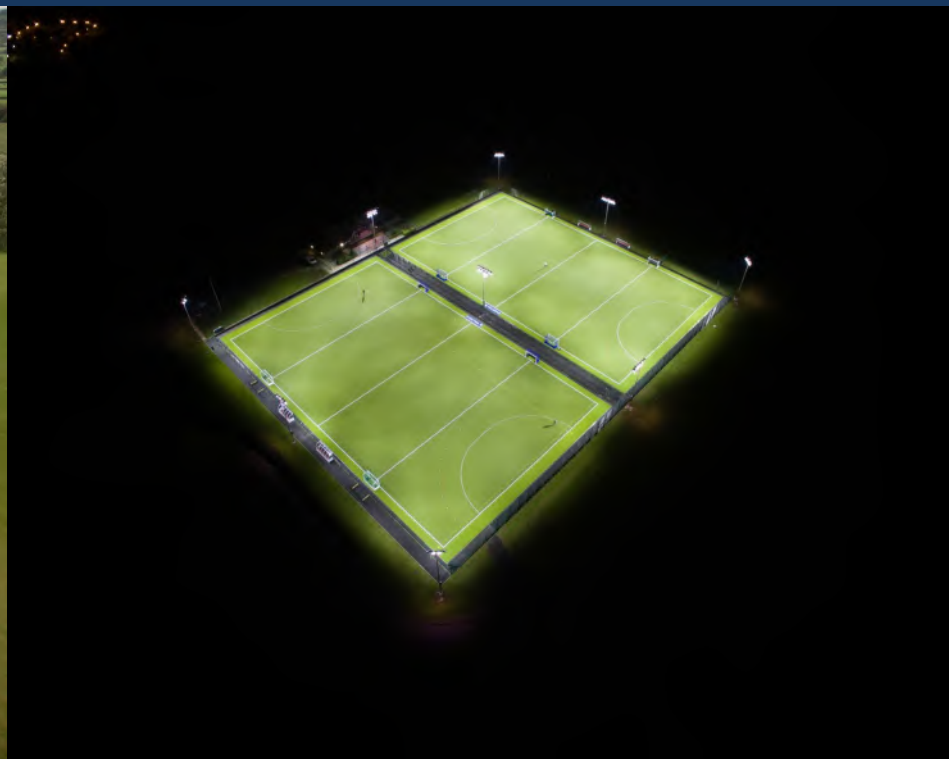


# ARTIFICIAL LIGHTING OF HOCKEY PITCHES



# Topics Outline

## 1) *Brief Introduction to Musco Lighting*

- 1) Who is Musco?
- 2) Notable Projects

## 2) *FIH Artificial Lighting Guidelines*

- 1) FIH Lighting Recommendations, Non-Televised Hockey (Outdoors)
- 2) FIH Guide-Sports lighting for Broadcasting

## 3) *Sports Lighting Systems*

- 1) 5 Easy Pieces
- 2) Sourcing Poles/Foundations Separate

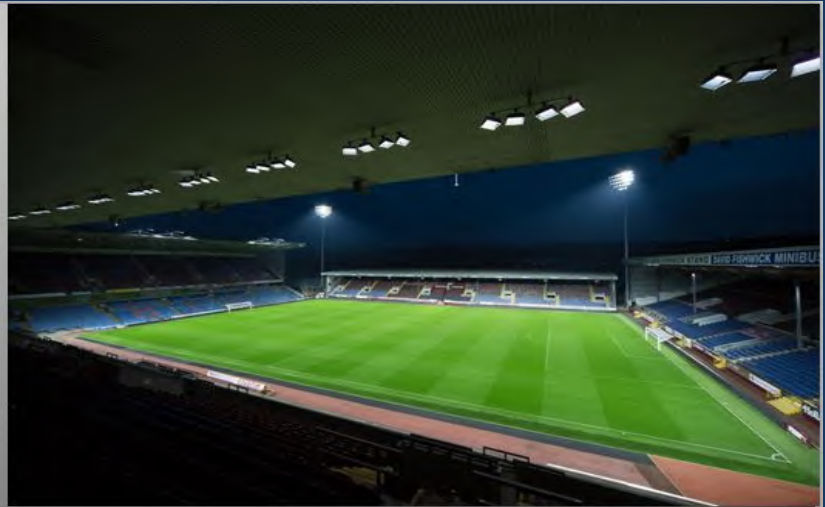
# Musco Lighting, Company Intro

- Sports Lighting Specialists
- Founded in 1976
- Based in Iowa, USA
- Global sales offices
- Manufacturing in US; China; Korea
- 1200+ Musco team members worldwide
- Completed projects in over 70 countries
- Complete over 200 temporary and 2500 permanent lighting projects annually
- From small town fields to Olympics, providing sports lighting solutions for over 40 years





# Notable Projects



Musco in the English Premier League



# Notable Projects



**NRG Stadium – Houston, Texas, USA – LED light source**

## **System Energy**

337 kW- 60% reduction from typical floodlighting

Cost to Operate Per Hour: \$33.70\*

*\$.10 per kilowatt hour*



# Notable Projects



**10-Year Life-Cycle Cost Savings: \$2,499,000**

**YAS MARINA CIRCUIT — Abu Dhabi, United Arab Emirates**

Drag Strip — 900-1000 constant horizontal lux

800 constant vertical lux to camera

Formula One™ Circuit — 1700 average horizontal lux

1500 constant vertical lux to camera

**System Energy Consumption:**

• Typical Floodlighting — 8046.0 kW • Musco Green™ — 6285.7 kW

Yas Marina Formula 1 Circuit

# FIH Artificial Lighting Guidelines

## 1) *FIH Artificial Lighting Guidelines*

- 1) [FIH Lighting Recommendations, Non-Televised Hockey \(Outdoors\)](#)
  - A. [Column Placement](#)
  - B. [Project Examples of Class I and II Lighting](#)
  - C. HID or LED, Selecting the Most Appropriate Lighting System
- 2) FIH Guide-Sports lighting for Broadcasting
  - A. TV1-TV3: Broadcast Lighting Categories
  - B. Lighting Performance Criteria: Lux Levels; Uniformities; etc...
  - C. Costs: Broadcast Lighting compared to Non-Televised Lighting



# HID & LED: Two light sources used in sports applications.

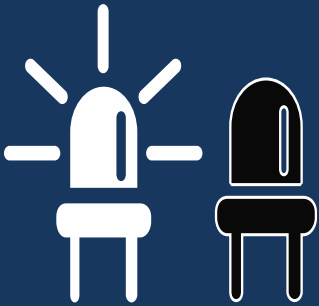




# HID & LED: Issues to Consider

Issues to Consider	Metal Halide	LED
<b>Budget</b> <ul style="list-style-type: none"> <li>• Initial Capital, System Costs</li> <li>• Operating Costs               <ul style="list-style-type: none"> <li>- Energy</li> <li>- Maintenance</li> </ul> </li> </ul>	✓   ✓	✓  ✓+
<b>Environment</b> <ul style="list-style-type: none"> <li>• Spill – surrounding area</li> <li>• Glare – players, neighbors</li> <li>• Sky glow</li> </ul>	✓ ✓ ✓	✓+ ✓+ ✓+
<b>Added features</b> <ul style="list-style-type: none"> <li>• Instant on/off</li> <li>• Dimming</li> <li>• Special effects</li> <li>• Flicker Free</li> </ul>		✓ ✓ ✓ ✓

# LED: LED Light Source Characteristics



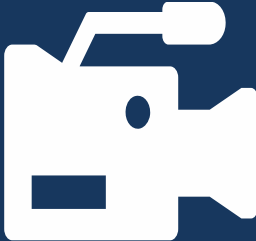
Instant On/Off



Light Show Capabilities



Dimming Capabilities



Flicker Free



Up to **70%** Less Energy



Potential for Increased Life Expectancy



Potential for Improved Spill & Glare Control

**LED:** You can get very poor LED systems



Paintsville Little League, Poor LED: Specification:

500 lux infield

300 lux outfield.

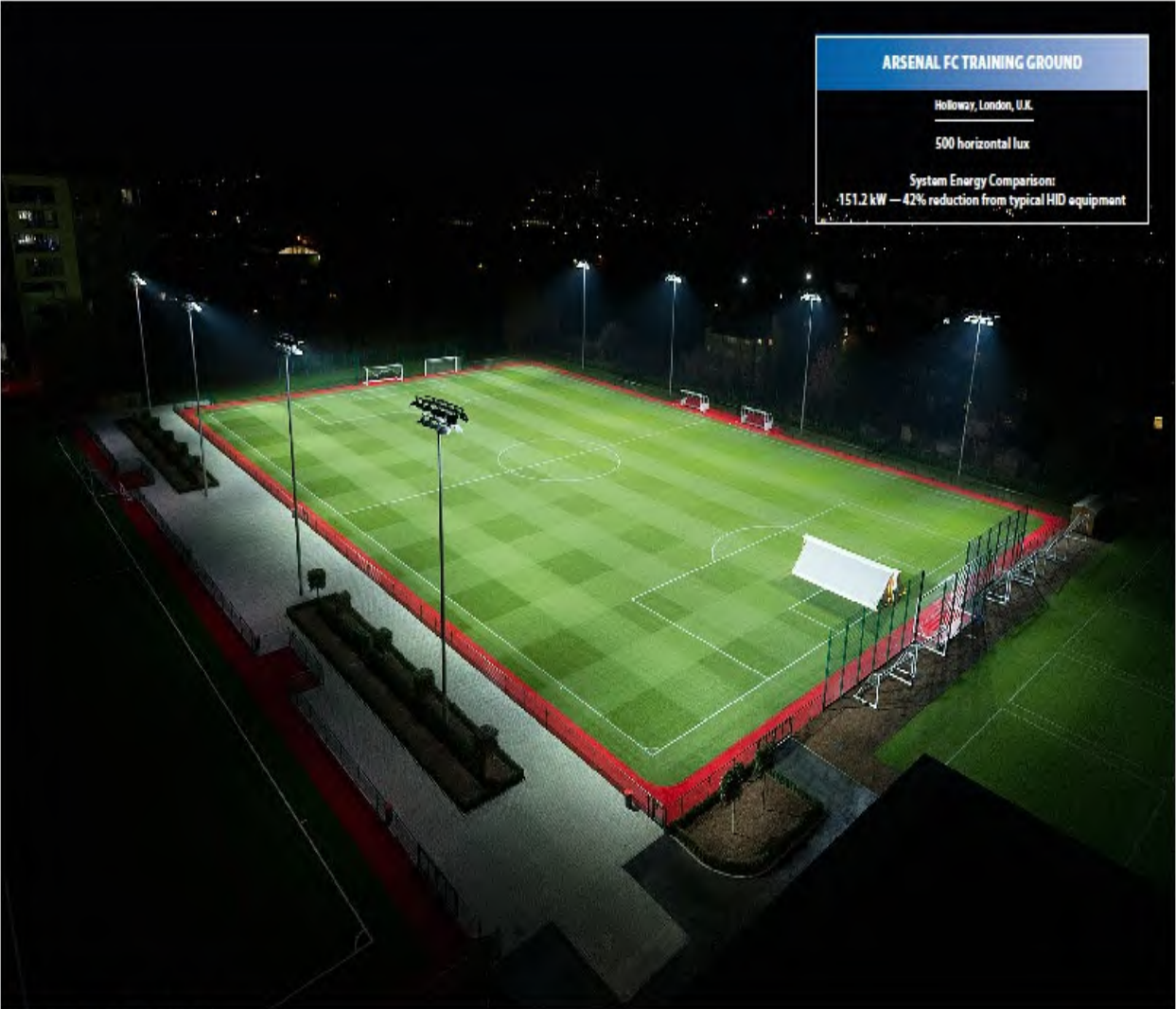
Actual:

170 lux infield

90 lux outfield



# LED: Quality LED systems do provide great solutions



**ARSENAL FC TRAINING GROUND**  
Holloway, London, U.K.  
500 horizontal lux  
System Energy Comparison:  
151.2 kW — 42% reduction from typical HID equipment

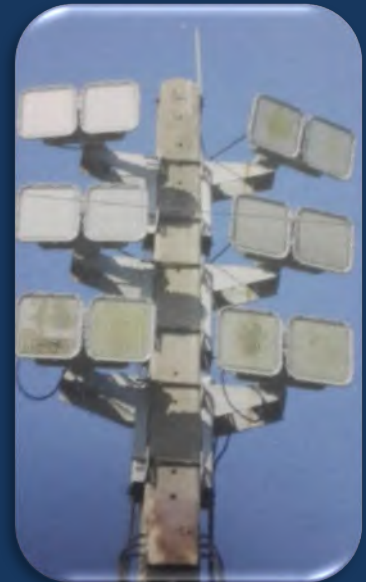
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**Muxco**

LED Light Source

## LED: Compare Warranties

- Compare warranties and services between product and companies
  - Some companies offer 1 year parts only while claiming 100,000 hours of life
  - Some offer limited warranties such as: you remove light; send to factory; they send back you install
  - Some offer 5 -10 years on “luminaire housing” but not the actual parts or drivers
  - Drivers can be problematic
  - Replacing an entire luminaire is very expensive compared to HID lamp.
  - Musco offers a comprehensive 10 year warranty for either LED or HID systems. Insist on comprehensive parts and labor for entire system for 10 years for either system



**LED:** Spill control with quality LED

Effective Spill/Glare Control – Musco LED

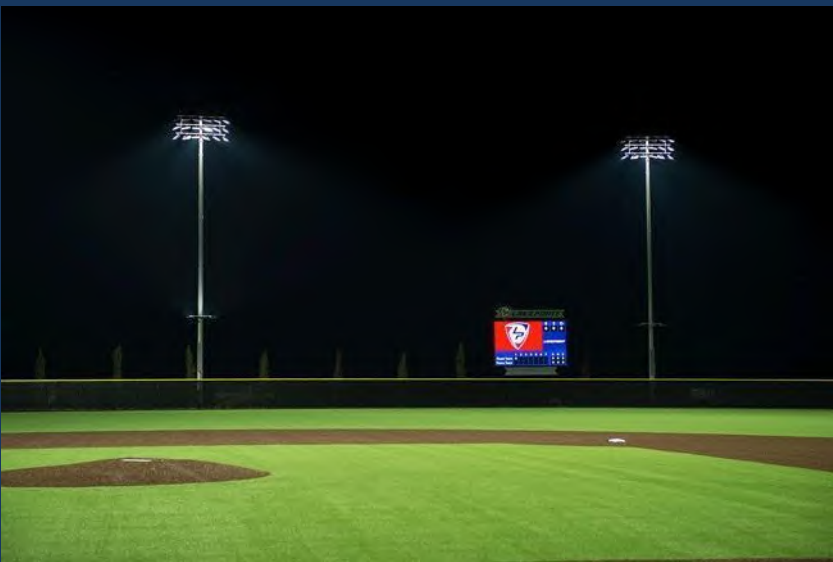


Millfield School



# LED: Glare can be minimized with quality LED systems

What can be



Musco LED light source

What often is



Other supplier LED light source

**LED:** Glare can be minimized with quality LED systems



**2014 Musco SportsCluster  
Green™ System with LED**  
**NRG Stadium · Houston, Texas,  
USA**



**2014 Other manufacturer's  
fixture with LED light source**

## LED: Controls

### 1) **Simple Dimming**

- 1) High; Medium; Low
  - 1) Requires 3 core copper to each ECE
  - 2) Cost effective
  - 3) Uniformities maintained
  - 4) Saves energy

### 2) **DMX Controls**

- 1) Complex controls
- 2) Show lighting scenes; programmable; music; waves; etc...
- 3) More costly but more options
- 4) Requires Cat 5e type cables indoors
- 5) Requires fiber to outdoor poles, when direct buried





# FIH Artificial Lighting Guidelines

## 1) *FIH Artificial Lighting Guidelines*

- 1) FIH Lighting Recommendations, Non-Televised Hockey (Outdoors)
  - A. Column Placement
  - B. HID or LED, Selecting the Most Appropriate Lighting System
- 2) FIH Guide, Sports lighting for Broadcasting
  - A. [TV1-TV3](#): Broadcast Lighting Categories
  - B. [Lighting Performance Criteria](#): Lux Levels; Uniformities; etc...
    - A. [TV1 Project Example](#)
  - C. Costs: Broadcast Lighting compared to Non-Televised Lighting
    - A. %100-%500 over Non-TV, very roughly speaking
      - A. Taller Poles
      - B. Bigger Foundations
      - C. More Lights
      - D. More Electrical



# Sports Lighting Systems

- 1) **5 Easy Pieces: Foundations; Poles; Wiring; Lights as a component system from 1 supplier**
  - 1) Saves install time
  - 2) Simplifies Installation
  - 3) Entire system is warrantied
- 2) ***Sourcing Poles/Foundations Separate is an Option***
  - 1) Sometimes done to save duty costs in countries where that is high
  - 2) Splits responsibilities and warranties.



# Thank You

