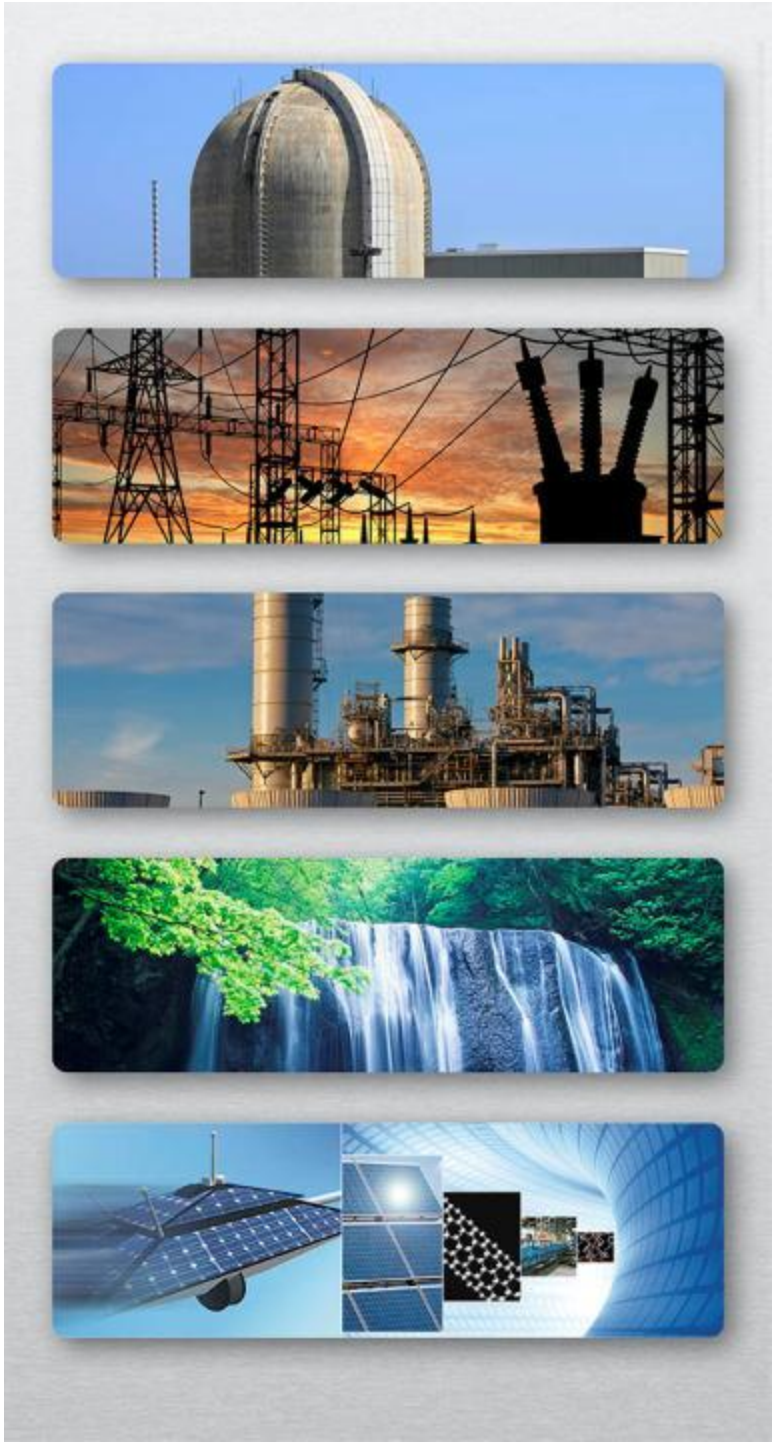

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Heat Pump Water Heaters Demonstration Project

Building America Stakeholder Meeting

Ron Domitrovic
Ammi Amarnath

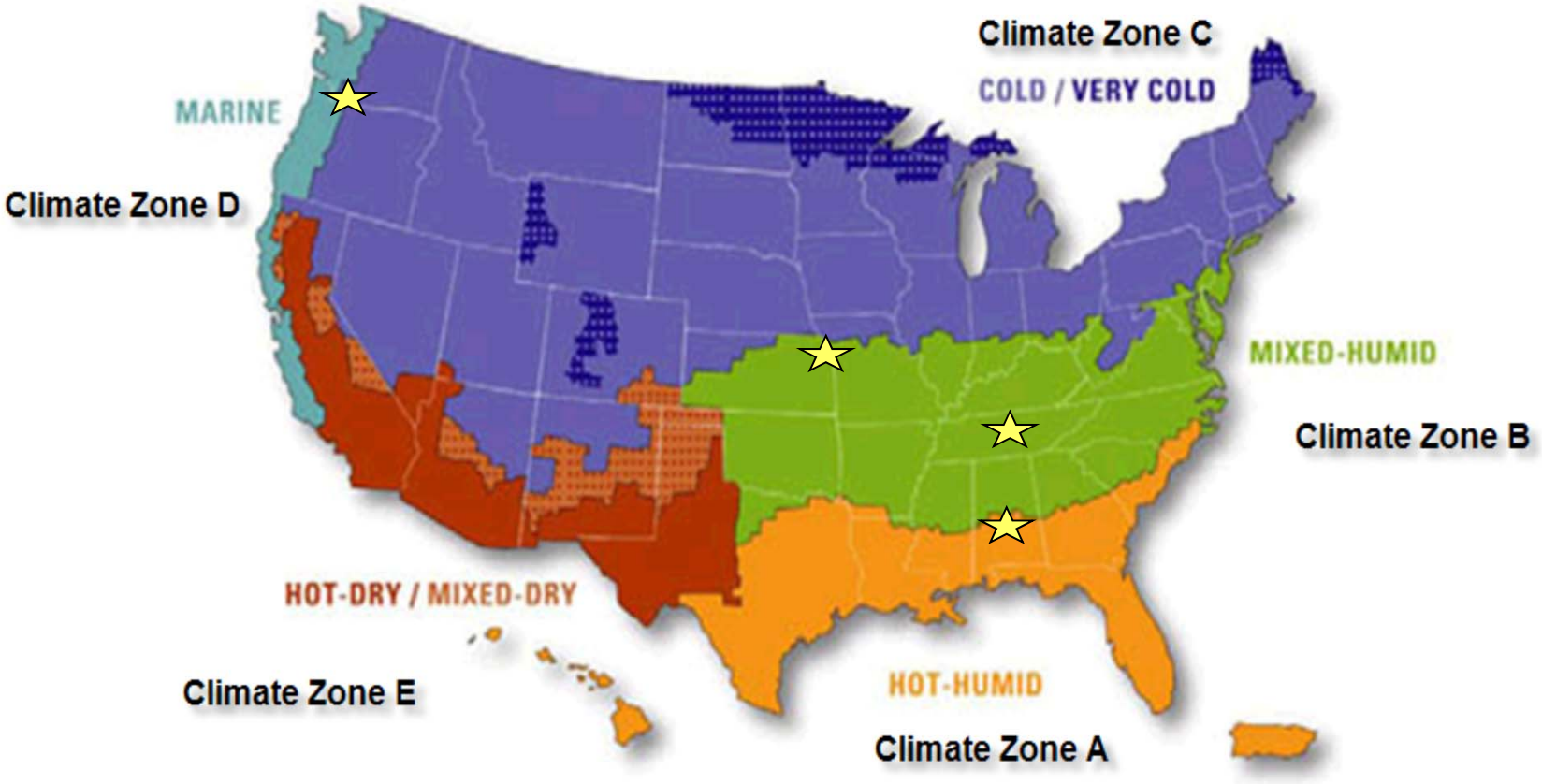
3/1/2012
Austin, TX

HPWH Field Demonstration: Research Objectives

- Assess heat pump water heater technology by measuring efficiency.
- Provide credible data on the performance and reliability of heat pump water heaters.
- Assess user satisfaction in a residential setting.

Demonstration Host Utilities
Target: 40 Units per Utility

★ Installed and Potential Sites by Climate Zone



Source: Department of Energy (DOE), Building America climate regions

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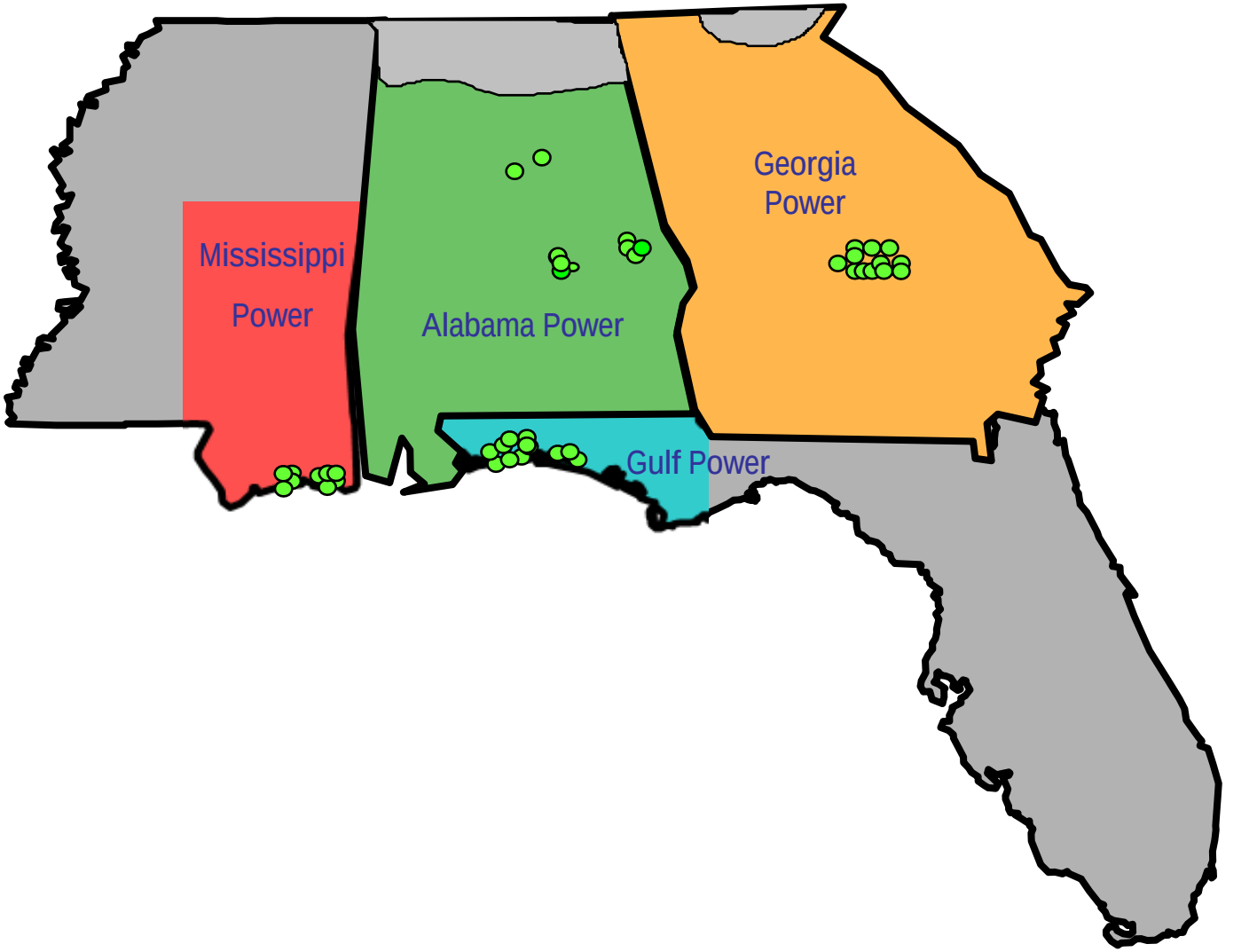
Installation Locations—Southern Company Region



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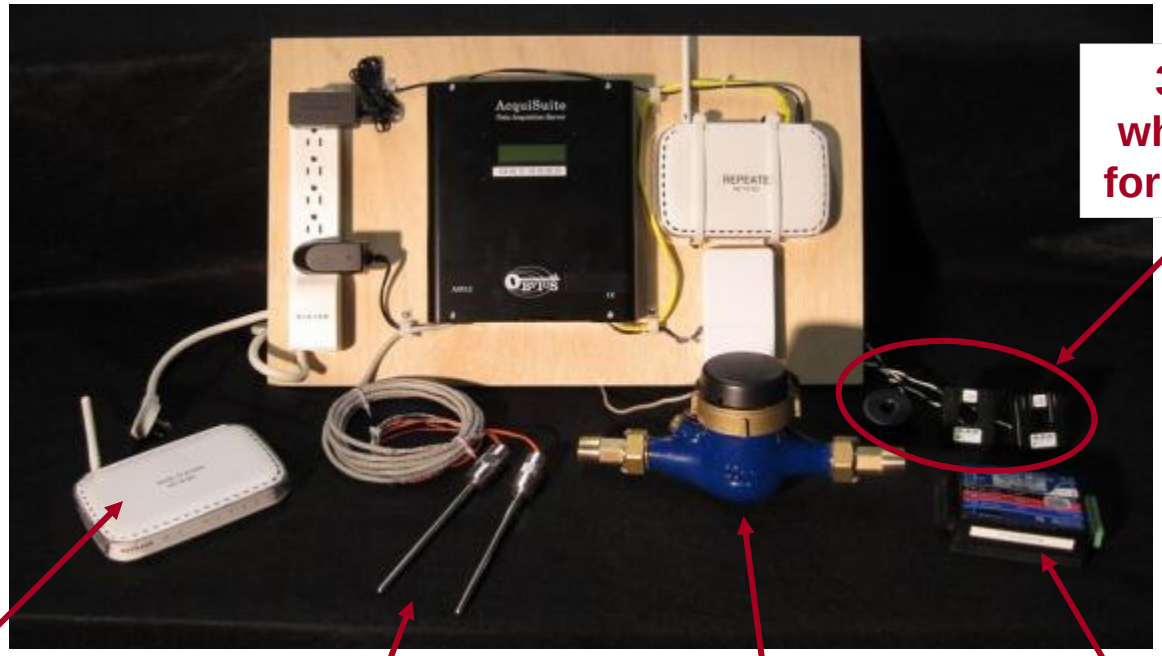
Overview

- Treatment and Control Sites
  - All sites monitored in parallel, until March 2012
  - Occupants instructed to operate HPWH normally, year-round
  - Occupants permitted to adjust water temperature and operating modes as desired
  - Control sites are ~10-20% of treatment sites
- Manufacturers Engaged
  - GE
  - A O Smith
  - Rheem
  - Daikin Altherma (water heater components only)

Full Instrumentation Package

Data-acquisition panel (data logger, ambient temp/humidity, and WiFi repeater), 24”x14”



3 CTs (2 for whole house, 1 for water heater)

WiFi base station (plugs into home router)

2 thermistor immersion probes (for water inlet and outlet temps)

Water meter

Power meter (measures electricity of both whole house and water heater)

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Installation Locations – Diverse

Attic

Garage

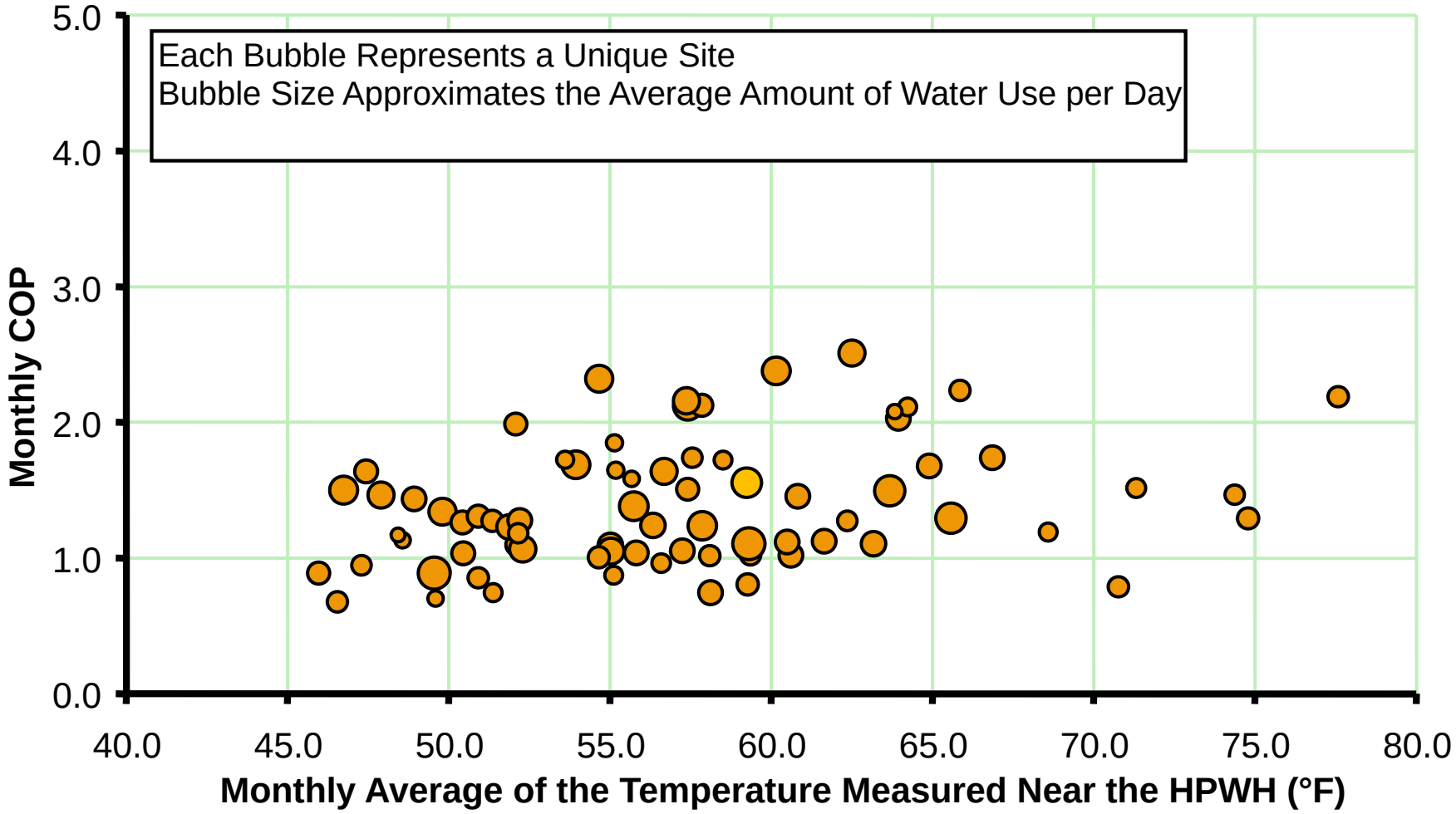
Conditioned Space

HPWH:
Units Analyzed

Location	Treatment Units			Control Units		Total
	Unconditioned	Conditioned	TBD	Unconditioned	Conditioned	
Garage	64	0	0	7	0	**71**
Basement	27	4	0	6	0	**37**
Other	15	15	0	9	5	**44**
TBD	0	0	20	0	0	**20**
Totals	**106**	**19**	**20**	**22**	**5**	**172**

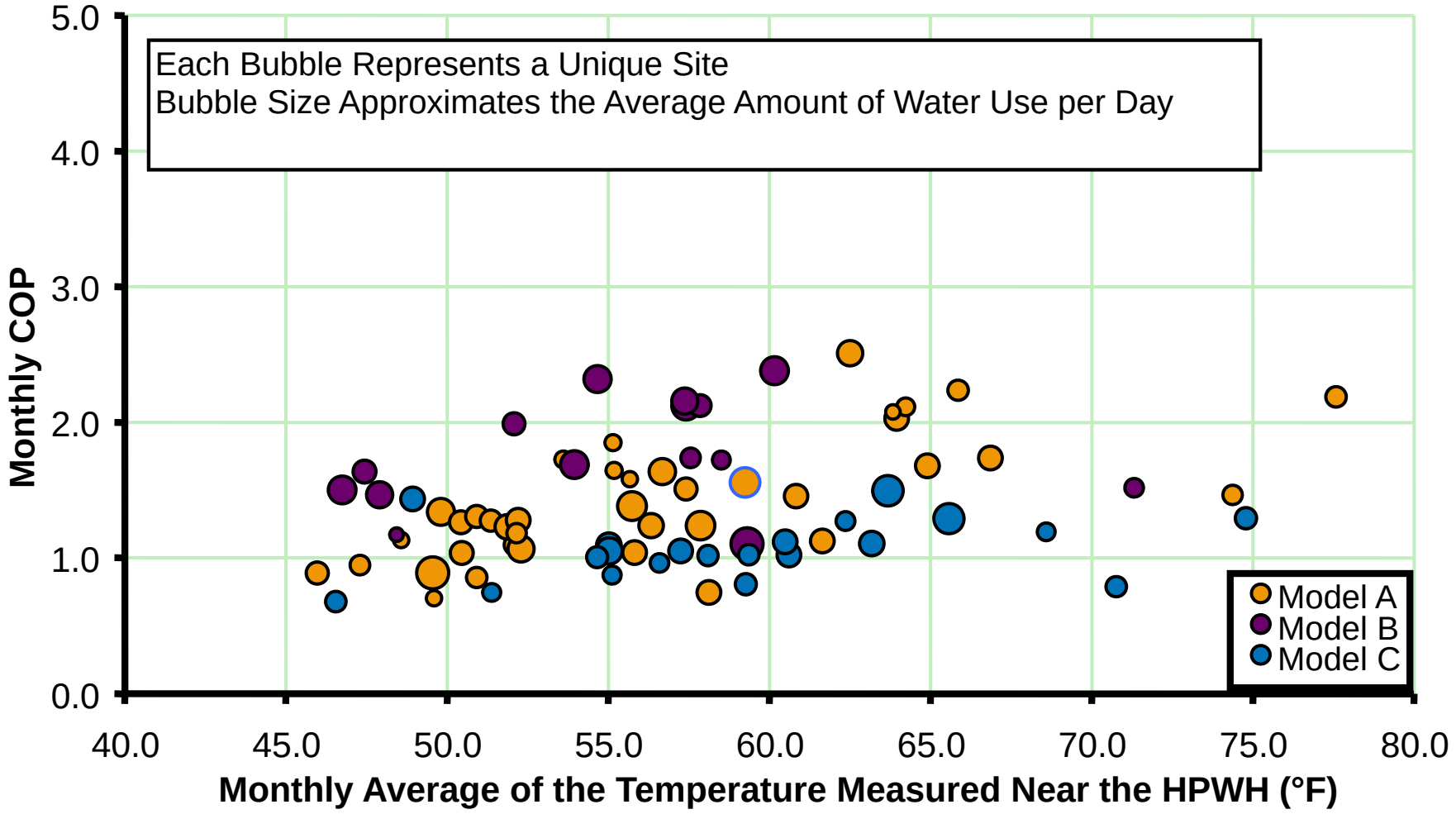
Note: "Other" locations are crawlspace, utility or mechanical room, bathroom and closet space.

Monthly COP vs. Ambient Temp for Most Sites, January 2011



Preliminary Results

Monthly COP vs. Ambient Temp for Most Sites, January 2011



Preliminary Results

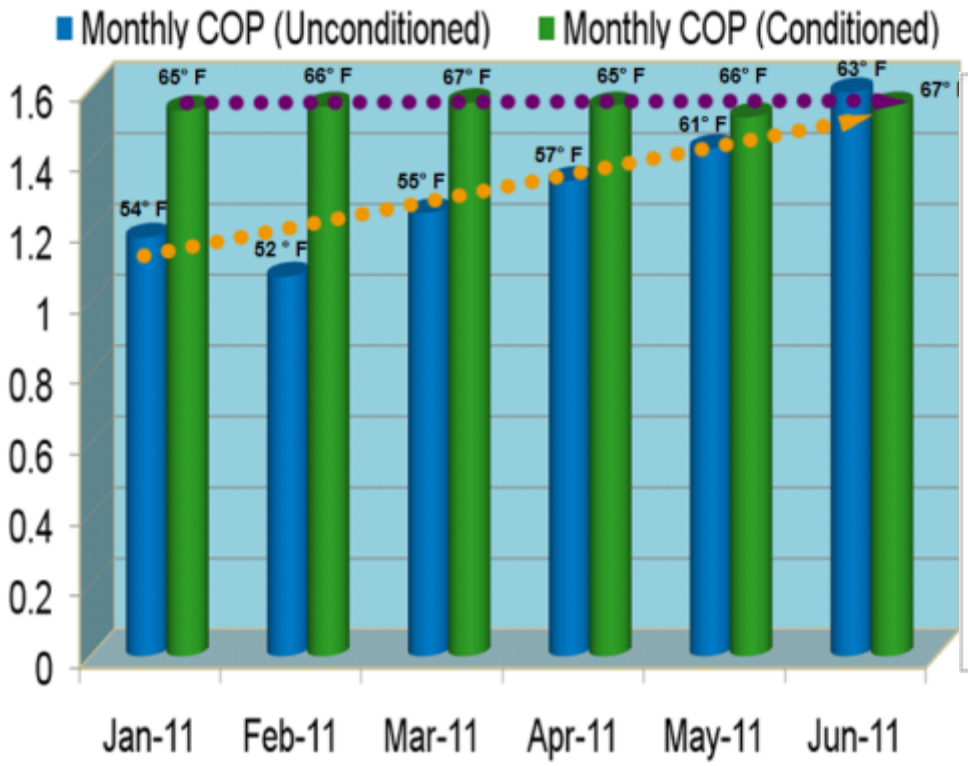
Monthly COP Summary: Three Utility Hosts

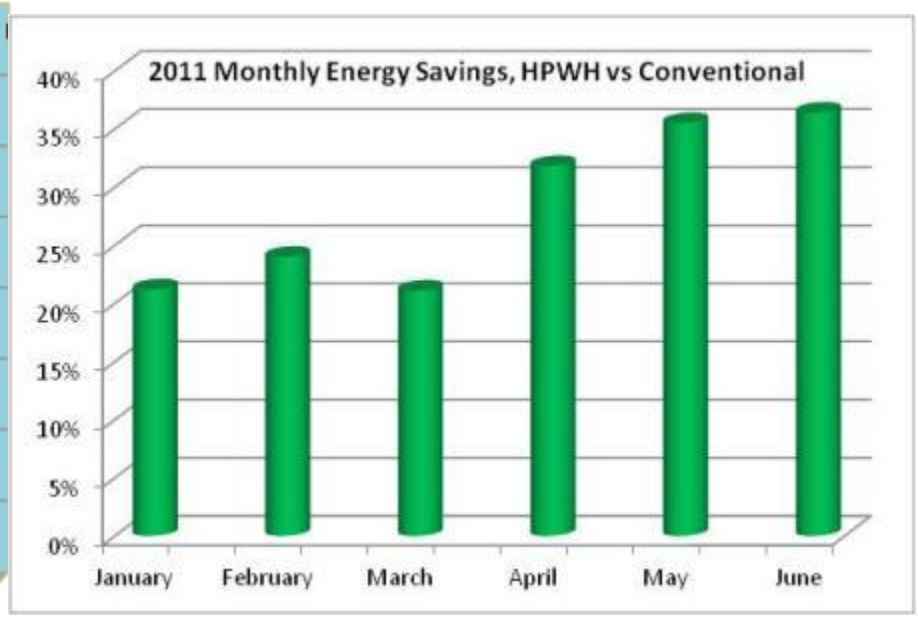
Utility	January 2011		February 2011		March 2011	
	Average COP	Average Ambient Temp. (F)	Average COP	Average Ambient Temp.(F)	Average COP	Average Ambient Temp.(F)
BPA	1.3	54.3	1.1	55.3	1.3	58.2
Southern Company	1.4	58.3	1.4	63.2	1.6	69.8
TVA	1.7	54.4	1.8	57.6	1.9	62.2

Average COP is the weighted COP for all sites installed within a specific host utility for a month, weighted by the monthly hot water usage (gallons) for each site.

Average Ambient temperature is the monthly average temperature of the space where the HPWH unit was located within the premise.

Six Month COP Trend





Values above the bars show monthly Average Ambient temperature for unconditioned and conditioned sites.

Preliminary Results

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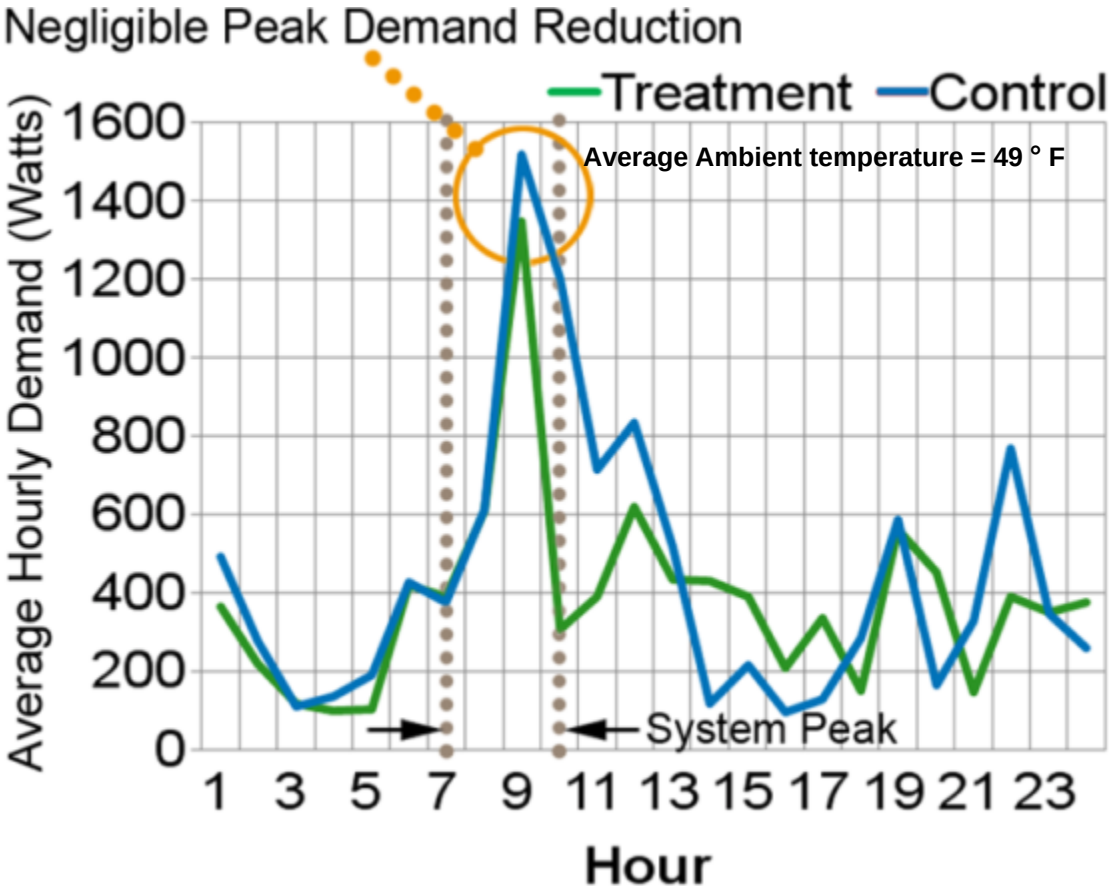
Coincident Peak Demand in Winter (System Peak Day)



Negligible impact on coincident peak demand *in winter* .

Preliminary Results

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Customer Satisfaction Survey

- Two HPWH post-installation surveys:
  - 1st was fielded in ~October 2010
  - 2nd was fielded in June 2011
- 28 and 33 Southern Company respondents respectively
- Survey gathered opinions regarding:
  - Satisfaction with:
    - Water heater performance
    - Installation process
  - Whether they noticed a difference in:
    - Hot water
    - Noise level
    - Temperature around water heater
    - Water or moisture on the floor

Overall Satisfaction

Summary Statement

Majority of respondents were satisfied with their new water heaters (from 1st and 2nd surveys).

Comments from those who "*not satisfied*"…

…from 1st survey:

- "Water does not get very hot nor does it last more than 1 shower or 1 tub fill up."
  - –Distribution company worked with customer to rectify issue

…from 2nd survey (different respondent):

- "…it takes up too much room and it is loud when it comes on."

Noticed a Difference with New Water Heater—Initially

Summary Statement

Less than half noticed a difference with their new water heater (from 1st survey).

For those that noticed a difference:

- Some cited favorable reasons:
  - Themes: More hot water, faster recovery, constant temperature
- Others cited unfavorable reasons:
  - Themes: Water not hot enough, not enough hot water, slower recovery

Questions?

Questions?

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