

# Distributed Solar Energy Generation: Sub-Utility Scale Photovoltaics: Market Analysis and Forecasts

Q3, 2009

## Abstract:

Distributed energy generation, using a variety of renewable power technologies, is one of the most important tools for addressing the challenge of meeting the world's growing electricity demand. Within the Renewable Distributed Energy Generation (RDEG) market, sub-utility scale solar photovoltaics (PV) are by far the largest and most significant segment, representing approximately 98% of the total.

Solar PV growth has been spearheaded in recent years by markets such as Germany, Japan, Spain, and the United States. Remaining countries in the European Union are starting to pick up strong momentum as well. Emerging markets in India and China show significant promise in the longer term. Of all the opportunities in PV, Pike Research finds that the most compelling growth potential lies in decentralized electricity generation, whether in small rooftop or large commercial installations. PV has the advantage of being truly modular, as it can reach cost efficiencies with installations that are just a few kilowatts to 20 MW or even 200 MW. For purposes of our study, distributed PV is considered to be those systems less than 20 MW in size, where electricity does not pass through the traditional transmission and distribution system prior to being used. The estimated size of the distributed PV market in 2008 was 3.6 GW, and we forecast that it will grow to 9.7 GW by 2013, representing a compound annual growth rate of 22%. This translates into a \$30 billion market in 2008, growing to nearly \$60 billion by 2013.

This Pike Research report analyzes the market for distributed solar PV in the context of the broader RDEG market, which also includes small wind energy generation and fuel cell technologies. The study covers key business issues and drivers of demand for sub-utility scale solar power, including government-driven legislation and incentives as well as market-based factors. Technology and cost issues are examined in depth, as are a number of key industry players. Market forecasts include distributed solar energy generation capacity, system revenues, and installed prices through 2013 for installations in all regions of the world, with line-item segmentation for 12 key countries.

## Table of contents:

1. *Executive Summary*
2. *Market Issues*
  - 2.1 Defining the Market
  - 2.2 Photovoltaic Systems
  - 2.3 Energy Storage
    - 2.3.1 Batteries
    - 2.3.2 Compressed Air Energy Storage

- 2.3.5 Supercapacitors
- 2.3.6 Superconducting Magnetic Energy Storage
- 2.4 Greening of Conventional DEG Technologies
  - 2.4.1 Microturbines
  - 2.4.2 Combustion Turbines
  - 2.4.3 Reciprocating Engines
- 2.5 Market Segmentation
  - 2.5.1 Global Cumulative Electricity Capacity
  - 2.5.2 Global Cumulative Renewable Electricity Capacity
  - 2.5.3 Global Electricity Generation Capacity Additions
  - 2.5.4 Global Renewable Electricity Generation Capacity Additions
  - 2.5.5 Global Distributed Renewable Electricity Generation Capacity Additions
- 2.6 Industry Growth Drivers
  - 2.6.1 Legislative, Regulatory, Incentives, and Subsidies
  - 2.6.2 Improvements to Existing Technologies
  - 2.6.3 Emergence of New Technologies
  - 2.6.4 Cogeneration
  - 2.6.5 Other Drivers
    - 2.6.5.1 Push for Energy Independence
    - 2.6.5.2 Benefits of Green Marketing
    - 2.6.5.3 Supporting Organizational Missions
- 2.7 Implementation Issues
  - 2.7.1 Grid Interconnection
    - 2.7.1.1 Grid Integrity and Safety
    - 2.7.1.2 Grid Intelligence
      - 2.7.1.2.1 Integration with System Components
      - 2.7.1.2.2 Net Metering
      - 2.7.1.2.3 Demand-Side Management
- 3. Technology Issues**
  - 3.1 Photovoltaic Systems
    - 3.1.1 History
    - 3.1.2 Basic Principles
    - 3.1.3 Strengths and Weaknesses
    - 3.1.4 Types
    - 3.1.5 Market Trends
      - 3.1.5.1 Installations by Country
      - 3.1.5.2 Grid Tied vs. Off Grid
    - 3.1.6 Marketability and Commercialization
      - 3.1.6.1 Cost
        - 3.1.6.1.1 Module Cost
        - 3.1.6.1.2 Economies of Scale
        - 3.1.6.1.3 Silicon Per Watt
        - 3.1.6.1.4 Silicon Supply
        - 3.1.6.1.5 PV System Installed Cost
      - 3.1.6.2 Efficiency
      - 3.1.6.3 Reliability

[Click Here to upgrade to  
Unlimited Pages and Expanded Features](#)

### 3.2 RDEG Applications

- 3.2.1 Residential Off Grid
- 3.2.2 Residential Grid Tied
- 3.2.3 Commercial and Retail
- 3.2.4 Community Microgrid
- 3.2.5 Telecom Primary and Backup Power
- 3.2.6 Hybrid systems
- 3.2.7 Application Comparison

## 4. Demand Drivers

- 4.1 Legislation, Regulations, Incentives, and Subsidies
  - 4.1.1 United States
    - 4.1.1.1 State Level
    - 4.1.1.2 California
    - 4.1.1.3 New Jersey
    - 4.1.1.4 Massachusetts
  - 4.1.2 Europe
    - 4.1.2.1 Germany
    - 4.1.2.2 Spain
    - 4.1.2.3 Italy
    - 4.1.2.4 France
    - 4.1.2.5 Rest of Europe
  - 4.1.3 Asia Pacific
    - 4.1.3.1 China
    - 4.1.3.2 Japan
    - 4.1.3.3 India
    - 4.1.3.4 Korea
  - 4.1.4 Rest of the World
- 4.2 Nonlegislative, Regulatory, Incentives, and Funding Drivers
  - 4.2.1 Conventional Energy Demand Trends
  - 4.2.2 Economics Overview
    - 4.2.2.1 Conventional Electricity Price
    - 4.2.2.2 RDEG Technology Price
  - 4.2.3 Break-Even Analysis

## 5. Market Forecasts

- 5.1 World Energy Generation
- 5.2 World Renewable Distributed Energy Generation
- 5.3 Photovoltaic Systems
  - 5.3.1 North America
  - 5.3.2 Europe
  - 5.3.3 Asia Pacific
  - 5.3.4 Rest of the World

## 6. Key Industry Players

- 6.1 Q-Cells
- 6.2 SolarWorld
- 6.3 Suntech
- 6.4 First Solar



*Your complimentary  
use period has ended.  
Thank you for using  
PDF Complete.*

**[Click Here to upgrade to  
Unlimited Pages and Expanded Features](#)**

- [7. Company Directory](#)
- [8. Acronym and Abbreviation List](#)
- [9. Table of Contents](#)
- [10. Table of Figures](#)
- [11. Scope of Study, Sources and Methodology, Notes](#)

**Order information:**

- Price: 1.500\$ US
- Free Executive Summary available (login to view)
- Link: <http://www.pikeresearch.com/research/distributed-solar-energy-generation>