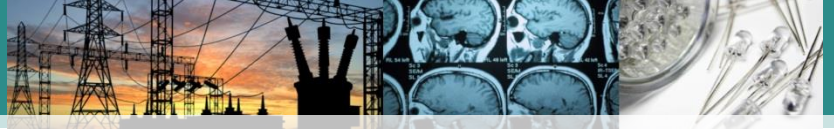
Fluorescent Ballast Dimming, Alternate Method

Full Output Power BLE and Input Power Delta Concept

Alternate Proposal Concept Topics

- Need for an Alternate Method
- Existing CA Title 20 Method
- Weighted Average BLE
- Alternative Method in Development
- Pros and Cons of the Alternative
- Conclusion

Note: Data and Values in this presentation are for concept demonstration purposes only. True values will need to be determined analytically, through extensive data gathering and testing.



Reasons to Consider Alternate Test Method Concept

- As discussed in previous briefs:
  - Measuring Filament Power Accurately can be Challenging
  - As Frequencies Increase, Instrumentation Test Setup and Wiring becomes more critical
  - Uncertainty within the Measurement Equipment Increases

Existing CA Method: Weighted Ave BLE

Ballast #:	Input Power @ 100%	Arc Power @ 100%	Input Power @ 80%	Arc Power @ 80%	Input Power @ 50%	Arc Power @ 50%	BLE @ 100%	BLE @ 80%	BLE @ 50%	Weighted BLE	Weighted BLE Standard
1	58.4	53.8	46.8	42.7	31.4	27.0	0.922	0.912	0.858	0.898	0.812
2	113.8	105.5	92.2	85.3	61.5	54.2	0.927	0.925	0.880	0.912	0.860
3	108.2	99.1	89.2	79.5	60.9	50.6	0.915	0.891	0.831	0.878	0.857
4	58.9	54.4	48.9	43.8	32.6	27.7	0.924	0.897	0.847	0.887	0.813
5	31.8	28.8	26.7	23.4	18.1	14.4	0.904	0.875	0.799	0.858	0.739

Weighted Ave BLE Formula =
(BLE @ 100% Output Power x .2) + (BLE @ 80% Output Power x .5) + (BLE @ 50% Output Power x .3)

Weighted Ave BLE Requirement =
100% Output Power Watts / (100% Output Power Watts x 1.091 + 7.55)

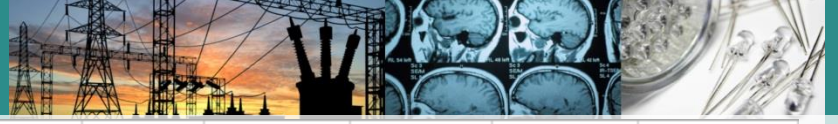
* Note that these Arc Power values include cathode heat

Alternate Idea Based on BLE at 100%, & Input Power Delta at 80% and 50% Dimming

- Test Setup is under development in ANSI

Method:

- BLE is measured at Full Light Output, must be > calculated specification.
  - Example: Existing PS DOE Requirement – X% (Dimming Ballast Circuit Power)
- Ballast is dimmed to 80%, and Input Power must be less (X)% of Pin at Full Light Output
- Ballast is dimmed to 50%, and Input Power must be less (X)% of Pin at Full Light Output
- Ballast must meet all three criteria to pass



Ballast #:	Input Power @ 100%	Arc Power @ 100%	Input Power @ 80%	Arc Power @ 80%	Input Power @ 50%	Arc Power @ 50%	BLE @ 100%	BLE @ 80%	BLE @ 50%	Weighted BLE	Weighted BLE Standard
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4	58.9	54.4	48.9	43.8	32.6	27.7	0.924	0.897	0.847	0.887	0.813
5	31.8	28.8	26.7	23.4	18.1	14.4	0.904	0.875	0.799	0.858	0.739
6	31.5	28.8	26.0	23.1	17.3	14.4	0.914	0.890	0.829	0.877	0.739
7	58.8	54.2	47.7	43.5	31.7	27.4	0.922	0.912	0.865	0.900	0.813
8	63.5	57.5	51.2	46.3	33.1	29.2	0.906	0.905	0.882	0.898	0.818
9	60.2	56.0	48.7	44.5	34.6	29.8	0.931	0.914	0.861	0.901	0.816
10	113.9	105.6	91.6	84.6	59.1	52.3	0.927	0.923	0.885	0.912	0.860

Values are not representative of actual products

BLE Requirement @ 100% Output and Input Power Delta Requirement at 80% and 50% Output

Ballast #:	Input Power @ 100%	Arc Power @ 100%	Input Power % @ 80%	Arc Power @ 80%	Input Power % @ 50%	Arc Power @ 50%	BLE @ 100%	Input Power % @ 80%	Input Power % @ 50%	BLE Standard @ 100%	BLE and Input Power %
1	58.4	53.8	0.802	42.7	0.538	27.0	0.922				
2	113.8	105.5	0.810	85.3	0.541	54.2	0.927				
3	108.2	99.1	0.824	79.5	0.562	50.6	0.915				
4	58.9	54.4	0.829	43.8	0.554	27.7	0.924				
5	31.8	28.8	0.840	23.4	0.567	14.4	0.904				
6	31.5	28.8	0.824	23.1	0.550	14.4	0.914				
7	58.8	54.2	0.812	43.5	0.539	27.4	0.922				
8	63.5	57.5	0.806	46.3	0.521	29.2	0.906				
9	60.2	56.0	0.810	44.5	0.575	29.8	0.931				
10	113.9	105.6	0.805	84.6	0.519	52.3	0.927				

TBD

Note: Top Section is the existing Title 20 requirement, Bottom Section is an example of an alternate method

Conclusion:

- Dimming Ballasts save energy when they are dimmed versus full power/light output operation
- Requiring an efficient BLE level at Full Light Output is consistent with other regulated ballasts
  - Instant Start has highest level, Programmed Start has next level, Dimming Ballasts should have a level which accounts for their additional dimming circuitry
- A reasonable maximum level for Input Power at different dimming levels can insure best power savings is occurring during dimming
- A simplified approach is needed to minimize testing burden, ensure accuracy and improve enforceability

Questions?