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Scoring LEED® Points with CHP

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Overview

- Minimum Energy Performance prerequisite and Optimize Energy Performance (OEP) credit
- Methodology for determining OEP points with CHP (stand-alone building and district energy settings)
- CHP's demonstrated point impact
- Alternative Compliance Path pilot credit
- EPA CHP Partnership LEED® resources

EPA's CHP Partnership

- Who we are
  - Focused on raising awareness and promoting the opportunities and benefits of CHP
  - More than 400 Partners
- Why we are engaged
  - Use of LEED® to recognize the energy performance of buildings and facilities continues to grow at a rapid pace
  - Stakeholders often lack knowledge of LEED's ® treatment of CHP
- Our goal
  - Help educate project developers, architects, LEED ® professionals, and other stakeholders on how CHP can contribute to a project's LEED ® point total

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Myself

- Senior Energy and Climate Consultant with Eastern Research Group, Inc.
- 10+ years experience supporting EPA and DOE programs
  - EPA CHPP: strategic planning, technical, and education/outreach support to help advance CHP development in the United States
- Education:
  - B.S. Mechanical Engineering, Washington University in St. Louis
  - M.P.P. Energy Policy, Georgetown University
  - LEED® A.P.

Minimum Energy Performance Prerequisite and Optimize Energy Performance Credit

- Purpose: “To reduce the environmental and economic harms of excessive energy use”
- Prerequisite must be met by all projects seeking LEED® certification
- Points awarded based on percentage reduction in energy costs of Design Building compared to Baseline Building
- 3 compliance pathways
  - **Option 1: Whole Building Energy Simulation (Performance-based)**
  - Option 2: ASHRAE Advanced Energy Design Guides (Prescriptive)
  - Option 3: Advanced Buildings Core Performance Guide (Prescriptive)

Importance of Energy & Atmosphere: Optimize Energy Performance Credit

LEED Version	Total # of Pts. Available	Total # of Pts. Needed to Earn LEED Certified*	Total # of Optimize Energy Performance Pts. Available
LEED v4	110	40	18 (16 for Schools; 20 for Healthcare)
LEED v2009	110	40	19

*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 would represent 45 percent (LEED v4) and 47.5 percent (LEED v2009) of the points needed to earn certification at the "LEED Certified" level.

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USGBC Methodology for Modeling CHP (BD+C)

Methodology for Modeling Combined Heat & Power for EAp2/c1 in LEED 2009

http://www.usgbc.org/resources/methodology-modeling-combined-heat-amp-power-eap2c1-leed-2009

- Guidance on how to account for CHP in the whole building energy simulation
- Applies to on-site CHP systems which can either have the same ownership as the project or different ownership

USGBC Methodology for Modeling CHP (BD+C)

1. Determine Energy Costs of Baseline Building
   - Estimate energy loads using an energy model (Baseline Building must meet requirements of ASHRAE 90.1).
   - Determine energy cost for building by summing purchased electricity and purchased thermal.
2. Determine Energy Costs of Design Building (includes CHP)
   - Estimate energy loads using an energy model.
   - Determine energy cost for building by summing cost of CHP input fuel and any additional purchased electricity and purchased thermal needed.
3. Determine OEP Points
   - OEP points are calculated based on the percentage reduction in energy cost of the Design Building compared to the Baseline Building.

Optimize Energy Performance Points

Percent Improvement Over Baseline*	Points	
	LEED® v2009	LEED® v4
6%	---	1
10%	---	3
14%	2	5
18%	4	7
22%	6	9
26%	8	11
30%	10	---
34%	12	---
38%	14	15
42%	16	16
46%	18	17
48%	19	---
50%	---	18

* Selection of OEP point thresholds

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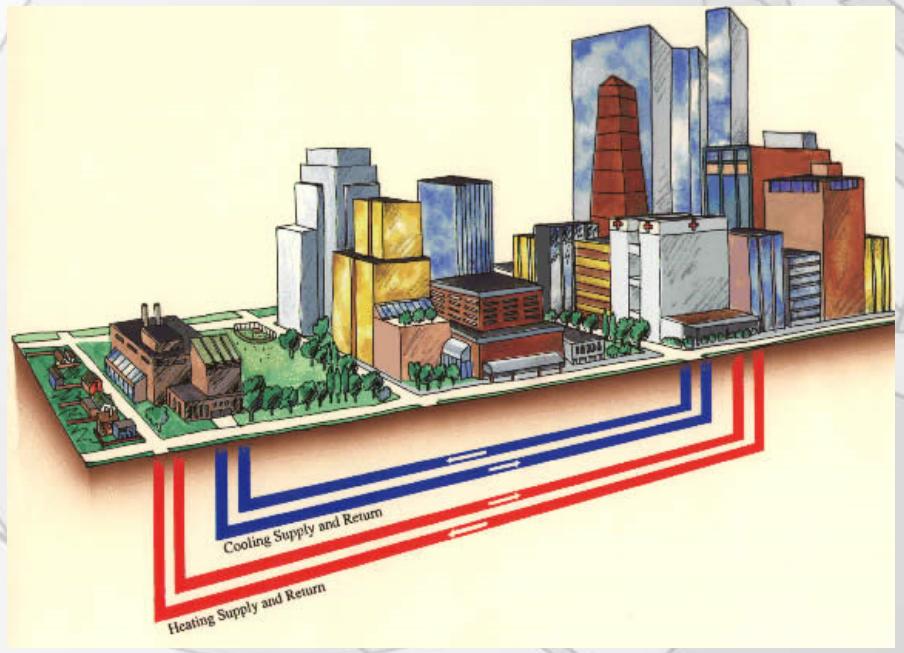
CHP and District Energy

Guidance available in LEED® v4 Reference Guide, "Project Type Variations" under Minimum Energy Performance description (pg. 363)

- 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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CHP's Demonstrated Point Impact

Building	# of Apts.	CHP Type/Size	Pts. w/out CHP	Pts. w/CHP
1	620	130 kW MT	2	8
2	340	65 kW MT	2	10
3	500	200 kW MT	2	7
4	100	65 kW MT	1	7
5	185	65 kW MT	3	9
6	250	65 kW MT	1	7
7	230	200 kW MT	0*	9
8	40	75 kW Recip	0*	4

* Would not meet Prerequisite w/out CHP

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CHP Plant "315 on A" – Boston, MA

- 225,000 square feet apartment building
- Aegen ThermoPower 75kW
- Provides domestic hot water heating (100%) and (80%) building heat
- Provides 28% of building's electrical load
- LEED® Gold
- System earned 8 OEP points; CHP responsible for 4 of them

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Whole Foods Market – Brooklyn, NY

- 56,000 square feet
- Seeking LEED Platinum
- Plans to achieve all 19 Optimize Energy Performance points
- CHP system
  - 157 kW plant with additional 250 kW backup generator
  - Offers the store black start and islanding capability (meaning it can continue to operate in the event of a grid outage).
- 100 and 168 ton Broad absorption chillers
  - No (synthetic) man made chemical refrigerants
  - CO2 direct expansion (transcritical) refrigeration system
  - Sub cooling provided by CHP for added efficiency
- 320 kw solar PV canopy array w/ rain water catchment for irrigation
- NYSERDA incentive participant

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Alternative Compliance Path (ACP) Pilot Credit

- Allows OEP point determination to be based on alternative metrics:
  - Source energy
  - GHG emissions
  - Primary energy
  - Time dependent valuation (TDV) energy
- Choice of which metric to use to earn the most OEP points depends on the site-specific interplay between:
  - Cost of electricity and natural gas
  - Efficiency of the CHP system
  - How much of the building's energy is met with CHP
  - Electric grid GHG factor

CHPP LEED® Resources

- **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
  - Available at: https://www.epa.gov/chp/documents-and-tools
- **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
  - Available at: https://www.epa.gov/chp/documents-and-tools
- **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
  - Coming soon…

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