Solar RD&D Opportunities and Issues

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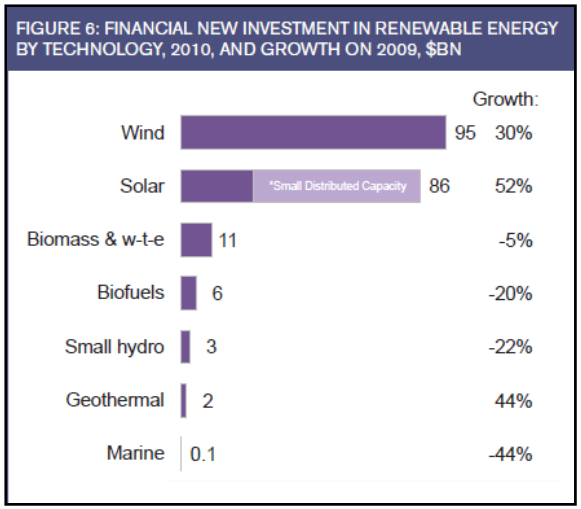
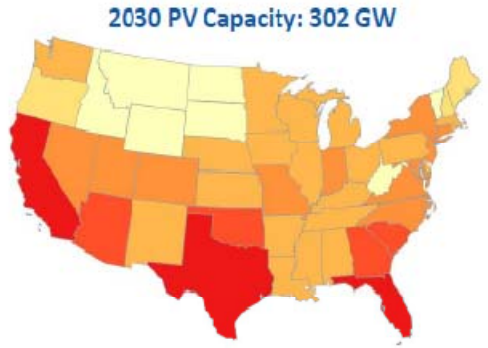
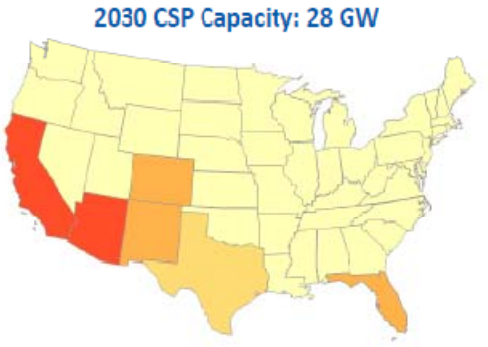
Solar Growth Prospects



Source: Bloomberg/UNEP: Global Trends in Renewable Energy Investment), 2011

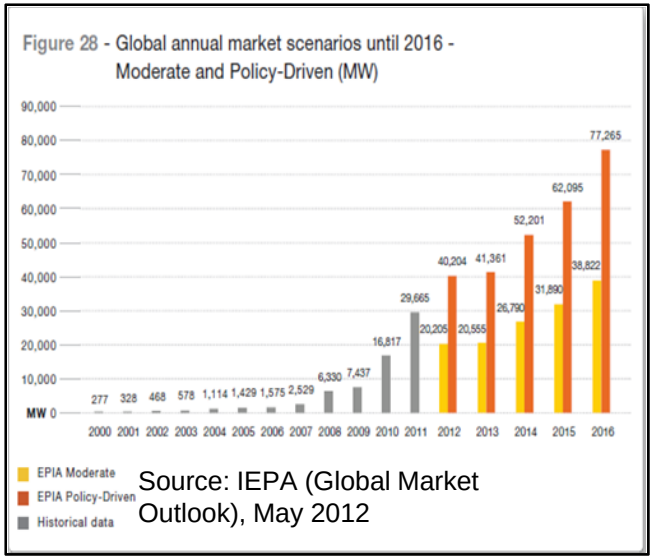
Over $86 billion invested in 2010





Source: DOE (SunShot Vision Study), Feb. 2012

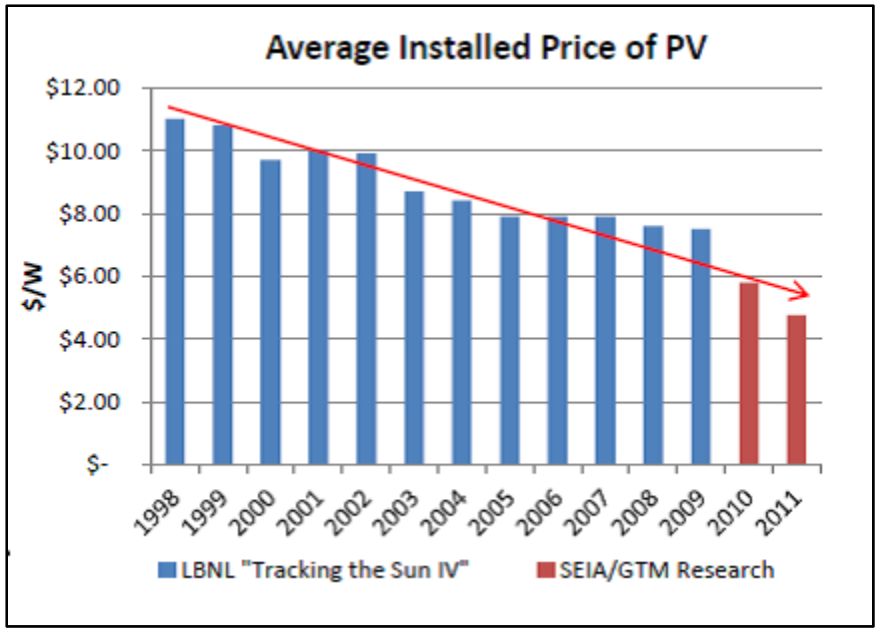
DOE sees a ten-fold increase in PV by 2030



Source: IEPA (Global Market Outlook), May 2012

IEPA expects PV capacity to more than double by 2017 (30 GW to 77 GW)

Solar Price Trends



2010 installed PV costs have dropped to less than half their 1998 values

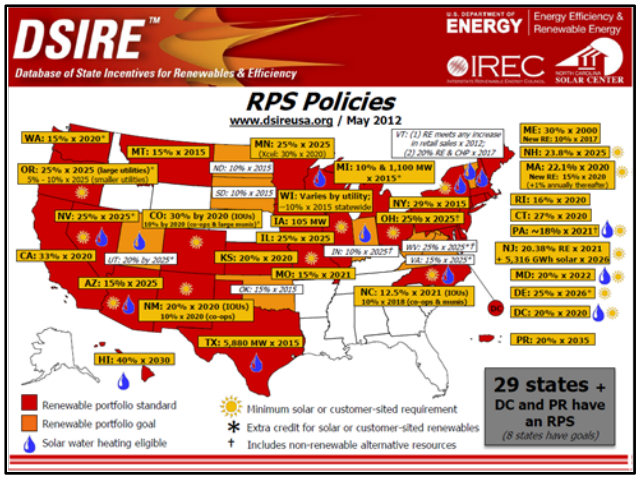
DOE's target for PV is a four-fold drop in costs by 2020 and a two-fold drop for CSP

Source: SEIA, 2012

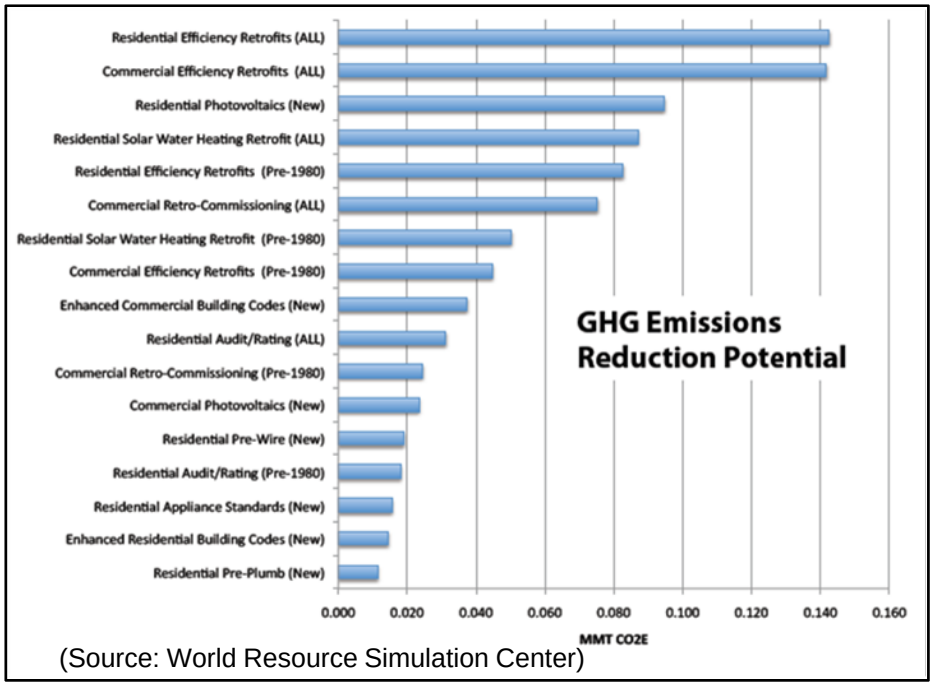
	Utility PV		Residential Rooftop PV		Commercial Rooftop PV		CSP					
	SunShot	Ref.	SunShot	Ref.	SunShot	Ref.	SunShot			Ref.		
	$/W$_{DC}$	$/W$_{DC}$	$/W$_{DC}$	$/W$_{DC}$	$/W$_{DC}$	$/W$_{DC}$	$/W$_{AC}$	hours storage[b]	CF (%)	$/W$_{AC}$	hours storage[b]	CF (%)
2010	4.00	4.00	6.00	6.00	5.00	5.00	7.20	6	43	7.20	6	43
2020	1.00	2.51	1.50	3.78	1.25	3.36	3.60	14	67	6.64	6	43
2030	1.00	2.31	1.50	3.32	1.25	2.98	3.60	14	67	5.40	6	43
2040	1.00	2.16	1.50	3.13	1.25	2.79	3.60	14	67	4.78	6	43
2050	1.00	2.03	1.50	2.96	1.25	2.64	3.60	14	67	4.78	6	43

Source: DOE (SunShot Vision Study), Feb. 2012

Solar Plays Many Roles Going Forward



Solar will play a critical role in achieving RPS goals. In CA, solar may contribute over 50% to the 33% RPS goal.



(Source: World Resource Simulation Center)

Reducing GHG emissions

(Source: Solar Panels- Green Power)

PV systems provide sustainable charging for PHEV; over 730,000 EV/ PHEV expected by 2016

Improving Solar Technologies/Integrating into the Grid

Improving performance and cost

- Increasing inverter reliability and lifetime
- Developing concentrating PV systems
- Hybrid PV/thermal systems

Enabling high PV penetration

- Improved inverter/meter communications
- Enhanced control systems with dashboards
- Transmission/distribution models for optimal PV locations
- Enhanced spatial and temporal solar models

Integrating DG solar with EE and DR

- Tools for optimal design of EE/DR/PV