Onsite Energy Technical Assistance Partnerships

Doug Heredos
Upper West Onsite Energy TAP | Director
doug.heredos@cascadeenergy.com | 503-928-3213

Alex Cimino-Hurt
Upper West Onsite Energy TAP | Assistant Director
alex.ciminohurt@cascadeenergy.com | 224-660-5025

Onsite Energy Technical Assistance Partnerships
U.S. DEPARTMENT OF ENERGY
Upper-West

Onsite Energy Program

The U.S. Department of Energy's (DOE) Onsite Energy Program provides technical assistance, market analysis, and best practices to help industrial facilities and other large energy users increase the adoption of onsite energy technologies.

battery storage | combined heat and power | district energy | fuel cells | geothermal | industrial heat pumps

renewable fuels | solar PV | solar thermal | thermal storage | waste heat to power | wind

Onsite Energy Technical Assistance Partnerships (TAPs)

DOE's 10 regional Onsite Energy TAPs provide technical assistance to end users and other stakeholders about technology options for achieving site energy objectives. Key services include:

Technical Assistance: Screen sites for opportunities to implement onsite energy technologies and provide advanced services to maximize economic impact and reduce risk from initial screening to installation to operation and maintenance.

End-User Engagement: Partner with organizations representing industrial and other large energy users to advance onsite energy as a cost-effective way to transition to a clean energy economy.

Stakeholder Engagement: Engage with strategic stakeholders, including utilities and policymakers, to identify and reduce barriers to onsite energy through fact-based, unbiased education.

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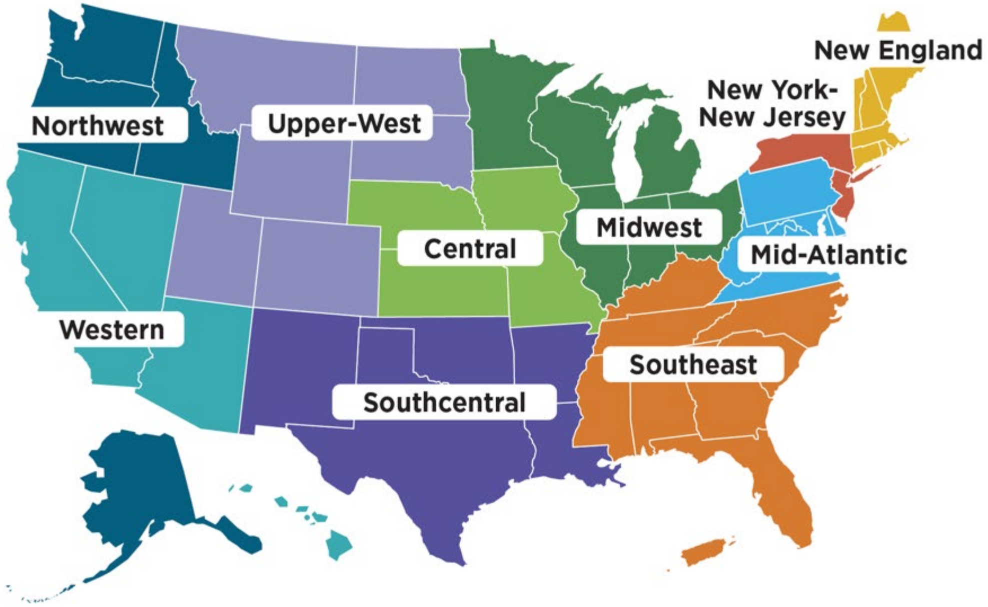
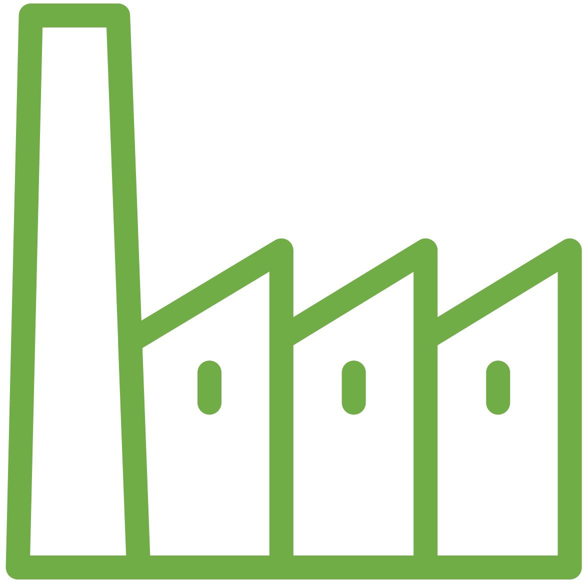


https://betterbuildingssolutioncenter.energy.gov/onsite-energy/taps

Who Benefits From This Program?



Industrial Sites

Hospitals

College Campuses

Wastewater Treatment Plants

Getting Started: How to Work with Your Onsite Energy TAP

Contact Your Regional TAP

Contact the Onsite Energy TAP in your region to start exploring onsite energy opportunities.

Discuss Site Characteristics, Goals, Objectives

Meet with the Onsite Energy TAP to discuss preliminary interest in onsite energy and learn about the facility's needs and energy-related goals.

Collect Site Data

Work with the Onsite Energy TAP to collect data needed to perform technical assistance (e.g., facility size, operations, electric and gas usage, etc.).

Conduct Analysis

Onsite Energy TAP works with technical analysis team to perform initial screenings for multi-technology options or advanced analysis to support project installations.

Review Results

When the results are ready, meet with your Onsite Energy TAP to review and discuss next steps (e.g., options worth further analysis or additional support available)

What does an Initial Technical Assistance look like?

Table 1: Technology Down-selection

Technology	Analyzed for ITA	Option for ATA	Explanation
Combined Heat and Power (CHP)	Y	Y	Consistent thermal load makes CHP a viable option. Could consider alternative fuel option (landfill gas) indicated in data collection form to further reduce emissions as part of an ATA.
Solar Photovoltaic (PV)	Y	Y	Substantial roof/open parking lots area availability makes the site a strong candidate for solar PV. A more detailed PV analysis as part of an ATA could be used to further optimize system economics and performance.
Wind Turbines (Wind)	Y	Y	Land availability onsite makes wind turbine generation a viable option. A more detailed site assessment as part of an ATA could help determine ideal placement and whether trees would need to be cleared and how that would impact project economics and performance.
Battery Energy Storage System (BESS)	N	Y	Electrical load is flat, and the rate structure does not incentivize short-term load shifting. Even if there was a tariff option with high on-peak-to-off-peak price ratios, a 6+ hour duration battery would likely be needed to sufficiently shift a flat load. However, BESS could be evaluated as part of an ATA resilience scenario.
Concentrated Solar Thermal (CST)	N	Y	CST was not evaluated as part of the ITA but could be considered as an alternative to CHP as part of an ATA, especially if site emission reduction is a priority. There is sufficient undeveloped land to accommodate a significant CST system.
Geothermal Heat Pumps (GHP)	N	N	Space heating loads are negligible and do not warrant consideration of space heating solutions. GHP cannot serve facility's process heating loads.
Air Source Heat Pumps (ASHP)	N	N	Space heating loads are negligible and do not warrant consideration of space heating solutions. ASHP cannot serve facility process heating loads.
Industrial Heat Pumps (IHP)	N	N	Collected site data do not indicate the presence of a waste heat source that could be boosted by IHPs to serve process heating loads.
Hot Thermal Storage (HTS)	N	N	There is no time shift needed between CHP heat generation and the heating load, so HTS is not needed.
Chilled Thermal Storage (CTS)	N	N	CTS was not considered because there is no economic incentive for time shifting cooling load, for many of the same reasons as for BESS.

Table 2: ITA Analysis Summary

	BAU	CHP	PV	Wind	CHP+PV+Wind
Electricity Cost ($/year)	1,260,000	460,000	1,080,000	810,000	280,000
Natural Gas Cost ($/year)	450,000	880,000	450,000	450,000	880,000
Incremental O&M Cost ($/year)	-	150,000	40,000	70,000	180,000
Net Operating Cost Savings ($/year)	-	230,000	140,000	380,000	370,000
Net Capital Cost ($)	-	1,830,000	1,380,000	4,090,000	3,510,000
Simple Payback (years)	-	8	10	11	9
Site CO_2 Emissions Reduction (tonnes/year)	-	42,000	24,000	59,000	67,000
Site CO_2 Emissions Reduction (%)	-	24%	14%	33%	38%
System Size(s) (kW)	-	1,104	2,000	2,000	CHP: 1,104; PV: 2,000
BAU: Business as usual; CHP: Combined heat and power; PV: Solar photovoltaic; Wind: Wind power					

Facility Equipment and Operation

Jelly Corp is a 120,000-square-foot facility located in Willimantic, CT. The facility produces synthetic gel and employs 400 people. The facility operates 24 hours per day (across three shifts), year-round.

According to the site data collected, the baseline annual energy consumption for the facility is approximately 11.6 million kWh/year, with a peak demand of about 1,500 kW. The facility uses approximately 43,000 MMBtu/year of natural gas. The annual utility costs are approximately $1,700,000 and the site emits approximately 178,000 tonnes/year of CO_2[1]. The blended, all-inclusive, utility costs based on one year of data provided by Jelly Corp are $0.11/kWh of electricity and $10.55/MMBtu of natural gas.

The primary fuel consuming equipment in the facility are the four hot water boilers, 4 MMBtu/hr each, generating 180°F hot water. These boilers are configured in two separate two-boiler "trains:" one for process thermal and one for space heating. One of the process boilers operates year-round at full firing capacity. Space heating boiler operation is weather dependent.

The process cooling equipment consists of three water-cooled 86-ton chillers. Two of the chillers operate on a lead/lag configuration, with the third one used for back-up. One chiller operates at full load capacity year-round providing 40°F chilled water.

In addition to the process chillers, a large cooling tower (1,985 tons) is used to cool process water. This cooling tower operates at half capacity on average year-round to cool the process water down to ambient temperature.

The main electricity-using equipment in the manufacturing facility are electric motors for process machines (approximately 550 HP total nameplate rating), air compressors (three compressors lead/lag/back-up, total 630 HP), an electric preheat boiler (2,700 kW), and electric ovens (200 kW). Equipment loading is process dependent.

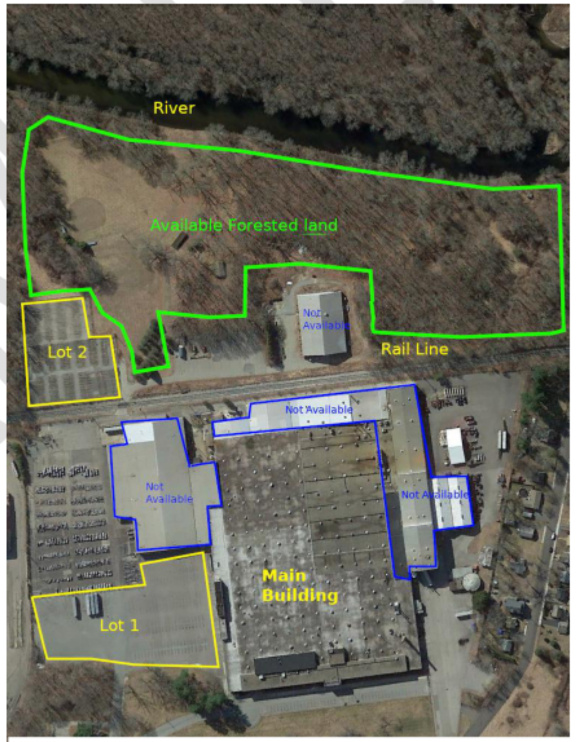


Figure 1. Aerial Image of the Jelly Corp Property and Layout.

Detailed comparison of alternatives

Initial Technical Assistance Analysis Results

Results of the ITA analysis are summarized in Table 1 and Table 2, and visually represented in Figure 1. Additional details for each scenario is presented in Table 3 and Table 4 in the Appendix.

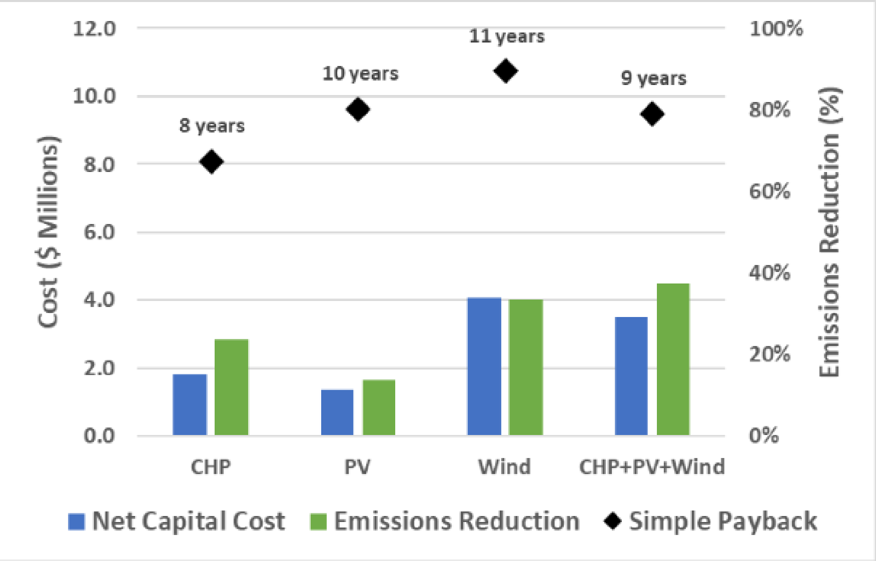


Figure 1. Cost ($ Millions), emissions reduction, and simple payback for various technology scenarios.

Results can be summarized as follows:

- A standalone 1,104 kW reciprocating engine CHP system was sized to meet the annual average heating load (combined space and process heating) of 4 MMBtu/hr of hot water. It serves approximately 80% of the annual facility electric load and 95% of the annual facility heating load. It serves 100% of the annual facility heating load when not under maintenance (maintenance takes place over 2 consecutive days per month in nine months out of the year, totaling 18 days). The CHP system has a net capital cost

[3] Jelly Corp appears to meet the eligibility criteria for an IAC Implementation Grant. Learn more about the grant program, eligibility, and application process by visiting: https://www.energywerx.org/opportunities/iacimplementationgrants. For more information related to Investment Tax Credit and Production Tax Credit, see EPA's Green Power Partnership summary: https://www.epa.gov/green-power-markets/summary-inflation-reduction-act-provisions-related-renewable-energy.

Table 3: ITA Analysis of Technology Scenarios – Energy

	BAU	CHP	PV	Wind	CHP+PV+Wind
System Size(s) (kW)	-	1,104	2,000	2,000	CHP: 1,104; PV: 2,000
Electricity Supplied by Grid (kWh/year)	11,550,000	2,360,000	9,280,000	6,610,000	1,530,000
Electricity Exported to Grid (kWh/year)	-	-	10,000	710,000	1,450,000
CHP Generation (kWh/year)	-	9,190,000	-	-	9,190,000
PV Generation (kWh/year)	-	-	2,280,000	-	2,280,000
Wind Generation (kWh/year)	-	-	-	5,660,000	-
Net Purchased Electricity Savings (%)	-	80%	20%	49%	99%
Annual Peak Demand (kW)	1,490	1,490	1,490	1,490	1,490
Annual Peak Demand Reduction (%)	-	0%	0%	0%	0%
Boiler Thermal Output (MMBtu/year)	34,400	1,700	34,400	34,400	1,700
CHP Thermal Output (MMBtu/year)	-	32,700	-	-	32,700
Natural Gas – Boiler (MMBtu/year)	43,000	2,100	43,000	43,000	2,100
Natural Gas – CHP (MMBtu/year)	-	81,500	-	-	81,500
Natural Gas - Total (MMBtu/year)	43,000	83,600	43,000	43,000	83,600
Natural Gas Savings (%)	-	-94%	0%	0%	-94%
Site CO_2 Emissions Reduction (tonnes/year)	-	42,000	24,000	59,000	67,000
Site CO_2 Emissions Reduction (%)	-	24%	14%	33%	38%

BAU: Business as usual; CHP: Combined heat and power; PV: Solar photovoltaic; Wind: Wind power

Table 4: ITA Analysis of Technology Scenarios – Economic

	BAU	CHP	PV	Wind	CHP+PV+Wind
System Size(s) (kW)	-	1,104	2,000	2,000	CHP: 1,104; PV: 2,000
Electrical Energy Cost ($/year)	$910,000	$190,000	$730,000	$520,000	$120,000
Electrical Demand Cost ($/year)	$350,000	$270,000	$350,000	$340,000	$270,000
Purchased Electricity Cost ($/year)	$1,260,000	$460,000	$1,080,000	$860,000	$390,000
Exported Electricity Revenue ($/year)	-	$0	$0	$60,000	$110,000
Annual Electricity Cost Savings ($/year)	-	$80,000	$180,000	$450,000	$980,000
Boiler Natural Gas Cost ($/year)	$450,000	$20,000	$450,000	$450,000	$20,000
CHP Natural Gas Cost ($/year)	-	$860,000	$0	$0	$860,000
Natural Gas Cost Savings ($/year)	-	($430,000)	$0	$0	($430,000)
Incremental O&M Cost ($/year)	-	$150,000	$40,000	$70,000	$180,000
Net Operating Cost Savings ($/year)	-	$230,000	$140,000	$380,000	$370,000
Gross Capital Cost ($)	-	$3,040,000	$2,400,000	$6,270,000	$5,440,000
Capital Incentives ($)	-	$1,210,000	$1,020,000	$2,180,000	$1,930,000
Net Capital Cost ($)	-	$1,830,000	$1,380,000	$4,090,000	$3,510,000
Net Present Value versus BAU ($)	-	$840,000	$290,000	$840,000	$1,130,000
Simple Payback (years)	-	8	10	11	9

BAU: Business as usual; CHP: Combined heat and power; PV: Solar photovoltaic; Wind: Wind power

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U.S. DEPARTMENT OF ENERGY

Northwest
AK, ID, OR, WA

Bob Kirchmeier, P.E.
Washington State University
360-338-8082
KirchmeierB@energy.wsu.edu

Western
AZ, CA, HI, NV

Jonathan Whelan
Optony, Inc.
415-450-7032
jonathan.whelan@optonyusa.com

Upper-West
CO, MT, ND, SD, UT, WY

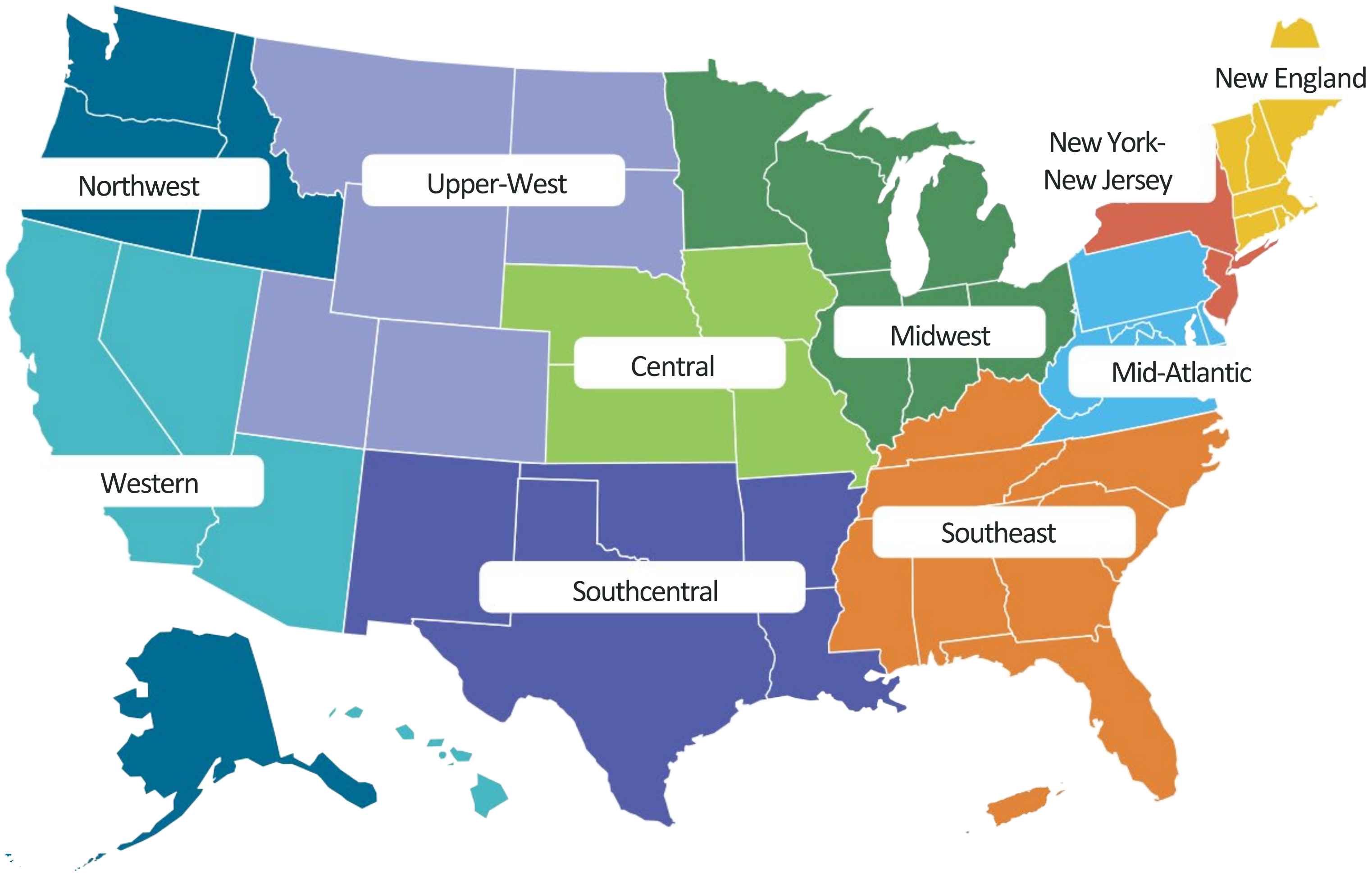
Doug Heredos
Cascade Energy, Inc.
866-321-4573
doug.heredos@cascadeenergy.com

Southcentral
AR, LA, NM, OK, TX

Carlos Gamarra, Ph.D., P.E.
Houston Advanced Research Center
281-364-6032
cgamarra@harcresearch.org

Midwest
IL, IN, MI, MN, OH, WI

Cliff Haefke
University of Illinois at Chicago
312-355-3476
chaefk1@uic.edu



Central
IA, KS, MO, NE

Cliff Haefke
University of Illinois at Chicago
312-355-3476
chaefk1@uic.edu

Southeast
AL, FL, GA, KY, MS, NC, PR, SC, TN, VI

Isaac Panzarella, P.E.
North Carolina State University
919-515-0354
ipanzarella@ncsu.edu

Mid-Atlantic
DC, DE, MD, PA, VA, WV

Jim Freihaut, Ph.D.
The Pennsylvania State University
814-863-2091
jdf11@psu.edu

New York-New Jersey
NJ, NY

Jim Freihaut, Ph.D.
The Pennsylvania State University
814-863-2091
jdf11@psu.edu

New England
CT, MA, ME, NH, RI, VT

Matt Davis, Ph.D.
University of New Hampshire
603-862-3171
matt.davis@unh.edu

How do you get started?

Reach out to us!

Doug Heredos

Upper West Onsite Energy TAP | Director

doug.heredos@cascadeenergy.com | 503-928-3213

Alex Cimino-Hurt

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alex.ciminohurt@cascadeenergy.com | 224-660-5025