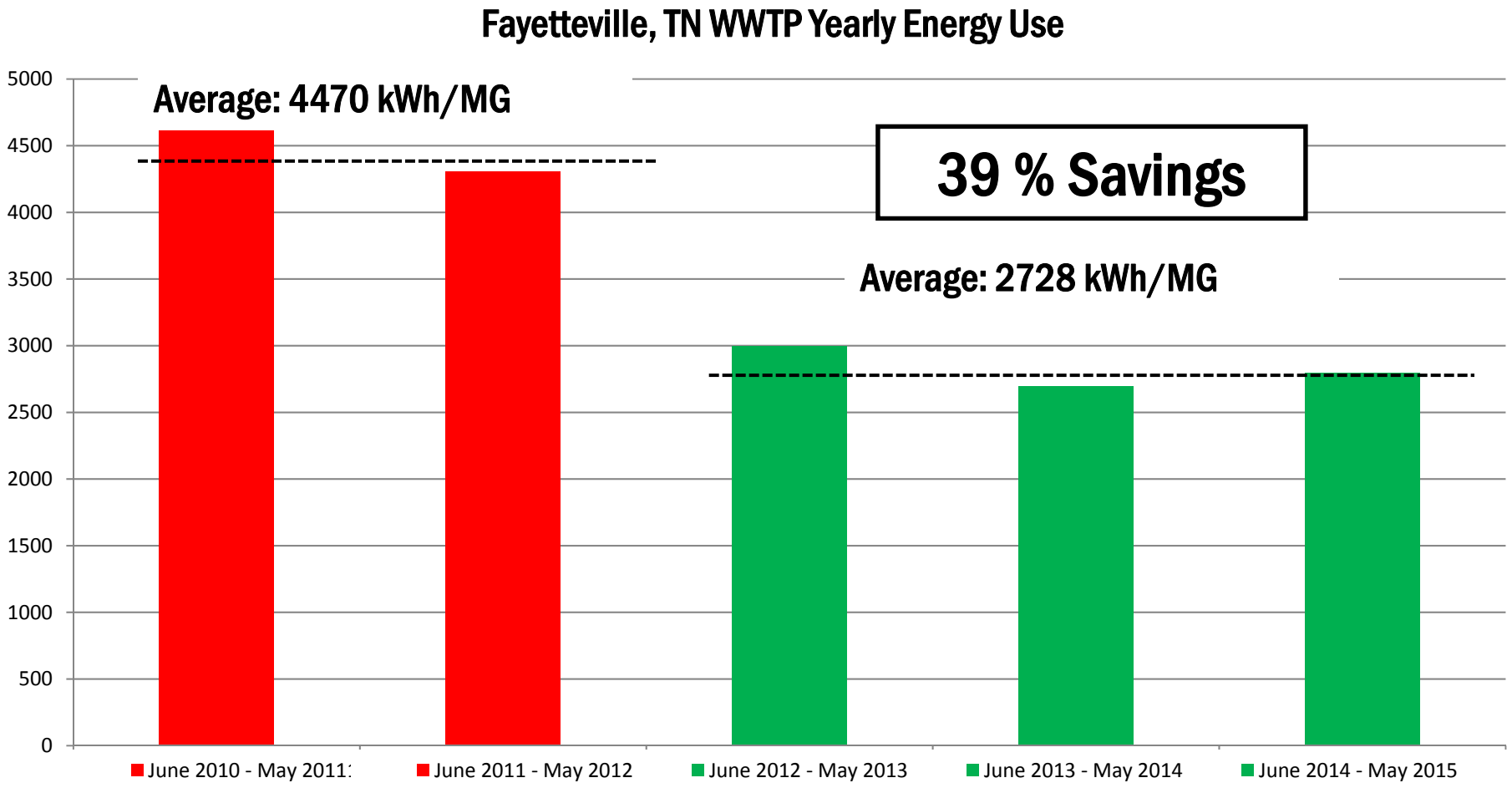
8/4/2016

Fayetteville WWTP

Fayetteville – Orbital Oxidation Ditch

Fayetteville – Aerobic Digesters

Fayetteville – Measured Energy Savings



Results Through 2015

- **Average Annual Energy Savings – 19%**

- **Measured** Annual Savings
  - Over 15,000,000 kWh
  - Over $1,500,000/year savings
  - Over 13,000 tons/year CO2 Reduction

- **Additional Annual Savings** of 1.5-2.0 million kWh (projected)

- 50% of the changes were implemented so far,
  <u>all at little to no cost</u>

U.S. Department of Energy Award - $469,947

- Advancing Energy Efficiency in Wastewater Utilities and Other Underserved Sectors
- Extends work of the partnership
- Shares best practices with Alabama to help develop the same program
- Assists 24 wastewater systems across 2.5 years
- 6 eligible systems for each year per state

DOE Award: Measuring Success

How to measure success with project

- Benchmark previous 2-years of utility data
- Monitor energy use for 12 months after measures implemented
- Verify reductions in energy consumption

Step 4: REPEAT & ADJUST address issues

Step 1: BENCHMARK energy use & perform energy ASSESSMENT

Step 3: MONITOR & VERIFY
Update benchmarks
Identify problems

Step 2: IMPLEMENT recommendations

Next Steps – Wave 5 in 2017

- Office of Energy Programs seeking 6 to 10 systems to PARTICIPATE in workshops
- Agree to track energy use in EPA spreadsheet
- Baseline: past 2 years of energy bills
- Future: 1 - 3 years after assessment

Franklin's Water Reclamation plant participated the first year and has installed a 1 MW solar array.
(Photos: Nashville Ledger (L) Google Earth image (R))

TN

Things We Recommend

- Manage electric load. Operate smart.
- LEDs bring instant energy savings.
- Upgrade HVAC with better controls.
- Install Variable-Frequency Drives.
- Upgrade pumps and motors.
- On/off operations

Things We Don’t Recommend

Lessons Learned

- Any size plant can find savings
- Minimal investment can produce big results
- Savings are savings
- Team approach works best

Photo: Tennessee History for Kids

Cumberland Mountain State Park

People will have different attitudes – positive and negative, for doing the same work.

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Questions?

Burgess Falls State Park

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