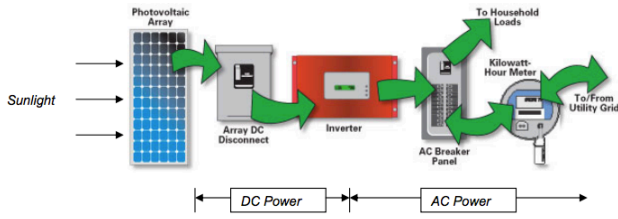


## How Does it Work?



Source: Homepower magazine

## Notable Policy

- Commercial Solar Power Purchase Agreement (SPPA)
- Solar Investment Tax Credit helps provide market stability
- Net Metering compensates owners providing excess energy back to the grid

## Importance of Policy

- Policy is needed to incentivize the R&D, commercialization, and expansion of PV in an otherwise hostile market whose prices outmatch current PV pricing in most U.S. regions.

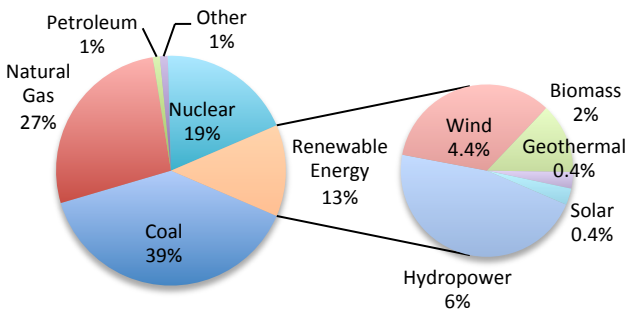
## Innovations

- Innovations in Solar PV are occurring continuously. Innovation is usually reflected in increased solar efficiency.

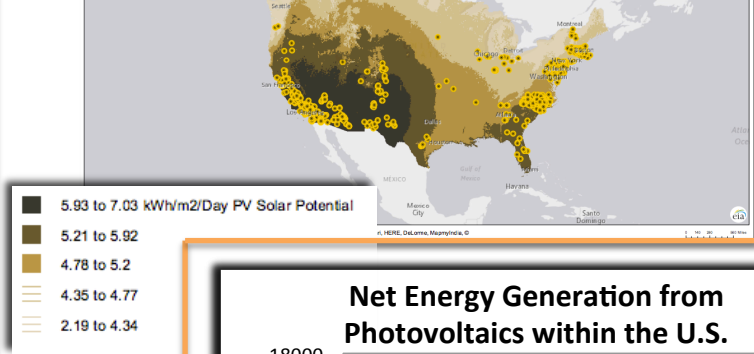
## Environmental Impacts?

- PVs do not produce by-products when generating electricity, and most components of a PV system can be recycled. The GHG Life Cycle is significantly smaller than that of non-renewable energy sources

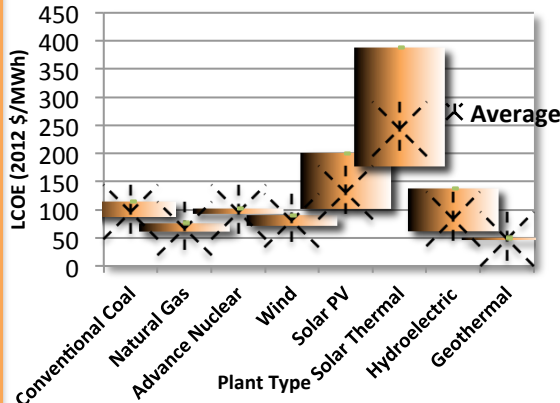
## Percent Share of Total U.S. Electricity Generation, 2014



## Distribution of Solar Power Plants & Solar Potential in the United States

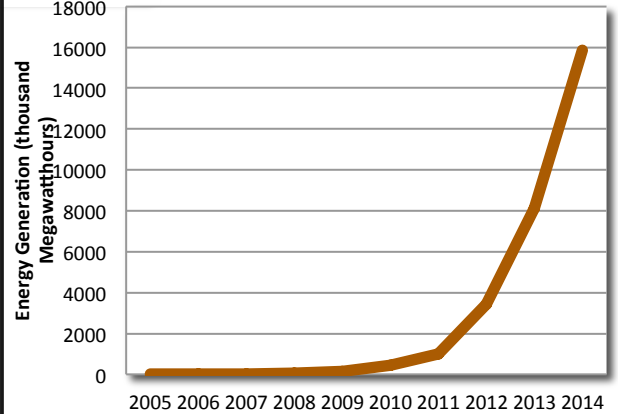


## Regional Variation Ranges in Levelized Cost of Electricity (LCOE) for New Generation Sources, 2019 Estimates

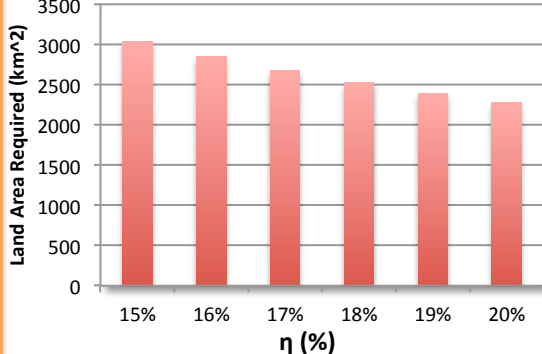


PV Solar Technology is a source of renewable electricity production generates voltage and current from charge separation created when sunlight enters a semiconductor (typically Silicon) generating electron hole pairs separated spatially. (IPCC 2011).

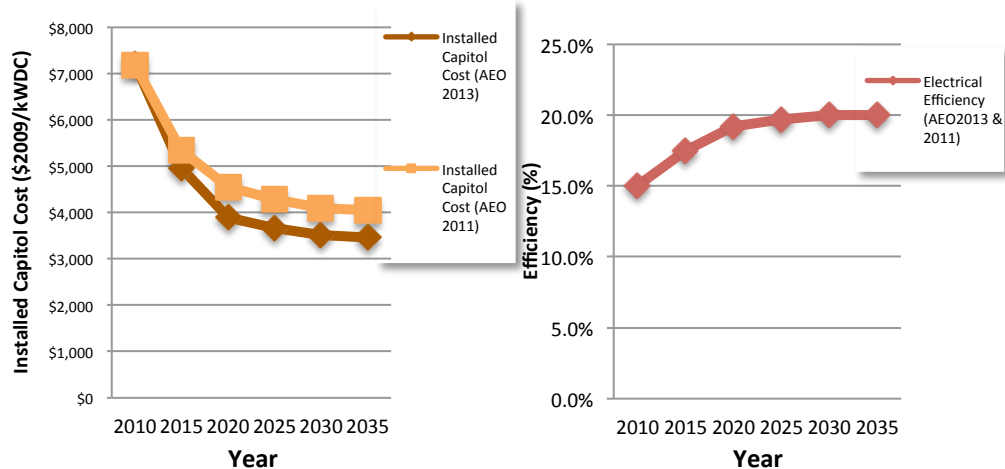
## Net Energy Generation from Photovoltaics within the U.S.



## Land Area Necessary for Complete PV Generated Elec. Based on PV Efficiency



## AEO Capitol Cost & Efficiency Estimates for Residential PV Installations



# References

## How Does it Work?

Figure found in:

Office of Integrated Analysis and Forecasting U.S. Energy Information Administration. (2010). *Photovoltaic (PV) Cost and Performance Characteristics for Residential and Commercial Applications: Final Report*. Retrieved from <http://www.eia.gov/analysis/studies/distribgen/system/pdf/appendix-a.pdf>

## Notable Policy

Issues and policies discussed at <http://www.seia.org/policy>

## Importance of Policy

## Innovations

## Environmental Impacts?

Information found:

International Panel on Climate Change. (2011). *IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation*. p. 351. Retrieved from <http://srren.ipcc-wg3.de/report/>

## Percent Share of Total U.S. Electricity Generation, 2014

Data from:

U.S. Energy Information Administration. (March 2015). *Monthly Energy Review [Data]*. p. 105. DOE/ EIA-0035(2015/03). Retrieved from <http://www.eia.gov/totalenergy/data/monthly/pdf/mer.pdf>

## Distribution of Commercial Sites & Solar Potential in the United States

Graph created using the EIA Energy Mapping System

Information derived from arcGIS data compiled by the National Renewable Energy Laboratory (NREL) and U.S. Energy Information Administration (EIA):

National Renewable Energy Laboratory. (1998-2009). [Visual Map derived from zipped shapefile datasets designed to be used in GIS software applications]. *Solar potential measured across the United States*. Retrieved from [http://www.nrel.gov/gis/data\\_solar.html](http://www.nrel.gov/gis/data_solar.html).

U.S. Energy Information Administration. (2014). [Visual Map derived from zipped shapefile datasets designed to be used in GIS software applications]. *Locations of Commercial Solar Power Plants*. Retrieved from <http://www.eia.gov/electricity/data/eia923/>

## Net Energy Generation from Photovoltaics within the U.S

Data from:

U.S. Energy Information Administration. (March 2015). *Electric Power Monthly [Data]*. Retrieved from [http://www.eia.gov/electricity/monthly/epm\\_table\\_grapher.cfm?t=epmt\\_1\\_01\\_a](http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_1_01_a)

## Regional Variation Ranges in Levelized Cost of Electricity (LCOE) for New Generation Sources, 2019 Estimates

Data From:

U.S. Energy Information Administration. (April 2014). *Levelized Cost and Levelized Avoided Cost of New Generation Resources in the Annual Energy Outlook 2014*. Retrieved from [http://www.eia.gov/forecasts/aeo/pdf/electricity\\_generation.pdf](http://www.eia.gov/forecasts/aeo/pdf/electricity_generation.pdf)

## PV Def:

Summarized from:

International Panel on Climate Change. (2011). *IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation*. p. 351. Retrieved from <http://srren.ipcc-wg3.de/report/>

## Area Necessary for Complete PV Generated Elec. Based on PV Efficiency

Efficiency values,  $\eta$ , determined by 2013 Best Research Cell Efficiencies for Multicrystalline and Thin-film Photovoltaic Cells. These values are attainable in the future; however, current performances of commercial and residential systems are average an efficiency of about 15%. Data from:

National Renewable Energy Laboratory. (2013). *Best Research-Cell Efficiencies [Graph]*. Retrieved from <http://energyinformative.org/nrel-efficiency-record-two-junction-solar-cell>

Required Land Calculation takes Total 2014 Solar Generation Data in kWh, divides it by the percent ( $\eta$ ) of Average Solar Insolation/yr ( $\sim 1800 \text{ kWh/m}^2/\text{yr}$ ) as estimated by Solar potential data released by the NREL:

National Renewable Energy Laboratory. (2011). *Annual Energy Review [Solar Photovoltaics Resource Map]*. Retrieved from [http://www.eia.gov/totalenergy/data/annual/pdf/sec4\\_23.pdf](http://www.eia.gov/totalenergy/data/annual/pdf/sec4_23.pdf)

This is then multiplied by a estimated land use factor of 2 and converted to  $\text{km}^2$ .

## AEO Capitol Cost & Efficiency Estimates for Residential PV Installations

Data From:

U.S. Energy Information Department. (2010). *Annual Energy Outlook [Data]*. Retrieved from <http://www.eia.gov/analysis/studies/distribgen/system/>

U.S. Energy Information Department. (2011). *Annual Energy Outlook [Data]*. Retrieved from <http://www.eia.gov/analysis/studies/distribgen/system/>

U.S. Energy Information Department. (2013). *Annual Energy Outlook [Data]*. Retrieved from <http://www.eia.gov/analysis/studies/distribgen/system/>