

California PIER Program

- Multifamily Central Domestic Hot Water Systems



Central v. Distributed
Architectures

ACEEE 2009 Hot Water Forum
Asilomar Conference Center ▪ June 7–10, 2009

Central DHW Systems Examples

Monitoring 8 MF buildings



Building #1
16 units, 2 story
400 feet 1.5" recirculation
loop

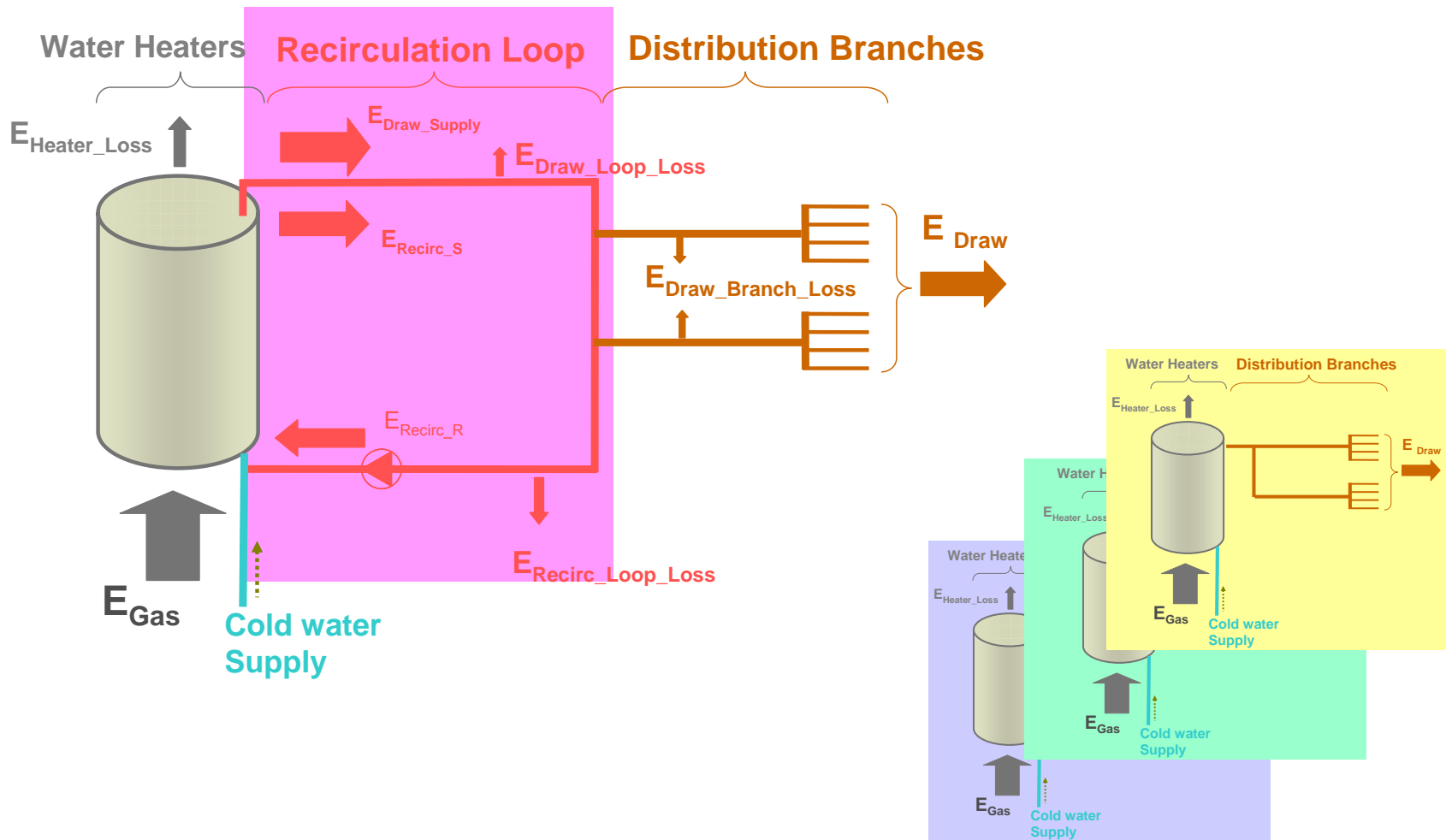


Building #2
87 units, 3 story
400 feet 2" + 200 feet 1"
recirculation loop

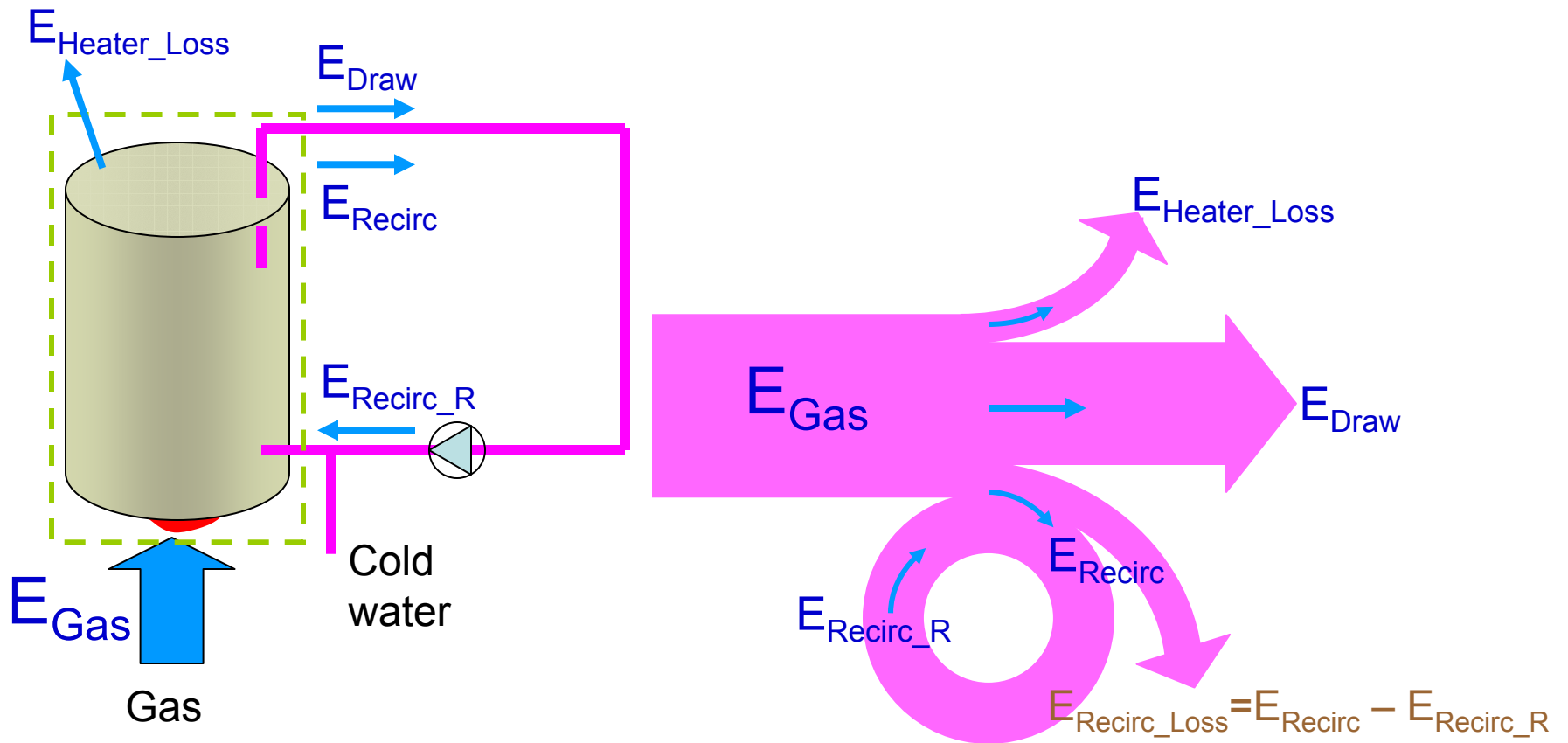
PIER MF DHW Study

- **Project Goals**
 - Characterize MF DHW system heat loss
 - Assess benefits of control technologies
 - Investigate monitoring and diagnosis methodologies
- **Major research activity**
 - Full on-site performance monitoring: 9 buildings
 - Partial on-site performance monitoring: 24 buildings
 - EDC historic data review
 - Recirculation loop model development

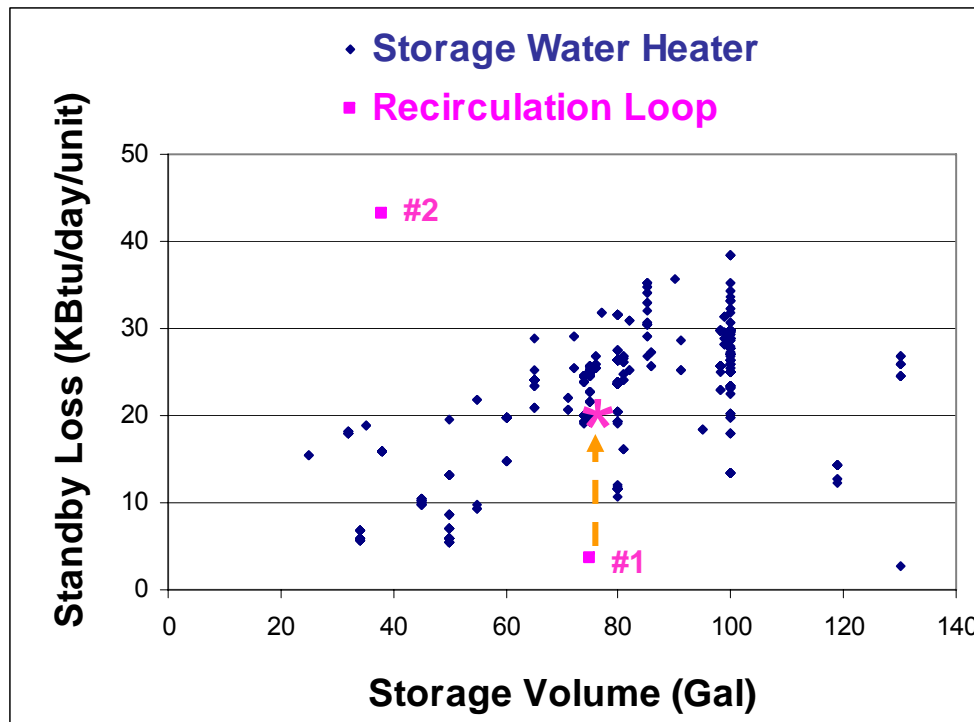
Central v. Distributed



System Energy Flow



Water Heater Standby Loss

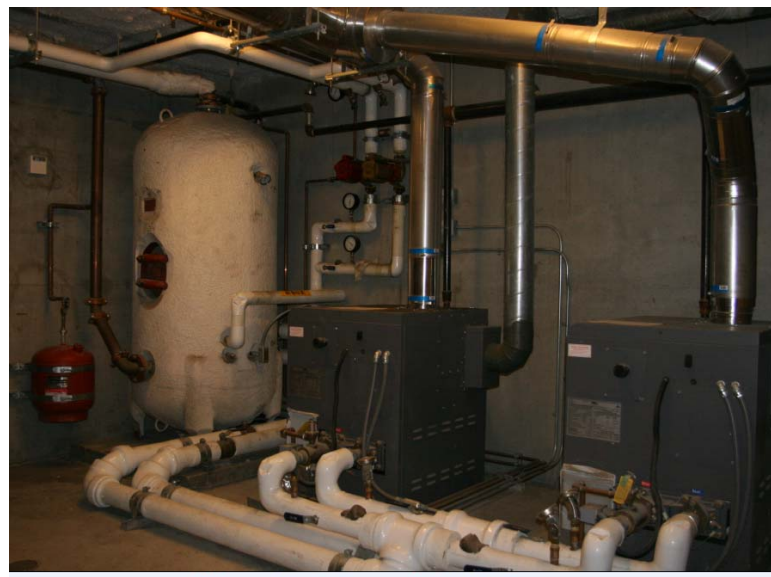


Building #1
 87 units, 3 story
 Loop: ~400 feet 2" pipe
 & ~200 feet 1" pipe
 Pipe well insulated
 Located in 2nd floor ceiling

Building #2
 16 units, 2 story
 Loop: 400 feet 1.5" pipe
 Pipe not insulated

Factors Determining System Performance

- System Design
 - Topology: balance between loop and branch
 - Pipe sizes and insulation, components selection
 - Water heating: technology, sizing
- Control Technologies
- Operation and Maintenance
 - High set temperatures
 - Short cycle
 - Crossover flow
 - Pump failure
 - Plumbing errors



Summary

- Building size is not the key factor in determining the selection of central or distributed designs
- Well insulated recirculation systems can have similar standby loss performance as distributed system
- Better system performance metrics and evaluation methods are needed for assessing performance of various system design option.