



Lighting Research Program



Program Advisory Meeting

September 15th and 16th, 2004

**Funded by California Energy Commission's
Public Interest Energy Research (PIER) Program**

HID Electronic Ballast Testing

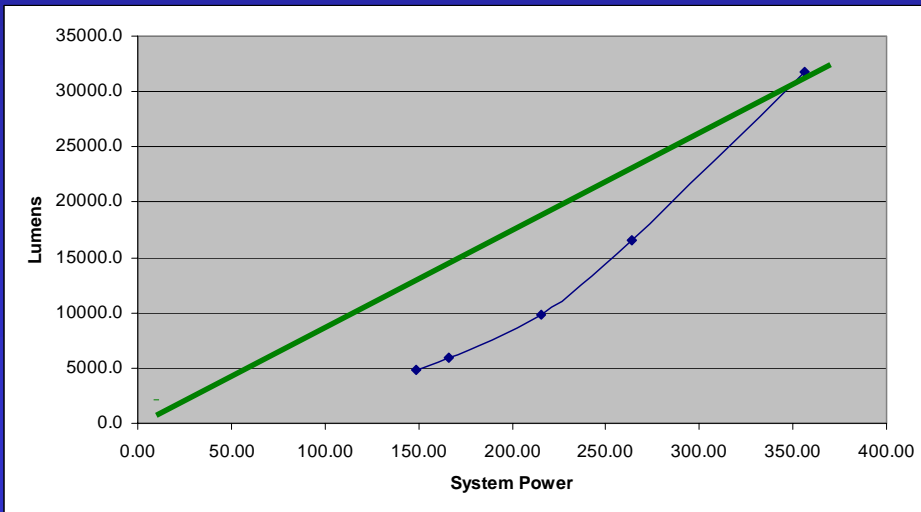
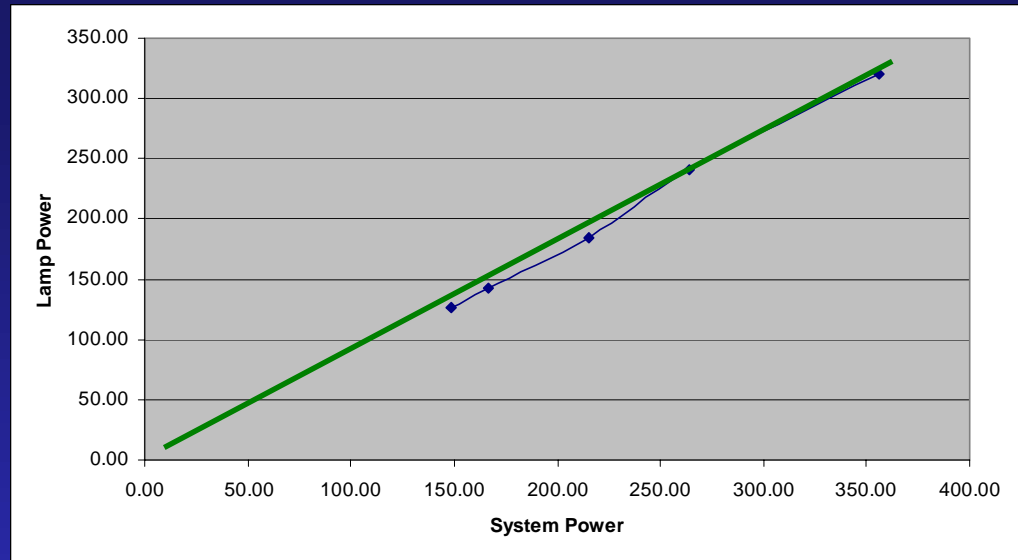


- **Concept:** The objectives are to test, analyze, and determine the potential of electronic ballasts for HID lighting systems in cooperation with manufacturers. Control strategies will be identified for commercial, industrial, and municipal applications.
- **Solution:** The measurements to characterize the performance of HID lamp-ballast systems are being performed in the laboratory at the LBNL. Both electrical and spectral performance measurements have been completed for low wattage systems (< 175 watts) and higher wattage systems. In related work, LBNL is also testing HPS electronic ballasts for the City of Oakland.



Performance of Dimming 350W Metal Halide System

Lamp Power as a Function of System Power

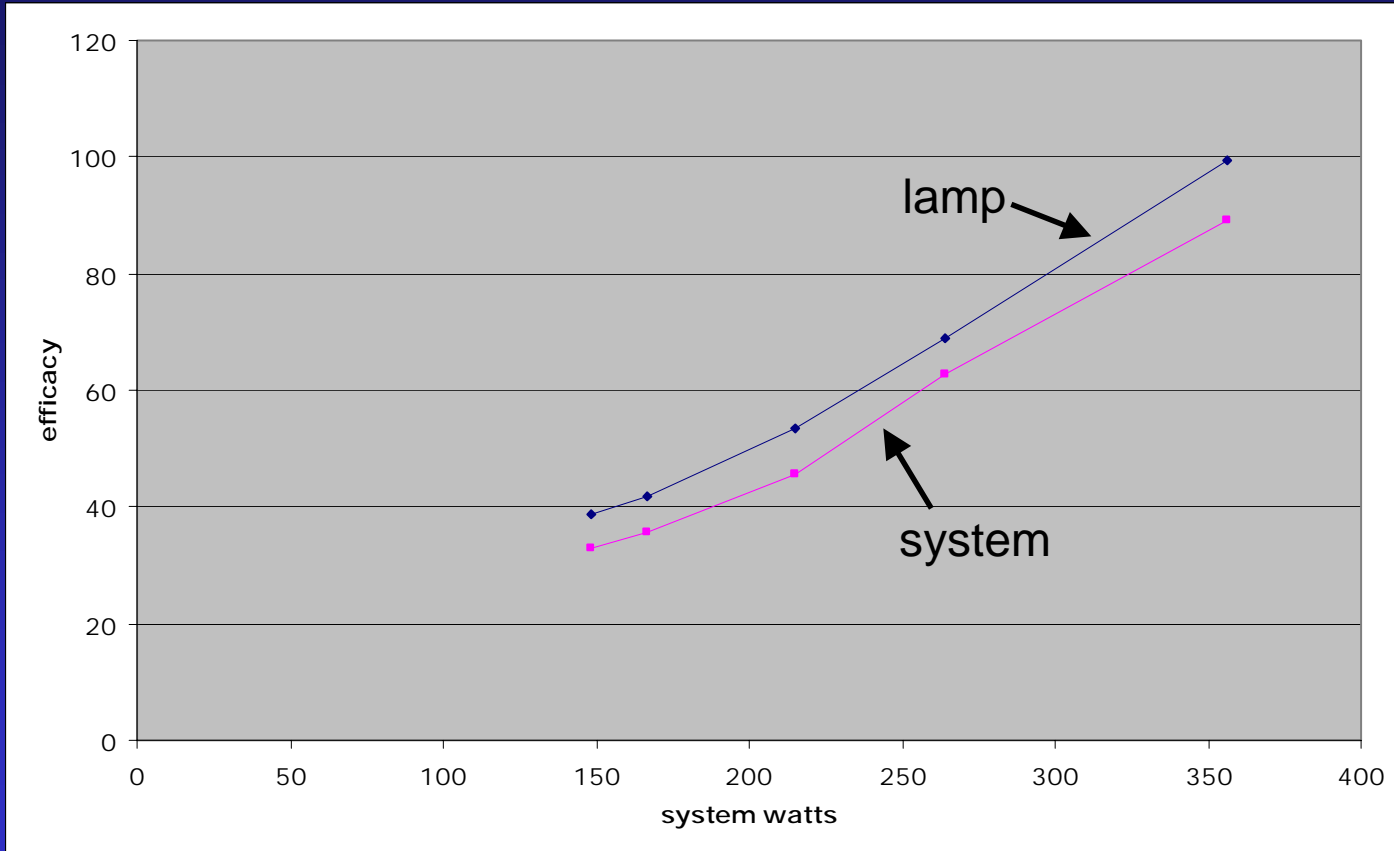


Lumen Output as a Function Of System Power



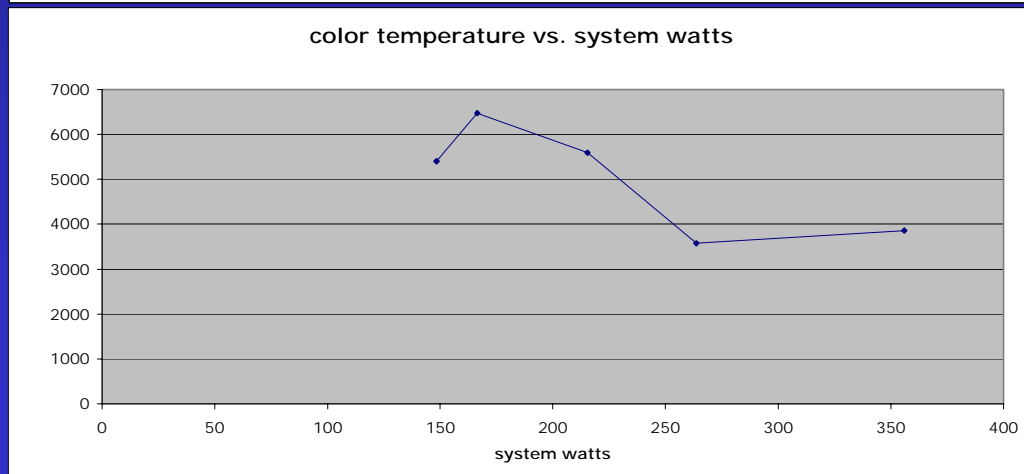
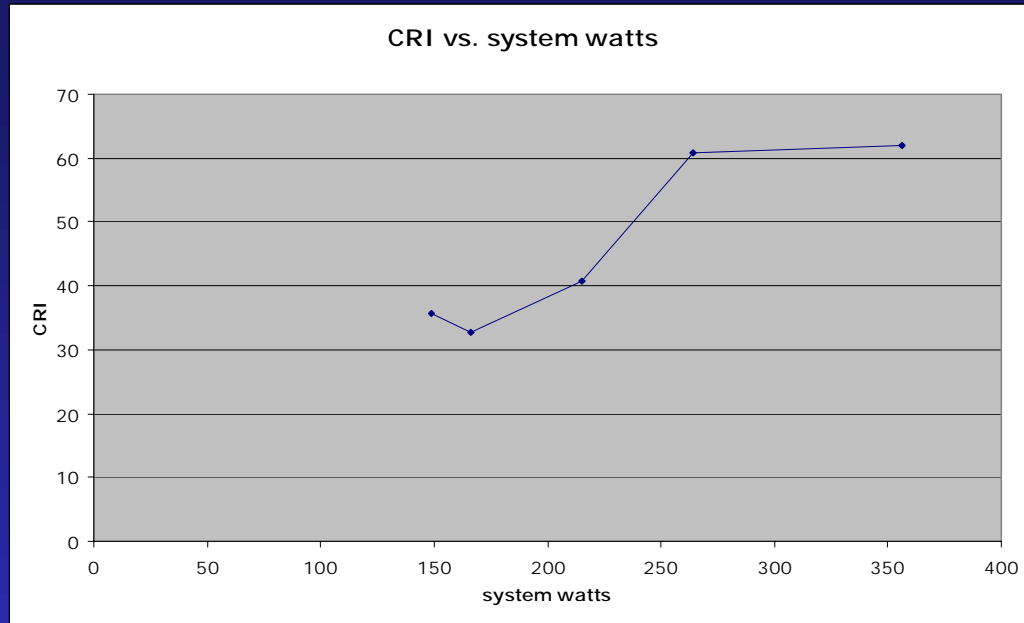
Performance of a Dimming 350W Metal Halide System

efficacy as a function of system watts

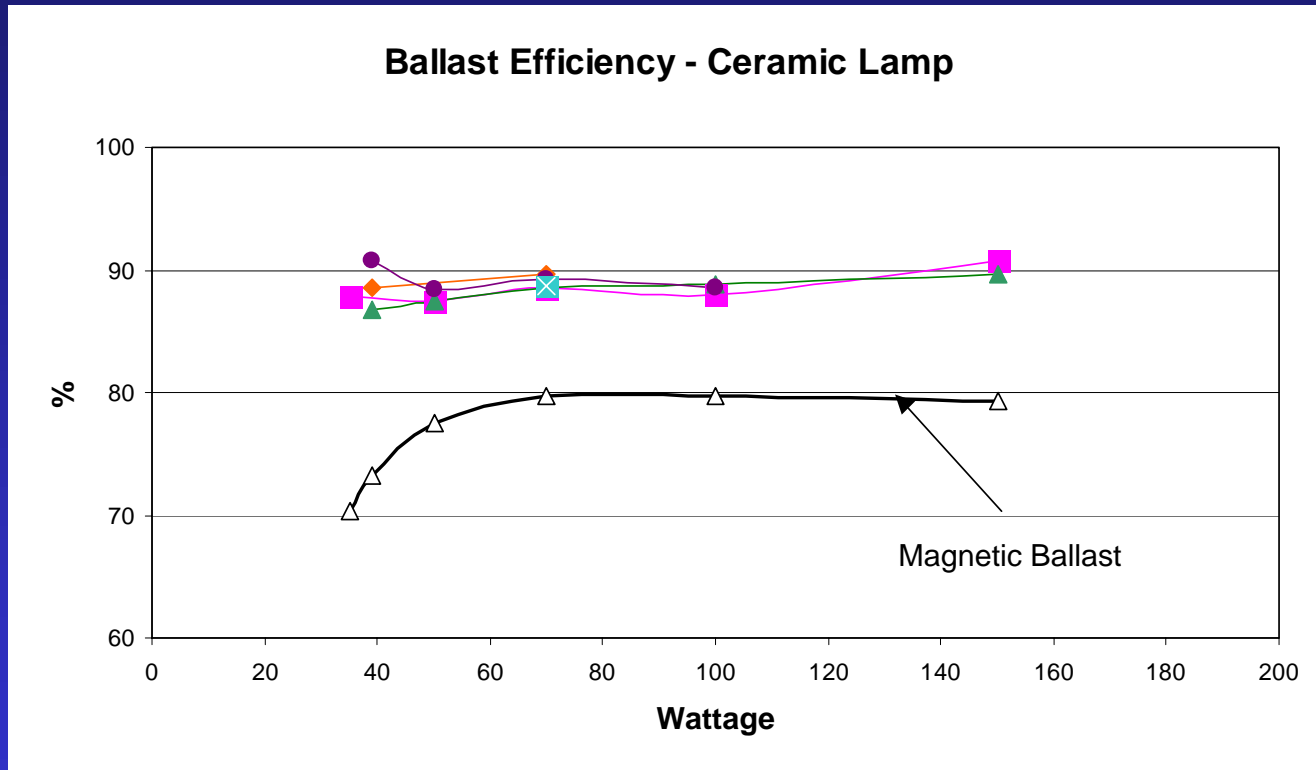




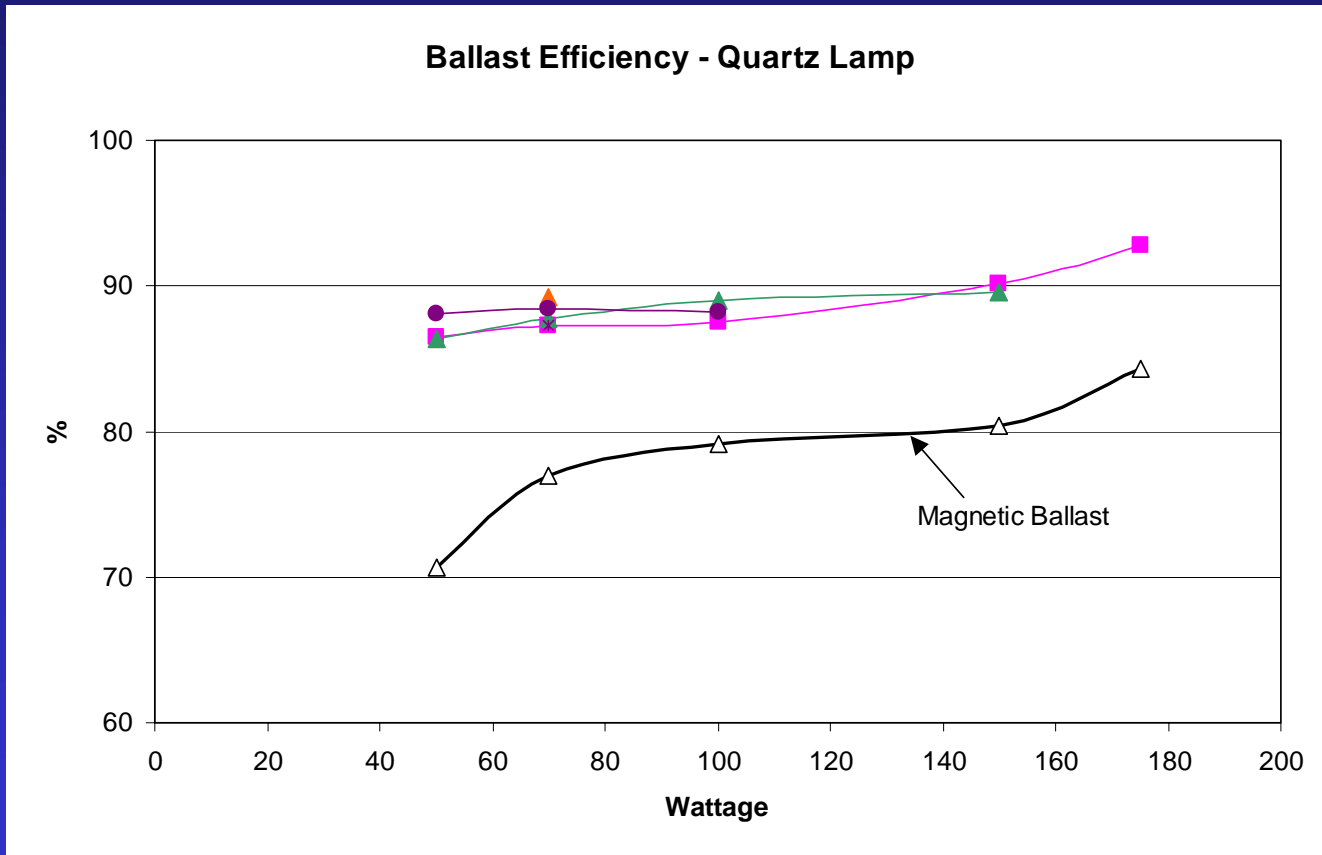
Performance of Dimming 350W Metal Halide System



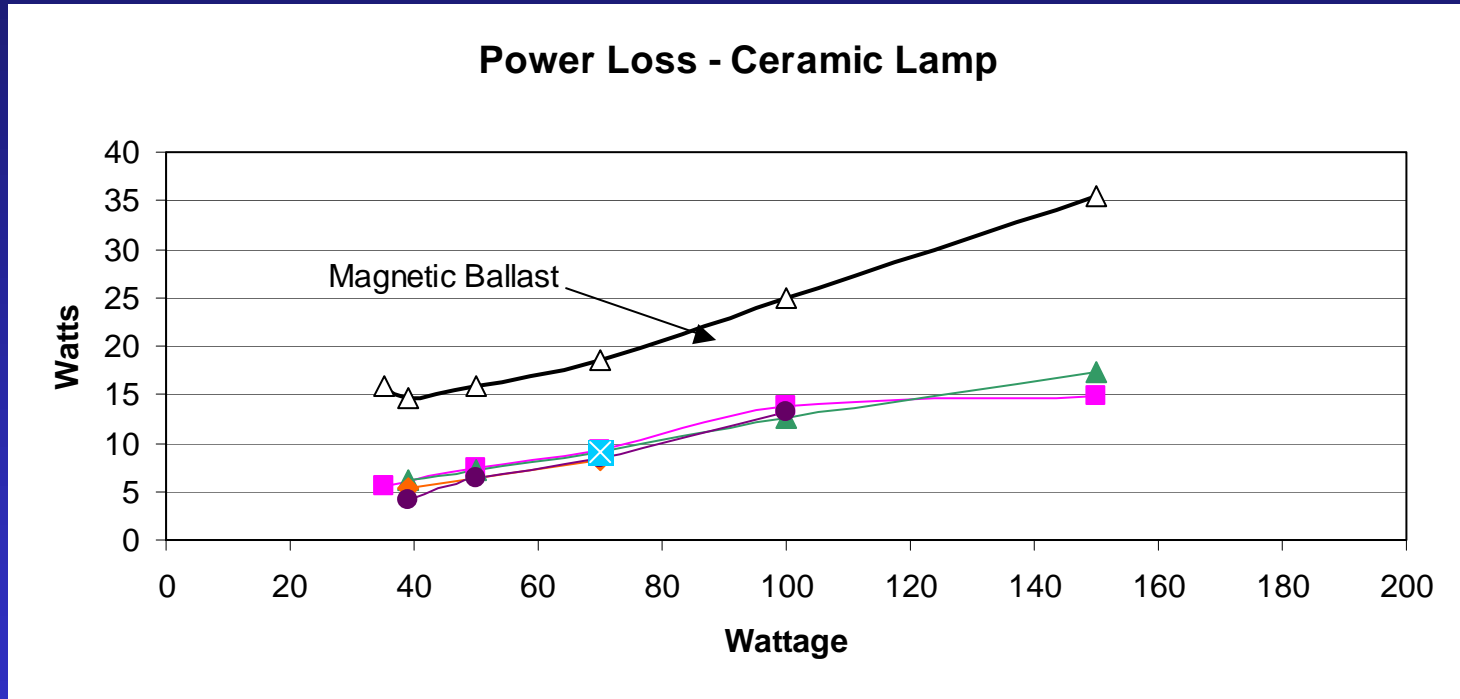
Performance of 35 to 175 W Metal Halide Systems



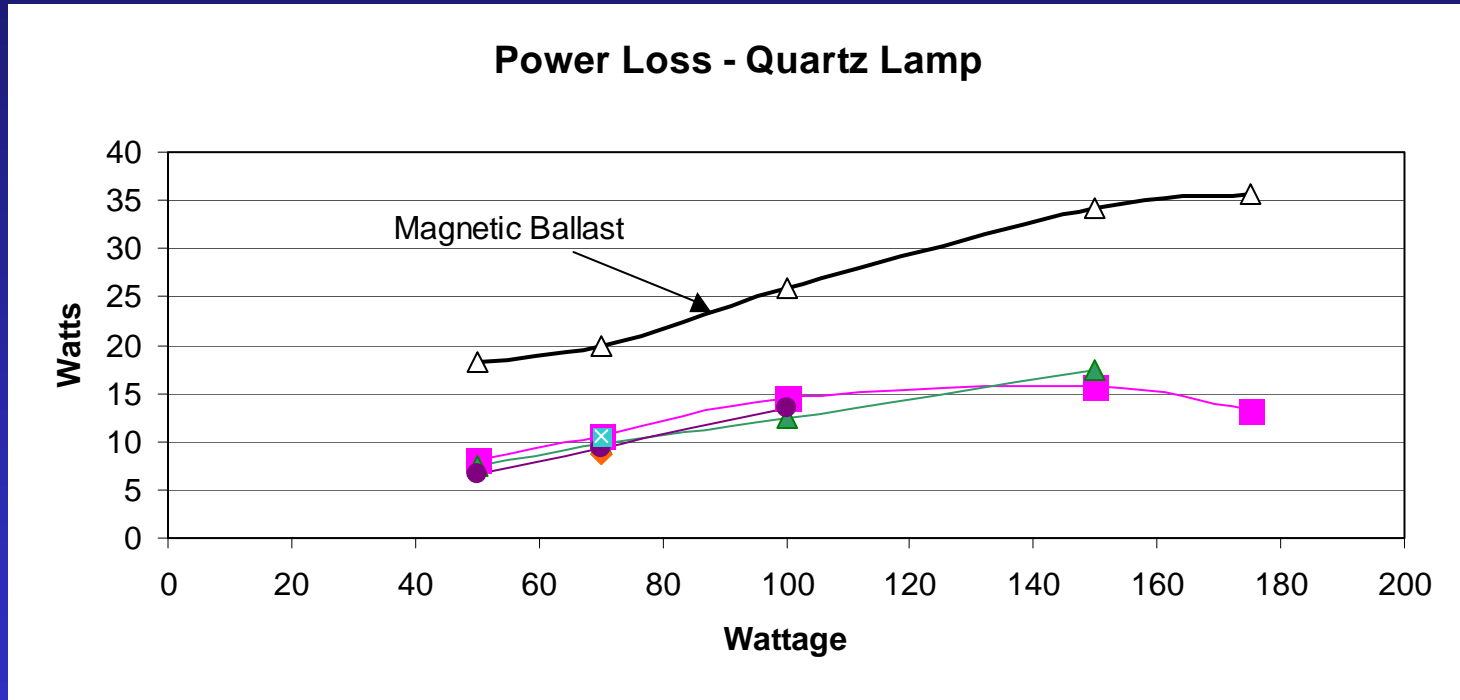
Performance of 35 to 175 W Metal Halide Systems



Performance of 35 to 175 W Metal Halide Systems



Performance of 35 to 175 W Metal Halide Systems





Conclusions:

Electronic vs Magnetic Ballast

- Electronic ballasts are on average 10% more efficient than magnetic
- Electronic ballasts maintain a constant power over $\pm 10\%$ line voltage
- Electronic ballasts maintain a constant flux and color temperature over line voltage fluctuations

Ceramic vs Quartz Metal Halide

- CMH has lower wattage lamps (20, 35, 39) and a range of lamp types
- CMH has overall higher CRI (≥ 85)
- CMH has overall higher efficacy
- 3 to 4 times more efficient than halogen



Potential Impact of Technology:

Total Lighting Energy Use

	Total energy	% INC	energy (Twh)
commercial	391 Twh	32	125.1
industrial	108 Twh	2	2.2
outdoor	58 Twh	11	6.4

Percentage of Lighting Electricity Consumed In Commercial Sector by Incandescent Lamp Types

		(Twh)
Standard – General Service	56%	70.4
Standard- Reflector	25%	31.3
Quartz Halogen	13%	15.6
Halogen Reflector	6%	7.8



Potential Impact of Technology:

Total Lighting Electricity Use in Commercial Buildings by the Retail Subsector

		INC	(Twh)
Strip shopping	29.6 Twh	31%	9.2
Retail (excluding mall)	33.2 Twh	32%	10.3
Enclosed shopping center/mall	13.5 Twh	31%	4.2
		Total	23.7 Twh



Potential Impact of Technology:

Application of Electronic Ballasts to Outdoor Lighting

Sheet Lighting	31.96 Twh
Parking Lots	22 Twh
Total	53 Twh

Changing Ballast 5.3 Twh