2011 GREEN REPORT

DAVID L. LAWRENCE CONVENTION CENTER

This 2011 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 2011 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 2011 calendar year. As this is the first formal report of this magnitude, information has also been provided for previous years of full operation to the extent which 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.

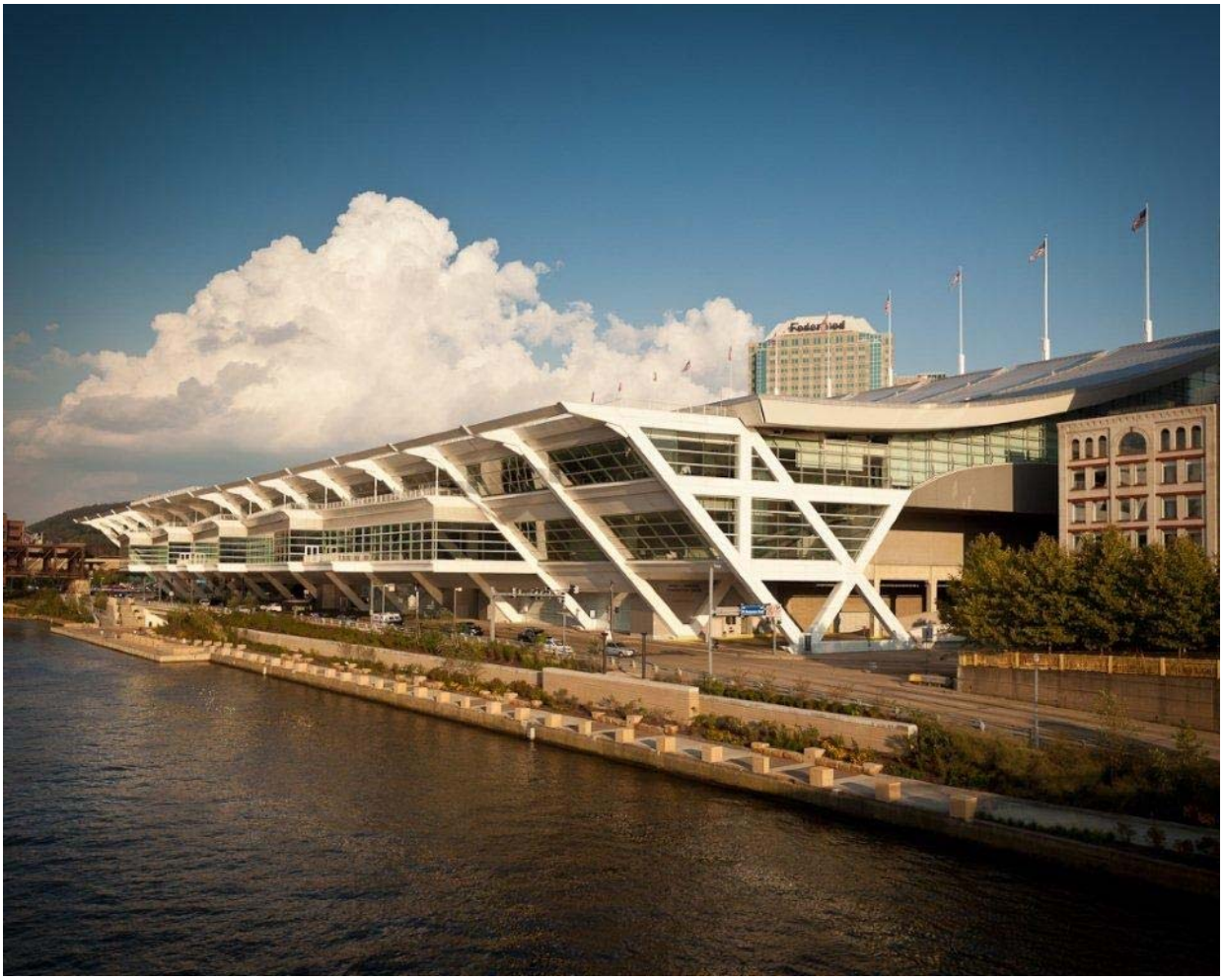
It is important to note that the environmental performance of the DLCC is directly affected by several external factors such as weather, event schedules, event type and size, and the needs and desires of attendees and event planners. These relationships are complex and not always quantifiable. It is 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 effectiveness.

(2011 performance indicators)

INTRODUCTION AND HISTORY

Located in downtown Pittsburgh adjacent 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, owned by the Sports & Exhibition Authority of Pittsburgh and Allegheny County (SEA) and managed by SMG, 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 anonymous foundation. 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 Viňoly 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. The strategic reuse of the site, 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 building opened 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 system[1], 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 organizational sustainability. The case study was completed in November 2011. The DLCC started the process to achieve certification through 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.

[1] The LEED green building certification program is the nationally accepted benchmark for the design, construction, and operation of green buildings. For more information on LEED, visit **usgbc.org**. LEED and the related logo is a trademark owned by the U.S. Green Building Council and is used with permission.

In November 2011, the David L. Lawrence Convention Center (DLCC) completed a two-year case study process that evaluated building performance, facility management, occupant satisfaction, and organizational sustainability. The project was coordinated by the Green Building Alliance and funded by the Heinz Endowments, with support from the SEA. The case study team included evolve environment::architecture, CJL Engineering, the Center for Building Performance and Diagnostics at Carnegie Mellon University, and Civil and Environmental Consultants. The study had three goals:

- Understand the return on investment and develop the business case for the building's high performance design and for ongoing operational initiatives,
- Leverage LEED® for Existing Buildings: Operations & Maintenance™ (O&M) as a tool to refocus the DLCC's commitment to sustainability, to establish innovative thought leadership, and capitalize on market recognition, and
- Research industry best practices and benchmark performance against internal goals and external standards.

The findings of the case study were based upon quantitative and qualitative assessments of the following areas of operation: energy, natural ventilation, water, site, transportation, waste, purchasing, commissioning, and occupant comfort. The case study also went beyond typical post-occupancy metrics to examine corporate culture, organizational learning, stakeholder perceptions, and marketing initiatives related to sustainability.

As part of the study's benchmarking process, data was gathered from a cohort of thirteen similar convention centers. The benchmarking results and rankings, such as the average recycling rate and average energy consumption, were then shared with the cohort convention centers so that they will be able to assess their own performance and create improved targets.

The case study concluded that DLCC's original green design has created an organizational identity, has resulted in significant energy savings and has generated significant revenue from "green seeking" events that come to the DLCC and spend money in the city.

The David L. Lawrence Convention Center has recognized its potential position of advocacy and leadership with respect to green buildings. The case study's findings were intended to guide by example, providing a concrete illustration of the challenges and benefits to green building and the importance of maintaining operational standards after LEED for New Construction certification. LEED for New Construction and LEED for Existing Buildings: O&M certifications have become increasingly desirable in both the convention center industry and the Pittsburgh region.

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**.

LEED FOR EXISTING BUILDINGS: OPERATIONS & MAINTENANCE

In 2009, the David L. Lawrence Convention Center (DLCC) initiated the process to achieve certification through the LEED for Existing Buildings: Operations & Maintenance (O&M) rating system, which was designed to assist building owners and operators measure operations, improvements, and maintenance on a consistent scale.

The documentation process involved multiple levels of building personnel, third-party consultants, and external stakeholders in the Pittsburgh region. As the building owner, the SEA provided oversight of the LEED application process. The SEA worked closely with SMG to create sustainability policies, and to evaluate and remediate building-related issues. Building technicians, engineers, and staff under the employment of SMG were responsible for instituting energy-efficient practices and continuing ongoing maintenance activities. Documentation for the LEED application was prepared by these groups as well as: Levy Restaurants, the DLCC's food and beverage provider, and Constellation Energy, the company managing the building's chilled water plant and wastewater treatment plant.

The final review of the LEED submission was received in April 2012. Eighty-four credits were awarded, making the DLCC the first convention center to receive a LEED for Existing Buildings: O&M Platinum certification. The DLCC is also the first convention center to receive LEED ratings under both New Construction and Existing Buildings: O&M rating systems.

FINAL SCORECARD

CATEGORY: SUSTAINABLE SITES		
SSc1	LEED Certified Design and Construction	4 points
SSc2	Building Exterior and Hardscape Management Plan	1 point
SSc3	Integrated Pest Management, Erosion Control, and Landscape Management Plan	2 points*
SSc4	Alternative Commuting Transportation	9 points
SSc5	Site Development: Protect or Restore Open Habitat	1 point
SSc7.1	Heat Island Reduction: Non-Roof	1 point
SSc7.2	Heat Island Reduction: Roof	1 point
SSc8	Light Pollution Reduction	1 point
CATEGORY: WATER EFFICIENCY		
WEp1	Minimum Indoor Plumbing Fixture and Fitting Efficiency	REQUIRED
WEc1	Water Performance Measurement	2 points
WEc2	Additional Indoor Plumbing Fixture and Fitting Efficiency	5 points
WEc3	Water Efficient Landscaping	4 points
WEc4.1	Cooling Tower Water Management: Chemical Management	1 point
CATEGORY: ENERGY & ATMOSPHERE		
EAp1	Energy Efficiency Best Management Practices: Planning, Documentation, and Opportunity Assessment	REQUIRED

*These credits have been designated Regional Priority credits for Pittsburgh by the local USGBC chapter. Achieving these credits in the LEED v2009 rating systems is awarded with a bonus point.

EAp2	Minimum Energy Efficiency Performance	REQUIRED
EAp3	Fundamental Refrigerant Management	REQUIRED
EAc1	Optimize Energy Efficiency Performance	8 points
EAc2.1	Existing Building Commissioning: Investigation and Analysis	2 points
EAc2.2	Existing Building Commissioning: Implementation	2 points
EAc3.1	Performance Measurement: Building Automation System	1 point
EAc4	On-site and Off-site Renewable Energy	6 points
EAc5	Enhanced Refrigerant Management	1 point
EAc6	Emissions Reduction Reporting	1 point
CATEGORY: MATERIALS & RESOURCES		
MRp1	Sustainable Purchasing Policy	REQUIRED
MRp2	Solid Waste Management Policy	REQUIRED
MRc1	Sustainable Purchasing: Ongoing Consumables	1 point
MRc2.1	Sustainable Purchasing: Durable Goods – Electric	1 point
MRc2.2	Sustainable Purchasing: Durable Goods – Furniture	1 point
MRc3	Sustainable Purchasing: Facility Alterations and Additions	2 points*
MRc4	Sustainable Purchasing: Reduced Mercury in Lamps	1 point
MRc6	Solid Waste Management: Waste Stream Audit	1 point
MRc7	Solid Waste Management: Ongoing Consumables	2 points*
MRc8	Solid Waste Management: Durable Goods	1 point
MRc9	Solid Waste Management: Facility Alterations and Additions	1 point
CATEGORY: INDOOR ENVIRONMENTAL QUALITY		
IEQp1	Minimum Indoor Air Quality Performance	REQUIRED
IEQp2	Environmental Tobacco Smoke (ETS) Control	REQUIRED
IEQp3	Green Cleaning Policy	REQUIRED
IEQc1.1	Indoor Air Quality Best Management Practices: Indoor Air Quality Management Program	1 point
IEQc1.3	Indoor Air Quality Best Management Practices: Increased Ventilation	2 points*
IEQc1.4	Indoor Air Quality Best Management Practices: Reduce Particulates in Air Distribution	1 point
IEQc1.5	Indoor Air Quality Best Management Practices: Indoor Air Quality Management Plan for Facility Alterations and Additions	1 point
IEQc2.1	Occupant Comfort: Occupant Survey	1 point
IEQc2.2	Controllability of Systems: Lighting	1 point
IEQc2.4	Daylight and Views	1 point
IEQc3.1	Green Cleaning: High Performance Cleaning Program	1 point
IEQc3.2	Green Cleaning: Custodial Effectiveness Assessment	1 point
IEQc3.3	Green Cleaning: Sustainable Cleaning Products and Materials Purchases	1 point
IEQc3.4	Green Cleaning: Sustainable Cleaning Equipment	1 point
IEQc3.5	Green Cleaning: Indoor Chemical and Pollutant Source Control	1 point
IEQc3.6	Green Cleaning: Indoor Integrated Pest Management	1 point

CATEGORY: INNOVATION IN OPERATIONS		
IOc1.1	Exemplary Performance in Additional Plumbing Fixture and Fitting Efficiency	1 point
IOc1.2	Exemplary Performance in Solid Waste Management: Durable Goods	1 point
IOc1.3	Exemplary Performance in Sustainable Purchasing: Durable Goods – Furniture	1 point
IOc1.4	Innovation in Operations for a Comprehensive Outreach Program	1 point
IOc2	LEED Accredited Professional	1 point
IOc3	Documenting Sustainable Building Cost Impacts	1 point

(economic impact)

The David L. Lawrence Convention Center's (DLCC) 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 2011, the DLCC hosted 186 total events and had a total attendance of 506,118. The mix of business at the DLCC varies from year to year. By event type, building usage in 2011 was as follows:

TYPE	Public Show	Convention	Trade Show	Meeting	Banquet	Other	TOTAL
EVENTS	17	35	2	67	24	41	186
ATTENDEES	281,506	134,787	3,941	8,845	8,552	68,487	506,118

2011 bookings consisted of slightly fewer meetings and slightly more conventions than in previous years. The main halls were occupied by events for 44% 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 but it should be noted that it does not account for other factors that affect the DLCC[1].

ECONOMIC IMPACT

While the number of attendees and visitors to the building is a measure of activity, the 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 35 "major" events held at the DLCC in 2011 was $112.7 million[2].

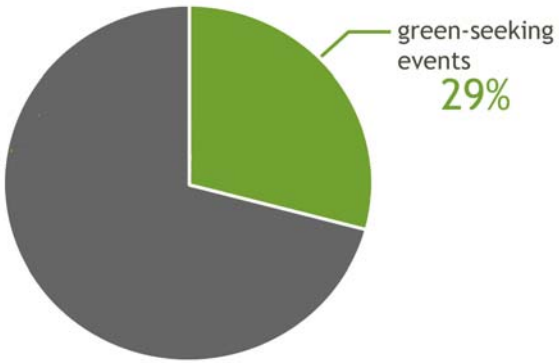
[1] In addition to the number of event attendees, the DLCC is affected by external factors such as weather; event volume, schedule, type, and size; and the needs of attendees and event planners.

[2] VisitPittsburgh. 2011 DLCC Economic Impact Report to SMG.

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 in their organizations regardless of their industry. According to VisitPittsburgh’s research, 22-23% of the convention market is seeking facilities with green operations and that figure is increasing every year[3].

In 2011, of the 35 “major” events at the DLCC (events that could not have been held in Pittsburgh but for the DLCC), 16 were green-seeking events. These green-seeking major events with about 28,000 attendees accounted for 25% ($3.5 million) of gross revenue[4] of the building and 29% ($32.5 million) of direct spending to the region. Green-seeking major events have been responsible for $176.3 million in direct spending since tracking began in 2006.



(2011 direct spending)

[3] Fulvi, Jason. Visit Pittsburgh. Interview with evolve environment::architecture. Pittsburgh, 8 November 2010.

[4] The DLCC, like other convention centers, operates as a loss leader to bring this tourism spending to the region. In order to stay competitive with other cities, the users of the facility cannot be charged enough to cover all the costs of operating the facility.

THE BIOPHILIC ADVANTAGE

Ecologist E. O. Wilson introduced the term “biophilia” to describe what he believed to be an intrinsic benefit to reconnecting humans to the natural environment. At the David L. Lawrence Convention Center (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.

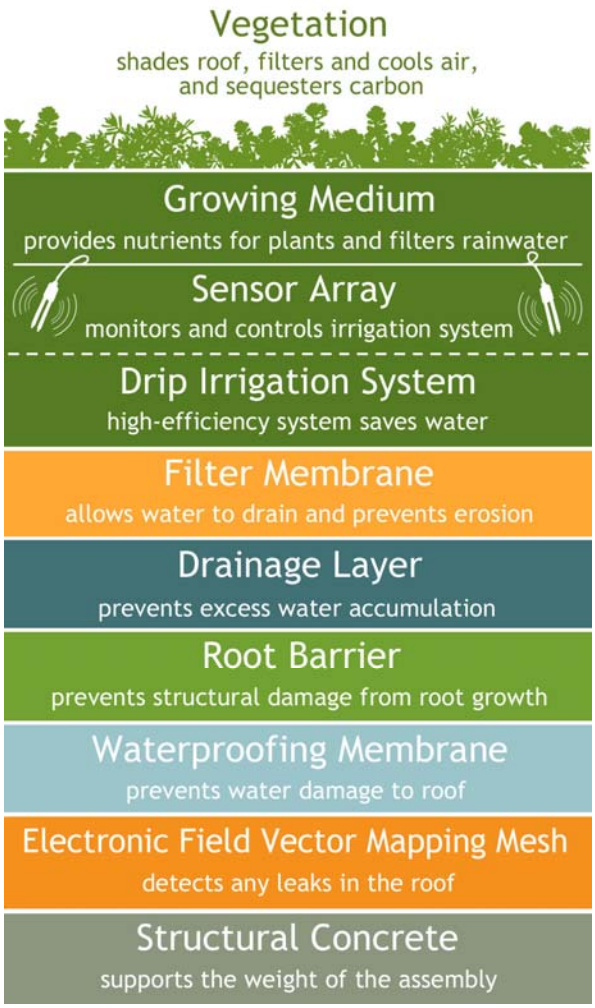
(dlcc site plan)

VEGETATED SPACES

Site restoration along the 11th Street site border began in August 2009 with the planting of native trees, shrubs, and grasses. As part of the Convention Center Riverfront Plaza (Riverfront Plaza), this natural landscape has now been extended 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 and the Point. The Riverfront Plaza also connects the DLCC Water Feature to the Allegheny River and provides a new docking area for waterway travelers. The Riverfront Plaza has quickly become a popular destination for both convention attendees and Pittsburgh residents. The Riverfront Plaza is currently maintained by DLCC staff with cooperation from the City of Pittsburgh.

In the summer and fall of 2011, the third floor terrace outside the cityside meeting rooms was renovated into a fully programmable combination intensive/extensive vegetated roof. The new 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. As the roof plantings continue to grow, they will provide an immediate connection to nature for visitors on the southern side of the building.



(parts of the green roof)

As do all vegetated spaces, 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 80% in the summer[1]. Through natural root intake processes and evapotranspiration, plants also remove pollutants from the air and water. Based on research gathered by the US EPA, the DLCC estimates that the South Terrace Green Roof will remove approximately 680 pounds of particulate matter from the air annually, which is approximately equivalent to the annual emissions of 255 passenger vehicles[2].

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 adaptive plantings, representing 8.5% of the total site area[3]. A total of 75 different species are represented on the DLCC's South Terrace Green Roof, 11th Street site border, and on the Riverfront Plaza site.

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. 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

[1] Berghage, Robert, et al. *Green Roofs for Stormwater Runoff Control*. US EPA, Feb 2009. Web. 29 Mar 2012. <http://www.epa.gov/nrmrl/pubs/600r09026/600r09026.pdf>.
[2] *Heat Island Effect*. US EPA, 09 Mar 2012. Web. 29 Mar 2012. <http://www.epa.gov/heatisld>.
[3] This calculation does not include the Riverfront Plaza landscaped area, which is an additional public site.

prolonged drought conditions. In 2011, this system was operated for only two hours on August 6th, resulting in a savings of 85,000 gallons of water over the year in comparison to conventional practice[4].

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. Based on a similar system installed at the nearby Scalo Solar Solutions building, the DLCC's system is projected to reduce total green roof irrigation by approximately 66% in comparison to conventional practice. This water use reduction will be further quantified in 2012, after the first full growing season.

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 1.8ºF to 5.4ºF warmer than surrounding rural areas[5]. 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 50ºF reduction in surface temperature compared with adjacent conventional roof materials[6].

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 newly-installed 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 material[7]. Even on a hot August day with full direct sunlight, the DLCC's roof remains only 18ºF warmer than the surrounding air.

[4] Conventional practice calculation includes both plant selection and irrigation, as in the LEED for Existing Buildings: O&M design case calculation baseline.

[5] Berghage, Robert, et al. *Green Roofs for Stormwater Runoff Control*. US EPA, Feb 2009. Web. 29 Mar 2012. <http://www.epa.gov/nrmrl/pubs/600r09026/600r09026.pdf>.

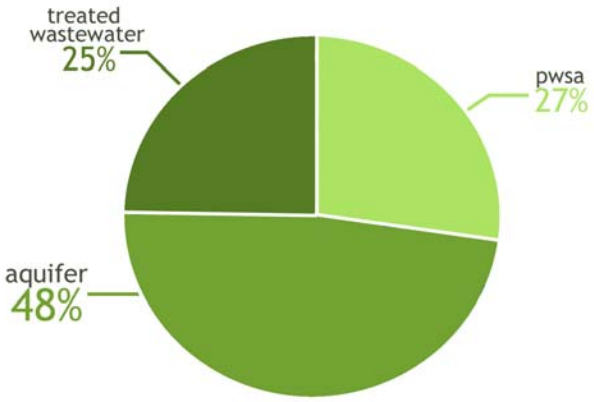
[6] "Green Roof." *Allegheny Green*. County of Allegheny, May 2011. Web. 29 Mar 2012. <http://www.alleghenycounty.us/alleghenygreen/COBroof>.

[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>.

(water)

POTABLE WATER

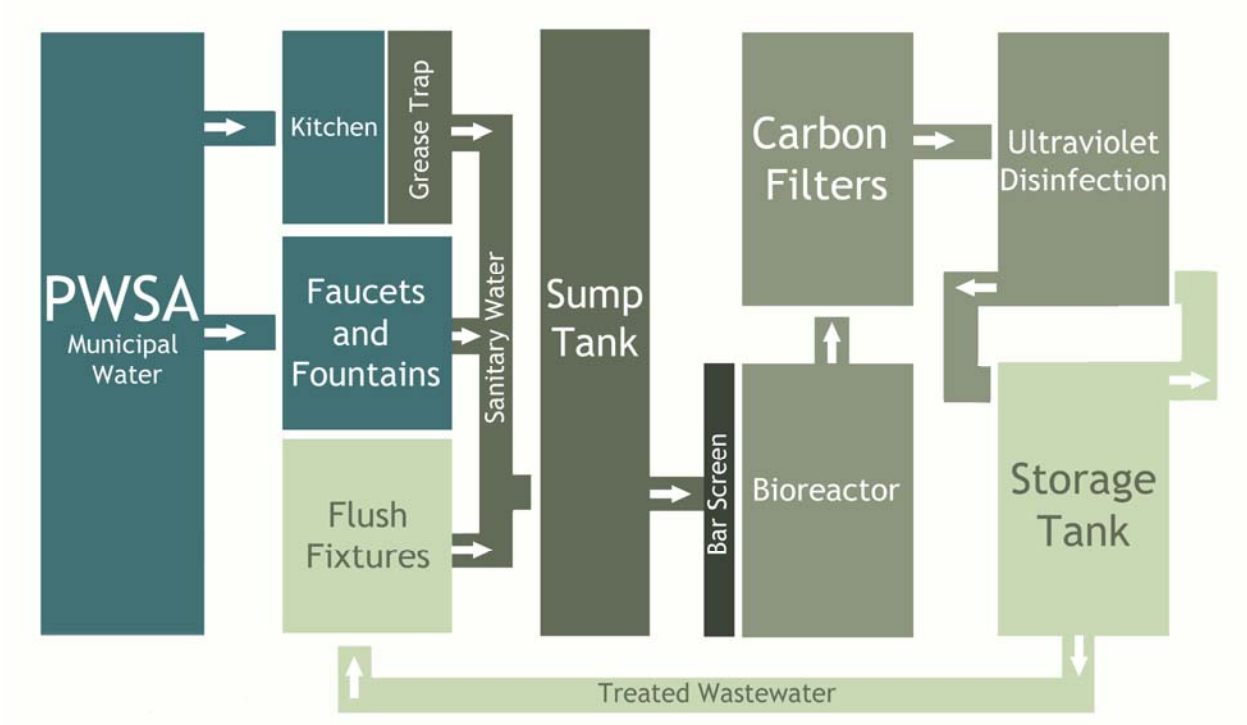
Potable municipal water used at the David L. Lawrence Convention Center (DLCC) is supplied by the Pittsburgh Water and Sewer Authority (PWSA). This water is used for drinking fountains, faucets, kitchen, and laundry. All plumbing fixtures are compliant with UPC/IPC codes. Fixtures in all restrooms throughout the building are equipped with sensor controls and metering faucets.



(2011 water sources)

WASTEWATER TREAMENT PLANT

The 50,000 gallon capacity on-site wastewater treatment plant collects and treats all wastewater from sanitary 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. The wastewater treatment plant is operated by Constellation Energy, an Exelon Corporation. In 2011, 2.8 million gallons of water were reused. This accounted for more than 26% of the total indoor water usage.



(wastewater treatment process)

A 2010 audit of the plant recommended several capital repairs to increase operational efficiency that were completed in 2011. The capital repairs included the installation of a bar screen to act as an additional filter for solids entering the plant and the modification of the carbon supply system to increase capacity of

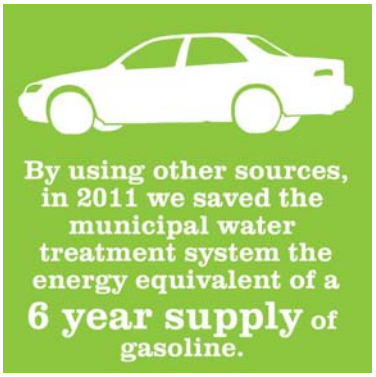
the system and allow for local delivery. Additional water meters were added to allow for more extensive tracking of the system flow and efficiency.

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

AQUIFER

The aquifer located under Downtown is the source for the cooling tower make-up water in the chiller plant. In 2011, 4.7 million gallons of aquifer water were used for this purpose, representing 48% of the DLCC's water requirements. The use of aquifer water eliminates the need for potable water use for this process, producing significant water usage savings each year.

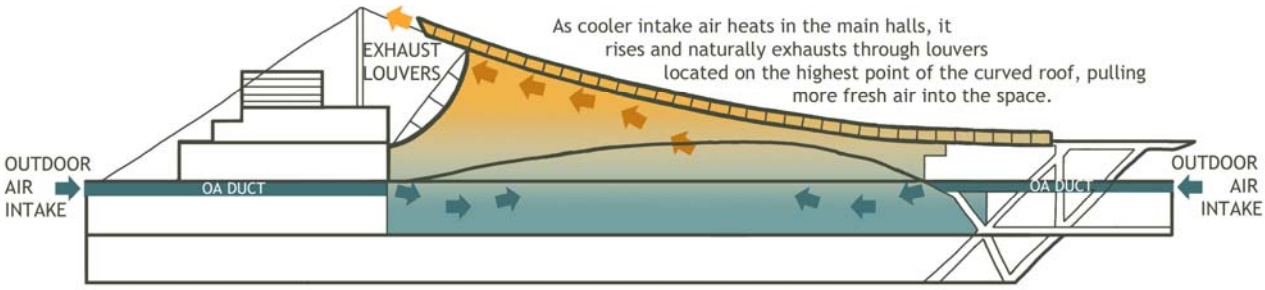
Although the aquifer water is filtered as part of the chiller plant operations, the raw aquifer water was intended for use at the 10th Street Water Feature (Water Feature). However, the high iron content of the unfiltered aquifer water was staining the concrete walls of the fountain. A third-party review also found that the hardness of the water could cause scaling and deposits to form. A greensand water filter was installed in July 2010 to filter out the iron and other minerals and the aquifer now supplies the water for the Water Feature. Using the aquifer water at the Water Feature reduced the use of potable water by more than 2.6 million gallons in 2011.



OPTIMIZING ENERGY USAGE

By the nature of the industry, the David L. Lawrence Convention Center (DLCC) is subject to significant variations in occupancy and therefore in energy demand. When no clients 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 clients or staff, they are left dark and unconditioned.

NATURAL VENTILATION



(natural ventilation system)

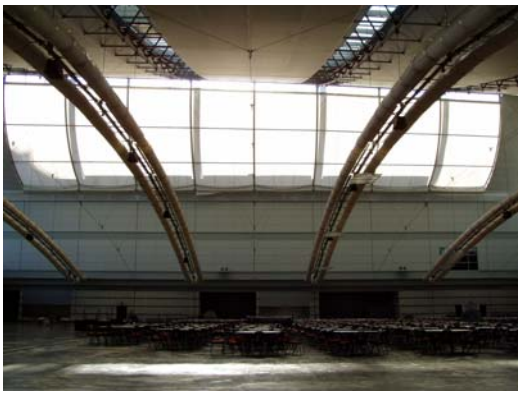
The natural ventilation system is capable of delivering direct outdoor air to the main exhibit halls when weather conditions are suitable. Operable intake louvers are located along all four walls of the building between the second and third floor level. When the system is in operation, outdoor air is 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.

(2011 natural ventilation use)

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 remotely 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 usable when the outside air temperature is between 45ºF and 64ºF. The *David L. Lawrence Convention Center: A Building in Operation [BiO] Case Study* noted operational issues with the natural ventilation system. These are addressed in the **(conservation measures)** section of this report.

The natural ventilation system was utilized for 34 event days in 2011 (representing 26% of the Exhibit Hall event days), eliminating the need for artificial cooling of the space on those days. This number does not include the natural ventilation use on move-in and move-out days for the exhibit halls. Natural ventilation is always in use during move-in and move-out periods, which accounted for more than 100 days in 2011.

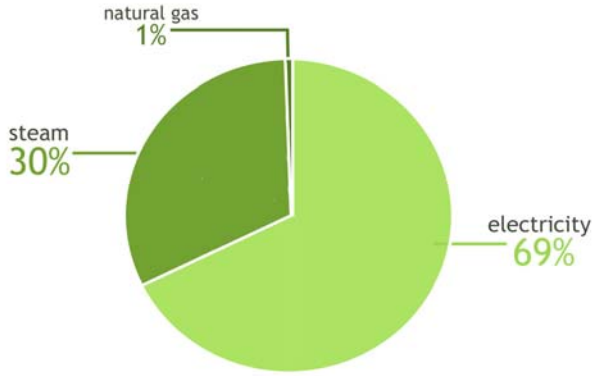


DAYLIGHTING

The original design team built a physical model of the building to test for the most effective daylighting strategy. 85% of regularly occupied spaces in the building are daylit, which reduces the amount of 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

The building uses steam provided by Pittsburgh Allegheny County Thermal (PACT) to heat the building in the winter months. Heating is delivered to spaces through heating coils in the air handling units and the steam becomes hot condensate.



(2011 energy consumption by source)

Cooling in the building is provided by an on-site chiller plant. The plant equipment consists of four Trane Model CVHF Centrifugal Chillers and two 6,000 gallon capacity cooling towers, located near the fifth floor penthouses. These 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.

The chiller plant was initially operated by NORESCO LLC, but the SEA exercised its option to buy out NORESCO's capital costs in the chiller plant in January 2011. The chiller plant is now operated pursuant to a contract with Constellation Energy, an Exelon Corporation.

ENERGY STAR PORTFOLIO MANAGER

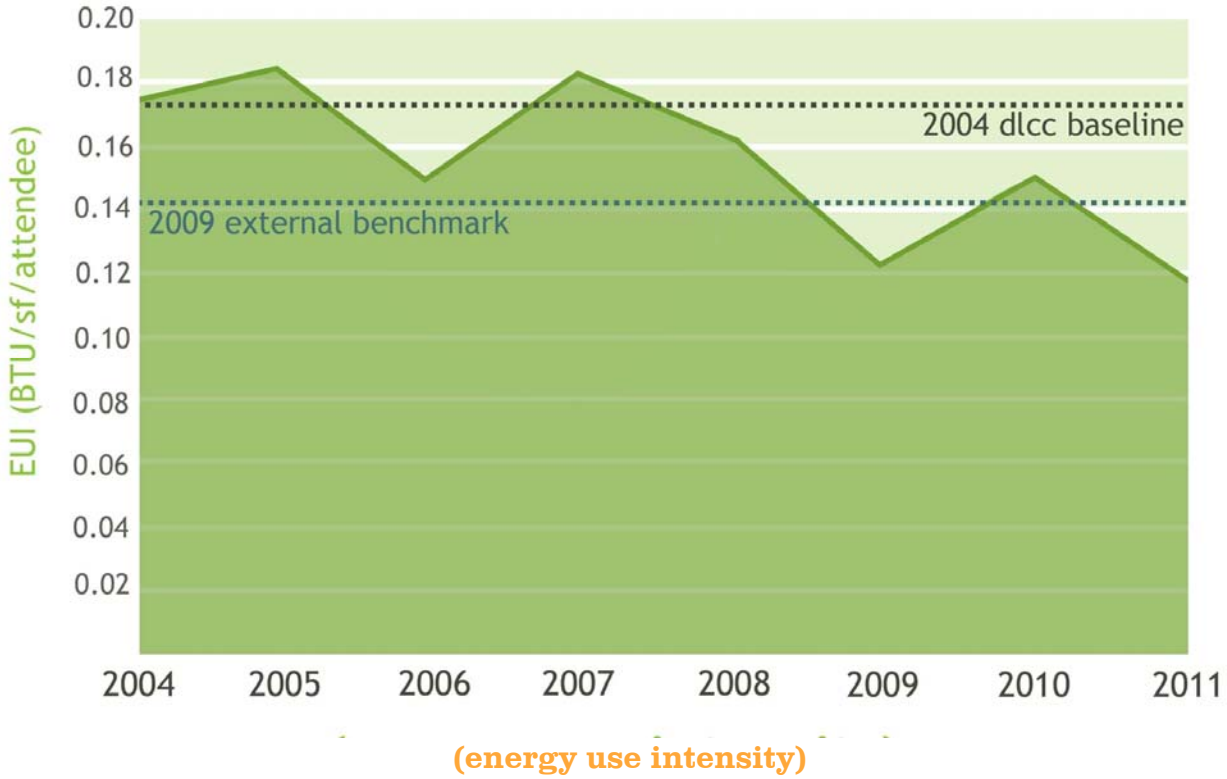
Portfolio Manager is an interactive energy management tool that allows buildings to track and assess energy and water consumption in a secure online environment. The SEA began using Portfolio Manager in 2010 in order that all utility information can be kept in one place and is accessible to both SEA and

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 system[1]. 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, in 2011 the DLCC was in the top 29th percentile for all national entertainment venues. The DLCC is also part of a group of thirteen convention centers that share energy and water data on the Portfolio Manager website.

ENERGY PERFORMANCE

In 2011, the DLCC used 21,871,334 kBTU of district steam, 49,497,202 kBTU of electricity, and 876,296 kBTU of natural gas. The total energy usage intensity (the total energy consumed by a building relative to its size) was 59,820 BTU/sf, a reduction of 33% 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 these efficiencies. The variance is related to the number and types of events held at the facility and the weather conditions.

In order to gain a more accurate representation of the energy use, the data can be normalized for event attendance. Considering the per-attendee[2] energy use intensity, the 2011 usage is a 32.5% reduction from the 2004 baseline.



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

2 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.

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 models[3]. The 2006 BHKR study was analyzed as part of the *David L. Lawrence Convention Center: A Building in Operation [BiO] Case Study*.

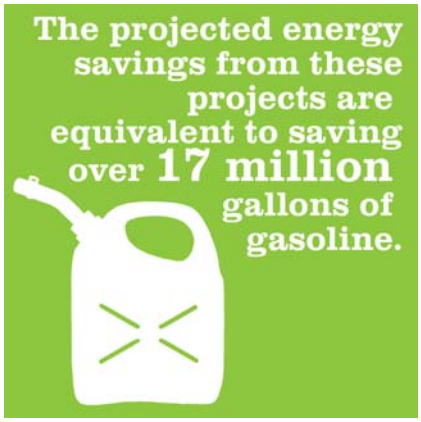
The analysis concluded that actual performance is consistent with the 2006 BHKR model and the DLCC is meeting, if not exceeding, forecasted energy savings, consistently performing approximately 20% better than the ASHRAE 90.1-2001 baseline building[4]. Based on this energy reduction over the ASHRAE-defined baseline model, the DLCC has saved more than $1,500,000 in utility costs since 2004.

[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.

(conservation measures)

The *David L. Lawrence Convention Center: A Building in Operation [BiO] Case Study* provided recommendations for improvements in energy efficiency[1]. Several of the recommendations were implemented in 2011, including the installation of local cooling units in server rooms to allow for the shut down of the chiller plant in the winter months; the installation of two capacitors to eliminate the power factor multiplier on electricity bills; lighting upgrades in the loading docks, service corridors and stairwells; and the repair of the natural ventilation system dampers. A portion of the lighting and natural ventilation projects will be completed in 2012. These projects will account for approximately $236,000 in annual utility savings with a return on investment (ROI) of 3.5 years.



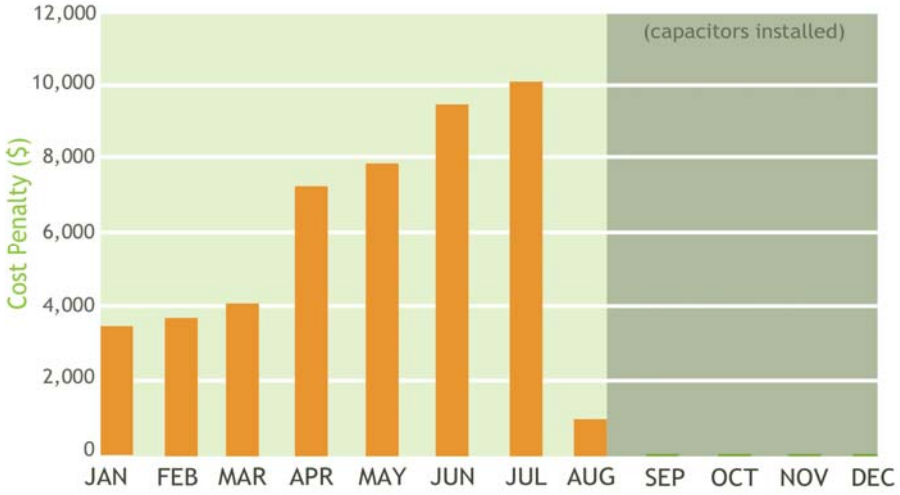
LOCAL COOLING UNITS

New independent cooling units were recently installed for the IT/AV rooms, which require year-round cooling. These supplemental units allow for the complete shutdown of the chiller plant when cooling is not needed elsewhere. This project will provide an estimated annual electricity savings of 600,000 kWh or $60,000.

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 1 percent by 2011, and 3 percent by 2013. Duquesne Light, the David L. Lawrence Convention Center's (DLCC) electricity provider, implemented a commercial sector incentive program based on kilowatt-hours saved. By providing electricity savings, the local cooling unit project qualified for $35,485 in Act 129 incentive funds.

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.



(2011 power factor penalties)

[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.

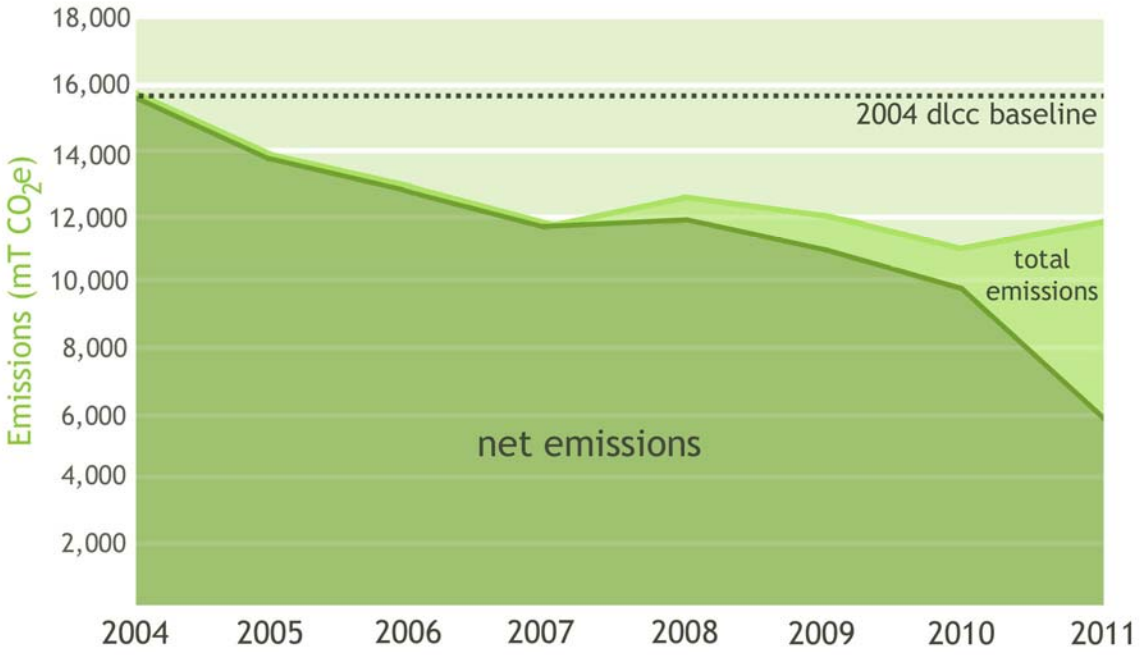
LIGHTING UPGRADES

Lighting technology has advanced significantly since the DLCC was originally constructed and high-efficiency bulbs have become readily available. SEA and SMG are evaluating lighting upgrade projects that would qualify for the Act 129 incentive funds. The first phase of upgrades was completed in 2011 and included the fixture change and 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 3.19 years. The ROI calculation includes the Act 129 reimbursement which is anticipated to be $26,475.

NATURAL VENTILATION SYSTEM REPAIRS

The natural ventilation system repairs began in October 2011. The initial phase included minor repairs, cleaning, adding access doors, and sealing 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 is planned for 2012. When complete, this project is expected to save approximately $50,000 per year in energy costs.

The David L. Lawrence Convention Center (DLCC) quantifies annual greenhouse gas emissions using the methodology of the Greenhouse Gas Protocol Initiative[1] 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).



(greenhouse gas emissions)

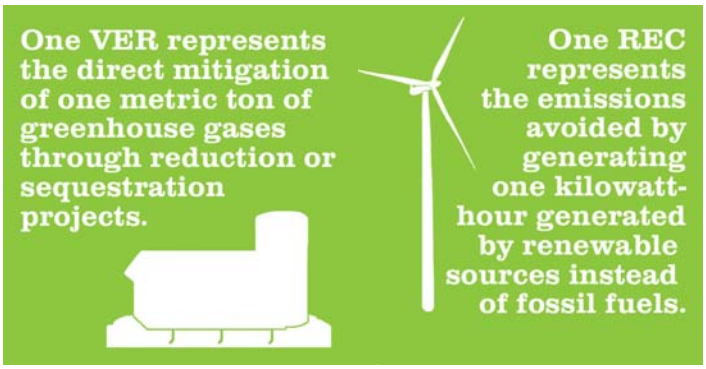
CARBON OFFSET STRATEGIES

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.

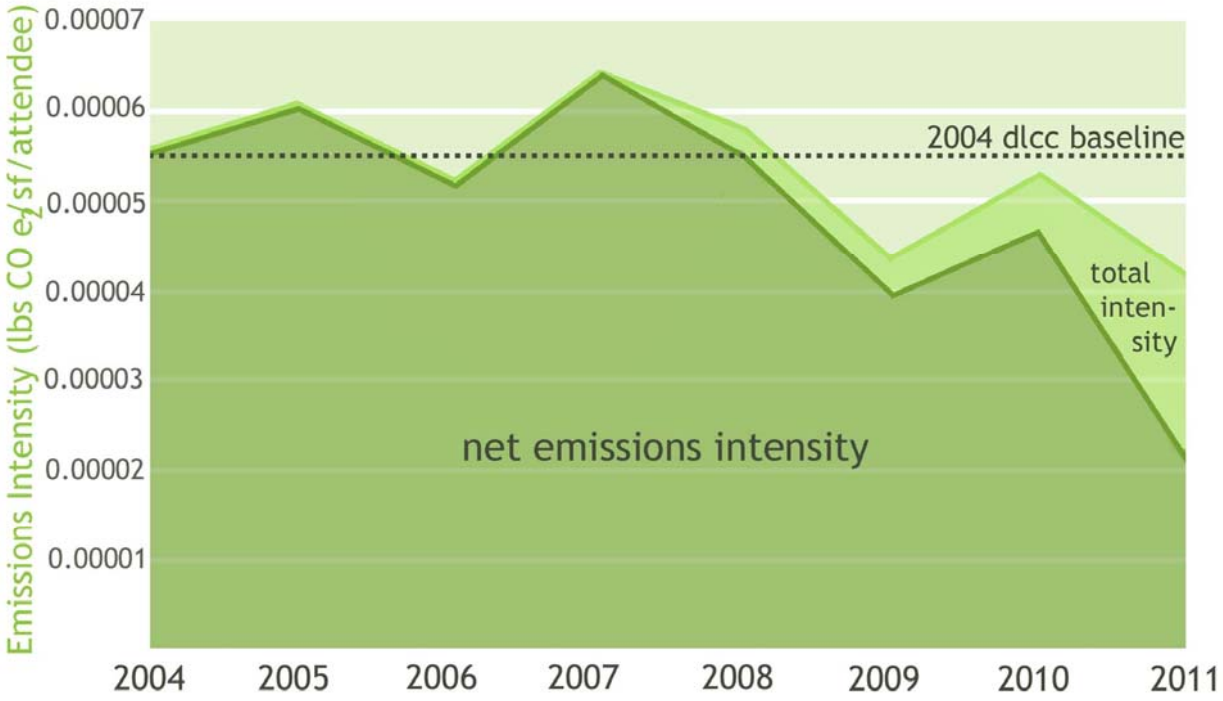
In May 2008, the SEA, the City of Pittsburgh, the County of Allegheny, and the Pittsburgh Water and Sewer Authority (PWSA) entered into an aggregated electricity procurement agreement with Duquesne Light Energy. This agreement stipulated that 10% of electricity purchased by the signatories should come from non-specific renewable sources[2]. In May 2010, this fraction was increased to 15%. In November 2011, the agreement was altered further to specify the procurement of the 15% electricity from only Green-e certified sources.

[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



In 2011, to coincide with the DLCC's formal commitment to sustainable operations under the LEED for Existing Buildings: O&M rating system, 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, 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 July 2013. With these additional offsets, as of July 2011 the DLCC produces zero net emissions from all activities associated with the building's operation[3].



(emissions intensity)

2011 FACILITY FOOTPRINT

Total emissions in 2011 were equivalent to 11,756 metric tons of carbon dioxide (mT CO_2e), of which 10,265 mT were from electricity consumption, 1,446 mT were from steam consumption and 45 mT were from natural gas consumption. This is a reduction of 24% below the 2004 baseline of 15,397 mT CO_2e.

[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.

Emissions intensity (the total emissions of a building relative to its size) per attendee[4] amounted to $4.21*10^{-5}$ lbs CO_2e/sf/attendee.

Although the carbon offset strategy began in January 2011, the REC/VER purchases did not take effect until July 2011. The emissions generated from January until July not already covered by the existing procurement agreement were not offset, bringing 2011 net emissions to 5,919.9 mT CO_2e. This represents a reduction of 9,477.4 mT CO_2e, 62% below 2004 levels. REC/VER purchases will offset all emissions in 2012, resulting in a carbon footprint of 0 mT CO_2e. The DLCC will continue 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.

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 energy model and current emissions factors, the theoretical baseline building used to predict the DLCC's energy performance would produce 15,813.9 mT CO_2e annually[5]. As a result of the sustainable components integrated into the building's design and ongoing improvements, the DLCC has saved an accumulated total of 25,582.6 mT CO_2e from this baseline since 2004. Offsetting strategies have reduced net emissions by an additional 8,864 mT.

OZONE-DEPLETING SUBSTANCES

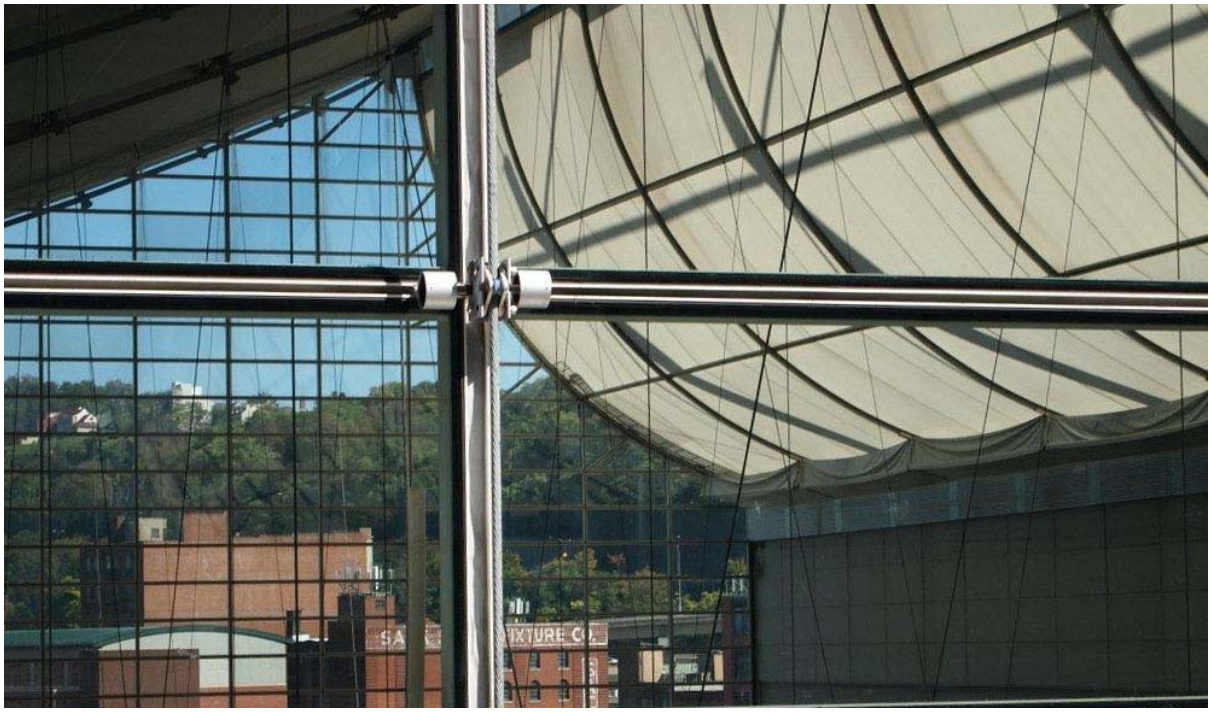
The DLCC uses no equipment containing chlorofluorocarbons, which are known to damage the ozone layer. Base building and concessions-serving equipment use less-damaging hydrochlorofluorocarbons and hydrofluorocarbons, which balance potential environmental impact with desired efficiency. The DLCC's weighted average refrigerant impact per ton is 31, much less than the threshold of 100 required by the LEED for Existing Buildings: O&M rating system[6]. To date, no equipment in the building has leaked any refrigerant charge.

[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 corrected energy model 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.**

Providing an exceptional indoor environment is a key goal of the David L. Lawrence Convention Center (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-being[1]. Increasing ventilation also dilutes and eliminates indoor air contaminants, preventing IAQ-related health issues such as Sick Building Syndrome.

All mechanical air-handing units in the facility were last tested in September 2011 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. 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, and can be adjusted in real-time through this system to maintain the client's requested setpoints.

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 building pressure are automatically recorded by the building automation system. Additional mobile carbon dioxide monitors, which can be placed directly in the breathing zone and moved to accommodate each event layout, are added whenever the natural ventilation system is active. If any contaminants ever exceed recommended maximum acceptable levels, all settings are automatically overridden and 100% outside air is brought into the room until indoor air quality is restored.

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

[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>.

The natural ventilation system is used whenever possible since it contributes to both IAQ-related and energy conservation-related goals. By contrast, increasing ventilation during the peak heating and cooling seasons does come with an additional energy cost. While this is a concern, savings from effective scheduling of HVAC equipment and the operation of the natural ventilation system during swing seasons help offset the cost of increased ventilation, such that indoor air quality can be prioritized year-round.

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 issues[2]. 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. In 2011, use of these chemicals was tracked indirectly by purchase value. Beginning in 2012, both the purchase and use of all cleaning chemicals will be tracked on an ongoing basis by the Director of Operations to ensure that the goals of the green cleaning program are being met.

To protect the health of housekeeping staff, sustainability standards were also created for all indoor and outdoor cleaning equipment. As of the close of 2011, 97% of the cleaning equipment inventory 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 surveyed, accompanied by spot measurements of critical indoor environmental factors[3]. These tests were conducted 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, and 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.

[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 launched the **g1 (greenfirst)®** program **(g1)**, a branding of the sustainable practices at the David L. Lawrence Convention Center (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 and 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. Every surveyed employee considered the **g1** program to be positive for the convention center, and 82% felt it was implemented successfully. As employees are the group which interacts most often with the building, they are the ones who are most impacted by the **g1** program, with 85% reporting the program impacting their behavior at work and 67% following similar practices at home. Employee awareness of sustainability and their resulting choices are evident in the energy performance, waste reduction, and water consumption of the building[1].

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. As one result of the program, 2011 events at the DLCC generated an average of 55% less source waste than the 2009 external benchmark[2].

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

The impact of the **g1** program on event planners was separately evaluated by the *David L. Lawrence Convention Center: a Building in Operation (BiO) Case Study.* Of the 17 event planners who responded to a survey, 29% indicated that the convention center's LEED-NC certification impacted their booking decision. 82% indicated that the **g1** program and the marketing of the convention center's environmental initiatives were a positive factor in their decision[3].

[1, 3] See the *David L. Lawrence Convention Center: A Building in Operation [BiO] Case Study*, Section 7.1 Sustainable Operating Systems | greenfirst Review for the full results of this survey.

[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.

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 signs 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. In 2011, 150 visitors accessed the audio tour during their visit to the facility. In addition, there were 3,093 unique visitors to the **g1** website in 2011.

Additionally, the DLCC recognizes its leadership role and the educational resources it can provide to those interested in sustainability in the built environment. SEA, SMG and the Green Building Alliance provide tours to parties interested in learning about the building's sustainable design features in greater detail. A total of 394 visitors were given tours in 2011. These visitors included high school, college, university, and continuing education students; international visitors; representatives for several Chambers of Commerce; and local, national, and international organizations.

(transportation)

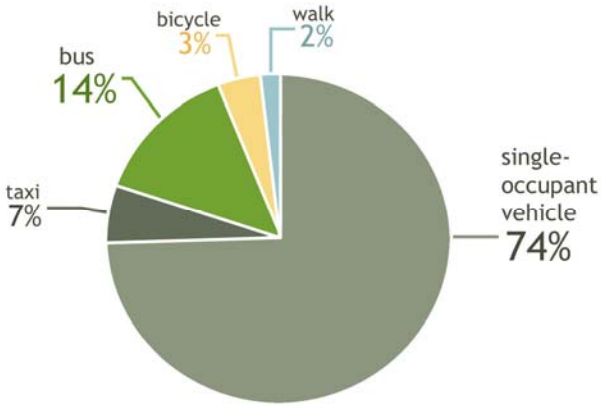
The David L. Lawrence Convention Center's (DLCC's) management does not have direct control over transportation modes chosen by attendees or staff, but these decisions are nonetheless a component of the facility's environmental impact. Evaluating transportation habits quantifies this impact and assists 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[1]. In accordance with current LEED guidelines, adapted from SCAQMD Rule 2202, overall impact has been determined by measuring the percentage of trips to and from the building which use alternative transportation modes[2]. The results of each survey are summarized below for the purposes of this report.

ATTENDEES

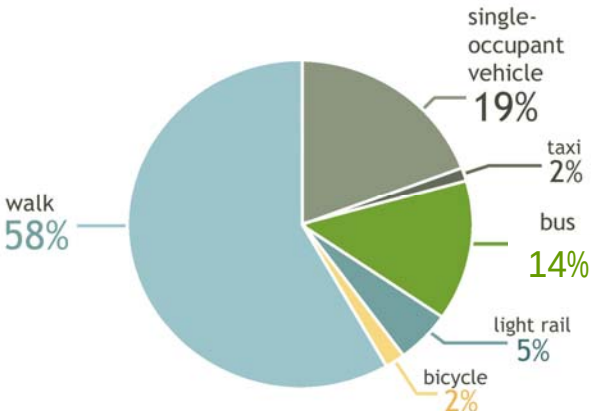
Attendees were surveyed during five separate events over the course of August 2010 and January 2011. Survey respondents were asked to detail their transportation choices when travelling to Pittsburgh and to the DLCC.

Local attendees were most likely to drive to the DLCC, with only 16% choosing an alternative transportation mode. 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.

However, alternative transportation was popular for non-local attendees when traveling from their hotels to the DLCC. 58% of non-local attendees walked or biked to the building, while 31% 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 a significant portion of potential emissions.



(local attendee travel from residences to dlcc)



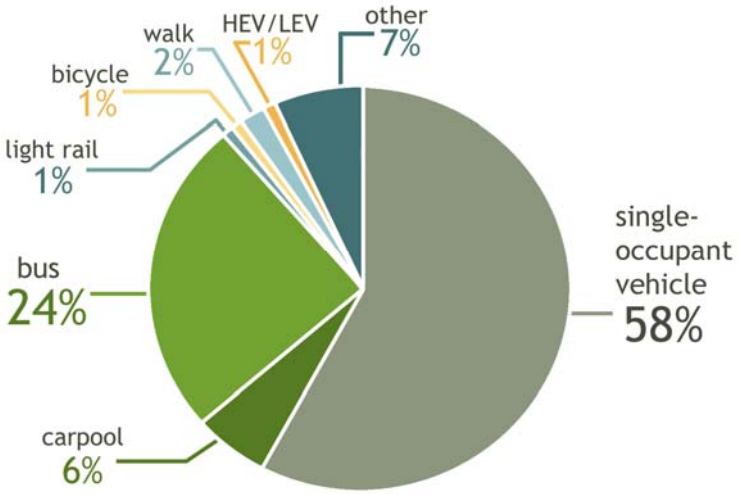
(non-local attendee travel from hotels to dlcc)

[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% carpooled with at least one other person, and 35% 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 CO_2e, 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 survey.

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[3] Using SCAQMD procedures, a carpooling trip is counted as ½ of a conventional trip and alternative transportation modes are counted as 0 conventional trips. Percent reduction is determined by number of trips made over the course of the week and not solely by number of employees.

At the David L. Lawrence Convention Center (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 by SMG, 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 2011 performance, are as follows:

CATEGORY	CRITERIA	GOAL[1]	2011 PERFORMANCE
Ongoing Consumables	• 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%	80.3%
Furniture	• 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%	95.6%*
Electronics	• 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%	83.7%
Cleaning Products	• Meet the applicable Green Seal standard for the product • Meet the applicable Environmental Choice standard for the product	60%	55%

[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.

	• Follow the EPA's Comprehensive Procurement Guidelines • Are USDA Certified Biobased products • Do not exceed the maximum volatile organic compound (VOC) limit specified by the California Code of Regulations		
Cleaning Equipment	• 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%	96.7%
Facility Maintenance and Alterations	• Paints and sealants meeting the applicable Green Seal standard or VOC limits set by the South Coast Air Quality Management District • Contain at least 10% post-consumer and/or 20% post-industrial content • Contain at least 70% salvaged materials • Contain at least 50% rapidly renewable materials • Contain at least 50% materials harvested, extracted, and processed within a 500 mile radius • Contain at least 50% FSC-certified products	50%	95% of all ongoing maintenance purchases; 66% of renovation projects (including the South Terrace Green Roof project)

* This includes the replacement value of furniture salvaged and reused onsite.

LOCAL PURCHASING

When practical, the DLCC purchases goods which are manufactured locally, reducing the energy needed to transport materials and supporting the local economy. In 2011, purchases were made from 10 manufacturers located with a 500 mile radius of the site. Notably, these products included all green cleaning supplies and the pavers installed on the new South Terrace Green Roof.

During the event planning process, clients are 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 standards[2].

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 high percentages of locally-sourced products, a few key concessions items are produced locally, accounting for 13.43% of all food purchases in 2011.

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

Levy Restaurants also maintains forty rooftop planters on the North Terrace, growing herbs and vegetables which are served during catered events throughout the growing season. Seasonal and organic ingredients are typically simpler to procure than local ingredients, and are incorporated into catering options when available.

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.

(3R program)

Achieving a high diversion rate of materials from landfill by "reducing, reusing, and recycling" is a cornerstone of the David L. Lawrence Convention Center's (DLCC's) **g1 (greenfirst)®** program. Ongoing improvements to the recycling plan and the increasing capabilities of local recycling entities have increased diversion rates by over 70% since the program's inception, diverting over 950 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 and counsel 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 collect and reuse salvageable office supplies, and turn 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. In 2011, a total of 6,000 folding chairs were salvaged from another SEA building and refurbished for use at the DLCC and 275 round folding tables were repaired for reuse through this program.

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. Levy, through the use of disposable serving ware made from corn starch and other compostable materials, enables them 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 throughout the facility, 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 2011, the DLCC produced an average of 1.7 pounds of waste per attendee[1], 27% lower than the 2005 baseline of 2.34 pounds per attendee and 55% lower than the 2009 external benchmark of 3.78 pounds per attendee[2]. While these numbers indicate that current source reduction strategies are effective, the DLCC continues to explore means to further encourage waste reduction.

RECYCLING

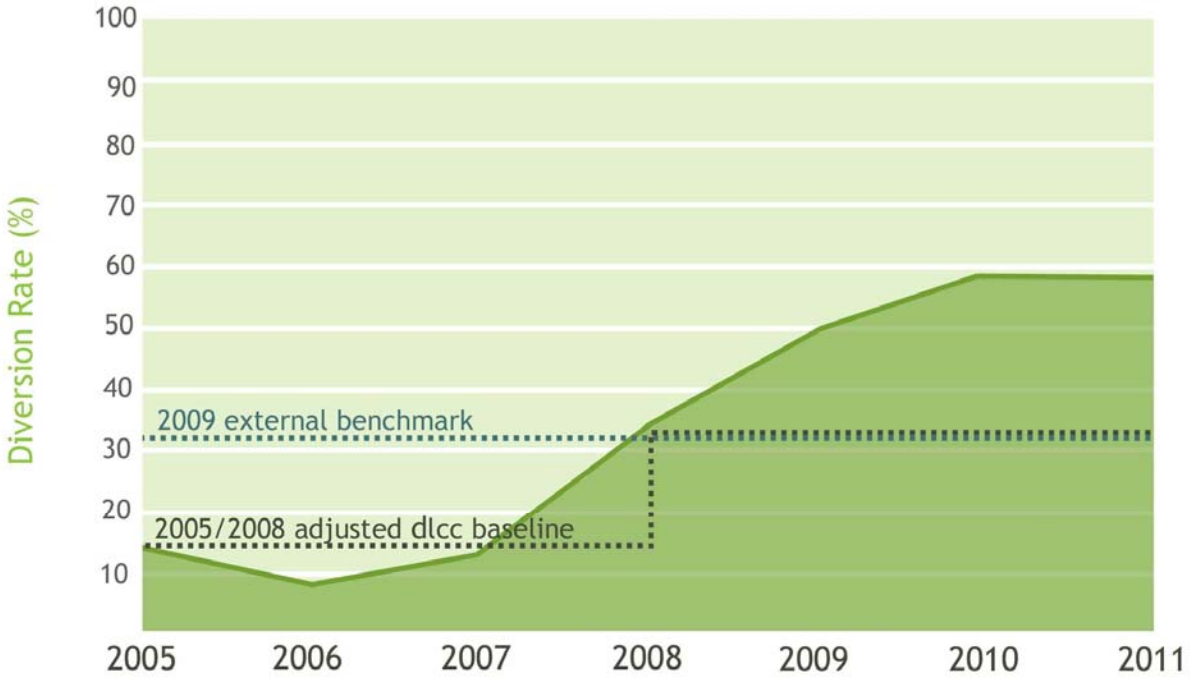
As part of the DLCC's recycling program, all waste is collected at stations throughout the building and brought to a single point, where it is stored and sorted. This practice ensures that waste diversion tracking remains accurate, and that no waste leaves the building in uncontrolled methods. Almost all recycling

[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.
[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.

companies which the DLCC works with have local Pittsburgh locations, reducing the transportation costs associated with recycling activities.

After sorting, materials such as paper and aluminum are sent to Greenstar, a local sorting and recycling facility. Large carpet scraps and surplus building supplies are donated to Construction Junction, a nearby reuse center, while furniture and other smaller durable goods such as computers and monitors are typically either donated to Goodwill 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 administration office and recycled by Batteries Plus, while lamps are collected by the building's Electricians and recycled by Scott Electric. Lastly, surplus catered meals are 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. 264.8 tons of organic waste have been composted, accounting for 33% 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 three years.



(waste diversion performance)

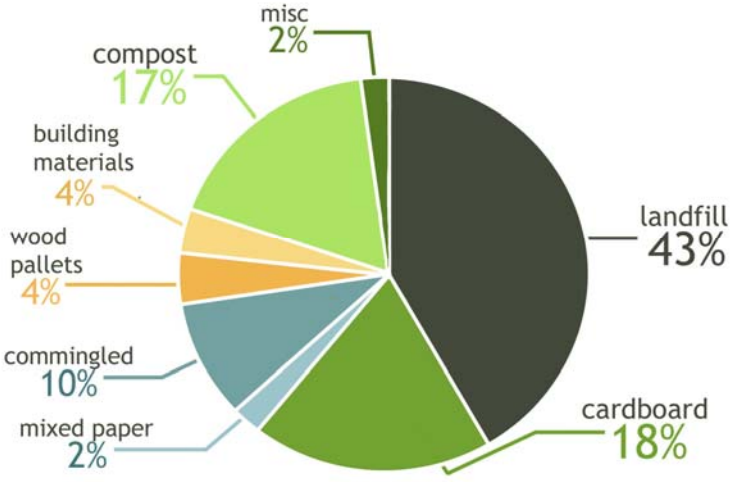
Achieving this goal requires careful planning on both sides of the client-facility relationship, as diversion rates are highly dependent on the volume and type of waste generated at each event. Waste-intensive public shows and trade shows with unusual waste streams pose the greatest challenges to the 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, and diversion rates well above the average can easily be reached during these types of events. 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.

2011 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. However, DLCC management 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 2011, the DLCC recycling program diverted 250.3 tons of waste from landfills of a total 431.6 tons of waste generated, achieving an annual diversion rate of 58%. The highest diversion rate for a single event was over 97% for the Association for the Advancement of Sustainability in Higher Education conference.



(2011 waste stream components)

By weight, diverted materials in 2011 were as follows:

- Cardboard: 79 tons
- Mixed / Bulk Paper: 9.44 tons
- Commingled Glass / Plastic / Aluminum: 42.86 tons
- Wood Pallets: 17.72 tons
- Building Materials: 16.32 tons
- Compost: 74.89 tons
- Miscellaneous: E-waste: 0.69 tons, Lamps: 0.72 tons

Additionally, 4.83 tons of food were donated to local food banks, and 3.85 tons of used cooking oil were converted into biofuel.

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 content[3]. 2011 diversion of cardboard, paper, glass, plastic, aluminum, and compost was responsible for an estimated savings of 512 mT CO_2e. An estimated total of 2,120 mT CO_2e has been avoided since recycling began in 2005, including 52 mT as a result of composting and 508 mT as a result of recycling 453 tons of wood, paper, and cardboard.

SOUTH TERRACE GREEN ROOF PROJECT

Waste management for major renovations is the responsibility of the contractors and is tracked separately from the building's operational waste stream. For the South Terrace Green Roof, a target diversion rate of 50% by weight was set for demolition materials. The final diversion rate was 73%. In total, 21 tons of artificial turf and 4.03 tons of insulation panels were donated to Construction Junction for reuse. 106 tons of concrete were recycled by Collier Stone Company, located fifteen miles from downtown Pittsburgh.

[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**.

(appendix a: reporting scope)

ORGANIZATIONAL BOUNDARIES

The content of this report is primarily focused on decisions made by SMG and the SEA with regard to the David L. Lawrence Convention Center (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, but those areas which the DLCC may have informal influence as relevant to its performance indicators are addressed to the extent currently possible.

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. Performance indicators have also been developed with respect to the Event Organizers Sector Supplement of the Global Reporting Initiative G3.1 Sustainability Reporting Guidelines[1], 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 two 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.
- 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.

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 is also taken into consideration. For this reason, many metrics are given in terms of both absolute values and per-attendee intensity metrics. It is important to note that the DLCC is directly affected by several external factors such as weather, event

[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**.

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. In particular, the DLCC has found it helpful to compare its own performance to the average performance of the 2009 convention center cohort developed by the case study. These results are referred to throughout the report as "2009 external benchmarks." More detail on the development of these benchmarks is included in the case study and in the evolve environment::architecture publication *Event Venue Benchmarking: A Look at the Convention Market*[2].

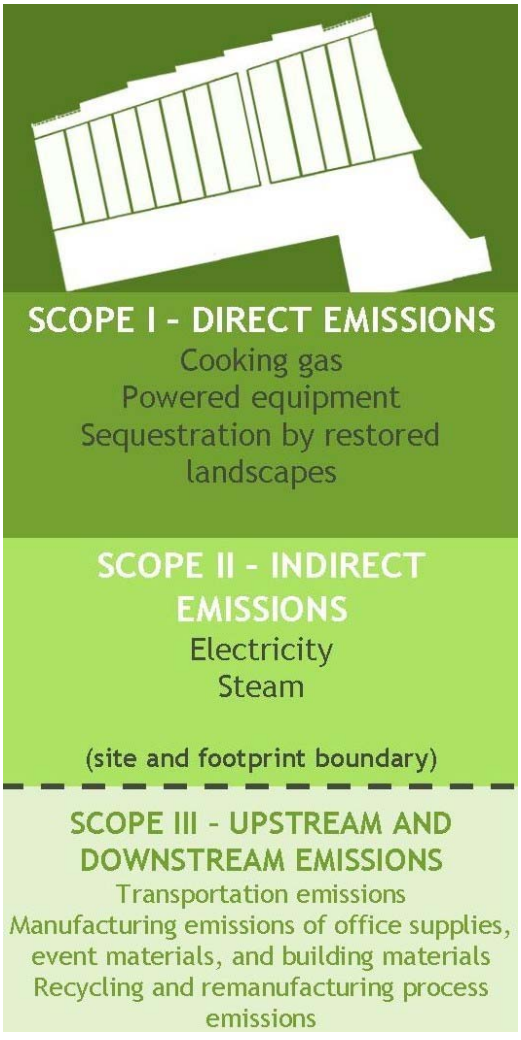
The organizational goals presented throughout this report reflect the DLCC's LEED for Existing Buildings: O&M certification strategy, and to the commitment to maintaining or exceeding the level of practice recognized by its LEED Platinum certification within reason of historical performance and trends.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

GREENHOUSE GAS INVENTORY METHODOLOGY

The DLCC quantifies annual greenhouse gas emissions using the methodology of the Greenhouse Gas Protocol Initiative[3] 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 2011, 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 time[4]. 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.



(dlcc carbon footprint)

[2] For information about this study, please visit **evolveea.com/work/event-venue-benchmarking**.

[3] 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**.

[4] 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.

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 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.