**How do solar cells produce electricity?**
- Made of silicon semiconductors.
- Average panel efficiency ~14-15%

**Costs associated with solar PV**

**Advantages**
- Peak power generation usually coincides with peak energy demand
- No harmful greenhouse gas emissions involved.
- Unlimited solar resource.
- Rapidly falling price leading to an increase in future economic feasibility.
- Low operation and maintenance costs.
- Promoted through govt. subsidy funding.

**Disadvantages**
- Relatively high current cost compared to many other large-scale electricity generating sources.
- Intermittency and unpredictability of solar resource
- Relatively low efficiencies
- Expensive inverters required to convert the direct current produced to alternating current.
- Toxic chemicals like Cadmium and Arsenic are used in PV production.

**Possible reasons for decreasing PV installation cost:**
- Improved racking, wiring and inverter technologies
- Large scale govt. support for R&D, subsidies and renewable energy standards.

**Resources, capacity & consumption**

**U.S. Solar Photovoltaic (PV) Factsheet**
Apratim (Appy) Mukherjee

**Even at efficiency of 7%, the land area required to produce the total US electricity from only solar PV <the area of Maryland.**

**Key current developments**
- U.S. EPA has been promoting the reuse of potentially contaminated landfills for solar PV energy generation through the RE-Powering America’s Land Initiative.
- Hanwha Q Cells construct the first US solar farm (10.86 MW) on Superfund site
- President Obama announces that investment tax credit will be removed from U.S. solar projects by end of 2016.

**U.S. Solar PV was 2nd biggest source of new electricity generating capacity in US in 2013 accounting for almost 25%.
US PV installations for the utility sector increased by approximately 80% in 2013 compared to 2012, higher than % increases in the residential and non-residential sectors.
### How do solar cells produce electricity?

- **Figure:** Photovoltaic Glass: How does it work? (n.d.). Retrieved from http://www.solarenergyexperts.co.uk/buyersguides/photovoltaic-glass-how-does-it-work/

### Resources, capacity & consumption

- **PV production vs. land resources**
  - Original calculation which assumes:
    - Average solar intensity of 5 (kWh/m²/year)
    - Efficiencies ranging from 7-20%
    - Total electrical energy generated in the U.S. in 2014 = 15.7EJ (no change from 2012).
    - Area of land reqd. = 2*Area of panel
- **Data regarding solar PV performance in 2013:**

### Costs associated with solar PV

- **New Coal can’t deliver**
- **Projected market penetration date**
- **Solar stocks calculation**
  - Original calculation with data from:
    - Stock data from Yahoo finance
    - Income statement reports from SEC.gov

### Advantages


### Disadvantages


### Key current developments