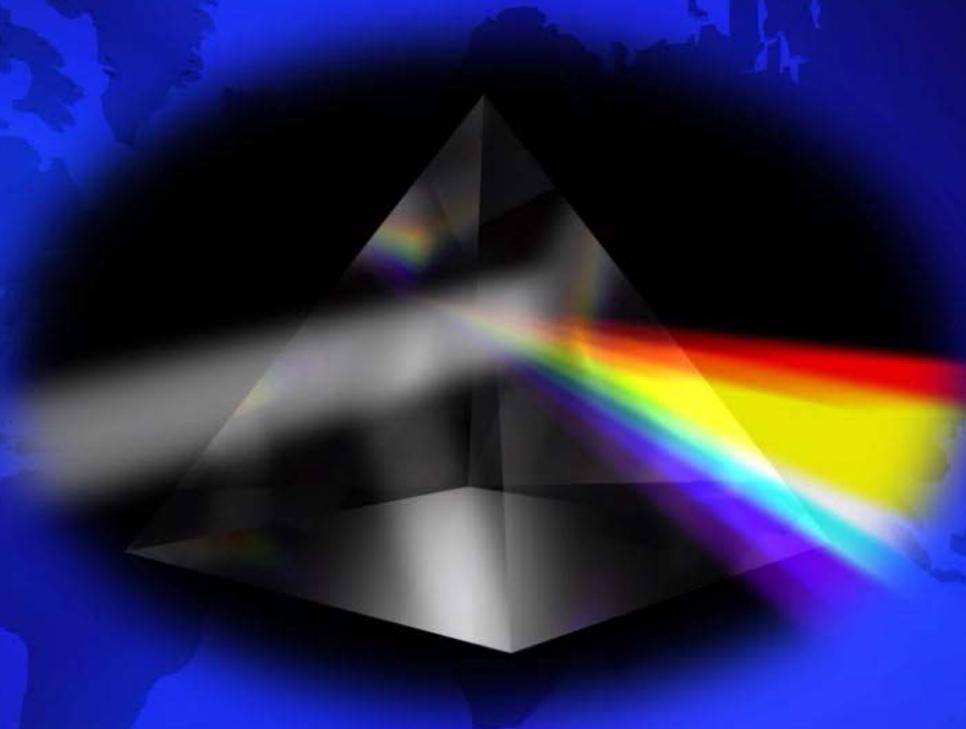




**SAFETY PAYS**

# ***IRTENZ Conference***

***Rotorua - 31st July-2nd August 2002***



***Martin Reinbach - Hella-New Zealand Limited***



# *Road transport lighting* *“Safety and Visibility”*

- **Current situation**  
LTSA vehicle audits-1999/2001
- **Introduction to LED technology**  
History of LED technology vs bulbs – the differences and applications in transport lighting.
- **Factors which affect safety and visibility**
  1. **Luminous Intensity (visibility) - theoretical vs actual/voltage drop on trailers/light output**
  2. **Reaction times - speed of lamp light-up and the effect on stopping distances**
  3. **Lamp colour dynamics - quality of colour vs visibility (hazardous conditions)**
- **Conclusions**
- **Questions**

# *Road Transport Lighting*

## *Factors which affect safety and visibility*

**Signal and marker lamps based on incandescent bulbs are the only safety equipment on a vehicle that fails haphazardly and is not covered by preventative maintenance programs.**

- On a large truck / trailer combination there are some 60 bulbs for which the end of life cannot be predicted.
- In a recent audit by the LTSA over 26 months (1999/2001) 283 vehicles were field tested with the following results.

<b>Total vehicles tested</b>	<b>283</b>
<b>Number of vehicles without faults</b>	<b>41</b>
<b>CoF revoked</b>	<b>22</b>
<b>Serious problems</b>	<b>141</b>
<b>Minor problems</b>	<b>80</b>

## The problems found in these audits were as follows:

Problems found	No Vehicles	%
Brakes	98	25%
Lights	70	18%
Towing	55	14%
Tyres	47	12%
Suspension	41	10%
Body	35	9%
Chassis	20	5%
Steering	17	4%
Exhaust	8	2%

\*Reference "LTSA Vehicle Stands Audits"  
The Mainlander-March 2002

**In lighting the following were the reasons given for problem reporting.**

<b>Location of fault</b>	<b>% of problems</b>
<b>Stop lamps, tail lamp, indicators</b>	<b>60%</b>
<b>Front headlamps, cab markers, side &amp; trailer rear end outline markers</b>	<b>40%</b>

# *Conclusion*

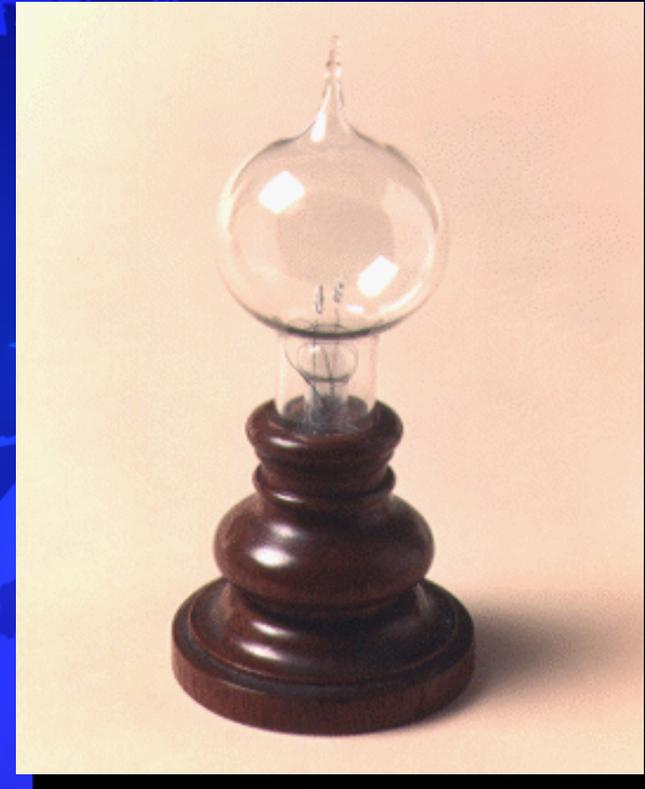
- **Of the vehicles found with problems in this 2 year study the only safety issue which cannot be resolved with a preventative maintenance program, is lighting.**
- **The arrival of ultra durable LED Signal and Marker lamps provides a solution that not only significantly enhances safety but can also represent considerable cost savings, even in the medium term, for the cost conscious operators of commercial transport fleets.**

# *Introduction to LED technology*

## *Incandescent Lighting*



*Thomas Edison*



**1879**

# *Light Emitting Diodes*

- The disadvantage of bulbs is that most of the energy consumed is converted into heat rather than visible light.
- Light Emitting Diode technology is changing this balance and luminous efficiencies 5 – 8 times to that of standard bulbs have been achieved.
- Early pioneer companies were Stanley Japan with the first spoiler mounted CHMSL and Hewlett Packard with the brightest red and amber LEDs on the market. The company Nichia Japan led the way with the colours green and blue and later, white.

# Globe versus LED

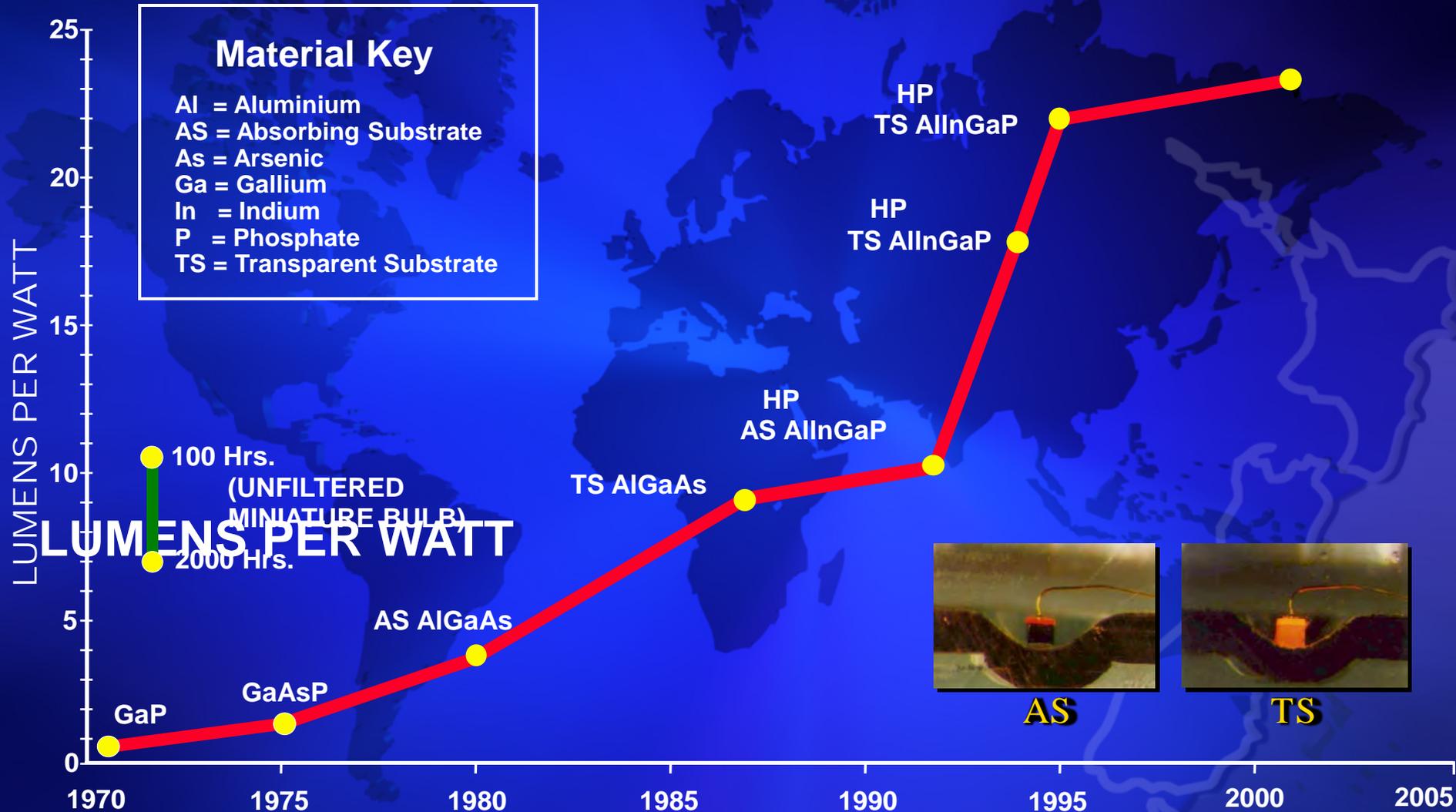


<b>Category</b>	<b>Globe (24 volt)</b>	<b>LED (DuraLed)</b>
<b>Rated Life</b>	150 hours*	Over 10 000 hours*
<b>Power Consumption</b>	21 watts	8 watts
<b>Response time</b>	0.145 sec.	0.000000020* sec.

\*Source:Philips

\*Source:LumiLeds datasheet

# History of LED performance



# *LED technology has significant advantages over traditional incandescent lamps*

- **Ultra long life –10,000+ hours compared with incandescent bulb lamps at 150-500 hours**
- **Significantly lower power consumption**
- **Very fast response time**
- **Close to monochromatic light source**

# *“Road transport lighting”*

## *Luminous intensity*

*For the stop signal to be effective it has to cause  
‘Discomfort Glare’*

- The luminous intensity of traditional incandescent (bulb) lamps is directly related to the available voltage.

# *Photometric and electrical performance Characteristics of rear lighting systems on in-service truck trailers*

<b>Vehicle Type</b>	<b>Mean (Voltage)</b>
<b>Dump trucks</b>	<b>12.15</b>
<b>Vans</b>	<b>11.63</b>
<b>Flatbeds</b>	<b>11.35</b>
<b>Doubles (1 trailer)</b>	<b>9.84</b>
<b>Triples (B-train/2 trailers)</b>	<b>8.45</b>

**DOT HS 807 545  
Final Report**

*Light output by voltage as a percentage of light output at 12.8V*

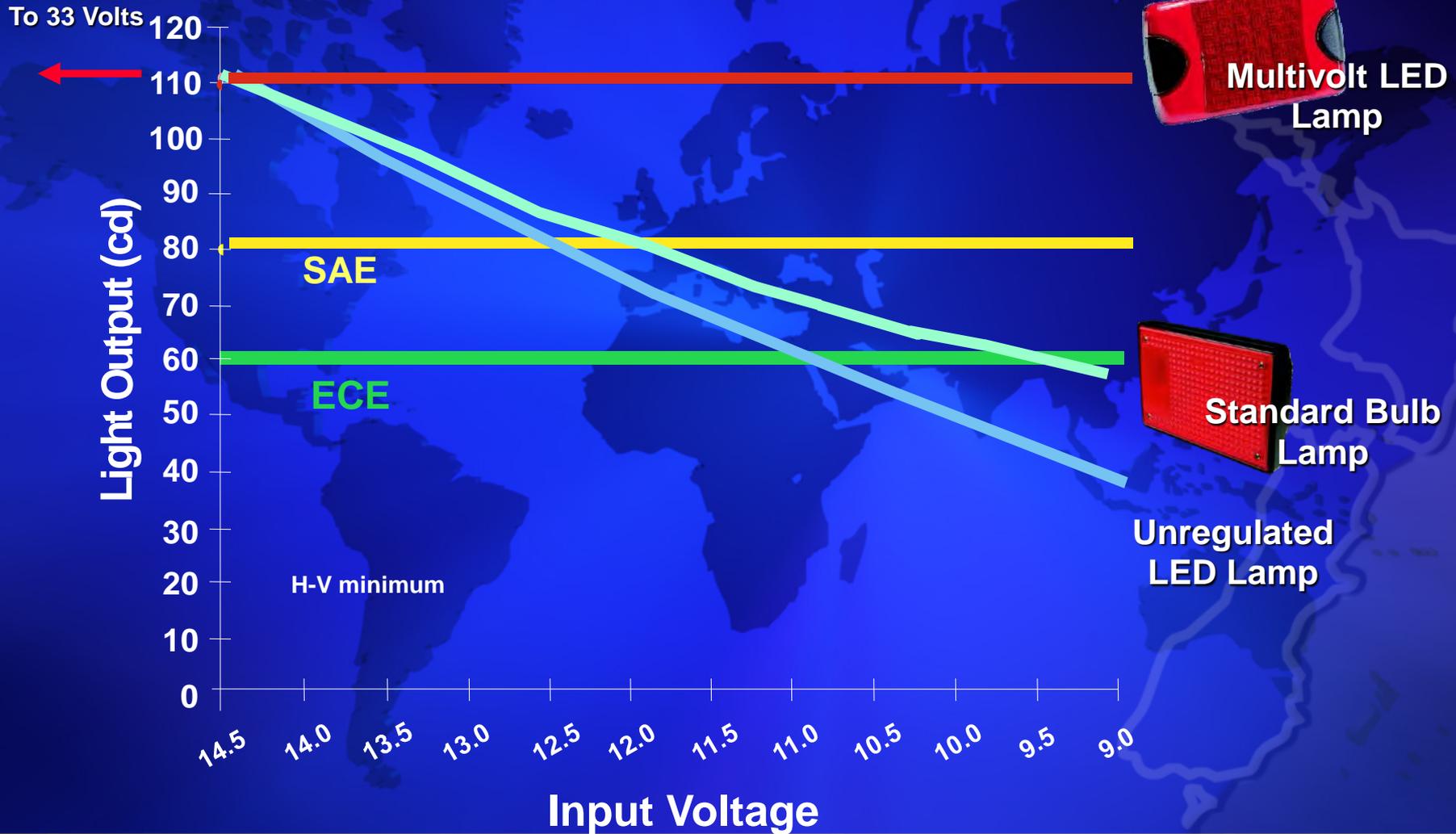
<b>Voltage (V)</b>	<b>Light output (%)</b>
<b>12.8</b>	<b>100%</b>
<b>12</b>	<b>79%</b>
<b>11</b>	<b>59%</b>
<b>10</b>	<b>42%</b>
<b>9</b>	<b>28%</b>
<b>8</b>	<b>18%</b>
<b>7</b>	<b>10%</b>
<b>6</b>	<b>5%</b>

A dark blue world map is centered in the background of the slide. The text is overlaid on the map.

***For the stop signal to be  
effective it has to cause  
'Discomfort Glare'***

***Professor Schmidt-Claussen  
University of Darmstadt***

# Photometric Performance Comparison Standard bulb rear stop lamp vs LED lamp with and without voltage correction circuit



# *Reaction times*

- **The reaction speed of a following motorist to the Stop Signal has been the subject of intense research.**
- **Nose to tail accidents still present a significant percentage of accidents on New Zealand roads and world-wide.**
- **Although less likely to be fatal between two motor cars, under drive accidents of cars under trucks often result in very serious injuries.**

# *The reaction speed to the Stop Signal can be influenced by several factors*

- Luminous intensity of the signal
- Speed at which the signal reaches full brightness.
- Size of the Stop signal
- Clarity of the Stop signal under less than ideal conditions e.g. rain, snow, ice, dirt obscured lens etc.

**LED Signal lamps provide instant full brightness not delayed by the relatively slow heat-up of a filament wire.**

# *Road Transport Signal Lighting - Safety through Visibility*

## *Reaction times*

- **A study by the University of Michigan Transportation Research Institute (UMTRI) in 1993 determined how voltage affected the visibility of incandescent truck lamps both in “rise time” and luminous output.**

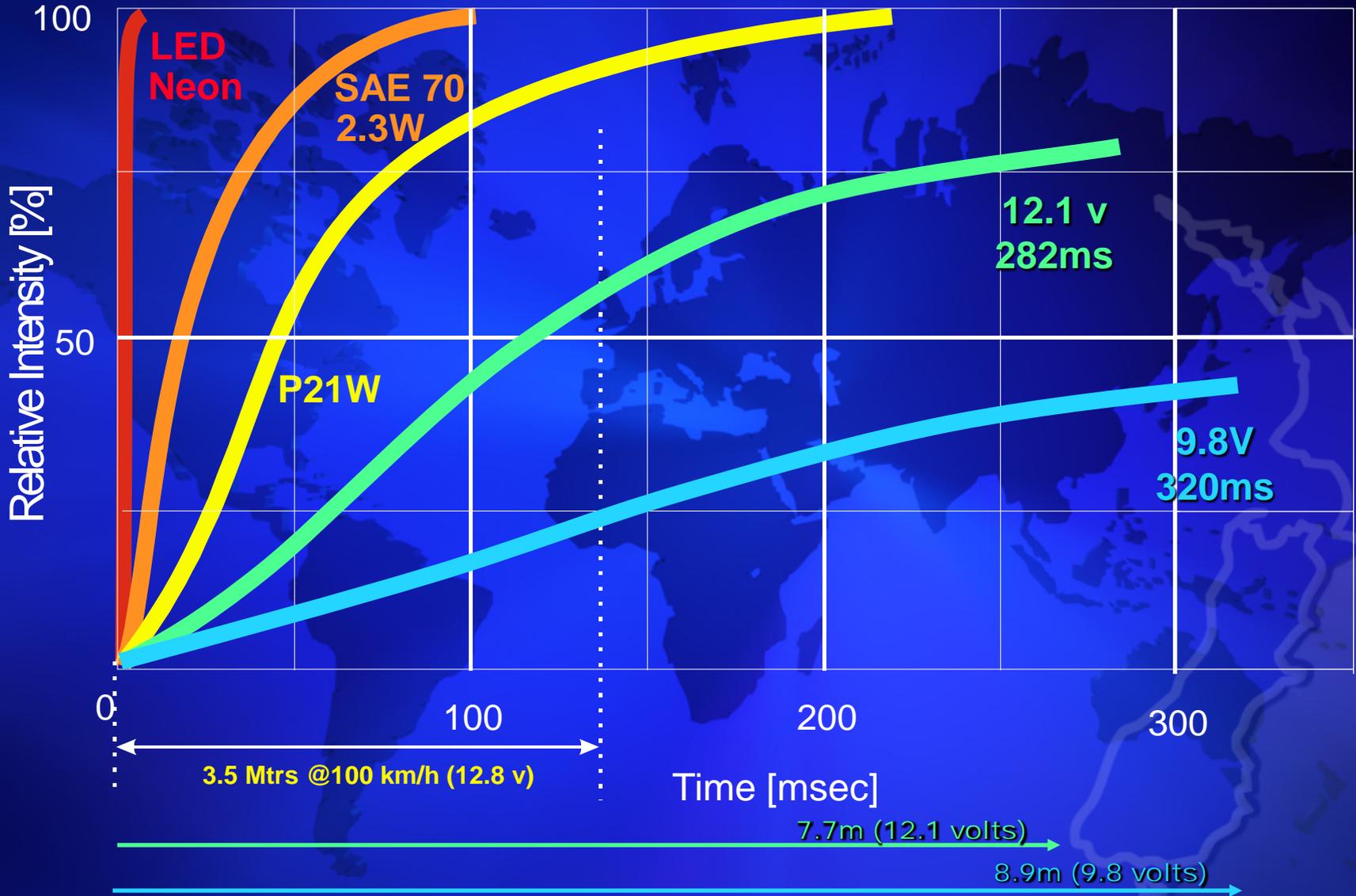
# *Reaction times*

*The results were as follows*

**Delay in reaching 90% of the full brightness at a given voltage**

<b>Voltage(V)</b>	<b>Delay (ms)</b>
<b>12.8</b>	<b>259ms</b>
<b>12</b>	<b>282ms</b>
<b>11</b>	<b>294ms</b>
<b>10</b>	<b>320ms</b>
<b>9</b>	<b>372ms</b>
<b>8</b>	<b>410ms</b>
<b>7</b>	<b>487ms</b>
<b>6</b>	<b>575ms</b>

# LED Instant Light-up = Extra Safety Distance



# *Lamp colour dynamics*

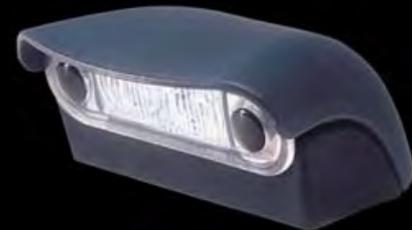
- **The physical nature of LED lighting produces a narrow band width of almost monochromatic colour signal, compared to incandescent lamps.**
- **Research is now suggesting that this results in improved visibility of LED lighting, particularly in adverse conditions such as heavy rain and fog.**

## *Conclusion*

**The over 100 year old incandescent bulb technology is now being replaced by maintenance free, energy efficient lighting systems which will enhance the safety of all traffic participants through increased Vision and Visibility.**

**These Lighting systems, of which LED technology is at the fore-front, will provide optimum visibility and safety (stopping distance) whilst saving money for operators through reduced maintenance and downtime**

**Thank you for your attention**



**SAFETY PAYS**