PLAY TO ZERO PLAYBOOK

BUILDING FOR THE NEXT GENERATION

JOURNEY TO ZERO
FOR SPORTS AND ENTERTAINMENT VENUES
I am pleased to present this Green Sports Alliance Playbook focused on the journey to zero for sports and entertainment venues: Building for the Next Generation.

Building for the Next Generation is a consolidation of insights and best practices from leading practitioners, organizations, and firms in the built environment. This playbook is more than how to push the boundaries of sustainable design and operations, it is a call to action to leave a lasting legacy by investing in superior design and technologies that reduce operating expenses, create partnership opportunities, enhance your brand and play a part in a healthy and prosperous future.

While new stadiums and arenas are making advances toward more sustainable design and operations, existing venues like Climate Pledge Arena in Seattle also present compelling opportunities for modernization and significant performance improvements. It is often stated that “the most sustainable building is the one already built.”

Sports have always been rooted in legacy - from the games we love to watch fought by the teams we stand behind and the players we admire. When teams win and players excel, they demonstrate that hard work, grit, and determination pay off.

Now, the hard work off the field must begin to address the urgency of the climate crisis. Leaders across the globe who are considering building a new venue or renovating their existing one have an opportunity. They have the chance to use these projects for good, to improve the social and environmental well-being of our communities and to advance the future of the entire sports and entertainment industry.

Now is the time to invest in a legacy rooted in more sustainable and regenerative practices so our industry can Build for the Next Generation.

ROGER MCCLENDON
GREEN SPORTS ALLIANCE EXECUTIVE DIRECTOR
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The sports industry is in a unique position to leverage the cultural and market influence of sport to tackle climate change while creating substantial value for our businesses. This Play to Zero playbook provides an essential roadmap for our industry to create value, lead by example and accelerate widespread change by making our buildings more efficient and reducing environmental impacts.

At the time of this publication, there are more than 25 new sports and entertainment venues being designed or constructed in the United States, and 52 major venues have been built in the last 6 years. Additionally, an estimated $1.5 billion worth of renovation projects have recently been announced. As a sector, buildings and construction account for 37% of global energy and process-related carbon dioxide emissions and more than 34% of global energy demand.¹

Forward-thinking sports team owners and executives are already leading the way by achieving net-zero energy, zero waste and 100% water balance. The opportunity has never been greater to create value and build purpose into your project that will leave a legacy.

In addition to the opportunities presented by building more sustainably, the risks to the sports industry from climate change are becoming increasingly apparent. We have the power to transform our relationship with the planet, increase our influence and do well financially in the process.

Every team, venue and league must make sustainability a strategic business priority. The risk of not doing so is simply too great to ignore. By investing in sustainability, sports can play a leading role in our battle against climate change. We can protect the future of our industry and communities by seizing opportunities to be more efficient and meaningfully engage our fans, communities and corporate partners.
INTRODUCTION: BUILDING FOR THE NEXT GENERATION

There are expert resources available to support our industry, including architects, engineers, contractors, consultants, and solution providers who are ready to ensure you maximize your investment. We know that to achieve greatness, we must lean on these experts, have a plan, and stick to the key fundamentals that will lead to success.

In this playbook, you will find five guiding fundamentals that are key to creating both short-and-long term value when renovating an existing venue or developing a new project.

FIVE KEY FUNDAMENTALS

Fundamental One: Green Venues are Good Investments
These inspiring projects result in tangible life-cycle savings for the owners, increase sponsorship opportunities and maximize return on investments.

Fundamental Two: Commit Early to Excellence
Beginning from Day One, authentic leaders must embed sustainability into the vision, goals and guiding principles.

Fundamental Three: Ensure Maximum Benefit to Communities
Venues serve the communities in which they are located. Project teams must strive to highlight and support the interdependencies between a venue and its surroundings.

Fundamental Four: Build for Our Future
Compiled together are many of the best and most forward-thinking green building design considerations for sports and entertainment venues to adopt and exceed.

Fundamental Five: Measure, Adapt, & Monitor
The work begins when construction is complete. Delivering a sustainable venue demands keeping it at its peak performance while constantly striving for improvement.

Sports and entertainment venues are some of the most iconic - and complex - structures in the urban environment and are presented with a unique opportunity to be leaders in driving sustainable design and operations.

Michael J. Soligo
President & CEO | RWDI
With the increased recognition of the importance of sustainability has elevated the need for common frameworks, standards, and certifications. The following graphic includes a list and brief description of some of the world’s most recognized and utilized green building rating systems and frameworks. This is not meant to be exhaustive, but to provide an at-a-glance look at the interrelationships between the most well known and impactful models and tools.

**ENERGY STAR**
Buildings that perform better than at least 75 percent of similar buildings nationwide

**SITES**
Comprehensive framework for designing, developing, and managing sustainable and resilient landscapes

**ISO**
Internationally-recognized best practices across the supply chain
- ISO 14001
  Environmental management systems
- ISO 14064-1
  Reporting for greenhouse gas emissions
- ISO 14040
  Life cycle assessment
- ISO 50001
  Energy management systems
- ISO 20121
  Sustainable Events

**LEED**
- LEED BD+C
  Addresses building design & construction activities
- LEED O+M
  Rating system for existing buildings toward more sustainable operations
- LEED Zero
  LEED complement for net zero carbon, energy, water, and/or waste

**ILFI**
- Arc Skoru
  Digital platform that measures and advises sustainability performance
- Play to Zero
  A performance- and recognition-based framework designed for sports and entertainment venues

**WELL**
- Living Building Challenge
  Most rigorous sustainable building standards in the world
- Zero Energy (ZE)
  Clean energy without fossil fuel consumption
- Zero Carbon
  Affecting climate change with zero operational and embodied emissions
- Core
  Ten simple first steps for achieving building sustainability
- WELL Health-Safety
- WELL Performance
- WELL Equity

**LENSES**
Not a certification; LENSES is a framework for cultivating systemic wellbeing in our communities

**PARKSMART**
Offers a roadmap for recognizing high-performing, sustainable, new and existing parking facilities

**TRUE**
A whole systems approach aimed at changing how materials flow through society, resulting in no waste

**WORLD GREEN BUILDING COUNCIL**
The World Green Building Council is a global network of national Green Building Councils in over 70 countries worldwide.

**STANDARDS, CERTIFICATIONS, & FRAMEWORKS FOR GREEN BUILDINGS**

The content of this publication has not been approved by the United Nations and does not reflect the views of the United Nations or its officials or Member States.
GREEN VENUES ARE GOOD INVESTMENTS

Embedding environmental design and management in venues has moved from quiet, cost-saving efforts to netting sports franchises mainstream headlines, lucrative partnerships and leadership recognition.

We are now firmly in an era where environmental, social and governance criteria are expected to inform business decisions. The fundamental shift to more holistic business thinking has firmly taken hold. Companies must address very real risks from climate to labor force to supply chain that have very real and escalating costs.

KEY TENETS OF A GOOD GREEN INVESTMENT

- Consider Total Life-Cycle Costs
- Expand the Life of the Building
- Maximize Return on Investments
- Build Brand Value & Activate Corporate Partners
- Collaborative Investments
GREEN VENUES ARE GOOD INVESTMENTS

Embrace Total Life-Cycle Cost
By considering both the first and total cost, venue owners can make more informed decisions that result in a more successful project in the long term. Striking the balance between construction first cost and total cost may involve investing in higher-quality materials or equipment during construction to reduce post-construction maintenance costs, or selecting a design that maximizes energy efficiency to reduce operating costs over time. Further, integrating sustainable building components into design and construction can decrease the need for future retrofits. There are also often utility and tax incentives for sustainable materials, energy efficiency measures and onsite renewable energy generation.

Expand the Life of the Building
There is a mantra in the built environment professional space that the most sustainable building is the one that does not have to get built. It is incumbent upon responsible owners, designers and builders to first ask themselves if the economic life of their current venue can be extended through an infrastructure-modernization plan. With new funding and financing approaches available, venue renewal projects can be just as effective as a new venue with significant capital savings for the public and private sectors.

"We set a goal of achieving the highest LEED rating because it was the right thing to do for our city and the environment, and with this achievement, we have a powerful new platform to showcase to the industry and to our fans that building sustainably and responsibly is possible for a venue of any type, size and scale."

Arthur Blank | Owner and Chairman Mercedes Benz Stadium
FUNDAMENTAL ONE:
GREEN VENUES ARE GOOD INVESTMENTS

Maximize Return on Investments
The following timelines serve as examples of green building practices resulting in tangible return on investment (ROI). All costs have been converted to 2023 dollar equivalent.

2006 - 2011: T-Mobile Park
Investment Toward Operational Improvements: $2,000,000
Baseline Year: 2006
Total savings by 2011: $2,000,000
Average Annual Energy Savings: $410,000
Average Annual Waste Savings: $130,000
Sustainability Sponsorship Revenue: $250,000

ROI: Achieved full return on investment and increased revenue generation in less than five years.  

2009 - 2011: Moda Center
Investment Toward Operational Improvements: $772,000
Baseline Year: 2009
Total savings by 2011: $1,141,000
Average Annual Energy Savings: $566,000
Average Annual Water Savings: $227,000
Average Annual Waste Savings: $358,000

ROI: Achieved full return on investment and increased revenue generation in less than three years.

2014 - 2019: Gillette Stadium
Four projects: 2014, 2016, and two in 2019
Investment Toward Operational Improvements: $13,835,000
Local Cost-Offsetting Incentives: $3,435,773
Total savings: $14,941,480
Average Annual Energy Savings (by end of 2019): $3,387,864

ROI: Individual projects range from 3 – 3.5 years

View Gillette Stadium’s full building sustainability projects breakdown.
Build Brand Value & Activate Corporate Partners

In the era of increased pressure to deliver on environmental and financial goals, look to build corporate partnerships that deliver co-benefits. By engaging corporate partners early in the design process, opportunities may emerge to deliver compelling, brand-aligned educational/marketing initiatives centered around stadium sustainability efforts. Event attendee engagement is a great way to showcase corporate sustainability commitments and drive future sustainability-related sponsorships.

Recently, new economic partners emerged in big-ticket sponsorship areas such as naming rights. Over the past few years, four separate facilities awarded naming rights to environmentally-focused partners including Footprint Center in Phoenix, Ariz. (Footprint) and Climate Pledge Arena in Seattle, Wash. (Amazon.com, Inc.). Amazon’s naming rights contract in Seattle is worth a reported $300-400 million over 20 years.

Collaborative Investments

Public-private partnerships (P3s) and Infrastructure-as-a-Service (IaaS) are becoming increasingly popular ways to finance, design, build and operate projects. When done right, P3s can result in:

- **Cost Savings:** P3s and IaaS can result in significant capital preservation and cost savings for the public agency, as the private entity may be able to obtain financing at lower rates and complete the project more efficiently than the public agency could on its own.
- **Risk Sharing:** P3s and IaaS allow the public agency to share or completely transfer risk to the private entity, as the private entity is responsible for the design and construction of the project and may be held accountable for any delays, cost overruns or other issues.
- **Innovation:** The private entity may bring innovative design and construction techniques to the project that may not have been available to the public agency, resulting in a higher-quality project.
- **Improved Public Services:** P3s and IaaS can result in improved public services, as the private entity may have a greater incentive to provide high-quality services to maintain its reputation and win future contracts.
Simply relying on a small group of sustainability experts or forming a green (or ESG) team will not suffice in advancing sustainability goals into transformational net-zero pledges or a competitive advantage. It is critical to instill a green building and sustainability mindset within the board members and C-suite executives – the drivers of the most critical decisions.

Articulate a compelling vision and set clear goals for your design and construction project. Ensure allocation of the resources and support needed to foster innovation and empower the team to take risks and try new approaches. Spend the time needed up front to identify anticipated risks and create a plan of action to address each. And be open to development of partnerships and collaborations that allow the team to share knowledge, resources and best practices to avoid making mistakes that others have already overcome.
FUNDAMENTAL TWO: COMMIT EARLY TO EXCELLENCE

Set Your Vision, Define Your Goals

The first step when creating a new venue is to clearly understand the vision for the project. The vision then sets the boundaries for goal setting, which will then guide the team through the design and construction phases. The earlier sustainable strategies are understood, prioritized and incorporated, the more integrated they are into the project, saving time and money.

This is especially important if a certification such as LEED, WELL, Living Building Challenge, TRUE or others will be pursued. Tracking a building certification along the design process helps make informative decisions when it comes to selecting a site, building orientation, material selections and system selections.

Think big and outside the box early. As design progresses it becomes increasingly more costly to pivot to the big new ideas.

When engaging with design and construction professionals, it's important to not simply set LEED Platinum or Living Building Certified as a target. It's crucial to be as specific and detailed as possible when it comes to setting project goals and targets. The more specific the targets, the better and more cost-effective the outcomes will be.

When establishing the vision and goals for the new venue, there are several areas to consider, each with differing degrees of investment and expertise required. Following are seven key areas to integrate into the visioning and goal-setting discussions:

1. Energy and Climate Action
2. Water
3. Material Management
4. Health and Wellness
5. Site Selection
6. Benefitting Local Community
7. Biodiversity
QUESTIONS TO CONSIDER

How are we going to drive maximum value creation by incorporating sustainability into the design process?

What positive community impact can we drive by making this venue a beacon of sustainability and equity?

What are the local environmental issues most important to address?

Which third-party certifications are appropriate to validate our results and convey our commitment?

How are we benchmarking ongoing waste, water and energy performance?

What is possible in minimizing and mitigating embedded and operational carbon?

How do we implement onsite distributed energy resources (e.g., renewable energy and storage)?

How can the venue be a leading steward of water both within the walls of the venue and in the broader community and watershed in which it will operate?

What is needed to operate a zero-waste venue?

Are there neighboring pollutants that could impact indoor environmental quality (IEQ)?

What are the expectations of current and potential sponsors and the company that will hold the venue naming rights?

How can we leverage this high-performance building through education and marketing to benefit our community and demonstrate leadership?
FUNDAMENTAL TWO:
COMMIT EARLY TO EXCELLENCE

Engage the Right, Best Team

An effective approach to assembling a design-build team should include:

Owners are critical to establishing the vision for the venue and providing the talent and resources needed to carry out that vision and achieve the stated goals. Ultimately, articulating these goals helps in identifying the right design team who will guide, inform and deliver on the owner’s vision.

When selecting the architect, general contractor and mechanical contractor, it’s important that their values align with the project values and goals. Take the time to ask architects to define their values and demonstrate their history of sustainable success on similar sports projects.

Engage your team early in the design process. Start with the end in mind and work toward that end.
FUNDAMENTAL TWO: COMMIT EARLY TO EXCELLENCE

Embrace Adaptive Management
Build into the design and construction process time needed to assess progress towards stated goals, evaluate tradeoff decisions and adjust strategies as needed. Adaptive management will need to be present post-construction to ensure the design of the building matches expectations when it is fully operational.

Embody the Integrated Design Process
The Integrated Design Process (IDP) is a collaborative approach to designing high-performance buildings that involves all parties from the very beginning. With an emphasis on collaboration, the purpose of the IDP is to ensure that all aspects of a project, from design to construction and operation, are carefully considered and integrated into a cohesive whole, ensuring optimized sustainability outcomes with lower costs and risks for the owner.

<table>
<thead>
<tr>
<th>CONVENTIONAL DESIGN PROCESS</th>
<th>INTEGRATED DESIGN PROCESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Involves only the members of the expanded team when necessary</td>
<td>Inclusion of all stakeholders from the beginning</td>
</tr>
<tr>
<td>Less time, energy, and collaboration in the first steps</td>
<td>Time and energy invested quickly and massively at the beginning of the project</td>
</tr>
<tr>
<td>Majority of decisions made by a limited number of stakeholders</td>
<td>Decision-making influenced by a large team</td>
</tr>
<tr>
<td>Linear process</td>
<td>Holistic iterative process</td>
</tr>
<tr>
<td>Systems often isolated (silos)</td>
<td>Comprehensive and systematic thinking</td>
</tr>
<tr>
<td>Optimization dictated by the constraints</td>
<td>Geared to complete optimization</td>
</tr>
<tr>
<td>Reduced search for synergies</td>
<td>Increased search for synergies across disciplines and building systems</td>
</tr>
<tr>
<td>Emphasis on the initial costs</td>
<td>Analysis of costs over the life cycle</td>
</tr>
<tr>
<td></td>
<td>Ongoing process after occupancy</td>
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</tbody>
</table>
Venues are anchor institutions within their communities. Not only do they provide a place where champions are made and celebrations held, they have long served as places of refuge, community and inspiration. By weaving the DNA of the local community and its native ecosystems into the venue design, these iconic structures can also become beacons of hope for a better tomorrow and positive stewards of community that serve all.
ENSURE MAXIMUM BENEFIT TO COMMUNITIES

FUNDAMENTAL THREE:

Increase sustainability through urban density and selecting brownfield sites.

Preserve natural habitat and encourage biodiversity.

Integrating transportation and land use.

Consider the health and environmental benefits of linking humans to nature, including accessibility to open spaces, neighborhood stormwater systems, waste treatment and food production.

Site Selection

The importance of site selection cannot be overstated. A legacy begins with the right site. Smart urban locations, accessibility to public transportation and preservation of environmentally sensitive lands are vital toward green building and operations. Choose a responsible site, design natural habitat preferences and protect it during construction.

- Increase sustainability through urban density and selecting brownfield sites.
- Preserve natural habitat and encourage biodiversity.
- Integrating transportation and land use.
- Consider the health and environmental benefits of linking humans to nature, including accessibility to open spaces, neighborhood stormwater systems, waste treatment and food production.

The venue site selection includes not only infrastructural and natural considerations, but also the social characteristics as well. The connections to surrounding areas and the community reaction to the venue greatly impacts how well the project will fit into the larger built environment.
## Guidelines to Local Community Engagement

- **Listen to local needs and voices in the design process.**
- **Form a local advisory council with good faith, long-standing community partners.**
- **Leverage existing organizations and align venue social priorities with local needs.**
- **Prioritize local businesses.**
- **Prioritize hiring local residents.**
- **Invest at the executive level to lead and create these opportunities.**

### Embody the Local Community

Discussions of sustainability in sports have largely focused on how to better design, build and operate sports facilities. But in any given community, the reach of a sports team is far greater than the footprint of its stadium or arena. To be truly bold and innovative on sustainability, new and retrofits of existing venues must actively benefit local residents and address their needs. Following are guidelines to local community engagement:

### Biodiversity

A cornerstone of sustainable development is the conservation of biodiversity. This involves beneficially managing living natural resources, safeguarding the diversity of ecosystems and species and preserving functioning ecosystems. Regardless of location or timing, all newly constructed or renovated venues will affect the local biodiversity.

Project teams can contribute by preserving spaces known to be critical for biodiversity, expanding natural habitats for animals and plants, restoring degraded habitats and supporting local communities in their conservation efforts.

Sports and entertainment venues also have the unique ability to expand awareness of human dependence on nature and conservation topics. Venues must play an active role in understanding the local ecosystem and their effects on it to play not only a preventative but also positive role.

As designers, we have the responsibility to continuously seek new, impactful solutions in response to the realities of the climate crisis. Beyond environmental impact, venues are a focal point for emerging crises related to environmental justice, affordability, health, disaster risks and water shortages.
FUNDAMENTAL THREE: ENSURE MAXIMUM BENEFIT TO COMMUNITIES

Design through a Regenerative Lens

The basic tenet of regenerative development is not only to avoid negative impacts, but to maintain an active and continual focus on natural and social systems that results in positive impacts through the life of a project.

Regenerative processes have three primary goals:
1. Catalyzing increased prosperity and health of human and natural environments through holistic design and meaningful community participation
2. Fostering positive feedback loops where human and natural resources are utilized within the biological carrying capacity of our planet.
3. Respecting and having deep consideration to local contexts, whether economic, cultural, or ecological, so that development is properly adapted to local ecosystems, cultural and economic circumstances.

Establishing a strong understanding of the socio-economic and environmental context of the venue/facility helps to inform the operating landscape of the venue. Inputs include analysis of the geographical location, local community and culture, the natural environment and interactions with logistics and supply chain, information technology, and connectivity to multi-modal transportation, tourism and hospitality infrastructure and public places including green space.

“With the increasing urgency of global challenges including climate change, biodiversity loss and excessive resource use, considering the concept of regenerative futures is timely.”

ENSURE MAXIMUM BENEFIT TO COMMUNITIES
BUILD FOR OUR FUTURE

Building for our future requires a focus on multiple aspects of green building design considerations including but not limited to the following: energy, material management, water and health and wellness. The following is not meant to be a blueprint; rather, these strategies are meant to be a starting point for design teams and owners.
Increasingly there is a stronger call for venues to achieve zero net carbon (ZNC). ZNC is achieved when a building is highly energy efficient and produces on-site, or procures, enough carbon-free renewable energy to meet annual building operations energy consumption. By themselves, the following strategies will achieve significant gains; taken together, they are able to help ensure sports and entertainment venues can achieve ZNC.

Passive Design

Passive design strategies rely on ambient energy sources instead of active energy sources like electricity, steam or natural gas. Leveraging passive systems dramatically decreases operating and total costs for the life of the building. The following passive design considerations should be evaluated early in the design process before moving on to active energy systems.

- Natural ventilation
- Daylighting and shading
- Solar thermal (heat/cooling sinks, Trombe walls)
- Building envelope/insulation strategies

Designing passive design considerations first will minimize the need for excessive energy consumption through active energy systems. Extensive energy modeling early in the design process can ensure the best mix possible for optimum energy efficiency and fan comfort.
Integrate Backup Power and Battery Energy Storage System (BESS). A BESS can complement onsite renewables by storing energy that can be utilized during outages or during peak demand times. If a venue is considering onsite renewable energy or has an existing renewable energy source, this can help shed capacity charges and store energy for later use.

**Electrification**

Electrification is the base for creating a decarbonized venue and includes the shift from infrastructure and equipment reliant on carbon intensive energy sources like natural gas, fuel oil, gasoline and diesel to carbon emission-free energy sources such as solar, wind and geothermal. A new venue or major renovation provides the opportunity to optimize the space for electrification and eliminate fossil fuels that may have been historically used for backup power generation, heating, cooking or onsite fleets. Electrification planning may include the following:

**Step One**

Ensure the venue is completely electrified, including no natural gas for heating or cooking. Full electrification requires the venue to focus on renewable energy production and renewable energy credits.

**Step Two**

Transition the fleet to electrified vehicles. While most venues do not have a traditional fleet of vehicles, the venue may own cars, trucks, golf carts, landscaping vehicles or other tools that may traditionally be fossil fuel powered. Ensure that your fleets are electrified, and the proper EV charging infrastructure is in place to meet capacity needs.

**Step Three**

Integrate Backup Power and Battery Energy Storage System (BESS). A BESS can complement onsite renewables by storing energy that can be utilized during outages or during peak demand times. If a venue is considering onsite renewable energy or has an existing renewable energy source, this can help shed capacity charges and store energy for later use.

**Step Four**

Include EV charging stations for fans’ vehicles.
Once the venue is designed for carbon-free electrification, ensure that the venue is also as energy efficient as possible. Following are four key areas to focus on, but this list is not meant to be inclusive:

**Energy Efficiency**

**Lighting**
LED lighting should be used for all interior and sport lighting. Networked lighting control systems with occupancy sensors can reduce energy consumption from lighting in unoccupied spaces. Integrate outdoor lighting into the lighting control system with dawn-to-dusk settings. And be sure to consider design elements that maximize passive lighting (sunlight).

**Appliances and Food Equipment**
Similar to home appliances, sports venues can opt for Energy Star rated commercial appliances and equipment and, if aiming for fully electric facilities, induction cooktop stoves and ovens.

**Heating, Ventilation, Air Conditioning (HVAC) and Refrigerants**
Sizing equipment appropriately is important to optimize energy efficiency for a space being heated or cooled. Reviewing energy rating of equipment, establishing a routine maintenance program and scheduling run times for equipment based on occupancy levels can help reduce energy use. Prioritize the use of refrigerants with low Global Warming Potential (GWP) and Ozone Depletion Potential (ODP) for cooling, following EPA guidelines.

**Building Envelope**
Ensure the venue is properly insulated and doors and windows are properly sealed to minimize the need for heating and cooling. Keep in mind insulation itself can have chemical contaminants that can damage air quality and the wellness of tenants and fans. Insulation should meet applicable volatile organic compound (VOC) emissions standards.

**Energy Use and Management**
Installing energy efficient equipment is critical as is ensuring that there is ongoing evaluation and management of that equipment. The following are key opportunities during the design phase:

**EMERGENCY MANAGEMENT PLAN**
An ongoing plan should include assessments of energy performance compared with a developed baseline, identifying energy saving opportunities and short-term and long-term energy reduction goals.

**BUILDING AUTOMATION SYSTEM (BAS)**
A BAS is important to manage and control heating, cooling and lighting, as well as control energy systems based on occupancy levels or changes in environmental conditions.

**BUILDING COMMISSIONING**
Building commissioning ensures all systems are operating as intended. For example, ensuring that the BAS, HVAC or lighting control systems that were designed to improve energy efficiency, are installed and operating correctly.

**SUBMETERING**
This practice helps identify areas of the venues with the most energy usage, which can inform decisions on how to manage resources more efficiently. Consider submetering in various parts of the venue.

**DEMAND RESPONSE PROGRAMS**
Energy companies may offer incentives or disincentives for demand response programs such as time-of-use pricing (i.e., charging for energy based on high and low demand periods).
RENEWABLE ENERGY

Designing onsite renewable energy into sports venues can generate zero-carbon energy to offset facility consumption. Rooftop and ground-mounted solar arrays connected to battery storage are becoming commonplace in today’s built environment. Many other options exist in design-build considerations, including:

- Wind energy turbines
- Geothermal heat pumps
- Sewer Heat Recovery
- Bioenergy and anaerobic digesters
- Thermal and phase-change energy storage
- Fuel cells

Facility owners should not limit renewable energy systems to onsite space availability. Venues consume a tremendous amount of energy, which can become costly when purchased directly from utilities. Opportunities exist for larger, utility-scale deployments through power-purchase agreements (PPAs) and other alternative funding models.

The Indianapolis Motor Speedway runs on 100% renewable energy. Their 39,312 solar modules generate 9.0 megawatts of power across 68 acres. This is equal to offsetting 10,288 tons of carbon annually. 8

— Greg Landa | CEO | CES Power

"Both new and existing venues must prioritize sustainable practices in construction and upgrades. The ultimate goal is to reduce the impact of these venues on the environment, promote the conservation of natural resources, and work towards a more sustainable future for generations to come."
Build for Circular Economy

The circular economy is an economic system based on the elimination of waste through reuse and regeneration of materials and products. The core principle is to retain items in use for as long as possible. Not only is a circular economy beneficial for the environment, but it has also proven economic benefits as well.  

Key tenets of a circular economy include:

Sharing | Leasing | Reusing | Repairing | Refurbishing | Recycling

The success of the circular economy depends on minimizing overall material consumption. Venues must look at waste patterns and strategize reductions. Rather than relying on raw materials, venues must innovate and find ways to utilize long-lasting, durable goods and make preferences for reusables products.

By embracing circular economy principles, we can minimize waste, conserve resources, and create new economic opportunities. Let’s shift from a linear to a circular mindset and build a better world.

Sam Scoten | Co-Founder & CEO | CheckSammy
Zero-Waste Operations Infrastructure

Zero-wasted is the most consistent, tangible way to engage fans and leverage venues to promote sustainability.

Back of House (BOH)
The BOH areas, specifically food preparation areas, need to be designed with space for appropriate waste and material diversion bins, most importantly for organic diversion. Composting can be one of the most cost-effective ways to reduce a venue’s carbon footprint.

Front of House (FOH)
Fan and employee engagement are critical to waste diversion. Planning for co-locating bins for each waste stream (typically compost, recycling and landfill) ensures that appropriate waste sorting options are visible and accessible to all. Consider convenient bin locations, appropriate signage and color-coded receptacles to match the specific material streams.

Waste Haulers and Partners
Determine what waste streams local municipalities and commercial entities can support by interacting with recycling facilities, compost facilities and edible food donation partners.

Space and Design Considerations
New construction must set aside adequate space in accordance with their venue. Managing multiple material streams requires waste separation space, multiple compactors or collection bins, potentially onsite composting equipment and storage facilities.

Space is one of the significant challenges with retrofitting existing venues for improved waste diversion; guard this designated space through the design process.

Learn about how Mercedes-Benz Stadium designed with zero-waste in mind.
Circular Construction and Deconstruction

By first aligning with the capabilities of local material recovery facilities, project teams need to develop a waste management plan and diversion goal for the beginning of life (construction) and end-of-life (demolition). Reducing construction and demolition waste disposed of in landfills is accomplished through waste prevention, reuse, recovery, and recycling.

Deconstruction and Reuse: 600 million tons of construction and demolition debris were generated in the United States in 2018 - more than twice the amount of generated municipal solid waste.11

Materials Selection

The design phase of a project affords an opportunity to procure more sustainable materials. The following are high-level guidelines for healthy material selection:

- **Recycled Content**
  Incorporate recycled content materials, thereby reducing environmental impacts from extraction and processing of virgin materials.

- **Healthy**
  Use materials that promote health among construction workers and occupants; avoid volatile organic compounds (VOCs) and hazardous materials.

  **Hazardous chemicals in buildings can have detrimental effects at all phases of their existence, from potential exposure of workers and adjacent communities during manufacture to noxious emissions during use to toxic inputs to air, soil, and water at disposal.**

- **Locally-Sourced**
  Source locally extracted and manufactured building materials and products, thereby supporting the use of indigenous resources, and reducing the environmental impacts resulting from transportation.

  **Elect low embodied carbon materials. Carbon is emitted in the production and transportation of the materials that construct the facility, which can be significantly higher in major venues.**
Sports and entertainment venues are inextricably linked with broader ecosystems and the watersheds in which they are located, each of which have or are expecting to face water shortages as well as water disruption caused by a more volatile climate and aging drinking, wastewater and stormwater infrastructure. The water use practices for drinking, irrigation, wastewater and stormwater affect the health of our local waterways, which will determine the availability of clean water for generations to come.

Without Water, the Show Cannot Go On

The Green Sports Alliance has launched the first-ever playbook on water for sports and entertainment venues:

**ALL SPORTS ARE WATER SPORTS PLAYBOOK**

The All Sports are Water Sports Playbook provides a foundation of knowledge, practice and inspiration to those who own, operate, manage, advise, service, design and build stadiums, arenas and fields. Four key strategies across drinking water, wastewater and stormwater management are presented:

Four key strategies across drinking water, wastewater and stormwater management are presented:

- **Strategy #1:** Understand your Water Baseline
- **Strategy #2:** Water Efficiency
- **Strategy #3:** Water Reuse
- **Strategy #4:** Water Replenishment & Ecosystem Stewardship

In 2009, the Target Center became the first arena in North America to install a green roof. The roof captures nearly 1 million gallons of storm water annually to prevent drainage into the Mississippi River. 

12
A Perfect Environment for Innovation

Our industry is presented with both a great opportunity and a great challenge to increase the resilience of our communities and to prepare for and respond to the future adverse impacts of climate change on the quality and availability of our most precious resource: water.

Sports and entertainment venues are high-volume, closed systems - the perfect environment to test new products, processes, partnerships and policies that improve water efficiencies, water capture and water reuse. We encourage you to review the playbook and consider from the very start of your project the way in which your venues will have the greatest opportunity to ensure availability of safe and affordable water resources for all of our communities.
A Healthy Perspective

Integrating strategies for your facility to support a healthy workplace for your employees and fans begins during the design phase.

When designing Healthy Buildings, it is important to have the knowledge and intuitive lens of being sensitive to human needs.

Sports and entertainment venues contain substantial amounts of embodied carbon, which needs to be prioritized and reinvented through the power of design.

Ryan Sickman PE, LEED AP | Global Director of Sports | Gensler Sports
HEALTH & WELLNESS CONSIDERATIONS FOR YOUR VENUE

AIR QUALITY
Ensure high levels of indoor air quality through diverse strategies that include source elimination or reduction, active and passive building design and operation strategies, and supporting positive human behavior and awareness.

WATER QUALITY
Design building systems to ensure the quality, distribution and control of water in a building. Provide easy access to hydration for building occupants.

VISUAL QUALITY
Integrating daylight and electric light to create lighting strategies that are focused on visual acuity, comfort (i.e., minimizing glare and contrast) and human health (i.e., daylight quality, circadian rhythm considerations) can lead to healthier, more enjoyable and more productive environments for your building occupants.

THERMAL COMFORT
Promote human productivity and ensure a maximum level of thermal comfort among all building users through passive design measures such as shading, thermal mass and natural ventilation to be supplemented with improved HVAC system design and control to meet individual thermal preferences for fans, players and employees.

ACOUSTIC COMFORT
Plan and design your venue to identify and mitigate acoustical comfort parameters so that fans, players and employees are not distracted or discomforted by unwanted noise. Considerations for maximum noise levels and sound quality can be controlled through good acoustical design practices such as sound modeling.

NUTRITIONAL QUALITY
The way our food environment is designed and operated as well as the availability and access to healthy foods and beverages in your venue plays a role in supporting healthy choices and promoting healthy eating behaviors. Promote fruits and vegetables, encourage nutritional transparency and allergen labeling and source food responsibly.

MATERIALS QUALITY
Select and install building materials to reduce or eliminate human exposure to hazardous building materials.

CONNECTION TO NATURE
People have an innate connection with the natural world that creates a sense of relaxation and well-being. How can the venue offer that experience?

PHYSICAL ACTIVITY
Design your venue so that it promotes movement, physical activity and active living and discourages sedentary behaviors through environmental design strategies, programs and policies.

MENTAL HEALTH
Implement policy, program and design strategies that support the cognitive and emotional well-being of occupants, fans, staff and players, including designing spaces to be accessible and comfortable for people of all backgrounds and abilities.
As is the adage, you cannot improve what you do not measure. Begin by setting up tools and procedures to ensure your venue can establish baselines and track performance. Many tracking systems integrate with building management systems for efficient operations daily. Leverage your tracking to continually improve your operational performance and identify inefficiencies.

Additionally, vendors and their initial contracts need to align with your data and reporting standards, especially for ESG-related reporting.
FUNDAMENTAL FIVE:
MEASURE, ADAPT, & MONITOR

Baselines and Benchmarks

A baseline is a measurement over a fixed period of time used to compare against future changes. Baselines are vital to understanding where you are or where you began in order to plan where you are going.

1. Knowing where, when and how often water or energy, for example, are used will define your efficiency improvement strategy.
2. Enables teams and venues to set reduction or strategic targets, demonstrating leadership and achieving operational savings.

Once the baseline for a facility and operations is better understood, it is useful to define the appropriate metrics to benchmark and track emission trends. For example, a common carbon metric is based on facility size, MTCO2e/m2. This allows for comparison across building types and regions.

Metrics such as these will allow for benchmarking your facility with others across the industry. They can serve as important data in establishing reduction goals and will allow for year-over-year monitoring and reporting of trends and return on investments.

Play to Zero

Play to Zero in Arc offers sports venues a comprehensive solution to input, track and benchmark their energy performance. Designed for sports venues, Play to Zero aims to shift towards net-zero energy operations within the sports industry. As a performance-based framework that enables all stakeholders to come together, enhance their practices and recognize exemplary leadership and performance, Play to Zero strives to create a sustainable future for the sporting community while celebrating milestones along the way.
Over the past two decades, the average lifespan of a sports and entertainment venue has shrunk considerably from roughly 50 years to 20-30 years. Yet, the costs of new construction and major retrofits have not.

Conversely, the expectations from fans that attend events, teams that call these venues home and musicians that prioritize the venues on their world tours have only increased during this same period. Shifts in expectations include increased sustainability performance, new technologies, better amenities, more seating options and more.

Alongside these shifts is a changing climate that is having dramatic impacts on the communities in which the venues are located. Temperatures and weather events are becoming more volatile and unpredictable. Calls for increased circularity and decreased carbon emissions are growing stronger. Competition for marketing dollars is increasing with a focus on alignment with environmental impact and social justice.

Through all these challenges a clear call to action has emerged for increased leadership on sustainability in new venue design and renovation of existing venues.

Those that heed this call will build cutting-edge sustainable buildings. From net-zero carbon to renewable energy, watershed stewardship, and zero-waste principles to the way in which the community is considered during the design phase through operation, those who answer understand the power of sports to Build for the Next Generation.
Now more than ever, the need to prioritize environmental and human health within our buildings, organizations, and communities is abundantly clear. We are at a pivotal moment for the sports industry to be at the forefront of this leadership and accelerating positive change — moving from awareness into action!

Carlie Bullock-Jones, LEED Fellow, WELL AP | Founder and Principle | Ecoworks Studio
We asked some of the most sustainable sports and entertainment venues in the US to share what they are doing to build a better future. What follows are several case studies featuring these venues from around the country, complete with highlights and details of how they are transforming their communities and the planet. All data from case studies is self-reported.
## VITAL STATS

<table>
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<tr>
<th>YEAR BUILT:</th>
<th>1962, RENOVATED IN 2021</th>
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<tr>
<td>LOCATION:</td>
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<tr>
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<td>TEAMS:</td>
<td>NHL - SEATTLE KRAKEN</td>
</tr>
<tr>
<td></td>
<td>WNBA - SEATTLE STORM</td>
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<td>ANNUAL EVENTS:</td>
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</tr>
<tr>
<td>ANNUAL VISITORS:</td>
<td>1,000,000+</td>
</tr>
</tbody>
</table>

## BUILD FOR THE FUTURE DATA

### Energy

- **Energy Usage from Renewable Resources**: 100%
- **Renewable Energy Profile**: 100% renewable energy through onsite solar and offsite renewables
- **Renewable Energy Type & Generation Capacity**: 1.2 MW solar portfolio
- **kWh per Year of Renewable Energy**: 570,000 kWh
- **LED Lights**: 224 LED displays are installed in and around the arena.
- **Design Considerations**: Built to LEEDv4 BD+C standards
- **Cogeneration Considerations**: The only all-electric arena in the world.

### Water

- **Storm Water Management**: 2 50,000 gallon storm water tanks
- **Cistern Info**: Cistern size: 15,000 gallons. Water is filtered, purified, and used to resurface their ice.
- **Indoor Water Conservation**: Waterless urinals and ultra-efficient shower. 20+ Water refill stations.
- **Landscape and Additional Design Considerations**: 67 London Plane trees preserved on the campus; 200-foot long living wall that holds some 8,500 plants kept alive with LED grow lights powered by renewable energy; 12,000 plants and trees on campus.

### Building Design

**Special Building Envelope Considerations**: Climate Pledge Arena began with an epic example of recycling that put a 44-million-pound historic roof from the 1962 World's Fair on stilts to build an entirely new arena underneath. This move to save the roof and expand the arena space underground reduced the embodied energy use typical of new construction.

### Mindset and Certifications

**Venue Funding Source**: Private: Oak View Group
**Original Sustainability Mission**: To be the most progressive, responsible and sustainable arena in the world.
**Original Goals**: 1) Create the first International Living Future Institute certified zero carbon arena in the world; 2) Eliminate single-use plastics at the arena by 2024; 3) Conserve water; 4) Achieve a 95% waste diversion rate; 5) Ban of single-use plastic in the building by 2024; 6) Sourcing 75% of all food ingredients within a 300-mile radius of the building; 7) 25% of our fans are to take public transit annually.
**What's Your Why?**: Commitment to net zero carbon across the business annually, ahead of the 2024 goal.
**Achieved during Construction**: In progress: ILFI Certified Zero Carbon; In progress: LEED Silver
**Achieved during Operations**: In progress: ILFI Certified Zero Carbon; In progress: LEED Silver

### Material Management

**Diversion Rate & Data**: 94%
**Procurement Considerations**: We have procured every material around the concourse to either be compostable or recyclable (minus 4 wrappers in the arena which we will eliminate before our 2024 ban of single use plastic goal).
**Donated Meals**: ALL viable food & food ingredients are donated to local community food programs and Farestart.
**Food Choices**: 75% of all food ingredients are procured within a 300 mile radius of the building. There are vegan and vegetarian food options throughout the concourse including Impossible.

### Site

**EV Charging Stations**: 24
**Parking Considerations**: 3,500 spots around the Seattle Center Campus. To encourage folks to take public transit your ticket to any event doubles as a free public transit pass.
**Carbon Zero**: Create first International Living Future Institute, no fossil fuel consumption in arena (first all electric arena in the world), 100% renewable energy, offsetting all indirect consumption.
**Decarbonization**: First ever all-electric Arena in the world, no fossil fuel usage utilized onsite. The building was fully decarbonized through guidance provided by the most stringent certification in the world: Zero Carbon Certification through ILFI

**Single-Use Plastic Elimination**: 100% plastic-free by 2024

## HIGHLIGHTS

- **THE ONLY ALL-ELECTRIC ARENA IN THE WORLD**
- **RECYCLED THE ENTIRE ARENA ROOF FROM THE 1962 WORLD'S FAIR**

### Biological Systems

Design of this project preserved the site's longest living tenants: 67 London Plane legacy trees dating back to the 1962 World's Fair, which capture roughly 3,216 collective pounds of carbon each year.

### Biodiversity Considerations

- **Biodiversity Considerations**: 25-30 places on the Living Wall
- **Public Transportation Options**: Light Rail/Bus/Monorail- free with ticket; Climate Pledge Arena has a fully-integrated transportation plan that includes electric vehicle charging stations, bike valets for events hosting more than 10,000 people and streamlined access from the monorail.

### Food Choices

- **Food Choices**: 75% of all food ingredients are procured within a 300 mile radius of the building. There are vegan and vegetarian food options throughout the concourse including Impossible.
**VITAL STATS**

**YEAR BUILT:** 1995  
**LOCATION:** PORTLAND, OR  
**CAPACITY:** 19,393  
**TEAMS:** NBA - PORTLAND TRAIL BLAZERS  
**ANNUAL EVENTS:** 150  
**ANNUAL VISITORS:** 1,700,000

**HIGHLIGHTS**

- **SINCE 2008,** cut water event-day-person by 38%. This equates to over 3 million gallons of water saved annually.
- **2022 LEED PLATINUM O+M**

**Mindset and Certifications**

- Venue Funding Source: Private: Vulcan Inc., a holding company owned by the estate of Paul Allen
- Original Sustainability Mission: Committed to making a big difference, with a small footprint.
- Original Goals:
  1. Lower and offset our environmental impact
  2. Inspire sustainable behavior change in our fans
  3. Vow to form aligned partnerships
  4. Engage in community philanthropy
- What’s Your Why?: We have a lifelong commitment to protecting the places we live, learn, and play.

**Achieved during Operations:**

- 2010 LEED O+M Gold
- 2014 LEED O+M Gold
- 2019 LEED O+M Platinum
- 2022 LEED O+M Platinum
- 2021-2023 WELL Health-Safety Rated

**Material Management**

- **Diversion Rate & Data:** 75%
- **Procurement Considerations:** Environmentally cautious purchasing & compostable concessionware. In the 2022-23 season we piloted a first-of-its-kind reusable foodware program in select concessions that eliminated 10,000+ single-use items (700 pounds of waste).
- **Donated Meals:** 48,325 pounds of reusable food has been recovered from Rose Quarter games and events, equaling 40,271 meals donated to children and families in need since 2014.
- **Dedicated Waste Sorting:** Post-game sorting operations for clean compost and recycling streams. 365 waste bins located across campus with compost, recycling, and landfill.
- **Dedicated Waste Sorting Space:** 2,000 sq ft
- **Single-Use Plastic Elimination:** Goal to achieve zero waste by 2030 with path to be 100% compostable, reusable, or recyclable in our concession stands.
- **Food Choices:** Conscientiously source, prepare, serve, and dispose of our food. Levy Restaurants currently sources 43% of our food and beverage sourced locally. There are also vegan and vegetarian food options at many stands with options on every concourse level.
- **Meal Donations:** 48,325 pounds of reusable food has been recovered from Rose Quarter games and events, equaling 40,271 meals donated to children and families in need since 2014.

**Water**

- **Indoor Water Conservation:** Low-flow toilets and fixtures. Smart irrigation & controls. Since 2008, we cut our water/event-day-person by 38%. This equates to over 3 million gallons of water saved annually. We also clean the building with environmentally friendly practices and products, eliminating over 400,000 gallons of waste-water every year.
- **Landscape and Additional Design Considerations:** Drought-resistant landscape. Balance 100% of water use through purchases of water restoration certificates. These restore water to the Middle Deschutes River.

**Site**

- **Heat Island/Emissivity Considerations:** Bright white cool roof
- **Public Transportation Options:** 7 lines leading to arena, Rose Quarter Transit Center stop. TriMet runs extra MAX service on game days.
- **EV Charging Stations:** 28 EV charging stations. Complimentary charging for fans that have paid for parking.
- **Parking Considerations:** Encourage fans to take alternative transit. Pre-sell parking passes and close garages to passes only.
VITAL STATS

YEAR BUILT: 2017
LOCATION: ATLANTA, GA
CAPACITY: 75,000
TEAMS: NFL - ATLANTA FALCONS
MLS - ATLANTA UNITED TEAM
ANNUAL EVENTS: 50 MAJOR EVENTS; 200 PRIVATE
ANNUAL VISITORS: 3,000,000+

HIGHLIGHTS

- TRUE CERTIFIED 2022
- LEED ZERO WASTE
- ABLE TO DIVERT 2.1 MILLION GALLONS OF STORMWATER RUNOFF THROUGH CISTERN

MINDSET AND CERTIFICATIONS

Venue Funding Source: Private: Arthur Blank
Original Sustainability Mission: We set out to build a venue that would not only exceed expectations, but also push the limits of what was possible in terms of stadium design, fan experience, and sustainability.
Original Goals: 1) LEED Platinum 2) Zero-Waste Stadium
What’s Your Why?: Leading the way in Sustainability in Sports pushing the bounds of what is possible.
Achieved during Construction: 2017 LEED Platinum
Achieved during Operations: TRUE certified 2022; LEED Zero Waste

ENERGY

Energy Usage from Renewable Resources: 13%
Renewable Energy Profile: 13% total renewable energy from Georgia Power (this is not just solar panel RECs. But also includes how much carbon free energy Georgia Power has in the grid). Depending on the year about 4% comes from solar panels on site.
Renewable Energy Type & Generation Capacity: 4000 Solar panels
kWh per Year of Renewable Energy: 1.6 million kWh
Design Considerations: Ethylene tetrafluoroethylene (durable lightweight translucent plastic that allows for natural light) retractable roof: 160,000 sq ft of ETFE to let in natural light

WATER

Storm Water Management: Able to divert 2.1 million gallons of stormwater runoff through cistern, bioswales, and a 1.1 million gallon underwater stormwater vault with slow release to prevent flooding
Cistern Info: Cistern size: 680,000 gallons. Used for irrigation & AC cooling tower
Indoor Water Conservation: Low-flow toilets and faucets. Waterless urinals
Landscape and Additional Design Considerations: Local food production features such as edible landscaping and an urban garden.

SITE

Biological Systems: Urban Garden and Bio Swells for carbon sequestration
Biodiversity Considerations: Native Grasses and 3 Bee boxes to stimulate urban Ag
Public Transportation Options: Two rail lines (MARTA Stations) that bookend the stadium
Bike Racks: 250 bike racks / Bike Valet for all Atlanta United and Falcons games
EV Charging Stations: 48 EV charging stations
Parking Considerations: 20,000 parking spots within a 20-minute walk

MATERIAL MANAGEMENT

Diversion Rate & Data: 90%+, TRUE Certified
Procurement Considerations: Only certified compostable food service wares or truly recyclable items in stadium.
Dedicated Waste Sorting Space: 6,000 sq ft
Donated Meals: 100,000 meals per year
Community Support: 90% of fans indicated that they are proud of the Falcons and United for being environmentally friendly
Plus, 93% of respondents took our Zero Waste pledge and also indicated that our Zero Waste initiative is important to them.

BUILD FOR THE FUTURE DATA

2017
ATLANTA, GA
NFL - ATLANTA FALCONS
MLS - ATLANTA UNITED TEAM
50 MAJOR EVENTS; 200 PRIVATE
3,000,000+

YEAR BUILT: 2017
LOCATION: ATLANTA, GA
CAPACITY: 75,000
TEAMS: NFL - ATLANTA FALCONS
MLS - ATLANTA UNITED TEAM
ANNUAL EVENTS: 50 MAJOR EVENTS; 200 PRIVATE
ANNUAL VISITORS: 3,000,000+
**VITAL STATS**
- **YEAR BUILT:** 2000
- **LOCATION:** St. PAUL, MN
- **CAPACITY:** 20,000
- **TEAMS:** NHL - MINNESOTA WILD
- **ANNUAL EVENTS:** 150
- **ANNUAL VISITORS:** 1,700,000

**HIGHLIGHTS**
- 144 SOLAR THERMAL PANELS - EACH 8’ X 20’ - THE LARGEST OF ITS KIND IN THE COUNTRY.
- 5500 LIGHTS HAVE BEEN UPGRADED TO LEDs IN THE LAST DECADE

**BUILD FOR THE FUTURE DATA**

### Water
- **Indoor Water Conservation:** 100% of faucets have been converted to low-flow, and specifications require that toilets and urinals are switched to low flow as they are upgraded.

### Material Management
- **Diversion Rate & Data:** 58%
- **Procurement Considerations:** Green Purchasing Playbook was first developed in 2011 to guide staff purchases for a wide range of items. The resource is updated periodically to keep pace with market development; Nearly all food service items are either compostable or recyclable, with collection areas throughout the concourses. Cleaning staff make dedicated laps through the seating bowls after an event to collect recycling, compostables, and finally any remaining trash.
- **Dedicated Waste Sorting Space:** 2400sq ft

### Site
- **Unknown Title:** Following demolition of the Saint Paul Civic Center, Xcel Energy Center was subject to space constraints as it was built on the existing urban site bordered by major traffic thoroughfares and the adjacent convention center.
- **Heat Island/Emissivity Considerations:** Xcel Energy Center’s roof is comprised of a white reflective membrane that minimizes solar heat gain.
- **Decarbonization:** The Minnesota Wild is a signatory of the Sports for Climate Action Initiative, which “aims to support and guide sports actors in achieving global climate change goals.” This partnership is dedicated to taking meaningful action toward reducing carbon emissions from the Sports industry.
- **Public Transportation Options:** Xcel Energy Center sits one block from a city bus terminal and within easy walking distance of the local high-speed rail line.
- **EV Charging Stations:** 8

### Energy
- **Energy Usage from Renewable Resources:** 100%
- **Renewable Energy Profile:** 100% renewable electricity through Xcel Energy’s WindSource program; Energy for cooling is 100% offset with REC purchases by utility partner District Energy Saint Paul; Approximately 50% of energy for heating comes from waste biomass burned in District Energy’s combined heat and power plant.
- **Renewable Energy Type & Generation Capacity:**
  - 81 kW portfolio (348 Solar PV panels); 1MW (144 Solar Thermal Panels, each 8’x20’) - the largest of its kind in the country.
- **kWh per Year of Renewable Energy:** 6.7 million kWh/yr in RECs from Xcel Energy’s WindSource program; The solar panels on the parking ramp generate approximately 50,000 kWh/yr; The solar thermal array on RiverCentre generates about 800 MWh heat per year.
- **LED Lights:** 80%+ of lighting; 5,500+ lights have been upgraded in the past decade.
- **Cogeneration Considerations:** Heating comes from District Energy’s combined heat and power plant

### Mindset and Certifications
- **Venue Funding Source:** Public: City of Saint Paul
- **Original Sustainability Mission:** To be a regional leader in sustainability
- **Original Goals:** In 2009 we created the goals: 1) ‘50-50 in 2’ - Reduce trash by 50% and increase recycling to 50% in 2 years; 2) ‘80-20 in 3’ - Reduce operational carbon footprint by 80% and increase efficiency to 20% better than average in 3 years.
- **What’s Your Why?:** Our goal across the entire organization is to create a greater state of hockey. It only makes sense to invest in making our venue as sustainable as possible to support our goal.
- **Achieved during Construction:** Xcel Energy is unique to this list as it was not built with sustainability in mind.
- **Achieved during Operations:** LEED PLATINUM 2019; Green Globes - 3 of 4 globes (2017); Events Industry Council Sustainable Events Certification – Gold.
- **Note:** all three certifications were originally achieved in 2014 at lower levels.
Q2 STADIUM

VITAL STATS

YEAR BUILT: 2021
LOCATION: AUSTIN, TX
CAPACITY: 20,738
TEAMS: MLS - AUSTIN FC
ANNUAL EVENTS: 350
ANNUAL VISITORS: 500,000

HIGHLIGHTS

- 2021 LEED GOLD
- NATIVE VEGETATION, PURPLE PIPE PLUMBED, BIO-FILTRATION POND INCLUDES 24 ACRES ONSITE AND 48.5 ACRES OFFSITE

BUILD FOR THE FUTURE DATA

Mindset and Certifications
Venue Funding Source: Private: R.H. Seale
Original Sustainability Mission: Embedded into initial design pillars
Original Goals: LEED Silver
What's Your Why?: Responsibility to the community and leader within MLS
Achieved during Construction: 2021 LEED Gold
Achieved during Operations: In Progress: TRUE Pre-Certification

Energy
Renewable Energy Type & Generation Capacity: 50 kW Portfolio (134 Solar PV Panels)
LED Lights: 100% of lighting
Design Considerations: Implement Fundamental Commissioning and Enhanced Commissioning for HVAC systems and a whole building energy simulation was used to demonstrate an improvement of 10% in the building performance rating compared with LEEDv4 baseline

Water
Storm Water Management: 4vault system for collection
Indoor Water Conservation: Low-Flow WaterSense labeled fixtures
Landscape and Additional Design Considerations: Native vegetation, purple pipe plumbed, bio-filtration pond includes 24 acres onsite and 48.5 acres offsite and a significant impact to reduce stormwater runoff produced by regulated storm.

Building Design
Special Building Envelop Considerations: Whole Building Lifecycle Assessment implemented to inform design
Construction Material Types and Benefits: Reflective roof to mitigate heat island effect

Material Management
Procurement Considerations: F&B flatware and most products are compostable. Suites utilize YETIs as a reusable product and all janitorial paper products are 100% recyclable materials
Donated Meals: Program just started in 2023 - through 9 events: 631.15 lbs of food

Site
Parking Considerations: Integrated parking network with limited onsite parking and use of surrounding development on event days. Park and ride with public transit
Single-Use Plastic Elimination: Net Zero Waste

Bike Racks: 144+ free bike valet on event days

Geographic Consideration: Sensitive Land Protection. Near the population center of Austin. Near public transit (bus and rail)
Heat Island/Emissivity Considerations: Highly reflective roofing material to minimize effects on microclimates, human, and wildlife habitats by reducing heat islands. Reduced hardscape and incorporated high SR materials
Biological Systems: Bio-filtration pond
Biodiversity Considerations: 8 acres of green space and over 250 trees planted onsite
Public Transportation Options: (3) Bus Routes and Rail Stop
Adaptive Management: (is a decision process that) promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Careful monitoring of these outcomes both advances scientific understanding and helps adjust policies or operations as part of an iterative learning process. Adaptive management also recognizes the importance of natural variability in contributing to ecological resilience and productivity. It is not a ‘trial and error’ process, but rather emphasizes learning while doing. Adaptive management does not represent an end in itself, but rather a means to more effective decisions and enhanced benefits. Its true measure is in how well it helps meet environmental, social, and economic goals, increases scientific knowledge, and reduces tensions among stakeholders.14

Arc: Arc is a digital platform created by Green Business Certification Inc (GBCI). It utilizes a data-driven approach to measure, track, and score the operational performance of energy, water, waste, human experience, and transportation. Connecting actions and tracking progress, Arc helps projects and portfolios strive for continuous improvement and receive recognition.

Decarbonization: the process of reducing and stopping carbon emissions, especially through the burning of fossil fuels. Additionally, decarbonization is the process of removing carbon or material containing carbon from an object or process.

Electrification: Electrification is the shift from using energy sources like natural gas, fuel oil, gasoline, and diesel to electricity.

Embodied Carbon: Embodied carbon refers to the greenhouse gas (GHG) emissions associated with the manufacturing, transportation, installation, maintenance, and disposal of building materials.15

Energy Star: ENERGY STAR buildings earn a score of 75 or higher on EPA’s 1 – 100 scale, indicating that it performs better than at least 75 percent of similar buildings nationwide – the score is based on the actual, measured energy use of a building and is calculated within EPA’s ENERGY STAR Portfolio Manager tool.

Goals: A project goal is a high-level statement that guides the design and construction process to help keep the team focused on the project’s values. For example: 1) Achieve net-zero; 2) Positively contribute to the community watershed.

IFLI Building Certifications Challenge: All four standards listed below are created and administered by the International Living Future Institute (ILFI), mostly widely known for its origination of the Living Building Challenge.

Living Building Challenge is a sustainable building certification created by the International Living Future Institute (ILFI) and is considered the world’s most rigorous proven performance standard for buildings. The Living Building Challenge is a holistic certification organized into seven (7) performance categories, or “petals”: place, water, energy, health + happiness, materials, and equity requirements must be achieved.

Core certification is a simple framework that outlines the ten (10) best practice achievements for buildings. It is a first step for project teams that aspire to achieve the Living Building Challenge, incorporating the same performance-based approach and requirement to comply with all metrics.
Integrated Design: Integrated Design Process (IDP) is a collaborative approach to designing high-performance buildings that involves all stakeholders from the very beginning, with an emphasis on collaboration. The purpose of the IDP is to ensure that all aspects of a project, from design to construction and operation, are carefully considered and integrated into a cohesive whole, ensuring optimized sustainability outcomes with lower costs and risks for the owner.

Zero Energy (ZE) Certified projects are proven to be highly efficient buildings that rely only on clean energy, without onsite combustion of fossil fuels. The certification requires demonstration over a 12-month performance period that all onsite energy consumption is offset on a net basis by renewable energy.

Zero Carbon Certification addresses both operational and embodied carbon emissions, offering owners a powerful tool to demonstrate credible climate action. The certification requires reduction and offset of embodied carbon as well as demonstration over a 12-month performance period that all onsite energy consumption is offset on a net basis by renewable energy.

ISO: Consensus developed best practice documents created and published by the International Organization for Standardization (ISO) for use by organizations. ISO Standards are often thought of as a formula that describes the best way of doing something. They range to include topics such as products, processes, services, and supply chain.

ISO 14001 "Environmental management systems — Requirements" sets out the criteria for an environmental management system and can be certified too. It maps out a framework that a company or organization can follow to set up an effective environmental management system.

ISO 14064-1 "Specification for quantification and reporting of greenhouse gas emissions and removals" Principles and requirements at the organization level for the quantification and reporting of greenhouse gas (GHG) emissions and removals.

ISO 14040 "Life cycle assessment — Principles and framework" Principles and framework for life cycle assessment (LCA)

ISO 50001 "Energy management systems - Requirements" sets out the criteria for an energy management system and can be certified too.

ISO 20121:2012 "Event sustainability management systems – Requirements" is a practical tool for managing events so that they contribute to the three dimensions of sustainability – economic, environmental and social.

IOC, FIFA, FIBA and WR all require ISO 20121 certified management systems for world cup/Games’ hosts. Venues are increasingly certifying to the standard given the number of events taking place in venues.

Healthy Building Network: HBN is advancing human and environmental health by improving hazardous chemical transparency and inspiring product innovation.
LEED: Leadership in Energy and Environmental Design (LEED) is the most widely used green building rating system used worldwide. Developed by the U.S. Green Building Council (USGBC), LEED provides a framework for healthy, efficient, and cost-saving green buildings and achieving LEED certification is a globally recognized symbol of sustainability achievement and leadership.

LEED BD+C: LEED for Building Design and Construction (LEED BD+C) addresses design and construction activities for both new buildings and major renovations. LEED is available for all building types and also works for existing buildings and interior spaces, homes, communities and cities.

LEED Zero: LEED Zero represents a level of achievement in green building and is a complement to LEED that verifies the achievement of net zero carbon, energy, water and/or waste goals in existing buildings over a 12-month period.

LEED O+M: LEED Existing Buildings: Operations + Maintenance (LEED O+M) is a rating system for existing buildings and spaces to pay close attention to building operations for more sustainable operations. LEED O+M is for buildings already operating and not undergoing a major renovation.

A directory of stadium projects can be found here.

USGBC has developed guidance specific to venue and hospitality projects here.

LENSES Framework: Not a certification, LENSES is a framework for cultivating systemic well-being in our communities demands that we evolve our relationships with each other and the places we live, guided by the principles of living systems and life itself.

Net-Zero GHG: A condition in which human-caused residual GHG emissions are balanced by human-led removals over a specified period and within specified boundaries.¹⁷

Owner’s Project Requirements (OPR): The OPR is a written, pre-design resource provided by the facility owner or owner’s representative to present necessary information for a technical basis of design (BOD). The OPR is a living document, meaning it should be used to guide decision-makers throughout the entire lifecycle of a project from project inception through to operations. It’s core purpose is to challenge assumptions and ensure alignment on core project expectations.

Parksmart: Parksmart is the world’s only certification program that defines, measures, and recognizes high-performing, sustainable parking facilities. Parksmart offers a roadmap for new and existing structured parking facilities to use innovative, solutions-oriented strategies and forward-thinking and sustainable practices in three categories: management, programs, and technology structure design.

Power Purchase Agreement (PPA): In a PPA, a venue enters a long-term agreement with a utility-scale solar, wind or other renewable energy system. A third party owns the system but guarantees a contractually set amount of energy delivery to the venue for a set price over the life of the contract. PPAs can be cost-effective means for procuring large-scale renewables without unnecessary investment costs or fluctuating energy costs.
Public Private Partnerships (P3): In a P3, a private entity typically provides financing and expertise in project design and construction, while a public agency provides land, regulatory approvals and oversight.

Regenerative Development: Regenerative development through ecological design involves seeking net-positive benefits with natural and social systems by focusing on doing no harm while maintaining an active, positive, and continual process of action throughout the life of the project. “With the increasing urgency of global challenges including climate change, biodiversity loss and excessive resource use, considering the concept of regenerative futures is timely.”

Renewable Energy Credits (RECs): RECs are used to offset Scope 2 emissions, defined as the greenhouse gas (GHG) emissions from the generation of electricity purchased by the venue. RECs reduce a venue’s emissions associated with electricity usage from the grid by certifying that a certain amount of electricity (MWh) used by your venue was generated offsite from a renewable source, fed into the grid, and then used by your venue.

Scope 1, 2, and 3 Emissions

Scope 1 emissions: greenhouse gas emissions from sources owned or directly controlled by the organization. Examples include fuel used by venue-owned non-electric vehicles or equipment, onsite natural gas or propane usage used for heating or cooking, or fossil fuels used for backup energy generation.

Scope 2 emissions: greenhouse gas emissions from the generation of purchased electricity, heat, cooling or steam consumed by the organization. This includes purchased electricity or steam utilized onsite.

Scope 3 emissions: greenhouse gas emission that is a consequence of the organization’s activities but arises from sources that are not owned or directly controlled by the organization. Examples include emissions resulting from fan/team travel, waste removal, employee commuting, and supply chain/supplier activities.

SITES: SITES provides a comprehensive framework for designing, developing, and managing sustainable and resilient landscapes and other outdoor spaces. SITES can be applied to a variety of project types (with or without buildings) and is the ideal tool to support nature-positive design. SITES projects enhance biodiversity and mitigate climate change while conserving resources, improving public health, and protecting critical ecosystems.

Stakeholder Engagement: Stakeholder engagement is the process used by an organization to engage relevant stakeholders for a clear purpose to achieve agreed outcomes. It is now also recognized as a fundamental accountability mechanism since it obliges an organization to involve stakeholders in identifying, understanding, and responding to sustainability issues and concerns, and to report, explain and answer to stakeholders for decisions, actions, and performance.

Sustainable Urbanism: Sustainable Urbanism Definition: the emerging and growing design reform movement that combines the creation and enhancement of walkable and diverse places with the need to build high-performance infrastructure and buildings. by Douglas Farr - author of Sustainable Urbanism: Urban Design with Nature.
TRUE (Total Resource Use and Efficiency): certification focuses on helping buildings, businesses and communities strengthen their commitment to resource management. TRUE offers several ways to pursue zero waste, including TRUE certification and recertification for a facility, TRUE precertification for projects in the planning stage, TRUE for Events certification and the TRUE Advisor certificate for professionals.

UN Sport for Nature Framework: In December 2022, the Sports for Nature Framework is designed to complement the UN Sports for Climate Action Framework. This framework is focused on ecosystems and biodiversity.

UN Sustainable Development Goals: The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries - developed and developing - in a global partnership. They recognize that ending poverty and other deprivations must go together with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests.

WELL: The WELL Building Standard is a library of holistic evidence-based building and organizational strategies that, when implemented, can improve the health and well-being of your people. WELL is administered by the International WELL Building Institute (IWBI), the global authority for transforming health and well-being in buildings, organizations and communities. The WELL Standard contains over 100 features, which are evidence-based strategies. These strategies are organized into 10 impact categories called WELL concepts: Air, Water, Nourishment, Light, Movement, Thermal Comfort, Sound, Materials, Mind and Community.

The WELL Health-Safety Rating for Facility Operations and Management is a roadmap for driving resilience into the center of business policies and operational plans.

The WELL Performance Rating helps organizations implement best practices for continuous monitoring and performance across key IEQ metrics related to air quality, water quality, thermal comfort, acoustics, lighting and occupant experience.

The WELL Equity Rating empowers organizations to take action and drive accountability toward their diversity, equity, inclusion and accessibility goals.

The World Green Building Council (WGBC): is a global network of national Green Building Councils in over 70 countries worldwide.

Zero Net Carbon (ZNC): A ZNC building is a highly energy-efficient building that produces on-site, or procures, enough carbon-free renewable energy to meet building operational energy consumption annually.
3. NRDC Report: Game Changer - How the Sports Industry is Saving the Environment
5. Environment + Energy Leader: Captivating Transformation - Empowering C-Suite Executives and Staff with ESG Education for Financial Sustainability and Climate Resilience
6. IUCN: Mitigating Biodiversity Impacts of New Sports Venues
7. Journal of Future Studies: Regenerative Futures - Eight Principles for Thinking and Practice
8. Indianapolis Motor Speedway: IMS Solar Power Facility Opens
9. Waste Management’s Role In The Circular Economy
10. Greenhouse Gas Emission
11. Build Reuse: About Deconstruction
12. About Target Center
13. Global Sport Matters: So Your City Wants to Build a Stadium. Here’s What to Know.
16. ISO: Sustainable Events
17. ISO: Net Zero Guidelines
**VITAL STATS**

<table>
<thead>
<tr>
<th>YEAR BUILT</th>
<th>LOCATION</th>
<th>CAPACITY</th>
<th>TEAMS</th>
<th>ANNUAL EVENTS</th>
<th>ANNUAL VISITORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>LAS VEGAS, NV</td>
<td>71,835</td>
<td>NFL - LAS VEGAS RAIDERS, NCAA - UNLV REBELS</td>
<td>41 MAJOR EVENTS; 110 PRIVATE</td>
<td>1,700,000</td>
</tr>
</tbody>
</table>

**HIGHLIGHTS**

- 99% LED LIGHTING
- ETFE ROOF IS CLIMATE ADAPTABLE, SELF-CLEANING, AND MADE FROM RECYCLEABLE MATERIALS

**BUILD FOR THE FUTURE DATA**

<table>
<thead>
<tr>
<th>Mindset and Certifications</th>
<th>Material Management</th>
<th>Water</th>
<th>Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Venue Funding Source: Public: Las Vegas Stadium Authority</td>
<td>Diversion Rate &amp; Data: 45% to 65% depending on the month</td>
<td>Cistern Info: Internal water used is sent back to Lake Mead via The Wash</td>
<td>Energy Usage from Renewable Resources: 29%</td>
</tr>
<tr>
<td>Original Sustainability Mission: Committed to developing sustainable policies and constantly improving on these efforts through waste diversion, green purchasing, water reduction, energy optimization, staff education, and connecting to the local community’s eco-efforts</td>
<td>Procurement Considerations: Green certified paper towels and toilet paper, compostable paperware is purchased by the food and bev team, Sustainability has provided stadium full time staff reusable coffee mugs and cutlery to assist with a reusable office program.</td>
<td>Indoor Water Conservation: Low-flow toilets and urinals, Low-flow Water Sense faucets.</td>
<td>LED Lights: 99% of lighting</td>
</tr>
<tr>
<td>Original Goals: Consistent building out and improvements of all listed pillars in the mission statement</td>
<td>Donated Meals: 7,000 lbs per month</td>
<td>Landscape and Additional Design Considerations: Subsurface dewatering stations discharges groundwater that has been collected and then is expelled into the plant beds around the exterior of the stadium.</td>
<td>Design Considerations: Roof is ETFE provides benefits of climate adaptability, insulating performance, long lifespan, self-cleaning, and is recyclable material.</td>
</tr>
<tr>
<td>What’s Your Why?: Bring to light conservation efforts, resource reduction efforts, Educating Guests/Staff/Clients, being an engaged key player in the community</td>
<td>Dedicated Waste Sorting Space: 4215sq ft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Achieved during Operations: In Progress: LEED Certification</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Building Design**

- Construction Material Types and Benefits: ETFE Roof - reduces need for more structural steel
- Site
  - Geographic Consideration: Desert
  - Heat Island/Emissivity Considerations: Chiller plant & air-handling units are energy efficient
  - Bike Racks: 35
  - Parking Considerations: 35,000 within 1 mile