PANEL DISCUSSION

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MSB General Service
Lamp Technology / Performance Pyramid

- **CFL**: 71 to 80 LPW
- **LED**: 40 to 70 LPW
- **Hybrid Halogen**: 30 > 42
- **Incandescent**: < 15 LPW
CFL’s and EISA

**CFL’s provide the best cost/energy savings potential for MSB general service lighting applications**

- Continued growth in CFL sales and saturation will continue to yield enormous energy savings and carbon reductions

- *...But the consumer market is not transforming fast enough:*
  - Today, 3 of 4 bulbs sold are still incandescent
  - CFL sales have plateau’ed.
  - Significant energy savings potential is unrealized

- And, LED replacement lamps are not yet competitive substitutes.
LED Lamps as a Solution?

- High volume sales of replacement LED lamps are still some years off.
- Cost is a big barrier – Retail price points on some current LED lamp products are $50/unit or more.
- Current LED replacement lamps perform poorly in most general lighting applications compared to CFLs.
- LED’s are excellent alternatives for directional lighting applications.
MSB General Service
Lamp Technology Future Positioning

Cost

LPW
MSB Lamp Forecast

- Incandescent
- CFL
- Halogen
- LED

Source: NEMA; Industry Data; TCP Estimates
Consumer Concerns About CFL’s...

“CFL’S Don’t Fit Some Fixtures”

“CFL’s Don’t Dim Very Well”

“CFL’s Are Slow to Light Up”
TCP’s Micro-Size
T3 & T2 CFL’s

13 watt 13 watt 13 watt
TCP’s New “Full Springlamp” Design

Previous 13 watt

TCP T3 13 watt

25% M.O.L. REDUCTION

SECONDARY BEND IN TUBE

SINGLE STRAIGHT CUT
TCP’s TruDim™ CFL

Comparison: Dimming Profiles

- Current TCP Dimmable
- New TCP "Super Dimmable"

% Lumens vs. % Voltage Input
TCP InstaBright G3™ CFL

TCP InstaBright G3 Run-Up Time Comparison
TCP CFL Product Technology Roadmap

- Optimized lamp optics
- Reduced mercury levels (< 1mg)
- Higher wattage CFL (+100w ~400w eq.)

2009:
- Reduced cost using full automation
- Reduced overall size
- High ballast efficiency

2010:
- End-of Life protection
- Thermal protection cutoff
- Increased ballast efficiency > 95%
- Full dimmable capability (to < 1%)

2011:
- Higher quality phosphors (improved LPW & CRI)
- Linear Dimming Performance
- Addressable control CFL (wire & wireless)
- Digital Ballast Control

Beyond:
- Full dimmable capability (to < 1%)
Zigbee Protocol Technology
Comparing Lighting Technologies

**CFL’s** VS. **LED’s**

- ✓ High Lumen Per Watt
- ✓ Lower Initial Purchase Cost
- ✓ Omni-directional Dispersion
- ✓ High Wattages

- ✓ (Size) Miniaturization
- ✓ Long Life
- ✓ Beam Angle Control
- ✓ Vibration Resistance
Comparing Lighting Technologies

**CFL’s** vs. **Halogen**

- ✔ High Lumen Per Watt
- ✔ Lower Lifecycle Cost
- ✔ Multiple Color Temperatures
- ✔ Long Life

- ✔ Incandescent Replacement
- ✔ Fully Dimmable
- ✔ Best Color Rendering
- ✔ Low Environmental Impact
## EISA - Product Comparison

<table>
<thead>
<tr>
<th>TODAY’S INCANDESCENT WATTAGE</th>
<th>TODAY’S INCANDESCENT LUMEN OUTPUT (TYPICAL)</th>
<th>TCP CFL WATTAGE / LUMENS</th>
<th>TCP IR HALOGEN WATTAGE / LUMENS</th>
<th>TCP LED WATTAGE / LUMENS</th>
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<tr>
<td>100W</td>
<td>1690</td>
<td>23W 1650 LUMENS</td>
<td>50W* 1600 LUMENS*</td>
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<td>75W</td>
<td>1170</td>
<td>18W 1300 LUMENS</td>
<td>40W* 1200 LUMENS*</td>
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<td>60W</td>
<td>850</td>
<td>13W 925 LUMENS</td>
<td>30W* 850 LUMENS*</td>
<td>12W* 850 LUMENS*</td>
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<td>40W</td>
<td>475</td>
<td>9W 600 LUMENS</td>
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<td>8W 450 LUMENS</td>
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* Available 2011
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<td>HARD TO REACH PLACES</td>
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TCP’s Unique Modular Hybrid IR Halogen Lighting System

- 2012 E.I.S.A. Compliant Halogen Lighting Capsule Element
  **Rated at 32 LPW (50w = 100w)**
- Removable, Interchangeable Safety Cover
  - Re-usable; reduces waste
  - Upgradeable
  - Multiple Cover Style Options
- Heat-Resistant Ceramic Lamp Socket Adapter
- Initial Availability - Medium Base