Solar Power: Coming of Age

Greg Rosen
Helio Micro Utility, Inc.
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Why Solar? Why Now?

• There’s space for it & it works
• Solar costs are dropping
• Opportunity cost of not deploying alternatives to fossil-fuel based electricity is increasing
  – Conventional electricity prices are increasing
  – Gov’t is starting to monetize negative environmental externalities of fossil fuels
• Corporate America is making money off solar
Solar Resources

Just 2.5% of Southwest U.S. available land is enough to power U.S. (Scientific American 12/16/07)

Incentive $0.48-70 kWh

Incentive $0.14-20 kWh

Source: SEIA
Concentrating Solar (CSP)

CSP costs are declining as well and the first large scale system in ~20 years was built.
Bavaria Solar Park - 10 MW
Dual Use: solar power and sheep grazing

In U.S. Nellis Air Force Base is 15 MW, Macy’s will have 9 MW on 28 stores

Source: SunPower
J&J Skillman, NJ – 505 kW

Source: SunPower
FedEx - Oakland Hub, CA – 904 kW

Source: SunPower
Lowe’s - Union City, CA – 690 kW

2.4 MW on 4 stores

Source: SunPower
Power and Shade - 1 MW

World’s Largest PV Carport, US Navy
Residential Retrofit - 6 kW
Integrated Solar Roof Tiles
BIPV - The Netherlands

Solar Skylights, The Netherlands
Available Space - Switzerland

Solar on highway sound walls, Switzerland
Historic Growth

Global CAGR: 46%

Source: PVNEWS
Global PV Demand Projections

MW

Source: PVNEWS
From 2005-2006:
• Grid connected up 55%
• Total U.S. up 32%

From 2006-2007:
• US Market up over 80%

Source: PVNews

U.S. CAGR: 43%
US Market Demand Forecast

MW

2006 2007 2008 2009 2010

Off Grid  Grid Tied

1,590 MW

U.S. CAGR: 83%

Source: PVNews
Existing State RPS Requirements: 23 States and Washington D.C.

- **PA**: 18% by 2020
- **NJ**: 22.5% by 2021
- **CT**: 23% by 2020
- **MA**: 4% by 2009 + 1% annual increase
- **WI**: requirement varies by utility; 10% by 2015 goal
- **IA**: 105 MW
- **MN**: 25% by 2025 (Xcel: 30% by 2020)
- **TX**: 5,880 MW by 2015
- **AZ**: 15% by 2025
- **NY**: 24% by 2013
- **NV**: 20% by 2015
- **ME**: 30% by 2000
- **HI**: 20% by 2020
- **RI**: 15% by 2020
- **CO**: 20% by 2020 (IOUs)
- ***CO**: 10% by 2020 (co-ops & large munis)
- **DC**: 11% by 2022
- **VA**: 12% by 2022
- **MD**: 9.5% in 2022
- **DE**: 10% by 2019
- **NH**: 25% in 2025
- **WA**: 15% by 2020
- **MA**: 4% by 2009 + 1% annual increase
- **ME**: 30% by 2000
- **10% by 2017 goal - new RE
- **HI**: 20% by 2020
- **NY**: 24% by 2013
- **NJ**: 22.5% by 2021
- **PA**: 18% by 2020
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**Minimum solar or customer-sited RE requirement**

* Increased credit for solar or customer-sited RE
† PA: 8% Tier I / 10% Tier II (includes non-renewables); SWH is a Tier II resource

Source: DSIRE, [www.dsireusa.org](http://www.dsireusa.org), June 2007
Next-Generation PV

Solar cell array turns concentrated sunlight into electricity.

Mirrors track the sun, reflecting light onto the receiver.

Integrated roof-mounting system snaps to adjacent module forming complete system.

Fans keep operating temperatures low.
Thin Film – *How fast will it grow?*

**Thin Film Cell/Module Production**

- **Global CAGR: 63%**

- **Source:** Photon

**Graph:**
- X-axis: Years (2006 to 2010)
- Y-axis: GW/year
- Data shows an increase in production from 0.4 GW/year in 2006 to 2.0 GW/year in 2010.
Comparing Efficiencies

Comparing Production and Record Efficiencies - 2006

Source: Photon, NREL, UNSW, & Company Announcements
Declining Cost of PV
Escalating Cost of Electricity

- California (PG&E, SCE) – 20%
  - TOU $0.37-45/kWh
- Massachusetts – 27.5%
- Connecticut – 22.4%
- New Jersey – 20%
- Nevada – 15%
- Arizona (APS) – 20%
- Hawaii – 100% since 2002
- Colorado – 15%
- DC – 38%
- Maryland – 72%

Electricity rates rarely go down

Source: SunEdison, SEIA
Keeping Momentum

• Long-Term Federal Incentives renewal
• Nation-wide Interconnection and Net-Metering
• Solar Carve-Outs in Renewable Portfolio Standards
• National Carbon Policy that Monetizes Solar Benefits
• Expansion of R&D to $250 million/yr
• Educate the public on the value of solar
Thanks
Gregory Rosen
Helio Micro Utility, Inc.

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