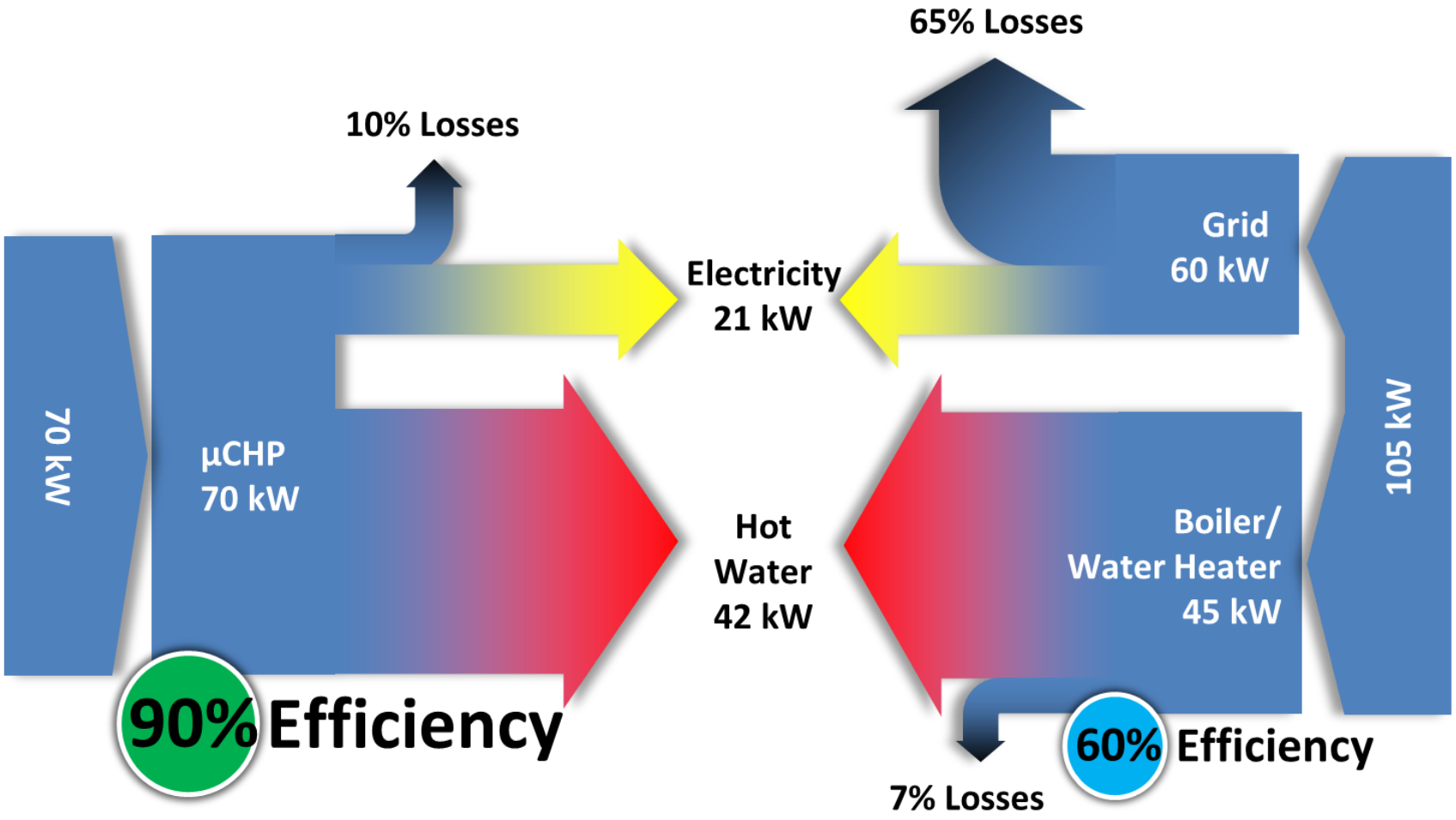
Demonstration of µCHP in Light Commercial Hot Water Applications

2015 Building Technologies Office Peer Review



U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Kris L. Jorgensen, kjorgensen@aosmith.com
A. O. Smith Corporation

Project Summary

Timeline:

Start date: October 1, 2014

Planned end date: September 30, 2017

Key Milestones:

1. T2M Plan – draft: 02/28/15
2. Identification of Potential Sites: 03/31/15
3. EPA Certification: 09/30/15

Budget:

Total DOE $ to date: $45,241

Total future DOE $: $629,759

Target Market/Audience:

Domestic Hot Water (Multifamily Housing, Lodging, Foodservice, Healthcare/fitness)

Space Heating

Key Partners:

YANMAR America
Briggs & Stratton
Oak Ridge National Lab
DOE-Office of Energy Efficiency and Renewable Energy (EERE)
MicroCogen Partners

Project Goal:

Provide stake-holders with the information needed to build a sustainable market. Specifically:

1. Verify value proposition of a three year installed cost payback
2. Identify and simplify installation and maintenance
3. Create effective training for installation & maintenance personnel

Purpose and Objectives

Problem Statement:

- Commission eight field demonstration sites across specified target markets and geographic regions in North America to address the following market barriers:
    1. Lack of value proposition – payback longer than product life
    2. Complexity of system/sale – customer, installer, distributor
    3. Complex end market interface – lack of a trained installer base
    4. Lack of States' regulatory consistency – net metering and FIT

Target Market and Audience:

- **Light commercial buildings with high hot water demand**: Full service restaurants, hotels & lodging, multifamily housing (75+ units), inpatient healthcare, education, fitness, car washes & laundromats. More than 370,000 potential buildings in NA in 2012, growing at 1% CAGR[1].

- **Geographic regions with favorable µCHP criteria:** North-East, Mid-West and CA

- **Stakeholders:** Distributors, building contractors, building owners, specifying engineers and contracting installers.

[1] *Micro-CHP: Light Commercial Market Opportunity Analysis in NA, BRG, Sept. 2013*

Purpose and Objectives

Impact of Project:

- Provide stakeholders with the information they need in order to make informed decisions regarding deployment of this technology. Specifically:
  - verifying the value proposition of <3 year installed cost payback
  - identifying and simplifying installation and maintenance/service issues
  - creating effective training programs for both installation and service personnel

- Technology to Market Plan laying out likely commercialization approach and anticipated time to commercialization (SOP late 2016)

- Total primary energy ***savings*** potential: 0.54 quads/yr

Approach

Approach:

- Install eight (8) µCHP field demonstration systems in four target markets with high daily hot water demands (>3000 GPD):
  - restaurants (full service)
  - small chain hotels (<200 rooms)
  - multi-apartment housing (>75 apartments)
  - inpatient healthcare/fitness
- … and in three geographic regions with favorable µCHP criteria:
  - Northeast (favorable spark spread, inter-connectivity, grid issues)
  - Midwest (favorable spark spread, inter-connectivity)
  - California (progressive energy policy, rigorous emissions regulations, grid issues).

Approach

Key Issues:

- Identification of appropriate demonstration sites
- EPA emission certification on engines (required to progress to demonstrations phase of project)
- Reliability/noise
- Lack of suitable space in retrofit applications

Distinctive Characteristics:

- Development with two different well-established engine partners
  - Product features, voice of the customer for NA incorporated from the start
- Turnkey 'plug and play' system solution to reduce unnecessary costs
- Develop a "best practices" approach for reducing installation and maintenance costs
- Working closely with gas utilities to solicit feedback on best approach to market

Progress and Accomplishments

Lessons Learned:

- Additional marketing questionnaire highlighted the same two concerns already known: first cost and an unproven technology
  - However, technology itself seemed well understood and overall efficiency liked

Accomplishments:

- Most activity focused on finding eight suitable sites:
  - Kept the natural gas industry, multiple utilities and others informed of our progress via webinars and presentations -> huge interest
  - Resulted in 12 committed potential sites and five interested sites plus numerous others looking for sites
- Engine suppliers seeking EPA approval for engines
- Preliminary cost estimates remain within targets

Market Impact:

- Based on testing in the AO Smith lab with the chosen engines, using real water draw profiles, the project is on track to meet performance and cost targets
  - 3 year installed cost payback without incentives for our target markets

Project Integration and Collaboration

Project Integration:

- Two engine suppliers are each supplying four engines plus controls and providing cost share. One of these (YANMAR) is a leading supplier of µCHP systems in Japan
- There is also direct utility engagement, state/regional agencies, industry trade group outreach

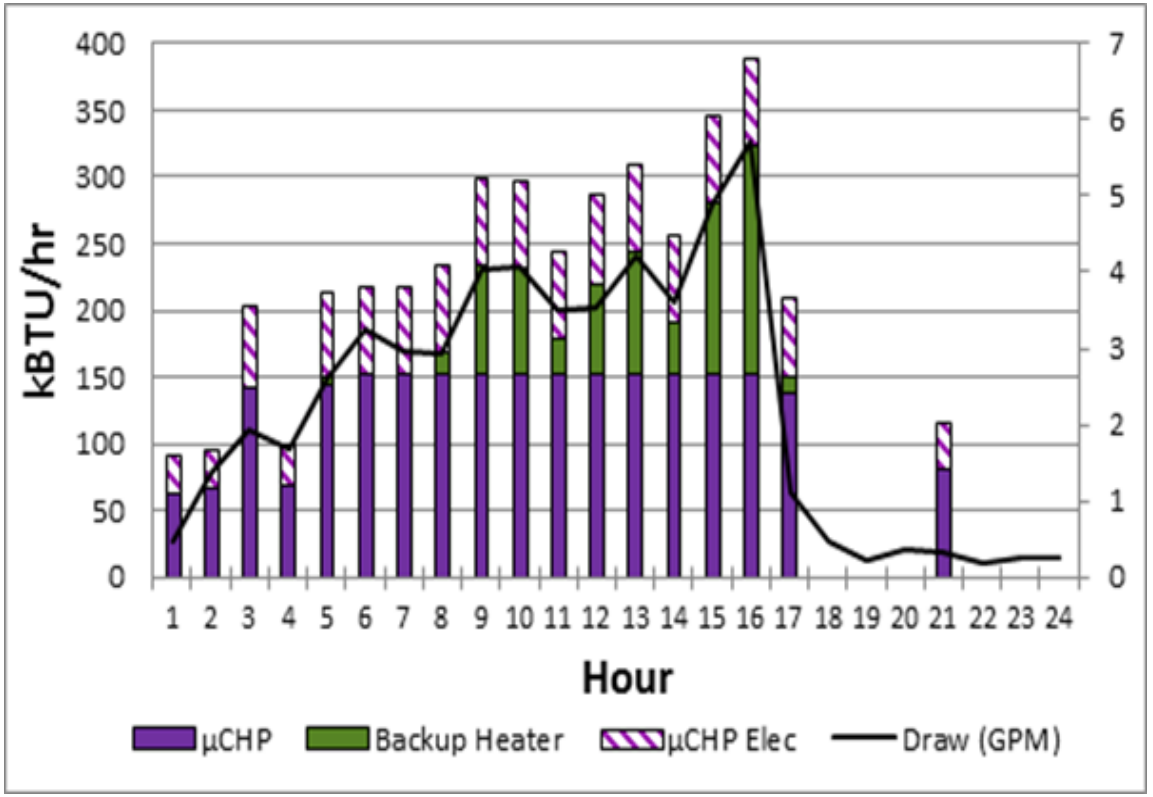
Partners, Subcontractors, and Collaborators:

- YANMAR America/Briggs & Stratton: engine suppliers, engine controls
- Oak Ridge National Lab: field test measurement and verification
- Microcogen Partners: consulting; identification of sites

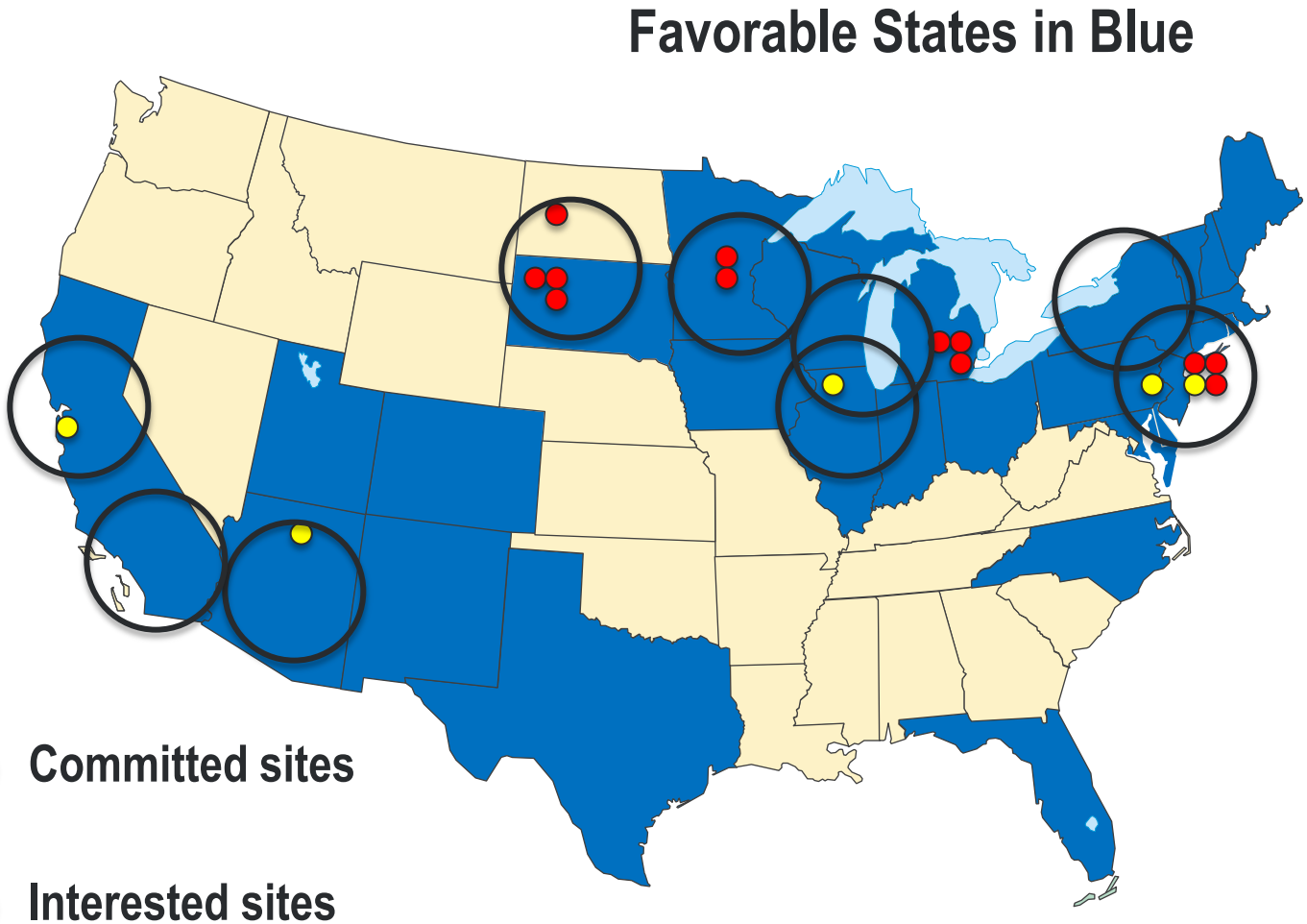
Communications:

- Webinars describing the project presented to natural gas utilities and utility trade groups

Verification of Performance in Lab



Target Regions and Demonstration Site Plans



Committed sites

Interested sites

Territory of groups (utilities, trade groups, state/local agencies) cooperating with site selection and market analysis

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Next Steps and Future Plans

Next Steps and Future Plans (to complete Yr. 1):

- Complete all site evaluations by 5/15/15
- Finalize site selection by 5/31/15; all contracts in place by 6/30/15
- Site baseline testing June through installation: ORNL
- Receive EPA approval for engines by 8/31/15
- Assemble all needed hardware for all 8 sites by 9/15/15
- Installation of 8 sites (October 2015 through March 2016)

REFERENCE SLIDES

Project Budget

Project Budget: $1,538,300 ($675,000 DOE, $863,300 Cost Share)

Variances: None

Cost to Date: $90,482

Additional Funding: None

Budget History					
October 1, 2014– FY2015 (current)		FY2016 (planned)		FY2017 – September 30, 2017 (planned)	
DOE	Cost-share	DOE	Cost-share	DOE	Cost-share
$300,847	$300,847	$374,153	$445,851	-	$116,602

Project Plan and Schedule