Lessons Learned from the U.S. Photovoltaics Industry:
Implications for Distributed Wind

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PV Production 1995 - 2005

Source: PV News,
From “Our Solar Power Future: The U.S. Photovoltaics Industry Roadmap Through 2030 and Beyond”
PV in American Markets

• More than 2000 solar installations (REPiS, 2003)
  – 36% Residential
    • Mostly CA, CO, and AZ*
    • High BTC in NY, IL, HI, NC, CA, NJ, MD, PA, VA, CO
  – 56% Non-residential (schools and government buildings)
  – 8% Commercial
    • Mostly CA, TX, HI, and IL*
    • High BTC in NY, MA, NC, CA, NJ, HI, MT, AZ, OR, RI

• Global nature of PV manufacturing
  – Historical U.S. dominance gone forever
  – U.S. Wind holds the dominant part of world market

• PV dealer/distributors often deal in small wind: natural synergy at distribution level

* - Commercial Solar Energy Market Potential Study ECONorthwest Feb 2004
How Has PV Grown Market Share Despite Relatively High Costs?

• Grassroots advocacy to influence state and local policy
• Communication networks
  – Early links to electric utility industry, State Energy Offices through IREC
  – “NCPV Hotline”: link to industry, NGOs, govt. decision-makers
• “Schools Going Solar” program
• Strategies to work with, create other government programs
  – State Energy Offices
  – CSTRR
• Consumer appeal of personal control of electricity
  – Comparative ease of PV installation
  – On retail side of meter
Stakeholders Invest When Sum of Values Exceeds Price of PV

Energy Service Provider Value Set

- Energy
- Demand/Capacity
- Distribution
- Transmission
- Generation
- Environment
- Building integration
- Building material
- Load management
- Reliability
- Economic development
- Uncertainty/Risk
- Fuel diversity risk
- Electric price risk

Consumer Owner Value Set

\[ \sum \text{Energy Service Provider Value Set} \]

\[ \sum \text{Government Value Set} \]

\[ \text{Price} = \sum \text{Consumer Owner Value Set} \]
PV and Wind Resources are Complementary – seasonally and daily

Data from SE Iowa

Hours of sunshine or average wind power (Watts/m²)

Hours of sunshine/month

Average wind power/month

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
DOE’s PV Initiatives

• **Goal:** Increased deployment of PV technologies

• **Approach**
  – PV4U: electric utility integration issues
  – Million Solar Roofs: grassroots approach to elimination, mitigation of market barriers to rooftop solar technologies
    • More than 930 partners nationwide at program conclusion
  – Solar America Initiative (proposed, 2006)
    • Two parts: R&D and “Technology Acceptance” (deployment)
    • Proposed 9-year duration
    • Focus: urban infrastructure
    • Goal: cost competitive with conventional grid electricity by 2015
    • Focused on commercial PV

• **Opportunities for Small Wind**
  – Link with existing MSR partner network
    • Expand existing pilot work started with Northeast MSR partners
    • Develop wind version of *NCPV Hotline*
PV in Schools: 2.7 MW installed (REPiS 2003)

- **Goals:** Capitalize on multiple opportunities of school settings: (1) Education mission: educate students and, by extension, their parents; (2) Technology visibility (schools as community hub); (3) Energy security (schools as emergency shelters)

- **Approaches**
  - “Schools Going Solar” www.irecusa.org/schools/
  - New York’s School Power Naturally www.powernaturally.org/Programs/SchoolPowerNaturally
  - Florida’s SunSmart Schools Program benefits

- **Opportunity for Small Wind**
  - Comparative “sexiness” of small wind
    - “Watching PV is just as exciting as watching toast brown”
  - Low cost using commercial micro-turbines
PV Zoning

- **Goal:** Reduce “hassle factor” of PV installation
- **Approach**
  - PV in Seattle ruled “outright use”
  - Place articles about zoning issues in trade journals
  - Work with Homeowner’s Associations for PV acceptance
    - MSR project
- **Opportunities for Small Wind**
  - Develop articles for variety of trade and professional journals
  - Work with SEPA
    - Communicate with utilities interested in distributed generation
PV Approach to Net Metering

- **Goal:** Reduce hassle factor

- **Approach**
  - Drop net metering requirement for systems 10 kW and less
    - Excess capacity unlikely in smaller systems
  - Use net metering policy as step toward standardized interconnection

- **Opportunity for Small Wind**
  - Work with PV industry to develop standardized interconnection standards
  - Acquire larger cap limits for net metering
  - Link with biomass
PV Certification/Training

• **Goal**: Establish credibility with consumers

• **Approaches**
  – NABCEP installer certification:
    • Voluntary
    • Too soon to assess market impacts
    • All states do not recognize NABCEP certification as legitimate alternative to their own process
  – IREC Workforce Training efforts
  – No PV hardware certification program program yet

• **Opportunities for Small Wind**
  – Wind has IEC standard and draft AWEA standard – need SWT standard
  – NABCEP Wind Installer Certification in development
    • Integrate manufacturers training with NABCEP certification
  – Workforce training through community colleges
Different PV Policy Incentives

• **Goal:** Grow market share

• **Approaches**
  – Federal Investment Tax Credit – combined incentives increase economic benefits
  – Production Incentive:
    • Market-driven
    • Works well for organizations with fiduciary responsibilities
    • Consumer function as utility and then become advocates for properly aligned incentives
  – New RPS policy with solar set-aside or increased credit for solar
    • DG technologies sometimes shut out by utility-scale wind

• **Opportunity for Small Wind**
  – Partner with DG advocates to adopt all DG technologies on inclusive federal and state policies
    • FITC, RPS, and PI
Current Renewable Energy Market Drivers in the United States

- Renewables Portfolio Standards
- Renewable Energy Funds
- Federal and State Tax Incentives
- Green Power Markets
- Integrated Resource Planning

![Annual US Wind Development (MW)](chart)

Other (economical, green power, IRP, etc.)
RPS-related
Renewable Energy Fund-related

Energy Analysis Department
RE Electricity Opportunities

Expected RE Capacity by Driver

Accelerated RE Capacity by Driver

Achieving up to $50B of Additional RE Investment in 2015
Renewables Portfolio Standards

State Goal
- PA: 18% by 2020
- NJ: 20% by 2020
- CT: 10% by 2010
- MA: 4% by 2009 + 1% annual increase
- WI: requirement varies by utility; 10% by 2015 Goal
- IA: 105 MW
- MN: 10% by 2015 Goal + Xcel mandate of 1,125 MW wind by 2010
- TX: 5,880 MW by 2015
- AZ: 1.1% by 2007
- CA: 20% by 2010
- NV: 20% by 2015
- CO: 10% by 2015
- IL: 8% by 2013
- MT: 15% by 2015
- HI: 20% by 2020
- NM: 10% by 2011
- VT: RE meets load growth by 2012
- NY: 24% by 2013
- NJ: 20% by 2020
- PA: 18% by 2020
- MD: 7.5% by 2019
- DE: 10% by 2019
- DC: 11% by 2022
  
  Minimum solar or customer-sited requirement

- Increased credit for solar
- Minimum wind/solar requirement

DSIRE: www.dsireusa.org April 2006
Opportunities for Distributed Wind
Messaging

• Aggregate DG to include small wind, solar thermal, PV, others
  – May facilitate coalition-building

• Categorize small wind as energy efficiency
  – Systems under 10 kW do not meet total needs of household
  – Unlike EE, small DG has measurable results
  – Either define as conservation measures or supply-side resource
  – Consider defining DG by scale and ownership instead of technology
Future Opportunities

• Industry
  – Develop package products for consumers that are simple and use multiple technologies
  – Work for mutually beneficial DG inclusive policy
    • Federal Investment Tax Credit
    • RPS set-asides and extra credit for DG
    • Productivity incentives
    • Standardized national interconnection
Future Opportunities - 2

- Government
  - Economic tools across DG (wind, PV, solar thermal, biomass, etc.)
  - Federal role – help communicate about what’s happening with DG across state boundaries
  - Write articles NACO journals to get information out about zoning
  - Develop “value” proposition for distributed wind
  - Wind for Schools program (see poster on NREL pilot project – M. Kelly)
  - Working with state utility regulators to incorporate DG as part of IRP
  - Continue to work market barriers such as zoning – defined guidelines in place – help minimize consumer hassle factors
  - Facilitate small wind on government procurement lists
Future Opportunities - 3

• Advocacy
  – Develop new consumer group conversant on DG
    • SEIA unable to support small wind in Colorado
    • Need a new group without history of supporting one DG technology
    • Operate with foundation funds
  – Build constituency by developing production incentives (PI) that turn consumers into political interest group by making them the utility
    • PI are beneficial since they are market-driven, ensure long-term production, and lessen probability that U.S. incentives will add a roller-coaster effect to the market like the ‘80s
    • PI works well for organizations with fiduciary responsibilities
  – Once regional/state advocacy groups matured – work on reducing hassle factor; e.g., zoning policies
Joint

- DG industries need to work together
- Bring robustness to the DG industry through hardware performance certification
  - Develop standards and certification protocol
  - Form a Distributed Generation Certification Corporation
- Need side-by-side strategies to develop utility sector and educate consumers on energy
  - Can’t rely on one-on-one communication; need to develop information through various channels