Solar 2008
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Concentrating Solar Power Forum
Concentrating Photovoltaics

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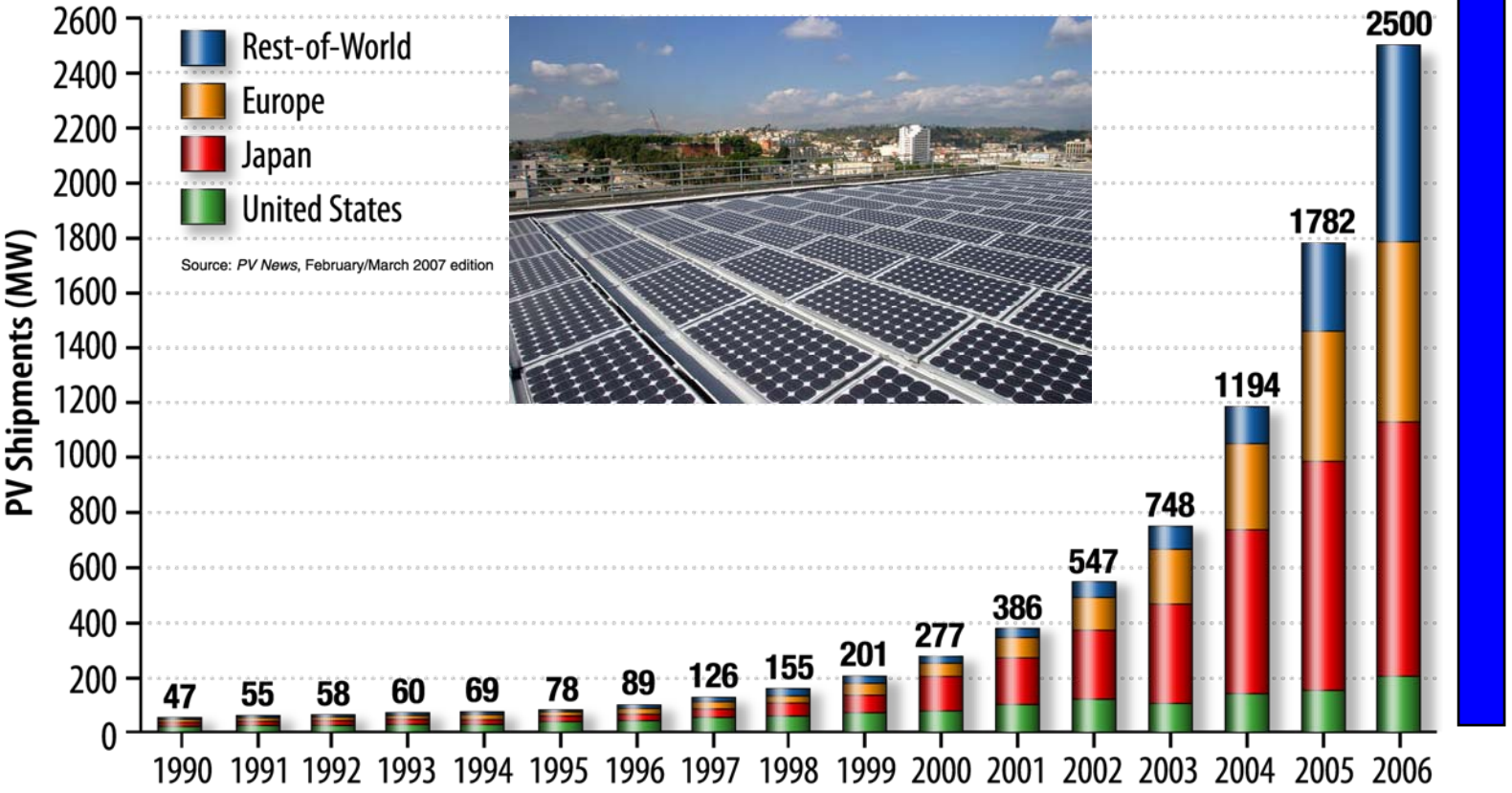
Outline

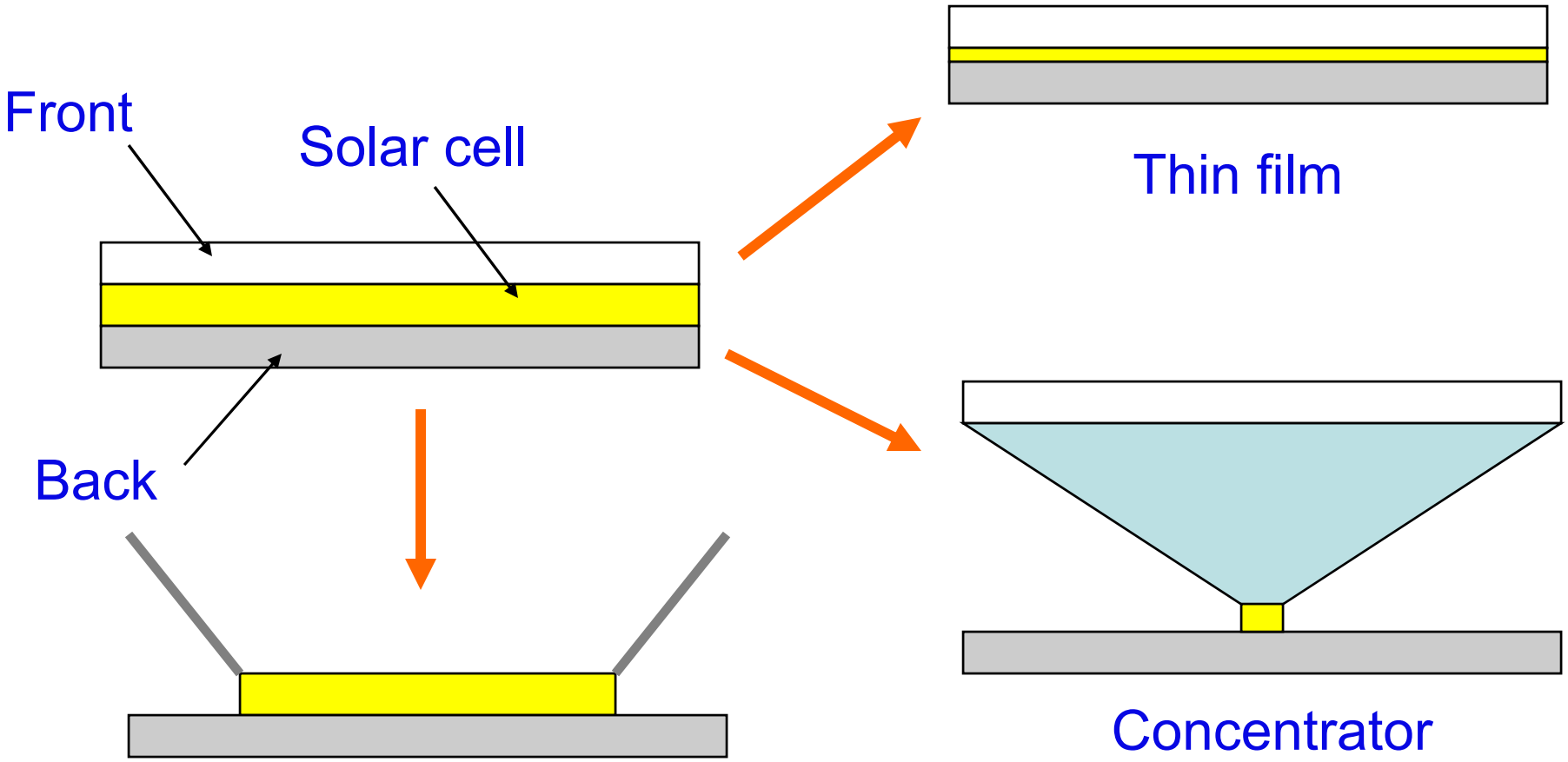
- Growing PV:
  - Use a variety of approaches to grow faster
- Comparison of three concentrator technologies
- Value of high efficiency
- Status of concentrator PV industry

Growth of photovoltaic industry



Growth of PV industry requires capital investment in Si purification

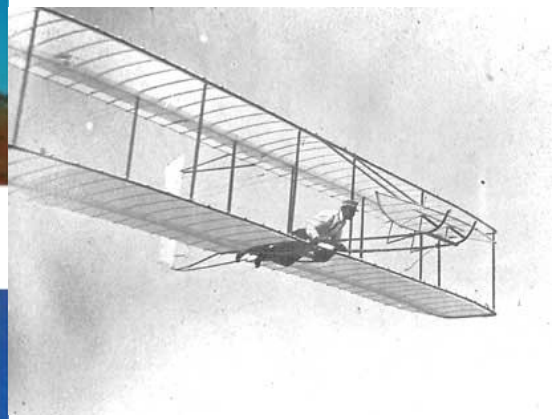
Reduce semiconductor material to reduce cost and capital investment

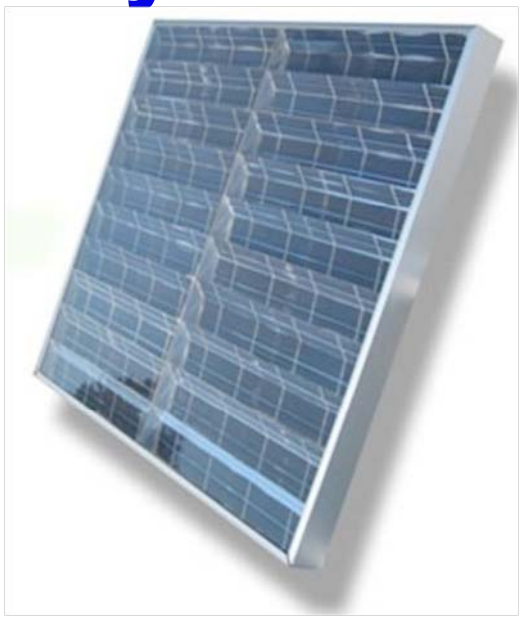


A high efficiency cell increases value of the optics

Concentrating Photovoltaic Systems: CPV

Dish: requires active cooling





Low-concentration

Fresnel lenses focus light on small cells: Passive cooling

High-concentration system mounted close to the ground

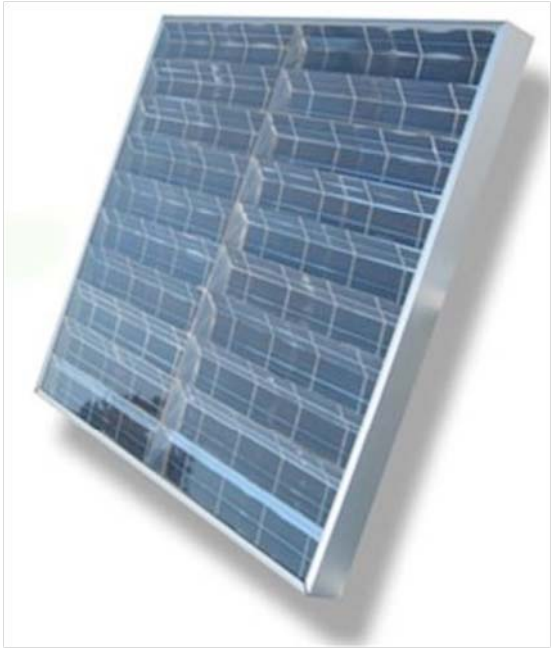
Concentrating Solar

Solar thermal

- > 100 MW fields
- 1-axis tracked
- Requires water for steam
- Hundreds of MWs experience
- Responds slowly to sun (storage)

High-concentration PV

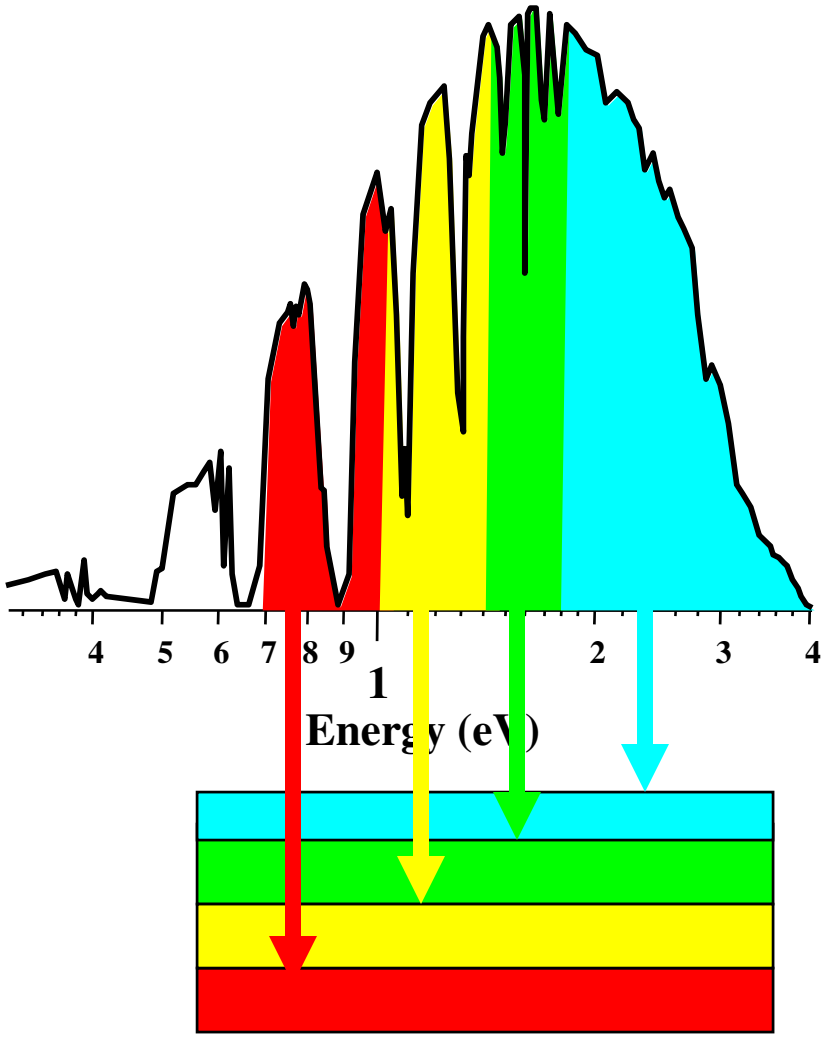
- > 30 kW fields
- 2-axis tracked
- May not require water
- MWs experience
- Responds quickly



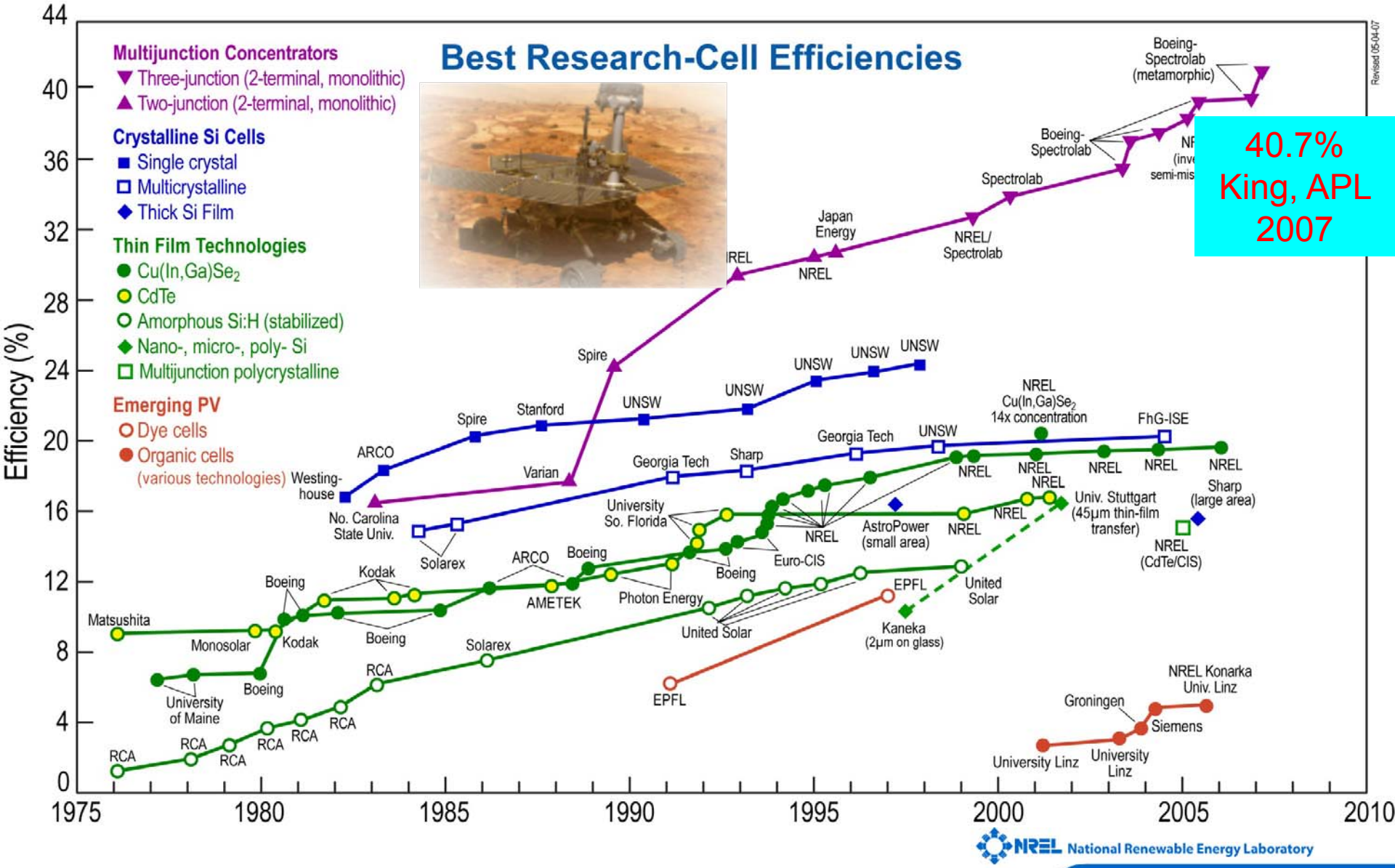
Low-concentration PV

- > 1 kW applications
- Can be static
- Passively cooled
- MWs experience
- Responds quickly to changes in sun

Multijunction cells use multiple materials to match the solar spectrum



Champion solar-cell efficiencies - Pathway to 50%



Companies with datasheets for multijunction cells

- Spectrolab
  - Minimum average efficiency: 36% @ 50 W/cm^2
- EMCORE
  - Typical efficiency: 36% @ 470 suns
- Spire Semiconductor (Bandwidth)
  - Typical efficiency: 35% @ 500 suns

- About one dozen companies have some cell capability

Some concentrator system companies using multijunction cells

- North America
  - Abengoa Solar
  - Amonix
  - Boeing
  - Concentrating Technologies
  - Cool Earth Solar
  - EMCORE
  - Energy Innovations
  - EnFocus
  - ENTECH
  - GreenVolts
  - Menova
  - OPEL International
  - Pyron
  - SolFocus
  - Soliant
  - SUNRGI
- Europe
  - Concentracion Solar La Mancha
  - Concentrix
  - Guascor Foton
  - Isofoton
  - Sol3g
  - SolarTec
- Australia
  - Solar Systems
  - Green & Gold
- Asia
  - Arima Ecoenergy
  - Daido Steel
  - Sharp

Flying high with high efficiency

Cells from Mars rover may soon provide power on earth

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