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US-CHINA
QUARTERLY MARKET REVIEW

OCTOBER 2010

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A COLLABORATIVE REPORT BY:

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US-CHINA PROGRAM

ACORE's US-China Program (USCP) is dedicated to increasing understanding of renewable energy policy, finance, and markets among industry participants and policymakers in the U.S. and China, with the aim of expanding renewable energy markets and promoting effective renewable energy policy. ACORE members who are leading voices in the U.S. and Chinese renewable energy industries are invited to join USCP as partners. Our partners actively shape program direction through consultation with other partners, the USCP strategic advisors, and ACORE staff.

We thank the USCP partners for their special effort toward this inaugural US-China Quarterly Market Review (QMR).

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Dear Participants in the US-China Program:

Welcome to the first Quarterly Market Review (QMR) from the US-China Program of the American Council On Renewable Energy (ACORE), prepared in conjunction with the Chinese Renewable Energy Industry Association (CREIA).

We are working together to make renewable energy more successful in the U.S. and in China, and working to create improved business opportunities for U.S. companies in the China market and for Chinese companies in the U.S. market.

This is the core idea of the US-China Program: to make all parties more successful. Often it is a matter of educating each side about how to do business in the other country. American companies need to learn how to do business in China. Chinese companies need to learn how to do business in the U.S. We will help both sides achieve success by learning about the other, with the philosophy that more renewable energy is good for everyone.

In this first QMR, you will read excellent status reports on market conditions, the state of financing, and current government policy, all written by knowledgeable experts in their field. We know that there are many things being written on renewable energy in the U.S. and China, but we believe this report goes beyond the current literature, and we therefore encourage you to take the time to read and reflect on it.

We thank the authors and recommend it to you.

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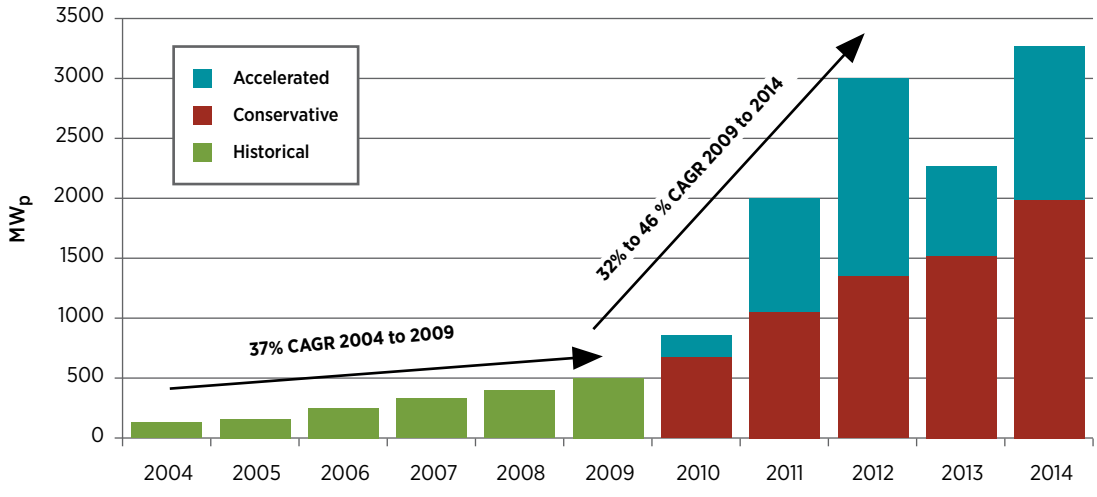
U.S. RENEWABLE ENERGY MARKETS

U.S. renewable energy markets have experienced tremendous growth over the past five years. Photovoltaics and wind markets have experienced the largest growth. The content of this paper therefore focuses primarily on these two technologies followed by comments on other renewable energy options. This quarterly report briefly reviews the overall U.S. markets for renewable energy. Subsequent articles will discuss in more detail pertinent market issues impacting each of the key renewable energy markets.

PHOTOVOLTAIC (PV) MARKETS

The U.S. PV market had a 37% Compounded Annual Growth Rate (CAGR) from 2004-2009, and going forward Navigant Consulting forecasts 32% - 46% CAGR through 2014 (Figure 1). In the accelerated scenario, changes in the German feed-in-tariff program and potential reductions in some other EU incentives may result in an overselling in 2012, and thus a slowing of the market in 2013 because of excess inventory. In 2009, the U.S. PV market was 488 MWp or 6% of the global market demand of 7.9 GWp.

Figure 1: U.S. PV MARKET DEMAND 2004-2014 (MW/YEAR)



Source: NCIPV Service Program. August, 2010. NCIPV Services provides market data using demand, not installations. Demand represents the materials ordered by the delivery channels and may slightly exceed installations in any given year.

In the U.S., utility companies are getting more involved in distributed PV assets either through **power purchase agreements (PPA)** or direct ownership of assets. Utility company interest in distributed solar is driven by:

- Utility companies now being able to qualify for the 30% investment tax credit (ITC) available for PV through 2016;
- 31 states plus the District of Columbia have **renewable portfolio standards (RPS)** and six states have goals. Of these, about 17 states have solar set asides or set asides that include solar. Utility companies need to comply with these solar **carve outs**, and although many are complying through PPAs, some are beginning to consider ownership to ensure compliance;
- Utility company concerns about third party providers coming into their service territories and taking away customer relationships, solar kWh sales, and maybe even more than solar kWh sales if PV is bundled with other service offerings. Owning PV can provide a hedge against this threat;
- Some Public Utility Commissions are allowing utility companies to **rate base** PV costs and spread the cost among all customers; and
- Customer sited PV can be quickly deployed and avoid transmission interconnection issues. The transmission queue for interconnection in some locations in the U.S. can be as long as three years and/or there can be a lack of transmission availability, hindering some central solar applications.

Grid connected systems represented 92% of the U.S. market in 2009. Commercial building demand represented 53% of the U.S. market followed by grid-tied residential at 31% and 8% utility owned. Moving forward, Navigant Consulting expects utility companies to increasingly explore business model options other than PPAs to help support PV deployment.

In 2009, PV module costs in the U.S. reduced almost 40% and system prices about 5%. With continued PV cost reductions, Navigant Consulting believes that several states with high retail electricity costs and favorable incentives could approach grid parity soon after 2015. One of the key macro trends that will pose some challenge for increased PV adoption is reduced natural gas prices (and thus cheaper electricity rates) resulting from greater availability of shale gas and lower overall electricity load demands across the U.S. Natural gas, however, also serves as **firming capacity** for the variable and intermittent loads from PV systems, so there is a positive role for natural gas technology to play in PV market adoptions, along with smart grid technology that will facilitate larger amounts of PV interconnected to the grid.

WIND ENERGY MARKETS

Over the past five years, wind energy markets in the U.S. experienced a 42% CAGR. This significant growth resulted in cumulative wind capacity of 35.6 GW in the U.S. at the end of 2009. Key states for wind development are shown in Figure 2. Annual installations in 2009 reached the largest ever at 10 GW. Moving forward, however, Navigant Consulting expects that wind market demand will reduce unless there is a national renewable energy standard (RES) or more consistent federal policy supporting wind energy development. As shown in Figure 3, Navigant Consulting estimates the wind market demand will drop

Figure 2: TOP TEN U.S. STATES FOR WIND DEVELOPMENT

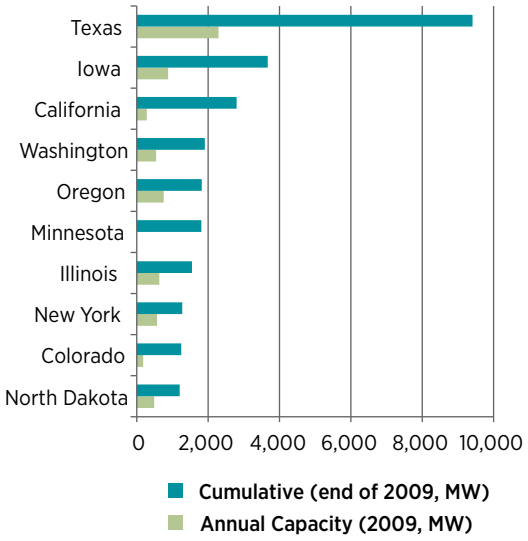
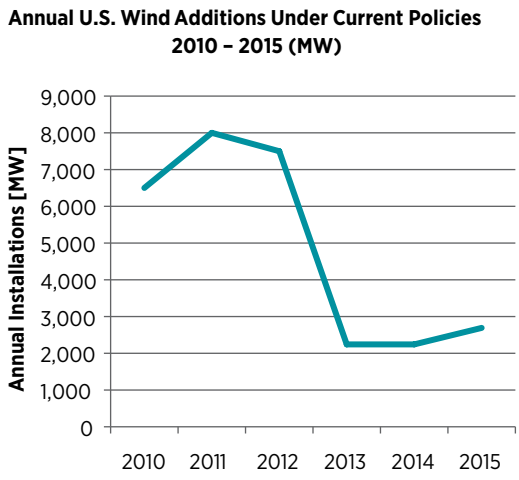


Figure 3: FORECAST OF U.S. WIND INSTALLATIONS



Source: Navigant Consulting estimates based on data from AWEA and industry stakeholders

Assumptions

- No federal RPS.
- No changes in state RPSs.
- Existing PTC expires as scheduled at the end of 2012.

Key Takeaways

- 2010 market is depressed due to a lack of PPAs and low gas and energy prices.
- 2011 to 2012 drop: construction must begin by the end of 2010 to qualify for U.S. Treasury cash grants.
  - Wind project construction is ~6 months, so most done by 2011.
- 2012 to 2013 drop: failure to extend PTC will have a significant impact.
- Transmission infrastructure build-out is needed to maintain industry growth.
- Passage of a federal carbon policy or RPS would alter these projections.

in 2010 to about 6,500 MW due to a lack of PPAs and low electricity prices. In addition, the existing production tax credit (PTC), which is critical to wind project economics, is due to expire at the end of 2012. Without any extension of the PTC, Navigant Consulting believes the market will drop to around 2,200 MW per year. Support at the state level, such as Competitive Renewable Energy Zones (CREZ) for transmission in Texas, will also be critical in encouraging wind development.

HYDROPOWER MARKETS

Over the past few years, hydropower (including inland and ocean), has received increased attention in the U.S. Inland hydropower systems, particularly hydrokinetic technologies, are starting to gain traction with several permit applications pending in the Federal Energy Regulatory Commission's (FERC) queue. The first federally licensed in-stream hydrokinetic project was commissioned in Minnesota in 2009. The FERC queue also has several pumped storage project applications because these types of systems are seen as energy storage solutions for intermittent renewables. The U.S. Department of Energy (DOE) and states like Oregon and Florida are increasing their development activity in various ocean power technologies such as wave, tidal, ocean thermal, and ocean current.

GEOTHERMAL ENERGY MARKETS

The U.S. is the world leader in installed geothermal power capacity with 530 MW installed between 2005 and 2010.[1] There are an additional 188 projects being deployed across the U.S. representing almost 7 GW of added base load power. Significant developments on the technology front offer even greater promise including the introduction of low temperature (~110° C) cycles capable of operating with hot water and increased research activity in enhanced geothermal systems. DOE increased funding for its geothermal power program and several of the projects being considered have received funding either through the American Recovery and Reinvestment Act (ARRA) or through the DOE Loan Guarantee Program.

BIOMASS MARKETS

There are over 10 GW of deployed U.S. biomass power from sources such as landfills, municipal solid waste, woody biomass and other biomass sources

1 http://www.geo-energy.org/

(agriculture waste, dairy waste, and sewage waste). Woody biomass is also gaining market interest as a potential source for direct combustion or co-firing in existing coal plants, especially in the southeastern and northwestern U.S. due to the availability of forest lands. The U.S. Environmental Protection Agency (EPA) has active programs encouraging deployment of landfill gas (LFG) and anaerobic digester gas (ADG) systems. The U.S. Department of Agriculture (USDA) also has Loan Guarantee Programs and other funding mechanisms to enhance the deployment of biomass power in the U.S. More recently, the EPA proposed a boiler Maximum Achievable Control Technology (MACT) standard that could adversely impact biomass boilers because of the proposed lower emissions limits in these standards. Navigant Consulting, however, expects that the interest in biomass power applications will continue to increase because of the base load power the technology provides with high capacity factors. This technology does not have some of the intermittency issues of some other renewable energy technologies.

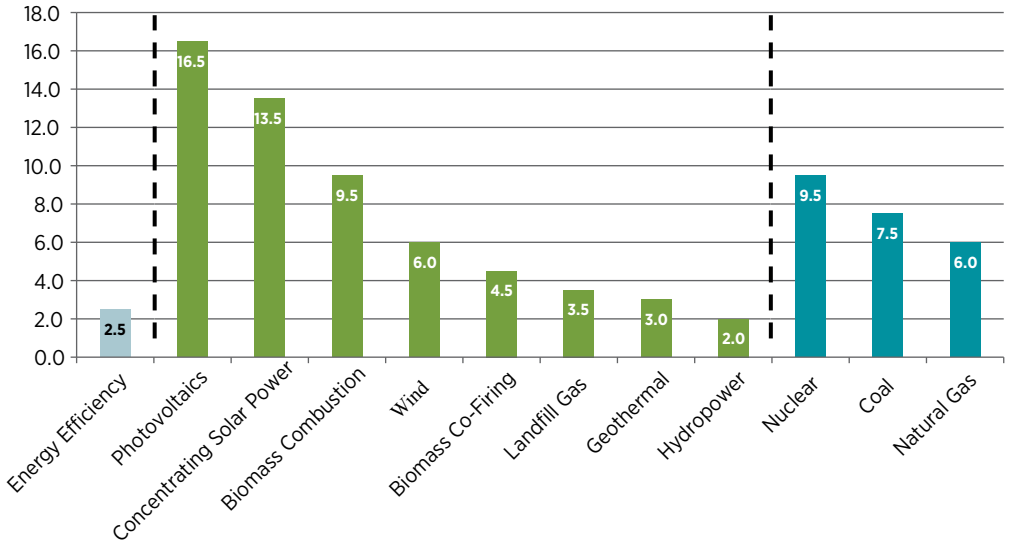
BIOFUELS MARKETS

Biofuel activities in the U.S. traditionally focused on first generation systems: corn-based ethanol and biodiesel from vegetable oils. More recently, DOE has increased its funding and is focusing on second generation cellulosic biofuels with several refineries being funded across the U.S. to demonstrate process scale up. DOE has also increased its funding for third generation algal biofuels technologies and companies such as Exxon and BP have invested in algal biofuel start ups in the U.S. It is anticipated that there will be continued support for advanced biofuels in the U.S. from both an energy security perspective and to meet aggressive renewable fuels standards (RFS).

CONCLUSION

In conclusion, the market for renewable energy technologies across the U.S. is significant as the U.S. has abundant renewable energy resources, but policy incentives will be needed in the near term to continue to support deployment. The consistent federal policy

Figure 4: LEVELIZED COST OF ELECTRICITY FOR VARIOUS POWER AND ENERGY EFFICIENCY OPTIONS



Notes: Assumes Federal & state incentives. CSP assumes trough technology. Natural gas price of $4.57/MMBTU
Sources: Navigant Consulting, Inc. 2010

support provided to PV will result in continued strong growth over the next five years with utility companies, third party providers, and others. Wind technology, however, will need the government to implement longer term policy support to encourage project financing, transmission interconnection, and cost competitiveness. As shown in Figure 4, many renewable energy technologies are close to being cost competitive with conventional power options. But with natural gas prices now closer to $4.50/MMBtu resulting in a **levelized cost of electricity (LCOE)** of around $.06/kWh, it will be harder for some renewable energy technologies to compete without incentives.

Many states are recognizing the value of renewable energy technologies and are taking a leadership role in supporting renewable energy implementation, regardless of the policy support at the federal level. States recognize the opportunity renewable energy technologies provide for:

- energy security,
- emissions reductions,
- price hedging against fossil fuel volatility, and
- economic development.

U.S. markets will continue to gain in global market share as both the federal and state level support continues to align and create valuable business and societal opportunities.

Although the United States Congress appears unlikely to enact comprehensive energy and climate legislation this year, the Obama Administration remains committed to fostering U.S. investment and leadership in renewable energy technologies and deployment as well as reducing emissions of greenhouse gases (GHGs) as proposed at the 2009 United Nations Climate Change Conference in Copenhagen.

U.S. RENEWABLE ENERGY POLICY

U.S. federal and state governments already have a number of policy tools likely to support increasing use of renewable energy in the next decade. Some of these tools—particularly state mandates and accompanying renewable energy credit (REC) markets—are likely to continue through 2020 and be important drivers. Prospects for continuation of existing federal financial incentives or enhanced federal financing are less clear. However, in the next 24-36 months, job creation is likely to be a much higher priority for the U.S. than decarbonization of its energy sector. Therefore, anyone evaluating near-term opportunities for investment in U.S. renewable energy technology, manufacturing, infrastructure or project development—and thinking about how to realize policy benefits such as government financial incentives—should focus on local job creation as a key to successful deployment of investment capital.

This article provides a brief overview of the principal policy tools currently fostering renewable energy deployment in the U.S. and concludes by highlighting some key evolving policies. These include a combination of: (a) state mandates; (b) federal tax incentives, grants, and loan guarantees; (c) state funding and policies focused primarily on distributed generation; and (d) transmission reform and governmental permitting. Future articles will address certain policies in greater depth.

STATE MANDATES AND RENEWABLE ENERGY CREDITS (RECS)

STATE RPS

Explosive growth in the U.S. renewable energy market has been driven primarily by renewable portfolio standards (RPS) in various states. An RPS is a state government mandate requiring that load-serving providers supply or acquire a minimum percentage of their power from qualifying renewable energy resources by a designated date. As of June 2010, mandatory RPS policies have been passed in 31 U.S. states and the District of Columbia, with six additional states approving non-mandatory renewables goals. These 31 states account for over 70% of the U.S. population and constitute significantly more than half of all electricity sales in the U.S.

RPS in California and Texas drive the two largest markets. For example, California, which is the eighth-largest economy in the world, originally adopted a standard of 20% by 2017 and then accelerated that target to be met by 2010. The state is currently implementing a new requirement for 33% renewables by 2020, the level determined by the governor last year as necessary to reach California's goal of reducing GHGs by 25%. The new RPS target, however, has proven controversial, with public concern over the economic cost of GHG reduction.

Texas, which is the thirteenth-largest economy in the world, enacted a requirement in 2005 that electric providers collectively generate 5.88 GW of new renewable power by 2015 and 10 GW by 2025. The first 10-year target is already being achieved in half the time due to the explosion of new wind development in 2008–2009; 10% of the 2015 target must also be met by non-wind resources.

RECS

A renewable energy credit (REC) is a tradable instrument that incorporates the positive environmental attributes realized from generating a MWh of power from a qualifying renewable energy resource. Each state with an RPS has implemented a REC system to aid in verifying compliance and to allow generators to purchase RECs rather than buy or own renewable generation capacity. Entities exist to "track" RECs from various states, but there is no significant market for trading RECs among different states. Although lack of transparency, limited market size, regulatory complexity, and pricing volatility combine to hamper the effectiveness of RECs, they remain important drivers of renewable energy development.

New Jersey, which has one of the most aggressive RPS in the country (22.5% by 2021), has become a leading venue for solar deployment through its online trading platform for solar RECs (SRECs). Generators can pay a fee instead of surrendering RECs at the end of each year, which tends to set the REC market price. Recent SREC prices have ranged from $170-$700/MWhr but averaged around $550/MWhr, providing a substantial incentive for new solar facilities. In New Jersey, most of the revenue from a new solar installation's first 15 years of operation (the period in which RECs are generated) will come from RECs rather than from electricity revenue, and REC proceeds will be set by future market prices. Thus, in order to obtain financing for a project, developers typically need to "hedge" or sell RECs forward to securitize their projected revenue stream.

FEDERAL TAX BENEFITS

PRODUCTION TAX CREDIT; INVESTMENT TAX CREDIT; AND ACCELERATED DEPRECIATION

Federal law provides an inflation-adjusted federal production tax credit (PTC, now $21/MWh) for ten years to wind projects that come online prior to the end of 2012. The PTC is based on actual production of power each year. The tax code provides an investment tax credit (ITC, available in the first year of operation) for solar and small wind projects worth 30% of the project's qualifying cost. The ITC for solar is available to projects that begin operations prior to the end of 2016. Developers may also take advantage of an accelerated depreciation schedule by depreciating the full cost of certain renewable energy projects over five years.

These benefits were critical to the commercial viability of new renewable energy projects financed through 2008, but they were dependent on the availability of tax equity investors who could effectively take advantage of the credits that many developers could not due to their limited tax liability. In the financial recession of 2007-2008, however, tax equity investors fled the market.

SECTION 1603 CASH GRANT PROGRAM.

In response to the flight of tax equity investors, Congress included a temporary provision in economic stimulus legislation in early 2009 (American Recovery and Reinvestment Act, or ARRA) allowing new renewable energy projects that begin construction prior to the end of 2010 to receive a 30% cash payment from the government in lieu of the ITC or PTC. This "Treasury Grant Program" (Section 1603 of the tax code) has been essential to continued growth in wind and utility-scale solar in 2009 and 2010. As of July 2010, $4.6 billion of grants had been awarded, mostly to large wind power projects. Congressional reauthorization of this program has been delayed for two reasons: internal disputes over the technical budget and appropriations framework for a longer-term program; and controversy over U.S. companies' receiving government benefits and then taking "green jobs" overseas, triggering proposals in Congress to limit or delay the program by requiring recipients to meet "Buy America" benchmarks.

FEDERAL LOAN GUARANTEES

In 2005, Congress created a loan guarantee program (Section 1703 of the tax code) aimed primarily at assisting new nuclear and clean coal projects by providing a government guarantee of financing up to 80% of the project cost, but the program was not fully implemented under the Bush Administration. ARRA extended and increased the loan guarantee program (in Section 1705 of the tax code), targeting renewable energy systems and facilities that manufacture related components, transmission systems, and biofuel projects. ARRA also appropriated $6 billion for payment of the credit subsidy (guarantee) costs, which under Section 1703 were paid by the developer. This amount was estimated to support $60-$100 billion of loans. This program is slowly maturing and having an important impact on both projects and manufacturing. Most utility-scale wind and solar projects now depend on a combination of the Section 1603 cash grant and either a Section 1703 or Section 1705 loan guarantee. However, the loan guarantee program

is also time-limited, ending September 30, 2011. Non-U.S. companies are eligible and have been successful in receiving funds, but projects must be in the U.S.

STATE FUNDING AND POLICIES

STATE BENEFIT FUNDS

About half of the states have public benefit funds (PBF) derived in most cases from a surcharge on retail electricity sales. The funds support a variety of renewable energy generation ranging from large projects to distributed generation, including rebates on rooftop grid-connected solar. California's PBF, the nation's largest, is committing $150 million per year to support PV solar.

STATE GRANT FUNDING

Out of a total of $16.8 billion in ARRA funds for clean energy, $2.7 billion was appropriated to supplement block grants to the states and $3.1 billion for State Energy Program (SEP) grants. These funds are being used by the states for a variety of locally-based subsidies and incentives including rebate programs, encouragement of manufacturing of renewable components, low-interest financing, research and training. Many of these state programs are focused on promoting distributed solar installation.

NET METERING

Net metering allows utility customers to use their own generation (solar; small wind generation) to offset consumption over a billing period by running their electrical meter backwards when they generate electricity in excess of demand. As a result, customers receive retail prices for power they generate that meets but does not exceed their annual demand. Net metering incentivizes installation of distributed renewable capacity. 37 states and the District of Columbia have a requirement making net metering available to some or all consumers.

TRANSMISSION REFORM

A major challenge facing the scale-up of U.S. renewable energy generation lies in the siting and cost recovery for new transmission lines necessary to connect wind and solar projects—many of which are geographically remote from load centers—with the grid. Each state has primary authority over siting of new interstate transmission lines, making it a huge challenge to site projects that cross several states. Regional attempts at voluntary multi-state planning appear to be the fastest route to ameliorating the current fragmentation of legal authority over siting.

Cost recovery is an equally vexatious problem. Disagreements between states and regions about whose ratepayers will bear the cost of new transmission are plentiful; and utilities or investors seeking to finance projects are finding it difficult to obtain the reasonable certainty of cost recovery necessary to proceed. The Federal Energy Regulatory Commission (FERC) has recently proposed a rule providing that all consumers that are likely to benefit pay a share of the project's costs. Conversely, consumers that do not benefit would not pay. This proposal, although controversial with some utilities and state commissions, is generally supported by renewable generators as a way to break the cost allocation logjam and spread costs over a region in proportion to the broad benefits associated with new transmission capacity. FERC appears to be focused intently on removing barriers to entry for renewable resources and is likely to finalize a rule that facilitates broad regional planning and rational cost allocation for interstate transmission early in 2011.

GOVERNMENT PERMITTING OF RENEWABLE ENERGY PROJECTS

The U.S. Department of Interior (DOI) and various state policies are critically important to renewables projects. While private land has been targeted for some medium size and smaller utility-scale solar facilities, large solar projects are mostly sited on federal public land managed by DOI's Bureau of Land Management (BLM). BLM is currently processing fourteen large solar projects (some jointly with California) under an accelerated schedule to allow 2010 construction so developers can claim ARRA benefits. BLM is also conducting a multi-year study to designate optimal locations for future solar projects. In the meantime, however, there is no comprehensive guidance for future permitting of solar projects, and siting

decisions have been left to developers. Consequently, speculators have applied for "rights of way" for large solar projects, getting first-in-line status without having to show ability to implement their projects.

Offshore wind development was formerly regulated by DOI's Minerals Management Service, which has recently split into three agencies following the Gulf of Mexico oil disaster. Because of the recent administrative restructuring, several important issues in the permitting process remain unclear. Developers are potentially faced with two major obstacles: first, reluctance to spend millions of dollars on studying an offshore site if they will then have to compete with others to secure it; and second, the prospect of having to prepare two separate and consecutive environmental impact statements (EIS), one for a preliminary plan and lease, and another for a construction permit, which could cause delays of up to nine years. Developers are working with DOI to finalize a more streamlined approach.

CONCLUSION

The U.S. renewable energy industry has been a bright spot during the recent economic downturn and the industry outlook remains strong. The current policy patchwork creates fragmented renewable energy markets. This factor, in conjunction with pending regulatory actions, legal challenges, and global competition, may ultimately spur comprehensive federal energy and climate legislation in the U.S. that would further strengthen the outlookfor renewable energy. But in the near future, industry participants must continue to navigate and optimize a wide array of incentives, mandates and other policy tools that comprise the current U.S. policy framework.

U.S. RENEWABLE ENERGY FINANCE

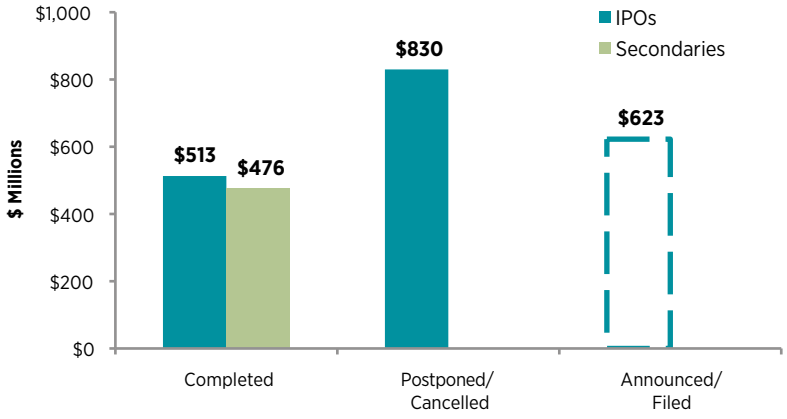
This section examines the performance of U.S. clean energy finance markets over the past several months. The review focuses on U.S. public equity markets, private equity markets, and debt markets, and concludes that: (1) following a successful first quarter, public equity markets have recently exhibited considerable volatility, largely due to the European credit crisis and policy uncertainty, resulting in many clean energy initial public offerings (IPO) being delayed and leading to a large IPO pipeline; (2) private equity and venture capital investments are increasing substantially quarter-on-quarter, with a particular focus on energy smart technologies, solar and wind, and investment still overwhelmingly concentrated in California; and (3) asset and corporate financings are recovering from the lows of 2009, but still lag behind Europe and, increasingly, China.

PUBLIC EQUITY MARKET ACTIVITY

There have been four IPOs and seven secondary offerings completed in the U.S. year-to-date, with a total of $513 and $476 million raised, respectively (Figure 5).[2] Two of the IPOs are U.S. companies—Codexis, a biofuels company; and Tesla Motors, an electric vehicles manufacturer—and two are Chinese companies—China Hydroelectric, a small hydro operator; and Jinko Solar, a vertically-integrated solar manufacturer. These companies represent a range of clean energy sectors, and their stock prices have each performed very differently since their IPO. This is partly due to the individual company's prospects and partly due to changing investor sentiment. Through the first quarter, investors exhibited growing confidence as markets appeared to begin a steady recovery from the global recession—as a result, first quarter clean energy public market investment in the U.S., traditionally the slowest quarter for public equities, exceeded the previous quarter's investment by more than 72% and exceeded first quarter 2009 investment by more than 144%. However, in the second quarter, the Eurozone sovereign credit crisis began impacting global equity markets, particularly those in Europe and the U.S. This is reflected in public market investment in clean energy in the U.S., which declined 2.6% from the first to second quarters, an unusual quarterly investment trend (Figure 6).

China Hydroelectric, which launched on the New York Stock Exchange on January 22nd 2010, was a casualty

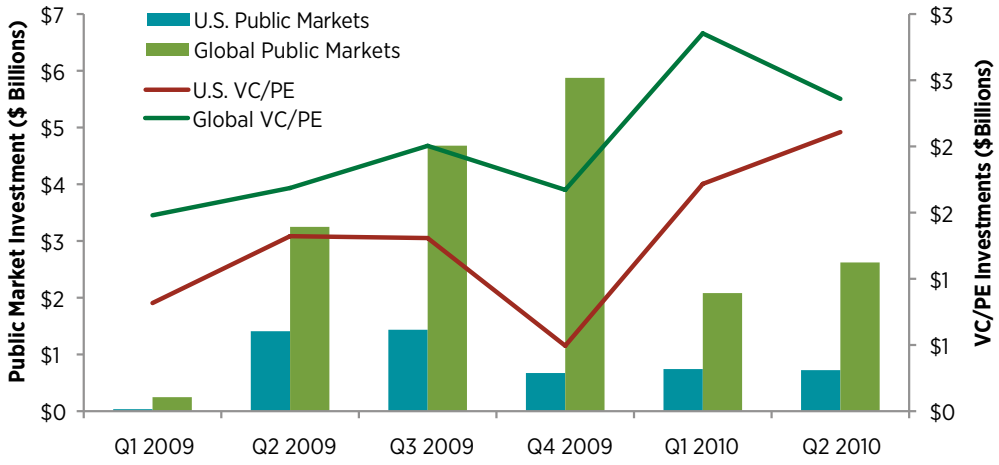
Figure 5: TOTAL DEAL VALUE OF U.S. IPOs AND SECONDARIES YTD 2010 BY STAGE



Source: Bloomberg New Energy Finance.
Note: No data on postponed/cancelled or announced/filed secondaries.

2 Note that all "year to date" references, and changes in stock prices since IPO are as of August 18, 2010

Figure 6: PUBLIC AND PRIVATE MARKET INVESTMENT, 2009 TO Q2 2010

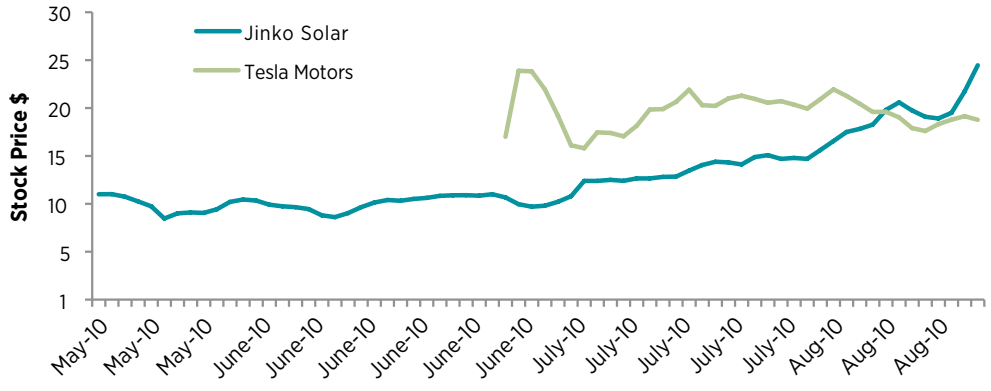


Source: Bloomberg Now Energy Finance

of this shift in investor sentiment. With a 61% decline in stock price from January to present, the company was the worst post-IPO performer in the U.S. this year. While this statistic illustrates the decline in investor appetite for clean energy deals since early-2010, it should be recognized in the context of the significant success of the IPO at the time of its offering—the company twice increased its offering size in the month preceding the offering, and ultimately raised $110 million, almost double its initial proposed deal size of $61 million. Second generation biofuel company Codexis, which made its IPO at the beginning of the unfolding of the European credit crisis, has also experienced a substantial decline in investor confidence—a 35% drop in stock price since its April 21 debut.

On the other hand, the recent IPOs of Jinko Solar and Tesla Motors have fared significantly better, with Jinko Solar's stock price increasing a substantial 98% since its May 13 IPO, and Tesla's stock up nearly 70% in early trading and 13% since its June 29 debut (Figure 7). Tesla Motors has attracted a considerable amount of attention for being the first and only company to produce a long-range battery powered car—the highly publicized "Roadster"—as well as developing strategic partnerships with industry incumbents Daimler and Toyota.[3] As a result,

Figure 7: JINKO SOLAR AND TESLA MOTORS STOCK PRICE, IPO TO PRESENT



Source: Bloomberg

3 Tesla's sports car product can travel 245 miles per charge, goes from 0 to 60 MPH in 3.7 seconds, and is highway capable

the IPO was an instant hit with investors—the company originally intended to raise $155 to $178 million, but increased the offering price when it recognized the extent of investor enthusiasm and ultimately raised $260 million in June 2010, making it the largest U.S. clean energy IPO of 2010. This is a remarkable feat in the current climate of investor caution, and Tesla's success can be attributed to the fact the company is operating in a sector of growing investor interest (i.e. energy smart technologies) and offers a differentiated product with strategic partnerships.

Still, the current environment remains one of investor caution, with two U.S. IPOs being pulled in June, and another in early August, with a cumulative potential deal value of nearly $745 million.[4] So far in 2010, the aggregate value of IPOs that have been postponsed or cancelled far exceeds the value of those that have actually occurred. Some companies have been in the IPO pipeline for several months now, waiting for an appropriate market opening (Figure 5). This hesitation to venture into the public markets in recent months is due to the increasingly selective nature of clean energy investors. U.S. and European investors are favoring companies with differentiated products or business models and are increasingly shying away from markets they perceive as commoditized, such as the wind and solar supply chain. Given the general capital shortage and market uncertainty, combined with an abundance of public clean energy companies to choose from, only those companies that are particularly differentiated from their competitors are receiving investor interest. However, an exception to the rule would be Jinko Solar, a vertically integrated solar manufacturer with a substantial increase in stock price since IPO. Yet, it should be noted that initial investor enthusiasm at IPO was muted and the majority of the stock price increase occurred in August, following the release of Jinko's Q2 2010 earnings. Q2 revenues and module shipments were up markedly from Q1 and substantially exceeded market estimates, resulting in upward revisions in expected annual earnings from equity research analysts and increased investor interest in the stock.[5]

PRIVATE EQUITY MARKET ACTIVITY

Private investment activity in clean energy in the U.S. has not tracked the public markets, with vast growth in investment from Q1 to Q2 2010: Q1 2010 investment was $1.7 billion, and Q2 2010 investment was $2.1 billion, both of which exceeded the previous four quarters of investment by a considerable margin.[6] These statistics demonstrate that the U.S. continues to lead the world in clean energy venture capital and private equity investment, with Q1 and Q2 private market investment representing 60% and 89% of the global total, respectively. As with public market investment, there has been a trend toward investment in energy smart technologies, particularly electric vehicles, as well as a continued interest in solar and wind companies. Illustrative of investor interest in electric vehicles, hybrid sports car manufacturer Fisker Automotive raised $74 million in Q2 and Coda Automotive raised $58 million in May 2010. The vast majority of this type of investment is centered in California, particularly with regard to solar, as a result of the generous policy incentives in the state.

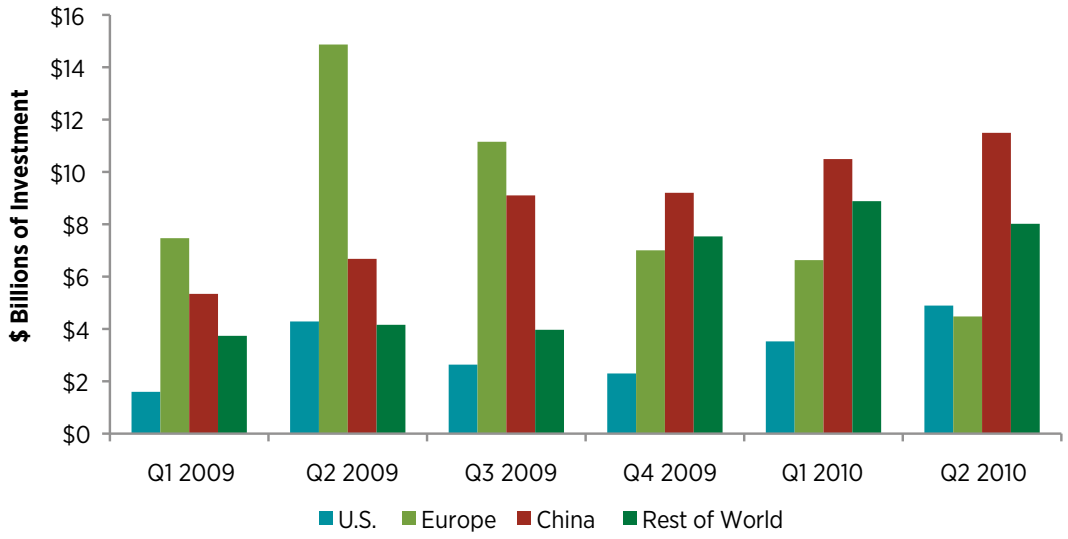
Private market investor sentiment is less cautious at present, with investors reporting an abundance of high-quality companies to choose from, relatively low valuations, and less competition than before the financial crisis. Therefore, for venture capital and private equity firms with capital, early and mid-2010 has been an optimal period in which to invest. These investors' exit strategies have also changed somewhat recently, given the public markets volatility and costs associated with a public offering. There is a shift toward strategic sales to corporates as opposed to IPOs, and there have been an increasing number of Asian companies actively seeking strategic acquisitions, which is a relatively new trend.

4 U.S. solar thermal company Solyndra's $300 million IPO and Chinese geothermal company Nobao Renewable Energy Holding's $207 million planned offering; Chinese solar manufacturer Trony Solar Corporation's planned $242 million offering on the NYSE

5 See, for example, "Jinko Solar Q22010 Earnings – Solid quarter post IPO", Credit Suisse, August 17 2010

6 Bloomberg New Energy Finance

Figure 8: ASSET FINANCINGS, 2009 TO Q2 2010



Source: Bloomberg New Energy Finance

DEBT MARKET ACTIVITY

The second quarter of 2010 saw 40 clean energy asset financings totaling $4.9 billion, up from $3.5 billion last quarter and $2.4 billion in Q4 2009.[7] As in previous quarters, the wind sector attracted the largest share of financings—there were 16 wind financings channeling $4.0 billion into the sector, followed by solar with 12 deals at a total value of $420 million.[8] In comparison to the second quarter of 2009, during which only 4 wind financings and 9 solar deals took place in the U.S., debt availability has increased markedly, with more banks able and willing to lend to clean energy projects.[9] The improvements in the financing market have been largely driven by an increased use of simplified project finance structures in the U.S., similar to the structures typically used in Europe, as opposed to the previous financing structures that were dependent on tax equity investors. This has been facilitated by the Treasury Grant Program (Section 1603 of the tax code), whereby owners of clean energy generation may convert the ITC into cash payments from the U.S. Treasury Department, thereby bridging the funding gap.[10] The combination of this and improved liquidity has brought project finance costs down across various capital structures relative to 2009: recent wind deals have been priced at approximately 275 bps over LIBOR. However, renewable energy project developers are cautious about pursuing new projects due to the uncertainty surrounding the expiration of Section 1603 at the end of 2010—without a renewal of the program, there are serious concerns that financings may slow down to 2008 levels.

In addition to the 1603 Program, in February 2009 the U.S. government also launched a Temporary Loan Guarantee Program (Section 1705) that extended the existing 1703 Program to include all clean energy technologies (as opposed to purely innovative technologies) and appropriated $6 billion in funding. The program was expected to facilitate and expand the clean energy project financing market during the recessionary environment, but disbursement of loan guarantees has been very

7 Bloomberg New Energy Finance
8 Among the more notable transactions were: (i) Terra-Gen Power, a developer affiliated with ArcLight Capital Partners, closing $1.2 billion in July to back the construction of 570 MW of its Alta Wind Project in Tehachapi, California; and (ii) Horizon securing $141 million in tax equity from Wells Fargo in exchange for Horizon's 28% stake in a trio of wind farms totaling 604 MW.
9 Bloomberg New Energy Finance, "Monthly Briefing," August 2009
10 Launched under the American Recovery and Reinvestment Act ("ARRA") of February 2009

slow and funds have been rescinded and re-allocated elsewhere twice since ARRA was signed into law.[11] As of August 2010, this leaves $2.1 billion in remaining funding, a substantial reduction from the initial $6 billion, but an amount that is still estimated to support $20 to $25 billion in future loan guarantees.[12] This is potentially a significant positive factor for the industry, particularly solar, given most of the recent loan guarantees have been provided to solar projects.[13]

To put U.S. debt markets in a global perspective, in the first half of 2010 there were $8.4 billion of asset financings in the U.S., relative to $11.1 billion and $22.0 billion in Europe and China, respectively (see Figure 8). Similarly, with corporate financings, China has vastly exceeded the U.S. with approximately $21.5 billion in transactions year-to-date, relative to $3.5 billion in the U.S. Many of the Chinese financings were provided by state-owned entities, capable of providing large, low cost loans,[14] while the U.S. financings have been smaller and tend to be provided by a syndicate of banks, often with Chinese participation. The key reason for this difference is that U.S. companies and banks continue attempting to shore up their balance sheets in the wake of the recent financial crisis and subsequent legislation—for example, the July 2010 "Dodd-Frank" financial reform bill that imposes regulations to ensure greater bank liquidity. As a result, providers of asset and corporate financings in the U.S. may become increasingly international.

11 To date there have been $4.1 billion in closed or conditional loan guarantees, requiring $400 million in funding from the program. In August 2009, $2.0 billion was re-allocated to the Cash for Clunkers Program, and in August 2010 $1.5 billion was re-allocated to the Education Jobs and Medicaid Assistance Act

12 Barclays Capital Clean Technology, August 11 2010

13 For example: (i) BrightSource's $1.37 billion guarantee for a 400 MW solar thermal plant; and (ii) Abengoa's $1.45 billion for its $2 billion 280 MW solar thermal power plant

14 For example, China Development Bank recently provided $5.3 billion to Yingli Green Energy Holding (July 2010) and $6 billion to Goldwind Science and Technology (May 2010)

CHINA MARKET REVIEW

CHINA RENEWABLE ENERGY MARKETS

As China's soaring economy consumes more energy, the government has prioritized renewable energy development to increase the country's energy supply; safeguard energy security; tackle environmental pollution; boost sustainable social and economic development; and to fulfill its commitment to responding to climate change. To meet these challenges, China adopted a goal of generating 15% of the country's energy from renewable sources by 2020.

In 2005, China passed the *Renewable Energy Law.* This bedrock legislation was followed by the adoption of the *Mid- and Long-term Development Plan for Renewable Energy in 2007.* In 2009, the *Renewable Energy Law* was further expanded via amendment. With the support of the government, China is fast-tracking renewable energy development. Small hydropower, wind power, biomass, solar energy, geothermal energy, and ocean power are all steadily developing. In recent years, large scale market development of wind power has created a complete value chain. Biomass has been widely promoted, leading to the maturation of methane gas and biomass power generation technology, and the refining of biomass for liquid fuels. Additionally, the market for solar energy appears promising. Supported by national policies, local governments are also issuing renewable energy development plans.

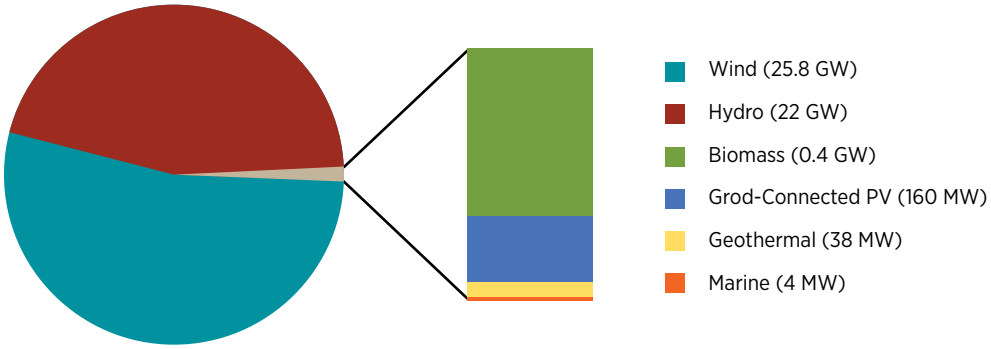
This update analyzes China's renewable energy market and policies. It first analyzes the current state of and future trends for the wind power, biomass, and photovoltaic markets. It then gives a brief analysis of the Chinese government's renewable energy policies and their consequences. Finally, it concludes with a look at the challenges that renewable energy development faces in China.

MARKET OVERVIEW

Renewable energy in China plays an increasingly important strategic role in the country's energy development. Total renewable energy capacity reached 226 GW in 2009, including 197 GW of hydro, 25.8 GW of wind, 3.2 GW of biomass, and 0.4 GW of grid-connected solar PV. Renewable energy now constitutes over one quarter of China's total installed power capacity (860 GW).

As an example of renewable energy's growth in China, wind power capacity grew thirty-fold from 2005–2009 from just 0.8 GW at the end of 2004. China is now second only to the U.S. in total wind capacity, tied with long-time leader Germany. China surpassed both of those countries in new capacity by adding 13.8 GW in 2009. 22 GW of new hydro, 0.4 GW of new biomass power, and 160 MW of additional grid-connected solar PV were also added in 2009. Additionally, Installations of grid-connected solar PV accelerated in 2009 as a true domestic market began

Figure 9: CHINA'S NEW INSTALLED RENEWABLE ENERGY CAPACITY IN 2009



Source: REN21 Global Status Report

emerging. Furthermore, small capacity amounts were added for both geothermal (34 MW) and marine energy (4 MW).

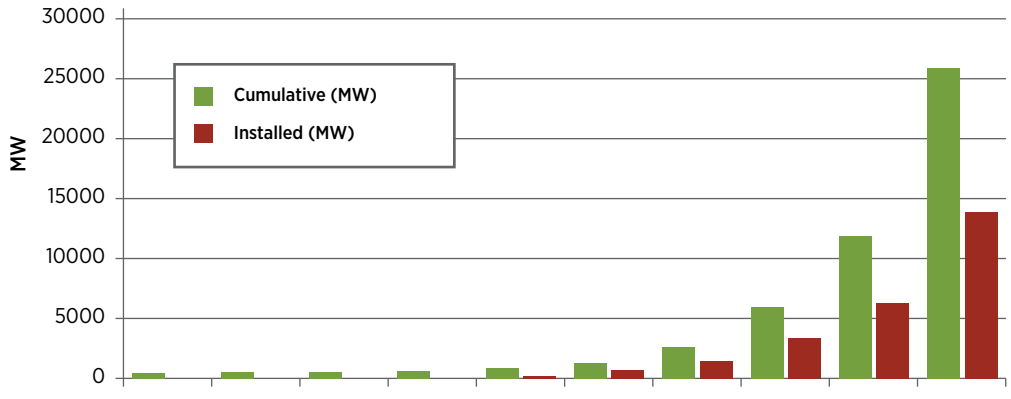
In just four years, China's wind turbine manufacturing industry became the world's largest. Three Chinese producers, Sinovel, Goldwind, and Dongfang, are now among the global top-10, and more than 80 domestic manufacturing firms now exist. Moreover, most Chinese turbines now belong in the 1.5–2 MW class, improving on the sub-1 MW models of earlier years.

China is now also the largest manufacturer of solar PV, supplying almost 40% of the global market in 2009.

The manufacturing capacity of China's 500+ solar PV firms was about 4 GW at the end of 2009. The top three Chinese producers were Suntech Power (704 MW), Yingli Green Energy (525 MW), and JA Solar (524 MW).

In other developments, the growth of the solar water heater market accelerated from 31 million m2 or 22 GW thermies (GWth) added in 2008 to 42 million m2 (29 GWth) in 2009. A new rural energy subsidy program for home appliances, which included solar water heaters, was partially responsible for this growth. The total existing solar water heating capacity increased to 145 million m2, enough to supply 60 million households (assuming 2.5 m2 of heat absorber each). Offshore wind power

Figure 10: ADDITIONAL INSTALLED WIND CAPACITY AND TOTAL INSTALLED WIND CAPACITY



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Cumulative (MW)	341.6	398.8	465.1	563.4	760.2	1,267.1	2,554.7	5,867.4	12,019.6	25,805.3
Installed (MW)	77.3	57.2	66.3	98.3	196.8	506.9	1,267.1	2,554.7	6,153.7	13,803.2

Source: GWEC

development is poised for growth, with bidding underway for at least one 100 MW project and several hundred megawatts planned across a number of other projects.

Looking to the future, the government's draft plan calls for a total of 500 GW of renewable power capacity by 2020, composed of: 300 GW of hydropower; 150 GW of wind power; 30 GW of biomass power; and 20 GW of solar PV. This would compose almost one-third of China's expected 1600 GW of total power capacity in 2020.

These targets are not yet official, and lower targets (totaling 362 GW) established as part of the 2007 *Mid- and Long-Term Development Plan for Renewable Energy in China*' still govern. The portfolio standards set forth in the *Mid- and Long-Term Development Plan* require utilities with capacity over 5 GW to achieve 8% of capacity and 3% of power generation from non-hydro renewables by 2020.

Many of these market developments can be traced back to the enactment of the landmark 2005 *Renewable Energy Law,* which took effect in 2006 after the passage of detailed implementation regulations. A provision for renewable portfolio standards (also called 'mandated market share') composed a key element of that law, along with feed-in tariffs for biomass, 'government-guided' prices for wind power, an obligation for utilities to purchase all renewable power generated, new financing mechanisms and guarantees, and other market-enhancing provisions. A wind power concession program in place from 2003-2007 complemented the law, resulting in the creation of 3.4 GW of wind power through annual competitive project bidding.

WIND ENERGY MARKETS

China possesses an estimated exploitable onshore wind capacity of 2,380 GW (50 meter high wind measurement tower data), spanning 96% of China's territory. Additionally, China's offshore wind resources total 200 GW. In 2003, China implemented a concession bidding program to bolster its domestic wind industry. To stimulate the development of large-scale, highly concentrated wind power projects, China designated seven 10 GW wind power bases in 2008. In 2009, China introduced a feed-in-tariff for wind power generation. From 2006 to 2009, installed wind power capacity doubled annually in China (Figure 10), and after eight years of fast-paced development, the onshore wind industry is now firmly established.

China's wind power generation market is shared among the "Big Five" power generation companies and several other major state-owned enterprises. These firms account for 76% of the total investment in wind power development. Other investment comes from local state-owned enterprises, such as the local enterprises of the State Grid Corporation. Private enterprises constitute only a small portion of total investment.

According to the goals set in the *Mid- and Long-term Development Plan for Renewable Energy,* total wind power capacity will amount to 5 GW in 2010 and 20 GW in 2020. However, in 2009 installed wind power capacity already hit 24 GW, far outpacing the original target. At this rate, China's wind power generating capacity is expected to exceed 100 GW in 2020.

Figure 11: DEVELOPMENT OF THE OFFSHORE WIND MARKET IN CHINA

2005
- *Renewable Energy Industry Guidance Catalogue* listed offshore wind as a priority industry

2007
- *Renewable Energy Development Eleventh Five-Year Plan* designated Jiangsu and Shanghai to develop pilot offshore wind projects 2006

2008
- Shanghai Donghai Bridge offshore wind project is approved by NDRC and construction begins

2009
- *Workshop on Offshore Wind Development and Construction* established the road map of China's offshore wind development

2010
- *Interim Regulation on Offshore Wind Development and Construction* released

Offshore wind power's attractiveness stems from strong policy support and the desire to access large electricity markets along the coast. The first offshore wind power demonstration project, the Shanghai Donghai Bridge Offshore Wind Farm, began generating power in June 2010. It is the first offshore wind project outside Europe. At the same time, the government launched public bidding for the first round of offshore wind concession projects this May. A new round of bidding for offshore wind concession projects will be completed by November 10, 2010, adding 1 GW of planned capacity along the coastline of Jiangsu Province.

BIOMASS MARKETS

The utilization of biomass in China is characterized by methane gas, biomass power, and bio-fuels. After decades of development, methane gas utilization technology has matured, particularly for household use. In 2003, a central government bond program allocating more than 2.5 billion RMB began promoting the construction of methane gas facilities for rural residents. By 2010, a total of 40 million rural households had access to methane gas, with annual methane gas production of 15.5 billion cubic meters. However, this number accounts for only 30% of the rural households that could potentially benefit from construction of methane gas facilities. By 2015, about 60 million rural households will have access to methane gas with annual production capacity around 23.3 billion cubic meters.

Although biomass power generation technologies, such as woody biomass power, urban waste power, and solid biomass fuel have been developed, their deployment remains immature. To achieve the target of 5 MW installed biomass capacity by 2010 and 30 MW by 2020, a number of problems must be solved, such as diffuse resources, the high cost of raw materials, and the discontinuity of raw material supply.

China is actively promoting R&D in new bio-fuel technologies and conducting pilot projects to alleviate oil shortages. In the Eleventh Five-Year Plan period, China approved four ethanol production pilot projects that use aged grain as raw material. Annual production capacity from this type of facility reached 1.02 million tons. Ethanol gasoline pilot projects have been carried out in 27 prefectures. Although bio-fuel production capacity reached 1.65 million tons in 2006, in 2007 China began limiting grain-based ethanol fuel production slowing momentum.

PHOTOVOLTAICS (PV) MARKETS

China is endowed with abundant solar energy across more than two-thirds of the country. Annual radiation exceeds 6 billion joules per square meter (J/m2), and the surface absorption of solar energy every year is equivalent to approximately 1-7 billion tons of standard coal energy. In the Northwest, Tibet, and Yunnan Province, solar energy resources are especially abundant.

Driven by recent strong demand in the international PV market, especially from Germany and other European countries, China's PV production capacity has expanded rapidly. China's production growth comes from manufacturing crystal silicon and solar cells and assembling solar modules. Following several years of strong growth, China is now the world's largest producer of photovoltaic cells.

The development and expansion of China's PV cell industry has benefited from huge infusions of capital. Since 2005, 17 Chinese enterprises producing PV modules have listed either abroad or domestically in order to raise capital. The additional capital allowed these firms to increase their production capacity to 4GW in 2009, accounting for about 40% of global output.

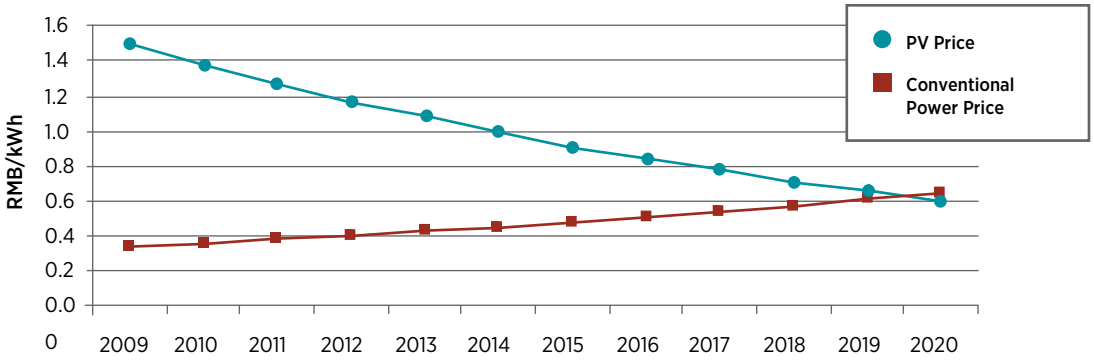
Although China might be the world's largest PV market in the future, China's domestic solar market remains immature due to the lack of a feed-in-tariff. However, the government introduced several solar PV subsidies to bolster and sustain industry entrants until solar energy costs reach acceptable levels (arguably 1 RMB or 0.15 USD/KWh). The Golden Sun program initiated by the Ministry of Finance (MOF), the Ministry of Science & Technology (MOST), and the National Energy

Administration (NEA) in 2009 provides capital subsidies for solar PV installations through 2011 on a project-by-project basis. Off-grid installations receive 70% subsidies while grid-connected installations receive 50% subsidies. Additionally, MOF and the Ministry of Housing and Urban-Rural Development (MOHURD) provide subsidies of RMB 15/watt ($2.20/watt) for grid-connected solar PV, and RMB 20/watt ($2.90/watt) for building-integrated PV (BIPV). In 2010, the subsidy levels were reduced to RMB 13/watt ($1.90/watt) for grid-connected and RMB 17/watt ($2.50/watt) for building-integrated PV. The provinces of Zhejiang and Jiangsu also established province-wide preferential tariffs for solar.

Instead of adopting European-model policy mechanisms to develop its solar market, China's solar development strategy is similar to its strategy for the wind market. China uses a concession bidding program to find the lowest, yet reasonable tariff for projects based on varying resources in different regions. The second-round solar concession project public bidding was held on August 10, 2010, and should result in the construction of 13 PV projects with a total capacity of 280 MW. Over 70% of the participants were state-owned companies, which submitted bids as low as 0.73 RMB ($0.107)/kWh.

Looking forward, the installed solar capacity in China is projected to be 2 GW by 2015, and it is estimated that grid parity for solar PV will be reached in 2020.

Figure 12: CHINA'S ROADMAP TO PV GRID PARITY



Assumptions:

1. In 2009, the standard price of on-grid PV was 1.5 RMB/kWh;
2. The price of PV-generated electricity is reduced by 8% every year;
3. In 2009, the average conventional power price was 0.34 RMB/kWh, with annual increases of 6% since then;
4. Distributed solar PV will achieve grid parity in 2015 with 15,000 RMB/kWp installed capacity of solar PV and a power price of 1 RMB/kWh;
5. Utility-scale solar PV power generation will reach grid parity in 2020 with installed capacity of 10,000 RMB/kWp and power price of 0.6-0.8 RMB/kWh.

CHINA RENEWABLE ENERGY POLICY

China's historical renewable energy policy development can be divided into three phases. The first phase was from the 1950s to the 1980s, when methane gas and small hydropower was proposed as a solution to energy problems in the countryside; the second phase was from the 1980s to the end of the 1990s, when optimization of the country's energy structure was the driving force; and the current phase started at the end of the 1990s with the aim of solving China's environmental problems, reducing CO_2 emissions, and achieving sustainable development.

In 2005, China issued and implemented the *Renewable Energy Law,* which it amended in 2009. In comparison to the original *Renewable Energy Law,* the amendment does not focus on promoting renewable energy, but rather on coordinating and solving the problems that emerge among stakeholders involved in the development of renewable energy. The 2009 amendment strengthened and consolidated a renewable energy fund created under the MOF as part of the 2005 law. Previously, the fund collected a 0.4 RMB/kWh (0.06 US cents/kWh) surcharge on electric power sales nationwide (with some customer classes exempt). The Ministry applies those funds to the costs of government-supported renewable energy projects and the costs of feed-in tariffs. However, the surcharge has not kept pace with expenditures, so the new revisions allow MOF to supplement the renewable energy fund from general revenues. The government has successively released more than 10 detailed rules, covering grid-connected prices; surcharge sharing; solar PV support; and public biddings for renewable energy projects.

Since local governments actively seek new economic development opportunities, many municipalities look favorably upon the renewable energy industry. Local officials believe rapid growth in the renewable energy industries will quickly boost GDP; promote the creation of a complete industrial chain; and encourage the development of green industry. Nearly 20 provinces,

China's Policies Related to Renewable Energy

POLICY	BASIC PRINCIPLES
2005 Renewable Energy Law and Tentative Management Measures for Renewable Electricity Price and Cost-sharing by NDRC [2006], No. 7	1. Grid enterprises should acquire the full amount of generating capacity from renewable energy projects; 2. Grid enterprises must give a reasonable on-grid price (reasonable cost + reasonable profit); 3. The surcharge to cover disparity from the conventional electricity price is shared by all electricity customers.
Tentative Management Measures for Allocation of Surcharge of Renewable Electricity by NDRC [2007]), No.44	1. Starting from June 2008, developers received an additional 0.002 RMB for every kWh generated from renewable sources. In November 2009, the rate was increased to 0.004 RMB/kWh; 2. Currently, four feed-in-tariff levels exist for wind power generation (0.51-0.61 RMB/kWh); 3. The price of biomass power is equal to the price of coal-generated power plus 0.25 RMB/KWh.

regions, and cities in China have issued stimulus plans for renewable energy, and over 100 cities are proposing to establish renewable energy industry bases, including: Shanghai, Shenzhen, Chengdu, and Suzhou.

At the Copenhagen Climate Conference in 2009, Premier Wen Jiabao committed China to increasing the proportion of non-fossil energy utilization to 15% of China's total energy use, and to focus on accelerating the development of renewable energy. With the beginning of China's *Twelfth Five-Year Plan* period, experts predict that China will attach increased importance to developing renewable energy, increasing the proportion of clean energy, and accelerating the transformation of China's energy structure.

CHINA RENEWABLE ENERGY OUTLOOK

Although the pace and scale of renewable energy development in China has surpassed that of many developed countries, some barriers still obstruct the creation of a strong domestic market, with cost being the most significant.

At present, China's generating cost of renewable energy significantly exceeds that of conventional energy. For example, the generating cost of small hydropower is about 1.2 times the cost of coal; 1.5 times for biomass power generation (methane gas); 1.7 times for wind power; and 11-18 times for PV power. High cost inhibits the renewable energy market. At the same time, a small market slows the reduction of the cost of renewable energy, creating a vicious cycle for the renewable energy industry. The industrialization of renewable energy sources will be realistic only when the prices of renewable energy and traditional energy reach parity.

China's current R&D levels still lag behind developed countries, characterized by relatively weak independent R&D and innovation. China lacks both accreditation standards for product quality and standards for connecting renewable energy to the grid. Inconsistency between the planning of renewable energy projects and the planning of transmission leads to difficulties in generating power. Furthermore, the rising proportion of renewable energy in China's energy portfolio will strain the grid in regards to peak regulation and frequency modulation. Therefore, more investment in the grid will be needed to accelerate modernization and the creation of a smart grid.

The development of renewable energy in China is still in the initial stages, supported mainly by government policies. However, merely relying on financial subsidies is insufficient, and long-term mechanisms will be needed to develop the industry in a sustainable and healthy way. Competition within China's renewable energy market is largely among state-owned power enterprises, with private investors being gradually marginalized. Nevertheless, both the wind power and PV industry were initially funded through private investment, and the encouragement of private capital in the renewable energy sector will push forward the development of renewable energy. Meanwhile, the introduction of market mechanisms and free competition also improves quality while reducing costs.

US-CHINA COLLABORATION UPDATE

U.S. Secretary of Commerce Gary Locke and U.S. Secretary of Energy Steven Chu visit "Future House USA", a clean energy residential development project in Beijing, China.

Image: AP

In 2009, we repeatedly heard from industry and government leaders that US-China cooperation was necessary to build a clean energy economy for future generations. Now in 2010, many of the promises that were made last year are coming true. Both the U.S. and Chinese governments have shown that they are serious about working together to modernize our energy usage and transportation infrastructure. Additionally, the U.S. and Chinese private sectors have demonstrated that the renewable energy industry stands to benefit greatly from partnership and collaboration.

Within our own US-China Program, we have developed an established program with two major initiatives: our semiannual **US-China Workshops** and our **Quarterly Market Reviews**. These two initiatives seek to increase cross-Pacific understanding of renewable energy policies, markets, and finance, with the aim of accelerating the deployment of renewable energy in both countries. Additionally we have weekly news updates and an interactive online community that we encourage you to sign up for by visiting www.acorechina.org.

GOVERNMENT INITIATIVES

In November 2009, President Barack Obama and President Hu Jintao made a number of exciting announcements for US-China cooperation on renewable energy, including:

- the establishment of a **US-China Clean Energy Research Center**;
- the launch of the **US-China Electric Vehicles Initiative**;
- and the establishment of the **US-China Energy Cooperation Program**.

Since these announcements, the U.S. and Chinese governments have made great progress in backing up their promises.

On September 2, 2010, U.S. Secretary of Energy Steven Chu announced that the University of Michigan and West Virginia University will receive a combined $25 million to lead two consortia of universities working on electric vehicles and emission-reducing coal technologies respectively. The government funding will be matched by the grantees, resulting in a $50 million research effort in the U.S. alone. The two consortia constitute two-thirds of the U.S. contingent of the **Clean Energy Research Center** (an additional $12.5 million-winning consortia focused on energy efficiency will be announced in coming months), and the Chinese government will be announcing Chinese research partners in fall 2010.

The University of Michigan "Clean Vehicles" group will include: Ohio State University, Massachusetts Institute of Technology, Sandia National Laboratories, Joint BioEnergy Institute, Oak Ridge National Laboratories, General Motors, Ford, Toyota, Chrysler, Cummins, Fraunhofer, MAGNET, A123 Systems, American Electric Power, First Energy, and the Transportation Research Center. Commenting on the importance of the University of Michigan consortium's work, Assistant Secretary of Energy David Sandalow stated that "our two countries are the world's largest auto markets and largest consumers of petroleum—what we do makes a difference."

Significantly, the **Electric Vehicles Initiative (EVI)** was expanded at the July 19 Clean Energy Ministerial hosted by Secretary Chu and Assistant Secretary Sandalow. The EVI now includes the U.S., China, the United Kingdom, Germany, Japan, South Africa, Spain, and Sweden. All of these nations are dedicated to creating multiple pilot cities for EVs, and China will lead off the these efforts by building a demonstration zone in one of its pilot cities and hosting an International Forum on Electric Vehicle Demonstration Cities.

The **US-China Energy Cooperation Program** (ECP) has also gained momentum with over 20 U.S. companies active in China's renewable energy market now working together to promote commercially viable project development. The renewable energy working group includes AES, First Solar, Honeywell, Tang Energy, and GE among others. These U.S. clean energy leaders are now teaming together to identify projects they can work together on at the local level in China.

PRIVATE SECTOR DEVELOPMENTS

Illinois Governor Pat Quinn commemorates the opening of Wanxiang America's Rockford PV plant and the bolstering of the state's solar RPS carve out.

Image: EarthTechling

On the same day that Illinois Governor Pat Quinn signed into law a state solar RPS requiring 0.5% of solar energy by 2012 and 6% by 2015, he also awarded $4 million of ARRA funding to a 62 MW solar project being developed in Rockford, Illinois by Rockford Solar Partners. While the strengthening of a state solar RPS and the announcement of a 62 MW project are significant developments in their own right, the composition of Rockford Solar Partners made the day even more newsworthy. Rockford Solar Partners is a joint venture between Chicago-based project developer New Generation Power and Wanxiang America, a subsidiary of one of China's largest private companies.

To supply the 62 MW solar farm, Wanxiang America is opening a $12.5 million solar panel assembly line in Rockford, initially employing 60 people and later expanding the workforce to 200. Adding to the US-China cooperative dynamic of the project, Massachusetts's Spire Corporation will be supplying Wanxiang with the plant's turnkey PV manufacturing lines. The Rockford assembly plant and solar farm serve as a prime example of the mutual benefits for U.S. and Chinese companies when national and local governments set forward-thinking energy policies to foster the creation of a clean energy economy.

Many other developments point to greater U.S. and Chinese renewable energy collaboration, including new solar R&D centers opened by DuPont and Applied Materials in China and GCL-Poly Energy in the U.S.; however, many challenges and contentious issues remain between our two countries. We hope that the increased dialogue and understanding engendered by efforts like this report and our semiannual US-China Workshops will allow industry and government leaders to address difficult issues like government procurement rules, transmission build-out, and meaningful government support of renewable energy.

SUCCESS STORIES: GCL WORKING IN THE U.S. MARKET

GCL-Poly Energy Holdings Limited (GCL) is China's largest polysilicon producer and one of the world's leading wafer suppliers. The company was jointly founded by two of the largest Hong Kong-based investment firms, Poly Investments and Golden Concord, and it began trading on the Stock Exchange of Hong Kong (SEHK) on November 13, 2007. In July 2009, GCL acquired 100% of GCL Silicon Technology, a China-based solar grade polysilicon producer founded in March 2006, for US $3.4 billion. In November 2009, China Investment Corporation subscribed to 3.1 billion GCL shares and is now the second largest shareholder of GCL with roughly 20% stake.

CHINA MARKETPLACE SUCCESS

GCL has had unparalleled success in China's solar market since it entered the industry, becoming China's largest polysilicon producer and one of the world's leading polysilicon and wafer suppliers. GCL has been consistently increasing their annual polysilicon production capacity. Reaching 18,000 million ton (MT) at the end of 2009, GCL is expected to reach 21,000 MT by the end of 2010, with the quality of polysilicon products reaching electronic grade level.

It isn't, however, just GCL's polysilicon business that has been making headlines. GCL has signed several long-term wafer contracts with downstream cell and module manufacturers in China, Taiwan, India, Europe and the U.S., including a September 3, 2010 agreement with Hareon Solar Technologies to supply photovoltaic wafers to for three years in a deal worth RMB 20.8 billion . In order to fulfill its high volume wafer orders, GCL began construction of wafer production facilities in the third quarter of 2009, and the company is targeting to achieve 3 GW of wafer capacity by the end of 2010. GCL's unique wafer co-location strategy, which involves setting up slicing facilities near customers' manufacturing sites, allows the company to form tight strategic alliances with downstream customers and further reduce wafer processing cost. Adding to its list of successful achievements, GCL built and now owns a 20MW solar farm in Xuzhou, Jiangsu province, which is currently the largest solar farm in China. The capstone on the company's success came in August 2010 when Fortune Magazine named GCL, "One of the Most Innovative Chinese Companies in 2010".

U.S. MARKETPLACE SUCCESS

As a highly ambitious company, GCL began turning its focus toward its potential as a polysilicon and wafer manufacturer and solar farm developer in the U.S. market during solar's strong growth period of 2007. The company performed initial market entry assessments in 2007-2008 before making its move into the market in 2009. By establishing dual North American headquarters in San Francisco and Washington State, GCL has established strong footing to carry out its solar research and development activities and expand its solar project development capabilities in the U.S. GCL anticipates its greatest success being in the solar energy independent power producing sector, by teaming with project developers to finance, build, and operate solar power projects in the on-site distributed generation and utility-scale markets.

Early on, GCL recognized their unique advantage to control the equipment cost of their solar project development business via their polysilicon and wafer manufacturing capabilities. The company was able to further increase its competitive advantage during the financial meltdown of 2009. While many developers were finding capital markets drying up, GCL's secure capital structure and deep pockets allowed it to source debt and

equity at very low costs. GCL's ability to combine these two advantages has allowed the company to move swiftly and with tremendous success into what it considers the highest growth subsectors in the solar industry—on-site distributed generation and utility-scale projects. After less than a year in the U.S. market, GCL has installed just under 10 MW of solar energy projects, comprised of a 2 MW solar energy system at the University of San Diego and 9.7 MW of solar energy systems located at various sites in and around Lancaster, California. GCL has found little difficulty in increasing awareness of their participation in the North American market, and it is celebrating the success it's had uniting its U.S. and China based staff. With its sights set on future U.S. success, GCL plans to steadily work toward becoming the powerhouse in the utility-scale solar development sector.

SUCCESS STORIES: DUPONT WORKING IN CHINA

Founded in 1802, DuPont is a world leader in chemical research and innovation. Some of the many products DuPont developed include: Mylar, Teflon, and Kevlar. DuPont Photovoltaic Solutions (DPVS) was founded more than 25 years ago to produce innovations in solar power. DPVS' advanced products include: frontsheet materials, photovoltaic (PV) encapsulates, PV metallizations, backsheet materials, junction box materials, and flexible substrates. DPVS recently announced plans to double production of some of its solar-enabling technologies, forecasting sales of $2 billion by 2014, outpacing many of its competitors.

CHINA MARKETPLACE SUCCESS

DuPont has been a business leader in China for more than 150 years. The company received its first Chinese order in 1862, and opened its first office in Shanghai in 1919. That presence has continually grown, and in 2005, DuPont launched a Research & Development (R&D) Center in Shanghai's Zhangjiang Hi-Tech Park which has received a total $25 million of investment. The facility was greatly expanded in 2009, when DuPont opened a PV technical center, consisting of three laboratories focused on cell and module manufacturing, PV metallization, and module reliability testing.

In 2008, the company launched DuPont Apollo—a thin film solar technology and turnkey services provider suitable for solar farms, residential and commercial rooftops, and building-integrated systems. DuPont Apollo began R&D activities in Hong Kong in 2009. The facility—housing over 100 engineers and scientist—is part of the "Shenzhen-Hong Kong Innovation Circle" project launched by the Hong Kong and Shenzhen governments to spur clean tech development in the neighboring cities. In parallel to the R&D center, DuPont Apollo commenced manufacturing of its thin film line in Shenzhen in 2009. The production line began with 25 MW of capacity, with plans to expand to 50 MW.

Since 40% of the world's solar production is in China, DuPont viewed the opening of R&D centers in Shanghai and Hong Kong as a way to better meet customer needs and continue to invent new technologies that will increase the efficiency of solar cells. Being geographically close to its customer base also allows DuPont to work in tandem with business partners to develop innovative business and technological solutions.

U.S. MARKETPLACE SUCCESS

DuPont Photovoltaic Solutions' expansion is not limited to its China operations. In 2010, DuPont announced intentions to invest $295 million to more than double the production of Tedlar film at its Fayetteville, North Carolina facility. Tedlar film is a critical component in solar cells that increases efficiency and extends product lifetime especially in extreme weather conditions.

In order to continue leading innovation within the PV industry, DuPont opened an applications lab specific to PV in Wilmington, Delaware in June 2010. The lab will utilize the large-scale testing facilities to experiment with new manufacturing processes and materials.

All of DuPont's efforts in China and the US lead towards its goal of increasing solar cell efficiency and durability. The company sees more affordable and efficient solar technologies as one of the very important solutions to global energy and environmental challenges.

GLOSSARY

Anaerobic digester gas (ADG)

Waste placed in an airless environment, where bacteria convert it to gas capable of generating heat and electricity.

Base load

The minimum amount of power that must be supplied by the utility. Base load power plants generate the majority of power, with additional plants activated when demand increases.

Block grants

Funds given to U.S. states by the federal government to run programs within defined guidelines.

BPS

Basis Point. A unit equal to 1/100 of 1%; it is used to define interest rates, i.e., a 1/10th of 1% change is equal to 10 bps.

Carve outs

Under their RPS, some states require a specific percentage of electricity from certain types of facilities (typically for solar or distributed generation).

Co-firing

Traditional power plants, such as coal plants, that can also burn biomass.

Credit subsidy (guarantee) costs

A cash payment to a reserve fund behind a loan guarantee, typically 10% of the amount of the guarantee.

Depreciation

A non-cash expense in accounting that represents the reduced value of an asset due to deterioration or obsolescence. Depreciation lowers a company's reported earnings.

"Dodd-Frank" financial reform

The largest U.S. financial reform legislation since the 1930s. Authored by Senator Chris Dodd and Representative Barney Frank. Signed into law on July 21, 2010 by President Barack Obama.

Environmental impact statements (EIS)

A report addressing the potential effects on the environment of a proposed project.

Firming capacity

Combining fluctuating renewable energy sources, constant traditional energy sources, and storage capacity to remove variability from the electric grid.

Initial public offering (IPO)

The first sale of stock by a private company to the public.

Levelized cost of electricity (LCOE)

The average cost, in ₵/kWh, of electricity produced over the life of a power plant, taking into account installation and commissioning costs, operations and maintenance, degradation and lifetime, and the output.

LIBOR

London Inter-Bank Offer Rate. The interest rate that the banks charge each other for loans.

Load-serving providers

Entities that secure energy and transmission services to serve the electrical demand and energy requirements of end-use customers.

Loan guarantee

A legally binding agreement under which the guarantor agrees to pay any or the entire amount due on a loan instrument in the event of nonpayment by the borrower.

Power purchase agreement (PPA)

A contract between an energy producer and an energy consumer defining the terms and conditions of the sale of electricity. Sometimes called a power sale agreement.

Process scale up

Shifting from a pilot-scale facility to a commercial-scale refinery or other process facility.

Public benefit funds (PBF)

A pool of resources typically created by levying a small fee or surcharge on customers' electricity rates, which can then be used by states to invest in clean energy.

Rate base

The value of a utility's physical assets according to their regulators. This value is used to determine the amount of money that a utility can profit from, which determines electricity rates.

Renewable energy credit (REC)

Tradable certificates that represent the environmental attributes of the power produced from renewable energy projects and can be sold separate from commodity electricity.

Renewable energy standard (RES)

See renewable portfolio standard (RPS).

Renewable fuels standard (RFS)

Like RPS, RFS requires a certain portion of fuel to be made from renewable sources. For example, 7.5 billion gallons of renewable fuel must be blended in to gasoline by 2012.

Renewable portfolio standard (RPS)

Regulations adopted by the majority of U.S. states requiring that load-serving providers supply or acquire a minimum percentage of their power from qualifying renewable energy resources by a designated date.

Second generation cellulosic biofuels

Converting non-food portions of biomass, such as stems, leaves, and non-food crops, into usable biofuel.

Secondary offerings

The issuance of new stock for public sale from a company that has already made its initial public offering (IPO).

Securitize

To buy loans (such as mortgages) from lenders, arrange them in groups, and issue bonds on the groups.

Tax equity investors

Entities that invest capital in projects, and earn a return by taking tax credits against their tax liabilities from other income.

Utility-scale solar

Large solar projects, generally over 1 MW in capacity.

Woody biomass

Generating electricity through burning trees, leaves, and other woody plants.