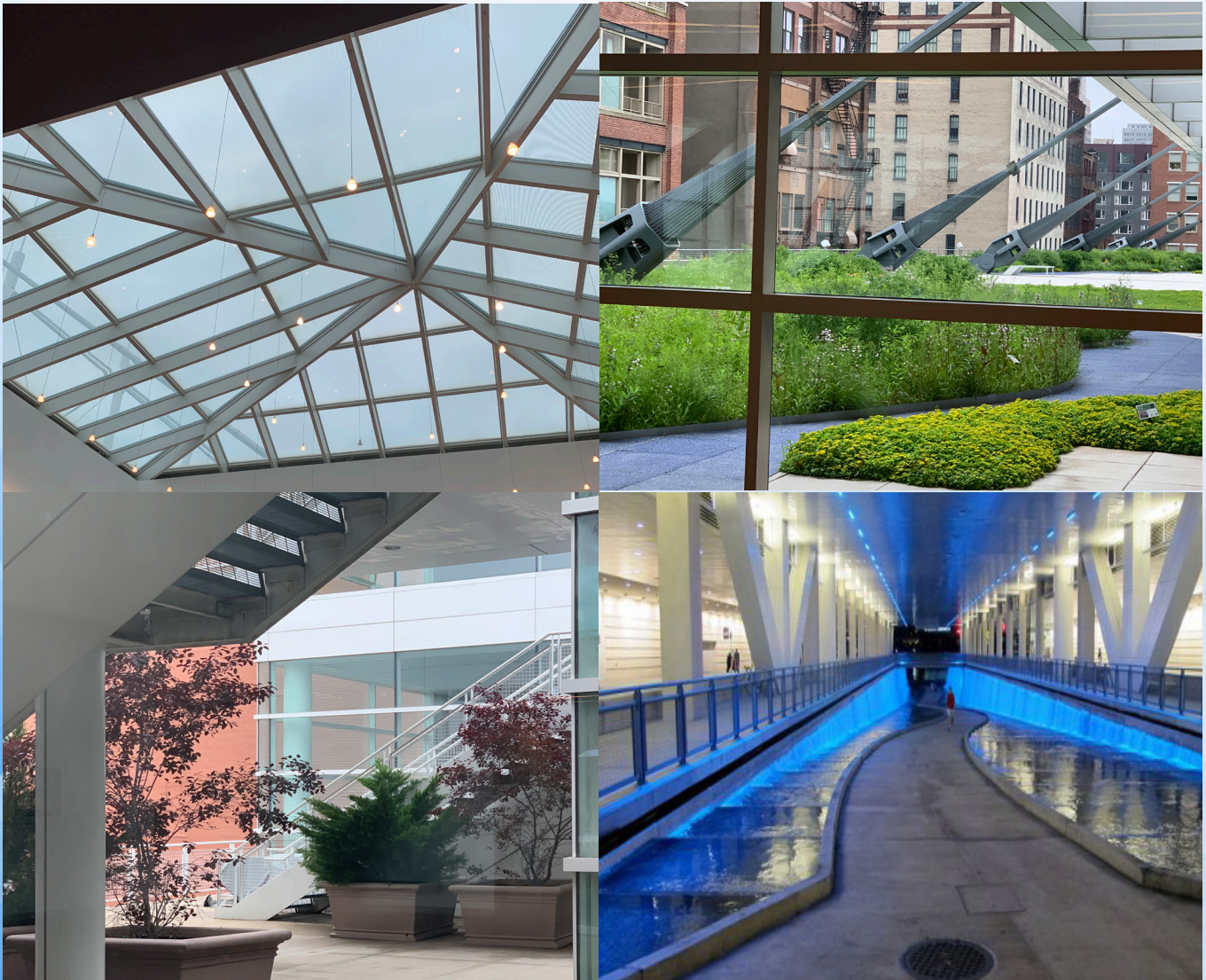


DAVID L. LAWRENCE CONVENTION CENTER 2018 GREEN REPORT



JUNE 27, 2019



Sports & Exhibition Authority
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DAVID L. LAWRENCE
CONVENTION CENTER
PITTSBURGH

The 2018 Green Report covers the operations within the physical boundaries of the David L. Lawrence Convention Center (DLCC) site related to environmental sustainability, with a focus on the performance of the 2018 calendar year. Topics were chosen based upon their relevance to external stakeholders and internal operations. The information in this report is summary in nature, with detailed data presented for the 2018 calendar year. Information is provided from previous years to the extent it is relevant.

The framework for the report is based on the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) for Existing Buildings: Operations & Maintenance ratings system, the Global Reporting Initiative's (GRI) Sustainability Reporting Guidelines, and the World Resources Institute (WRI) Greenhouse Gas (GHG) Protocol Initiative. A technical description of the extent to which each of these guidelines has been adopted and the determination of the reporting boundaries to which they apply is given in Appendix A.

It is important to note that the environmental performance of the DLCC is directly affected by several external factors such as seasonality, event schedules, type, and size of events, as well as the needs of attendees and event planners. These relationships are complex and are not always quantifiable. It is common for the hours and days of operation for convention centers to vary widely, not only from week to week and month to month, but from year to year, unlike a typical commercial building.

This report aims to be transparent about factors impacting performance. Where possible, qualitative and quantitative measures have been provided regarding the effects of these factors upon environmental performance, as well as the limitations or challenges they might impose. A simple view of energy consumption from one year to the next is not always an accurate measure of performance given the unique nature of the building.

A glossary defining key terms in this report is provided in Appendix B.

55% of all **waste**, 260 tons,
recycled, reused, donated
or composted instead of
going to the landfill
(page 18)

35% of all **electricity**
purchased from Green-e
certified sources
(page 14)

25% of all **water**
used on-site was
recycled wastewater
(page 7)

17 Green Seeking
events generated
\$8.1 million in direct
spending
(page 3)

2018 highlights

6.9 million gallons of
municipal **water** saved
through aquifer water use
(page 8)

1,723 gallons of gas saved
through free **EV charging**
(page 14)

83% of consumables purchased for
food and beverage are compostable
(page 15)

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DAVID L. LAWRENCE CONVENTION CENTER

Located in downtown Pittsburgh, adjacent to the Allegheny River, the 1.5 million sq. ft. David L. Lawrence Convention Center (DLCC) is a symbol of the City's economic and environmental revitalization. The DLCC opened in 2003 and is owned by the Sports & Exhibition Authority of Pittsburgh and Allegheny County (SEA). The SEA contracts with SMG (SMG), a professional management company, for the day-to-day operations of the facility. The DLCC was built as a public investment to attract non-resident attendees to the region and to grow tourism spending in Pittsburgh. With encouragement and support from local organizations, an additional goal was decided upon: to create an innovative and environmentally responsible facility that would showcase the benefits of sustainable building design and operations.

Pittsburgh's philanthropic community played a major role in the development of the DLCC by supporting an international green building design competition for the planning of the convention center. The \$750,000 design competition was funded by the Heinz Endowments, the Hillman Foundation, the Claude Worthington Benedum Foundation, the Buhl Foundation, the Richard King Mellon Foundation, and an anonymous foundation.

In February 1999, the Southwestern Pennsylvania Convention Center Design Commission unanimously selected the design proposal of Rafael Viñoly Architects (RVA). Inspired by the "Three Sisters" suspension bridges near the site, RVA's design uses a cable support system to suspend a dramatically sweeping roof. Daylighting, natural ventilation, and water reclamation strategies were implemented throughout the facility to an extent that was unprecedented in the meeting and convention industry during that time. In addition, the DLCC was constructed on the same site as the previous convention center facility which virtually eliminated the need for the construction of additional supporting roads and utility infrastructure.



CERTIFICATIONS AND EVENTS

LEED

LEED was integrated into the design of the building from its inception. To further the environmental goals of the building, the Heinz Endowments provided \$7 million in grants and loans, administered by the Green Building Alliance (GBA), for costs associated with green building consultation services, commissioning, and integration of green technologies.

In 2003, upon completion, the DLCC became the first convention center to be certified LEED Gold® for Building Design and Construction. The DLCC was one of only seventy-five LEED New Construction certified projects and the largest building to get LEED certification at the time.

In 2012, the SEA completed its new interior office space, located within the DLCC. The location was previously being used for storage. The SEA Office earned LEED Platinum® for Commercial Interiors in April 2013.

Continuing a commitment to sustainability the DLCC has earned LEED Platinum® for Existing Buildings: Operations and Maintenance (LEED O+M). The first LEED O+M certification was earned in 2012 and the building was re-certified in 2017. Re-certification is required every 5 years to show that sustainable operations continue at the required levels.

LEED O+M requires the reporting of energy and water usage in relation to square footage and occupancy as well as looking at the comfort of occupants and the methods by which they travel to the building. It also encompasses the purchasing of recycled products, and diverting as much as possible away from the landfill and towards recycling, donation, and composting.



Apex/ASTM Sustainable Meeting Venues

APEX/ASTM® is composed of nine certification categories including: Meeting Venue, Food and Beverage, Exhibits, Destination, and Audio/Visual. The final rating for a venue is based on the points it receives which translate to four levels, with the fourth (IV) level of achievement being the highest. In January 2018, the DLCC earned Level II certification as an APEX/ASTM Sustainable Meeting Venue¹.



Figure 1. The International Living Future Institute hosted their Living Product Expo (a green seeking event) at the DLCC in 2018

¹ <https://www.eventscouncil.org/Sustainability/About-Sustainability>

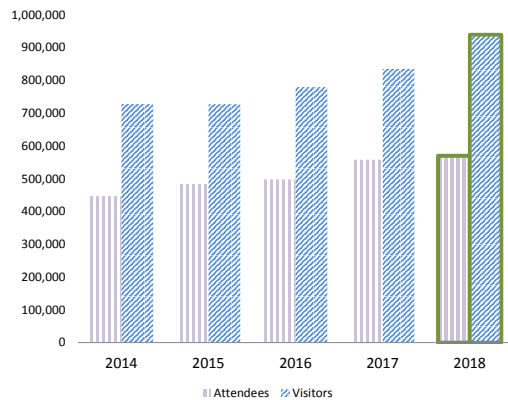


Table 1. DLCC attendees and visits 2014-2018

Green-Seeking Events

The building's LEED certifications and on-going sustainable operations at the DLCC attract event organizers who seek facilities with green operations, known as green-seeking events.

Of the 174 events at the DLCC in 2018, 17 were green-seeking events of which 5 are major events.¹ These green-seeking events, with 24,480 attendees, accounted for \$2,057,858 in gross revenues to the DLCC.

The green-seeking major events generated \$8.1 million in direct spending to the region. Green-seeking major events have been responsible for \$262.5 million (19%) in direct spending since tracking began in 2006.² In addition to events, the DLCC engaged 66 individuals in educational green tours of the building highlighting various features from the roof to the wastewater treatment plant. Anyone can request a free sustainability tour of the DLCC with SEA or SMG staff.



Figure 2. AASHE Fill it Forward Promotion

Activity at the DLCC

No single measure of building utilization accounts for the diversity and variation in convention center building usage. Attendance and visits are measures of building activity used in this report. Attendance is the total of (1) the attendance count for public shows, banquets, meetings, and (2) the delegate count for conventions and trade shows. Visits is the attendance with the length of the event taken into account and counts an attendee who attends an event over multiple days. Neither measure differentiates between event type, duration, or spaces utilized (e.g., exhibit hall, ballroom, meeting rooms etc.), all of which impact building operations, energy and water use differently. Table 1 shows the number of events and attendance in the past 5 years. **Attendance in 2018, at 570,342 is the highest attendance in the DLCC's history.**

Green Event Spotlight: AASHE Fill it Forward

The Association for the Advancement of Sustainability in Higher Education (AASHE) came to the DLCC in October 2018 and continued their sustainable conference tradition with their Fill it Forward campaign. Attendees were given an AASHE cup or a tag to put on their existing water bottle that would be scanned with each reuse. The scans allowed the attendees to track the impact of the reuse. For every instance of reuse that got tracked AASHE and sponsors donated to clean water initiatives around the world. The AASHE conference helped show that going green can be engaging and informative.

AASHE's net impact included 870 pounds of emissions saved, 217 pounds of waste diverted, and 2,099 kWh of electricity saved³.

¹ Major Events are (a) larger events that typically book 18 months and further into the future, (b) require the Center's facilities (i.e. there is no other local venue that can physically accommodate the event), and (c) use a significant number of hotel rooms.

² Source: VisitPittsburgh

³ <http://cupanion.com/2018/10/the-2018-aashe-conference-is-filling-it-forward>

GREEN AND VEGETATED SPACES

3rd Floor South Terrace Green Roof

The third floor terrace outside of the City-side meeting rooms was renovated into a green roof space and opened in May 2012. The 3rd floor South Terrace Green Roof (Green Roof) features a mix of non-invasive adapted sedum species and a “meadow” filled with native perennials, separated by a walking path and a plaza for outdoor receptions. The Green Roof plantings provide a connection to nature for visitors on the southern side of the building. In 2018, 13 events were held on or adjacent to the Green Roof, and brought nearly 50,000 attendees to the building.

Studies have shown that green roofs in Pennsylvania's climate retain 50% of rainfall on average, with up to 100% retention in the summer.¹ Through natural root intake processes, evaporation and transpiration, plants also remove pollutants from the air and water. Based on research gathered by the US EPA, it is estimated that the Green Roof removes almost 680 pounds of particulate matter from the air annually, which is approximately equivalent to the annual emissions of 255 passenger vehicles.

With the addition of the Green Roof, 41,555 sq. ft. of the DLCC's site has been restored with native or non-invasive adaptive plantings, representing 8.5% of the total site area. A total of 75 different species are represented at the Green Roof, 11th Street hillside, and the Riverfront Plaza. See Figure 3 for the locations of the green elements at the DLCC.

11th Street Hillside and Riverfront Plaza

Along 11th street, bordering the east side of the DLCC, is a 13,200 sq. ft. hillside that has been restored with native trees, shrubs, and grasses. The Convention Center Riverfront Plaza (Riverfront Plaza) extends this natural landscape along the north side of the building.

Opened to the public in May 2011, the Riverfront Plaza links two previously disconnected components of Pittsburgh's 22-mile Three Rivers Heritage Trail, providing a safe route for walkers, bikers, and joggers to travel between the City's Strip District commercial area and Point State Park. The DLCC Water Feature provides pedestrian access from the City-side to the Allegheny River and trail.

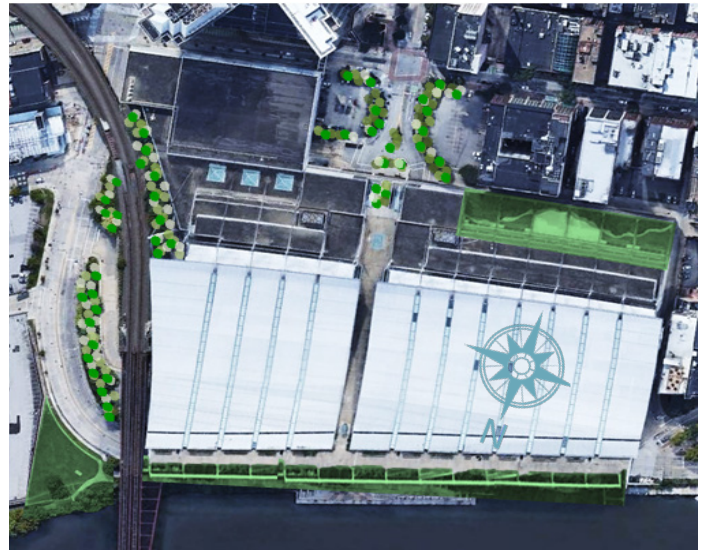


Figure 3. Aerial view highlighting green spaces



Figure 4. Butterfly and milkweed plants on 4th Floor Terrace

¹ Penn State Center for Green Roof Research. "Stormwater Quantity." Source: <https://plantscience.psu.edu/research/centers/green-roof/research>

Maintenance

All landscape maintenance activity adheres to the DLCC's Integrated Pest Management, Erosion Control, and Landscape Management Plan. In accordance with this plan, landscaping and planters are hand-weeded and landscaping waste is collected for composting. Fertilizers are rarely used. When fertilizers are needed, they are organic. Irrigation is only used when necessary and some areas, such as the Green Roof, relied only on rain-water in 2018 and did not use irrigation.

4th Floor North Terrace Vegetable Gardens

The abundant sunlight that reaches the North Terrace makes the location an excellent spot for herb and vegetable gardens. Levy Premium Foodservice (Levy), the DLCC's food and beverage provider, maintains 1,200 sq. ft. of planters on the roof terrace. The planters produce organically-grown heirloom vegetables and herbs such as squash, peppers, beans, tomatoes, eggplant, and parsley, which are enjoyed by attendees during catered events. Levy uses hoop houses to extend the growing season of the produce, increasing the amount of local food served to attendees at the DLCC.

Rooftop Hops

In 2018, Levy incorporated hops grown on the DLCC rooftop to produce a signature beer called Rooftop Hops. An innovative local purchasing partnership features the use of the hops grown on the 4th Floor North Terrace and brewed with a local independent brewer. The DLCC's beer, branded "Rooftop Hops," debuted in 2018. The DLCC was featured in the Pittsburgh Post-Gazette in February 2019¹. Rooftop Hops is now also available in various restaurants downtown as well as PNC Park.

4th Floor North Terrace Monarch Waystation

In June 2012, the DLCC established a Monarch Butterfly Waystation (Monarch Waystation Registry #6071) on the North Terrace. The Monarch population has declined from habitat loss resulting from urban sprawl and herbicide-resistant crops.² Monarch Waystations are planted with milkweed and other complimentary plantings, creating a habitat suitable for Monarch butterflies to lay their eggs.

The butterfly larvae sustain themselves on milkweed plants until they reach adulthood. Each fall, Monarch butterflies migrate from Canada and the United States to Central Mexico for the winter and return north in March.



Figure 5. Executive Chef Dominique Metcalf picking tomatoes on the rooftop garden



Figure 6. Hops growing on the DLCC Rooftop

¹ <https://www.post-gazette.com/life/drinks/2019/02/28/Beer-Rooftop-Hops-David-Lawrence-Convention-Center-North-Country-Brewing-cans/stories/201902190137>

² For more information on Monarch Waystations visit www.monarchwatch.org.

Heat Island Mitigation

Heat island effect occurs primarily during the summer months when sunlight is absorbed by roofing and paving and then re-radiated as heat energy. This causes urban areas to be 1.8°F to 5.4°F warmer than surrounding rural areas¹ and results in increased cooling costs, air pollution, and health issues. The use of vegetation, such as a green roof, or using highly reflective surfaces can mitigate the effects of the built environment on temperature increases.

Green roofs and vegetated spaces reduce solar heat gain by naturally cooling the air through evapotranspiration. The nearby Allegheny County Office Building green roof showed a 40°F-50°F reduction in surface temperature compared with adjacent buildings whose roofs are made of conventional roofing materials and a reduction of 10-20% in heating and cooling costs.² The differential temperatures vary depending on the building's sun exposure and the type of roofing materials on neighboring buildings.

The urban heat island effect can also be mitigated by selecting materials with high solar reflectance index (SRI) values. Solar reflectance is the material's ability to reflect solar energy from its surface back into the atmosphere. A value of 0 indicates that the material absorbs all solar energy and radiates a great deal of heat. Higher SRI values indicate that there is reflectance, less solar energy absorption, and less heat generation. A standard black surface has an SRI of 0, while a standard white surface has an SRI of 100 (some materials may exceed these boundaries).

The DLCC reduces the contribution to urban heat island effect by using pavers on the Green Roof with an SRI value of 85, significantly reducing heat gain in comparison to conventional materials. The SRI value of the DLCC's 249,800 sq. ft. curving stainless steel roof was measured in-situ in August 2010, in accordance with ASTM E 1980³, to be 113.9, 52% higher than the minimum required SRI for ENERGY STAR roofing materials.⁴ Even on a hot day in direct sunlight, the DLCC's roof surface is only 18°F warmer than surrounding air, while surrounding buildings with conventional roofing systems may have surface temperatures 40°F to 70°F warmer than surrounding air.⁵

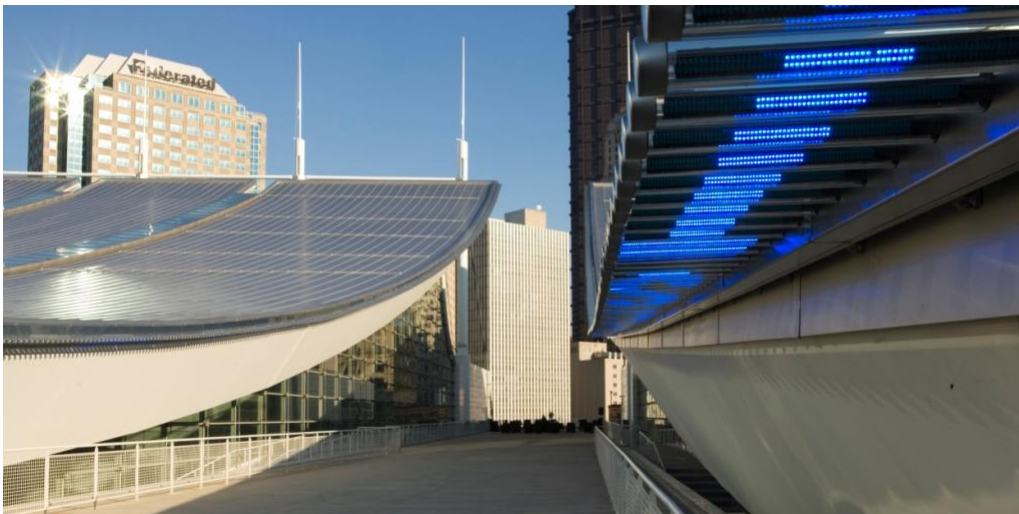


Figure 7. The highly reflective metallic roof of the DLCC is not only a major architectural feature. It also helps keep the building and surrounding areas cooler through its highly reflective surface.

¹ Berghage, Robert, et al. Green Roofs for Stormwater Runoff Control. US EPA, Feb 2009.

² 3 Rivers Wet Weather. "Green Roofs." Source: www.3riverswetweather.org/storm-water-green-solutions/stormwater-bmps/green-roofs

³ <https://www.usgbc.org/glossary/term/5590>

⁴ ENERGY STAR Program Requirements for Roof Products. Energy Star.gov, 2010. Source: https://www.energystar.gov/ia/partners/product_specs/program_reqs/Roof_Products_Program_Requirements.pdf

⁵ Heat Island Effect. US EPA, n.d. Source: <https://www.epa.gov/heat-islands>

WATER

Water Consumption

The DLCC, unlike a typical building, has multiple sources of water serving the needs of the building and its occupants. The DLCC uses municipal water, filtered aquifer water, and recycled wastewater. In 2018, 26% of the water used at the DLCC was municipal water, 49% was from the aquifer, and 25% was reclaimed wastewater from the on-site wastewater treatment plant (Figure 8). Figure 9 shows the end uses of the total water usage at the DLCC.

Potable Water

Potable municipal water used at the DLCC is supplied by the Pittsburgh Water and Sewer Authority (PWSA). This water is used for drinking fountains, faucets, kitchen, and laundry purposes.

All plumbing fixtures and fittings meet plumbing code requirements from the Uniform Plumbing Code (UPC) and the International Plumbing Code (IPC) which align with LEED standards. Fixtures in all restroom facilities are equipped with sensor controls and aerating faucets.

Wastewater Treatment Plant

The DLCC has a 50,000-gallon on-site wastewater treatment plant that collects and treats wastewater

from sanitary and potable uses. This water is treated, and re-used for toilet flushing only. The plant's treatment components include a sump tank, aerobic digester, carbon filter system, and ultraviolet disinfection system. In 2018, the wastewater treatment plant was operated through a contract with Veolia Water North America (Veolia).

3.5 million gallons of reclaimed water were reused in 2018 and accounted for 25% of the building's total water usage. This amount of water would have cost the DLCC \$71,904 if purchased through municipal sources.

Recycling wastewater on-site helps to mitigate combined sewer overflows into nearby streams and rivers, which benefits water management in the greater Pittsburgh area.

Operating the wastewater treatment plant is currently more expensive than municipal water services. Operating an on-site wastewater treatment plant, however, provides reclaimed water to the DLCC at a consistent cost while municipal water and sewage rates are steadily rising.

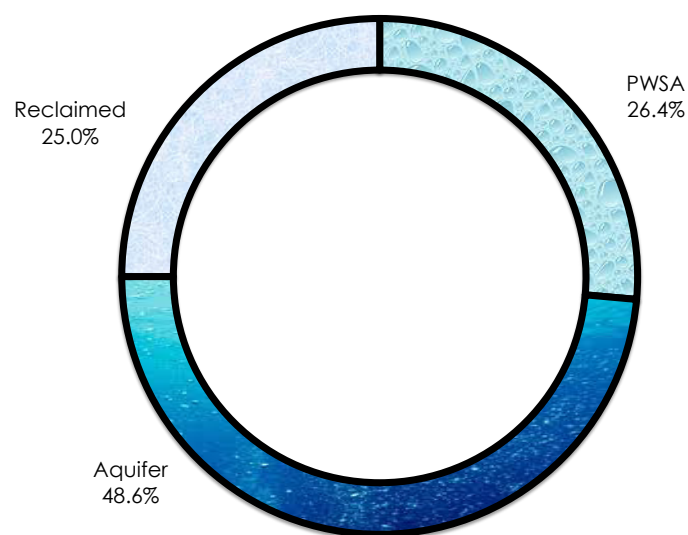


Figure 8. 2018 sources of water use

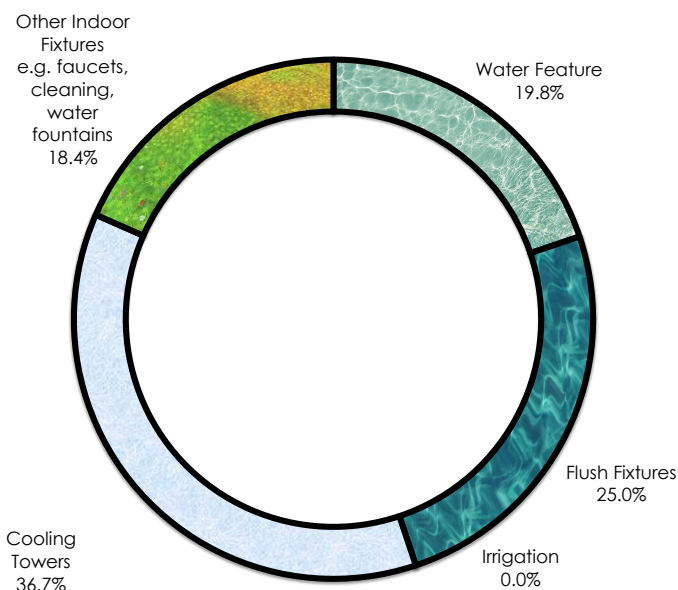


Figure 9. 2018 total building water end uses

Aquifer

The Wisconsin Glacial Flow is an aquifer, sometimes referred to as Pittsburgh's "Fourth River," located approximately 50 feet below the DLCC. Aquifers are geological formations containing or conducting ground water. Aquifers, when correctly managed, recharge through groundwater infiltration from precipitation absorbed into the ground that passes through soil layers and then into the water-bearing rock layers making up the aquifer. See Figure 10 for a typical cross section that represents the aquifer.

The use of the aquifer conserves municipal water. Every effort is made to withdraw water from the aquifer in a responsible way that allows for adequate replenishment through groundwater infiltration.

In 2018, the aquifer accounted for 6.9 million gallons of water usage, 48.6% of total water use. Using the 2018 average effective rate charged for municipal water, the use of aquifer water saved the DLCC an estimated \$174,800 in municipal water costs.

The aquifer primarily provides water for the cooling tower, and 10th Street water feature. And, on rare occasions, provides water for irrigation of the 3rd Floor South Terrace Green Roof and 11th Street planted hillside area.

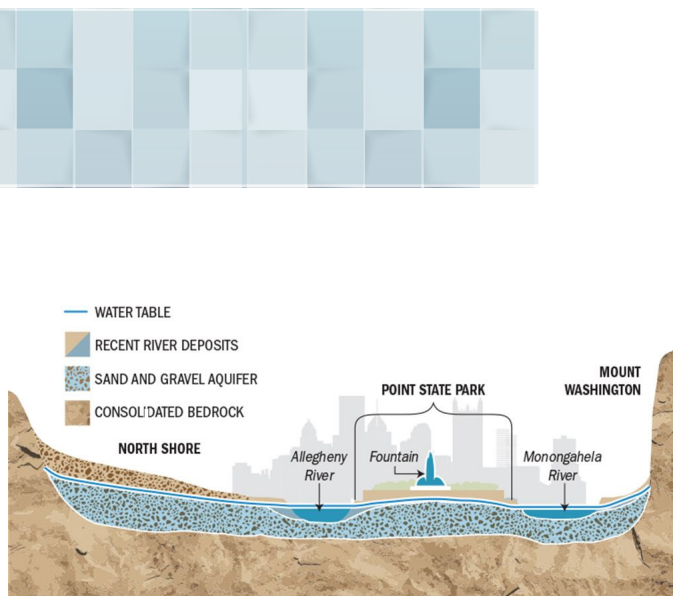


Figure 10. Cross section of the aquifer serving the DLCC
Source: Pittsburgh Post Gazette January 14, 2019.

Cooling Tower

In 2018, 5.2 million gallons of aquifer water were used by the cooling tower to provide water for the chiller plant, representing 37% of the DLCC's total water usage.

10th Street Water Feature

The aquifer provides water with a very high iron content due to the rock the water infiltrates on its journey through the rock strata. The high iron content was staining the walls of the water feature. To address the staining issue the water undergoes an iron filtration process before being used in the water feature. Using the aquifer to supply the water feature reduced the DLCC's use of potable water by over 1.7 million gallons in 2018.

3rd Floor South Terrace Green Roof

Moisture sensors continually monitor the Green Roof's growing medium and control a high-efficiency drip irrigation system that draws filtered aquifer water. These sensors relay data (surface and subsurface soil temperature, soil moisture, and rainfall data) to a web-based monitoring system. This system allows the irrigation cycle to automatically shut off when irrigation is not needed. The Green Roof did not require irrigation in 2018, and relied entirely on rainwater.

11th Street Vegetated Hillside

It is the DLCC's policy to use the irrigation system serving the 11th Street hillside only in extreme or prolonged drought conditions. In 2018, the 11th Street irrigation system was not used. The native and adaptive species thrive under normal site conditions, minimizing the need for irrigation and fertilizers.

SYSTEMS: LIGHT AND HVAC

Daylighting

The DLCC was the first convention center in the world to implement daylighting on an extensive scale, departing from the typical “black box” convention center model. 85% of the regularly occupied spaces in the building are capable of providing natural daylighting, reducing the need for artificial lighting and energy use. For example, Exhibit Halls A, B, and C can be lit entirely by daylight during daytime hours.

Space Conditioning: Heating

The building uses the district energy steam system provided by Pittsburgh Allegheny County Thermal (PACT) to heat the building. After the steam is used for this purpose, it condenses into hot condensate and returns through the system to be reheated and re-circulated. The DLCC is equipped with a pump system to return the 170°F-180°F condensate water back to PACT, increasing the efficiency of the PACT facility by providing hot water for its processes.



Figure 11a. Looking West from Halls A-C pre-function

Space Conditioning: Cooling

Cooling in the building is provided by an on-site chiller plant that is operated through a contract with Veolia. Water cooling is delivered to spaces through cooling coils in the air handling units. The building's HVAC system uses low-temperature cooling equipment, which enables higher efficiencies. The plant equipment consists of two 1,500 ton centrifugal chillers, a 750 ton centrifugal chiller with a variable frequency drive, and two 6,000 gallon capacity cooling towers.

Ozone Depleting Substances

The DLCC does not use equipment containing chlorofluorocarbons (CFCs), which are known to damage the ozone layer. Chilling equipment, primarily for food and beverage, uses hydro-chlorofluorocarbons (HCFCs) and hydrofluorocarbons (HFCs), which are less damaging and balance potential environmental impact with efficiency. The DLCC's weighted average refrigerant impact, a measure used by LEED to look at the balance between refrigeration power and refrigerant toxicity, is 21, much less than the maximum threshold of 100 required by the LEED for Existing Buildings: O+M rating system.¹



Figure 11b. Skylights and windows in Halls A,B, and C

¹ For more information on the refrigerant impact determination used here, please see The Treatment by LEED of the Environmental Impact of HVAC Refrigerants, TSAC HCFC Task Group, 2004, available at <http://leadinggreen.com/wp-content/uploads/2014/01/The-Treatment-by-LEED-of-the-Environmental-Impact-of-HVAC-Refrigerants.pdf>

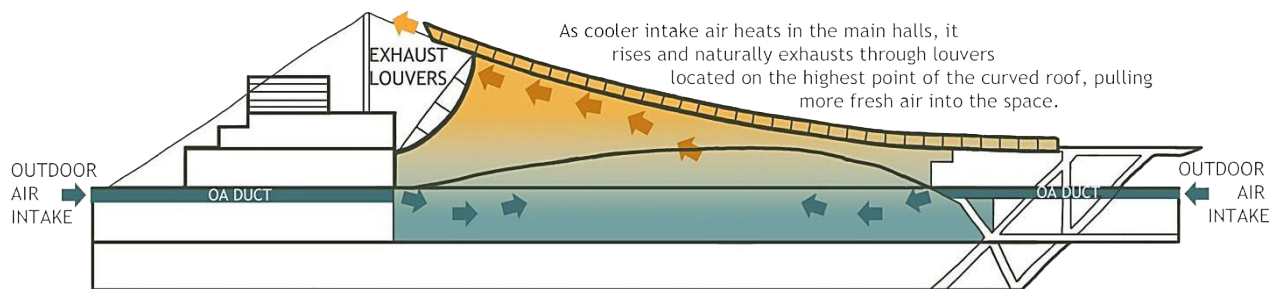


Figure 12: DLCC Natural Ventilation Diagram - Main Exhibit Halls

SYSTEMS: VENTILATION

Ventilation is essential to maintain indoor air quality (IAQ) levels, which improve occupant comfort, increase productivity, and promote general well-being.¹ Increasing ventilation eliminates indoor air contaminants, preventing the IAQ-related health issues associated with “sick building syndrome.”

Natural Ventilation

The natural ventilation system delivers outdoor air to the Exhibit Halls A, B, and C when weather conditions are suitable. Operable intake louvers are located along all four walls of the building between the second and third floor level. Cooler outdoor air is directly ducted to the exhibit halls at floor level and released through exhaust louvers at the higher end of the building’s curved roof letting warmer air flow out with the resulting lower pressure at floor level causing outside air to flow into the building. This process is commonly referred to as the “chimney effect” or “stack effect.” When the natural ventilation system is in operation, airflow and building pressure are automatically recorded by the Building Automation System (BAS). Mobile CO₂ monitors that communicate with the BAS system (placed directly in the breathing zone and moved to accommodate each event layout) are used with the natural ventilation system to ensure IAQ standards are maintained.

The natural ventilation system is coordinated with the DLCC’s HVAC system through the BAS controls. Natural ventilation is used when the outside air temperature is between 45°F and 64°F, and during move-in/ move-out days when the loading dock garage doors are open. In 2018, the natural ventilation system was utilized for 11 event days in addition to 169 move-in/move-out days. Using the natural ventilation system, when conditions allow, conserves energy by eliminating the need for mechanical heating and cooling.

Mechanical Ventilation

All mechanical air-handling units are tested regularly to verify that they meet ANSI/ASHRAE Standard 62.1-2007: Ventilation for Acceptable Indoor Air Quality. Each air handling unit undergoes maintenance every 3,000 hours’ runtime to keep all components working properly. Key IAQ-related factors such as CO₂ levels and temperature are continually monitored by the centralized BAS, and can be adjusted in real-time to maintain the client’s requested set-points. If contaminants exceed acceptable levels, 100% outside air is brought into the system until IAQ is restored.

¹ US Green Building Council LEED for Existing Buildings: Operations and Maintenance v2009 Reference Guide, page 330

ENERGY

Energy Usage

The DLCC is subject to variations in occupancy and energy demand on a daily basis. Occupancy may range from a few visitors in a meeting room to thousands occupying all five exhibit halls. The energy usage profile of the building also varies greatly from year to year (see Figure 14 for a historical view of energy use). DLCC technicians minimize energy waste by carefully programming HVAC and lighting schedules through the BAS to match each client's needs. High-resolution HVAC zoning capabilities and the use of variable fan drives allow HVAC levels to be adjusted incrementally. Lighting systems in controllable groupings are customized to event and safety needs. When spaces are not occupied they are left unlit and unconditioned.

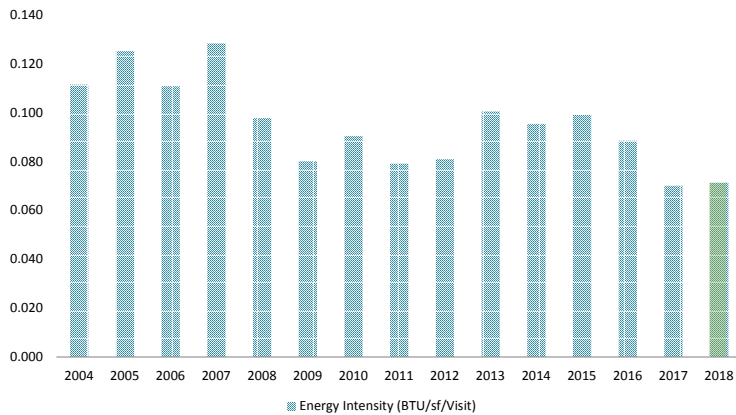


Figure 13. Energy consumption BTU per square foot per visitor (Energy Use intensity per visitor)

Energy Performance

2018 DLCC Site Energy Usage Intensity (EUI) (the total energy consumed by a building relative to its size in kBtu per square foot)

Energy Use Types

- 2% Natural Gas (used for cooking)
 - 1,533 Mcf (1,577,148 kBTU)
- 37% Steam (used primarily for heating the building)
 - 25,010 kLB (29,862,179 kBTU)
- 61% Electricity (used for plugged in items, lighting, operating the cooling and heating systems, and everything else)
 - 14,531,595 kWh (49,581,802 kBTU)
 - 9.8% (4,861,129 kBTU) of the electricity is used for the chiller plant operation
 - 90.2% (44,714,072 kBTU) of the electricity is used for everything else

Baseline and Usage

- DLCC EUI of energy usage per square foot is 67.1 (kBtu/sf)
- 30% reduction from the DLCC's baseline year in 2004
- DLCC energy usage per visit per square foot is .071 Btu/sf/visit
- A 64 % reduction over the 2004 baseline per-visit energy intensity
- An increased number of visits results in higher overall energy usage, but lower per visit energy usage

Seasonality

Seasonal changes typically influence the electricity used to produce chilled water in warmer months and the steam used in colder months (Figures 14 and 15). Heating Degree Days (HDD) and Cooling Degree Days (CDD) (the monthly sum of daily average temperature differences above or below 65°F) help track the impact of exterior temperatures on indoor energy usage. While the use of steam for heat and electricity for air conditioning generally fits along the CDD and HDD fluctuations, there are also some months where the degree-days don't line up with energy usage, especially in border months that have both cool and warm weather. In these cases an especially warm day may spike electricity usage for an otherwise cooler month if it coincides with high building usage.

Green Energy

The SEA, City of Pittsburgh, Allegheny County, PWSA, and others (referred to as the Western PA Electricity Consortium), have entered into aggregated electricity procurement agreements and a reverse energy auction which stipulates that a percentage of the electricity purchased is to be derived from Green-e certified sources. In 2018, the DLCC continued purchasing energy through a contract with Direct Energy, a retail electricity provider, that provides for 35% electricity from Green-e certified sources, an increase from 30% of electricity from Green-e sources in the previous contract from 2016.

Demand Response

The Center participates in two separate "demand response" programs. Demand response is a program to lower electricity consumption during high usage days. In the summer months, the increased electricity load due to air conditioning overwhelms the power grid and can cause brown- and black-outs. Through financial incentives, large scale users of electricity are asked to cut down on electricity usage (including for cooling) during key hours of peak usage days.

The DLCC uses various methods to lower usage during the demand response time such as pre-cooling, which involves increasing cooling before the demand response event, together with significant restriction of cooling during the demand response event.

In 2018, the Center participated in a demand response event during three high usage days (July 2nd, July 3rd, and August 6th) and was able to take 10,340 kWh of load off of the grid, resulting in a payment to the DLCC of \$14,915. In comparison, the average home in the United States uses 10,399 kWh per year.

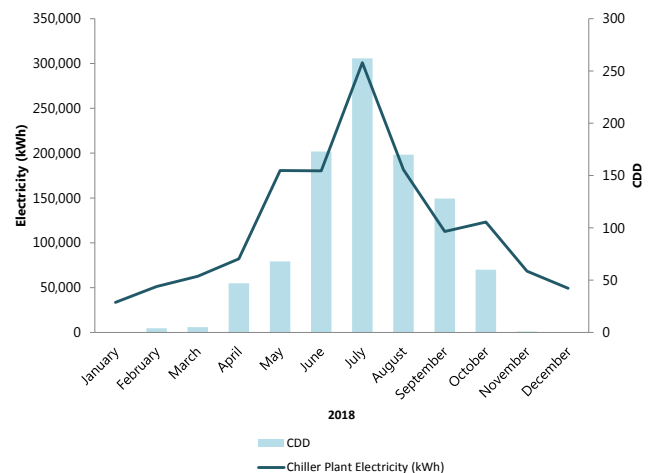


Figure 14. 2018 Cooling Degree Days (CDD) and chiller plant electricity usage

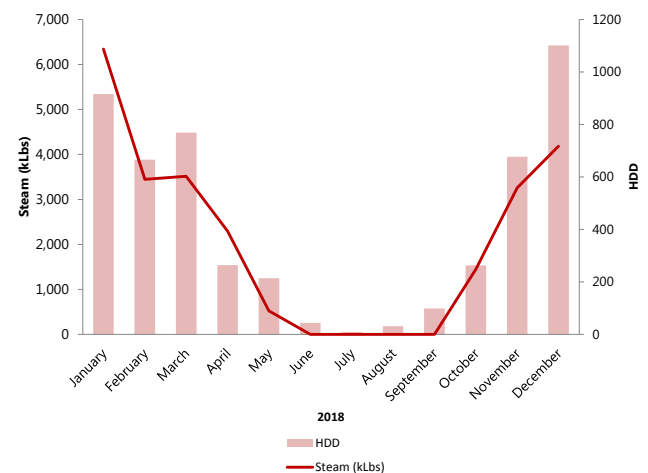


Figure 15. 2018 Heating Degree Days (HDD) and PACT steam usage

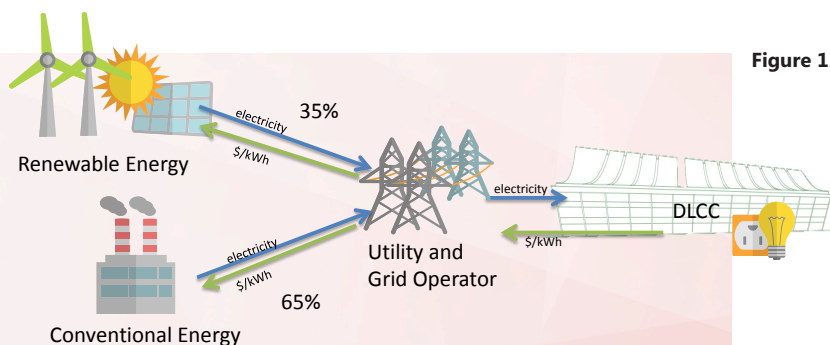


Figure 16. Flow of Conventional and Renewable Energy for the DLCC

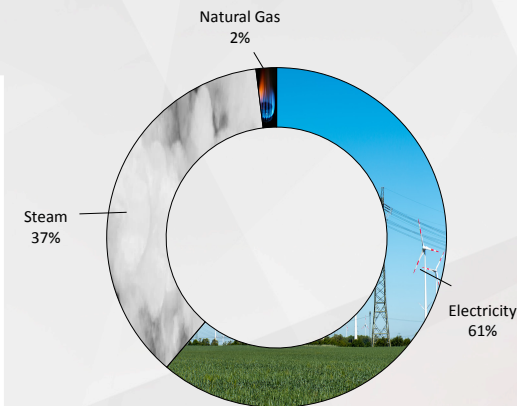


Figure 17. 2018 energy sources

Energy Performance Verification

The original commissioning of the building was completed by Burt Hill Kosar Rittelmann Associates ("BHKR"). In July 2006, BHKR reviewed operations, estimated energy utilization, and concluded that the DLCC was performing as originally intended with respect to energy consumption.¹

The DLCC was the subject of the report titled David L. Lawrence Convention Center: A Building in Operation (BiO) Case Study in 2011. The 2006 BHKR commissioning review was used as a source for the BiO case study. The BiO case study concluded that actual performance of the DLCC is exceeding the energy savings forecasted in the 2006 BHKR report.²

Based on the data presented in the reports the DLCC has saved 161,931,112 kBTU in annual cumulative energy in comparison to the 2004 baseline, set by the reports.³ See Figure 17 for a breakdown of the 2018 energy sources.

Act 129 Incentives

The BiO case study recommended some specific energy efficiency improvements, the majority of which have been implemented. For a timeline of the DLCC's conservation measures compared to the DLCC's baseline performance, see Appendix C-2.

When determining whether to undertake energy efficiency improvements, special consideration is given to projects that qualify rebates such as the PA Act 129 incentive funds. PA Act 129 requires electric distribution companies in Pennsylvania to reduce energy consumption across their service territory. Under PA Act 129 Duquesne Light

provides a rebate for certain projects that provide electricity savings. The DLCC also participates in a PJM based program that gives additional rebates for the permanent load reduction from the projects. In 2018, the total rebates for current and past projects equaled \$29,438. Pursuant to their programs, Duquesne Light and PJM have provided partial reimbursement for qualified DLCC projects and upgrades including:

- Wastewater treatment plant control system upgrade
- Building automation system upgrade
- Chiller plant reconfiguration
- DLCC parking garage LED lighting upgrade
- Water feature lighting upgrade
- Local cooling units
- Lighting upgrades
- Natural ventilation system repairs
- 10th and Ft. Duquesne Blvd Roadway Lighting
- Air Compressors

Sub-meters

The DLCC has implemented the use of sub-meters for electricity and water use in the building. These sub-meters help provide the DLCC with a record of energy, water, and cost savings resulting from building investments.

Sub-Meters

Energy Sub-meters:

- Chiller Plant (800amp/400amp)
- Water Feature motors
- AT&T cellular tower equipment
- Electric vehicle charging stations
- Retail spaces
- Waste Water Treatment Plant
- SEA Office
- DLCC parking garage lighting
- 10th and Ft. Duquesne Blvd Roadway Lighting

Water Sub-meters:

- Cooling tower make-up (aquifer water)
- Water Feature (aquifer/municipal water)
- Water Feature (aquifer/municipal water)
- 11th Street irrigation (aquifer water)
- South Terrace Green Roof irrigation (aquifer water)
- SEA Office
- Retail spaces (reclaimed water/municipal water)

¹ See BHKR Associates (2006), David L. Lawrence Convention Center Energy Study for the Sports and Exhibition Authority.

² See the David L. Lawrence Convention Center: A Building in Operation [Bio] Case Study (2011), Section 2.1 Benchmarking for more information.

³ As of 2018, energy saved from 2004 has been adjusted to reflect the actual annual utility rates and annual energy mix for electricity and steam on a year to year basis to provide for a more accurate estimation of savings.

EMISSIONS

2018 Emissions

The DLCC calculates annual greenhouse gas (GHG) emissions resulting from building energy consumption uses GHG Protocol Initiative methodology.¹ The DLCC strives to reduce impact by reducing total emissions.²

Annual Energy Performance Statistics:

- The originally predicted performance in the BHKR energy model: 15,814 MtCO₂e
- 2004 actual usage (set as a baseline): 15,399 MtCO₂e.
- 2018 total DLCC emissions: 12,466 MtCO₂e, a 30% reduction over the 2004 baseline.

2018 Emissions break down as follows:

- 10,282 MtCO₂e from electricity
- 1,975 MtCO₂e from steam
- 82 MtCO₂e from natural gas

The DLCC has saved an accumulated total of 52,867 MtCO₂e since 2004.

Emissions Intensity

Total building emissions relative to size and attendance is a method of looking at how the emissions are affected by the DLCC's activity. In 2018 the emissions per attendee based on building size is 4.1×10^{-5} pounds of carbon dioxide of emissions per square foot per attendee (CO₂e/sf/attendee). Figure 18 shows the historical emissions intensity based on attendees and building size compared to overall attendee numbers.

Net Emissions

The purchase of green power and carbon offsets help to mitigate the effects of emissions resulting from building usage. Net DLCC emissions in 2018 were 8,739.5 MtCO₂e, which takes into account the carbon mitigation realized from the purchase of 35 % of our electricity from certified Green-e climate sources. No carbon offsets were purchased in 2018. Through the purchase of renewable energy and carbon offsets the DLCC has mitigated 102,161 MtCO₂e since 2004.

Electric Vehicle Charging Stations

In 2012 the DLCC installed in its garage the first two free publicly accessible universal EV charging stations in Downtown Pittsburgh. In October 2018 the DLCC installed four Tesla chargers, and two additional universal EV charging units at the garage. The DLCC EV stations are listed on the registry of EPA Alternative Fuel Data Center vehicle chargers, which is used by most mapping systems that assist EV drivers in finding charging stations.

In 2018, 16,031 kWh of electricity was used by the charging stations. Based on the fuel economy of a 2017 Nissan Leaf,³ this charging activity at the DLCC provided energy equivalent to 1,723 gallons of gasoline.⁴ The electricity cost to the DLCC for the charging stations was \$1,317 in 2018.

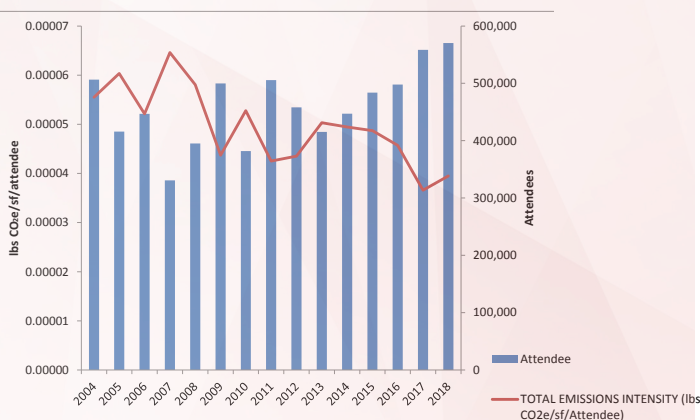


Figure 18. Historical Emissions Intensity (MTCO₂e/sf/attendee) and the number of attendees per year

¹ The GHG Protocol is the most widely used and accepted emissions accounting methodology. More information may be found at ghgprotocol.org

² Actual emissions produced as a result of on-site activities and net emissions (total emissions less carbon offset strategies).

³ "Find and Compare Cars: 2017 Nissan Leaf" Fuel Economy. US Department of Energy. www.fueleconomy.gov/feg/notframes/38428.shtml

⁴ Data used: 2017 Nissan Altima 31 mpg city/highways from www.fueleconomy.gov/feg/bymodel/2017_Nissan_Altima.shtml

CLEANING AND PURCHASING

DLCC cleaning and purchasing decisions aim to decrease the environmental impact of maintaining the facilities while promoting a healthy indoor environment. This includes reducing packaging, recycling, and purchasing materials that have sustainable qualities.

Indoor Air Quality

Indoor Air Quality (IAQ) is affected by the products used at the DLCC. The DLCC focuses on only using products and equipment that do not emit toxic compounds that become part of the occupants' breathing space.

The IAQ management process involves reducing air pollutants at their sources. Volatile organic compounds (VOCs), commonly found in paints, adhesives, and furniture, are a source of IAQ-related health issues.¹ During the DLCC's construction, materials with low VOC concentrations were installed to prevent the accumulation of harmful chemicals. In accordance with LEED and as a continuation of the commitment to a low

VOC environment, DLCC's Sustainable Purchasing Policy requires all products, such as paint, used during facility maintenance adhere to the VOC limits set forth by the South Coast Air Quality Management District (SCAQMD)².

Sustainable Purchasing by Category

The DLCC's Sustainable Purchasing Policy quantifies purchasing practices and sets minimum standards for all purchases whenever possible. The standards are based on sustainability criteria for each purchasing category aligning to LEED standards.³ The policy covers all purchases necessary for the DLCC including office supplies, furniture, electronics, lighting, and cleaning products. Criteria for each category, along with 2018 performance, are listed in Table 2.

The key metrics from Levy purchases, which are tracked separately, are as follows: 81% of Levy's cleaning products were ecologically friendly; and 83% of the disposable serve-ware used is compostable.

CATEGORY	CRITERIA	GOAL*	2018 PERFORMANCE
ONGOING CONSUMABLES**	<ul style="list-style-type: none"> •Contain at least 10% post-consumer and/or 20% post-industrial content •Contain at least 50% rapidly renewable material •Contain at least 50% materials harvested and extracted within a 500-mile radius •Contain at least 50% Forest Stewardship Council (FSC)-certified paper products •Contain rechargeable batteries 	50%	67%
FURNITURE	<ul style="list-style-type: none"> •Contain at least 10% post-consumer and/or 20% post-industrial content •Contain at least 70% salvaged materials •Contain at least 50% rapidly renewable materials •Contain at least 50% materials harvested, extracted, and processed within a 500 mile radius •Contain at least 50% FSC-certified products 	40%	88%
ELECTRONICS	<ul style="list-style-type: none"> •Energy Star-labeled products, when available •Electronic Product Environmental Assessment Tools (EPEAT) bronze-rated products or better •Maintenance equipment and vehicles which replace conventional gas-powered equipment 	40%	89%
CLEANING PRODUCTS	<ul style="list-style-type: none"> •Meet the applicable Green Seal standard for the product •Meet the applicable Environmental Choice standard for the product •Follow the EPA's Comprehensive Procurement Guidelines •Are USDA Certified Bio-based products •Do not exceed the maximum volatile organic compound (VOC) limit specified by the California Code of Regulations 	60%	47%
CLEANING EQUIPMENT	<ul style="list-style-type: none"> •CRI Green Label or Seal of Approval, as applicable •Operating sound levels less than 90 dBA (70 dBA for vacuum cleaners) •Equipped with filters for capturing fine particulates •Uses gel batteries 	100%	100%
FACILITY MAINTENANCE & ALTERNATIONS	<ul style="list-style-type: none"> •Paints and sealants meeting the applicable Green Seal standard or VOC limits set by the South Coast Air Quality Management District •Contain at least 10% post-consumer and/or 20% post-industrial content •Contain at least 70% salvaged materials •Contain at least 50% rapidly renewable materials •Contain at least 50% materials harvested, extracted, and processed within a 500 mile radius •Contain at least 50% FSC-certified products 	50%	95%

Table 2. Sustainable purchasing by category

*Each goal is based on the percentage of annual purchases within the purchasing category that meet at least one of the applicable sustainability criteria

**On-going consumables are defined as goods regularly used and replaced through the course of business. These materials include paper (printing or copy paper, notebooks, notepads, envelopes), toner cartridges, binders, batteries and desk accessories. Food and beverages are excluded from this category.

1 "Volatile Organic Compounds." An Introduction to Indoor Environmental Air Quality (IAQ). US EPA, 03 May 2012.

2 [Http://www.aqmd.gov/home/rules-compliance/rules/scaqmd-rule-book](http://www.aqmd.gov/home/rules-compliance/rules/scaqmd-rule-book)

3 Per the DLCC's LEED for Existing Buildings: Operations and Maintenance (O+M) certification, up to 10% of the building's square footage can be exempt from the Sustainable Purchasing credit as the facility includes outside vendors whose purchases are not controlled through SMG.

Local Purchasing

Whenever practical, the DLCC purchases goods that are manufactured within a 100 mile radius of the DLCC in order to support the local economy and reduce transportation emissions. During the event planning process, clients are also encouraged to use local suppliers in order to reduce the environmental impact from their operations.

Cleaning Products and Equipment

The DLCC's Green Cleaning Policy and Plan specifies the use of sustainable cleaning products, including those which meet applicable Green Seal standards,⁴ are made of bio-based and biodegradable content, and have low/no VOC concentrations. Green Seal provides standards that are based on life cycle research of environmental impacts and are recognized by LEED.

To protect the health of staff, sustainability standards are followed for all cleaning equipment as well. In 2018, 100% of the cleaning equipment purchased met one or more sustainability criteria such as dust-capturing filters, operating on electricity versus gasoline, among others. All cleaning equipment is serviced regularly to ensure that the equipment continues to operate at optimal safety and efficiency.

One of the most innovative pieces of equipment at the DLCC is the Orbio machine. The Orbio unit, which is located on-site, makes a scent-free and VOC-free solution of sodium hydroxide in water by passing electric current between two electrodes through a medium of tap water and sodium chloride (salt). The DLCC uses the Orbio solution to clean glass, carpet, counters, stainless steel, laminate, fabric surfaces, and tile as well as sidewalks near the entryway.⁵

Food and Beverage

Levy tries to use sustainable food and beverage products and to employ sustainable practices for DLCC events. Sustainable food and beverages are those that are organic, produced within a 100-mile radius of the site, and/or meet equitable harvesting standards.⁶

The large volume of food purchases required, the variability in types of food being served, as well as Pittsburgh's geographic location and seasonality poses a challenge to sourcing local food. In 2018 38% of all food and 75% of all beverage purchases were local.

Levy maintains rooftop planters growing herbs and vegetables served during catered events. (see pg. 5)

The DLCC food service provided by Levy is designated as a Platinum Plate Sustainable Pittsburgh Restaurant for the commitment to sustainability.⁷



Figure 19a: Prickly Pear growing on the DLCC Rooftop



Figure 19b: Eggplant growing on the DLCC Rooftop

⁴ Green Seal provides environmental certification standards to help manufacturers, purchasers and consumers make responsible product choices. To learn more about Green Seal Standards, visit <http://www.greenseal.org/AboutGreenSeal.aspx>.

⁵ <https://www.tennantco.com/content/dam/resources/orbio/case-studies/Case%20Study%20SMG.pdf>

⁶ Standards include: Food Alliance Certified, Protected Harvest Certified, Fair Trade, or the Marine Stewardship Council's Blue Eco-Label.

⁷ As a program developed by Sustainable Pittsburgh, a Sustainable Pittsburgh Restaurant demonstrates a commitment to managing the social and environmental impacts of its operations as central to its strategy for business success.

WASTE AND RECYCLING

Reducing, re-using, and recycling is a cornerstone of the DLCC's sustainability efforts.

Diversion rate is the percentage of total refuse leaving the building that goes to a non-landfill facility, such as recycling, donation, or composting. On-going improvements to the recycling plan and the capabilities of local recycling entities have increased diversion rates. Since the program's inception the DLCC has diverted 2,632 tons of recyclable, compostable, and donation worthy waste from landfills. Table 3 (see following page) shows the historical diversion rates for the DLCC.

Waste is collected at stations throughout the DLCC and brought to a single point to be sorted into compost, recycling, and landfill. This ensures that waste diversion tracking is accurate, and that no waste leaves the building in uncontrolled methods. All recycling, and composting facilities utilized by the DLCC are located within a 12 mile radius of the building.

DLCC management communicates with the recycling entities, and has conducted on-site visits to confirm that waste management practices meet the DLCC's sustainability standards.

DLCC Recycling, Composting, and Donation Entities

Agrecycle: Compostable items such as food scraps, serve-ware, paper, and landscaping waste

Construction Junction and Habitat for Humanity: Usable construction waste, furniture, reusable lighting, carpet scraps, surplus building supplies, furniture

BatteriesPlus: Small electronics and batteries from East lobby collection point

Evolution E-Cycling: Computers and monitors

Greater Pittsburgh Community Food Bank, 412 Food Rescue, and Jubilee Soup Kitchen: Surplus prepared food

Largent: Pallets

New Market Waste Solutions: Cooling oil

Roadrunner Waste Management: Baled plastic films, Non-contaminated linear low-density polyethylene (LLDPE) and low/high density polyethylene (LDPE, HDPE). Baled clean cardboard.

Scott Electric: Light bulbs

Waste Reduction and Prevention

Source reduction, or waste prevention, is purchasing with an eye towards less packaging and less overall potential for waste, as well as the use of more durable goods.

The DLCC's food and beverage operations make a practice of buying in bulk and requiring reduced packaging options for products. Practices such as serving water in pitchers instead of individual bottles further reduces the waste generated by events and building operations.

Event organizers have the option to use either reusable china, and/or single-use compostable serve-ware. Disposable serve-ware used for events is made from compostable materials, the use of which eliminates the need to sort organic waste from the plates, trays, cups, and utensils.

In 2018, the DLCC produced an average of 0.74 pounds of landfilled waste per attendee, which is 63% lower than the 2005 benchmark of two pounds per attendee.

In order to meet recycling and composting goals, careful planning on both sides of the client-facility relationship are required. Diversion rates are dependent on the volume and type of waste generated at each event or by DLCC building improvement. During pre-event meetings, event planners are encouraged to include reusable and/or recyclable materials in their own purchasing and operating decisions.

Public shows and trade shows with unusual waste streams pose the greatest challenge to the waste diversion program. Proper planning for diversion methods and for adequate labor is required. Strategies for diverting unusual materials must be considered prior to the event in order to be successful.



Figure 20 Pennsylvania Resources Council Zero Waste Award to the DLCC for efforts towards waste diversion.

2018 Waste Diversion Performance

Waste is diverted from the landfill to recycling, composting, and donation facilities. The rates of diversion are tracked throughout the year and reported based on several major categories. The DLCC has set a goal of 50% for the overall annual diversion rate, which it has met or exceeded over the past nine years.

Composting has made the single largest impact to the DLCC diversion rate. Composting accounts for 28% of all waste diverted since the program began in 2008. The addition of composting and the significant change it created led to the moving of the waste management baseline year from 2004 to 2008.

In 2018, 211 tons of waste was sent to landfill and 260 tons of waste was diverted away from landfill resulting in a diversion rate of 55%. See Table 3 for historical diversion rates, and Figure 20 shows the breakdown for diversion and landfill. By weight, diverted materials in 2018 were as follows:

- 53 tons of cardboard baled and recycled
- 48 tons of commingled glass /plastic /aluminum recycled
- 11 tons of wood Pallets donated/reused/recycled
- 44 tons of building materials¹ donated or recycled
- 83 tons of organic waste composted
- 11 tons of food donated to local food banks
- 4 tons of cooking oil donated for biofuel
- 7 tons of plastic baled and recycled
- Minimal to no E-waste² recycled and donated

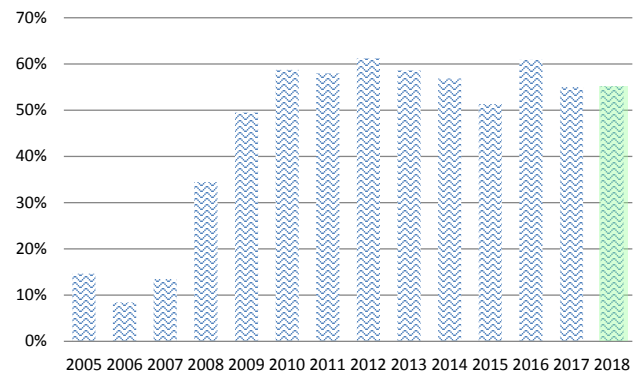


Table 3. Waste Diversion Rate 2005 to 2018

Although the full scope of the environmental impacts associated with the recycling program cannot be accurately tracked at this time, the energy saved by manufacturers and total emissions mitigation as a result of recycling activities can be estimated using the EPA's Waste Reduction Model (WARM). The factors used in WARM are based upon comparisons between typical lifecycle impacts of manufacturing processes using raw materials and of those using recycled content.³ 2018 diversion of cardboard, paper, glass, plastic, aluminum, and compost was responsible for an estimated savings of 400 MtCO₂e. An estimated total of 4,814 MtCO₂e has been avoided since recycling began in 2005.

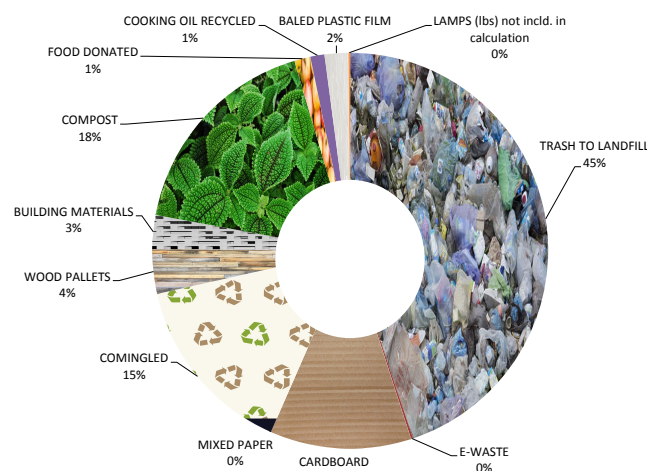


Figure 20. 2018 diverted waste

¹ Waste management for major renovations is a requirement to track and is included in project specifications. Beginning in 2012, this data is included in the building's total waste data as "Building Materials."

² "E-waste" or electronic waste, is a term to describe used electronics that are at the end of their useful life that can be recycled. Examples of e-waste include: computers, monitors, TVs, printers, scanners, cell phones and other electronic devices.

³ Emissions impact includes transportation by hauler to the recycling facilities. In the interest of consistency, the DLCC has estimated impacts from only those products included in WARM. Other components of the DLCC's waste stream have not been included in these impacts. For more information on the model and its methodology, visit epa.gov/warm.

2030 DISTRICT GOALS

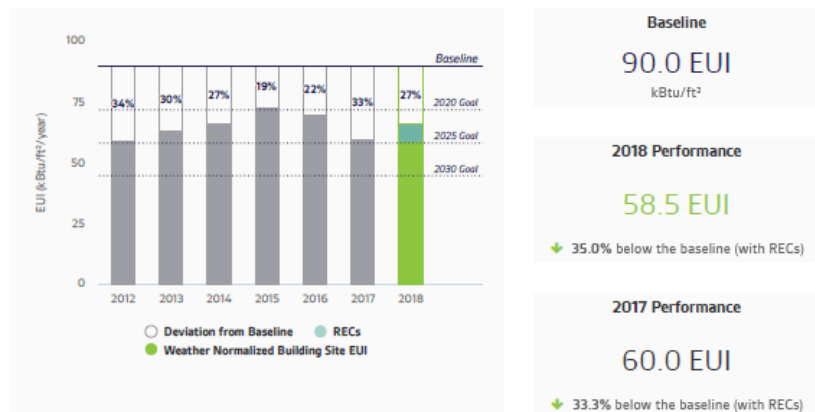


Figure 21. DLCC Energy data from the 2030 District Report

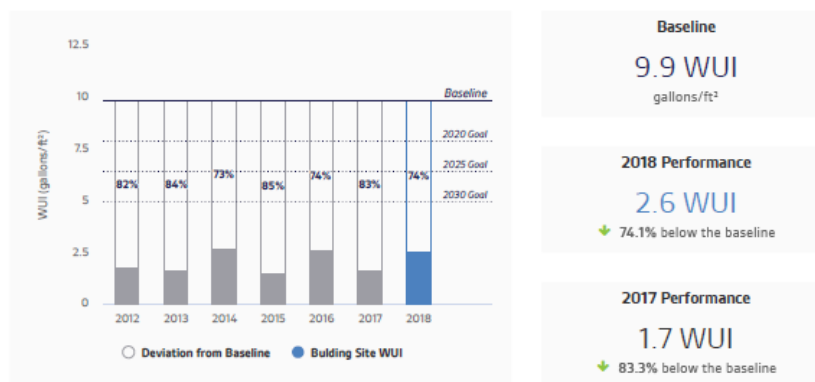


Figure 22. DLCC Water data from the 2030 District Report



The Pittsburgh 2030 District is a collaboration of building owners in Downtown Pittsburgh, Oakland, and Northside that aims to dramatically reduce energy and water consumption, reduce emissions from transportation, and improve indoor air quality. The 2030 District is facilitated by the Green Building Alliance (GBA). The SEA, as building owner of the DLCC, is a founding partner of the 2030 District.

The 2030 District uses site EUI as a gauge of performance. The GBA established the energy use baseline for the DLCC at 90 kBtu/sq. ft., which is the actual performance of the DLCC in 2004. The site EUI for the DLCC in 2018 was 58.5 kBtu/sq. ft., a 35% reduction from the baseline¹ which exceeds the 2020 goal and approaches the 2030 goal.

The 2030 District uses site Water Use Intensity (site WUI) to gauge water usage. Site WUI is similar to site EUI in measuring a building's annual water usage per square foot. GBA established the Water Use baseline for the DLCC at 9.9 gal/sq. ft., representing the actual performance in 2006, the first full year that the wastewater treatment plant was in operation. The Site WUI for the DLCC in 2018 was 2.6 gal/sq. ft., a 74% reduction from the baseline which exceeds the 2030 goal.

Visit www.2030districts.org/pittsburgh for more information regarding the Pittsburgh 2030 District initiative.

¹ This adjusted EUI considers the DLCC's renewable energy purchases. The DLCC currently is getting 35% of their annual electricity from Green-e certified sources per the current agreement with the energy consortium.

APPENDIX A: REPORTING SCOPE

ORGANIZATIONAL BOUNDARIES

Reporting boundaries typically follow the site boundary of the building. Decisions by planners and attendees are difficult to quantify in most cases, they are discussed but not generally included in building statistics.

The DLCC encourages each event to adopt relevant sustainable practices, however, the DLCC cannot reasonably account for the impact of event purchasing, attendee transportation choices, and other externalities. Practices which do not directly affect the building's environmental performance have not been measured and included in this report.

BASELINES, METRICS, AND GOALS

To measure performance in a broadly accepted and translatable manner, the DLCC adopted the metrics and methodologies of LEED for Existing Buildings: O+M; the goals of the Pittsburgh 2030 District; and some performance indicators from the Event Organizers Sector Supplement of the Global Reporting Index G4 Sustainability Reporting Guidelines.¹ Multiple metrics are tracked in absolute values and in per-attendee intensity. It is important to note that the activity level and building demands at the DLCC are affected by externalities such as weather, event schedules, and event needs, type, and size.

2004 was the first full year of operations and data measurement and was generally adopted as the DLCC's baseline year. Baseline years are adjusted to reflect changes that significantly shift performance as follows:

- Water – The DLCC uses 2010 as a baseline year for internal tracking due to the change in water types used in building operations (filters were installed to allow aquifer water to replace potable water in the 10th Street Water Feature, reducing municipal water needs). The 2030 District uses 2006 as a baseline year due to the wastewater treatment plant coming online (it reflects a significant change in overall water consumption consistent with their program parameters).
- Waste – The DLCC uses 2008 as the baseline year, due to a composting program that was added in that year (significantly increasing the diversion rate).

GREENHOUSE GAS INVENTORY METHODOLOGY

The DLCC quantifies annual Greenhouse Gas (GHG) emissions according to the methodology of the GHG Protocol Initiative² and the ENERGY STAR Portfolio Manager program. This methodology separates emissions into three different scopes according to the relationship between the emission's origination and the level of control over those emissions.

SCOPE I

Scope I emissions, known as direct emissions, result from on-site emissions-releasing activities. The largest Scope I source at the DLCC is the combustion of natural gas used by the kitchen equipment, which only comprises 1% of the building's total emissions. All other Scope I emissions are considered de minimus, and are not directly tracked at this time.³

SCOPE II

Scope II is the carbon footprint of the facility that consists of emissions from the purchase of electricity and steam. Emissions resulting from electricity consumption are calculated based upon the most recent grid-specific factors reported to the US EPA. Emissions from district steam consumption are based on a national average reported by the Portfolio Manager program.

SCOPE III

Scope III emissions are from sources outside the direct control of the reporting organization, but may still be influenced by the organization's decisions or activities. Under the GHG Protocol, these emissions are optional to track because they do not fall within the organization's direct responsibility.

At the DLCC, Scope III emissions include those associated with purchased materials, waste management, and transportation of visitors. It is currently beyond the organization's capabilities to accurately track these emissions. The uncertainty associated with Scope III emissions would reduce the integrity of the DLCC's formal carbon footprint, therefore they are not included with Scope I and II emissions.

The carbon footprint given in the emissions section of this report represents only the facility footprint (i.e. the emissions associated with the use of the physical building and its systems).

¹ The GRI is a nonprofit organization that develops and provides broad and consensus-based sustainability reporting guidelines. For more information, please visit globalreporting.org.

² The GHG Protocol Initiative is the most widely used and accepted emissions accounting methodology and is administered by the World Resources Institute and the World Business Council for Sustainable Development. More information may be found at ghgprotocol.org.

³ Defined by California Climate Registry as emissions comprising less than 5% of total footprint, de minimus emissions aren't tracked in an inventory unless deemed otherwise significant.

APPENDIX B: GLOSSARY

Act 129 Rebate Program	PA Act 129 requires electric distribution companies in PA to develop plans to reduce energy consumption. Electricity distributors often offer monetary incentives such as rebates to clients that make qualified energy savings upgrades.
aerating faucets	Controls faucet flow and regulates its pressure by adding air to the water flow.
Air-Handling Units (AHUs)	Device used to regulate and circulate air as part of a heating, ventilating, and air-conditioning (HVAC) system.
APEX/ASTM Sustainable Meeting Venue	A third-party certification that is specific to the meeting and events industry. APEX/ASTM is a collaboration between APEX and ASTM.
APEX	The Accepted Practices Exchange
ASTM	American Section of the International Association for Testing Materials
aquifer	Geological formation containing or conducting ground water.
ASHRAE	The American Society of Heating, Refrigerating and Air-Conditioning Engineers.
biofuel	A fuel derived directly from living matter.
Building Automation System (BAS)	A comprehensive tracking and controlling system that can monitor conditions inside the DLCC, like building pressure and air flow, and set activation parameters for building elements. It is designed to simultaneously help keep guests comfortable and reduce the unnecessary use of energy.
built environment	The man-made spaces in which we all live, including buildings, developed open spaces, and transportation infrastructure.
carbon offset	A reduction in emissions of carbon dioxide in order to offset an emission made elsewhere. The reduction can be sold through certified agencies in order to allow others to compensate for their emissions.
centrifugal chiller	Removes heat from chilled water lowering its temperature in the process
compostable	Organic substances that may be used to fertilize soil, like leaves, unused food, or paper and cardboard products.
Cooling Degree Days (CDD)	Days with an average temperature exceeding 65 degrees Fahrenheit, such days increase the strain on and use of building cooling systems. Taken in a year, the number of CDDs help put cooling-related energy usage into perspective.
cooling tower	Device that rejects waste heat to the atmosphere as a result of cooling a water stream to a lower temperature.
daylighting	The utilization of windows and other portals for natural light. This reduces electricity usage and improves the atmosphere of a building.
demand response curtailment	A program through which businesses receive payments for voluntarily reducing their electricity usage when heavy demand threatens the reliability of the region's electricity grid.
direct spending	Spending by attendees, exhibitors and organizers based on hotel-room consumption and other spending. VisitPittsburgh utilizes the Destination Marketing Association International (DMAI) economic impact calculator to measure direct spending. The method is considered to be conservative in that it counts only direct spending for major events and uses actual Pittsburgh rates and prices rather than national averages.

diversion rate	The rate at which materials are diverted from landfill by “reducing, reusing, and recycling”.
emissions intensity	The total emissions of a building relative to its size measured in CO ₂ e/sqft or, for cross-year comparison including the relative intensity related to attendance levels, CO ₂ e/sqft/attendee is used.
Energy Star Portfolio Manger	A web-based energy management tool developed by the U.S. EPA and the U.S. Department of Energy as a component of the ENERGY STAR energy performance rating system.
evapotranspiration	The process by which water and moisture are moved from the soil to the air through both the ordinary heating of water into vapor and the escape of water through the porous leaves of plants.
Green Building Alliance (GBA)	A regional non-profit that has been promoting sustainable practices in Western Pennsylvania since 1993.
Green-e Certified	A clean energy certification that ensures that green energy purchases are regulated and conform to standards.
Greenhouse Gases (GHG)	Any gas that absorbs infrared radiation from the sun and re-radiates it, like carbon dioxide or chlorofluorocarbons. These substances are associated with climate change and the greenhouse effect.
green-seeking events	Events that request or inquire about sustainable features during the sales process, or ask for green information in their request for proposals. Green-seeking events include those hosted by environmental organizations as well as a wide variety of clientele who value sustainability regardless of their industry.
heat island effect	The increased temperatures experienced in urban areas when sunlight is absorbed by roofing and paving materials and the light is re-radiated as heat energy, causing built up and paved areas to be significantly warmer than rural and undisturbed areas.
Heating Degree Days (HDD)	Days with an average temperature below 65 degrees Fahrenheit. Such days increase the strain on and use of building heating systems. Taken in a year, the number of HDDs help put heating-related energy usage into perspective.
Indoor Air Quality (IAQ)	The the air quality within and around buildings and structures, especially as it relates to the health and comfort of building occupants
Integrated Pest Management, Erosion Control, and Landscape Management Plan	A DLCC management plan mandating landscaping and planters to be hand-weeded, and landscaping waste collected is composted. Fertilizers are to be used rarely, and when used, must be organic.
LEED (Leadership in Energy and Environmental Design) certification	Issued by the U.S. Green Building Council which is a globally recognized symbol of sustainable achievement in the built environment.
major events	Major Events are (a) larger events that typically book 18 months and further into the future, (b) require the Center's facilities (i.e. there is no other local venue that can physically accommodate the event), and (c) use a significant number of hotel rooms.

net emissions	The difference of total emissions less the emissions mitigated through carbon offset strategies.
payback period	A common measure of a project's financial viability. The cost is divided by the annual expected returns which results in the amount of time it will take for the project to pay for itself.
sick building syndrome	Health related effects on people occupying buildings with poor indoor air quality. Those who spend too much time in buildings with poor ventilation or chemical contaminants may experience headaches, eye/nose/throat discomfort, difficulty concentrating, or nausea.
Site Energy Usage Intensity (Site EUI)	The total energy consumed by a building relative to its size. An output from the EPA's ENERGY STAR Portfolio Manager, this measure takes the building's annual energy performance over its gross square footage.
Site Water Usage Intensity (WUI)	A similar measure to Site EUI, this measure takes the building's annual water performance over its square footage.
SCAQMD	South Coast Air Quality Management District, the air pollution agency responsible for regulating stationary sources of air pollution in the South Coast Air Basin, in Southern California. The regulations are used throughout the country.
stack effect	Also called the "chimney effect," this is the phenomenon of natural, cyclical ventilation and cooling that occurs when cool air enters a building to replace the warm air escaping upward.
sub-meters	Meters that measure water or energy usage in a sub-section or component of a building.
Thousand British Thermal Units (kBtu)	A common standard unit for energy performance, used to ensure consistency and comparability across electricity, steam, and natural gas usages.
Variable Frequency Drives (VFDs)	Effective method of reducing the energy and operational costs of motors in air-handling units and allows HVAC systems to better adjust to changes in demand.
Volatile Organic Compounds (VOCs)	Components of many household and office products, like paint, adhesives, or furniture, that concentrate much more heavily inside than outside of buildings and may have adverse health effects that range from simple eye/nose/throat discomfort to the long-term threat of cancer, depending on the chemical in question.
Waste Reduction Model (WARM)	Created by the EPA to estimate recycling-related energy savings. Compares the typical lifecycle impacts of manufacturing processes that employ raw materials to those that use recycled materials.
wastewater	Any water that has been affected by human use.

APPENDIX C: 2018 PROJECTS

Air Handling Unit Variable Frequency Drive Upgrade

Design of the replacement of the drives in the Air Handling Units (AHU) with Variable Frequency Drives (VFD) continued from 2017 into 2018 with installation due in 2019. VFDs are an effective way to manage energy by reducing operational cost of motors by varying torque loads for the AHUs and other HVAC operations. Motors account for 20% of energy used in buildings and 95% of the life cycle cost is in maintenance and repairs.¹ Instead of running the motor at full output for all uses, it can switch to a lower output and save energy when conditions allow. The ability to throttle down the intensity of the motor also results in less wear and tear on the gears, thereby reducing maintenance costs. A small investment in a VFD results lifetime savings.

The estimated energy savings is 66% over the current motors. This is achieved through a constant speed reduction of 30% (70% of maximum speed). Actual results may vary, as the drives will operate at a variety of speeds depending on demands throughout the year. The payback period is between eight months and 36 months for the VFD replacement, the upgrade qualifies for PA Act 129 rebates.

10th Street and Ft. Duquesne Lighting Upgrade

The exterior lighting over 10th Street and the Fort Duquesne Blvd. consisted of the original metal-halide fixtures from the building's original construction. In 2017 the design process of replacing the fixtures with retrofit kits that feature high-quality, programmable LED lights occurred, with installation completed in 2018. The energy usage of the new fixtures will be 50%-60% less than current fixtures and will require less maintenance.

Waste Receptacle Replacement

The DLCC purchased 66 additional three-compartment landfill/compost/recycling receptacles for use by visitors in Exhibit Halls A through E and the meeting rooms and pre-function areas. The receptacles are composed of recycled material and feature graphics showing visitors where to place their compostable and recyclable items.

¹<https://www.buildings.com/article-details/articleid/9345/title/roi-from-vfds-cutting-costs-with-variable-frequency-drives>

APPENDIX D: IMPROVEMENTS TIMELINE

