HIGH MAST LED LIGHTING INSTALLATIONS

- VISUAL IMPROVEMENT
- COST SAVING
Key Take Aways

Upfront Take Aways:

- Energy (i.e. cost) reduction is the mission, LED is just the tool to achieve this goal.
- Improved Performance/Quality of Light => White Light
- Increased Light Output while constantly reducing costs.
- Trade-offs between:
  - Product Cost (#LEDs),
  - Energy efficiency (Drive Current/Droop)
  - Product Reliability and Life Time

- "Controls" take the lead = Digital world, heading towards the Smart City.
SPILL LIGHT AND LIGHT POLLUTION
**TECHNOLOGY IMPROVEMENT**

- **Chip Size**: 2mm² vs. 4mm²
  - Allows more power/LED

- **Typ. Power /LED**: 2 W (700ma) vs. 4.25 W (1.4A)
  - Allows more power/Area

- **Typ. Flux @typ power**: 254 lm vs. 560 lm
Various new optics developed for increasing energy savings by decreasing the amount of spill light.
USING MODERN TECHNOLOGY TO PROVIDE SOLUTIONS
LIGHTING CALCULATIONS

- Maintaining minimum light levels over area of application.
- Offering solutions to prevent placing of additional lighting masts.
- Energy savings range from 10-50% (HPS), or up to 70% (MH)
GOING BEYOND LIGHTING

- Flexible dimming profiles
- Integration of sensors/detectors/CCTV
- Flexible control of lighting groups
- Reduction of energy consumption
- Energy metering
- Integration of sensors
- Flexible reporting
- Customized/anticipated workload
- Open architecture enables integration of other services
- Independent from power grid
- Secured data storage
- Redundancy
- Safety mechanisms
RETURN ON INVESTMENTS

- **Energy**
- **Maintenance**
- **Investment**

### Comparison
- **HID**
- **OMNISTAR**
- **OMNISTAR + Dimming**

1. Cost Breakdown
2. TCO (Total Cost of Ownership)

### Charts
- Graphs illustrating cost components for different lighting solutions.
ADVANTAGES OF LED LIGHTING

• LED lights last longer than other lights
• LED lights use less power compared to HID luminaires
• LED lights generate instant light
• LED lights generate white light in different colour temperatures
• LED lights come in a variety of form and shapes available for most all applications
• LED lights have extremely low maintenance requirements
• LED lights are perfect for intelligent lighting concepts
• LED lights do not contain hazardous materials

These two value propositions are lost if LED Fixture is damaged after the first lightning storm
The next page gives the exact Measured OFD per region. Check to see what the OFD is of your nearest Town.
TRANSIENT SURGES

Frequency (Hz)

Surge Voltage (V)

- Direct Lightning Surge
- Induced Lightning Surge
- Switching Surge
- Load Dump Surge
- ESD
- Pulse Noise
INDUCED SURGES

Without EQUI:
Energy pulse goes through the LED module

<table>
<thead>
<tr>
<th>Distance</th>
<th>1 m</th>
<th>30 m</th>
<th>60 m</th>
<th>90 m</th>
<th>120 m</th>
<th>150 m</th>
<th>180 m</th>
<th>210 m</th>
<th>240 m</th>
<th>270 m</th>
<th>300 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage to remote earth in kV</td>
<td>31 kV</td>
<td>106 kV</td>
<td>53 kV</td>
<td>35 kV</td>
<td>27 kV</td>
<td>21 kV</td>
<td>18 kV</td>
<td>15 kV</td>
<td>13 kV</td>
<td>12 kV</td>
<td>11 kV</td>
</tr>
</tbody>
</table>
PROTECTION STAGES

- SPD at Luminaire
- SPD at bottom of pole
- SPD at distribution board
### 20kV & 10kV SPD Specifications

#### Table: Surge Current and Number of Hits

<table>
<thead>
<tr>
<th>Surge Current</th>
<th>Number of Hits in each mode without degradation (20kV/20kA SPD)</th>
<th>Number of Hits in each mode without degradation 10kV/10kA SPD</th>
</tr>
</thead>
<tbody>
<tr>
<td>20kA (~40kV) - Imax</td>
<td>1 (Single)</td>
<td>10kA (~20kV) – Imax</td>
</tr>
<tr>
<td>15kA (~30kV)</td>
<td>2</td>
<td>7kA (~14kV)</td>
</tr>
<tr>
<td>10kA (~20kV) – Inom</td>
<td>15 (Multiple)</td>
<td>5kA (~10kV) – Inom</td>
</tr>
<tr>
<td>3kA (~6kV)</td>
<td>100</td>
<td>1.5kA (~3kV)</td>
</tr>
<tr>
<td>1.7kA (~3.5kV)</td>
<td>1000</td>
<td>700A (~1.4kV)</td>
</tr>
</tbody>
</table>

- **Nominal surge current.** The nominal discharge current is a measure of the SPDs endurance capability; 15 hits of discharge current uses the 8/20us current waveform are given and SPD should not degrade with them.

- SPD specified for Inom will typically withstand much more number of surge hits before it reaches end of life. 20kV & 10kV SPDs can withstand up to 100 hits of rated nominal surge current of 10kA and 5kA respectively without failure, thus ensuring the Luminaire remains protected for longer durations.

- Sometimes SPD is also specified with Imax - Maximum surge rating but it is only for 1 hit after which SPD can get degraded and damaged immediately or in the subsequent surges.
Thank you for your attention!