Role of Renewables in Smart Grid: PV Solar

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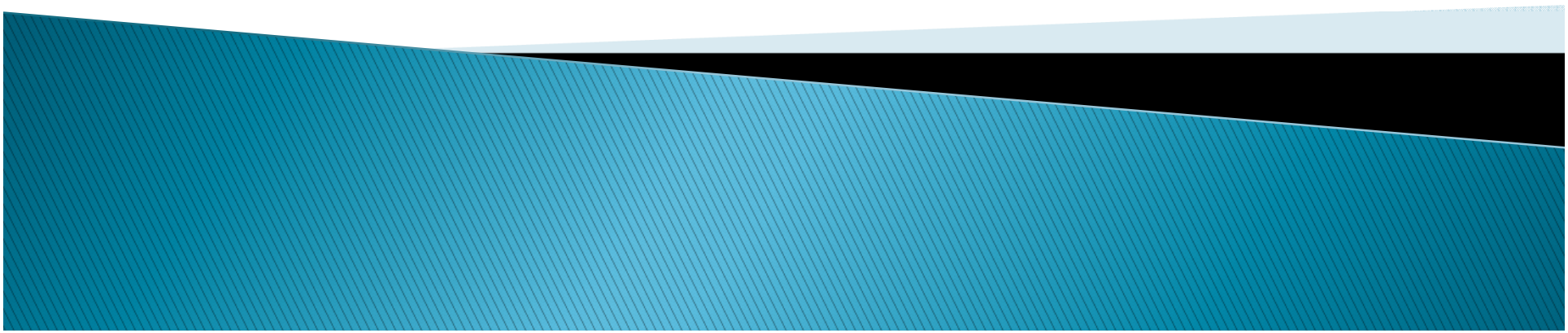
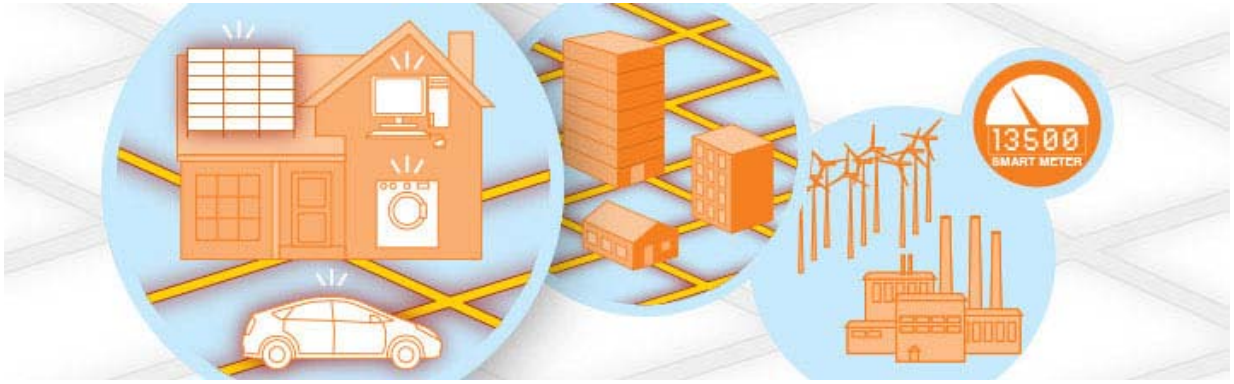


Overview

- What is Smart Grid?
- Key Components in Smart Grid
- Role of Solar (residential applications)
- Future concerns and predictions
- Projections in USA

What is Smart Grid?

- A "smart" electric grid allows homes and businesses to **use, monitor,** as well as **produce and sell,** electricity in a more technologically advanced way.
- **'Smart'** means the grid has two-way communications with home meter & utility

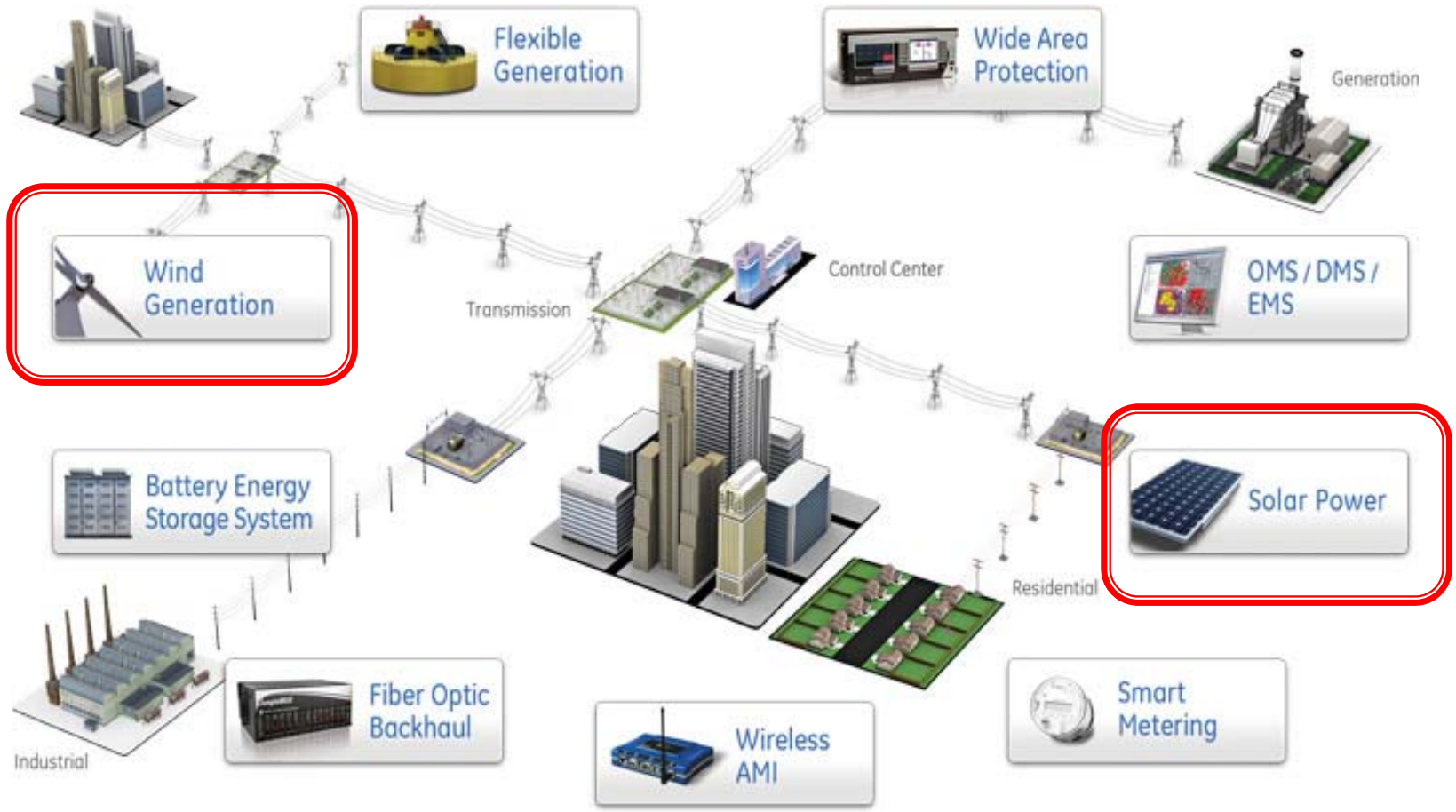


Source:
http://www.edf.org/climate/smart-grid-overview

Smart Grid (Key Features)

- Smart meters are essential components
- Self-healing, Resist Attack
- High Quality Power, Enable high penetration of intermittent generation sources
- Accommodate generation options (wind, solar)

Smart Grid (cont'd)



Source:
http://www.purdue.edu/discoverypark/energy/research/efficiency/smart-grid_what-is.php

Role of Solar PV

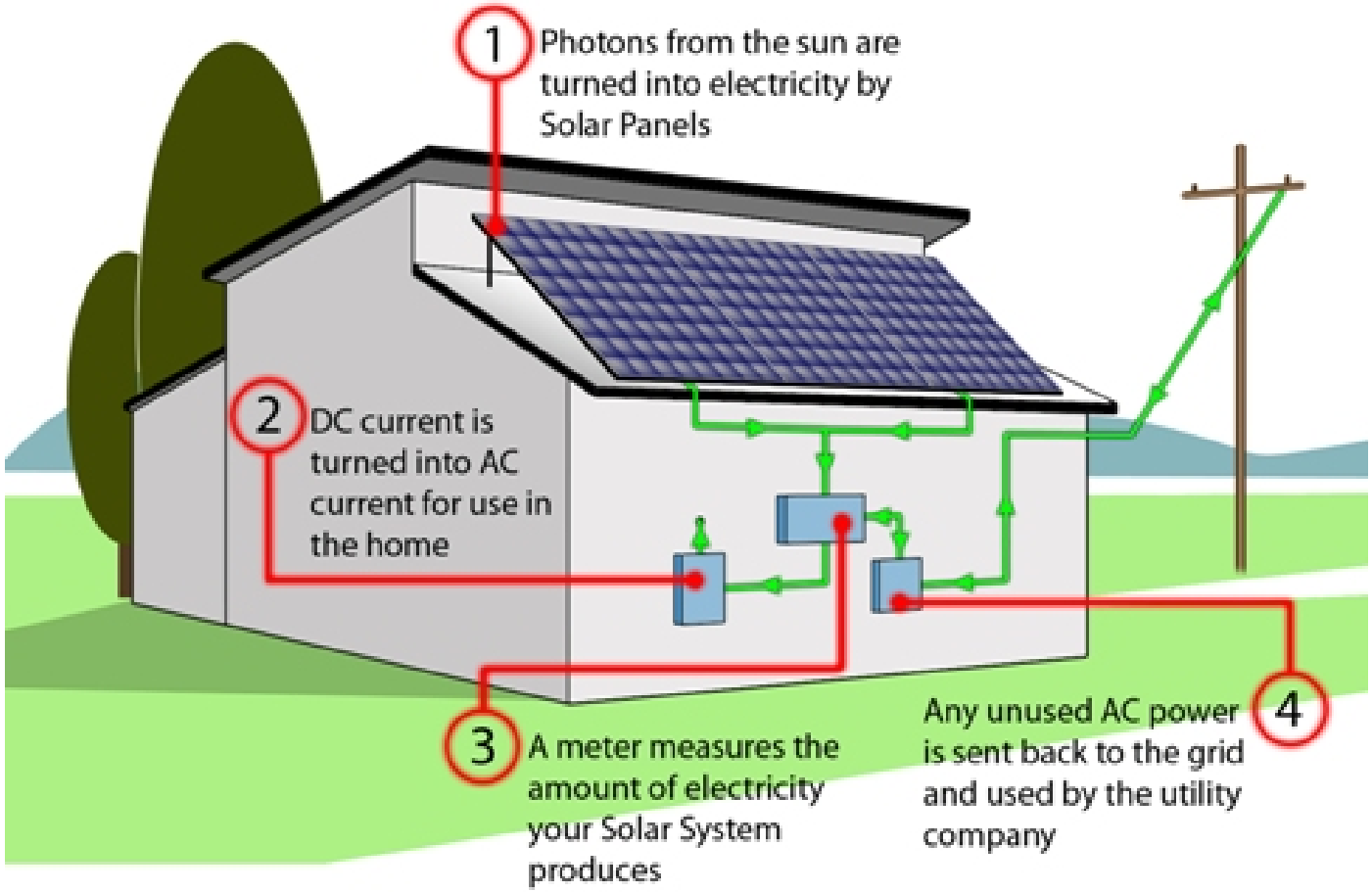
- From 2010-2013, the total global capacity from Solar PV increased from 40GW to 139GW (cheaper solutions have been the driving force)

- Most states have an Optimistic estimate of 20% solar by 2025. (Unlikely at this point)

- Currently grid is only 8% renewable – of which only 0.9% is solar

Source: http://ecoperformancebuilders.com/invest-solar-pv-sell-power-back-grid/

Residential Solar Applications



Source:
http://www.caplor.co.uk

Residential Solar Applications (cont'd)

- TOU (Time of Use) deployment allows users to work around their usage reducing their energy bill
- Peak time – 2pm–7pm (Solar homes don't have higher rates + excess power sold to utility)
- Off-peak – rest of the day
- Enhanced features of monitoring provided by AMI meters

Residential Solar Advantages

- Many states are offering rebates and tax credits to solar home owners (DC, CA, TX etc…)
- A survey suggests many homeowners are making about $3000/year, through combination of selling excess power, and cashing in on government clean energy incentives.

Source:
http://ecoperformancebuilders.com/invest-solar-pv-sell-power-back-grid/

Renewable Energy ←→ Smart Grid

- Advanced sensors and controls with accurate system models make the grid more reliable, predictable, and efficient.
- Smart meters and inverters connect customers' energy AND information with the grid, making both stronger and more flexible.
- With a Smart Grid, variable large scale wind and solar resources become more manageable, and more desirable.

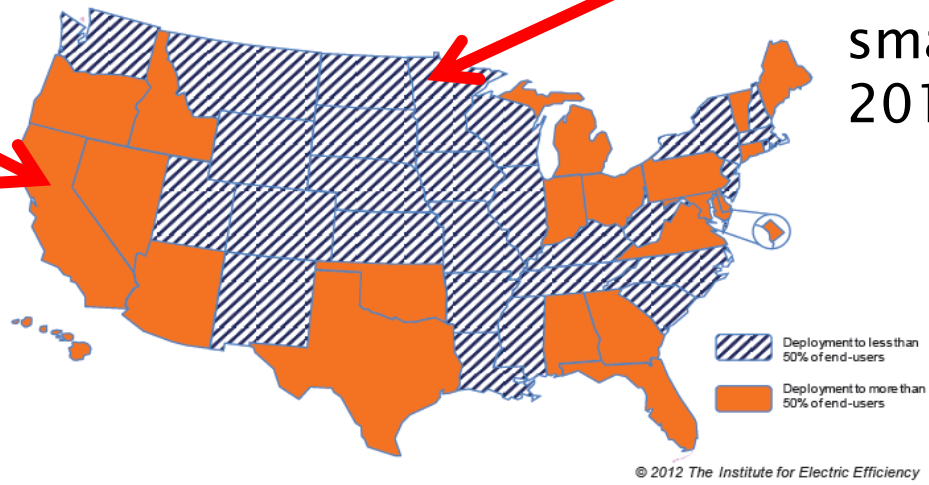
Source:
http://energy.gov/sites/prod/files/OE_Smart_Grid_Talking_Points.pdf

Projection in USA

- Smart meters are the driving force behind the switch from a conventional to smart grid and enabling solar residential solutions

orange shaded states are expected to have more than 50% smart meters by 2015

blue shaded states are expected to have less than 50% smart meters by 2015



Source: http://www.edisonfoundation.net/iee/documents/iee_smartmeterrollouts_0512.pdf

Concerns

- Solar and Wind power are inherently variable (lack of proper storage)
- Grid Congestion – overburdened power lines make it difficult to move electricity from wind/solar farms into the grid
- Most renewable rich areas (like Arizona) are not where demand is maximum and without smart infrastructure its hard to take advantage of them

Source: http://www.itsyoursmartgrid.com/solutions/integrating_renewables.html/

QUESTIONS?