

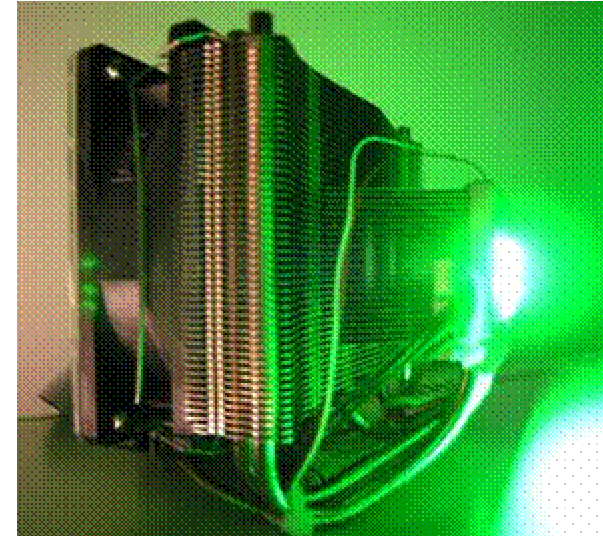
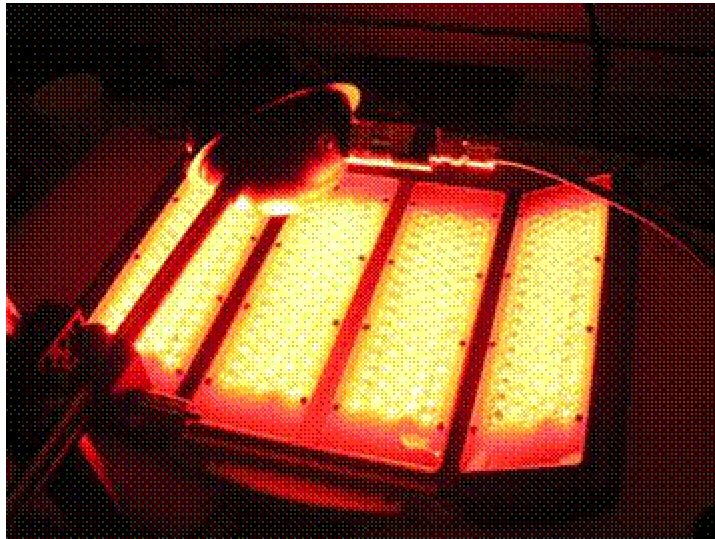


Global Watch Service

# ENFIS



**Multi-Watt LED Light Engines  
Systems & Technology  
Medical and Lighting Applications  
Dr Gareth Jones – CTO, Enfis**



[www.enfis.com](http://www.enfis.com) Tel +44 1792 485660

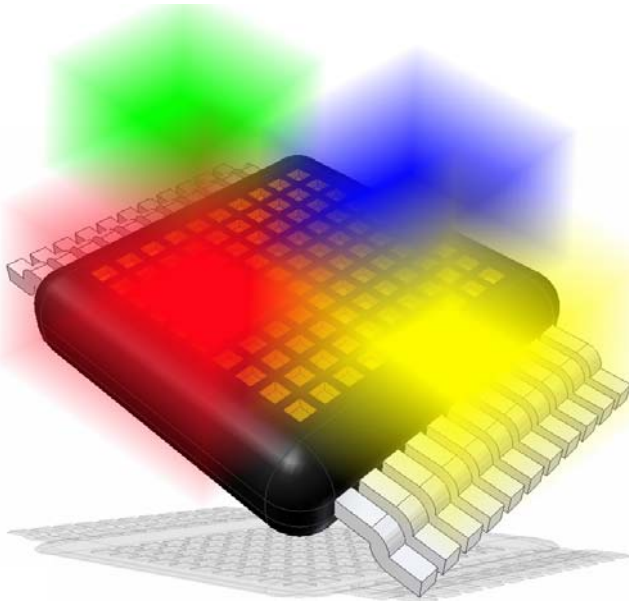
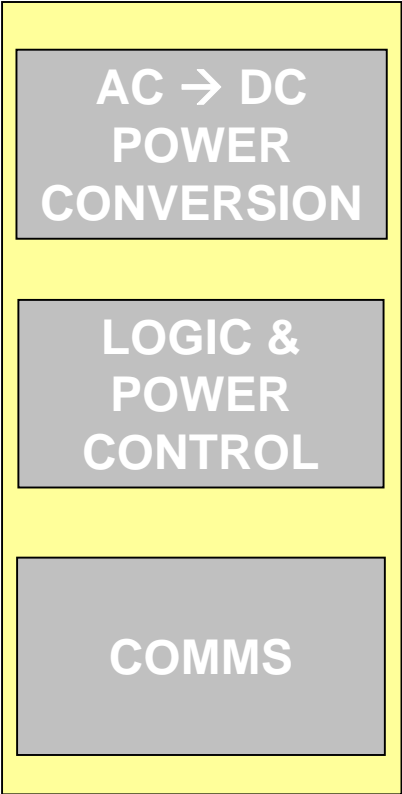
# ENFIS



- UK's most dynamic technology company specializing in High Power Multi-Watt MW-LED Light Engine systems
- Flexible and responsive company (currently employ 19 full-time specialists) backed by large multi-national manufacturing and financing team
- MW-LED Light Engine Systems Developer & Provider for Medical, Industrial, Agri-foods and niche Lighting Applications
- Technology and Applications IP protected by international patents.



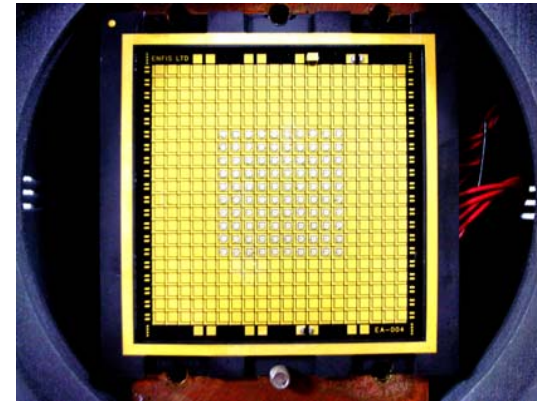
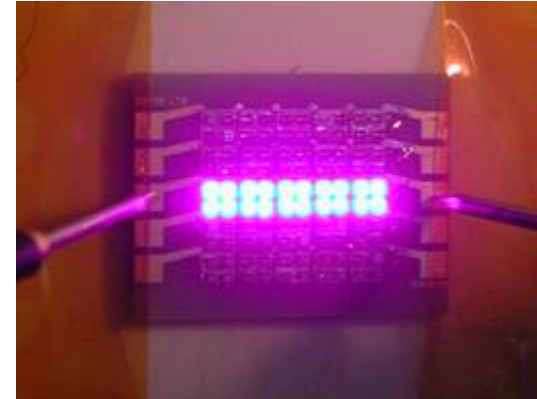
# MW-LED Light Engine Building Blocks



## MW-LED Array Specifications State-of-the-art LED Power Specs

UVB/C	<320 nm	50mW/cm <sup>2</sup>
UVA	370 nm	250 mW/cm <sup>2</sup>
BLUE	460 nm	>2500 mW/cm <sup>2</sup>
GREEN	520 nm	>1500 mW/cm <sup>2</sup>
YELLOW	590 nm	>1000 mW/cm <sup>2</sup>
RED	640 nm	>3000 mW/cm <sup>2</sup>
NIR	800 - 980 nm	>3000 mW/cm <sup>2</sup>

Multi-Watt LED arrays  
(MW-LEDs) have arrived  
with KiloLumen output

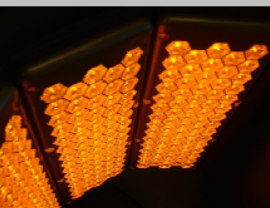


# Comparison with Enfis MW-LED Class Arrays

Company Name	Part No	Size (cmxcm)	Area (cm <sup>2</sup> )	Light Output mW / Lumen	Radiant Power Density (mW/cm <sup>2</sup> )	Thermal Resistance (K/W)
Lamina	BL-3000-red	27x32	8.6	6800/1938 *	790	<1
Lumileds	Luxeon III	8x15	1.1	770/140 **	690	15
Enfis	MW-5x5-red	9x12	1.1	4000/880 ***	3700	<1

Lamina  $\lambda_d \sim 618\text{nm}$  \*; Luxeon  $\lambda_d \sim 627\text{nm}$  \*\*; Enfis  $\lambda_d \sim 625\text{nm}$  \*\*\*

- Better than best in class commercially available high power LED packages and LED arrays
- Superior thermal resistance compared with single die packages
- Enfis expertise in Thermal Management is crucial to achieve MW-LED power levels

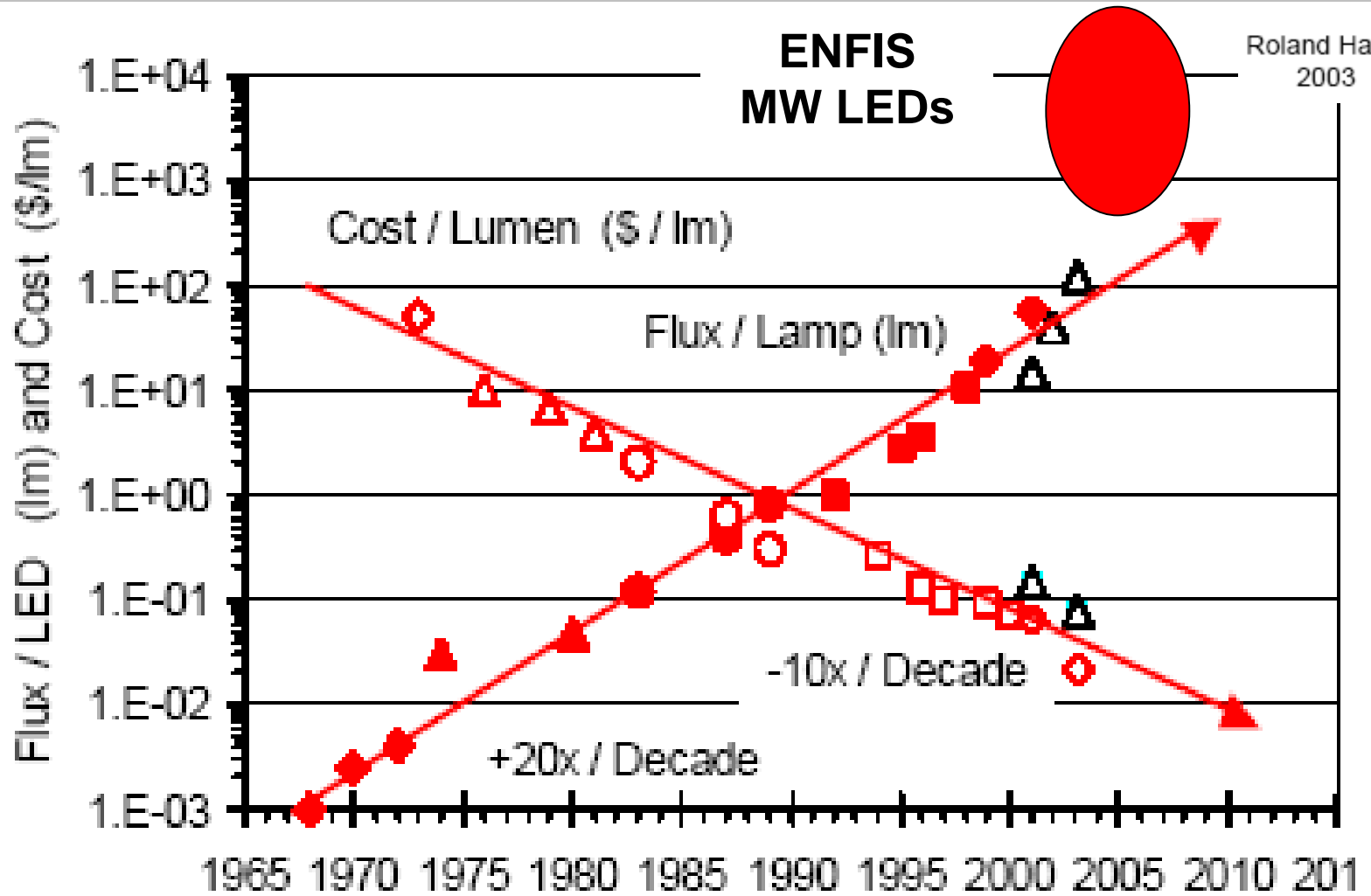


# MW LED Advantages and USPs



- Powerful, Single LED Packages up to **10000++** Lumen
- Small footprint. LED packages size from 1cm x 1cm to 4cm x 4cm - Other dimensions can be constructed by tiling / cascading the single packages
- Built-in LED chips redundancy. Series parallel approach.
- Individually control **RGBY** clusters and multi-wavelengths greater than 4
- Adjustable Colour Temperature, Brightness
- Build-in colour sensing facilities for constant colour and intensity for life of system
- Build-in temperature monitoring light stability control
- **Densely** mixed RGBY LED chips provide better colour mixture - high quality white light
- Packages suitable for **Mass Production Capacity** and **Price**

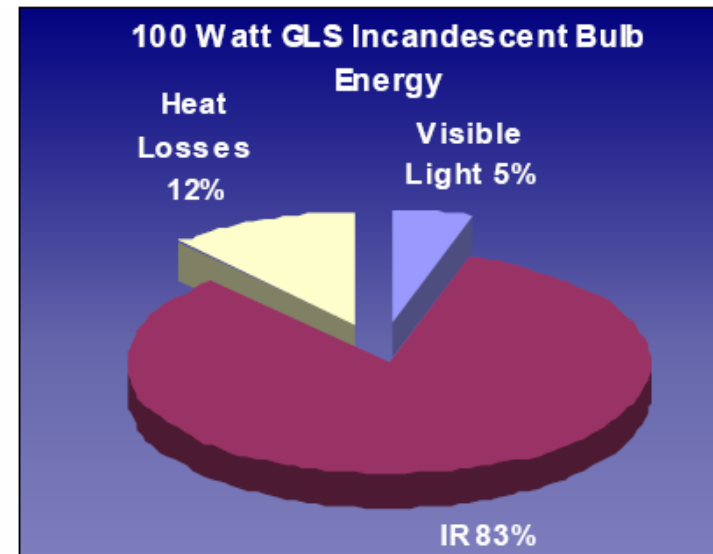
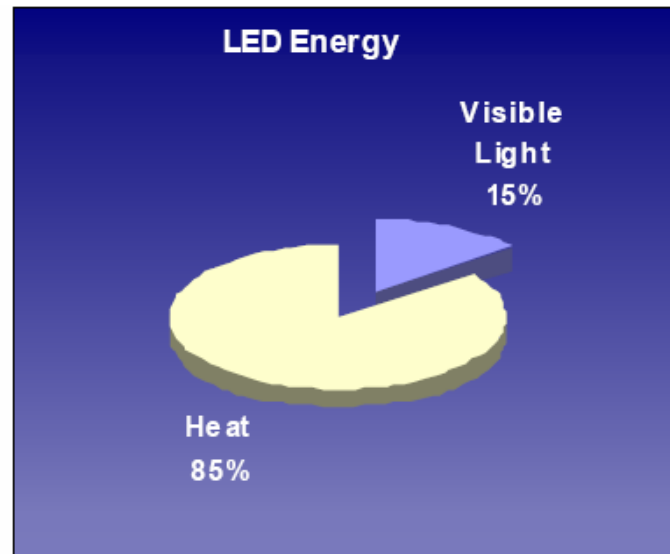
# LED Market Projections



Cost - Lumen/\$ critical design limitation

Thermal Management

Effective heat dissipation is the key technical challenge



Two Scenarios

- Ensure LED Chips reliably & efficiently operate at higher temperatures – packaging and encapsulation innovation
- Remove heat from LED array/package to maintain low LED chip temperature – integrated conduction/convection thermal solutions : cheap and small size

# Future Directions for Medical Applications

## ● Less Invasive Treatments

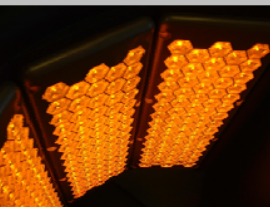
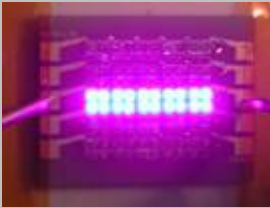
- PDT - Endoscopy
- Light treatment and diagnosis via endoscopy

## ● More home-based medical treatments

- Need to be safe and low cost and robust i.e. no calibration
- Wound Healing / Glucose Sensing

## ● Smart therapies

- Adjustable dosage based on measurements e.g. type of skin or fluorescence measurements
- Example - Photo-Dynamic Therapy & Photo Dynamic Diagnosis in closed loop treatment reducing pain and/or minimising treatment time.



# Applications for New LED Wavelengths of Interest

## ● Skin Treatments

- to replace lasers, Hg Lamp & Excimer Lasers

## ● Disinfection / Sterilisation

- UVC - 260nm to replace Hg germicidal lamps

## ● Acne Treatment

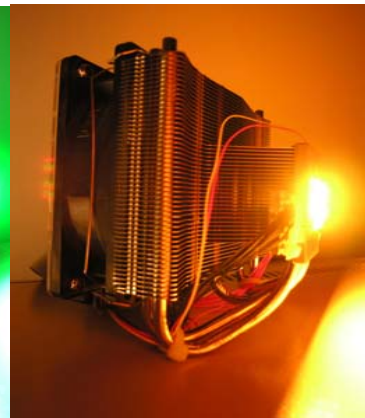
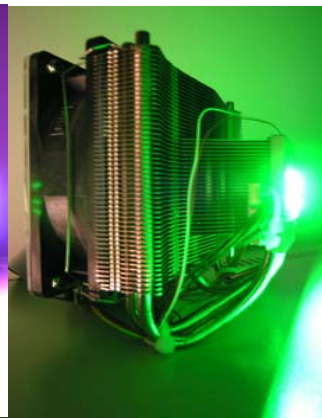
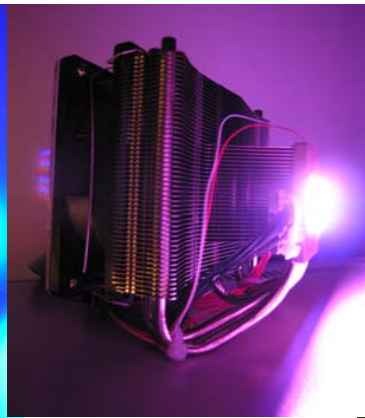
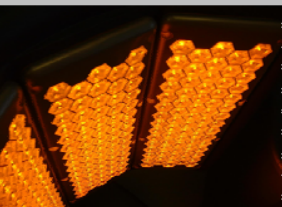
- Yellow 590nm - need to improve efficiency and temperature dependence

## ● Medical White Lighting – Treatment/Surgical etc

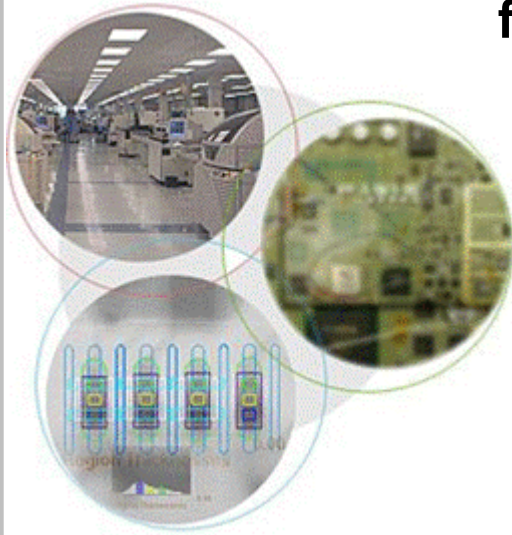
- Improved CRI through New phosphors or RGBY LED colour combination



# MW LED Light Engines Current Application



## Enfis has access to large global manufacturing base for complex MW LED arrays and systems:



- 273,000 square foot (25400 m<sup>2</sup>) of advanced manufacturing facilities in Canada and the United Kingdom
- 42,000 square foot (3900 m<sup>2</sup>) facility in the United States
- approximately 700 experienced employees including 100 dedicated to engineering services, an established infrastructure including a fully implemented SAP system.

