The Energy Evangelists (EnergyPlus Team)

ASHRAE LowDown Showdown

SimBuild 2016 Conference

Building Type: Healthcare
Total Floor Area: 50,000 ft²
Number of Floors: 3
Location: Omaha, Nebraska

Total Energy Usage
2,745 MWh

Site EUI
694 kWh/sq.m.

Source EUI
871 kWh/sq.m.

Annual Electricity Usage
318 MWh

Annual NG Usage
2,427 MWh of BIO GAS

Annual Water Usage
3,353 Cubic Metres

Annual Electricity Cost
-25,080 $

Annual NG Cost
12,066 $

Annual Water Costs
18,318 $

Total Annual Costs
5,304 $

CPSF

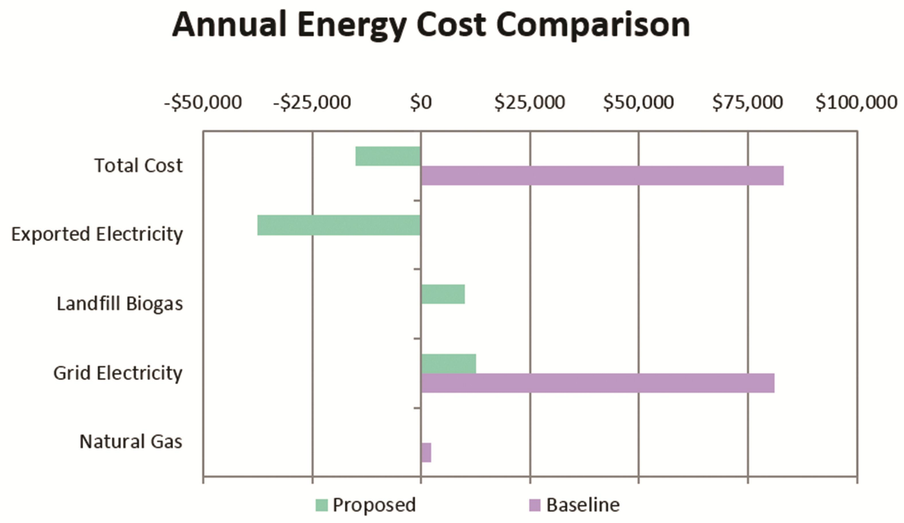
Total Energy Generation
3,126 MWh

Net Zero Energy

Carbon Equivalent
- 215,825 Pounds

Model Description

The proposed design has a circular form with easy access to critical areas and 30% window-to-wall ratio. An efficient dedicated outdoor air system (DOAS) equipped with a desiccant heat recovery wheel and an evaporative cooler provides fresh air to all the zones. Chilled water (CW) and hot water (HW) coils were selected for the DOAS unit. Four-pipe chilled and heated beams provide zone conditioning. A few high load zones were equipped with supplemental CW fan-coil units to satisfy thermal comfort. PV and combined heat and power (CHP), fed by local bio-gas from a landfill, provide the entire building electricity demand with 26% surplus energy fed back to the grid annually.



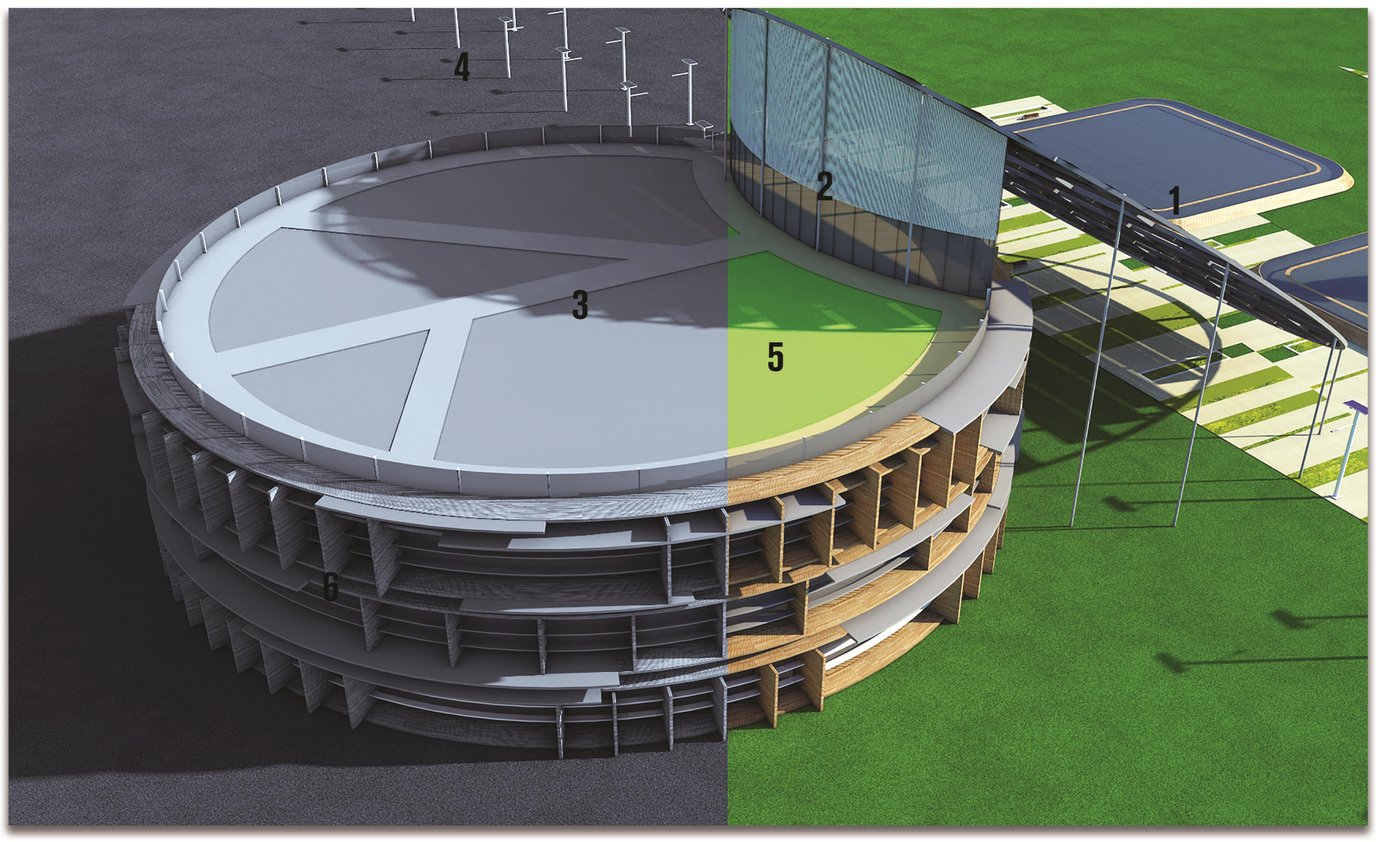
LDSd Results Summary	Baseline	Proposed Design
Total Energy Usage (MWh)	1,409	2,745
Site EUI (kWh/m2)	356	694
Source EUI (kWh/m2)	1,038	871
Annual Electricity Usage (MWh)	1,069	318
Annual Natural Gas Usage (MWh)	340	2427 (bio-gas)
Annual Water Usage (m3)	509	3,353
Annual Electricity Cost ($)	81,111	(25,080)
Annual NG usage ($)	2,209	12,066
Annual Water Costs ($)	2,760	18,318
Total Energy Generation (MWh)	-	3,162
Carbon Equivalent (lbs Ceq)	1,659,504	(215,825)

Energy Savings Strategies

- The compact circular building form provides ample daylight while minimizing the exterior exposure.
- A very tight envelope (0.1 CFM/ft2 infiltration) with R-40 roof, R-40 wall and triple pane windows (U-0.18 Btu/hr.ft2.F, SHGC-0.2, VT-0.7) combined with medium thermal mass reduces the HVAC loads.
- LED lighting for the entire building and daylight sensors for all the perimeter spaces.
- Thorough research was performed on internal loads and key strategies targeted elevator, medical equipment and office computer loads.
- DOAS has a desiccant heat wheel and evaporative cooler to minimize heating and cooling energy.
- Both DOAS and four-pipe beams' CW/HW coils take advantage of a central water plant heat recovery with a micro-turbine and an absorption chiller.

Design features

1. Panels tilted at 35 degree facing south direction – provides shade from the direct glare. Also, increases the yield of the electricity.
2. Semi-covered spaces for the patients
3. Optimized shape of the building
4. Street/exterior lighting with PV panels
5. Green roof
6. Optimized shading devices



Team

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