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Quantifying CII Water Use Efficiency and Market Potential

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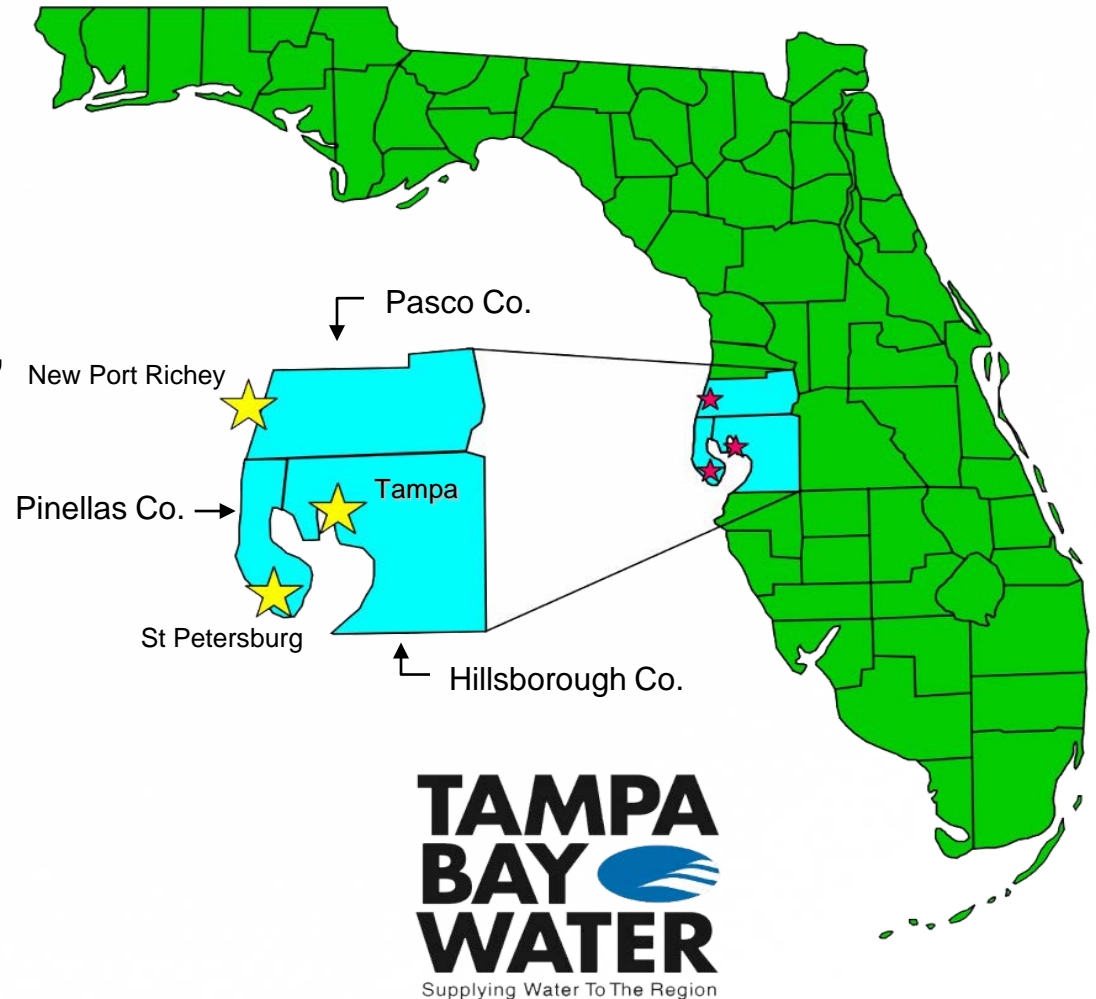
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Presentation Outline

- Background
- CII Profiling
- Estimating Market Potential and Water Savings Rates
 - Plumbing Fixtures
 - Commercial Dishwashing
 - Cooling Towers
- Results / Conclusions
 - Water Savings Potential
 - Cost Effectiveness

Agency Background

- Regional water supply authority serving over 2.3 million customers
- Six member governments, across three counties
- Members historically implemented programs
- Member demands:
 - 2010: 222 MGD
 - 2035: 270 MGD (variability expected)



Background on Agency Efforts

- U.S. Energy Policy Act effective (EPAAct, 1994)
- Agency completed first Demand Management Plan (1997)
 - Dependability of EPAAct savings unknown
- Market for water efficient products has evolved post-EPAAct
- Cost of future supply options has increased

- 2008 Board approved Demand Management Plan update to be included in 2013 Long-term Water Supply Plan
 - 1st opportunity to assess future passive efficiency projections post EPAAct
 - 1st integration and direct cost comparison to supply costs (apples to apples)

Increased efficiency provides regional benefits

- Conserved water = economic benefits
 - 1 mgd saved = \$15 - 20M capital cost deferment
 - 1 year deferral of \$100M capital project saves agency \$5M in interest
- Avoided energy and chemical operating costs



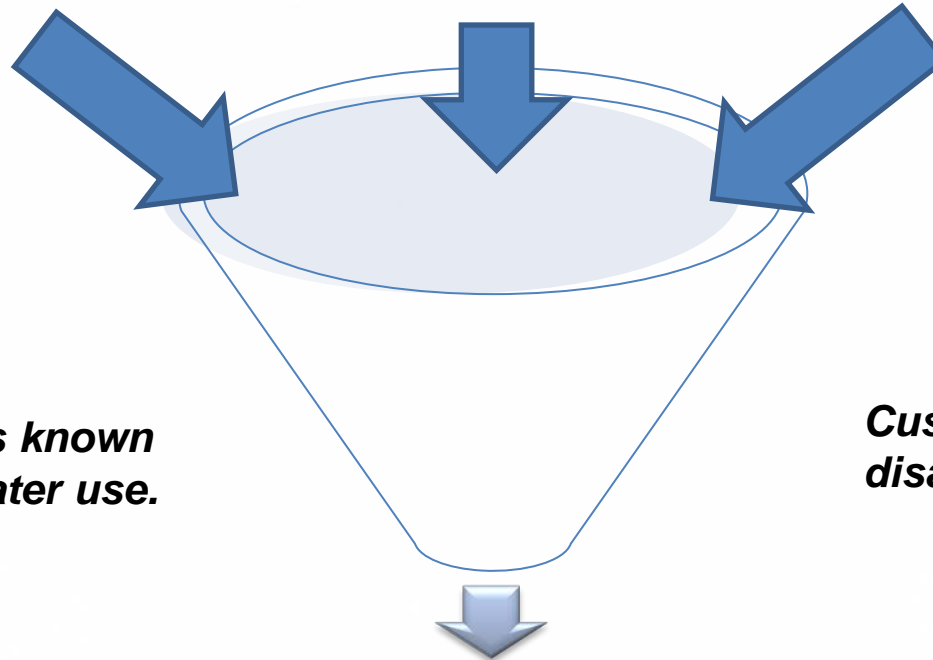
CII Profiling

Good Data Sources = Good Information

**Member Water Use /
Conservation Data /
Single-Family Survey**

**Property Appraiser /
FDOR Property Use
Designations**

**Florida State
Government Datasets
Seating/Rooms/Students**



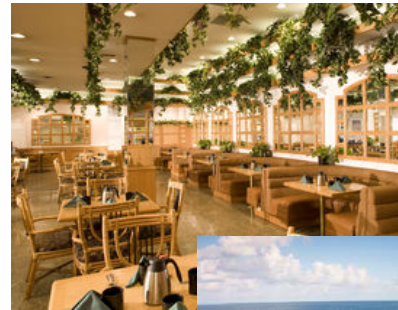
*Characteristics known
to influence water use.*

*Customer class
disaggregation.*

**Database for water use
characterization**

FDOR Property Use Codes Standardization

- FDOR property use designations standardized to permit consistent classification across CPA's for DMP
 - Three levels of increasing detail
 - Super Sectors (8)
 - Lowest resolution
 - Sectors (33)
 - Mid resolution
 - Sector Types (86)
 - Highest resolution
 - More sector options, more consistent categories





Water Use Prioritization

Super Sector	Sector	Building Area (1000 sq ft)	Million Gallons per Day	Gallons per Unit Day (Sq Ft)	Locations	Distribution of Water Use	Distribution of Total Locations	Total GPD Ranking	Proportion of Total Use to Total Locations	Proportion of Total Use to Total Locations Ranking	Proportion of Total Use to Total Locations Ranking Weighted by	Sector Type Ranking
Commercial	Hotels, motels	20,736	3.48	0.17	449	0.09	0.02	0.92	4.53	0.96	0.89	1
Institutional	Government	12,714	3.04	0.24	626	0.08	0.03	0.81	2.84	0.88	0.71	2
Industrial	Heavy Manufacturing	9,992	1.40	0.14	168	0.04	0.01	0.65	4.86	1.00	0.65	3
Institutional	Health Care	24,678	3.43	0.14	1460	0.09	0.07	0.88	1.38	0.73	0.65	4
Institutional	Education	44,939	2.32	0.05	692	0.06	0.03	0.73	1.96	0.85	0.62	5
Institutional	Retirement	9,271	1.15	0.12	168	0.03	0.01	0.62	4.00	0.92	0.57	6
Commercial	Retail Stores	66,204	5.40	0.08	3238	0.14	0.15	1.00	0.97	0.54	0.54	7
Commercial	Restaurants and Fast Food Outlets	5,268	2.65	0.50	1202	0.07	0.05	0.77	1.29	0.65	0.50	8
Industrial	Light Manufacturing	28,315	1.75	0.06	882	0.05	0.04	0.69	1.16	0.62	0.43	9
Commercial	Office Buildings	82,830	4.63	0.06	3839	0.12	0.17	0.96	0.71	0.42	0.41	10
Commercial	Warehouse/Transportation	83,330	3.29	0.04	2878	0.09	0.13	0.85	0.67	0.38	0.33	11
Commercial	Grocer/Food Store	5,918	0.25	0.04	94	0.01	0.00	0.31	1.55	0.81	0.25	12
Commercial	Entertainment	4,489	0.49	0.11	261	0.01	0.01	0.42	1.11	0.58	0.24	13
Commercial	Vehicle Wash	406	0.25	0.61	107	0.01	0.00	0.27	1.34	0.69	0.19	14
Institutional	Fitness and Leisure	3,134	0.41	0.13	325	0.01	0.01	0.38	0.75	0.46	0.18	15
Commercial	Golf	1,640	0.18	0.11	77	0.00	0.00	0.23	1.38	0.77	0.18	16
Institutional	Churches	22,736	0.91	0.04	1505	0.02	0.07	0.58	0.36	0.27	0.16	17
Commercial	Convenience Store	1,811	0.64	0.35	657	0.02	0.03	0.50	0.57	0.31	0.15	18
Commercial	Service shops	1,609	0.34	0.21	339	0.01	0.02	0.35	0.59	0.35	0.12	19
Institutional	Non-profit services	1,164	0.07	0.06	45	0.00	0.00	0.19	0.88	0.50	0.10	20
Commercial	Mixed Use Commercial	7,527	0.53	0.07	1004	0.01	0.05	0.46	0.31	0.19	0.09	21
Commercial	Auto Service and Repair Shops	14,102	0.79	0.06	1613	0.02	0.07	0.54	0.29	0.12	0.06	22
Institutional	Mortuaries, cemeteries, crematorium	630	0.04	0.07	77	0.00	0.00	0.12	0.32	0.23	0.03	23
Agriculture	Crops	521	0.06	0.11	111	0.00	0.01	0.15	0.30	0.15	0.02	24
Commercial	Florist/Greenhouses	284	0.02	0.06	65	0.00	0.00	0.08	0.15	0.08	0.01	25
Agriculture	Livestock	38	0.00	0.08	12	0.00	0.00	0.00	0.15	0.04	0.00	26
Institutional	Parks and Recreation	29	0.01	0.22	52	0.00	0.00	0.04	0.07	0.00	0.00	27
TOTAL		454,312	38		21946	1.00	1.00		1.00			

Top 10 nonresidential sectors highlighted in Grey.

Water Use Benchmarking

Hotels/Motels	Office Buildings	Restaurants
<p>1/2 use more than national benchmarks</p>	<p>1/3 use more than national benchmarks</p>	<p>1/2 use more than national benchmarks</p>
<p>9% of accounts use 50% of total water use</p>	<p>5% accounts use 60% of total water use</p>	<p>8% of accounts use 32% of total water use</p>
<p>Seasonal factors: Irrigation, Cooling, Spring Break</p>	<p>Seasonal factors: Cooling</p>	<p>Full service restaurants may have most efficiency potential</p>

Estimating Market Potential and Water Savings Rates

Accounting for efficiency

- Study considered both passive and active water efficiency potential
 - Measures evaluated
 - Plumbing fixtures (10 sectors)
 - Commercial Dishwashers
 - Pre-rinse Spray Valves
 - Cooling Towers
 - Other measures considered but presence could not be verified

Plumbing Fixture Potential

Basis of Passive Efficiency Potential

- Estimated Water End Uses for all NR sectors
 - University of Florida Methodology
 - Toilets, urinals, faucets, showers
 - Fixture coefficients derived from Building Code
 - Min. fixture requirements based on ft.²
- Estimated the distribution of differing water-use intensities across time and technologies
 - Baseline penetration and end-use average flow rates
 - Future penetration and end-use average flow rates

Nonresidential Fixture Estimates

- Aggregated fixtures to 10 key sectors
 - Based on ability to estimate water use intensity
- Assumptions made regarding flush type mechanism

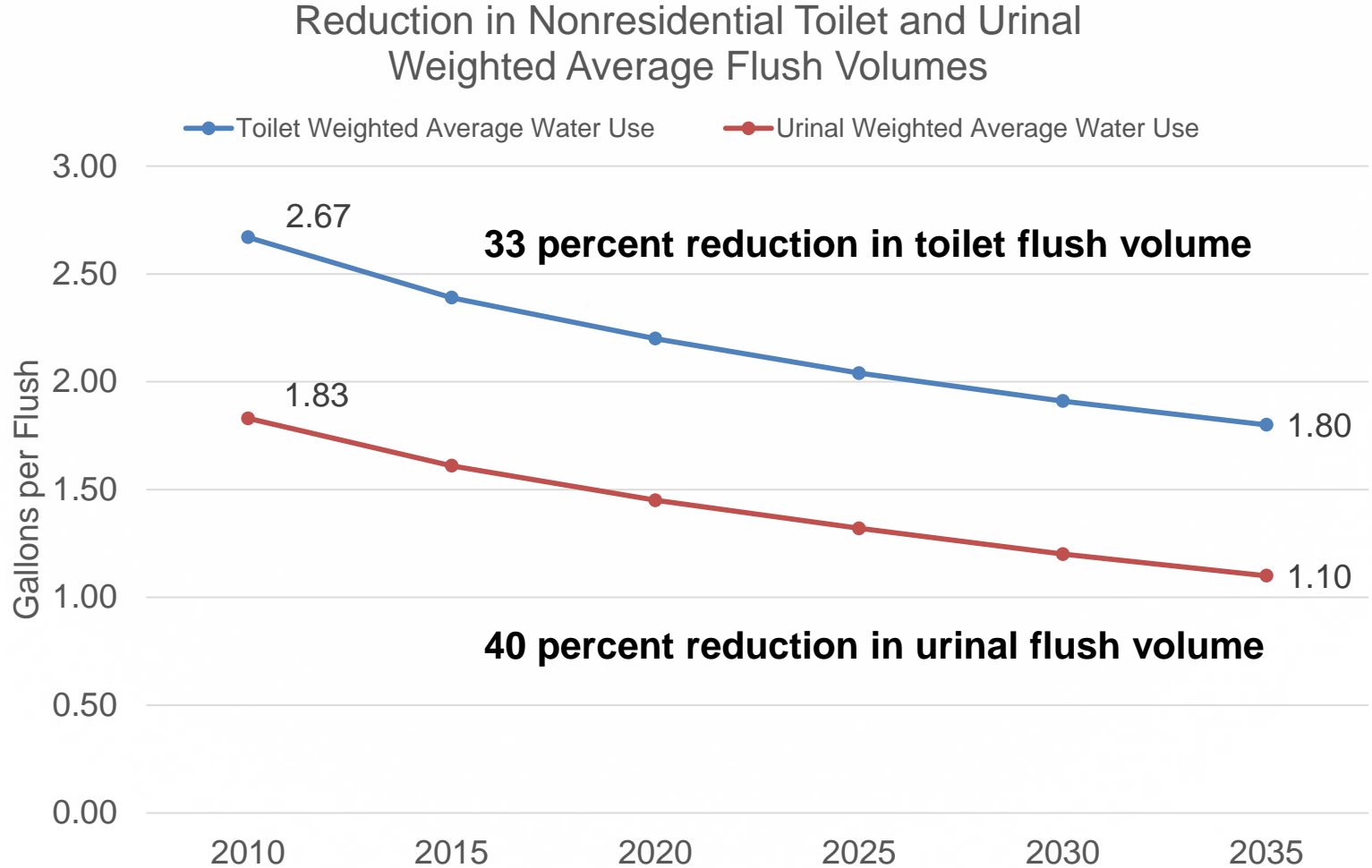
Key Sector	Flush Mechanism
Churches	Tank
Education	Valve
Government	Valve
Health	Valve
Hotels	Tank
Office	Valve
Others	Valve
Industrial	Tank
Restaurants	Valve
Retail	Tank/Valve
Others	Valve

Water Use Assumptions/Savings

- Assumptions available for 10 key water use sectors
 - FDOR Toilet/Urinal Estimates aggregated to agree

Key Sector	Occupancy				Employee Intensity			Visitor Intensity		
	2010 Employees	Visitation	Employee Days	Visitation Days	Female Toilet Flushes	Male Toilet Flushes	Male Urinal Flushes	Total Flushes	Toilet Flushes	Urinal Flushes
Hotels	47,267	20,286	250	365	2.5	1.0	1.5	5.0	4.83	0.17
Churches	24,289	24,289	250	0	2.5	1.0	1.5	0.5	0.33	0.17
Health	72,445	72,445	250	250	2.5	1.0	1.5	0.5	0.33	0.17
Office	193,547	193,547	250	250	2.5	1.0	1.5	0.5	0.33	0.17
Government	119,546	119,546	250	250	2.5	1.0	1.5	0.5	0.33	0.17
Education	98,738	783,819	180	180	1.875	0.75	1.125	1.17	0.86	0.31
Industrial	236,189	0	250	0	2.5	1.0	1.5	0.5	0.33	0.17
Retail	155,351	328,506	250	250	2.5	1.0	1.5	0.2	0.13	0.07
Restaurant	30,848	131,300	250	365	2.5	1.0	1.5	0.2	0.13	0.07
Other	226,757	226,757	250	250	2.5	1.0	1.5	0.2	0.13	0.07

Passive Savings v. Time



Eligible Active Measures and Water Savings Estimates

Nonresidential incentives

Fixture Type	Available Measures	Savings Estimates (gpd)
Tank-Type HET	19,500	35
Valve-Type ULFT	28,317	49
½ Gallon HEU	39,099	52

- Estimated distribution of eligible fixtures after passive savings
 - 3.5 / 5.0 gpf toilets
 - 1.0 / 3.0 gpf urinals
- Estimated weighted average fixture savings based on use assumptions for 10 key sectors

Commercial Dishwashing Potential



Commercial Dishwashing Equipment

- Energy Star Dishwashers
 - 20 to 25% more expensive, but costs are decreasing (CEE-2010)
 - Larger % of models sold are Energy Star qualified
 - U.S. EPA market analysis (2009), 78% met criteria
 - Much of the equipment is leased
 - especially true for door-type and conveyor units
 - chemical/lease contracts
 - often rebuilt for secondary sales / lease market
- Pre-rinse Spray-valves
 - Significant savings potential exists
 - 3 gpm down to 1 gpm (WaterSense labeled products)

Assumptions to estimate presence of commercial dishwashers

- Approx. 5,000 restaurants in region
 - FL Bureau of Profession Regulation permit database
 - Identified full service restaurants (2,401 units) and seating capacity
 - Four dishwasher types were assigned to full service restaurants based on seating capacity

Types of Commercial Dishwashers



Under Counter System
<60 persons/day-small restaurants



Door Type system
<150 persons/day



Conveyor Type System
150-300 persons/day or peak use racks/hr



Flight type System
300-1000's (hospitals, large hotels, institutions)



Commercial Dishwashers Water Use and Cost Assumptions

	Dishwashers	Under-Counter	Door-Type	Conveyor	Flight
	Unit	Rack	Rack	Rack	Dish
Seats per Location	Locations	258	1,429	678	36
	Seats	7,276	111,622	142,483	25,636
	Avg. Seats/DW	28.2	78.1	210.2	712.1
Operational Assumptions	Customers/Hour/Seat (1)	1.0	1.0	1.0	1.0
	Hours of Operation (2)	5.5	5.5	5.5	5.5
	Dishes per Unit (rack)	14	14	14	na
	Meals per Unit (rack)	2.85	2.85	2.85	na
	Units (rack/dish) per Day	54	151	406	19,239
Water Use (gallons per unit)	CUWCC Median Baseline	1.20	1.18	0.86	0.015
	Energy Star Median	0.79	0.79	0.45	0.01
Potential Water Savings	Gallons per Unit	0.41	0.39	0.41	0.005
	Gallons/Dishwasher (GPY)	8,145	21,458	59,951	35,112

1 Birchfield J. Design and Layout of Foodservice Facilities.

2 Koeller and Hoffman, (2010). CUWCC Potential Best Management Practice for Commercial Dishwashers.

Type	Conventional Unit Cost Average	ES Unit Cost Average	Savings, Useful Life (yrs)	Savings, Per Unit (gpy)	Gallons Saved over Useful Life	Incentive (\$/measure)			Average Cost (\$/1000 gallons)		
						Low	Med	Hi	Low	Med	Hi
Under-Counter	\$4,900	\$5,900	10	8,145	81,446	\$250	\$500	\$1,000	\$3.07	\$6.14	\$12.28
Door	\$6,700	\$8,750	15	21,458	321,873	\$250	\$500	\$1,000	\$0.78	\$1.55	\$3.11
Conveyor	\$15,500	\$19,000	20	59,951	1,199,020	\$250	\$500	\$1,000	\$0.21	\$0.42	\$0.83
Flight	\$60,000	\$60,000	20	35,112	702,242	\$250	\$500	\$1,000	\$0.36	\$0.71	\$1.42

Dishwashers

- Department of Business and Professional Regulation
 - 2,401 Full service restaurants in 2008
 - NRR: 5% (20 years)
 - HE Market Share: 78%
 - Penetration Rate:75% by 2035
 - Costs: Energy Star / CUWCC

PRSV

- Dishwasher locations assumed to have PRSV
 - NRR: 20% (5 years)
 - HE Market Share: 50% (≤ 1.0 gpm)
 - Penetration Rate:75% by 2035
 - Consistent with Member Governments existing programs

Cooling Tower Potential

How to assess cooling tower technology and programs?

- Identify tools available to determine presence
- Estimate:
 - average cooling load hrs
 - average COC's
 - durability of savings
 - average savings rate



Cooling Tower Screening and Water Use Determination

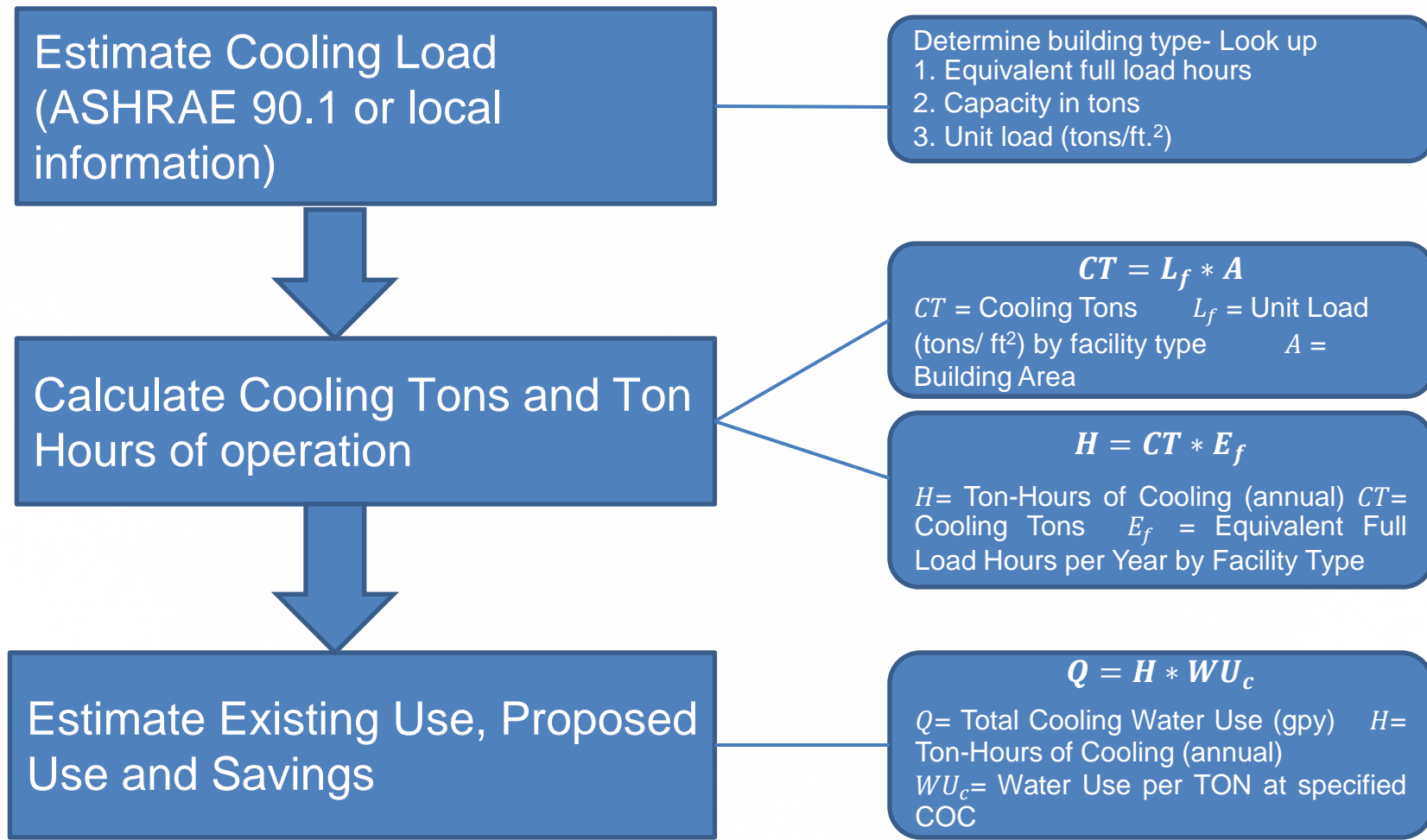
- Screening: building $>25,000$ ft.² or >4 stories (ASHRAE)
- Conducted visual evaluation of all sites
 - 569 in 2008 (conservative # based on discussions w/HVAC manufacturer/operator)
- Grew by NR account growth rate
 - 801 by 2035
- City of Tampa - RCW Master Plan
 - estimated COC's



Cooling Tower Screening and Water Use Determination

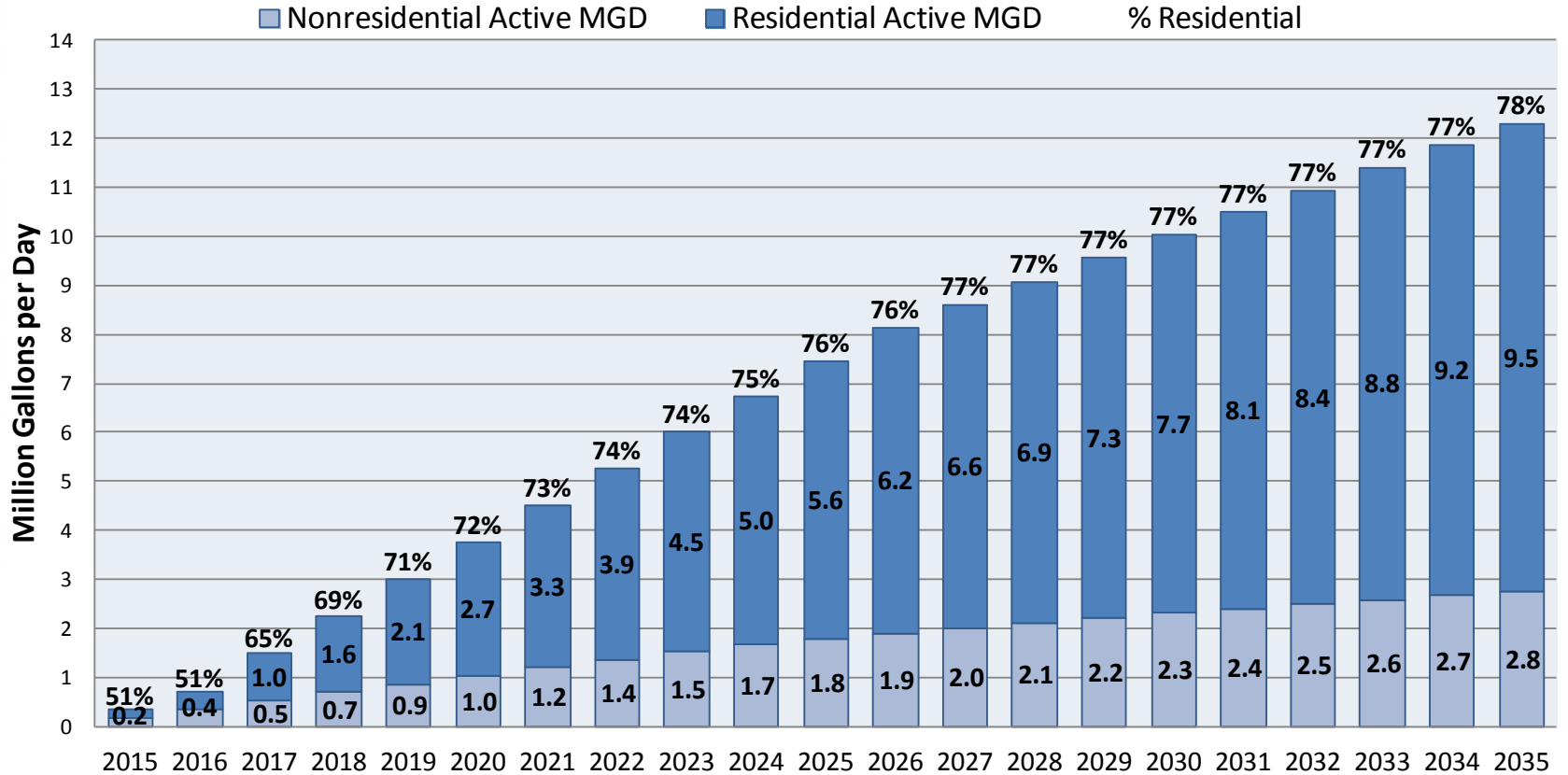
- All cooling towers considered eligible
 - 25% program penetration by 2035 (~10/year)
 - Savings rate based on median (2.5 to 6 COC's)
 - Program costs and savings consistent nationally (conservative for Florida)
 - Program costs
 - submetering
 - financial incentive for treatment technology
 - Financial incentive offered - \$1000

Estimating Cooling Tower Water Use/Potential



Overall Results and Conclusions

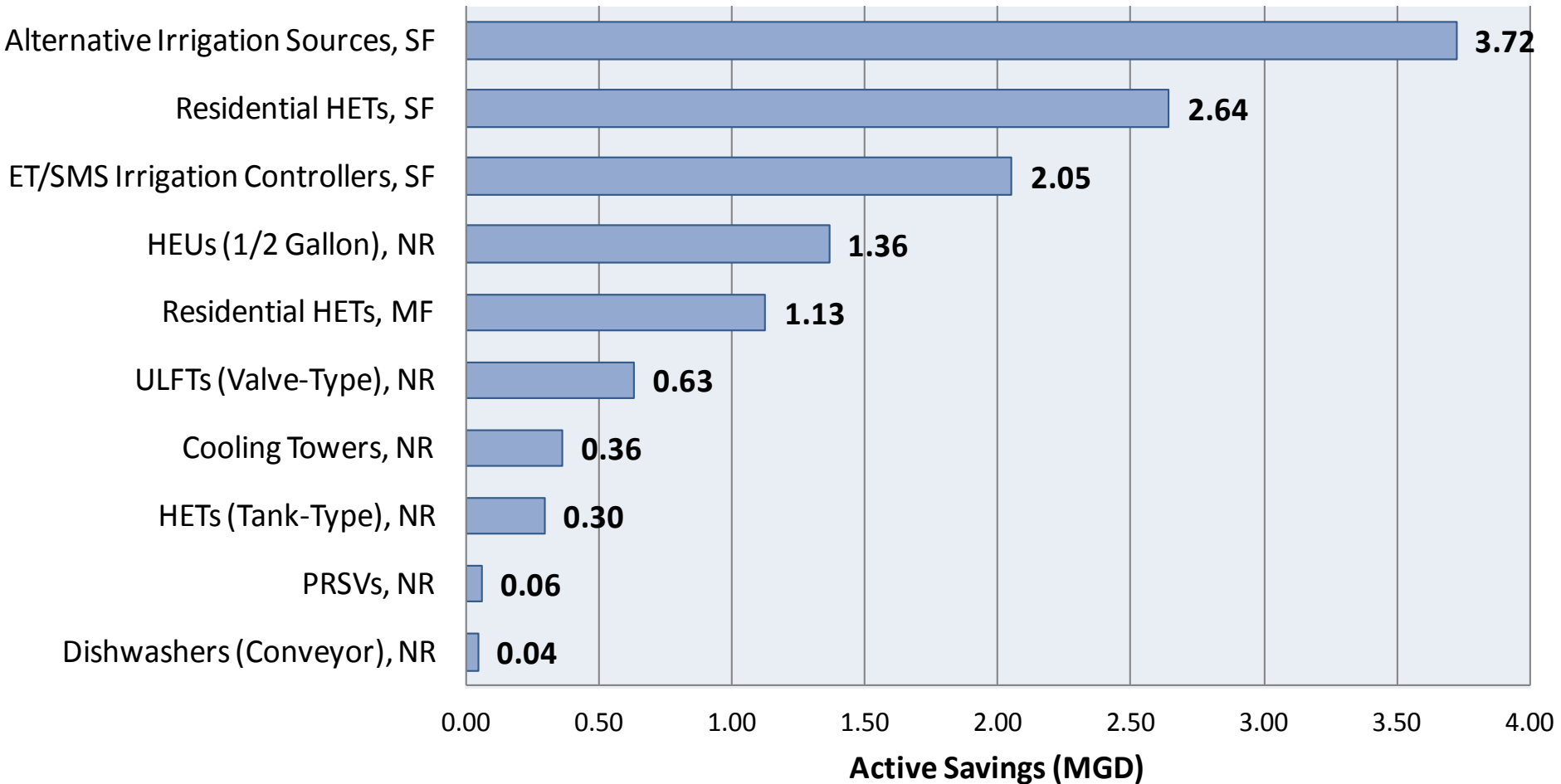
Estimated Water Savings Potential



Selected Programs

Activity Name	Class	Cost / 1000 gal	BCR	NPV	Savings MGD
Cooling Towers	NR	\$0.07	8.15	\$1,308,673	0.38
PRSVs	NR	\$0.11	5.93	\$201,064	0.06
ET/SMS Irrigation Controllers	SF	\$0.35	1.82	\$3,532,198	2.05
HEUs (1/2 Gallon)	NR	\$0.23	1.24	\$880,734	1.36
Alternative Irrigation Sources	SF	\$0.32	1.17	\$1,610,602	3.72
ULFTs and HETs	NR	\$0.22	1.16	\$321,513	2.64
Residential HETs	SF	\$0.36	1.09	\$710,960	2.64
Dishwashers (Conveyor)	NR	\$0.42	1.08	\$10,003	0.04
Residential HETs	MF	\$0.35	1.01	\$41,397	1.13
Total			1.28	\$8,617,144	12.31

Total Estimated Potential Savings



Conclusions

- Program potential based on presence, program acceptability, and proven success
- Penetration rates (passive) are important to accurately forecast water use changes
- Measurement of penetration rates needs to occur both locally and nationally
 - Locally through use of ongoing survey tools or other metrics (AMI)
 - Nationally through research into market based penetration rates for products
- Passive savings will occur and should be quantified and considered in long-term planning processes

Thank you!

Questions?

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