



2014 GREEN REPORT

DAVID L. LAWRENCE CONVENTION CENTER

This 2014 Green Report (report) covers all activities within the physical boundaries of the David L. Lawrence Convention Center (DLCC) site related to environmental sustainability, and is primarily focused on performance during the 2014 calendar year. Topics included in this report were chosen based upon their relevance to external stakeholders and to internal operations. The information in this report is summary in nature, with detailed data presented for the 2014 calendar year. Information has also been provided for previous years to the extent data is available and relevant.

The framework for the report is based on the U.S. Green Building Council's LEED® for Existing Buildings: Operations & Maintenance™ rating system, the Global Reporting Initiative's Sustainability Reporting Guidelines, and the World Resources Institute's Greenhouse Gas 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 the (reporting scope) section at the end of this document.

It is important to note that the environmental performance of the DLCC is directly affected by several external factors such as weather, event schedules, event type and size, and the needs and desires of attendees and event planners. These relationships are complex and 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 office building. Further, the needs of users of the facility and their demand for energy and other services vary widely as the DLCC hosts a variety of events each year.

This report aims to remain transparent on factors impacting performance. Where possible, qualitative observations have been provided regarding the effects of these types of factors upon environmental performance, as well as the current limitations or challenges they might impose. A simple view of energy consumption from one year to the next is not necessarily a measure of performance efficiency.

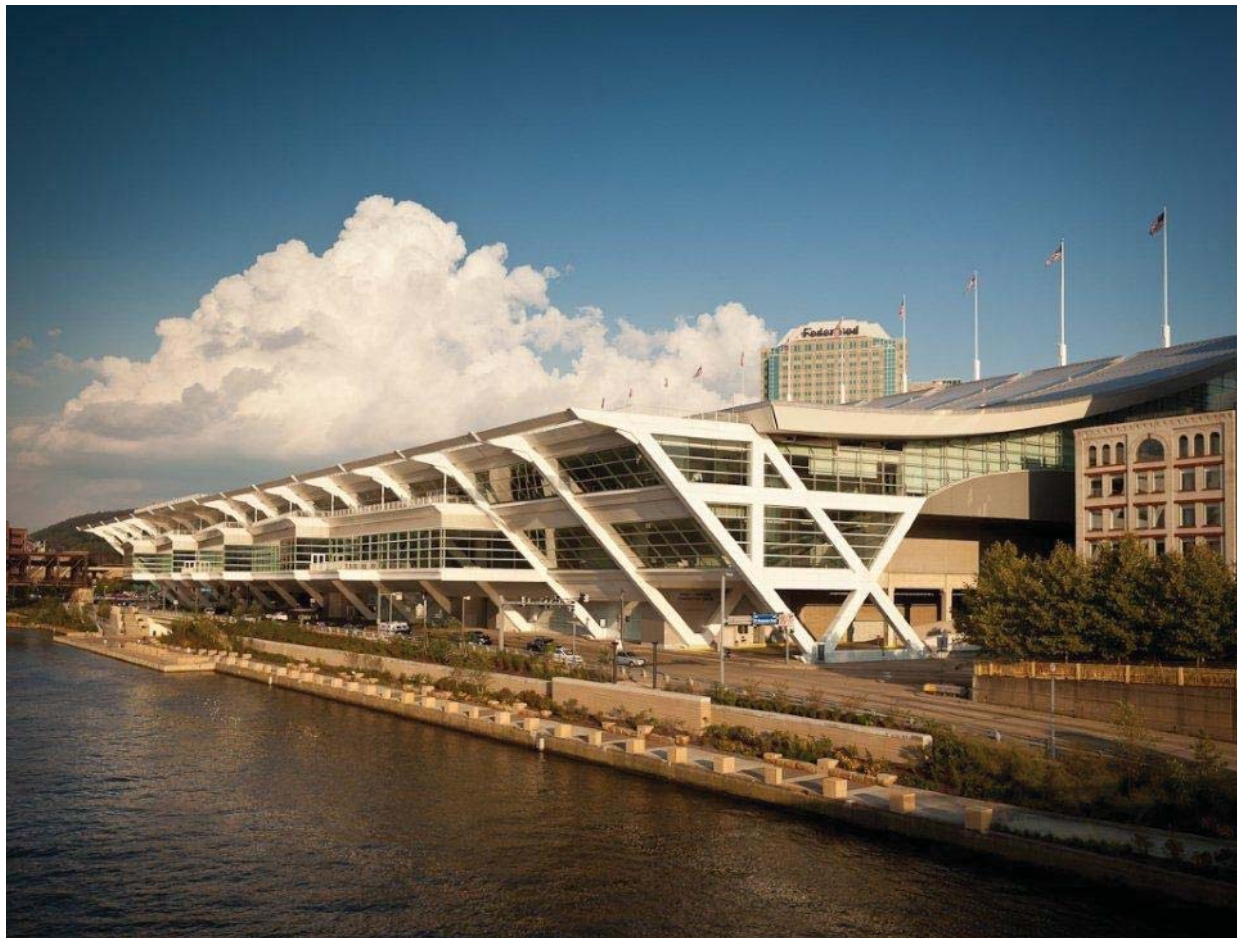
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INTRODUCTION AND HISTORY

Located in downtown Pittsburgh adjacent to the Allegheny River, the five-story, 1.5 million square foot 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 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 visitors to the region and to bring tourism spending to 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 design and operations.



Pittsburgh's philanthropic community played a major role in the development of the DLCC by supporting an international competition for the design of the convention center. The foundations that funded this \$750,000 design competition included the Heinz Endowments, the Hillman Foundation, the Claude Worthington Benedum Foundation, the Buhl Foundation, the Richard King Mellon Foundation, and an additional foundation that chose to be anonymous. The competition required that the design proposals include green building strategies.

In February 1999, the Southwestern Pennsylvania Convention Center Design Commission unanimously selected the design proposal of Rafael Viñoly Architects (RVA). Inspired by the landmark “Three Sisters” suspension bridges adjacent to the site, RVA’s design uses a cable support system to suspend a dramatically sweeping roof. Daylighting, natural ventilation, and water reclamation strategies are implemented throughout the facility to an extent that was unprecedented in the meeting and convention industry. In addition to these energy and water saving strategies, the DLCC was placed on the same site as the previous Pittsburgh convention center facility. Reusing the old site, rather than placing the building on a new site outside of the city, virtually eliminated the need for the construction of additional supporting roads and utility infrastructure. Other design and construction initiatives such as the construction materials selection and waste management created significant savings in materials, labor, and energy use.

To further the environmental integrity of the building, the Heinz Endowments provided a \$4 million grant administered by the Green Building Alliance (GBA) for green building consultation services and commissioning, and another \$3 million loan to the SEA to cover a portion of the cost of green technologies. Building construction began in February 2000 and the full building was open for operations in September 2003. Upon completion, the David L. Lawrence Convention Center became the first convention center to receive Gold certification under the LEED® for New Construction and Major Renovations™ rating system¹, and at that time was the largest green building in the world.



In 2009, a case study process was initiated to evaluate building performance, facility management, occupant satisfaction, and operational sustainability. The case study was completed in November 2011. The final report, the *David L. Lawrence Convention Center: A Building in Operation [BiO] Case Study*, is available to the public at www.pgh-sea.com/conventioncenter.htm.



The DLCC started the process of applying for certification under the LEED® for Existing Buildings: Operations & Maintenance™ (O&M) rating system in 2009. In April 2012, the DLCC received Platinum certification under the LEED for Existing Buildings: O&M rating system.

In August 2012, the SEA completed its new office space which is located within the DLCC. The space was previously a portion of the shell for a junior ballroom for the proposed DLCC hotel. The SEA Office received a Platinum rating under the LEED for Commercial Interior (CI) rating system in April 2013.



¹ LEED and the related logo is a trademark owned by the U.S. Green Building Council and is used with permission.

(economic impact)

The DLCC's primary focus is to bring non-resident visitors, namely convention and meeting delegates, to the region. That in turn helps tourism-related industries create economic development and opportunity for area residents.

ACTIVITY AT THE DLCC

In 2014, the DLCC hosted 168 total events and had a total attendance of 447,168. The mix of business at the DLCC varies from year to year. By event type, building usage in 2014 was as follows:

TYPE	Public Show	Convention / Trade Show	Meeting	Banquet	Other*	TOTAL
EVENTS	19	48	44	20	37	168
ATTENDEES	213,927	96,543	9,146	7,061	120,491	447,168

* "Other" event type refers to special events, sports events, and other miscellaneous events.

SMG reports that in 2014, the DLCC experienced a slight decrease in the number of events but an increase in attendance and number of visits when compared to 2013. This can be attributed to the different types of events hosted at the DLCC. The main exhibit halls were occupied by events for 43% of the year.

The total number of attendees is used throughout this report to calculate per-attendee intensity metrics. A per-attendee intensity measurement is used because it is easily quantifiable however it should be noted that it does not account for other factors that affect the activity level and building demands at the DLCC¹.

ECONOMIC IMPACT

While the number of attendees to the building is a measure of activity used in this report, the DLCC's primary goal of economic impact is measured in other ways. One measure of economic impact is direct spending generated by "major" events (events that could not have been held in Pittsburgh but for the DLCC). Direct spending is defined as spending by the attendees, exhibitors, and organizers based on hotel room-nights and other spending. As calculated by VisitPittsburgh, direct spending from the 37 "major" events held at the DLCC in 2014 was \$94.5 million².



¹ In addition to the number of event attendees, the activity level and building demands at the DLCC are affected by external factors such as weather; event volume, schedule, type, and size; and the needs of attendees and event planners. In addition, the "attendee" measure does not take into account the number of visits an attendee would make for an event lasting more than one day.

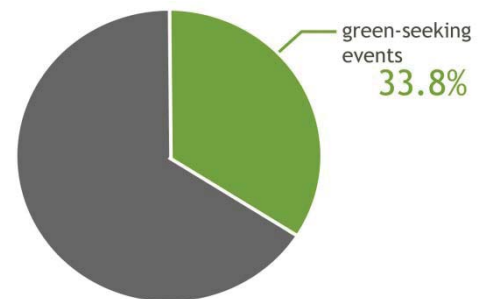
² VisitPittsburgh. 2014 DLCC Economic Impact Report to SMG. Direct spending is only tracked for "major" events.

GREEN SEEKING EVENTS

The LEED® certifications and ongoing sustainable operations of the DLCC can attract (and have attracted) certain events that seek facilities with green operations. “Green-seeking” means that the clients specifically asked about the DLCC’s sustainable or green initiatives during the sales process, or requested green information in their request for proposals. In today’s convention market, green-seeking events are no longer only those hosted by environmental organizations, but include a wide variety of events that value sustainability regardless of their industry.

In 2014, of the 37 “major” events at the DLCC (events that could not have been held in Pittsburgh but for the DLCC), 12 were green-seeking events. These 12 “major” events accounted for 33.8% (\$32.0 million) of 2014 direct spending to the region. Green-seeking major events have been responsible for \$246.6 million in direct spending since tracking began in 2006.

There were 32 green-seeking events in total including major and non-major events. These green-seeking events, with about 28,762 attendees, accounted for 24.6% of 2014 gross revenue of the building.



(2014 direct spending by “major” events)

(green spaces)

THE BIOPHILIC ADVANTAGE

Ecologist E. O. Wilson introduced the term “biophilia” to describe what he believed to be the intrinsic benefit of reconnecting humans to the natural environment. At the DLCC, proximity to open and vegetated spaces on an urban site has resulted in both practical environmental benefits and a quantifiable “biophilic advantage” that enhances the visitor experience.

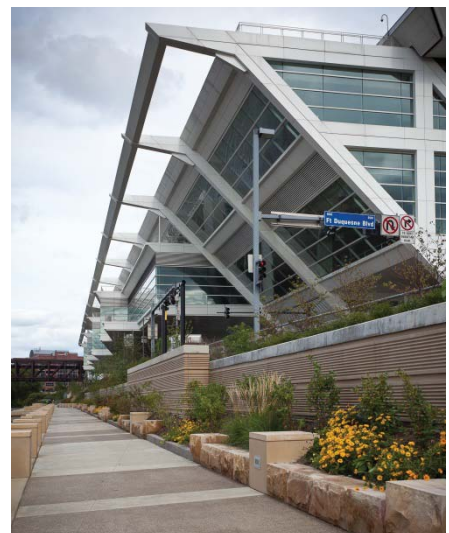


VEGETATED SPACES

11TH STREET AND RIVERFRONT PLAZA

The 11th Street site border to the East of the DLCC was restored with native trees, shrubs, and grasses. The Convention Center Riverfront Plaza¹ (Riverfront Plaza) has extended 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 twenty-two mile Three Rivers Heritage Trail greenway, providing a safe route for walkers, bikers, and joggers to travel between the Strip District commercial area and Point State Park. The Riverfront Plaza also connects the DLCC Water Feature to the Allegheny River and provides a docking area for up to 37 boats. The Riverfront Plaza has quickly become a popular destination for both convention attendees and Pittsburgh residents.



Riverfront Plaza

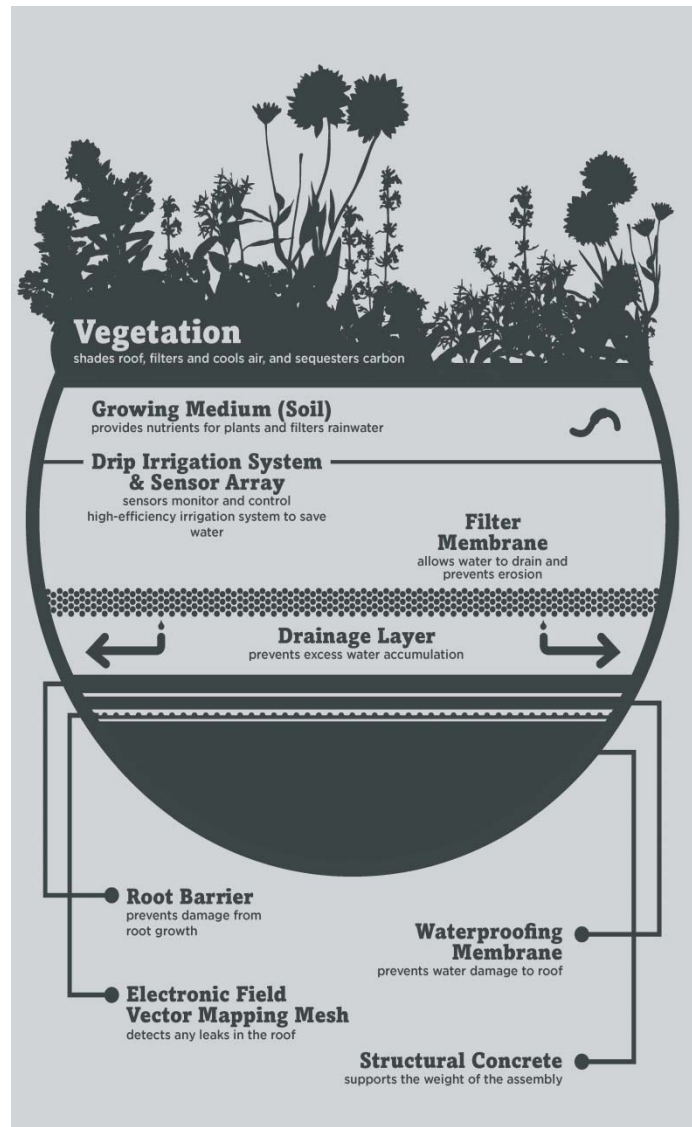
¹ The site plan and green space calculations do not include the Riverfront Plaza.

SOUTH TERRACE GREEN ROOF

In the summer and fall of 2011, the third floor terrace outside the cityside meeting rooms was renovated into a fully programmable combination intensive and extensive vegetated roof. May 2012 marked the opening of the South Terrace Green Roof. The South Terrace Green Roof features a mix of noninvasive adaptive *Sedum* species and a “meadow” filled with native perennials, separated by a walking path and a plaza for outdoor receptions. The roof plantings provide a connection to nature for visitors on the southern side of the building. In 2014, 50 events were held on or adjacent to the green roof. The South Terrace Green Roof is pictured on the cover of this Report.

The green roof functions as a stormwater runoff control device, lessening the DLCC’s contribution to Pittsburgh’s combined sewer overflow (CSO) events. Studies by the Penn State Center for Green Roof Research have shown that green roofs in the Pennsylvania climate retain approximately 50% of rainfall on average, reaching up to 100% in the summer². 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 South Terrace Green Roof will remove almost 680 pounds of particulate matter from the air annually, which is approximately equivalent to the annual emissions of 255 passenger vehicles³.

With the addition of the South Terrace Green Roof, 41,555 square feet of the convention center’s site has been restored with native or non-invasive adapted plantings, representing 8.5% of the total site area. A total of 75 different species are represented at the South Terrace Green Roof, 11th Street site border, and the Riverfront Plaza.



(structure of the south terrace green roof)

² Stormwater Quantity. Penn State Center for Green Roof Research. Web. 9 March 2015. <<http://plantscience.psu.edu/research/centers/green-roof/research/stormwater/stormwater-quantity>>.

³ Reducing Urban Heat Islands: Compendium of Strategies. US EPA, Oct 2008. Web. 15 Jun 2015. <<http://www.epa.gov/heatisland/resources/pdf/GreenRoofsCompendium.pdf>>.

MONARCH WAYSTATION

In June 2012, the DLCC established a Monarch Waystation (#6071) on the North Terrace's rooftop gardens. Developed by the University of Kansas' Monarch Watch program, Monarch Waystations are a way for individuals to create a habitat for the monarch butterflies. Each fall, hundreds of millions of monarch butterflies migrate from the United States and Canada to spend the winter in Central Mexico. In March, they begin their return journey north. Over the last decade, the monarch population has declined as a result of urban sprawl and herbicide-resistant crops, which have caused habitat loss. Named after the stops used by steam engines and the Pony Express in the 19th century, Monarch Waystations are gardens planted with milkweeds and nectar-providing plants. Monarch butterflies lay their eggs on milkweed plants. From when they hatch until they reach adulthood, the larvae only eat from the milkweed plant on which they were born. Then, as they prepare for their migration, the adult butterflies feed on nectar from flowers in the gardens.



Monarch Waystation

VEGETABLE AND HERB GARDENS

The abundant sunlight that reaches the North Terrace makes the location an excellent spot for gardens, even in the middle of downtown Pittsburgh. Levy Restaurants, the DLCC's food service provider, maintains 1,200 square feet of planters on the roof terrace. In the summer, these planters produce organically-grown heirloom vegetables and herbs such as squash, peppers, tomatoes, and parsley, which are enjoyed by visitors during catered events.



Rooftop Planters

IRRIGATION AND MAINTENANCE

All landscape maintenance activity conducted by in-house staff and outside contractors 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, landscaping waste is collected for composting, and only organic fertilizers are used if ever needed. The DLCC's native plants have low maintenance requirements because they are well-adapted to the region's soil and rainfall patterns.

When necessary, aquifer water is used to irrigate the 11th Street area and the South Terrace Green Roof. Although the use of the aquifer conserves municipal water, the aquifer is a ground source of fresh water so every effort is made to conserve its use at the building.

In accordance with this conservation priority, it is the DLCC's formal policy to use the irrigation system serving the 11th Street area only in extreme or prolonged drought conditions. In 2014, the 11th Street area did not need to be irrigated.

Due to its elevation, plants on the South Terrace Green Roof are subject to greater stresses and require additional care. As part of the roof's design, a high-efficiency drip irrigation system connected to an array of moisture sensors was installed. These sensors continually monitor the green roof's growing medium and control the irrigation system based on natural rainfall patterns. In 2014, 227 gallons of aquifer water were used to irrigate the South Terrace Green Roof. This figure also represents the total irrigation use for the DLCC in 2014, which is a 99% reduction in water over conventional irrigation practices⁴.

URBAN HEAT ISLAND MITIGATION

During the summer, sunlight is absorbed by conventional roofing materials and re-radiated as heat energy, causing densely-developed urban areas to be 1.8°F to 5.4°F warmer than surrounding rural areas⁵. This phenomenon, known as the urban heat island effect, can result in increased cooling costs, air pollution problems, and health issues during the summer.

Green roofs and other vegetated spaces mitigate the urban heat island effect by reducing solar heat gain and naturally cooling the air through evapotranspiration. Measurements taken during hot summer days on the extensive green roof at the nearby Allegheny County Office Building have shown a 50°F reduction in surface temperature compared with adjacent conventional roof materials⁶.

The urban heat island effect can also be mitigated by selecting materials with high SRI values, which absorb and re-radiate less solar energy than conventional materials. SRI, or solar reflectance index, is a comparative measurement of heat gain. A standard black surface has an SRI of 0, while a standard white surface has an SRI of 100 (though other materials may exceed these boundaries).

The pavers on the South Terrace Green Roof have an SRI value of 85, significantly reducing heat gain in comparison to conventional materials. The SRI value of the DLCC's curving stainless steel roof was measured in situ in August 2010 by McGuire Associates on behalf of the material's manufacturer, Contrarian Metal Resources. In accordance with ASTM 1980, the 249,800 square foot surface's measured SRI was 113.9, 52% higher than the minimum requirements for an ENERGY STAR roofing material⁷. Even on a hot August day with full direct sunlight, the DLCC's roof remains only 18°F warmer than the surrounding air while conventional roofs can become 50-90°F warmer⁸.



South Terrace Green Roof

⁴ Conventional practice calculation includes both plant selection and irrigation, as in the LEED for Existing Buildings: O&M design case calculation baseline. LEED does not recognize ground source fresh water, like the aquifer, as a non-potable source.

⁵ Berghage, Robert, et al. *Green Roofs for Stormwater Runoff Control*. US EPA, Feb 2009. Web. 18 Jun 2015. <<http://nepis.epa.gov/Adobe/PDF/P1003704.PDF>>.

⁶ "Green Roof." *Allegheny Green*. County of Allegheny, May 2011. Web. 29 Mar 2012. <<http://www.alleghenycounty.us/alleghenygreen/COBroof.aspx>>.

⁷ *ENERGY STAR Program Requirements for Roof Products*. US EPA, Dec 2007. Web. 29 Mar 2012.

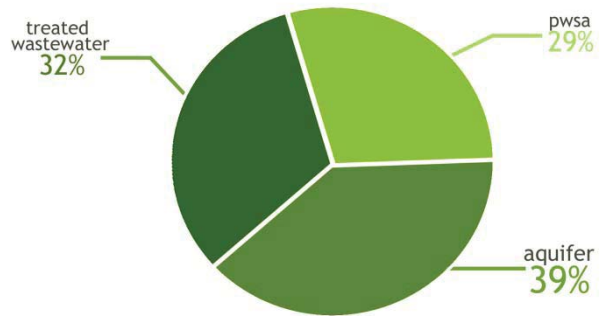
<http://www.energystar.gov/ia/partners/product_specs/program_reqs/Roof_Products_Program_Requirements.pdf>.

⁸ *Heat Island Effect*. US EPA, n.d.. Web. 16 May 2014. <<http://www.epa.gov/heatisland/about/index.htm>>.

(water)

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. All plumbing fixtures are compliant with UPC/IPC codes. Fixtures in all restrooms throughout the building are equipped with sensor controls and metering faucets.

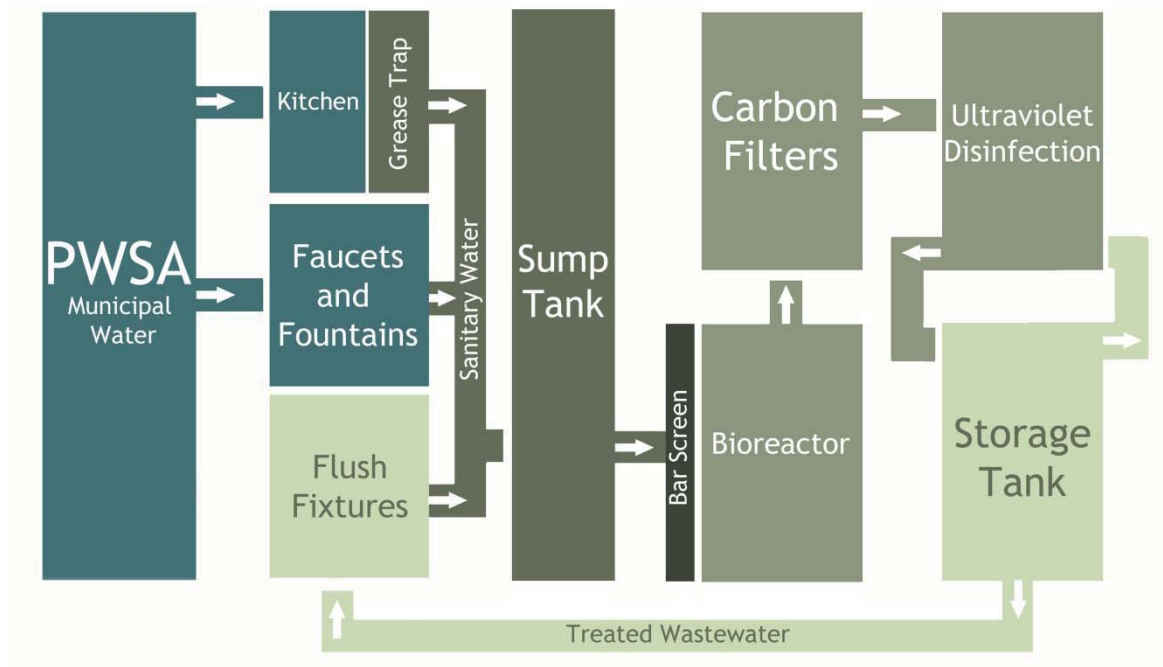


(2014 water sources)

WASTEWATER TREATMENT PLANT

The 50,000 gallon capacity on-site wastewater treatment plant collects and treats all wastewater from sanitary and potable uses. This water is then recycled throughout the building for toilet flushing. The plant's treatment components include a sump tank, aerobic digester, carbon filter system, and ultraviolet disinfection system. In 2014, the wastewater treatment plant was operated through a contract with Veolia Water North America. 4.2 million gallons of water were reused in 2014. This accounted for almost 32% of the total indoor water usage. The water usage related to the SEA Office is excluded from the data in this section in order to provide a more accurate year-to-year comparison.

Although the use of reclaimed water is more expensive on a cash basis to the DLCC than using municipal water, the decrease in potable water consumption and discharge of water to the municipal sanitary system has a significant impact on the operation of PWSA's and the Allegheny County Sanitary Authority's overall systems.



(dlcc wastewater treatment process)

AQUIFER

An aquifer called the Wisconsin Glacial Flow is located approximately fifty feet below the DLCC. Aquifers are geological formations containing or conducting ground water. Unlike most aquifers that do not follow a channel, the Wisconsin Glacial Flow is more like an “underground river” as it flows at the slow rate of five to six miles a day. Although the use of the aquifer conserves municipal water, the aquifer is a ground source of fresh water so every effort is made to conserve its use at the building.

The aquifer is the source for the cooling tower make-up water in the chiller plant. In 2014, 2.9 million gallons of aquifer water were used for this purpose, representing 22% of the DLCC’s water requirements. The use of aquifer water eliminates the need for potable water for this process.

The aquifer supplies the water for the 10th Street Water Feature (Water Feature). Using the aquifer water at the Water Feature reduced the use of potable water by almost 2.3 million gallons in 2014.

The aquifer is also the source of water for the irrigation of the 11th Street area and the South Terrace Green Roof. In accordance with the DLCC’s water efficiency goals, it is the management’s formal policy to use the irrigation system serving the 11th Street area only in extreme or prolonged drought condition therefore the 11th Street area was not irrigated in 2014. In 2014, the South Terrace Green Roof used only 227 gallons of aquifer water for irrigation.

In total, the aquifer accounted for 5.2 million gallons or nearly 40% of the DLCC’s water usage in 2014. Using the 2014 average effective rate for municipal water, the use of aquifer water saved \$67,800 in utility costs.

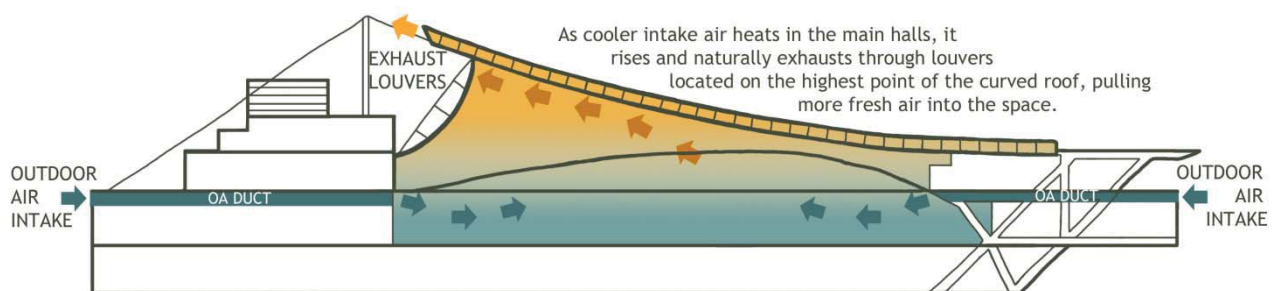


**By using other sources,
in 2014 we saved the
municipal water
treatment system energy
equivalent to a
7.5 year supply of
gasoline for one car.**

OPTIMIZING ENERGY USAGE

By the nature of the industry, the DLCC is subject to significant variations in occupancy and therefore in energy demand. When no attendees are in the building, major spaces may be unoccupied for several days. During event days, occupancy may range from a few people in a meeting room to thousands of visitors occupying all five exhibit halls. DLCC technicians are able to minimize the energy waste that might result from these patterns by carefully programming HVAC and lighting schedules via the building automation system to match each client's needs. High-resolution HVAC zoning capabilities and the use of variable fan drives allow conditioning to be turned on or off in each room. Lighting systems are controllable on a fixture-by-fixture basis, such that lighting use can be completely customized to event needs. When spaces are not occupied by either attendees or staff, they are left dark and unconditioned.

NATURAL VENTILATION



(natural ventilation system)

The natural ventilation system is capable of delivering direct outdoor air to the main exhibit halls and is used when weather conditions are suitable. Operable intake louvers are located along all four walls of the building between the second and third floor level. When the system is in operation, outdoor air is directly ducted to the primary exhibit halls and released through identical interior louvers. Exhaust louvers are located along the higher end of the building's curved roof. Air is passively exhausted through these louvers using natural "chimney effect" dynamics.

Building technicians operate the natural ventilation system through the same computer-based building automation system (BAS) as the mechanical air handling units. Through the BAS, the pneumatic valves that open and close each damper can be controlled from a single interface. When the natural ventilation system is in operation, the BAS automatically records and monitors airflow and building pressure. The system is able to be used when the outside air temperature is between 45°F and 64°F. The natural ventilation system was utilized for 98 days in 2014, which accounts for events days as well as exhibit hall move-in and move-out days, eliminating the need for artificial cooling / heating of the spaces on those days.

Using the natural ventilation system when conditions allow, particularly in spring and fall months, contributes to energy conservation by eliminating the need for mechanical cooling / heating. If the outdoor conditions are within the operation range, the natural ventilation system is also utilized during peak heating and cooling seasons.

DAYLIGHTING

The original design team built a physical model of the building to test for the most effective daylighting strategy. Of the regularly occupied spaces in the building, 85% are daylighted, which reduces the need for artificial lighting and energy use. The main exhibit halls can be entirely lit by daylight. The DLCC was the first convention center to implement daylighting on such an extensive scale.



SPACE CONDITIONING

HEATING

The building uses steam provided by Pittsburgh Allegheny County Thermal (PACT) to heat the building in the winter months. After the steam is used for this purpose, it condenses to become hot condensate. The DLCC is equipped with a pump system to return the 170-180 degree condensate water back to PACT. This system increases the efficiency at the PACT facility by providing hot water for their process.

COOLING

Cooling in the building is provided by an on-site chiller plant that was operated pursuant to a contract with Veolia Water North America in 2014. The cooling towers are supplied by filtered aquifer water instead of municipally-supplied potable water. 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. In order to fully shut down the chiller plant in the winter months, independent cooling units were installed in the IT/AV rooms in 2011. More information on the project can be found in the (conservation measures) section of this report.

The plant equipment originally consisted of four 1500 ton Trane Model CVHF Centrifugal Chillers and two 6,000 gallon capacity cooling towers, located near the fifth floor penthouses. The plant was originally sized for a cooling design load for maximum use of the building and operation of an adjacent 500-room hotel, yet to be built. The design loads significantly exceeded the actual usage loads. As a result, the chillers had an excessive number of start / stop cycles and chiller surge. The low load condition also affected the efficiency of the chillers, increasing electricity consumption by 150% or more.

By the summer of 2013, all four chillers required repairs. Two of the original chillers and one cooling tower were taken offline and the motors of these two chillers were rebuilt and placed back into service. A third chiller was idled and still remains on-site. In August 2014, the fourth original 1500-ton chiller was removed and replaced with a 750-ton Trane centrifugal chiller with a variable frequency drive. This 750-ton chiller will help to address the low load condition and increase the efficiency of the chiller plant, resulting in anticipated electricity savings for the DLCC. Following its removal from the chiller plant, the 1500-ton chiller was dismantled by the contractor and sent to a metals recycling facility.

ENERGY STAR PORTFOLIO MANAGER

Portfolio Manager is an interactive energy management tool that allows buildings to track and assess energy and water consumption in a secure online environment. The SEA began using Portfolio Manager in 2010 in order that all utility information can be kept in one place and be accessible to both SEA and the DLCC building manager, SMG. Portfolio Manager is a web-based energy management tool developed by the U.S. Environmental Protection Agency and the U.S. Department of Energy as a component of the ENERGY STAR energy performance rating system¹. Typically, Portfolio Manager outputs allow buildings to achieve an ENERGY STAR rating, but convention centers are not currently eligible. Although the DLCC is not able to obtain an ENERGY STAR rating, the figures generated by the Portfolio Manager tool can be benchmarked against a standard used for LEED for Existing Buildings: O&M certification. Based on this benchmarking, the DLCC performed 30% better than the national average of all entertainment venues in 2014.

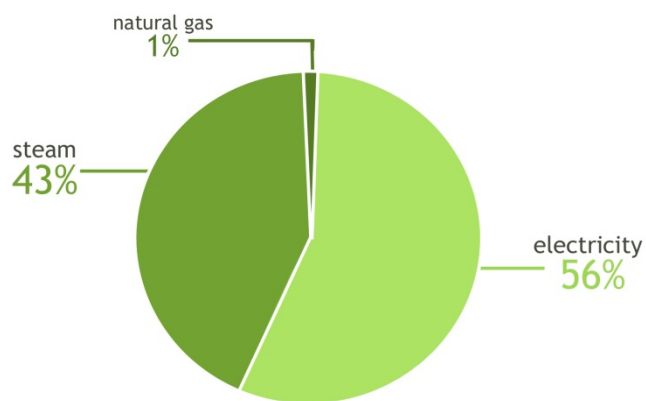
ENERGY PERFORMANCE

In 2014, the David L. Lawrence Convention Center used 36,354,733 kBTU (30,448 Mlb) of PACT steam, 46,596,289 kBTU (13,756,311 kWh) of electricity, and 920,543 kBTU (895 Mcf) of natural gas.

The total Site Energy Usage Intensity (the total energy consumed by a building relative to its size) was 69.4 kBTU/sf, a reduction of 22.4% from the 2004 baseline year. However, it is important to note that the energy usage profile of the building varies greatly from year to year without consideration of the efficiency of the systems. The variance is impacted significantly by the number and types of events held at the facility and the weather conditions. There was an increase in energy usage from 2013 to 2014 due primarily to increased steam usage, which may be attributable to more cold weather in 2014. Colder weather is demonstrated by an increase in Heating Degree Days (HDD) for the Pittsburgh region from 2013 to 2014².

The energy usage related to the SEA Office is excluded from the data in this section in order to provide a more accurate year-to-year comparison.

In order to gain a more accurate representation of energy use, the data can be normalized for event attendance. Considering the per-attendee³ energy use intensity, the 2014 usage is a 10.7% reduction when compared to per-attendee energy use intensity in 2004.

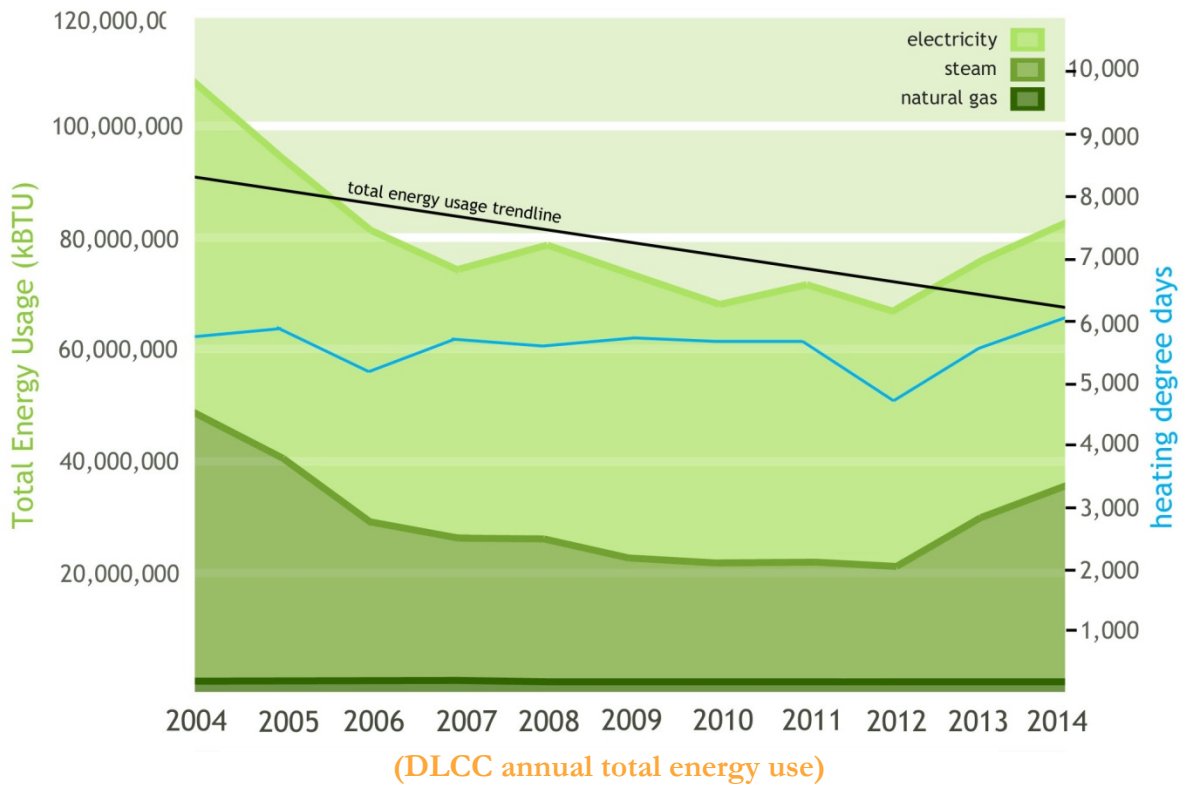


(2014 energy consumption by type)

¹ For more information on ENERGY STAR and Portfolio Manager, visit energystar.gov.

² 2013 HDD = 5,569; 2014 HDD = 6,057. http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/cdus/degree_days/

³ A per-attendee intensity measurement is used because it is easily quantifiable; it is recognized, however, that this is an imperfect measure that does not take into account building activity level and demand, weather, event volume, type, schedule, size and needs of attendees and event planners.



ENERGY PERFORMANCE VERIFICATION

The original commissioning of the facility was completed by Burt Hill Kosar Rittelmann Associates (BHKR), with a final report being issued in November 2004. In July 2006, BHKR released a report which described in detail the estimated energy utilization for the DLCC. BHKR concluded that the DLCC was performing as originally intended with respect to energy consumption, as demonstrated by current and predicted energy utilization models³. The 2006 BHKR study was analyzed as part of the *David L. Lawrence Convention Center: A Building in Operation [BiO] Case Study*.

The analysis concluded that actual performance is consistent with the 2006 BHKR model and the DLCC is meeting, if not exceeding, forecasted energy savings, consistently performing approximately 20% better than the ASHRAE 90.1-2001 baseline building⁴. Based on this energy reduction over the ASHRAE-defined baseline model, the DLCC has saved more than \$2,560,000 in utility costs since 2004.

Our energy savings in 2014 could meet the needs of

361 Pittsburgh households for one year.

³ BHKR Associates. *David L. Lawrence Convention Center Energy Study for Sports & Exhibition Authority*. 2006.

⁴ See the *David L. Lawrence Convention Center: A Building in Operation [BiO] Case Study*, Section 2.1 Benchmarking | Internal for more information on this analysis.

DEMAND RESPONSE

Demand response curtailment is a program through which businesses receive payments for voluntarily reducing their electricity use when heavy demand threatens the reliability of the region's electricity grid. The SEA entered into a curtailment service provider agreement with CPower Corp. (formerly Converge, Inc.) for the DLCC in 2013 that will expire in May 2016. For 2014, electrical grid emergency events may only be called on weekdays June through September between the hours of 12:00pm and 8:00pm, at a maximum of ten times per year. The DLCC turns off non-essential loads at the building, such as the 10th Street Water Feature, in order to reduce electricity demand during electrical grid emergency events. It is recognized that during building events, demand response strategies must be conservative in order to keep event attendees comfortable. There is no penalty to the DLCC for non-compliance. In 2014, the DLCC curtailed electrical load for one test event.

(conservation measures)

The *David L. Lawrence Convention Center: A Building in Operation [BiO] Case Study* provided recommendations for improvements in energy efficiency¹. The recommendations are being evaluated and implemented on an ongoing basis, and these projects are detailed in this section of the report. The majority of recommendations from the Case Study have been implemented, with the goal of full implementation of all recommendations.

Special consideration has been given to energy efficiency projects that would qualify for the Act 129 incentive funds. Signed into law in 2008, Act 129 requires electric distribution companies in Pennsylvania to develop cost-effective plans that will reduce energy consumption across the service territory by specific percentages in target years. Duquesne Light, the DLCC's electricity provider, implemented an Act 129-compliant commercial sector incentive program based on kilowatt-hours saved, providing partial reimbursement to the SEA for qualified projects as detailed below.

2014

BUILDING AUTOMATION SYSTEM UPGRADE

A full system upgrade of the Building Automation System (BAS) was started in 2014 and will be completed in 2015. BAS system components installed as a part of the original construction of the DLCC are technologically obsolete and/or have exceeded their useful life, and an upgrade was necessary to keep the HVAC system operating properly.

This upgrade includes hardware replacement and software updates on the BAS user interface computer workstation and a full re-commissioning of all network-level controllers, field-level controllers, and end devices. An ongoing service contract was also put in place to maintain commissioning efforts for maximum system efficiency. In addition to estimated savings in utility costs, this project will be eligible for an Act 129 rebate, estimated at \$30,000 to \$50,000, and has an estimated ROI (Return on Investment) of 4.1 years.

2013

PARKING GARAGE LIGHTING UPGRADE

Lighting technology has advanced significantly since the DLCC was originally constructed. High-efficiency lamps and fixtures have become more readily available. The original DLCC parking garage lighting consisted of uncontrolled metal halide fixtures. The new parking garage lighting project, started in 2013 and completed in 2014, included the installation of new LED fixtures and a wireless control system which incorporates occupancy sensors for increased energy savings.

This project is anticipated to both reduce annual electricity usage in the garage and reduce the annual maintenance costs due to the increased life of the fixtures. The estimated ROI for the project is 4.9 years. The parking garage lighting project qualified for \$27,620 in Act 129 rebate which is included in the ROI calculation.

¹ See the *David L. Lawrence Convention Center: A Building in Operation [BiO] Case Study*, Section 3.1 Energy Conservation Measures for further discussion of each recommendation.

2012

WATER FEATURE LIGHTING UPGRADE

The 10th Street Water Feature (Water Feature) was originally illuminated by underwater metal halide fixtures. For the lighting upgrade, the fixtures were removed from the pools and new LED lights were installed above the Water Feature. This project reduced the lighting load by 95% and is saving additional \$60,000 (estimated) in annual maintenance costs due to the increased life of the fixtures. Mounting the new fixtures to the ceiling also eliminates the damage from flooding that was experienced previously. The estimated ROI for the project is 4.1 years. The project qualified for \$36,149 in Act 129 rebate which is included in the ROI calculation.



10th Street Water Feature

2011

The following projects were implemented in 2011. A portion of the lighting and natural ventilation projects were completed in 2012.

LOCAL COOLING UNITS

New independent cooling units were installed for the information technology / audio visual (IT/AV) computer equipment rooms. The IT/AV rooms require year-round cooling. These independent cooling units allow for the complete shutdown of the chiller plant when cooling is not needed elsewhere. The annual electricity savings for this project was estimated at 600,000 kWh². There was a 1.1 million kWh decrease in annual electricity usage for the chilled water plant in 2013 in comparison to 2011. By providing electricity savings, the local cooling unit project qualified for \$35,485 in Act 129 rebate.

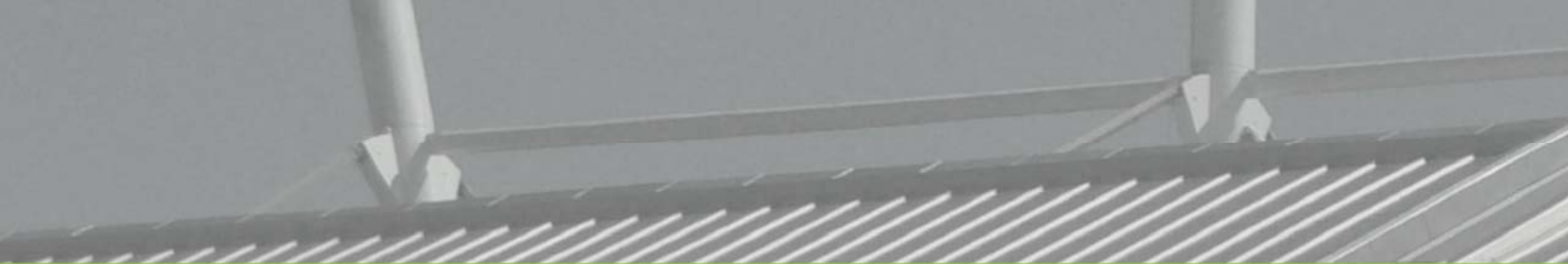
POWER FACTOR CORRECTION

Monthly utility bills for the building included Power Factor penalties ranging from 1.16 to 1.45 times demand charges, which resulted in increased annual utility costs at an average of \$71,500 per year. The installation of two capacitors in August 2011 reduced the Power Factor multiplier to 1.0, resulting in significant annual cost savings. The DLCC has not received a Power Factor penalty charge since the installation of the capacitors.

LIGHTING UPGRADES – LOADING DOCKS, UTILITY CORRIDORS, & STAIRWELLS

The 2011 lighting upgrades included a fixture change and the addition of occupancy sensors in the loading docks and utility corridors, and the addition of occupancy sensors in the stairwells. The estimated ROI for the project is 4 years. The ROI calculation includes the Act 129 rebate which was \$26,680.

² See the *David L. Lawrence Convention Center: A Building in Operation [Bio] Case Study*, Section 3.1 Energy Conservation Measures.



NATURAL VENTILATION SYSTEM REPAIRS

The natural ventilation system repairs began in October 2011. The initial phase included minor repairs, cleaning, adding access doors, and repairing dampers that were stuck in the open position. In order to have a fully functioning system and reap the maximum energy savings, a second phase of more robust repairs was completed in 2012. This project is expected to save approximately \$65,000 per year in energy costs³. The project was not eligible for an Act 129 rebate.


³ See the *David L. Lawrence Convention Center: A Building in Operation [BiO] Case Study*, Section 3.1 Energy Conservation Measures.

(emissions)


The DLCC quantifies annual greenhouse gas emissions using the methodology of the Greenhouse Gas Protocol Initiative¹ and the ENERGY STAR Portfolio Manager program. The DLCC strives to reduce its impact on the global climate by reducing both total emissions (actual emissions produced as a result of on-site activities) and net emissions (total emissions net of off-site investments and offsets, i.e. total emissions less carbon offset strategies).

CARBON OFFSET STRATEGIES

Although energy conservation is the primary strategy for reducing total emissions, technological limitations and the need to balance environmental concerns with the goals of clients limit its effectiveness as a single tactic. To make an immediate positive step towards emissions reductions, the DLCC has complemented conservation efforts with an ongoing carbon offset strategy.



One VER represents the direct mitigation of one metric ton of greenhouse gases through reduction or sequestration projects.



One REC represents the emissions avoided by generating one kilowatt-hour generated by renewable sources instead of fossil fuels.

In May 2008, the SEA, the City of Pittsburgh, the County of Allegheny, and PWSA entered into an aggregated electricity procurement agreement with Duquesne Light Energy. This agreement stipulated that 10% of electricity purchased through the agreement should come from non-specific renewable sources². In May 2010, this fraction was increased to 15%. In November 2011, the agreement was revised further to specify the procurement of the 15% electricity from only Green-e certified sources. Green-e certification is a nationally recognized program to help consumers identify green electricity products that have undergone an independent, third-party certification. The current agreement with Duquesne Light Energy began in June 2013 and expires in May 2016, and provides for the procurement of 25% electricity from Green-e certified sources. At the conclusion of the current agreement with Duquesne Light Energy, a new agreement will commence with Constellation Energy which provides for the procurement of 30% electricity from Green-e certified sources.

In 2011, to coincide with the DLCC's pursuit of LEED for Existing Buildings: O&M certification, further measures were sought to offset remaining greenhouse gas emissions. In November 2011, the DLCC purchased Renewable Energy Credits (RECs) generated by domestic Green-e certified wind power to offset the remaining 85% of electricity not already obtained from renewable sources. Emissions from steam and natural gas, which were not included in the existing procurement agreement with Duquesne Light Energy, were separately covered by the purchase of Verified Emission Reductions (VERs) created by landfill gas mitigation projects. The RECs and VERs purchased in 2011 cover emissions generated from July 2011 until June 2013. With these additional offsets, the DLCC produced zero net emissions from all activities associated with the building's operation³. Although the additional REC/VER purchases expired in June 2013, the DLCC continues to evaluate strategies to reduce total greenhouse gas emissions, including the pursuit of planned upgrades and operational adjustments and working closely with clients during the event planning stages.

¹ The Greenhouse Gas Protocol 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.

² The 10% above does not include the minimum renewable energy mix purchased by the utility as specified by the Pennsylvania Alternative Energy Portfolio Standard

³ In other words, from all emissions as included in this footprint. A technical description of the determination of sources included in the DLCC's formal carbon footprint may be found in the (reporting scope) section at the end of this report.

2014 TOTAL EMISSIONS

Total emissions in 2014 were equivalent to 12,115 metric tons of carbon dioxide (mT CO₂e), 9,663 mT of which were from electricity consumption, 2,404 mT were from steam consumption and 48 mT were from natural gas consumption. This is a reduction of 21% below the 2004 baseline of 15,397 mT. Emissions intensity (the total emissions of a building relative to its size) per attendee⁴ amounted to 4.9×10^{-5} lbs CO₂e/sf/attendee. The emissions related to the SEA Office are excluded from the data in this section in order to provide a more accurate year-to-year comparison.

Measuring progress against the DLCC's own historical performance is the main focus of this report, but it is also important to note how actual emissions compare to the facility's originally predicted performance. Based on the source breakdown present in the BHKR energy model⁵ and current emissions factors, the theoretical baseline building used to predict the DLCC's energy performance would produce 15,813.9 mT CO₂e annually. As a result of the sustainable components integrated into the building's original design and improvements made, the DLCC has saved an accumulated total of 38,519 mT CO₂e from this baseline since 2004.

NET EMISSIONS

Net emissions are determined by subtracting the emissions mitigated through carbon offset strategies from total emissions. Net emissions in 2014 were equivalent to 7,247 mT CO₂e, which takes into account the carbon mitigation realized from the purchase of 25% electricity from Green-e certified sources.

As a result of carbon offset strategies, the DLCC has mitigated 66,168 mT CO₂e since 2004.

OZONE-DEPLETING SUBSTANCES

The DLCC uses no equipment containing chlorofluorocarbons, which are known to damage the ozone layer. Base building and food and beverage equipment use less damaging hydrochlorofluorocarbons and hydrofluorocarbons, which balance potential environmental impact with desired efficiency. The DLCC's weighted average refrigerant impact per ton is 32, much less than the threshold of 100 required by the LEED for Existing Buildings: O&M rating system⁶.

Another benefit of the chiller plant reconfiguration project was the reduction in the total amount of refrigerant used in the plant. By replacing one of the 1500-ton chillers with the 750-ton chiller and removing a second 1500-ton chiller from service, the chiller plant's total refrigerant usage has decreased from 11,200 lbs to 7,250 lbs.

The environmental impact of mitigating 66,168 mT CO₂e since 2004 is equivalent to preserving a forest more than 53 times the size of the DLCC's own site.



⁴ A per-attendee intensity measurement is used because it is easily quantifiable; it is recognized, however, that this is an imperfect measure that does not take into account weather, event volume, type, schedule, size and needs of attendees and event planners.

⁵ The energy model referenced here is the BHKR Associates updated energy mode from 2006 used in the *David L. Lawrence Convention Center: A Building in Operation [Bio] Study*. See Section 2.1 Benchmarking | Internal for further details.

⁶ 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 usgbc.org/Docs/LEED_tsac/TSAC_Refrig_Report_Final-Approved.pdf.

(indoor environment)

Providing an exceptional indoor environment is a key goal of the DLCC management. Through effective ventilation, pollution source control methods, and constant monitoring, the DLCC strives to ensure the health and well-being of all building occupants.



VENTILATION RATES

Adequate ventilation is an essential step in maintaining high indoor air quality (IAQ) levels. Higher ventilation rates have been shown to improve occupant comfort, increase productivity, and promote general well-being¹. Increasing ventilation also dilutes and eliminates indoor air contaminants, preventing IAQ-related health issues such as Sick Building Syndrome. Mechanical and natural ventilation strategies are employed at the DLCC and are detailed below.

MECHANICAL SYSTEMS

All mechanical air-handling units in the facility are tested regularly to confirm they are capable of exceeding the prescriptive ventilation rate requirements of ANSI/ASHRAE Standard 62.1-2007: Ventilation for Acceptable Indoor Air Quality even in worst-case conditions. The most recent testing cycle was started in November 2014 and will be completed in 2015. Each of these air handling units undergoes maintenance every 3,000 hours runtime to keep all components working properly. Key IAQ-related factors such as carbon dioxide levels and temperature are continually monitored by a centralized Building Automation System (BAS), and can be adjusted in real-time through this system to maintain the client's requested setpoints. If any contaminants ever exceed recommended maximum acceptable levels, 100% outside air is brought into the room until indoor air quality is restored.

NATURAL VENTILATION

The natural ventilation system incorporated in the main halls was modeled during the building's design in order to confirm its ability to provide adequate ventilation. When this system is in operation, airflow and

¹ U.S. Green Building Council. *LEED for Existing Buildings: Operations & Maintenance v2009 Reference Guide*, page 330.

building pressure are automatically recorded by the BAS. Additional mobile carbon dioxide monitors, which can be placed directly in the breathing zone and moved to accommodate each event layout, are added prior to use of the natural ventilation system.

SOURCE CONTROL AND GREEN CLEANING

The IAQ management process is simplified by reducing air pollutants at their sources. Volatile organic compounds (VOCs), commonly found in paints, adhesives, and furniture assemblies, are a common source of IAQ-related health issues². During the DLCC's design and construction, indoor materials with low VOC concentrations were installed to prevent the accumulation of harmful chemicals. Following those original standards, the DLCC's Sustainable Purchasing Policy mandates that all products used during ongoing facility maintenance adhere to the VOC limits set forth by the South Coast Air Quality Management District.

The DLCC's green cleaning program also mitigates contaminants and contributes to exceptional indoor air quality. In April 2011, the preexisting green cleaning program was expanded and formalized into the DLCC Green Cleaning Policy and Plan. The plan specifies the use of sustainable cleaning products, including those which meet applicable Green Seal standards, are made of biobased and biodegradable content, and/or have low VOC concentrations. Green Seal provides several standards that are based on life cycle research of environmental impact and are recognized by LEED. The use of these chemicals is tracked indirectly by cost of the chemical purchases. In 2014, 50% of the cleaning products purchased met the goals provided in the DLCC Green Cleaning Policy and Plan.

To help protect the health of housekeeping staff, sustainability standards were also created for all indoor and outdoor cleaning equipment. In 2014, 100% of the cleaning equipment purchased met at least one or more applicable purchasing criteria, including dust-capturing filters, low operating noise levels, and ergonomic design. All regular cleaning equipment maintenance is logged by the Director of Operations to ensure that equipment continues to operate safely and at peak efficiency.

OCCUPANT SATISFACTION WITH INDOOR ENVIRONMENTAL QUALITY

As part of the *David L. Lawrence Convention Center: A Building in Operation [BiO] Case Study*, the Center for Building Performance and Diagnostics at Carnegie Mellon University conducted a series of general occupant satisfaction surveys, accompanied by spot measurements of critical indoor environmental factors³. These surveys and measurements were obtained during three events from August 2010 to January 2011. The spot measurements taken by the CMU team found that carbon dioxide levels throughout the day remained within the range recommended by ANSI/ASHRAE Standard 55-2004: Thermal Environmental Conditions for Human Occupancy, and VOC and particulate matter concentrations were negligible. Overall satisfaction with indoor air quality was 86.6% as reported by all survey respondents, which is above the goal of 80% as set forth in the ANSI/ASHRAE Standard. These results validate the combined effectiveness of the green cleaning program, source control strategies, and increased ventilation rates in reducing indoor pollutant contamination.

² "Volatile Organic Compounds." *An Introduction to Indoor Environmental Air Quality (IAQ)*. US EPA, 03 May 2012. Web. 30 May 2012.

<<http://www.epa.gov/iaq/voc.html>>.

³ See the *David L. Lawrence Convention Center: A Building in Operation [BiO] Case Study* Section 6.1 User Satisfaction | Thermal, Air Quality, Visual & Acoustic for further details on these tests.

In September 2008, SMG, as building manager, launched the g1 (greenfirst)[®] program (g1), a branding of the sustainable practices at the DLCC, to highlight the facility and staff's commitment to sustainability and to putting "green first" in everyday activities. Under the g1 umbrella is an array of educational initiatives targeted towards groups who regularly interact with the building: employees, event planners, attendees, Pittsburgh residents, and sustainability professionals. Through varied programming with a cohesive overlying message, the g1 program informs activities for each of these groups.

EMPLOYEES

For employees, the g1 program is part of overall workplace culture. The program is linked to sustainable purchasing, recycling procedures, and operational practices. Employees are aware of the DLCC's reputation as a green leader, and regularly consider how their actions affect this reputation. Employee awareness of sustainability and their resulting choices are evident in the energy performance, waste reduction, and water consumption of the building.

EVENT PLANNERS

An overview of the building's sustainable operations practices is highlighted on the program's dedicated website, www.greenfirst.us. This website lists suggestions for "green practices" geared specifically towards event planners and exhibitors. These suggestions cover practices from pre- to post-event, including publicizing transit options to attendees, using recycled and recyclable materials for packaging and signs, and sending virtual copies of company literature rather than distributing physical copies. Discussing these practices in detail during the event planning stages increases their implementation.

Interested events may request a report which provides feedback on their waste diversion efforts. This report allows event planners to quantify their efforts for the purposes of communicating with attendees and evaluating future event practices.

COMMUNITY AND ATTENDEE OUTREACH

A passive education program targets convention center attendees who may be interested in the building's green components. This program is accessible in three ways: (1) through a series of physical signage developed by the Green Building Alliance, located in the third floor prefunction area; (2) as an audio tour; and (3) as a series of webpages designed for smartphones. Wall decals throughout the building list the phone number to call for an audio topic and include a QR code leading to the corresponding smartphone webpage. In each version of the tour, the topics of the building's construction, natural ventilation, daylighting, water reduction strategies, and recycling strategies are covered in a depth appropriate to the medium.

Additionally, the DLCC recognizes its leadership role and the educational resources it can provide to those interested in sustainability in the built environment. SEA and SMG provide tours to parties interested in learning about the building's sustainable design features in greater detail. A total of 281 visitors were given tours in 2014. These visitors included high school, university, and continuing education students; and local, national, and international organizations.



ELECTRIC VEHICLE CHARGING STATIONS

In December 2011, the SEA, in partnership with Pittsburgh Region Clean Cities and thirteen other local organizations, received a grant through the Alternative Fuels Incentive Program to provide 40% funding for two Level 2 electric vehicle charging stations in the DLCC's public parking garage. They were installed in December 2012 as the first publicly-accessible EV charging stations in Downtown Pittsburgh, providing an amenity to DLCC visitors and local commuters. The stations are part of the Energy Corridor 376 project that established 45 electric vehicle charging stations along Interstate 376 and surrounding areas. Energy Corridor 376 is a partnership of 19 regional public and private entities working to expand electric vehicle infrastructure in the region.



EV Charging Stations in DLCC Garage

In 2014, 4,357 kWh of electricity was used in the charging process. Based on the fuel economy of a 2014 Nissan Leaf¹, this charging activity at the DLCC provided the electricity needed for an electric vehicle to travel more than 14,000 miles. Based on actual electricity usage, the additional electrical cost to the DLCC for these two charging stations was \$370 in 2014.

PITTSBURGH 2030 DISTRICT

The Pittsburgh 2030 District is a collaboration of building owners in both the Downtown Pittsburgh and Oakland neighborhoods 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, was one of the founding partners of the launch of the 2030 District in October 2012. At the end of 2014, 60% of real estate in Downtown Pittsburgh was committed to the 2030 District, representing 152 buildings and 37.6 million square feet. By becoming a Downtown District partner, the DLCC committed to the following goals:



Energy Use: A minimum of 10% reduction below the Downtown District baseline by 2015, with incremental targets reaching a 50% reduction by 2030.

Water Use: A minimum of 10% reduction below the Downtown District baseline by 2015, with incremental targets reaching a 50% reduction by 2030.

Transportation Emissions: A minimum 10% reduction below the Downtown District baseline by 2015, with incremental targets reaching a 50% reduction by 2030.

Indoor Air Quality: (In development.)

¹ "2014 Nissan Leaf Fuel Economy, Compare Side-by-Side." *Fuel Economy*. US EPA Office of Transportation and Air Quality, n.d. Web. 5 February 2015. <<http://www.fueleconomy.gov/feg/Find.do?action=sbs&id=34699>>.

DLCC PERFORMANCE AGAINST BASELINES

The Energy Use baseline is measured by Site Energy Use Intensity (Site EUI). Site EUI measures a building's annual energy performance normalized by its gross square footage and is an output from ENERGY STAR Portfolio Manager. The majority of District partners use 2003 Commercial Buildings Energy Consumption Survey (CBECS) data from the U.S. Energy Information Administration to set their baselines, but CBECS does not include convention centers. Therefore, GBA established the Energy Use baseline for the building at 90.2 kBtu/sqft, which is reflective of the actual performance of the building in 2004, the first full year of operations. The actual Site EUI for the DLCC in 2014 was 67.1 kBtu/sqft, which represents a 25% reduction from the baseline. A 25% reduction demonstrates that the DLCC is already meeting the incremental 2020 goal (20% reduction from baseline) established by the Pittsburgh 2030 District.

The Water Use baseline is measured by Site Water Use Intensity (Site WUI). Site WUI functions similarly to Site EUI in that it measures a building's annual water performance normalized by its gross square footage. Since no national water consumption data for existing building exists, the baseline was developed using historic water consumption information. GBA established the Water Use baseline for the building at 4.46 gal/sqft, which is reflective of the actual performance of the building in 2006, the first full year that the wastewater treatment plan was in operation. The actual Site WUI for the DLCC in 2014 was 2.6 gal/sqft. This is a 41% reduction from the baseline that demonstrates that the DLCC is already meeting the 2025 goal (35% reduction from baseline) for the initiative.

The baseline for transportation emissions is being finalized and this information is expected to be included in the 2015 report.

The baseline for indoor air quality is currently in development.

(transportation)

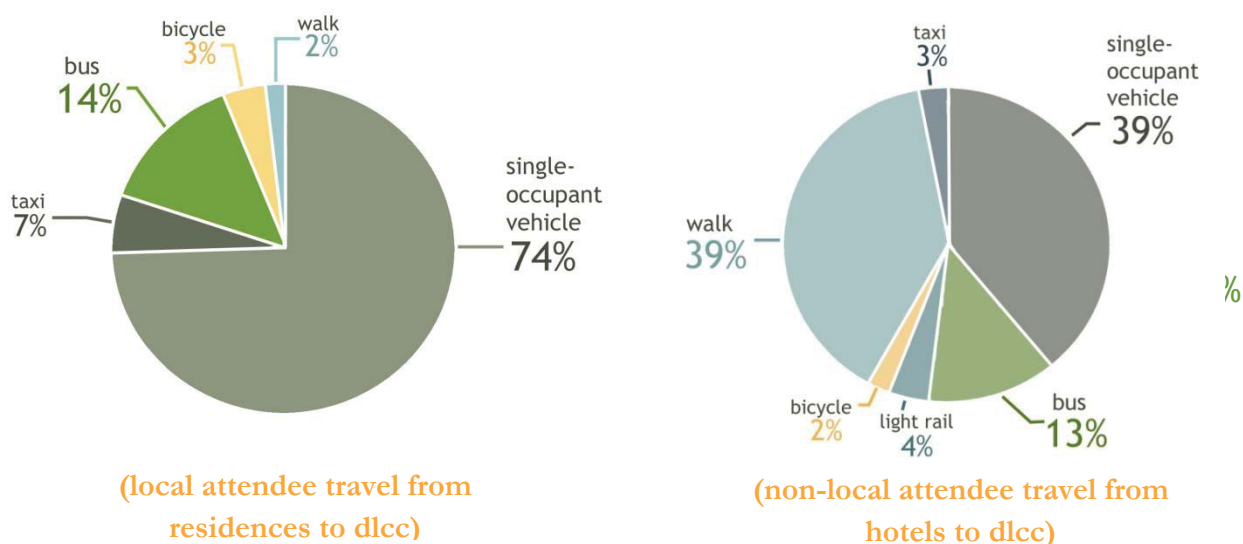
The SEA and DLCC's management does not have direct control over transportation modes chosen by attendees or staff, but these decisions are nonetheless a component of the facility's environmental impact. Evaluating transportation habits quantifies this impact and assists in identifying means to promote sustainable options. As part of the *David L. Lawrence Convention Center: A Building in Operation [BiO] Case Study* and the LEED® for Existing Buildings: Operations & Maintenance™ (O&M) certification process, computer-based transportation surveys were administered to both attendees and employees as described below¹. In accordance with current LEED guidelines, adapted from SCAQMD Rule 2202, overall impact was determined by measuring the percentage of trips to and from the building which use alternative transportation modes². The results of each survey are summarized below for the purposes of this report.

ATTENDEES

Attendees were surveyed during five separate events that occurred from August 2010 through January 2011. Survey respondents were asked to detail their transportation choices when traveling to and from Pittsburgh and the DLCC.

Local attendees were most likely to drive to the DLCC, with only 19% choosing an alternative transportation mode (public transit, walk or bicycle). Only 4% of non-local attendees traveled to Pittsburgh using an alternative transportation mode, with 45% arriving by airplane and 51% by car. Only 26% of non-local attendees who flew to Pittsburgh chose an alternative transportation mode to travel from the airport to their hotels.

Alternative transportation, however, was popular for non-local attendees when traveling from their hotels to the DLCC. 41% of non-local attendees walked or biked to the building, while 13% used public transportation. Attendees who stay at one of the fourteen hotels within walking distance to the DLCC benefit the most from the facility's downtown location and in doing so avoid creating a significant portion of potential emissions.



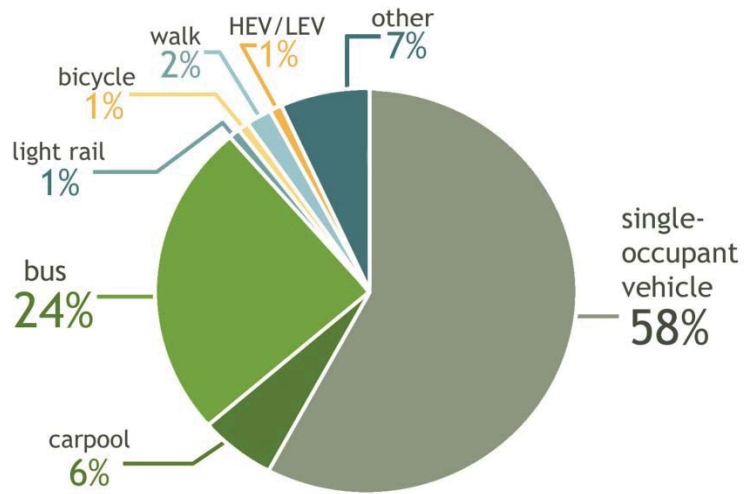
%

¹ See the *David L. Lawrence Convention Center: A Building in Operation [BiO] Case Study* Section 5.2 Operations | Transportation Review for a more detailed analysis and explanation of the survey

² Alternative transportation modes include bus, light rail, bicycle, walking, and vehicles with a minimum ACEEE Green Score of 40 or defined by the California Air Resources Board as a low-emissions vehicle).

EMPLOYEES

Employees were surveyed in February 2011. The survey requested information on the employee's transportation choices for each working day of the week prior to taking the survey. During the seven-day survey period, 58% of employees commuted by single-passenger vehicle, 6% carpoled with at least one other person, and 36% chose an alternative transportation mode (including high-efficiency or fuel-efficient vehicles according to third party standards), resulting in an overall reduction of conventional commuting trips by 38.74%³. The average one-way commuting distance was 9.8 miles.



(employee commuting to dlcc)

Not enough data is currently available to calculate the carbon footprint of employee commuting with certainty. However, estimations can be made based on national average emission rates for each transportation mode, the number of days worked by each employee, and the length of each employee's commute. Using this method, the commuting footprint within the weeklong survey period was estimated to be 3.07 mT CO₂e, 27% lower than if all employees had chosen conventional commuting methods. As the most frequently-used alternative transportation mode, bus transportation was responsible for 55% of the total estimated emissions reduction. Due to the variability of operational schedules over the year, annual emissions have not been extrapolated from the February 2011 survey.

2030 DISTRICT

As part of the 2030 District initiative (see (greenfirst) section), an updated transportation survey will be administered. It is anticipated that those results will be included in the 2015 report.

(purchasing)

At the DLCC, environmental management strategies aim to minimize the depletion of natural resources at each stage of the manufacturing cycle: by reducing unnecessary source waste, by recycling as much waste material as possible, and by purchasing materials with high levels of recycled content or other positive environmental attributes.

SUSTAINABLE PURCHASING BY CATEGORY

In April 2011, the DLCC instituted a Sustainable Purchasing Policy which formalized and quantified pre-existing practices regarding material purchases. The policy covers all purchases made at the DLCC, including office supplies, furniture, electronic equipment, lamps, and cleaning products. The policy includes specific sustainability criteria for each purchasing category, aligning to the LEED® for Existing Buildings: Operations & Maintenance™ (O&M) rating system standards. Whenever possible, the DLCC requests of its vendors and supply chain to provide goods, packaging, and shipping options with reduced lifecycle impacts in mind. The DLCC makes its purchasing decisions based on these sustainability-related factors.

The DLCC has developed a sustainable purchasing tracking system, integrated into the existing accounting program, which facilitates regular evaluation of current purchasing performance against the goals set forth in the Sustainable Purchasing Policy. Criteria for each category, along with 2014 performance, are as follows:

CATEGORY	CRITERIA	GOAL ¹	2014 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%	86%
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%	n/a*
Electronics	<ul style="list-style-type: none"> • EnergyStar-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%	100%
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 	60%	50%**

¹ Each goal is based on the percentage of annual purchases within the purchasing category that meet at least one of the applicable sustainability criteria.

	<ul style="list-style-type: none"> ● Are USDA Certified Biobased products ● Do not exceed the maximum volatile organic compound (VOC) limit specified by the California Code of Regulations 		
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 and Alterations	<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%	84%

* No furniture purchased in 2014.

** This includes cleaning products purchased by Levy Restaurants.

LOCAL PURCHASING

When practical, the DLCC purchases goods which are manufactured locally, reducing the energy needed to transport materials and supporting the local economy. During the event planning process, clients are also encouraged by event services staff to use local manufacturers, printers, and suppliers in order to reduce their own impact.

LEVY RESTAURANTS

As the DLCC's exclusive food and beverage provider, Levy Restaurants has developed a set of sustainable catering options and practices for events which can be implemented whenever feasible. In alignment with LEED guidelines, sustainable choices consist of food which is extracted and produced within a 100 mile radius of the site, organic food, and products meeting equitable harvesting standards².

The large volume of food purchases required to meet demand each year, as well as the geographic location of the DLCC, challenges local sourcing. Although it is not currently possible to achieve 100% locally-sourced products, 30.6% of all food purchases in 2014 were local. Levy Restaurants also maintains 120 linear feet of rooftop planters on the North Terrace, growing herbs and vegetables which are served during catered events throughout the growing season.

The use of local and organic ingredients is highly dependent on the requests of clients, and must be able to suit both the volume of food requested and the client's price point. Client requests remain the greatest factor in implementing or hindering sustainable catering practices throughout the year.

² Standards include Food Alliance Certified, Rainforest Alliance Certified, Protected Harvest Certified, Fair Trade, or the Marine Stewardship Council's Blue Eco-Label.

(3R program)

Achieving a high diversion rate of materials from landfill by “reducing, reusing, and recycling” is a cornerstone of the DLCC’s g1 (greenfirst)[®] program. Ongoing improvements to the recycling plan and the increasing capabilities of local recycling entities have increased diversion rates by almost 80% since the program’s inception, diverting over 1700 tons of recyclable waste from landfills. Additionally, careful planning and source reduction measures have been put in place in order to eliminate rejections of shipments due to contamination ratios, and to reach the highest diversion rates possible.

SOURCE REDUCTION

Generally, reducing the total amount of waste generated by DLCC operations reduces the extraction of raw materials and lessens the economic and environmental costs associated with recycling. Reducing the amount of waste is achieved through environmentally preferable purchasing (reusable items, items with less packaging) and the advice given to event planners during the planning process.

To further facilitate internal source reduction, DLCC management operates a reuse program which complements the preference for using durable goods throughout the facility. For instance, DLCC staff collects and reuses salvageable office supplies, and turns single-sided printouts into “second-life” note paper. Furniture which no longer meets operational standards or is not currently needed for events is stored and inventoried for future refurbishment.

Levy Restaurants also incorporates source reduction in its purchasing by buying in bulk and requiring reduced packaging options for products. Practices such as serving water in large refillable “cambros” and pitchers instead of individual bottles further reduces the waste generated by events and building operations. The use of disposable serving ware made from corn starch and other compostable materials, enables Levy to create fully compostable box lunch events, thereby eliminating sorting organic waste from packaging and reducing the contamination ratio to meet composting requirements. If box lunches are not being served, Levy uses china serving ware in lieu of disposable options.

As part of the g1 program, event planners are encouraged by staff to make use of these and other sustainable options, such as the DLCC’s reusable sign boards, throughout the course of their event. Event planners are also encouraged to include reusable and/or recyclable materials in their own purchasing decisions.

In 2014, the DLCC produced an average of 1.53 pounds of waste per attendee¹, 35% lower than the 2005 baseline of 2.34 pounds per attendee and 60% lower than the 2009 external benchmark of 3.78 pounds per attendee². While these numbers indicate that current source reduction strategies are effective, the DLCC continues to explore means to further encourage waste reduction.

RECYCLING

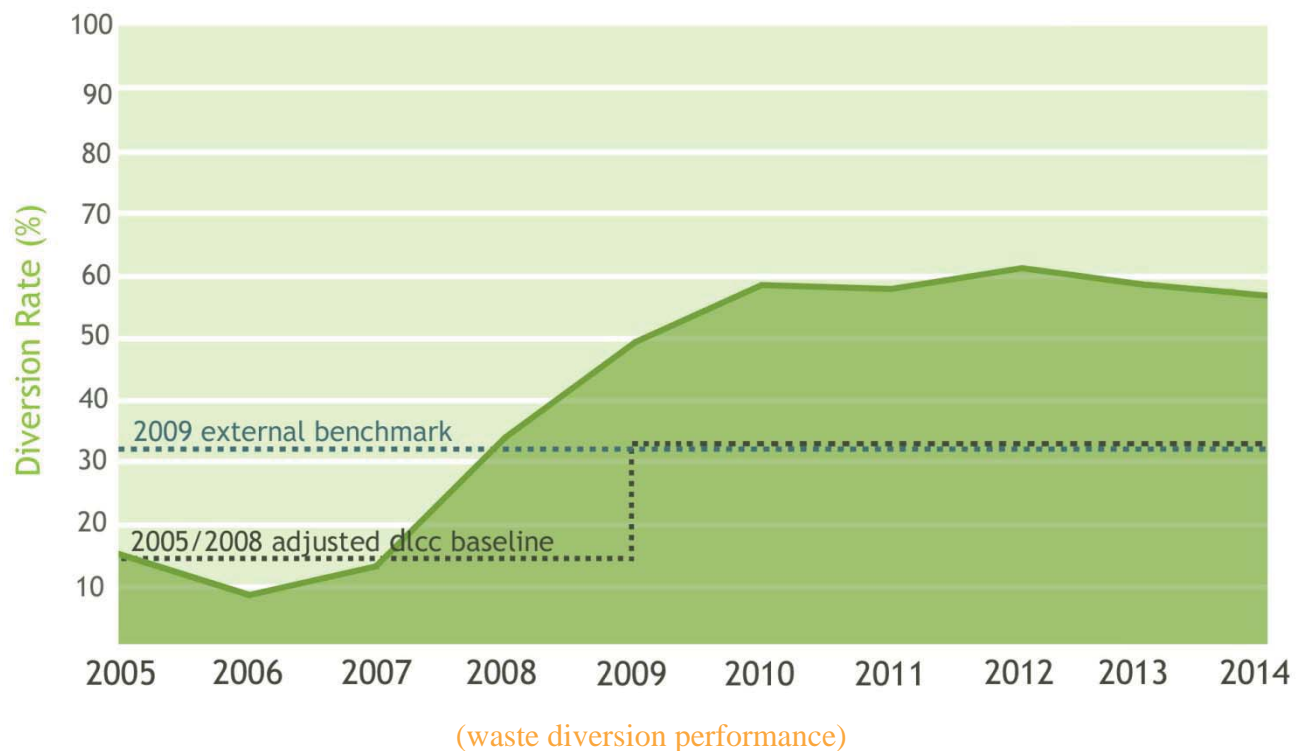
As part of the DLCC’s recycling program, all waste is collected at stations throughout the building and brought to a single point, where it is stored and sorted. This practice ensures that waste diversion tracking remains accurate, and that no waste leaves the building in uncontrolled methods. Almost all recycling companies that the DLCC works with have local Pittsburgh locations, reducing the transportation costs associated with recycling activities.

¹ A per-attendee intensity measurement is used because it is easily quantifiable; it is recognized, however, that this is an imperfect measure that does not take into account weather, event volume, type, schedule, size and needs of attendees and event planners, or number of visits.

² See the *David L. Lawrence Convention Center: A Building in Operation [BiO] Case Study*, Section 2.2 Benchmarking | External for the determination of the 2009 external benchmarks.

After sorting, materials such as paper and aluminum are sent to a local sorting and recycling facility (currently a facility owned by Waste Management). Large carpet scraps and surplus building supplies are regularly donated to Construction Junction, a nearby reuse center, and Habitat for Humanity, while furniture and other smaller durable goods such as computers and monitors are typically either donated or included in the internal reuse program. Wood pallets are collected in a designated area and picked up by Largent, a local company that reuses the pallets. Food scraps and landscaping waste are sent to AgRecycle, a Pittsburgh-based organic composting facility. Because AgRecycle is capable of composting food-contaminated paper and cardboard in addition to organic materials, items such as disposable coffee cups which would otherwise be sent to landfills are also diverted. All small electronic items and batteries are collected in the East Lobby and recycled by Batteries Plus, while lamps are collected by the building's electricians and recycled by Scott Electric. Lastly, surplus prepared food is donated to the Greater Pittsburgh Community Food Bank and Jubilee Soup Kitchen, and used cooking oil is donated to New Market Waste Solutions to be converted to biofuel.

Although source reduction measures and capture rates have consistently improved since the recycling program's inception, the greatest single contributing factor to diversion rates at the DLCC has been the addition of composting in 2008. 496 tons of organic waste have been composted, accounting for 32% of all waste diverted since 2008. Based upon this program's performance, the DLCC has set a goal of a minimum 50% annual average diversion rate, which it has met for the past six years. Beginning in 2013, the waste stream data includes waste from the SEA Office.





Achieving this goal requires careful planning on both sides of the client-facility relationship, as diversion rates are highly dependent on the volume and type of waste generated at each event. Waste-intensive public shows and trade shows with unusual waste streams pose the greatest challenges to the recycling program. Proper planning for diversion methods and for adequate labor is required. In particular, any strategies for diverting or donating unusual event-specific materials must be considered prior to the event in order to be successful.

Meetings and conferences typically produce a more manageable waste stream in terms of volume and content so that diversion rates well above the average can easily be reached. Attendee buy-in has a large impact on the success of the recycling program.

Proper identification and sorting of recyclable goods by building occupants facilitates higher diversion rates by reducing the labor needed to re-sort recycling after collection.

2014 DIVERSION PERFORMANCE

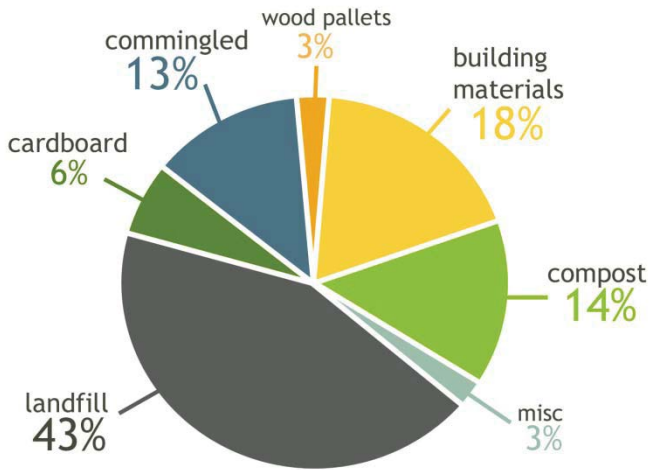
The diversion rates reported here are based solely on the on-site waste management practices; downstream loss rates at recycling facilities are not currently taken into consideration and are beyond the control of the DLCC. DLCC management, however, regularly communicates with these recycling management facilities, and has conducted on-site visits to confirm that downstream waste management practices meet the building’s own sustainability standards.

In 2014, the DLCC recycling program diverted 243.5 tons of waste from landfills of a total 428.5 tons of waste generated, achieving an annual diversion rate of 56.8%.

By weight, diverted materials in 2014 were as follows:

- Cardboard: 27.1 tons
- Commingled Glass / Plastic / Aluminum: 55.0 tons
- Wood Pallets: 11.8 tons
- Building Materials: 78.5 tons
- Compost: 61.1 tons
- Miscellaneous: E-waste: 0.4 tons

Additionally, 7.1 tons of food were donated to local food banks, and 2.4 tons of used cooking oil were converted into biofuel.



(2014 waste stream components)

Although the environmental impacts associated with the recycling program cannot be accurately tracked in full at this time, 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 content³. 2014 diversion of cardboard, paper, glass, plastic, aluminum, and compost was responsible for an estimated savings of 350 mT CO₂e. An estimated total of 3,329 mT CO₂e has been avoided since recycling began in 2005, including 99 mT CO₂e as a result of composting and 1,877 mT CO₂e as a result of recycling 613 tons of wood, paper, and cardboard.

CAPITAL PROJECT WASTE DIVERSION

Waste management for major renovations is the responsibility of the contractors but a requirement to track the information and strive for a high diversion rate is included in project specifications. Beginning in 2012, this data is included in the building's total waste data as "Building Materials."

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 convention center's waste stream have not been included in these impacts. For more information on the model and its methodology, visit epa.gov/warm.

SEA OFFICE LEED FOR COMMERCIAL INTERIORS

In August 2012, the Sports & Exhibition Authority (SEA) completed its new office space which is located within the DLCC. The space was previously a portion of the shell for a junior ballroom for the proposed DLCC hotel. The SEA Office consists of approximately 8,000 square feet with full access to the windows along Penn Avenue.

Following on the LEED¹ for New Construction Gold rating and LEED for Existing Buildings: O&M Platinum rating for the DLCC, the SEA pursued LEED for Commercial Interiors for the build out of the space. LEED for Commercial Interiors is the recognized system for certifying high-performance green tenant spaces. The SEA Office received a Platinum rating under the LEED for Commercial Interior (CI) rating system in April 2013.



SEA OFFICE UTILITY USAGE

The energy and water usage related to the SEA Office is excluded from the data in the (energy), (emissions), and (water) sections of this report in order to provide more accurate year-to-year comparisons for the DLCC.

Data now exists for the SEA office for two full years, 2013 and 2014. While this is a very small data set, it is important to begin to show how the SEA office is using energy and water and to identify where there are opportunities for additional efficiency to be realized.

Usage Type	2013	2014	% Change
Electricity (kWh)	115,652.3	99,720.2	13.8% decrease
Steam (Mlb)	385.4	314.2	18.5% decrease
Water (gal)	2027.1	2096.7	3.4% increase
Graywater (gal)	11,388.5	12,391.0	8% increase

As part of the CI certification, the SEA purchased RECs to cover 100% of the electricity usage for 2013.

SEA OFFICE WASTE AND GREEN CLEANING

SMG provides janitorial services for the SEA Office and uses the same green cleaning products that are used in the DLCC. SMG also provides waste removal service for the SEA Office and all waste is combined with the DLCC's overall waste. It would be difficult to quantify the data related to waste diversion rates and the percentage of green cleaning products purchased. Therefore this data is included in the overall DLCC data in the respective sections of this report.

¹ LEED and the related logo is a trademark owned by the U.S. Green Building Council and is used with permission.

(appendix a: reporting scope)

ORGANIZATIONAL BOUNDARIES

The content of this report is primarily focused on decisions made with regard to the DLCC and reporting boundaries typically follow the physical site boundary. Decisions by event planners and attendees also affect the convention center's environmental performance, and therefore event practices which directly impact the DLCC's operations have been included in the scope of this report.

The DLCC encourages each event to adopt relevant sustainable practices, and some of its own improvements are a direct result of increased interest in sustainability in the convention and meeting industry. However, the DLCC cannot reasonably take responsibility for the full impact of event purchasing, attendee transportation choices, and other external decisions. Event practices which do not directly affect the building's environmental impact have not been measured by the DLCC at this time. Likewise, upstream and downstream practices by external organizations are not explicitly included in this report.

BASELINES, METRICS, AND GOALS

Performance indicators presented in this report have been chosen due to their perceived importance to external stakeholders and to internal operations. In order to measure performance in a broadly accepted and translatable manner, the DLCC has adopted the metrics and methodologies of the LEED for Existing Buildings: O&M rating system and certain performance indicators of the Event Organizers Sector Supplement of the Global Reporting Initiative G3.1 Sustainability Reporting Guidelines¹, an internationally-adopted framework for measuring and reporting sustainability performance.

As the first full year of operations and the first year for data measurement, 2004 levels have been adopted as the DLCC's baseline for most performance indicators. Following the guidance of the Global Reporting Index G3.1 Sustainability Reporting Guidelines, organic growth or decline did not cause any adjustments to baseline values. Baselines have only been adjusted to reflect changes in reporting scope or adoption of new program elements which significantly affect performance. In this report, baselines have been changed from 2004 levels for three specific categories:

- Water – The DLCC's onsite wastewater treatment plant became operational in 2006, eliminating the use of potable water for flush fixtures. In 2010, filters were installed to allow aquifer water to replace potable water in the 10th Street Water Feature, reducing municipal water needs per attendee by five gallons. 2010 is the current baseline year. The SEA Office is excluded from this baseline and associated analysis.
- Waste – The waste diversion program was initiated in 2005, and a composting program was added in 2008. This has resulted in an increase of 33% in diverted materials since 2008, and is therefore considered a significant operational change. 2008 is the current baseline year. The SEA Office is included in the associated analysis but its effects are negligible.
- Energy – 2004 is the current baseline year. The SEA Office is excluded from this baseline and associated analysis.

Sustainability performance at the DLCC, particularly in the key indicators of water consumption, energy consumption, and waste diversion, is highly dependent on building usage. While the full environmental impact of the building must be measured in absolute values, any inter-annual comparison of absolute values would not be accurate unless event size and frequency are also taken into consideration. For this reason, many metrics are given in terms of both absolute values and per-attendee intensity metrics. It is

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

important to note that the activity level and building demands at the DLCC are directly affected by several external factors such as weather, event volume, event schedules, event type and size, and the needs and desires of attendees and event planners. Using the per-attendee intensity metric does not account for these other factors. Per-attendee intensity metrics were used throughout the *David L. Lawrence Center: A Building in Operation [BiO] Case Study*, and this report seeks to build on those metrics where possible.

The organizational goals presented throughout this report reflect the DLCC's LEED for Existing Buildings: O&M certification strategy, and the commitment to maintaining or exceeding the level of practice recognized by its LEED Platinum certification. These goals will continue to be refined in the future as a result of operational experience and other developments.

GREENHOUSE GAS INVENTORY METHODOLOGY

The DLCC quantifies annual greenhouse gas emissions using the methodology of the Greenhouse Gas Protocol Initiative² and the ENERGY STAR Portfolio Manager program. This methodology categorizes emissions into three separate scopes, according to the degree of control the reporting body has over the source.

SCOPE I

Scope I emissions, also referred to as direct emissions, result from fuel combustion or other on-site emissions-releasing activities. The largest Scope I source at the DLCC is the combustion of natural gas used in Levy Restaurants' kitchen equipment. In 2014, emissions from this source comprised less than 1% of the building's total emissions. All other Scope I emissions result from the combustion of gasoline and propane which fuels the non-electric maintenance equipment used throughout the site.

As these emissions are estimated to be equally (if not more) minimal than emissions from natural gas, they are considered *de minimus* emissions, and are not directly tracked at this time³. The annual carbon sequestration by the growth of plants in restored landscaped areas on site is also estimated to be small compared to the magnitude of the DLCC's footprint and has likewise not been included.

SCOPE II

The entire effective carbon footprint of the facility consists of indirect, or Scope II, emissions from the purchase of electricity and steam. Emissions resulting from electricity consumption are calculated based



(dlcc carbon footprint)

² The Greenhouse Gas Protocol 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 the California Climate Registry as any emissions comprising less than 5% of the total footprint, *de minimus* emissions are not typically directly tracked in an inventory unless deemed otherwise significant.

upon the most recent grid-specific factors reported to the US EPA, while emissions as a result of district steam consumption are based on a national average used in the Portfolio Manager program.

SCOPE III

Scope III emissions are also called upstream and downstream emissions. These 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 Greenhouse Gas Protocol, these emissions are optional to track because they do not fall within the organization's direct responsibility.

At the DLCC, sources which could potentially be included under Scope III emissions include those associated with material consumption, waste management, and transportation of visitors to and from the facility. Although the DLCC has made efforts to quantify these activities when feasible, it is currently beyond the organization's capabilities to accurately track every variable associated with these emissions. Because the uncertainty associated with Scope III emissions would reduce the integrity of the DLCC's formal carbon footprint, they are not included in the same management strategy as Scope I and II emissions.

The carbon footprint given in the (emissions) section of this report therefore represents only the facility footprint—the emissions associated with the use of the physical building and its systems. When possible, estimates of the emissions resulting from those Scope III sources that the DLCC has influence over or are otherwise considered to be of interest are provided elsewhere in the report.

