World's First "Solar Battery" Runs on Light and Air

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Background

Why energy storage is important these days:

- Difficulty in load forecasting
- Cut power cost
- Deal with emergencies

Types of Energy Storage

- Water’s potential energy

- Battery

Renewable Energy & Energy Storage

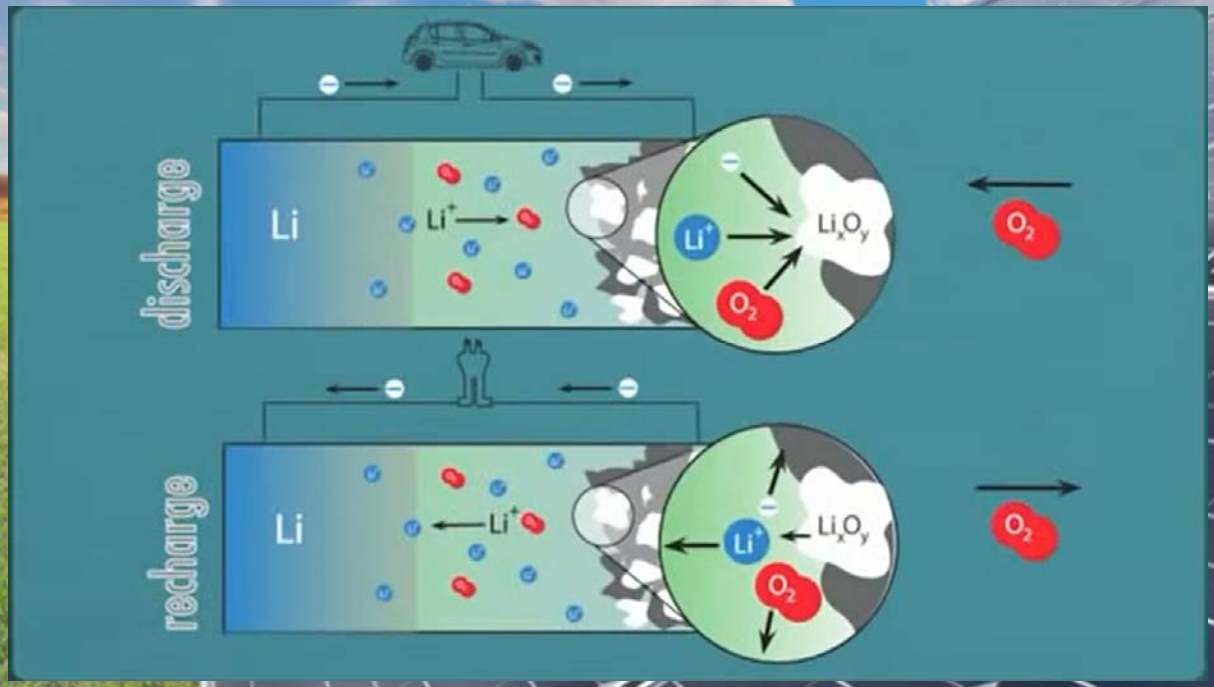
- Let’s go back to the load issue…

Solution - “Solar Battery”!!!

- **Hybrid** solar-cell battery
- Patent-pending, still under research
- Professor of Chemistry Dr. Yiying Wu
- KAir Company

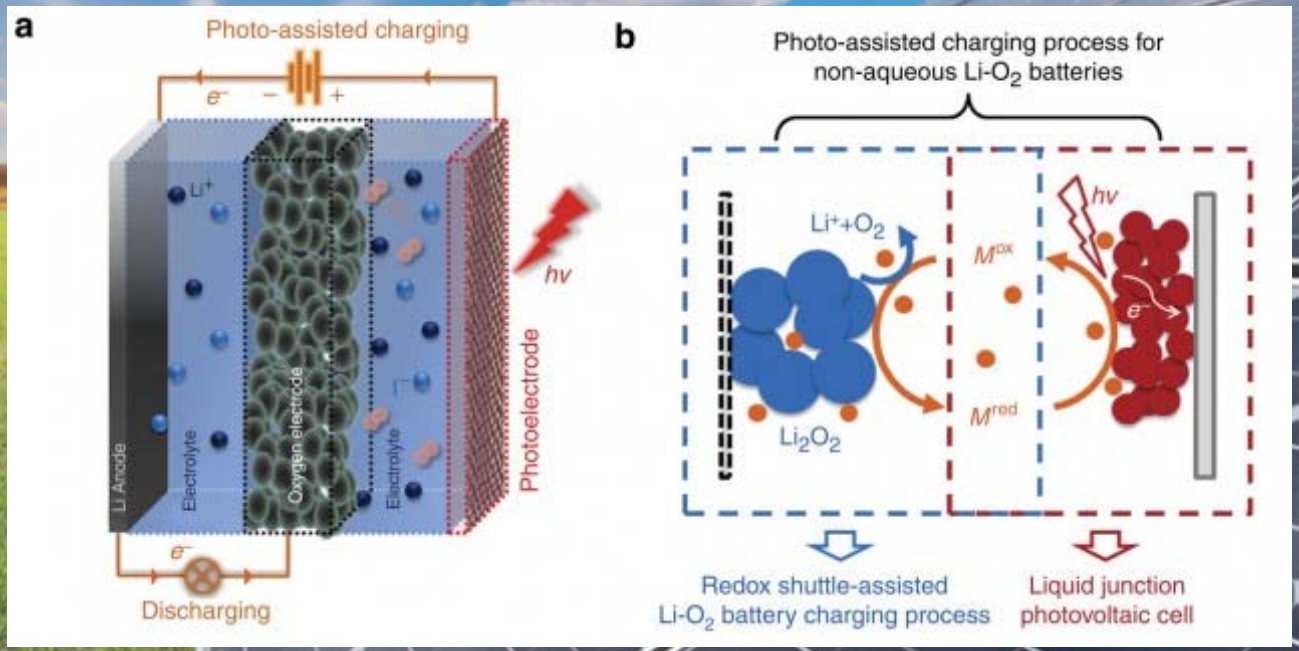
Working Principle

- Let’s first look at the typical Li-Air battery

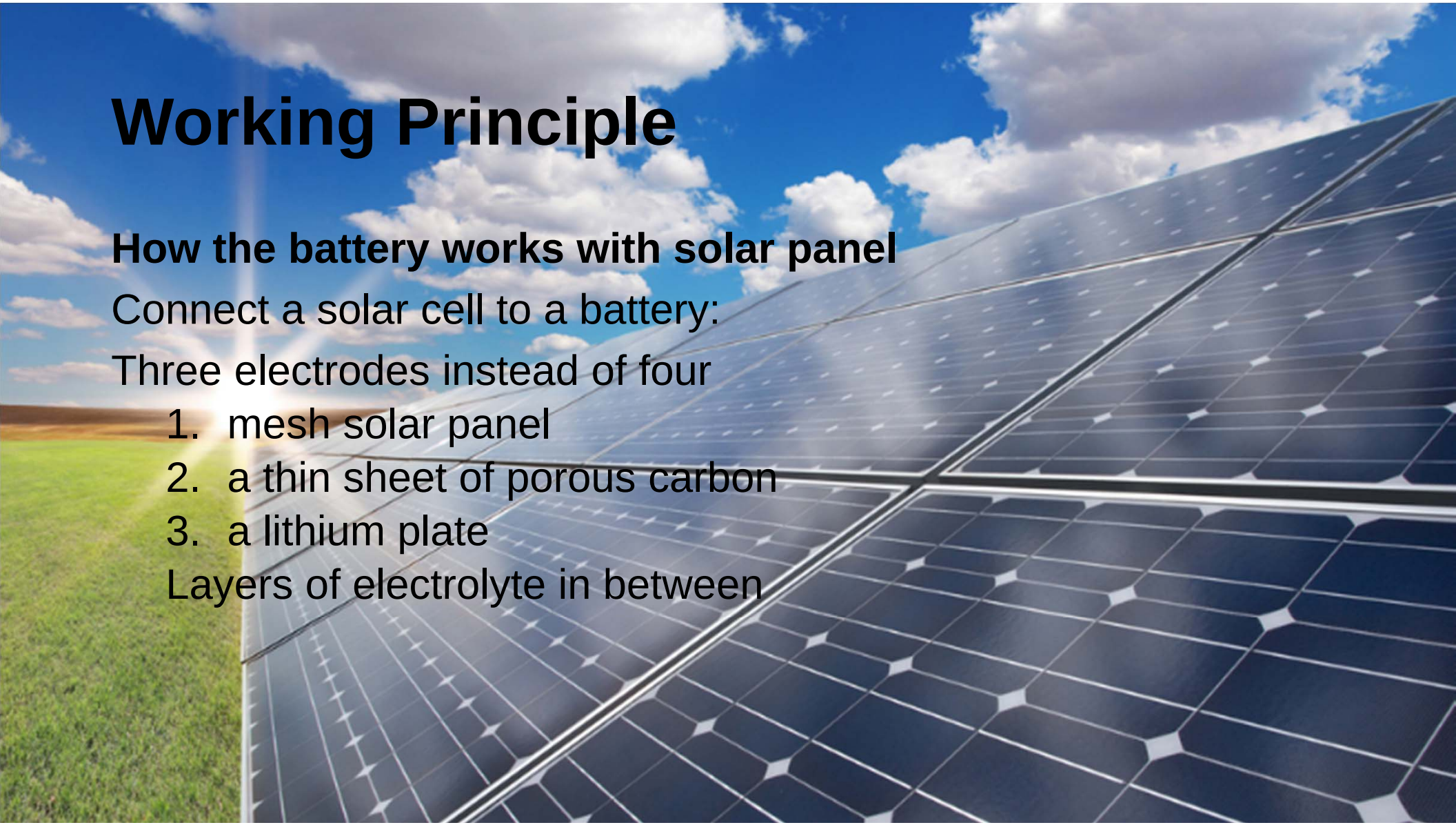


Working Principle

- What makes the “solar battery” different?



Two distinct chemical reactions during discharging and recharging – “breathing effect”



Working Principle

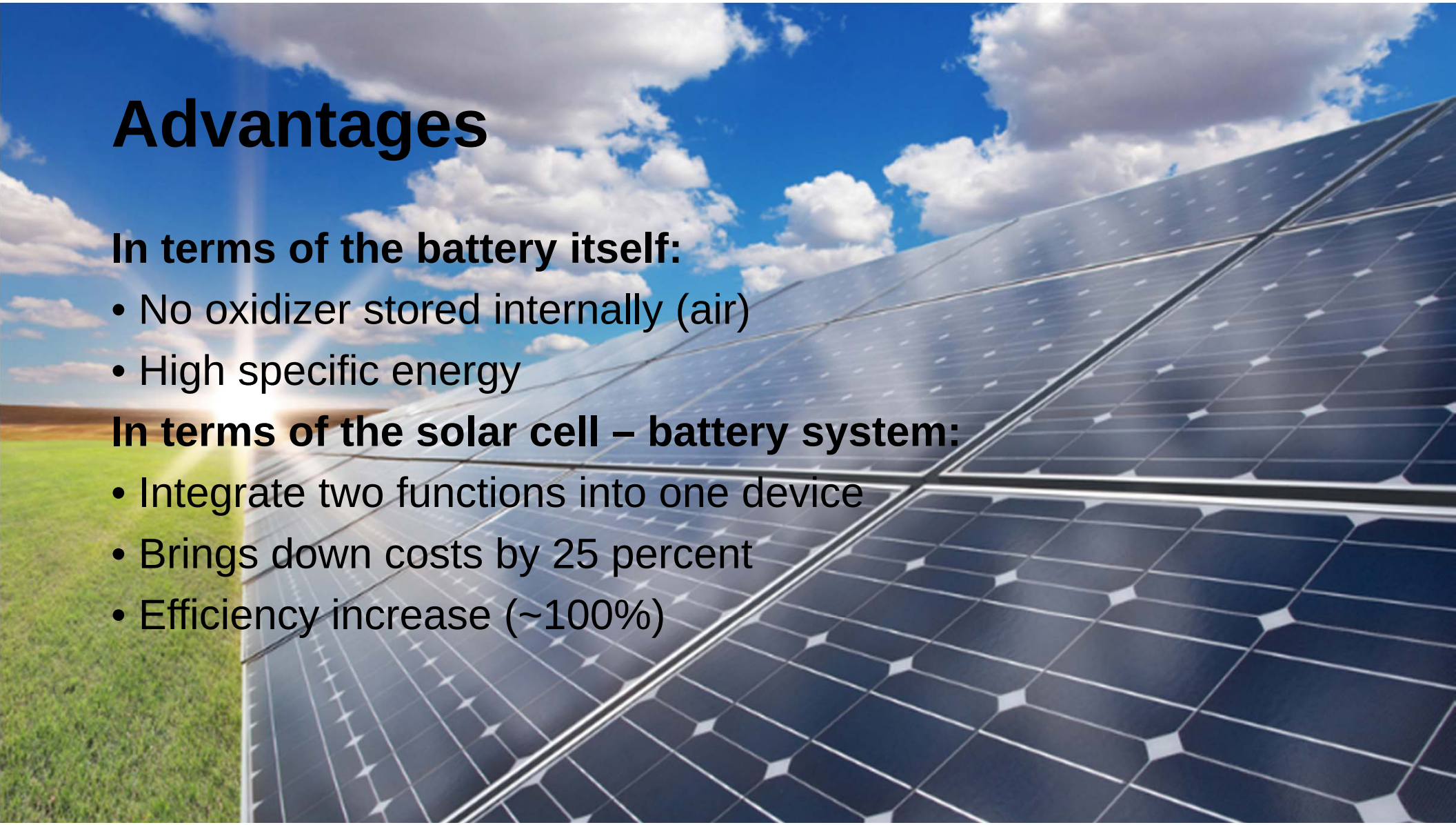
How the battery works with solar panel

Connect a solar cell to a battery:

Three electrodes instead of four

1. mesh solar panel
2. a thin sheet of porous carbon
3. a lithium plate

Layers of electrolyte in between



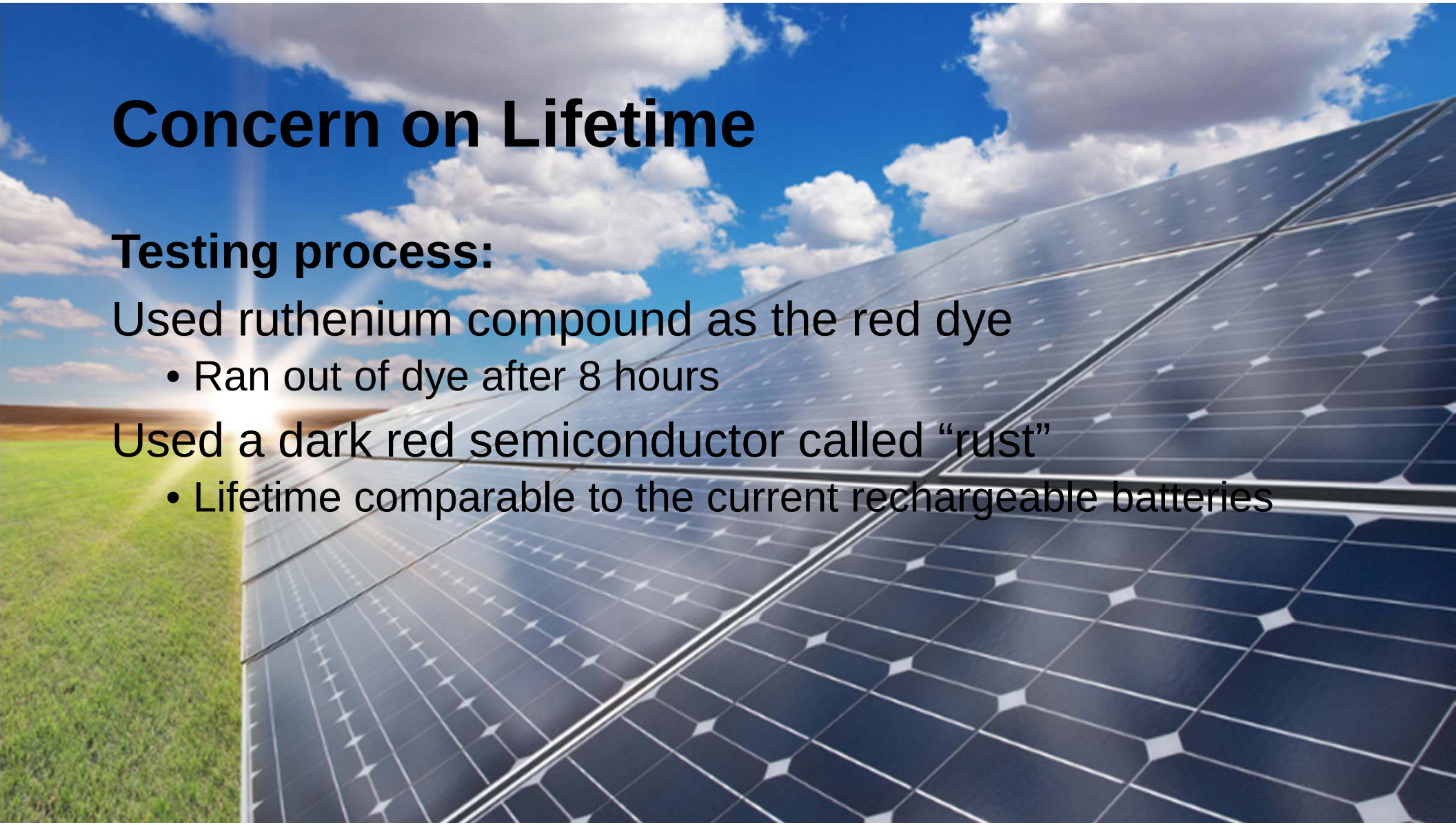
Advantages

In terms of the battery itself:

- No oxidizer stored internally (air)
- High specific energy

In terms of the solar cell – battery system:

- Integrate two functions into one device
- Brings down costs by 25 percent
- Efficiency increase (~100%)



Concern on Lifetime

Testing process:

Used ruthenium compound as the red dye

- Ran out of dye after 8 hours

Used a dark red semiconductor called “rust”

- Lifetime comparable to the current rechargeable batteries

Opportunity

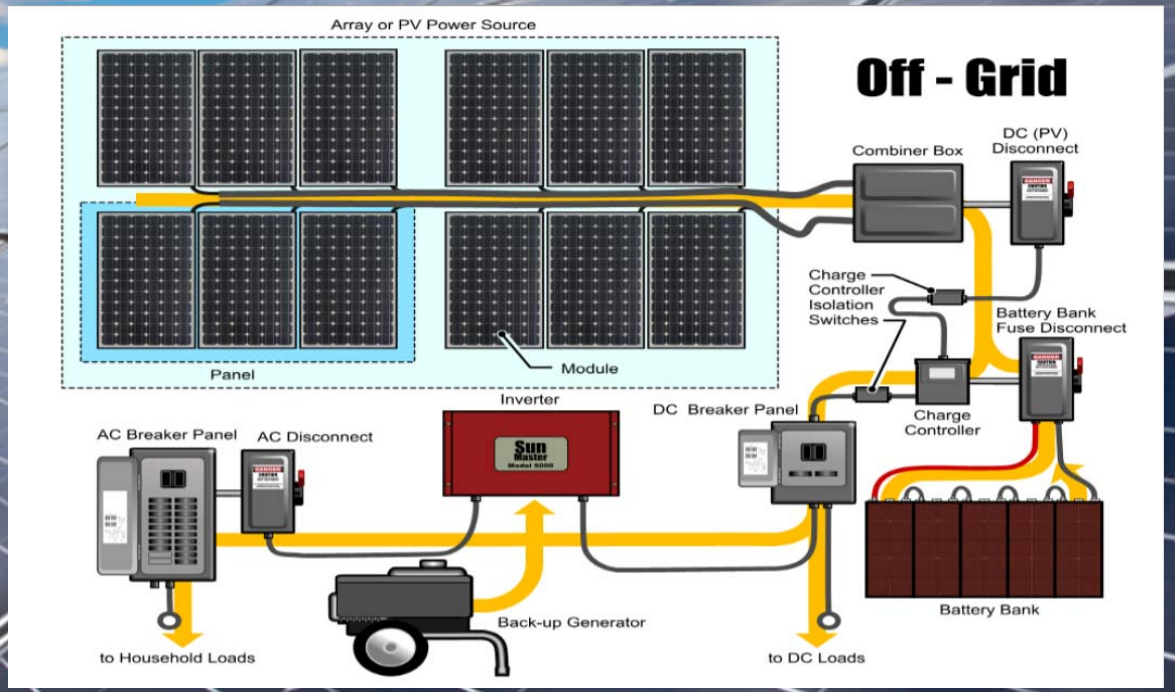
Rooftop solar is now cheaper than buying from the grid

Current issue of back-feeding solar power from rooftop into the grid

Potential Application

An Australian Company called Renewable Energy Devices

- Solar battery system



On Battery Lecture's Last Slide…

Types of Batteries

Lead Acid:
- Most common for PV because they are cheap!
- Widely available
- Long Lifetime
- Low Energy Density
- Limited Depth of Discharge
- Can explode if not properly charged

Various Nickel Cadmium and Nickel Metal Hydrides
- Not typically used for PV

Li – Ion Batteries (Including the related Li-Polymer Batteries)
- King of all batteries!
- Expensive!
- Highest Volumetric and Specific Energy Densities
- Very robust
- Mucho research into cost reductions and improvements – is likely the future

Adding energy storage ~triples the cost of a PV installation so you best really need the batteries! Better approach Smart Grid.

Questions?

Sources

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