



Plastic Photovoltaic Technology for Energy Harvesting Applications

Energy Harvesting 2014

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It all starts at the end of a journey of
Eight minutes and 19 seconds...



- Jan 2009 – Incubation Phase in Cambridge University
- Sep 2010 – Company Foundation
- 2011 – Development of Pay-As-You-Go Solar business model
- Aug 2012 – Formation of Azuri



Eight19 Vision

- Leading supplier of flexible organic photovoltaics, “plastic solar”
- Development of the lowest cost manufacturing process
 - Significant emphasis on solution process
 - Focus on module architectures that facilitate low-cost & distributed manufacturing
 - Working with a wide variety of suppliers

Eight19's Plastic Solar Attributes

Physical

Flexible, Light-weight, Thin, Robust

Aesthetic

Colours, Semitransparency

Excellent low-light performance

Environment

Low embedded energy, rapid energy payback

Excellent Value



Eight19's Plastic Solar Benefits

Physical

Flexible, Light-weight, Thin, Robust

Aesthetic

Colours, Semi-transparency

Excellent low-light performance

Environment

Low embedded energy

Excellent Value

- Broad deployment options
- Low cost of deployment
- Storage options – e.g. roll-up
- Reduced shipping costs

Eight19's Plastic Solar Benefits

Physical

Flexible, Light-weight, Thin, Robust

Aesthetic

Colours, Semi-transparency

Excellent low-light performance

Environment

Low embedded energy

Excellent Value

- Design flexibility
- Applications requiring transparency – e.g. windows
- IR sensitivity

Eight19's Plastic Solar Benefits

Physical

Flexible, Light-weight, Thin, Robust

Aesthetic

Colours, Semi-transparency

Excellent low-light performance

- Indoor applications

Environment

Low embedded energy

Excellent Value

Eight19's Plastic Solar Benefits

Physical

Flexible, Light-weight, Thin, Robust

Aesthetic

Colours, Semi-transparency

Excellent low-light performance

Environment

Low embedded energy

Excellent Value

- Can be part of large-scale approaches to reduce CO₂ emissions
- Good environmental credentials when used on products

Eight19's Plastic Solar Benefits

Physical

Flexible, Light-weight, Thin, Robust

Aesthetic

Colours, Semi-transparency

Excellent low-light performance

Environment

Low embedded energy

Excellent Value

- Can reach price points to enable very high-volume product applications
- In volume can compete on \$/Wp with silicon PV

Near-term Opportunities for Value Creation

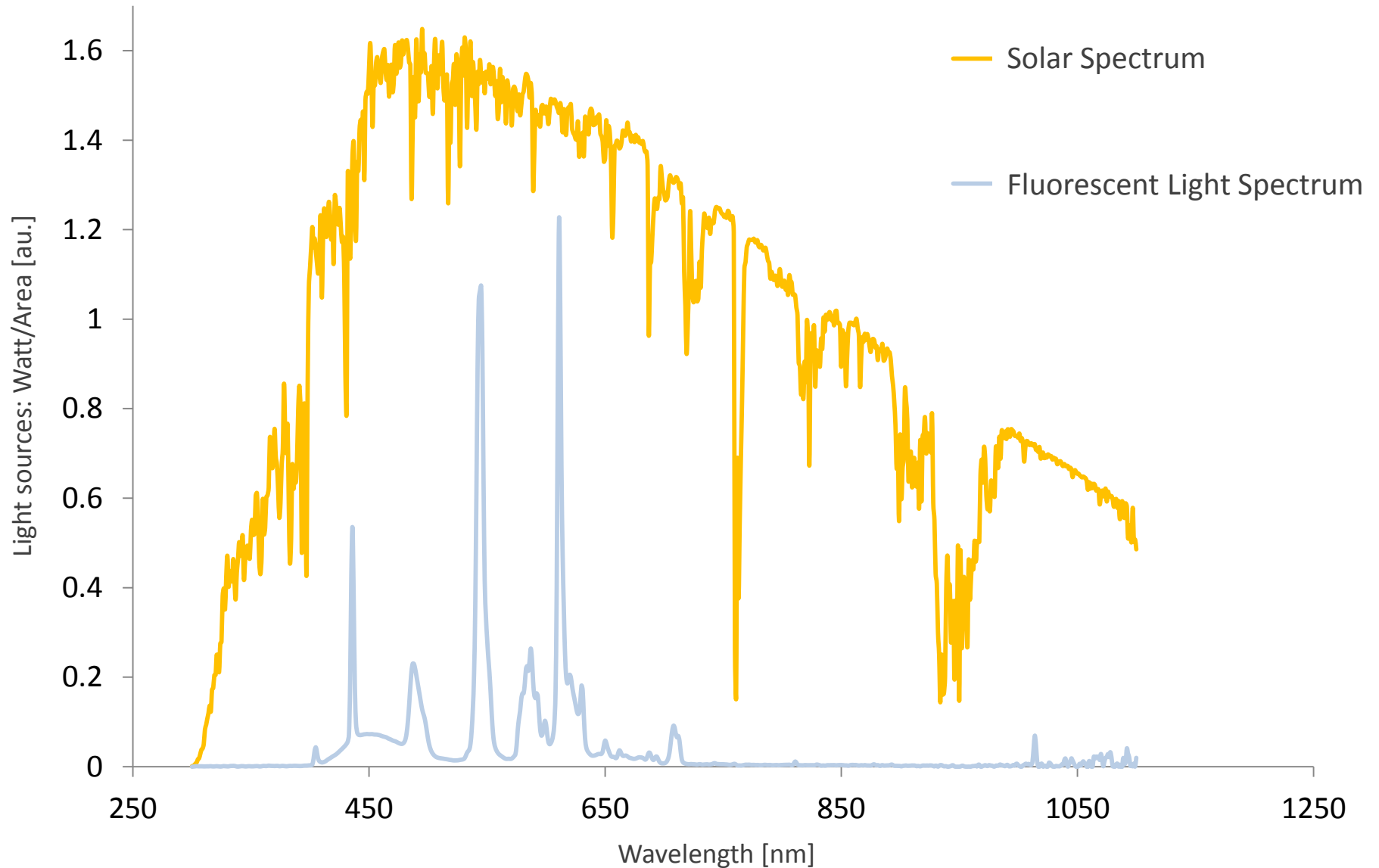
Power for wireless electronics

- Primary battery elimination
- Reduced installation costs
- Labour savings on battery changes
- End-of-life issues with battery disposal
- Design flexibility
 - Deployment on casing
 - Tunable colour
 - IR harvesting – visibly opaque
 - Semi-transparency

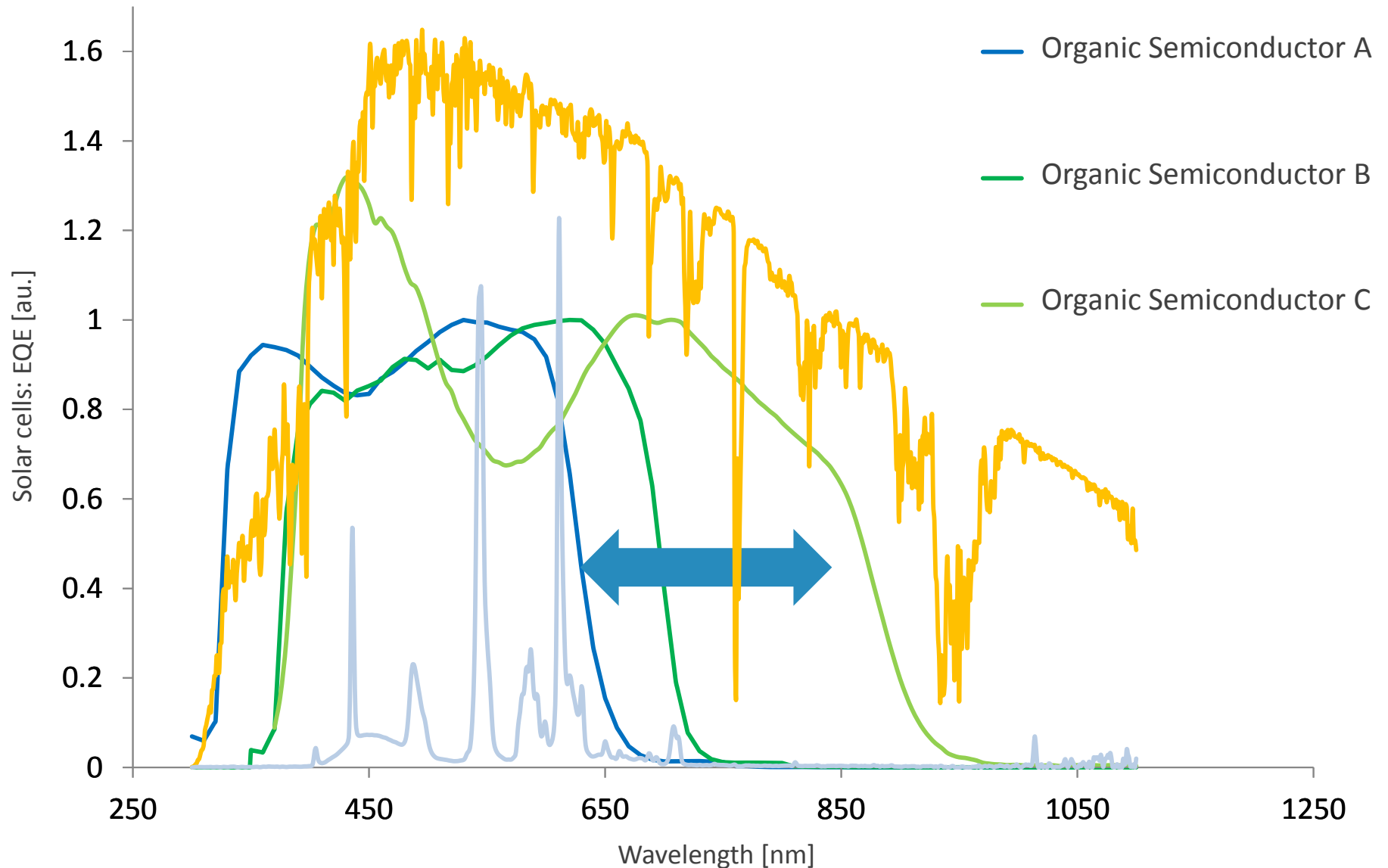
Energy Harvesting Applications

- Power for electronics on product packaging
- Wireless electronics/sensors/Internet of Things
- Wireless signage
- Portable power – for charging mobile devices/lighting

Illumination Spectra



Tuning Photovoltaic Absorption



Measuring Illuminance

- Indoors, artificial lighting is for human vision “illuminance”
- Not measured in watts but lumens
- 1 lux is 1 lumen/m²

1 lux	1m from a single candle
3.4 lux	colour vision fully operational
100 lux	hallway
320-500 lux	office lighting, retail environment
1,000 lux	overcast daylight
10,000 lux	full daylight (indirect sun)
100,000 lux	direct sunlight

Illuminance versus distance

Inverse Square Law for a point source....

200 lux at 3m from a point light source

800 lux at 1.5m from same light source

Move harvester as close to light source as possible...

Wireless Signage - Example

200 lux produces $10 \mu\text{W}/\text{cm}^2$ with Eight19 plastic photovoltaics

100cm² can generate 1mW at 200 lux

Illustrative example If....

Writing the display consumes per event	100mJ
Reading data from wireless consumes per event	10mJ
Background power consumption of electronics is	100μW

Available energy generated is	60mJ/minute	at 200lux
Reading every 30s consumes	20mJ/minute	
Background power consumed	6mJ/minute	
Power remaining is	34mJ/minute	

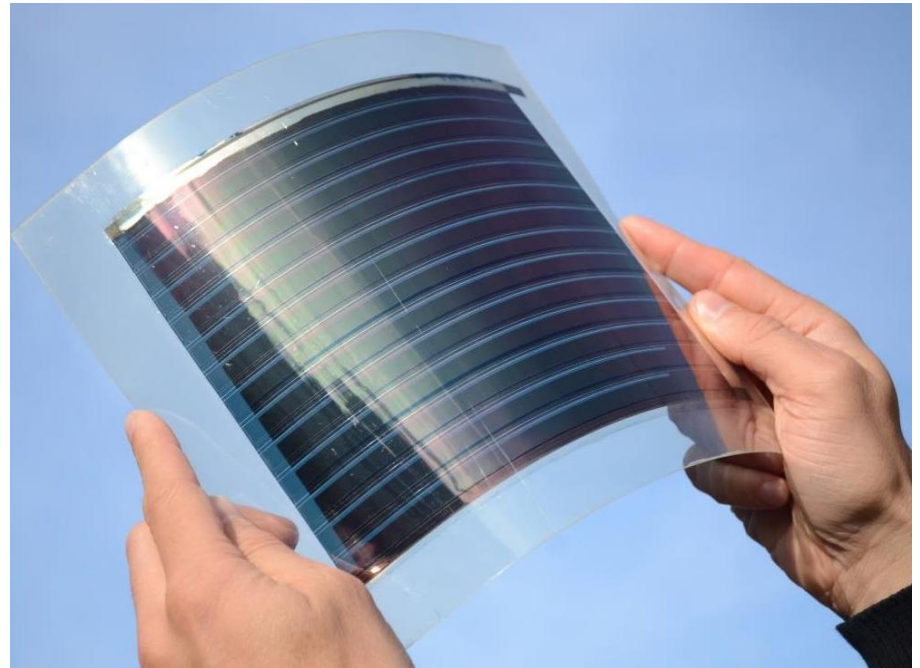
Display can be updated once every ~3minutes

* Champion cell data



Design Flexibility

- Voltage, current & number of stripes
- Length and width



Manufacturing & Commercial Development

- Developing custom designs for leading end-users
- Market trials this year
- Small-scale production in 2015
- Production ramp-up
- Continued improvements in lifetime and efficiency

Talk to us about your application





For more information please contact

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