Energy Efficiency Opportunities at Surface Water Plants

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ADEM Surface Water Conference

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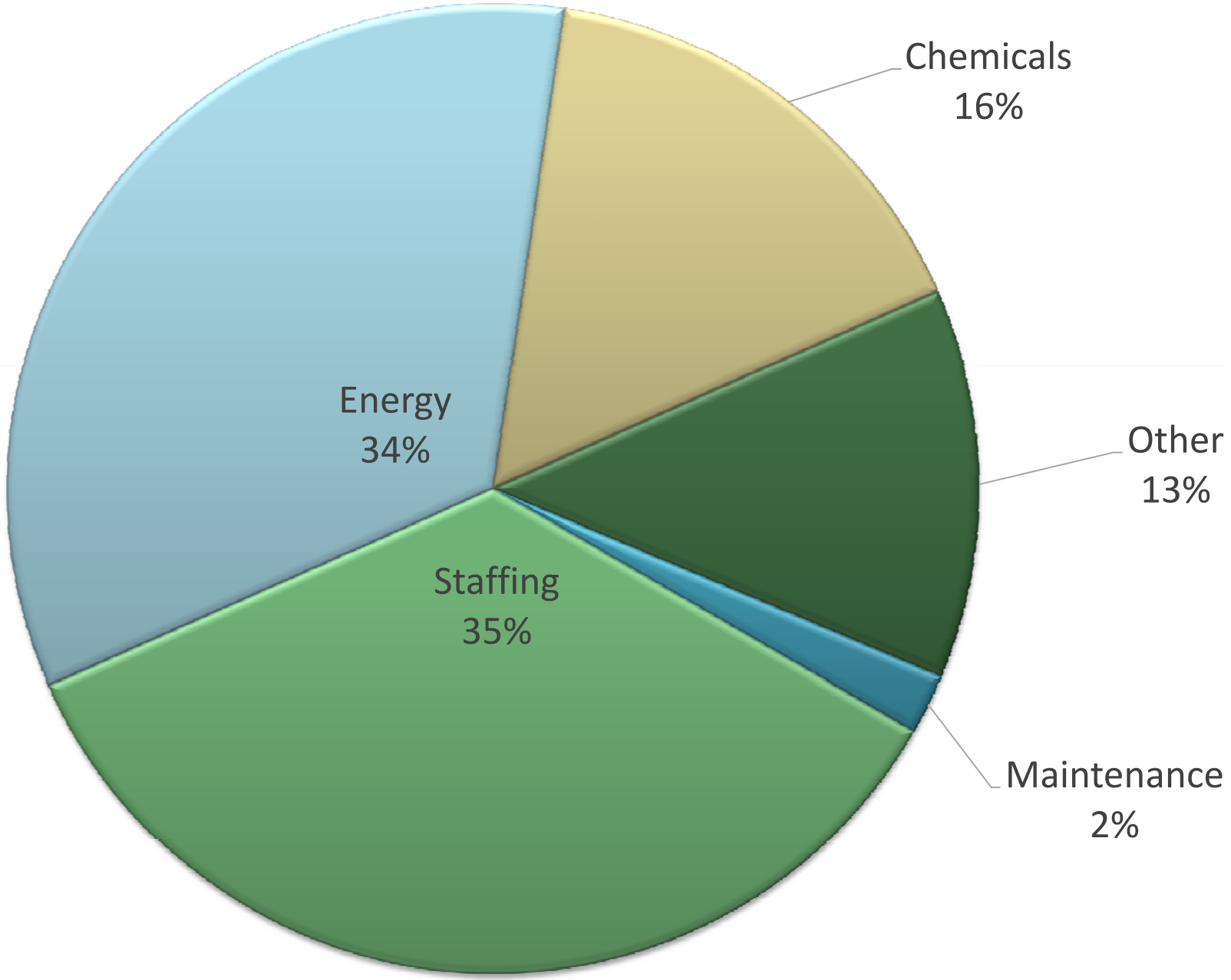
Overview

- Energy Use at Surface Water Plants
- Laying the Groundwork
- Finding Early Wins
- Next Steps
- Assistance and Incentives
- Summary

Typical Operating Costs at Public Water Systems



"Typical" Energy Use at SW Plants

Volume Treated (MGD)	Pop. Served	kWh/month	$/month
1	5,000	40,000	$2,800
5	25,000	190,000	$13,000
10	50,000	395,000	$28,000
20	100,000	770,000	$54,000

Based on a surface water plant with the following unit processes: Raw pumps, rapid mix, flocculation, sedimentation, chemical feed systems, backwash pumps and finished water pumps. Approx. $0.07/kWh electric cost.

Source: Water Research Foundation, 2013

Management Support:
Laying The Groundwork

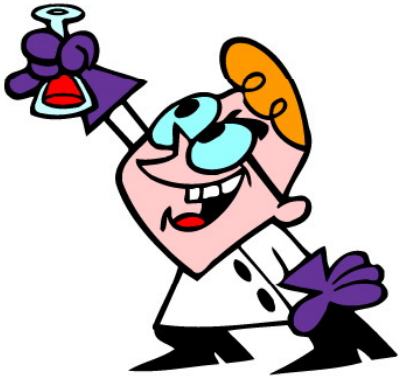
1) Establish an Energy Team

Operators

Energy Management Team

Finance & Governance

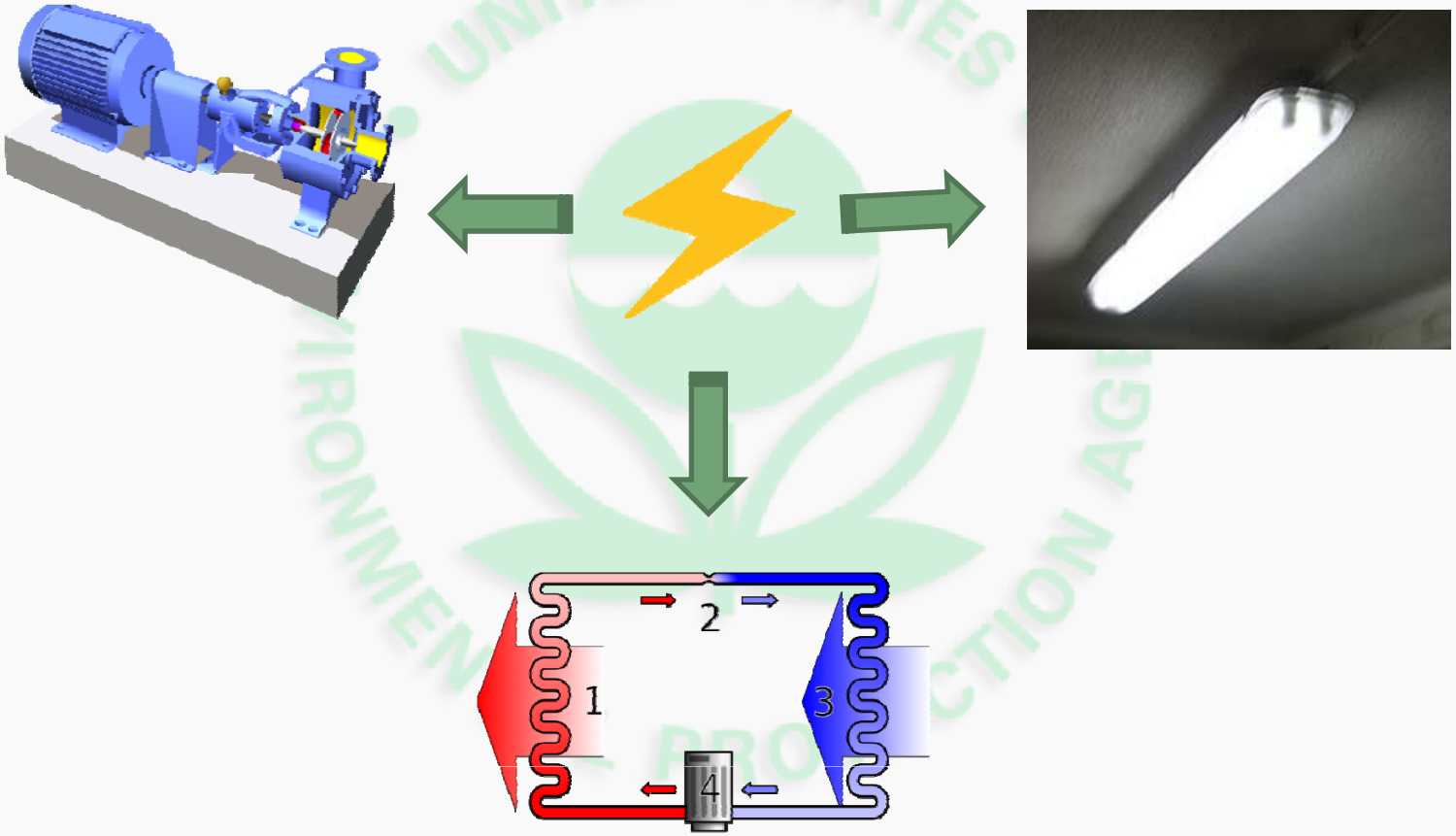
Engineers



Laboratory Specialists

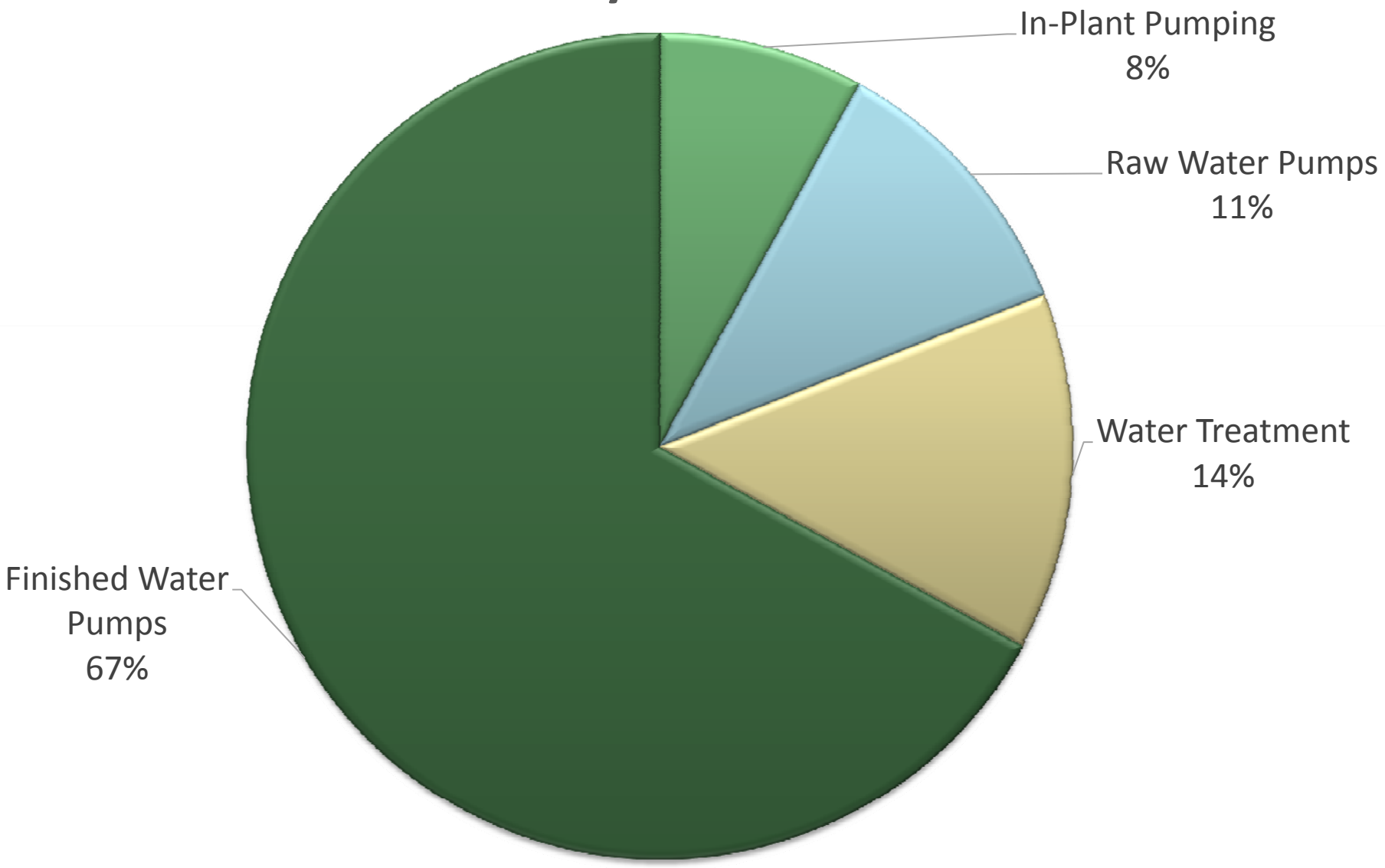
Early Energy Team Objectives

Where does the energy go?



Resource: Equipment Inventory from Appendix of “Ensuring a Sustainable Future”

Typical Energy Uses at Public Surface Water System



Source: EPRI, 2005

Early Energy Team Objectives

WARNING! This may blow your mind:

Resource: Equipment Inventory from Appendix of “Ensuring a Sustainable Future”

Early Energy Team Objectives

How are you being charged?

Time of Use Rates?
Real Time Pricing?

$ per kWh per kVA??
Contract Minimums?

Incentive Programs?

Early Energy Team Objectives

How are you being charged?

MONTHLY RATE (SECONDARY)

Base Charge:
$50.00 per customer; plus

Charge for Billing Capacity:
$4.74 per kW of billing capacity; plus

Charge for Energy:
For the first 250 kWh per kW of billing capacity:
8.9331¢ per kWh for all kWh.

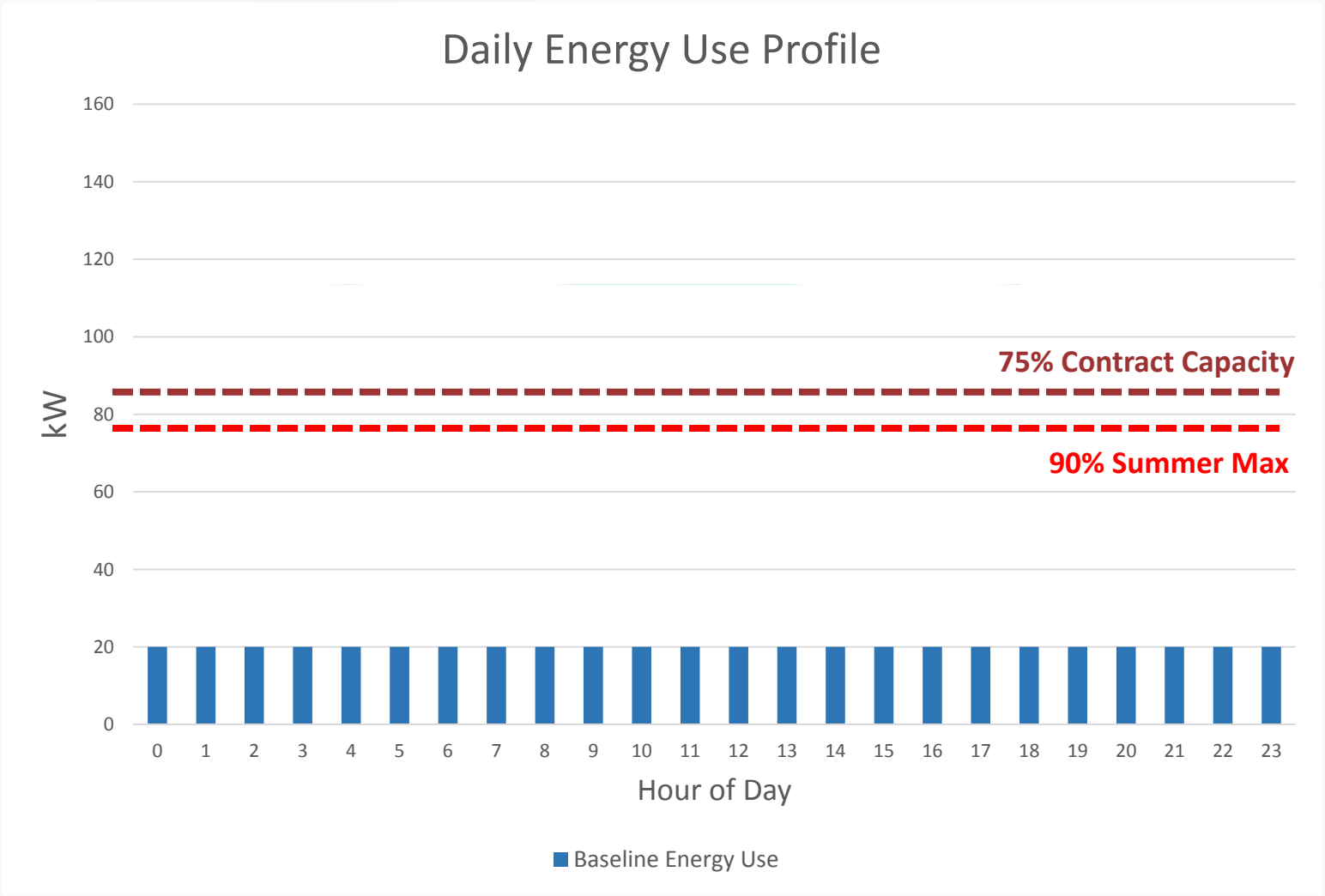
For all over 250 kWh per kW of billing capacity:
6.9668¢ per kWh for all kWh.

DETERMINATION OF BILLING CAPACITY

The monthly billing capacity shall be the measured maximum integrated fifteen (15) minute capacity during each billing period of approximately thirty (30) days measured in kW; provided, however, that such capacity shall be no less than ninety percent (90%) of the measured maximum capacity requirements established during the billing months of June through September falling within the eleven (11) months preceding the billing period or seventy-five percent (75%) of the contracted capacity, whichever is greater. No billing capacity shall be for less than 5 kW for secondary service from the distribution facilities, 25 kW for primary service, or 100 kW for service from the transmission facilities.

Source: Alabama Power LPM Rate Schedule

How are you being billed?



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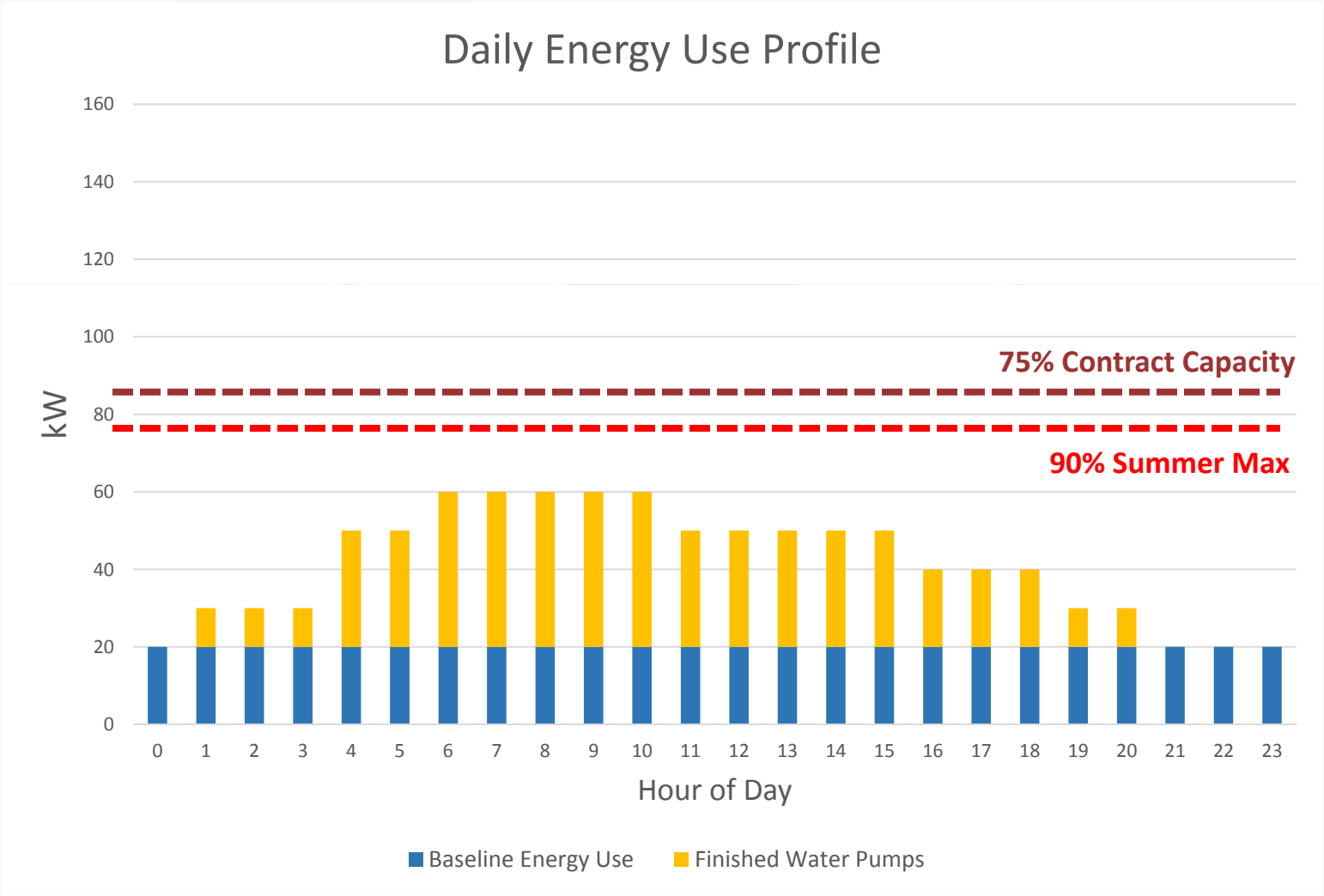

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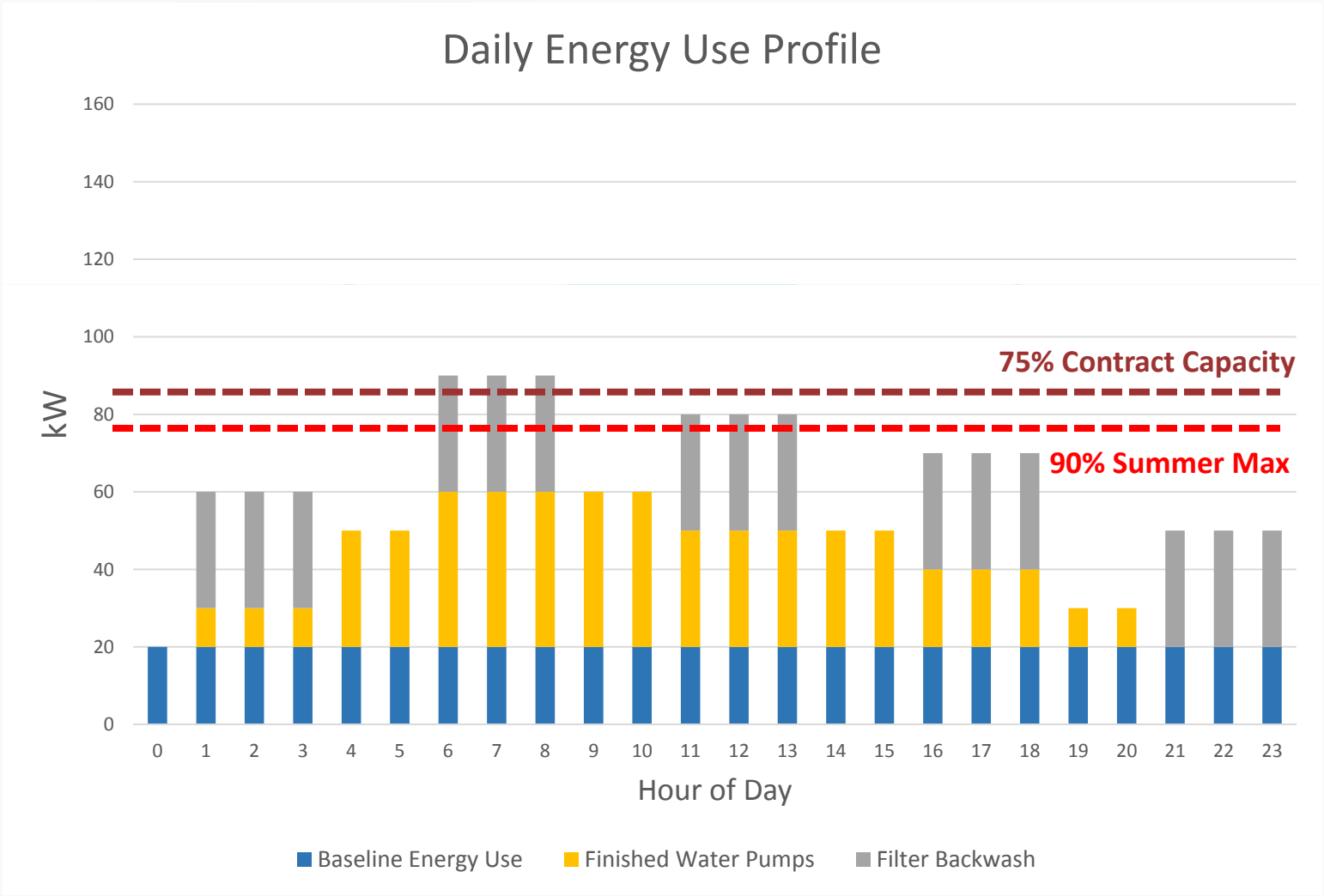

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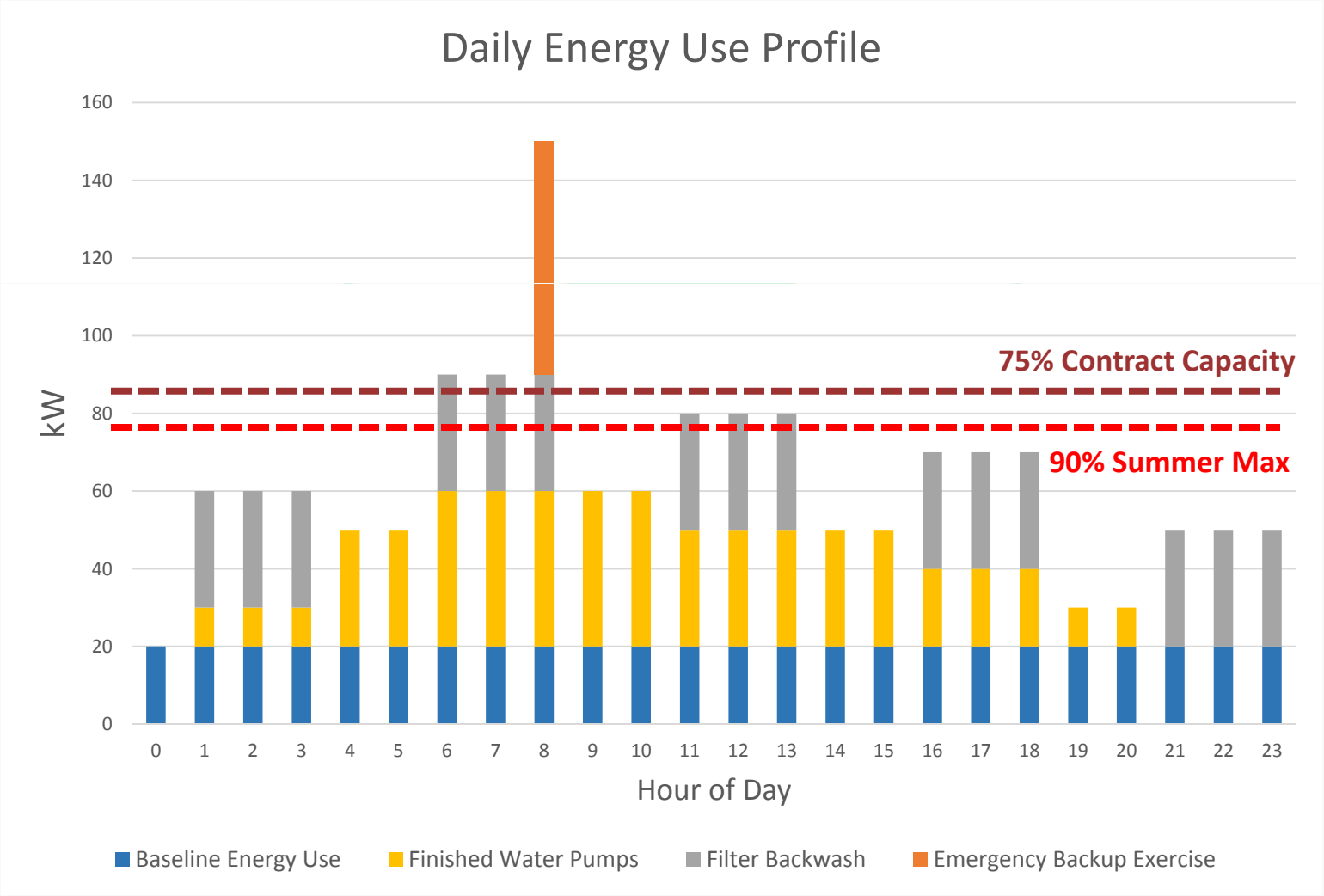


2) Set an Energy Policy

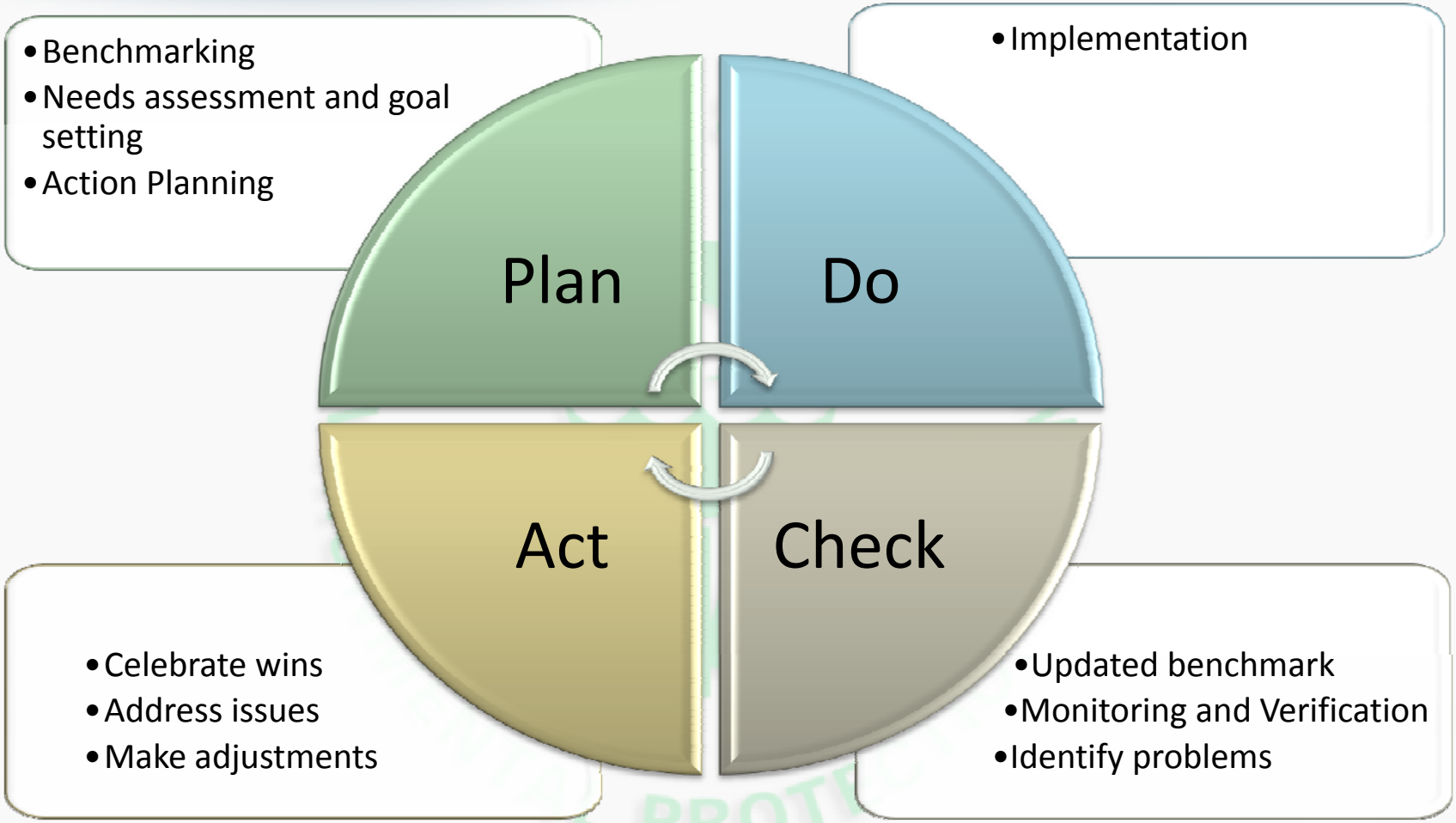
“It’s more than a memo”

What is the goal?

How is it evaluated?
Who is accountable?

How does it fit with other objectives?

3) Evaluate Progress

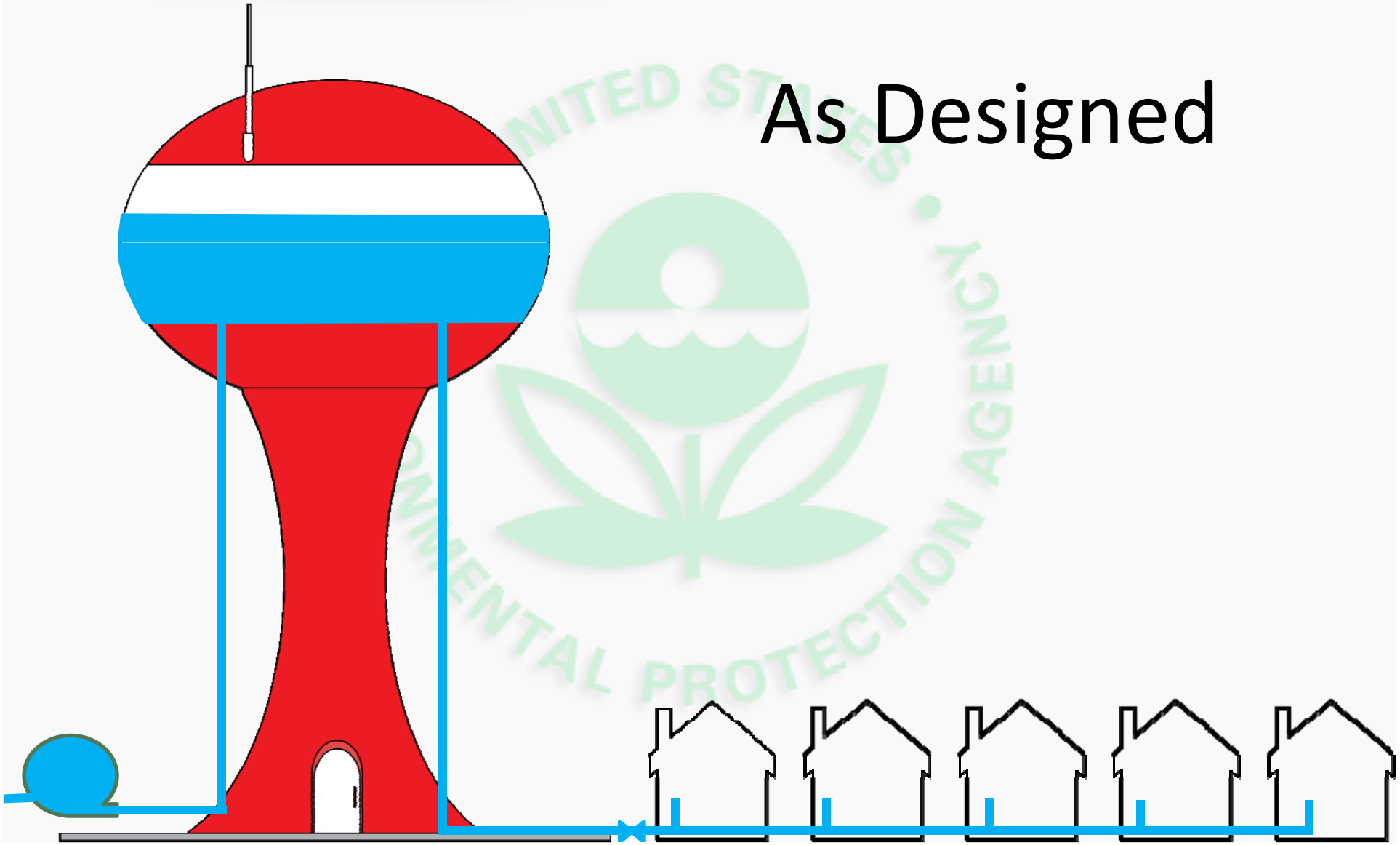


Resources:

- R4 EMI Equipment Inventory (email me)
- "Ensuring a Sustainable Future" – EPA Energy Management Guidebook (Google)

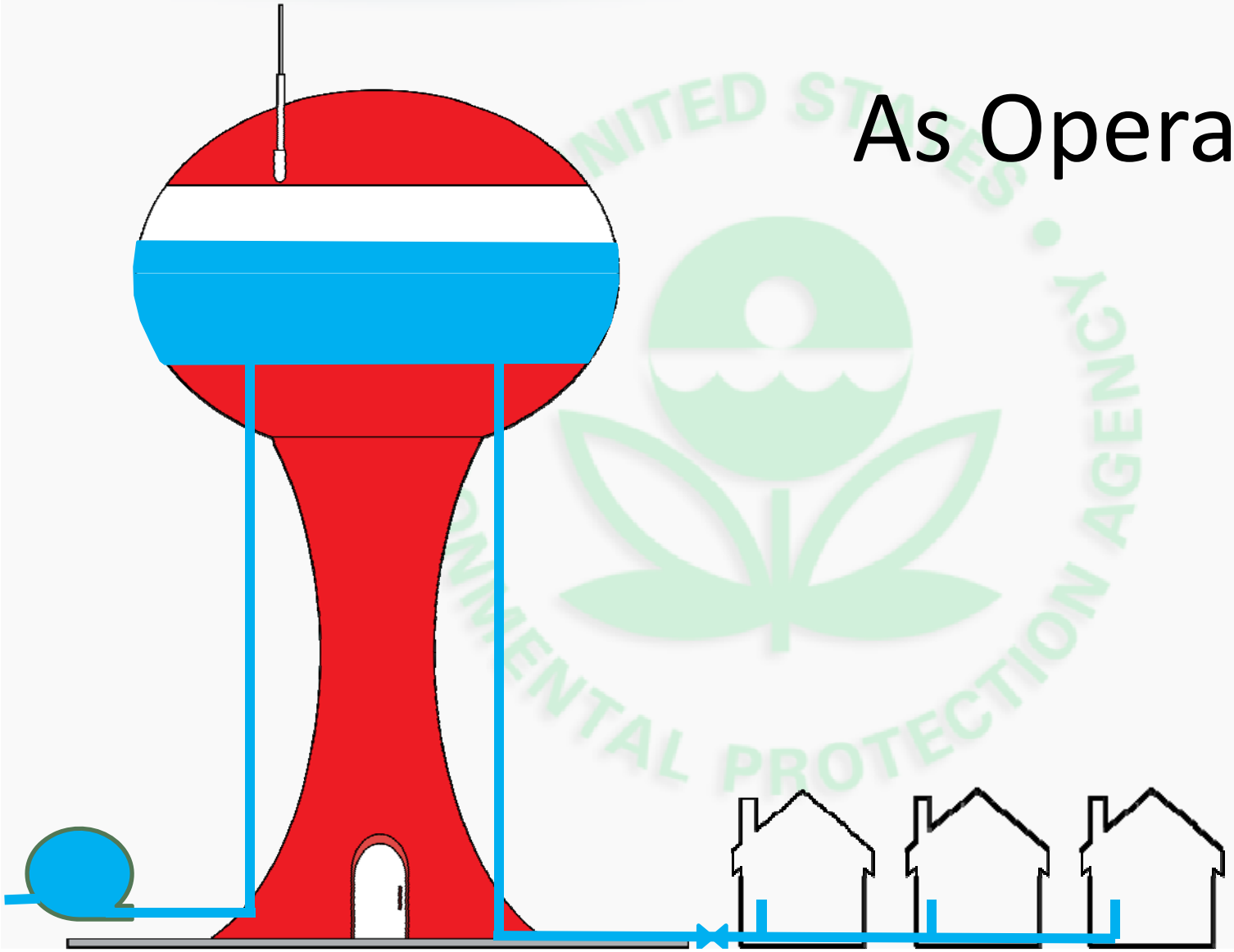
Finding Easy Wins

Elevated Tanks – Top Capacity Level



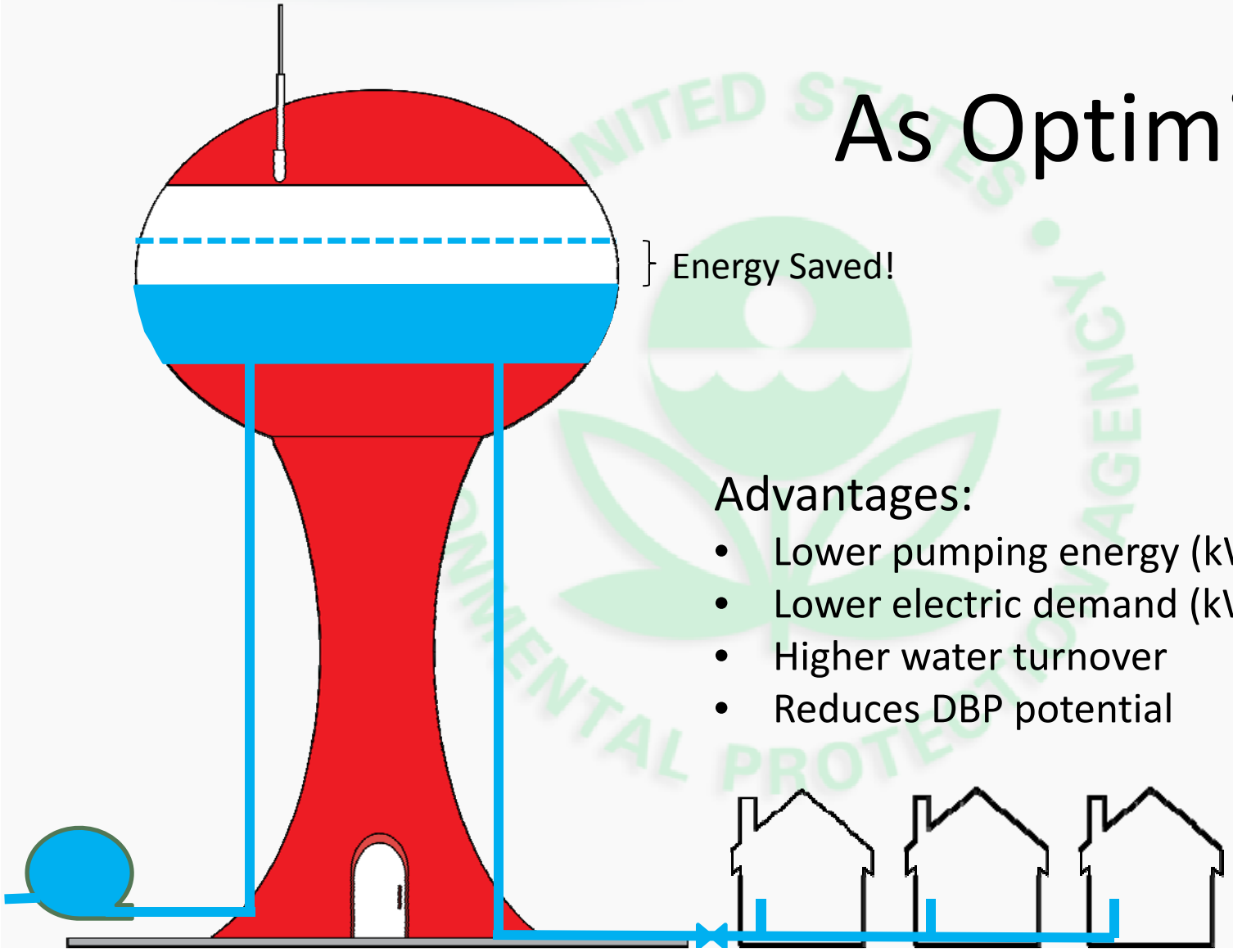
As Designed

Elevated Tanks – Top Capacity Level



As Operated

Elevated Tanks – Top Capacity Level

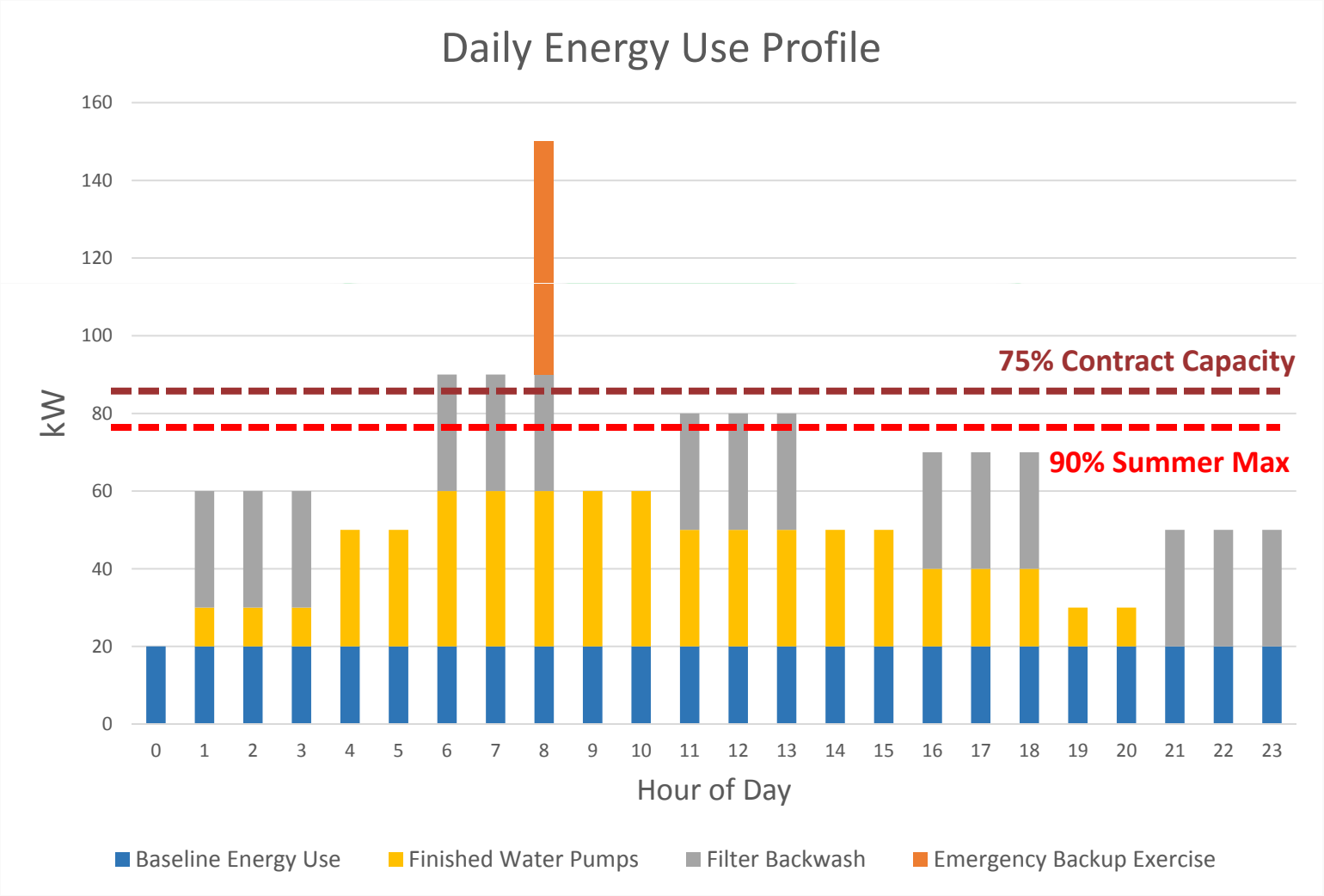


As Optimized

Advantages:

- Lower pumping energy (kWh)
- Lower electric demand (kW)
- Higher water turnover
- Reduces DBP potential

Demand Management



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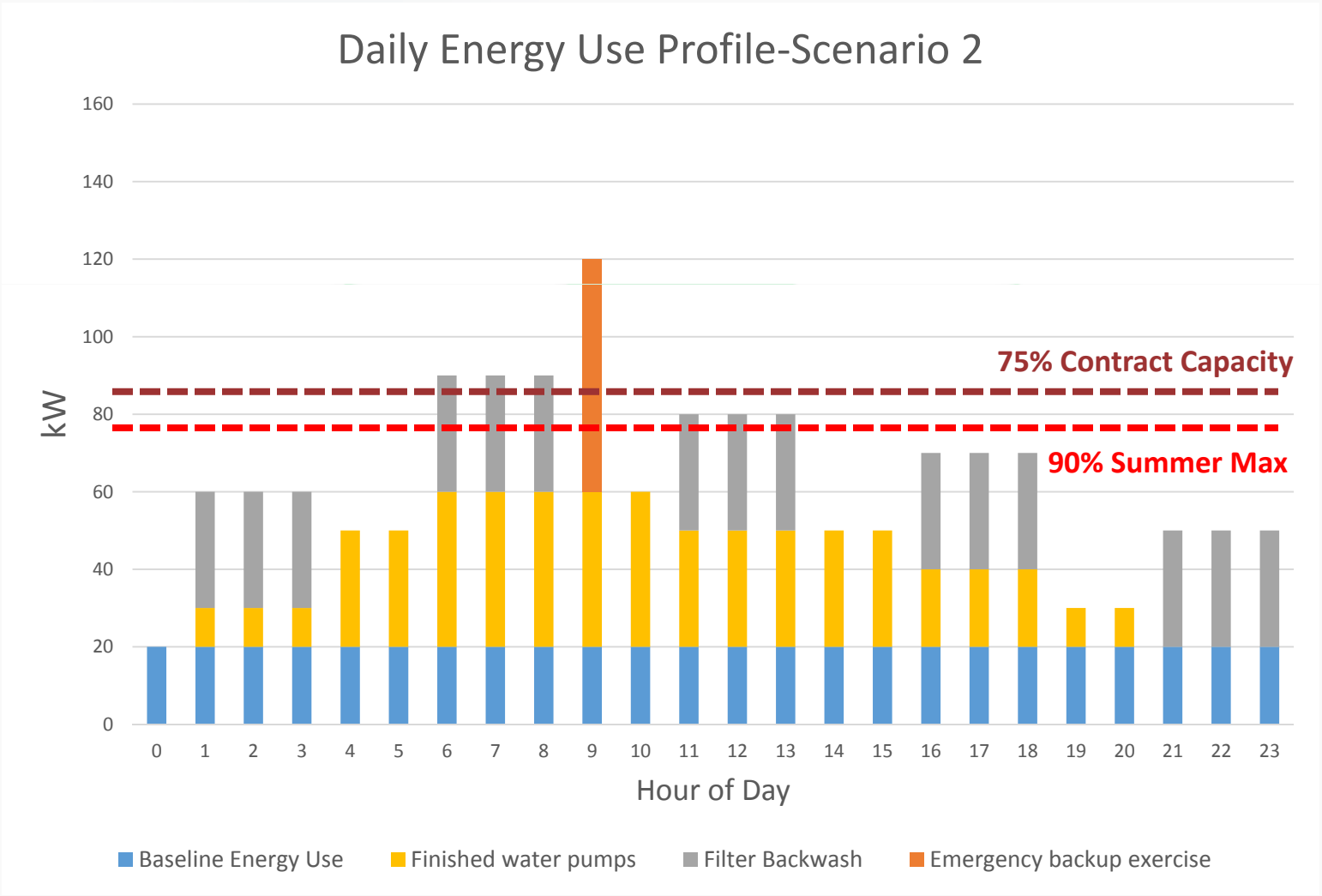
Source: Alabama Power LPM Rate Schedule

Demand Management

	Scenario 1
kW billing capacity	150
kWh consumed	45300
kWh/kW	302
Total kW cost	$711
kWh cost (up to 250 kWh/kW)	$3350
kWh cost (over 250 kWh/kW)	$2613
Base charge	$50
Total Monthly Charge	**$6723**
% Savings	-
Annual Savings	-

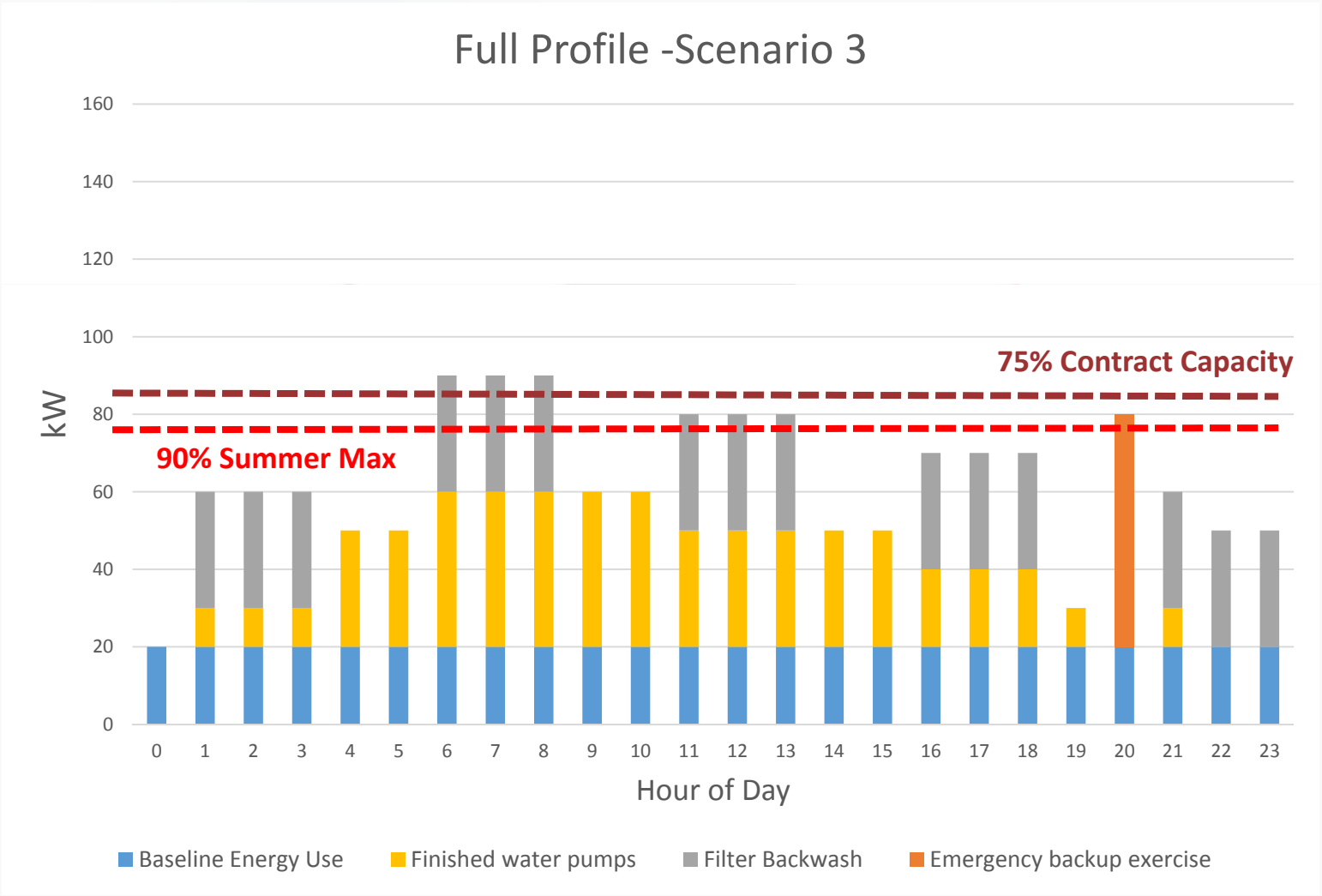
Demand Management



Demand Management

	Scenario 1	Scenario 2
kW billing capacity	150	120
kWh consumed	45300	45300
kWh/kW	302	378
Total kW cost	$711	$569
kWh cost (up to 250 kWh/kW)	$3350	$2680
kWh cost (over 250 kWh/kW)	$2613	$2090
Base charge	$50	$50
Total Monthly Charge	**$6723**	**$5389**
% Savings	-	*19.9%*
Annual Savings	-	*$16,008*

Demand Management



Demand Management

	Scenario 1	Scenario 2	Scenario 3
kW billing capacity	150	120	90
kWh consumed	45300	45300	45300
kWh/kW	302	378	503
Total kW cost	$711	$569	$426
kWh cost (up to 250 kWh/kW)	$3350	$2680	$2010
kWh cost (over 250 kWh/kW)	$2613	$2090	$1567
Base charge	$50	$50	$50
Total Monthly Charge	**$6723**	**$5389**	**$4054**
% Savings	-	*19.9%*	*39.7%*
Annual Savings	-	*$16,008*	*$32,028*

Demand Management

Other considerations

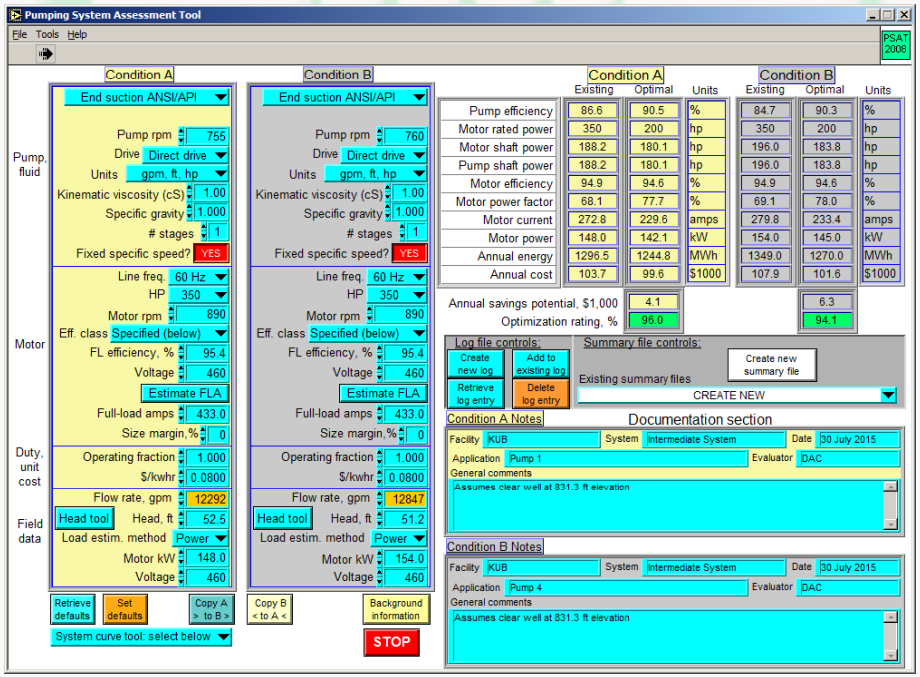
- Can filter backwash schedule be adjusted?
  - AWOP partners have reported modest energy savings
  - Evens out waste load - friendlier to WWTP colleagues
- Can other equipment be rested for large intermittent demands?
- Inrush current is not a large concern from billing standpoint
  - Initial spike (lasts seconds) is averaged out over 15-min period
  - However, across the line starts can be hard on equipment

Next Steps

Pump System Assessment Tool

What is it?

- Free tool downloadable from Department of Energy
- Uses flow rate, pressure, electrical measurements
- Snapshot of pump efficiency
- Compares efficiency to available pump/motor systems
- Estimates savings based on that comparison



Pump System Assessment Tool

Who does it?

- TVA customers can get a PSAT analysis through Comprehensive Services – contact local power company to request
- DOE has Industrial Assessment Centers
  - Must have annual energy bill >$100,000
  - Must be 150 miles from Tuscaloosa
  - Contact: Dr. Keith Woodbury (woodbury@me.ua.edu)
- DOE-certified PSAT qualified specialists (Google-able)

- Ok, fine. EPA R4 (email us)

Water Loss Control & Water Conservation

- Saves energy on both ends – your WWTP will thank you!
- Cheapest gallon to produce is the one you don't
- Can delay costly capital expansions
- Remember the TCL?

Incentive Programs

TVA Customers:

- Comprehensive services – evaluate pump & blower efficiency, PSAT analysis
- Energy Right Solutions – pays lesser of 70% of project cost or $0.10/kWh saved during first year
  - Need to apply in advance of project work
  - Incentive money can run out over course of FY
- EnerNOC Demand response – pays you to shut down during peak periods. No penalties.

Others:

- DSIRE – Database of Incentives for Renewables & Efficiency. Searchable by ZIP code.
- Call your local power company

Key Points

1. There's money to be saved – and it doesn't have to cost you much
2. Management has a BIG role
3. Start small – what do you pay for?
4. You're not in this alone

Contact Us

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