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

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Notable Projects

**Yas Marina Formula 1 Circuit**

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 — 8048.0 kW
- Musco Green™ — 6285.7 kW
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

<table>
<thead>
<tr>
<th>Issues to Consider</th>
<th>Metal Halide</th>
<th>LED</th>
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<tbody>
<tr>
<td><strong>Budget</strong></td>
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<td></td>
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<tr>
<td>• Initial Capital, System Costs</td>
<td>✓</td>
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<td>• Operating Costs</td>
<td>✓</td>
<td>✓+</td>
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<td>- Energy</td>
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<tr>
<td>- Maintenance</td>
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<td>✓+</td>
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<tr>
<td><strong>Environment</strong></td>
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<tr>
<td>• Spill – surrounding area</td>
<td>✓</td>
<td>✓+</td>
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<tr>
<td>• Glare – players, neighbors</td>
<td>✓</td>
<td>✓+</td>
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<tr>
<td>• Sky glow</td>
<td>✓</td>
<td>✓+</td>
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<tr>
<td><strong>Added features</strong></td>
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<td></td>
</tr>
<tr>
<td>• Instant on/off</td>
<td>✓</td>
<td></td>
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<tr>
<td>• Dimming</td>
<td>✓</td>
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<tr>
<td>• Special effects</td>
<td>✓</td>
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<tr>
<td>• Flicker Free</td>
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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:  
- Infield: 500 lux  
- Outfield: 300 lux  

Actual:  
- Infield: 170 lux  
- Outfield: 90 lux
LED: Quality LED systems do provide great solutions
**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 “luminarie 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
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

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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

musco Lighting
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