



Renewable Energy Finance

Solar Securitization: A Status Report

Value Proposition

The U.S. solar industry is an \$11.5 billion market¹ with over 360,000 systems in place.² Securitization of the cash flows associated with distributed solar systems (i.e., those serving residential and commercial customers) represents an emerging investment opportunity for institutional money managers.

Background

Every day, more energy falls on the United States—in the form of sunshine—than the country uses in an *entire year*.³

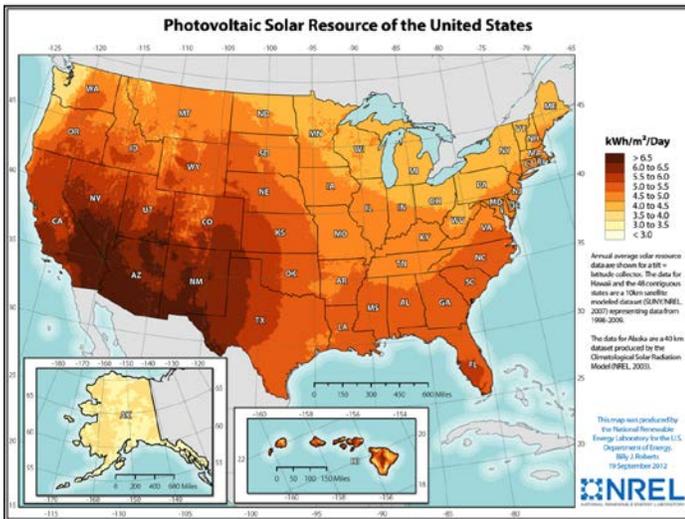


Figure 1. U.S. solar energy intensity⁴

The ability to convert solar energy into cost-effective electricity via photovoltaic (PV) technology has been refined over the last 50 years.⁵ Since 2000, the cost of installing a PV system has declined by 6%–7% per year due to improving conversion efficiencies, manufacturing economies of scale, and deployment advancements adopted by the industry.⁶

Over that same time period, annual deployment grew dramatically from roughly 700 to 90,000 installations per year.⁷ The industry is currently on pace to install one PV system every four minutes.⁸

Continued Industry Growth and Cash Flows

The U.S. Department of Energy’s (DOE) Sunshot Initiative has targeted an additional two-thirds cost reduction by 2020 and set a goal of solar energy production fulfilling 14% of total U.S. electricity needs by 2030, up from less than 1% currently.⁹ Meeting this generation target will require sustained growth of 25% per year, consistent with near-term independent projections.¹⁰

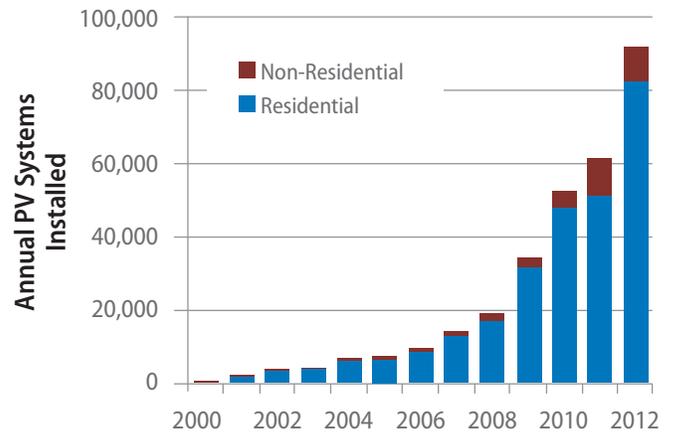


Figure 2. Distributed solar systems installed (2000–2012)

Improving economics, in part driven by lower cost of capital, and strong demand due to state Renewable Portfolio Standards (RPS) and customer desire for clean energy will help drive that growth. RPS programs—which require increasing levels of renewable energy generation in the electricity mix—are currently instituted in 29 states and Washington, D.C.¹¹

The capital investment to construct a solar system is generally repaid through a lease or power purchase agreement (PPA) contract. At present, cash flows from these contracts represent roughly \$93 million per year in the United States.¹²

Preparing for Securitized Investment

Industry experts identified several critical items to address investor risks:

1. Standardize contracts and other documentation and installation practices
2. Improve publicly available data addressing renewable energy risks
3. Inform investors on the valuation of renewable energy generation assets.

To meet that challenge, over 150 members of the industry—including leading developers, law firms, financiers, and analytic entities—participate in the Solar Access to Public Capital (SAPC) working group, a project led by the National Renewable Energy Laboratory (NREL) and funded under DOE's Sunshot Initiative.¹³

SAPC recently completed development of standard lease and PPA contracts for widespread industry adoption. This milestone is expected to improve consumer transparency, lower

transaction costs, increase deal flow, and enable project cash flows to be pooled for securitization and other public capital investment.

In addition, SAPC is actively pursuing other risk-reduction efforts to engage institutional investment, including:

- Developing best practices in system installation and maintenance for consistency in build quality, operating performance, and cash flow
- Constructing performance datasets to comprehend and enable mitigation of production risk
- Engaging the rating agencies to provide shadow ratings of mock residential and commercial portfolios to further the industry's understanding of investor risk perception.

For additional information on SAPC activities and solar industry deployment and cost reductions, please contact: sapcinfo@financeRE.nrel.gov.

1 Solar Energy Industries Association (SEIA). "U.S. Solar Market Insight 2012 Year in Review." Washington, DC: SEIA.

2 Feldman, D. Conversation. Golden, CO, NREL.

3 DOE/IEA. Renewable Energy Annual 1998. DOE/IEA-0603(98). Washington, DC: DOE/IEA, 1998.

4 See the history of photovoltaics at <http://inventors.about.com/od/timelines/a/Photovoltaics.htm>.

5 Feldman, D.; Barbose, G.L.; Margolis, R.; Darghouth, N.; James, T.; Weaver, S.; Goodrich, A.; Wisner, R.H. Photovoltaic System Pricing Trends: Historical, Recent, and Near-Term Projections - 2013 Edition. Berkeley, CA: LBNL, 2013.

6 Solar Energy Industries Association (SEIA). "U.S. Solar Market Insight 2012 Year in Review." Washington, DC: SEIA, 2013.

7 Greentech Media. "A Solar System Is Installed in the U.S. Every 4 Minutes." Boston, MA: Greentech Media, August 2013.

8 See the SunShot Initiative website: <http://www1.eere.energy.gov/solar/sunshot/index.html>.

9 Solar Energy Industries Association (SEIA). "U.S. Solar Market Insight 2012 Year in Review." Washington, DC: SEIA, 2013.

10 For more on RPS programs, see the Database of State Incentives for Renewables and Efficiency (DSIRE) at <http://www.dsireusa.org/rpsdata/index.cfm>.

11 Mendelsohn, M.; Feldman, D. Financing U.S. Renewable Energy Projects Through Public Capital Vehicles. Golden, CO: NREL, 2013.

12 Mendelsohn, M.; Feldman, D. Financing U.S. Renewable Energy Projects Through Public Capital Vehicles. Golden, CO: NREL, 2013.

13 See SAPC description and materials at: https://finance.nrel.gov/finance/solar_securitization_public_capital_finance.



NREL and the Strategic Energy Analysis Center (SEAC) conduct a broad range of energy analysis in support of NREL programs and initiatives, DOE's Office of Energy Efficiency and Renewable Energy (EERE), technology transfer, and the greater energy analysis community. With offices in Washington, D.C., and Golden, Colorado, SEAC promotes understanding and collaboration through partnerships, publications, conferences and seminars, and various online resources.

National Renewable Energy Laboratory
15013 Denver West Parkway
Golden, CO 80401
303-275-3000 • www.nrel.gov

NREL is a national laboratory of the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, operated by the Alliance for Sustainable Energy, LLC.

NREL/FS-6A20-60553 • October 2013

Photos credits (page 1, left to right): iStock 13737597; Pat Corkery, NREL 16374; iStock 12123595; Toyota Motor Sales, USA, NREL 16933; Dennis Schroder, NREL 18229; Dennis Schroeder, NREL 19163

Printed with a renewable-source ink on paper containing at least 50% wastepaper, including 10% post consumer waste.