CHP

EPA COMBINED HEAT AND POWER PARTNERSHIP

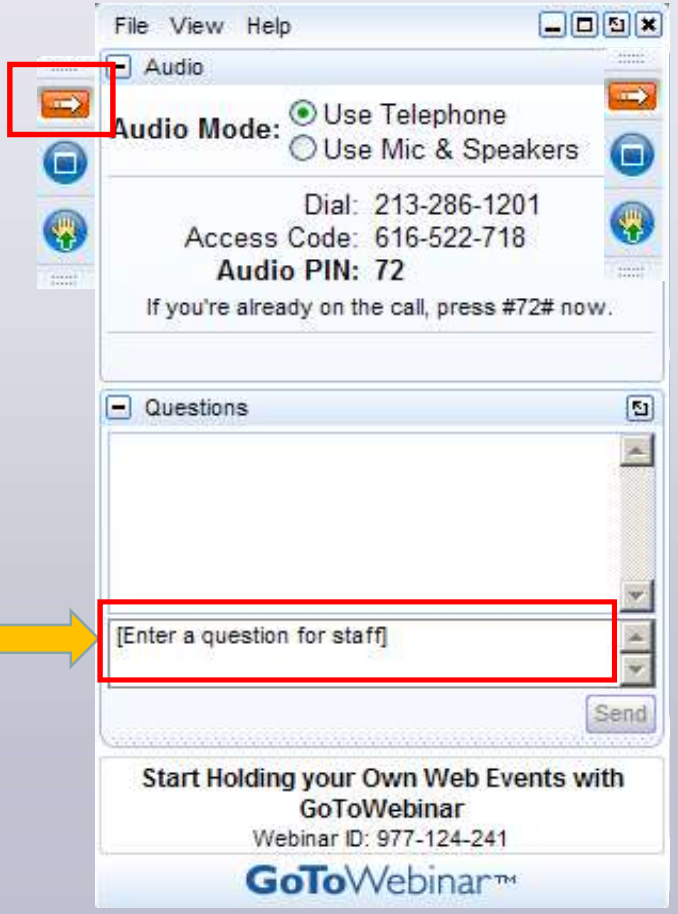
CHP- Equipped District Energy: A Winning Strategy for LEED® and PEER

January 18, 2017

Participating by Phone Today

Open and close your control panel

Submit written questions in this box.



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Scoring LEED® Points with CHP-Equipped District Energy

Charlie Goff
Eastern Research Group, Inc. (contractor to EPA CHP Partnership)
January 18, 2017

Our Work

- Why we are engaged
  - Use of LEED to recognize the environmental performance of buildings and facilities continues to grow at a rapid pace
  - Stakeholders often lack knowledge of LEED's treatment of CHP
- Goal of LEED Project
  - Help educate project developers, architects, LEED professionals, and other stakeholders on how CHP can contribute to a project's LEED point total
- Focus to date:
  - LEED for Building Design & Construction: New Construction and Major Renovations
    - Stand-alone buildings
    - Buildings connected to a district energy system

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LEED® v4 Certification Levels

Level	Points
Certified	40-49
Silver	50-59
Gold	60-79
Platinum	80-110

56 credits worth a potential 110 points

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Importance of Energy & Atmosphere: Optimize Energy Performance Credit (LEED v4)

Total # of Pts. Available	Total # of Pts. Needed to Earn LEED Certified*	Total # of Optimize Energy Performance Pts. Available
110	40	18 (16 for Schools; 20 for Healthcare)

*LEED Certified is the lowest level that can be achieved under LEED. LEED Silver is earned with 50 points; LEED Gold is earned with 60 points; LEED Platinum is earned with 80 points.

➔Achieving all of the available Optimize Energy Performance credits represents 45 percent of the points needed to earn certification at the "LEED Certified" level.

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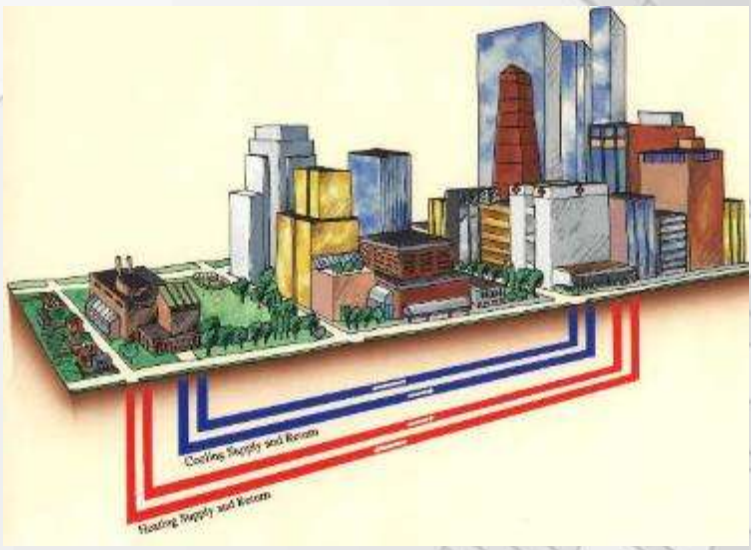
CHP and District Energy

- District Energy is heating, and/or cooling, and/or CHP for an entire university, office park, medical campus, mixed use sustainable development, or downtown
- USGBC LEED Guidance:
  - Methodology guidance contained in LEED v4 Reference Guide
  - Assigns portion of central plant CHP input fuel and electricity output to connected building based on proportion of thermal energy supplied to building.



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How OEP Points are Earned

1. Determine Energy Costs of Baseline Building
2. Determine Energy Costs of Design Building
3. Determine OEP Points

1) Determine Energy Costs of Baseline Building

1. Using an energy model, determine the electricity load of the Baseline Building.
2. Calculate the Baseline Building electricity cost by applying the site-appropriate utility rate to the modeled electricity load for the Baseline Building.
3. Using an energy model, determine the thermal load of the Baseline Building by assuming that the building's thermal is provided through an onsite system (e.g., boiler, chiller).
4. Calculate the Baseline Building's thermal energy cost by applying the site-specific fuel rate to the modeled thermal energy load.
5. Calculate total energy cost for the Baseline Building by summing the building electricity and thermal energy costs.

2) Determine Energy Costs of Design Building

1. Using an energy model, determine the electricity and thermal energy loads of the Design Building.
2. Calculate the CHP fuel input for the DES allocated to the Design Building.
   - This is done based on the proportion of DES thermal provided to the Design Building.
3. Calculate the cost of the CHP fuel input by applying the cost of CHP fuel to the fuel allocated to the Design Building.
4. Determine the cost of any excess purchased electricity and fuel needed for onsite thermal production.
5. Calculate total energy cost for the Design Building by summing the cost of the CHP fuel input allocated to the Design Building and any additional electricity or thermal energy cost

3) Determine OEP Points

1. Calculate the percentage improvement in energy costs of the Design Building compared to the Baseline Building.
2. Determine if the Minimum Energy Performance prerequisite is met
   - In LEED v4, the Design Building must demonstrate a 5 percent improvement in energy costs compared to the Baseline Building.
3. If the Minimum Energy Performance prerequisite is met, OEP points are earned according to percent improvement

Optimize Energy Performance Points (LEED v4)

Percent Improvement Over Baseline*	Points
6%	1
10%	3
14%	5
18%	7
22%	9
26%	11
38%	15
42%	16
46%	17
50%	18

* Selection of OEP point thresholds

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Example Point Impact

Factor	Case A (Baseline Building)	Case B (Design Building, No DES)	Case C (Design Building, DES)
Purchased electricity cost ($)	$454,360.00	$431,642.00	$128,253.09
CHP input fuel allocation cost	NA	NA	$196,630.45
Boiler NG cost ($)	$195,617.00	$185,836.15	$82,605.16
Total cost	$649,977.00	$617,478.15	$407,488.70
% cost savings from baseline	**NA**	**5.00%**	**37.31%**
OEP points	**NA**	**0**	**14**

EPA's CHP LEED® Resources

- **Treatment of District Energy CHP Outputs in LEED® for Building Design and Construction: New Construction and Major Renovations**
  - Summarizes how a building connected to a district energy system with CHP earns LEED® points
  - https://www.epa.gov/sites/production/files/2016-09/documents/chp-treatment-distinct-energy-leeds.pdf
- **Treatment of CHP in LEED® for Building Design and Construction: New Construction and Major Renovations**
  - Introduces CHP and its benefits to architects and engineers
  - Summarizes how CHP is treated under LEED® BD+C: New Construction
  - https://www.epa.gov/sites/production/files/2015-07/documents/treatment_of_chp_in_leedr_for_building_design_and_construction_new_construction_and_major_renovations.pdf
- **LEED® CHP Calculator**
  - Estimates the energy cost savings and "Optimize Energy Performance" points a building meeting the requirements of ASHRAE 90.1 can achieve with CHP
  - Intended to be used at very early stages of building design so that CHP is given consideration as an energy option
  - https://www.epa.gov/sites/production/files/2015-10/chp_leed_calculator.xlsm

Contacts

Charlie Goff
Eastern Research Group, Inc.
773-697-7702
charlie.goff@erg.com

Gary McNeil
U.S. Environmental Protection Agency
Combined Heat and Power Partnership
202-343-9173
mcneil.gary@epa.gov

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Courtney Yan
U.S. Green Building Council
January 18, 2017

OVERVIEW

- PEER and CHP

PEER is…

- A rating system for energy generation, transmission, and distribution
- Modeled after LEED
- Developed by the U.S. Green Building Council (USGBC) and Green Business Certification, Inc. (GBCI)

RELIABILITY & RESILIENCY (RR)	▪ Interruption metrics and benchmarking ▪ Damage and exposure prevention ▪ Islanding and long/short term backup
ENERGY EFFICIENCY & ENVIRONMENT (EE)	▪ Air emission intensity ▪ Water use and solid waste recycled ▪ Renewables
GRID SUPPORT & SERVICES (GS)	▪ Load optimization ▪ Dynamic pricing ▪ net metering, interconnection
OPERATIONS, MAINTENANCE & SAFETY (OP)	▪ Opportunity cost and value analysis ▪ Emergency response planning ▪ Meters, energy management systems and controls

PEER Project Types

Version 1 (Available for Use)

	Electricity Only	Electricity + Thermal
Utility Microgrids & Municipal Utilities	X	(X)
Campuses & Buildings	X	(X)
Suppliers	X	(X)

- DES+CHP eligible (electricity performance only)

COMING UP

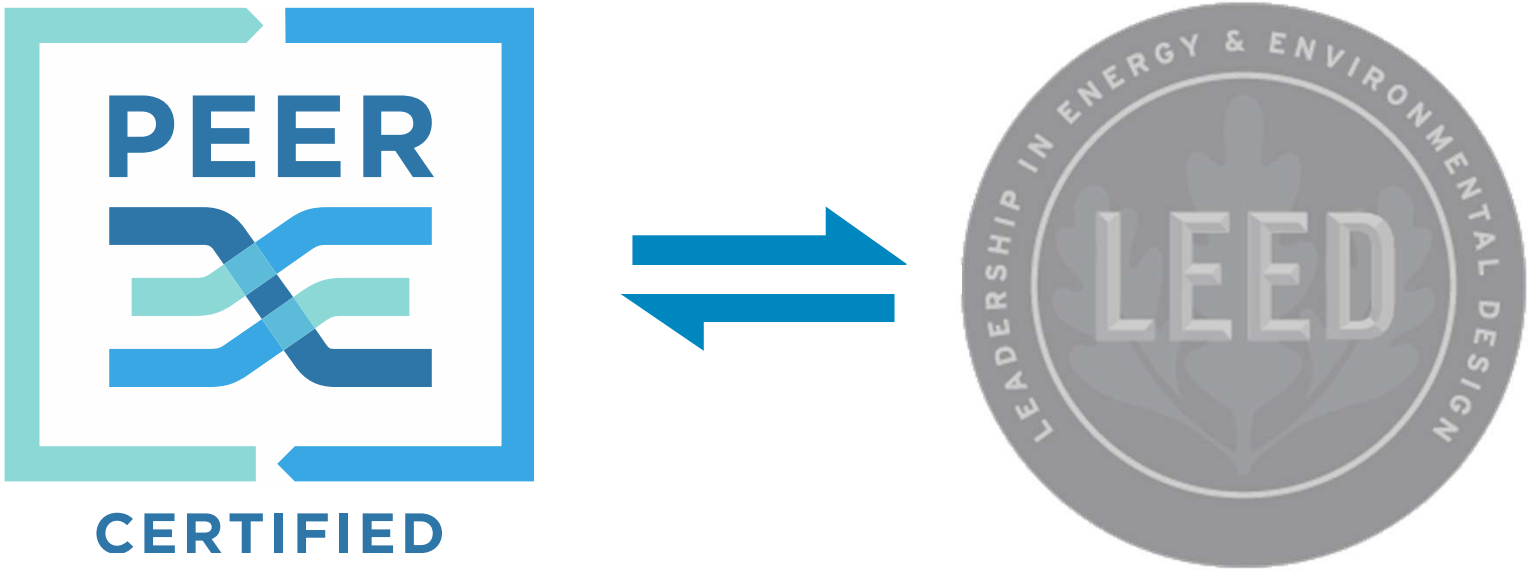
- PEER v2 with refined thermal pathways
- LEED ACP for PEER District Energy

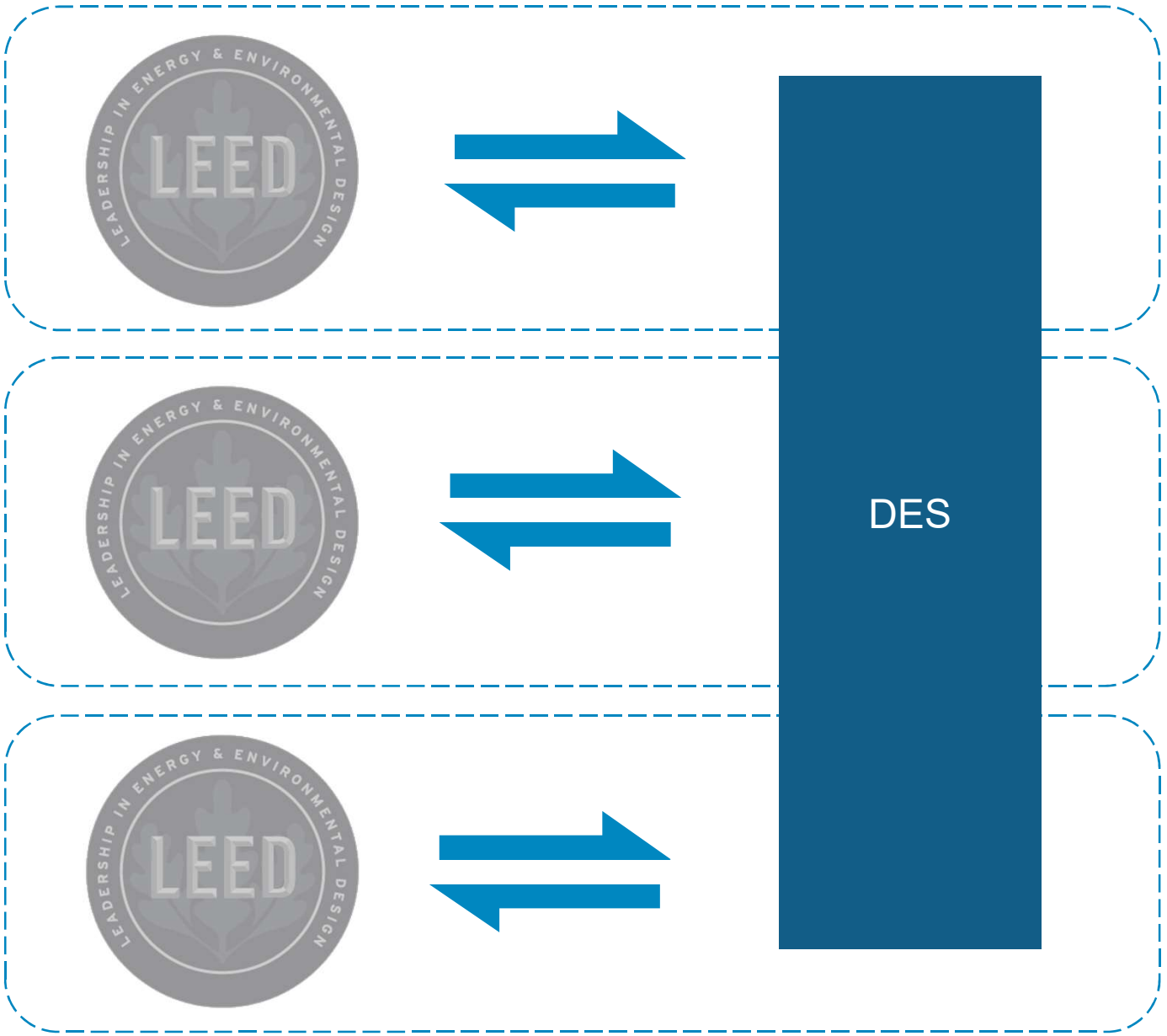
PEER Project Types

Version 2 (Under Development)

	Electricity Only	Electricity + Thermal	Thermal Only
Utility Microgrids & Municipal Utilities	X	X	(X)
Campuses & Buildings	X	X	(X)
Suppliers	X	X	(X)

- DES+CHP eligible (electricity + thermal performance)
- v2 available Q2 2017


PEER
CERTIFIED
LEADERSHIP IN ENERGY & ENVIRONMENTAL DESIGN
LEED


LEED
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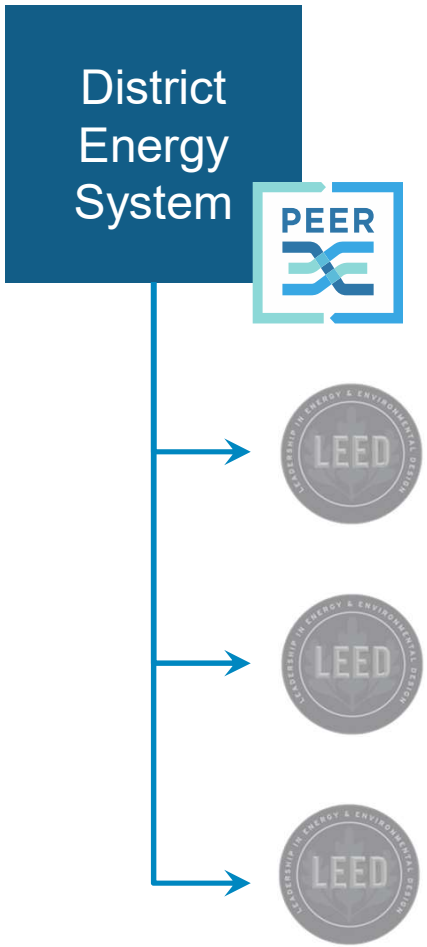
DES

ACP: PEER District Energy for LEED points



1. DES receives PEER score:
   - Air emissions intensity
   - System energy efficiency
   - Source energy intensity

2. LEED building earns additional points based on:
   - % of building load served by DES
   - PEER score

PEER District Energy for LEED points

- In addition to points for building efficiency
  - Up to max points available for EA Credit Optimized Energy Performance (EAc1)
  - Cannot be used to achieve EA Prerequisite Minimum Energy Performance (EAp2)
- DES with and without CHP eligible

- Developed by the LEED and PEER District Energy System Task Group
- Currently under review by LEED EA Technical Advisory Group

GET INVOLVED

- **Learn more** at PEER.GBCI.org
- **Join** as a PEER Participant for certification
- **Comment** on the PEER v2 draft (available Q1 2017)
- **Volunteer** for the LEED and PEER DES Task Group

Questions?

Courtney Yan
Technical Director, PEER
U.S. Green Building Council
cyan@usgbc.org

PEER Participation