Understanding Renewable Energy: Solar

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This note provides an introduction to solar energy, including the different types of solar projects, the benefits and limits of solar energy and the federal and state programs that promote this technology. This note also discusses how the electricity produced by solar projects is typically sold and the challenges to the continued growth of this renewable resource.

For the US solar energy industry, 2011 represented a historic year. According to a report issued by the Solar Energy Industries Association (SEIA), a leading industry group, installed capacity of new solar photovoltaic (PV) reached 1,855 megawatts (MW) in 2011, a 109% increase from 2010 (see *U.S. Solar Market Insight Report, SEIA, March 13, 2012* (*SEIA Solar Report*)).

The growth in PV installations, the largest share of the solar market, occurred in every market segment (residential, commercial and utility) and in 18 of the 23 states that the SEIA tracks. As of December 2011, there was a total of 3,954 MW of cumulative PV installed capacity in the US, which is roughly equivalent to eight base load fossil fuel power plants or more than two major nuclear generating stations (see *SEIA Solar Report*). For more information on solar PV projects, see *Solar PV*.

While concentrating solar power (CSP) capacity is smaller in the US, at year end 2011, 516 MW of cumulative CSP capacity had been installed. For more information on CSP projects, see *Concentrated Solar Power or Concentrated Solar Thermal*.

The growth in solar installations can be attributed to several factors, including:

- Larger energy companies making equity investments in large-scale solar projects.
- Federal support for renewable energy projects and technologies, including tax incentives and loan guarantees.
- State incentives that have attracted new solar investments, including a growing market for renewable energy certificates (RECs).
- A decrease in the cost of solar technologies which has made construction of solar plants more cost-efficient.

However, challenges and disadvantages remain for solar energy, despite the dramatic increase in solar panel installations and the continued investment in this sector.

This Note serves as a general introduction to solar energy, discussing these challenges and disadvantages, as well as:

- The advantages and benefits of solar energy.
- The issues solar project developers and their counsel should consider and anticipate when engaging in a solar project.
- The tax incentives and other government programs that exist to promote solar energy deployments, including investment tax credits (ITCs) and RECs.

WHAT IS SOLAR ENERGY AND WHY SHOULD IT BE USED?

Energy policy makers, including President Barack Obama, have stated that US energy policy should be an "all-of-the-above" strategy and the US's energy needs should be met with energy produced from a combination of:

- Renewable resources including solar, wind, biomass and hydropower.
- Alternative sources including fuel cell technology and nuclear generating facilities.
- Traditional fossil fuel sources such as coal and natural gas.

An all-of-the-above strategy recognizes that each energy technology, whether renewable, alternative or traditional, has advantages and disadvantages and an energy policy that achieves reliability and cost-effectiveness while reducing greenhouse gases and other harmful environmental impacts requires all these technologies to play a role.

Advantages of Solar Energy

Similar to other renewable energy technologies, the advantages of solar energy include:

- The "fuel source" (sunlight) is free.
- Sunlight is generally considered to be unlimited and reliable.
- It may reduce American dependence on foreign oil imports.
- It decreases reliance on dirtier fossil fuel sources (whether domestic or foreign).
- It produces zero emissions of carbon dioxide, other greenhouse gas emissions or conventional pollutants.

For more information on the advantages of renewable energy, see *Practice Note, Renewable Energy: Overview (US) (http://us.practicallaw.com/4-518-1338)*.

In addition to these advantages, which apply to renewable energy sources generally, solar energy has many advantages that other renewable sources do not have, including:

- Solar PV projects can range from small roof-top and ground-mounted installations to large-scale, multi-acre "solar farms." Many solar projects can be built in or near major cities or other significant load centers. This is unlike wind energy projects, which:
  - must be built in windy areas like mountaintops, the Northern Great Plains, along the shoreline or offshore; and
  - may require that project developers construct new and expensive transmission lines to transport the energy the project produces to the load centers.
- Solar PV projects are relatively simple mechanically, with no moving parts and low maintenance costs. Unlike other renewable technologies, such as wind, tidal, biomass or geothermal, the mechanical engineering involved in a solar project usually consists of the following simple component parts:
  - solar panels;
  - a tracking system;
  - inverters;
  - generator offtake leads or wires;
  - a metering device; and
  - digital monitoring equipment connected to the meter to allow for internet tracking and monitoring of system basics.
- The energy produced from solar projects may be stored. Unlike other renewable sources of energy, such as wind, if the electricity produced is not used because of reduced demand, curtailment or otherwise, the electricity is not necessarily lost. Solar energy can be stored in molten salts and batteries.
- Solar projects, especially CSP projects, can be built and are attractive for regions in the US that may not be suitable for other renewable technologies such as the desert and other areas that are otherwise uninhabitable or unproductive.

For more information on solar projects, see *Types of Solar Projects*.

Disadvantages of Solar Energy

Despite its many advantages, sunlight does not generate energy anywhere near the level of traditional fossil fuel technologies. For example, according to the Department of Energy (DOE)'s Energy Information Administration (EIA), in 2010, solar projects generated 0.1% of the electricity produced in the US. By contrast:

- Coal generated 44.9%.
- Natural gas generated 23.8%.
- Nuclear power generated 19.6%.
- Conventional hydropower generated 6.2%.

(See *DOE: Energy Efficiency & Renewable Energy: 2010 Renewable Energy Data Book (2010 Energy Data Book)*)). For more information on the renewable energy market, see *Practice Note, Renewable Energy: Overview (US) (http://us.practicallaw.com/4-518-1338)*.

The limited energy capacity of solar energy is due to the technology's disadvantages, including:

- The size of the site required for utility-scale solar projects (see *Site Size Requirements*).
- Solar projects are land intensive (see *Intensive Use of Land*).
- The need for specific site topographies (see *Site Topography Requirements*).
- Sunlight is intermittent and seasonal (see *Intermittency and Seasonality of Sunlight*).
- Solar projects are expensive to develop (see *High Capital Costs*).

Site Size Requirements

Solar projects, namely solar PV projects, can be installed on rooftops which do not require much land (see *Advantages of Solar Energy*). However, these projects are by definition limited in their available output to the roof size and may further be constrained by:

- Other roof-top obstacles.
- Equipment, such as vents, HVAC systems or elevator shafts.
- The orientation of the roof.
- Nearby tree growth.

For example, rooftop installations can range from four kilowatts (kW) in the case of residential installations to 500 kW to 600 kW for big-box retail stores. By contrast, ground-mounted CSP installations that are intended to generate electricity for sale to a utility or another third party (also referred to as grid scale or utility scale) generally range from 10 MW to 200 MW (10,000 kW to 200,000 kW) and require a lot of land to install the project components.

Depending on the topography of the site, the efficiencies of the solar panels and the technology being used, a solar project may require three to 10 acres of land per MW of electricity produced. To build a solar farm with an installed capacity of 20 MW to 30 MW, which, although large, is not uncommon, a project developer may need around 60 to 300 acres. Compare this requirement to a natural gas generation plant that can be built to generate 150 MW to 300 MW of electricity and be installed on about five to 10 acres.

Intensive Use of Land

In addition to requiring large amounts of land, the land used for ground-mounted solar PV and CSP projects must provide unobstructed access to sunlight. As a result, solar project developers generally require exclusive use of the property. In contrast to wind projects, land used to build solar farms cannot share space with farming, grazing and other agricultural activities.

Site Topography Requirements

Generally, utility-scale solar projects (which are often CSP projects) require flat and open areas without trees or structural obstructions that may interfere with the sunlight and reduce the amount of energy the project can produce. This necessarily limits the areas in which these projects can be built. Although grid-scale CSP solar projects can theoretically be built in any area that has sufficient sunlight, the quantity and type of land required generally limits these projects to the Western desert states, including California, Nevada, Arizona and New Mexico.

Intermittency and Seasonality of Sunlight

The amount of sunlight that is available to convert into energy varies depending on the time of day, the season and the weather. In contrast to a natural gas or coal-fired plant which operates and produces energy continuously, a solar plant can generate electricity only when it is sunny. Although this tracks electric demand since electricity use is generally higher during the day, it also limits the amount of time each day available for energy generation.

This natural constraint limits the capacity factor of solar projects. In 2011, solar projects had an average capacity factor of 24%. By contrast:

- Nuclear projects had an average capacity factor of about 89%.
- Geothermal projects had an average capacity factor of about 70%.
- Biomass projects had an average capacity factor of about 65%.
- Coal projects had an average capacity factor of about 61%.
- Wind projects had an average capacity factor of about 32%.

(See *US Capacity Factors by Fuel Type (2011), Nuclear Energy Institute, Apr. 2012*.)

In an effort to optimize access to direct sunlight, some solar PV projects use more sophisticated tracking systems that are designed to track the sun by causing the solar panels to tilt during daylight hours as sunlight moves across the horizon from sunrise to sunset. While costly, these tracking systems can improve the energy efficiency output of solar PV systems by as much as 25% in some cases.

High Capital Costs

While sunlight is free and generally available, the cost of constructing a solar project can be quite high because of the expenses associated with:

- Acquiring sufficient land rights to construct the project.
- Conducting environmental studies and obtaining the necessary permits.
- Analyzing the proposed site and its energy generating capacity.
- Acquiring solar panels and constructing the other facilities that may be required to produce, store and transport the energy.
- Operating and maintaining the project.

Solar panel prices have fallen dramatically in the last few years. However, despite this decrease, the cost per unit or per solar project continues to exceed almost all fuel sources except nuclear power. Even with the ITCs available to solar PV projects, the cost may range from 12 cents to 18 cents per kW of electricity for a CSP project or three cents to six cents per kW for a solar PV project (see *SEIA Solar Report*).

The costs per kW of solar PV are weighted average installed costs drawn heavily from reported large-scale solar PV installed by utilities. Because of their size, these are installed at significantly lower costs (in the three cents to four cents per kW range).

The average cost per kW is significantly higher for smaller commercial or residential projects that are unable to benefit from economies of scale. By contrast, depending on the region, the cost of natural gas fired generation ranges between three cents to four cents per kW installed. These estimates exclude transmission, distribution, taxes and federally mandated congestion charges or other non-bypassable tariff charges.

US SOLAR ENERGY MARKET

Despite the historic year that the solar industry had in 2011, the US solar market also faced challenges, including:

- The expiration of the Section 1603 Treasury grant in lieu of tax credit (see *Expiration of Section 1603 Treasury Grant*).
- The bankruptcy of Solyndra LLC which triggered significant political backlash against the industry (see *Solyndra Bankruptcy and Political Backlash*).
- The fall in the price of solar panels or modules as a result of less expensive Chinese panels flooding the US market (see *Solar Panels Anti-Dumping Suits*).

These developments, coupled with a general economic recession, have had a significant impact on the renewable energy industry generally and the solar sector, in particular. Many banks and other lenders are reducing the amount of loans they are making in this sector. This has led to a paralyzing constraint of available equity and debt available to finance newer solar manufacturers and project developers. As a result, the future of the solar industry is a bit uncertain. This uncertainty is expected to continue until public policy trends turn in favor of more demand for renewable energy.

Expiration of Section 1603 Treasury Grant

Established under the American Recovery and Reinvestment Act of 2009 (ARRA), this program was intended to encourage investment in renewable energy projects by reimbursing owners of eligible projects for a portion of their project installation costs. It allowed project owners whose projects were eligible to claim the production tax credit or the ITC to instead claim a non-discretionary and non-taxable cash grant from the Treasury Department equal to 10% to 30% of the project's qualified project costs. As of July 20, 2012, more than $2.7 billion has been awarded for more than 44,052 solar projects with a total capacity of 3,307 MW under this program (see *1603 Program Information*).

To qualify for this grant, projects were required to achieve commercial operation by December 31, 2011. However, projects that did not meet this deadline can still qualify for this grant if they procured at least 5% of the project's equipment by December 31, 2011 under certain safe harbor provisions (see *US Treasury Cash Grants*). Use of the cash grant and compliance with the safe harbor provisions require careful legal and tax analysis that are beyond the scope of this Note.

Solyndra Bankruptcy and Political Backlash

Solyndra LLC received a $535 million line of credit under the ARRA's loan guarantee program, which was established by amending Section 1705 of the Energy Policy Act of 1992 (EPAct 1992) (see *Section 1705 Loan Guarantee Program*). This program was designed to promote commercial renewable energy systems, electric power transmission systems and leading edge biofuels projects that commenced construction no later than September 30, 2011. After Solyndra filed for bankruptcy in 2011, the loan program attracted polarizing political attacks and was dubbed "Hurricane Solyndra". Many Congressional hearings were initiated to review the Solyndra loan and the DOE's loan guarantee programs more generally.

Solar Panels Anti-Dumping Suits

To address the fall in solar panel prices caused by the flood of Chinese manufactured panels imported in the US, in October 2011, SolarWorld Industries America Inc., together with six other solar developers, filed an anti-dumping and countervailing duty petition with the US Department of Commerce and the International Trade Commission against Chinese crystalline silicon PV cells and module manufacturers. For purposes of the investigation, dumping occurs when a foreign company sells a product in the US at less than fair value. The petitioners claimed that Chinese suppliers benefitted from illegal subsidies and were dumping product into the US market.

On May 17, 2012, the Commerce Department issued a preliminary determination, finding merit to the claims and announcing its intention to impose duties on the Chinese solar products allegedly dumped (see *Commerce Department, Anti-Dumping Preliminary Finding Fact Sheet*). A final determination by the Commerce Department is expected to be announced in October 2012. These duties are in addition to countervailing duties of about 5% on Chinese manufactured cells imported into the US on or after December 27, 2011.

In response to this preliminary decision, the Chinese government on May 25, 2012 filed a complaint with the World Trade Organization against the US contesting these and other custom duties.

Despite Chinese challenges to the US's anti-dumping claims, questions persist and SolarWorld recently joined other European solar manufacturers in urging the European Union to investigate allegations that Chinese solar manufacturers are selling solar panels and related components in the global markets for less than the costs of making these products. For the foreseeable future, it is reasonable to expect continuing reductions in solar panel prices especially on products from China. But the risk that significant duties may be imposed on these products and the supply chain disrupted as downstream markets are forced to respond to these duties and other governmental investigations, may result in some volatility in the costs of these products.

TYPES OF SOLAR PROJECTS

There are generally two kinds of solar technologies

- Concentrated Solar Power (CSP).
- Solar Photovoltaics (PV).

Concentrated Solar Power or Concentrated Solar Thermal

While there are different technologies and designs for CSP projects, these projects typically capture the sun's energy by using long rectangular, concave-shaped mirrors that track sunlight to heat a fluid that activates or drives a steam turbine connected to a generator to produce electricity. By contrast, fossil fuel production uses internal combustion engines as the heat source to boil the water required to power the turbine generators. CSP projects are typically located in or are proposed for installation in the western US, including California, Nevada, Utah and New Mexico, where the sun is intense and barren land is plentiful.

CSP projects vary significantly in design and output potential from that of solar PV. In particular, unlike a solar PV project, CSP projects:

- Are only economical in large utility-scale plants with installed capacity in the hundreds of MW and that can generate hundreds of thousands of megawatt hours (MWh) of electricity, offering a meaningful alternative to conventional power plants. By contrast, a solar PV project is considered large scale if it has an installed capacity of 10 MW to 30 MW. However, 1 MW to 5 MW capacity PV projects are more common.
- Require significantly more land, typically hundreds of acres, to be efficient and achieve utility scale. Because this amount of land is typically available only in the western US, CSP projects are not possible in most areas of the US.
- Are considered more environmentally problematic. These projects are often criticized for causing bird deaths, impairing wildlife habitats and using large amounts of water in areas that are already water challenged. As a result, these projects are often subject to more extensive environmental review (see *NEPA Review of CSP Projects*). For the same reason, CSP projects typically attract public opposition, which increases the siting and development risks of these projects.
- Are exclusively grid connected. The power produced is generally sold to Western wholesale power marketers or electric utilities under power purchase agreements (PPAs).

Solar PV

Solar PV projects typically capture solar energy on panels that convert the energy into direct current (DC) (like that available from batteries), which then gets transformed with inverters into alternating current (AC) usable in typical wattages. These projects can be connected to the electric grid and their output sold to a utility or other third party or used on site to meet the site's energy needs (see *Grid Connected versus Distributed Generation*).

Rooftop Solar PV Projects

As the name implies, a rooftop solar PV project is installed on a residential, nonresidential or commercial rooftop. Often, but not always, these projects are intended to power the host and are wired electrically "behind the meter." Projects that are intended to power the host site are referred to as distributed generation. In these projects, the energy produced by the installation flows into the host building's electrical system and provides part or all of its energy requirements.

Rooftop projects are typically not large. Even in the case of a big-box retail store, rooftop solar projects are typically no larger than 500 kW to 600 kW. However, these projects can be substantially larger if they are intended to power large warehouses or factories.

Ground Mounted Solar PV and Solar Farms

A ground mounted solar PV system or solar farm can be sized to meet the electrical requirements of the host property owner's operations or can be grid connected. These installations, including tracking systems, can vary significantly with some installed as canopies over parking lots and others installed in vacant fields. These projects can be built on a larger scale than rooftop installations, which reduces the cost per kilowatt hour (kWh).

Grid Connected versus Distributed Generation

A solar project may be built to sell electricity to a utility (referred to as grid connected) or to provide electricity to the site where the project is located (referred to as distributed generation). Grid connected projects are designed to meet the energy needs of a local electric utility, electric distribution company or regional power grid. By contrast, a distributed generation project is primarily intended to meet the energy needs of the site where the project is located.

Grid connected projects raise several issues not present in distributed generation, including:

- Safely connecting the solar project to the power grid (see *Interconnection Analysis* and *System Reliability Issues*).
- Obtaining the necessary permits in a timely and cost-efficient manner (see *Permitting Review*).
- Understanding and complying with federal regulations that apply to wholesale sales of electricity (see *Federal and State Energy Regulatory Issues*).

All CSP projects are grid connected. By contrast, solar PV projects may be grid connected or distributed generation projects depending on whether they are rooftop installations or ground-mounted.

Net Metering

Depending on the state where the solar project is located, a distributed generation project may also be net metered. In a net metered project, the owner of the project enters into an agreement with the local utility to sell to the utility its excess generation or to purchase electricity in case the amount generated by the project is insufficient. To track electricity usage, a two-way meter is installed on the project to measure the flow of electricity to and from the utility to the site. The two-way meter keeps track of the amount of electricity delivered by the utility to the host and by the host's solar PV project to the electric grid. The utility can then calculate the net flow of electricity on a monthly or other periodic basis.

In a net metered project, the project developer or host must consider:

- The amount the utility will pay for the energy delivered to the grid from the net metered project. A utility's net metering tariff typically describes the rules applicable to specific projects and the amount that will be paid for delivering surplus power to the grid.
- The state or federal regulations or requirements that apply to the project. For example, counsel should query whether the state's regulatory policy allows the solar PV project to be sized larger than necessary to meet the energy needs of an on-site host and to require the electric utility to buy the surplus power. This analysis varies by state and the decisions approved by the states can lead to clashes or litigation over state versus federal laws (see *Federal and State Energy Regulatory Issues*).

Distributed generation projects have many advantages (see *Distributed Generation*). However, because of their limited size, the cost of the electricity per watt may be higher than in grid-connected or utility-scale projects.

The terms net metered and grid-connected can be confused because they are used differently by different jurisdictions. For example, some jurisdictions use the term grid connected to refer to projects that are net metered (so energy is designed for the host) but connected to the incoming power feed of the local electric utility, such that power from the solar PV project could be delivered to the grid if the host uses less energy than the project uses. Counsel should review the local laws and the administrative agency requirements of the relevant jurisdiction to ensure they understand the terms used.

PRELIMINARY ISSUES FOR SOLAR PROJECT DEVELOPERS

When engaged in the development of a solar project, project developers and investors should consider:

- The land rights needed to build the solar farm or install the solar PV project (see *Acquisition of Property Rights*).
- The amount of energy that a project built on the selected site can produce (see *Solar Resource Analysis*).
- The environmental regulations to which the project is subject (see *Environmental Review*).

- The local, state and federal permits required to construct and operate the project and to sell the electricity produced (see *Permitting Review* and *Federal and State Energy Regulatory Issues*).
- The government incentives available to promote and encourage investments in solar projects (see *Federal Incentives* and *State Incentives*).

Acquisition of Property Rights

To develop a solar farm or a utility-scale project, a solar project developer must secure sufficient property rights to build, operate and maintain the project. There are various possible real estate entitlements that can be acquired to support a solar project, ranging from an outright purchase of the land at one extreme to a license at the other end. To minimize their land acquisition costs, some project developers use an option agreement for a ground lease or a purchase to be memorialized in formal documentation after all other permits and approvals are secured. While a full analysis of land rights issues are beyond the scope of this Note, there are a few issues that developers and their counsel should consider.

Easements

Some project developers seek an easement to convey the property interest needed. An easement is a possessory interest in real property that provides the holder with the right to use another party's real property for a specific purpose. Legal title to the real property encumbered by the easement is retained by the original owner for all other purposes. Easements are usually used for rooftop and smaller-scale solar PV projects.

Leases

A lease is probably the most common device used to convey the necessary real property rights to a solar developer. These agreements provide broad rights and are normally used for CSP projects and ground-mounted PV systems. Depending on the size of the project, a ground lease may be used.

When negotiating these agreements, solar developers and their counsel should make sure they obtain:

- Unrestricted access to and from the property.
- Exclusive right to use the property to construct, operate and maintain the solar project.
- Generous lease renewal and extension rights.

The scope of the rights a solar developer may receive depends on:

- The identity of the lessor. A solar developer may be able to negotiate broader rights from private landowners than they can from the Bureau of Land Management (BLM), the agency within the Department of the Interior that manages federally owned land or land held by the government in trust for Native American groups (see *Federal Managed Land*).
- The topography of the land. As previously discussed, solar farms require exclusive use of large amounts of land that provide unobstructed access to sunlight (see *Intensive Use of Land* and *Site Topography Requirements*). To make the negotiations easier and to minimize the amount the solar developer may have to pay, solar developers may need to seek property with minimal alternative use.

Energy Services Agreement

Another possible contracting strategy for acquiring property rights is to combine the real estate acquisition agreement with a PPA in a contract sometimes called an energy services agreement. Under this agreement, the property owner:

- Conveys to the solar developer the requisite real estate entitlement rights to develop the project.
- Agrees to buy the power produced by the project.

This approach has its proponents but it is rarely used because a breach of the PPA by the property owner may lead to the termination of the agreement. In turn, this may result in the developer losing its right to lease the property and operate the solar project. If an energy services agreement is used, the developer, to the extent commercially and practically feasible, should negotiate the right to continue occupying the leased premises and operate the solar PV facility even if the power sale provisions are no longer effective.

If a separate lease and PPA with the property owner are used, project developers and their counsel should carefully consider whether the lease survives the termination of the PPA. Project documents are frequently drafted so that the lease terminates on termination of the PPA. However, similar to the combined lease and PPA, the project developer may wish to retain the lease rights to continue to operate the solar facility to sell the electricity it produces to a third party even if the PPA with the property owner terminates for any reason (other than breach by the developer).

If the PPA terminates, the lease should be kept in effect to, among other things, give the developer a mechanism to mitigate its damages if the property owner improperly terminated the PPA. The developer can enter into a PPA or a tariff sale transaction with a local electric utility to sell its electricity wholesale. However, certain regulatory issues are triggered if an on-site host ceases to buy power from the solar PV project but the project continues to operate. Depending on the identity of the offsite buyer of the power, the project developer may become a wholesale seller or a retail seller subject to regulations that were not an issue before. For example:

- If it becomes a wholesale seller, the project developer may need authorization from the Federal Energy Regulatory Commission (FERC) to engage in wholesale sales of electricity under the Federal Power Act (FPA) in the form of a power marketer authorization.
- If a retail sale is taking place, the project developer may need a license from the state public utility commission to engage in retail sales of power.

The best option under this situation may be to declare the project a qualifying facility (QF) under the Public Utilities Regulatory Policy Act (PURPA) and to sell the power to the local electric utility, which may simplify the regulatory issues and analysis (see *Federal and State Energy Regulatory Issues*).

Fee Simple Estate

Another alternative to easements and leases is to obtain fee title to the property required. This is the greatest possible interest in real property because the owner's rights are unconditional, unlimited and perpetual. Owning the property outright, however, is often expensive and imposes several obligations on the owner that a solar developer may not want.

Federal Managed Land

Solar project owners must often enter into leases with the BLM for the property needed because of:

- The amount of land that may be required to build a CSP power plant or a solar PV farm.
- The land characteristics that are most conducive to solar project developments.

The BLM manages more than 250 million acres of land of which over 20 million acres (located primarily in Arizona, California, Colorado, Nevada, New Mexico and Utah) have been identified as having significant solar potential. The BLM approved its first solar project in 2011 and as of July 2012, has approved ten additional projects capable of producing more than 4,500 MW of electricity which is sufficient to power over 1.3 million homes (see *BLM Solar Projects Fact Sheet*). The BLM has also approved rights-of-way for transmission lines to enable the construction of six additional projects with another 1,475 MW of installed solar generation capacity.

Federally granted land rights differ from purely private arrangements in several ways. In many cases, the rights of way and leases are not exclusive. More materially from the perspective of the project's lenders, the BLM does not generally execute estoppel certificates that give project lenders certain rights (including exercising the developer's rights under the lease) if the project's developer defaults under the lease. In addition, in every federal land transaction, the solar developer will have to satisfy environmental review requirements (see *Federal Environmental Review*).

Solar Resource Analysis

One of the key issues a project developer must determine at the outset of every project is the amount of sunlight that a proposed site receives on a daily, weekly, monthly and yearly basis and the location of the sun during those times. This is called "insolation" and understanding it allows the project developer to determine:

- The size of the project that can be built on the proposed site.
- The amount of energy the project can produce.
- The technology and facilities that are required.

In the early stages, the project developer typically retains engineering or technical consultants to assist in modeling and analyzing the available solar resources. The National Renewable Energy Laboratory's website has published modeling and analysis resources, including *National Renewable Energy Laboratory: Photovoltaic Solar Resource Map of the United States* and *Concentrating Solar Resource Map of the United States*.

Environmental Review

It is essential that the developer and its counsel conduct a thorough environmental due diligence review in the early stages of the project before finalizing the lease (or other real estate entitlement) and certainly before permitting or site work begins. Environmental review of the project site before commencing construction is important to:

- Ensure the parties' rights and responsibilities are properly documented.
- Ensure that all relevant risks are properly identified and allocated.
- Evaluate areas of potential environmental concern (for example, subsurface contamination) or sensitive environmental receptors (including wetlands, endangered species habitat and historic resources). In either case, the findings of the environmental review should lead the project development team and appropriate legal and technical advisers to consider whether remediation, mitigation or avoidance strategies are needed.
- Satisfy prudent lending or equity investor requirements. Except in the case of residential or small commercial solar PV projects, lenders and investors typically insist that environmental due diligence be undertaken to ensure areas of potential environmental concern are understood and delineated before building the project.
- Ensure there is a baseline against which to evaluate any future environmental issues. Typically, a ground lease or other real estate entitlement document imposes on the project developer, as lessee, the duty of indemnifying the lessor for environmental issues caused by the project or occurring during the lease term. A baseline environmental assessment may identify preexisting conditions or areas of concern that arose before the solar lease term began. As a result, the lessee may require in the lease that the lessor indemnify the lessee for preexisting environmental conditions.

The failure to undertake basic environmental due diligence could lead to project delays or unexpected surprises later in the project development process. For example, some states, such as New Jersey and Connecticut, have statutes imposing environmental remediation responsibility on parties to real estate transactions, including leases. As a result, it is possible that a party to a lease for a solar project could become responsible at the end of the lease term for environmental conditions on the site even if the lessee did not cause or contribute to the environmental issue. For more information on these issues, see *Practice Note, Environmental Law: Overview: Environmental Liability in Transactions (http://us.practicallaw.com/2-500-4092)* and *Environmental Diligence (http://us.practicallaw.com/2-500-4092)*).

In addition, because of recent US Supreme Court decisions and subsequent regulatory developments at the Environmental Protection Agency, environmental lawyers generally agree that environmental due diligence should meet the test of having conducted an "all appropriate inquiry." This legal standard is intended to protect the party acquiring a real property interest in the site from later treatment as an "owner/operator" responsible for the preexisting environmental conditions, within the meaning of certain environmental statutes, including but not limited to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), commonly known as the federal Superfund law.

Counsel with knowledge of the specific state environmental laws should be consulted to ensure that the necessary environmental due diligence is conducted properly.

Federal Environmental Review

A project to be located on federal land typically requires a review under the National Environmental Policy Act (NEPA). A NEPA review assesses the environmental impact of the project on natural, cultural or historic resources and wildlife. Generally these projects require a Phase I environmental site assessment (ESA) along with a NEPA screen (sometimes referred to as a NEPA checklist) to determine the project's impact on these resources.

Depending on the outcome of this review, an Environmental Impact Statement (EIS) may also be required. Generally the EIS covers the same scope of information as an ESA, except in more depth. An EIS review can be complicated, lengthy and expensive. Depending on the project, it may take more than three years to complete and cost millions of dollars.

The Phase I ESA should be compliant with the standards most recently published by ASTM International (formerly known as the American Society for Testing and Materials). In 2005, ASTM published an update to its Phase I ESA standard (see *ASTM E1527 - 05 Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process*).

NEPA Review of CSP projects

CSP projects typically require NEPA review because they are often located on land that is owned by either the federal government or Native American communities (see *Federal Managed Land*). NEPA reviews for these large scale CSP projects are typically complex and require extensive stakeholder collaboration through a full EIS process that usually includes scoping of alternative undertakings.

NEPA Review of PV projects

Solar PV projects can require a NEPA EIS review if the project is:

- Substantial in size (25 to 100 acres).
- Located near sensitive environmental receptors such as wetlands or watercourses.

However, most solar PV projects are smaller in scale and land use approvals typically involve local zoning boards and electrical and building officials.

State Environmental Review

The scope of the environmental review conducted at the state level depends on the project and the laws of the applicable state. Some states conduct this review simultaneously with the permitting process. Developers' counsel should discuss with local counsel the relevant requirements and the timing for completing this review.

Permitting Review

Permitting of solar projects is usually governed by the laws of the local and state jurisdictions where the project is located, unless the facility will be located on land owned or managed by the federal government. The permitting requirements of solar projects are generally not that challenging, unless the project will be located on environmentally sensitive land. For example, if wetlands, watercourses or coastal resources are on or near the site, the permitting requirements may be more extensive and stringent. A smaller project that is proposed to be built on or near a wetland can expect more permitting difficulty, including a more thorough and detailed level of environmental review, than a larger project proposed to be built on a rooftop or a canopy over a parking structure. Project developers building on farmland may also find that the land has acquired some protected farmland status which, depending on state law, may or may not be compatible with a solar farm use.

However, some land use permitting can still be expected. The land use permits that are required depends on the local jurisdictional requirements and the design features of the project, including whether the project is installed on a rooftop or on the ground. Solar projects generally require:

- Approval from a local land use board or zoning authority.
- A building permit.
- An electrical permit.

Although, the permitting of solar projects is generally not complex, the process can be time consuming and expensive. This is because of the number of agencies that are typically involved (at the federal and state levels) and the documents that must be furnished in support of the permit applications. As a result, the permitting process can delay the deployment of solar projects. Several initiatives have been implemented to improve the permitting process for solar projects, but it is still an issue that project developers should consider when developing their project plans (see *Streamlining Permitting and Environmental Review*).

Federal Permitting

Solar projects proposed for land that is owned or managed by the federal government may require permits from the BLM or the Department of Agriculture's Forest Service. These permits and rights of way are typically awarded after the completion of any NEPA review (see *Federal Environmental Review*).

State Permitting

The permits required and the process for obtaining permits varies depending on the state. Some states have a single agency or siting authority that manages the permitting process for all solar projects and other large utility infrastructure within the state. By contrast, in other states, the developers may have to obtain permits from different state and local agencies. These varied permitting systems can be detrimental to solar project deployment. Once a developer has identified the location for its project, its counsel and project technical consultants should review the applicable laws to determine the agency that has siting and permitting authority over the project. Understanding the permitting process is crucial because it can have a material impact on a project's development schedule and cost.

Some states have enacted zoning preference laws that declare solar to be a "beneficial use" within the meaning of their zoning laws, which has the practical effect of shifting the burden of proof and establishing the presumption in a zoning process that the zoning permit should be approved for the solar project. These laws vary by state and should be examined carefully by counsel advising the project locally.

Interconnection Analysis

Interconnection is the fundamental access point for a solar project to deliver energy to the grid, either by direct sales to the local electric utility or indirect sales in the form of net metered transactions with a host (see *Grid Connected versus Distributed Generation*). If the project is intended for net metering, interconnection is critical to ensure the electricity is delivered to the grid when the host uses less energy than the solar PV facility produces (see *Net Metering*). This is done indirectly in cases where the host uses all of the output of the solar PV facility. In this case, the interconnected project "delivers" electricity to the grid in the form of displacement by offsetting what would otherwise need to be supplied by the utility to the host if the solar PV project was not installed.

Interconnection agreements are typically pre-approved for the utility by the state public utility commission and usually are not open to negotiation, except that project-specific information can be added to the agreement identifying:

- The project's location.
- The project's general design characteristics.
- Interconnection points and electrical engineering details.
- The project owner and the purchaser of the electricity.

Electric utilities may have different types of interconnection agreements depending on:

- The project's size.
- The process for applying for interconnection.
- The project's impact on the utility's system.

The project developer must pay the costs required for the utility to accept an interconnection and for any facilities and upgrades that may be required. The fee for interconnecting can vary significantly from low for small commercial or residential to substantial for larger scale projects. These system upgrade costs are non-negotiable. However, for upgrades to the network transmission system, the project developer receives a credit against future transmission service.

Any improvements or additions to the transmission and distribution systems are the property of the utility, not the project developer, and become part of its system. This is because the utility typically owns all the facilities from the meter located on the customer's property back to the point of interconnection.

System Reliability Issues

For a variety of reasons, local electric utilities bear substantial reliability obligations, not the least of which are imposed by federal law, FERC regulations and FERC-approved mandates and regulations of the North American Electric Reliability Corporation.

The fundamental issue electric utilities are concerned with during an evaluation of a potential solar facility is the impact it will have on the electric system or grid reliability. Solar project developers who are applying to the electric utility for interconnection must:

- Support the system impact study process.
- Agree to pay for the system upgrades necessary to allow for the safe interconnection of the project to the grid.

While project engineers and the developer's representatives can and should attend scoping meetings with the local electric utility representatives and, for big projects, with the regional transmission operators (RTO) or independent system operators (ISO), the requirements for interconnection will be prescribed for the project. As a result, the project developer typically has no opportunity to challenge or negotiate the specified system upgrades identified as conditions precedent to the interconnection.

For wholesale sales of electricity, RTOs and/or ISOs typically require new generators to:

- Apply for a place in the "queue" or line of planned generation in development.
- Pay for a transmission study or system impact study to evaluate how the new generator will likely impact the rest of system.
- If system upgrades are needed to accommodate the new generator's interconnection, pay for all upgrades needed to support the system's reliability after the new generator's interconnection is energized.

Local electric utilities also undertake state-specific system impact reviews for distribution-level interconnections. Just like the RTO or ISO on the regional or interstate level, local electric utilities similarly evaluate from a reliability perspective whether, in the utility's judgment:

- The local or intrastate system can accept the interconnection.
- Upgrades are required to accept the interconnecting solar projects.

While these reviews will likely be pro forma and simplified exercises for smaller scale residential or small commercial solar PV projects, project developers should anticipate substantial lead time and cost for interconnections proposed for larger scale solar PV or CSP projects.

Federal Incentives

Many federal incentives are available to renewable energy projects generally and solar projects in particular.

Investment Tax Credit

In the final months of the Bush administration, Congress gave the renewables industry generally and the solar industry in particular, a boost with the enactment of the Energy Improvement and Extension Act of 2008 (EIEA) (as part of the bill informally known as TARP). Since October 3, 2008, the EIEA has provided nearly $17 billion in various tax credits to promote clean power generation technologies, alternative fuels, renewable energy and energy efficiency.

The solar industry emerged as one of the clear winners in the legislation as it extended for eight years through December 31, 2016 the 30% ITC for qualifying solar energy systems. The credit is still available after 2016, but it is reduced to 10%. Tax owners of qualifying solar energy systems can receive a credit equal to 30% of the capital expenditures for solar facilities, which reduces significantly the cost of constructing a solar project. The EIEA also eliminated the previously applicable $2,000 cap on residential solar installations. The ITC is realized in the year the project is placed into service and vests ratably over a five-year period.

Section 1705 Loan Guarantee Program

This temporary loan program was established under Section 1705 of the EPAct 1992 and is administered by the DOE. Of the nearly $34.7 billion that has been awarded under this program, about $23.7 billion has been awarded to 16 solar projects (see *DOE: Loan Programs Office: Our Projects*). As discussed above, this program has been the subject of significant controversy and criticism following the high profile bankruptcy of Solyndra LLC in 2011 (see *Solyndra Bankruptcy and Political Backlash*). Although the program expired in 2011, in May 2011, the DOE sent letters to more than three dozen project sponsors who could not meet the Section 1705 program deadline, informing them that they could apply for a guarantee under Section 1703 of the EPAct 1992, which has about $34 billion in lending capacity.

Following the bankruptcy filings of a few other grant recipients (Abound Solar, which received $400 million in guarantees, and Beacon Power Corporation, which received $43 million in guarantees), a pending bill in the US House of Representatives calls for the DOE to cease issuing guarantees under all loan guarantee programs and for more oversight of the DOE's administration of these programs (see *HR 6213: No More Solyndras Act*). Although it is unlikely that this bill will be passed, it and other similar initiatives among some members of Congress continue to demonstrate the hostility to and political polarization of support for renewable energy incentives in Washington, DC, which continues to cause uncertainty for the renewable energy industry.

US Treasury Cash Grants

Shortly after entering office and representing his first legislative initiative, President Obama signed the ARRA, further expanding the federal incentives for renewables. Most prominently for the solar industry was ARRA Section 1603, which created a Treasury grant program that gave renewable project developers the option to obtain a 30% cash grant in lieu of the ITC. Payment under this program is made within 60 days of the project achieving commercial operation and submitting appropriate documentation. To be eligible to receive this credit, a solar project must have been placed in service before December 31, 2011 or otherwise qualify for the safe harbor as follows:

- It has incurred 5% or more of its capital costs before the expiration of the program.
- The project costs are declared applicable to a specific project by September 30, 2012.
- The project is placed in service by December 31, 2012.
- The project developer submits the requisite paperwork documenting the project's details.

This requirement has created a situation in which solar developers have acquired solar panels or modules in 2011 for projects that do not yet exist with the expectation or hope that they can be used and declared applicable to specific projects by September 30, 2012.

Bonus Depreciation

In addition to the Treasury grant program that is still available to the extent the 5% safe harbor requirement is met, Congress has authorized bonus depreciation of 50% for capital costs incurred after January 1, 2012. This is a "bonus" because the developer is also eligible to claim a depreciation of 50% using the usual Modified Accelerated Cost Recovery depreciation deduction rules over the applicable period.

State Incentives

Many states in the US have been promoting investments in renewable energy, energy efficiency and conservation for many years. But recent concerns about the risks of climate change have added enhanced urgency in the various states to use policies such as a renewable portfolio standard (RPS) or public utility incentives to achieve the following major public policy objectives:

- Reduce greenhouse gas emissions.
- Increase renewable energy production.
- Reduce consumption of energy.

States have come to recognize that it is extremely difficult for Congress to enact a national energy strategy or nationwide RPS program and have elected to set their own policies. To date, 29 states have enacted state specific RPS (see *Database of State Incentives for Renewables & Efficiency: Renewable Portfolio Standards Map*).

Although several states provide renewable energy incentives, New Jersey and California lead by a wide margin.

Renewable Portfolio Standards and Renewable Energy Credits

One key element that provides support for solar development is an RPS program. Under these programs, load-serving entities (typically, utilities and competitive suppliers) must purchase a percentage of their electricity from clean energy sources (including wind, solar and geothermal) or make a penalty payment, an alternative compliance payment (ACP), into a state clean energy fund. Some states have a separate percentage of electricity that must be obtained from solar energy sources (referred to as the solar carve-out).

In an effort to simplify clean energy transactions in the wholesale market, owners of renewable energy projects are allowed to "disaggregate" or sell separately the renewable energy "attributes" of their project outputs from the actual electricity delivered to hosts or into the power grid by selling RECs or solar renewable energy credits (SRECs), in the case of solar, separately in the market. For each MWh of electricity produced, a qualifying project earns one REC or SREC, as the case may be. If a load-serving entity cannot acquire enough RECs or SRECs, in states with a solar carve-out, they must pay an ACP or solar ACP (SACP), as the case may be.

Once the state determines the ACP or SACP, that amount becomes the ceiling price for RECs or SRECs and the trading market for these credits can flourish under typical supply-demand market forces below the ACP or the SACP, as applicable. The value of the ACP or SACP sets the ceiling price for what RECs or SRECs can possibly rise to in the market because a compliance entity would make the ACP or SACP payment rather than pay for RECs or SRECs if its costs increase above a certain price.

New Jersey

New Jersey is the leading state in the northeast in implementing market-based solar incentives that have attracted large investments, but other states are adopting similar approaches. In the last few years, New Jersey's governors have signed legislation that:

- Exempts renewable energy systems from real property taxes in the state.
- Sets zoning preferences.
- Limits the ability of municipal zoning authorities to regulate solar.

The state also enacted a solar bill that steadily increases the quantity of solar energy that must be procured over at least the next decade to satisfy the state's RPS. Under its RPS program, New Jersey has established a goal of obtaining more than 20% of its energy from renewable energy by the year 2020. Also, under New Jersey's Global Warming Response Act, the state's electric utilities are authorized to invest directly in renewable energy projects and recover their investment costs in utility rates which is viewed as a key component to achieve its RPS goal.

In addition, New Jersey's public utility commission, the Board of Public Utilities, issued orders authorizing and directing the electric utilities to implement solar programs that support the growing market. One utility was authorized to start a solar loan program that covers 60% of the project cost and allows repayment of the loans in the form of assignment of SRECs, instead of in cash. Other utilities were required to procure contracts for the long-term delivery of SRECs at a specified price. Unlike feed-in tariff programs common in Europe, the SREC programs developed in states like New Jersey create market mechanisms that support private investments in renewables without direct cash grants from the government or utilities.

The results of New Jersey's market-support incentives speak for themselves. Through July 2012, New Jersey has more than 17,100 residential and commercial solar projects installed with a capacity to produce about 856 MW of solar energy, second only to California. Another 756 MW of solar projects are in development in New Jersey. However, this rise in the supply of installed solar capacity in New Jersey has led to saturation in the market, with SREC values dropping.

California

On March 29, 2011, the California legislature reaffirmed that state's ambitious commitment to support renewables with the enactment of Senate Bill X1-2, expressing the policy intent that the amount of electricity generated per year from renewable energy resources in California be increased to 20% per year by 2013 and 33% by the end of 2020, the second most ambitious state standard in the US, second only to Hawaii's 40% standard.

Massachusetts

Massachusetts has established an auction process for SRECs that offers project developers a minimum price of $300 per SREC sold through the auction, less a $15 per SREC administrative fee. A project developer, therefore, has reasonable near-term assurance that there is a floor in the market of $285 per SREC (although SRECs are currently trading in the $500 MWh range). This assumption, however, only holds while the market remains constrained with less than the 400 MW authorized by the solar program. When more than 400 MW of solar PV is deployed in the Massachusetts market, however, the auction will be closed out and the bottom will likely drop out of the floor of the SREC market. This will probably happen later in 2012 once the aggregate capacity for 1% of nongovernmental net metered projects (which translates to 400 MW) is reached.

Project developers unsure of whether they are at risk, therefore, will start to sell contracts for SRECs below $285 in light of the market risk uncertainty. As a result, a program designed to provide assurances to the market provides uncertainty that poses a challenge to solar energy development and growth in the market.

Massachusetts also enacted the Green Communities Act with strong support for solar and other renewables.

Connecticut

Connecticut enacted legislation in 2011 that promotes "zero emission" technologies (ZRECs) and "low emission" technologies (LRECs) by establishing a market for ZRECs and LRECs to satisfy the state's RPS. As a result, Connecticut's electric utilities are conducting procurement auctions to buy long-term contracts for the sale of ZRECs and LRECs, with solar PV facilities qualifying for ZRECs. Connecticut's ZREC and LREC approach reflects a state policy to eschew "picking winners and losers" in the renewable sector. Connecticut is instead striving to be agnostic to solar versus other technologies and seeks to let the renewable energy industry decide what technologies make sense for Connecticut. Other states, like New Jersey and Massachusetts, have policies that clearly favor and contain carve outs for solar, which critics describe as these states picking winners and losers.

Federal and State Energy Regulatory Issues

Under the FPA, FERC has regulatory jurisdiction over wholesale sales of power. Sellers of wholesale power must obtain FERC authorization, the power marketer authorization, and file with it its tariffs. In addition, state regulations may also apply. Whether FERC jurisdiction and regulation applies and the extent of state regulation depends on several factors, including:

- The size of the project.
- Whether the project is connected to the grid.
- The entity to which the power produced will be sold.

Generally, solar projects are subject to FERC's regulatory supervision unless they can qualify as an:

- Exempt wholesale generator (EWG). Created under the EPAct 1992, an EWG is a category of power producer that is exempt from certain financial and legal restrictions stipulated in the Public Utilities Holding Company Act of 1935, and following its repeal, the Public Utility Holding Company Act of 2005. EWGs are independent power producers (IPP) that generate electricity for sale in wholesale power markets at market-based rates. An IPP may qualify as an EWG, and thereby become exempted from certain regulation if the IPP is exclusively in the business of owning and/or operating an electric generation facility for the sale of electricity to wholesale customers. This exemption is available to an IPP regardless of the size of the facility or the fuel used to generate the electricity.
- Qualifying facility (QF). This refers to the status conferred on a generation facility owned and operated by an individual or corporation, but that is not primarily engaged in the generation or sale of electric power. QFs are either renewable power production (such as biomass, geothermal, hydroelectricity and solar) or co-generation facilities that qualify under Section 201 of PURPA. Under PURPA, a small power producer may obtain QF status and be eligible for exemption from the FPA's authorization, tariff and other provisions, except that small producers that are larger than 1 MW must file a Form 556 registration with FERC declaring and self-certifying to QF status. Smaller projects can qualify for QF status without satisfying the filing requirements.

A solar facility may be subject to the extensive regulation of the state where it is located depending on the entity to which it sells its electricity. Retail sales are governed by state law and wholesale sales are governed by federal law. Depending on the nature of its sales, the solar facility may qualify as a public utility under state law, which then makes it subject to extensive regulations regarding tariffs and terms of sale. Because of the shared jurisdiction of FERC and state public utility commissions over electric energy law and regulation, there are specific federal regulatory issues that arise from the sale of power from a solar system to the grid or utility through a state metered arrangement.

When Does a Net Metering Arrangement Trigger FERC Regulation?

Certain states such as New Jersey embrace net metering. However, because these arrangements involve the sale of excess generation to utilities, they may trigger federal laws and regulations governing wholesale sales of electricity. For example, the New Jersey solar program's net metering allows for up to one year of averaging if the solar host uses more energy on average over the year from the solar project than the solar project supplies to the grid. It is an open legal question as to whether this yearly averaging constitutes a wholesale sale of electricity subject to FERC jurisdiction.

As FERC explained in its *Sun Edison LLC* decision, where there is no net sale over a billing period, FERC does not assert FPA jurisdiction when the end-use customer connected to a net metered solar PV facility receives a credit against its retail power purchases from the selling utility (*129 FERC ¶ 61, 146 (Nov. 29, 2009)*). While FERC has suggested that net metering over a month may be allowed if that is consistent with the customer's billing period, it has not yet ruled on the propriety of longer-term net metering situations, such as those lasting one year. There is uncertainty, therefore, on whether FERC would approve of programs such as New Jersey's that allow for up to one year of net metering.

The particularly vexing issue in a net metering situation is whether the wholesale "seller" for FPA purposes would be deemed by FERC to be the developer (or the owner and/or operator of the net metered solar PV facility) or the host. This is because it is the host, not the developer, that:

- Has the interconnection agreement with the local electric utility.
- Will be entitled to payments from the electric utility if the solar project results in net sales of power to the electric utility because the host's electric consumption dropped.

Wholesale Price

Another issue to consider is price at which the solar facility sells the excess power to the local electric utility. Under PURPA, electric utilities have an obligation to buy power from wholesale IPPs such as QFs at avoided cost rates. This rate was intended in 1978 to be the cost a utility avoided by not having to manufacture the electricity that was purchased from the QF. Currently, however, after many states mandated that electric utilities "deregulate" by selling off their power plants to competitive wholesale power companies, the avoided cost calculation has now been replaced with the wholesale market price of power obtained through the RTOs and/or ISOs.

Given the avoided cost language in PURPA, the question is whether feed-in tariffs, like the one California uses to incentivize solar procurements with above-market power prices, can pass muster under PURPA. The electric utilities have challenged these tariffs in court and the courts have tried to strike a balance that respects the federal limitations while allowing some flexible interpretations of what is meant by avoided costs. This area of law remains in flux that will not likely be resolved unless Congress passes a national renewable energy law that provides more clarity on how to reconcile the federal and state energy programs.

A related development emerged with the Energy Policy Act of 2005 (EPAct 2005), which empowered FERC to relieve certain electric utilities of the PURPA avoided cost purchase obligation if FERC determined that the electric utility is operating in a "competitive" wholesale marketplace. Some utilities have petitioned FERC for these determinations and, in some cases, FERC has been granting limited relief from the avoided cost obligation.

For example, in New Jersey, one of the electric utilities successfully petitioned FERC to discontinue the obligation to buy power from QFs at avoided costs, but FERC limited this relief to projects with a capacity of 20 MW or greater. As a result, solar PV projects that are under 20 MW in New Jersey will continue to have the ability to compel the interconnecting local electric utility to engage in mandatory purchases of wholesale power from the QF under the PURPA avoided cost requirement, but projects over 20 MW would have to sell surplus power into the Pennsylvania New Jersey Maryland Interconnection (PJM), the regional electric transmission system's ISO.

POWER PURCHASE AGREEMENTS

The PPA is one of the main contracts of any energy project. This agreement is especially important if the project is project financed because most lenders will not extend financing unless there is a firm PPA in place that can provide a predictable income stream to service the debt. The terms and scope of the PPA depend on several factors, including:

- Whether it is being used to document the sale of power to a utility or other third party or as part of a distributed generation project.
- Whether the sale of electricity is coupled with the sale of RECs.
- The nature of the power plant. PPAs for solar and other renewable energy-sourced power plants raise several issues that are not present in other PPAs.

While a detailed analysis of PPA issues are beyond the scope of this Note, this section discusses some preliminary issues that developers and their counsel should consider.

Distributed Generation

There are generally two different business models that are used in distributed generation transactions:

- Customer as host.
- A third party PPA.

Customer as host

Under this structure, a property owner buys the solar PV equipment that is appropriate for its location and enters into a contract with a third party to install the system. The property owner is responsible for ownership, operation and maintenance of the project. The project owner is the "tax owner" of the solar project and can therefore claim any incentives for which the project may be eligible including the ITC and any accelerated depreciation benefits. In this situation, the primary contract needed is an engineering, procurement and construction (EPC) contract.

This approach may be used:

- In states that do not allow the third-party PPA model or that do not allow net metering.
- Where a property owner is willing to accept the cost and inconvenience of owning, operating and maintaining a solar installation in exchange for the ability to claim its full benefits (including electricity at cost and tax and renewable energy benefits).

In this case, there is no PPA because the owner uses the power produced by its solar installation.

Third-party PPA model

Under this structure, which is the preferred approach, the owner of a property (whether residential or commercial) enters into a contract with a third-party energy provider under which it gives the energy provider the right to design, install, own, operate and maintain a solar installation or project on the property. In exchange, the owner agrees to purchase the energy generated by the project for a specified period.

This model:

- Enables a property owner to receive a reliable and long-term supply of electricity without having to invest significant capital in a new energy plant.
- Allows the host to avoid the costs associated with the operation and maintenance of the project.
- Provides a property owner with a predictable and in some cases less expensive source of electricity. The purchase price for the electricity in these contracts is in many cases lower than what the property owner would have to pay to a utility, but still priced high enough to allow the solar developer to make a reasonable profit.

Depending on the transaction, this PPA may be a separate agreement from the property lease or combined with it in one agreement, although the latter is not preferred (see *Energy Services Agreement*).

If the business customer is a non-commercial entity such as a government, hospital, school, college or other charitable organization, the PPA model also allows the third party or its lenders to access ITCs that would be otherwise unavailable. These non-taxpayers do not have the tax attributes that would enable them to take advantage of the ITC and they need a third party to unlock the value of the credit that can be monetized and passed back to the non-profit in the form of lower energy costs.

A third-party PPA may be structured as a:

- **Take or pay.** Under this arrangement, the host site is unconditionally obligated to pay the amounts specified in the PPA whether or not the solar project actually produces or delivers any output to the host site, although in some cases, the payment may be reduced if there is no output if output is reduced materially. Take or pay PPAs are not common, however, in distributed generation transactions. The host site typically expects to receive and to be obligated to pay for power it actually receives. In addition, one of the main purposes of having a solar project on-site is to reduce the amount of electricity that must be purchased from the utility or other third-party provider. Host sites do not want to be in the position of paying the project developer and a utility or other third party for electricity it needs.
- **Take and pay.** Under this arrangement, which is less burdensome for the host, the host is obligated to take and pay for all output actually delivered by seller, but does not have to pay for any output not actually produced or delivered. This approach is more common in PPA transactions.

Utility- or Grid-scale Projects PPAs

In a grid-scale PPA, the seller of the electricity is the owner of a ground-mounted PV installation or CSP project who typically sells the electricity generated by the project to a utility or into the wholesale power markets. A utility-scale PPA, however, raises many issues that are beyond the scope of this Note, including:

- Permitting.
- Interconnection and transmission.
- Pricing.
- Commencement of service.

Similar to distributed generation facilities, a utility PPA may be structured as a take or pay or a take and pay contract. Take-or-pay contracts are typically used in a power facility financing to protect lenders or bondholders because they provide a guaranteed revenue stream to the project developer that lenders can rely on to support repayment of any loans they make. However, the take or pay structure has fallen out of favor in the aftermath of litigation in the early 1980s in which courts voided take or pay contracts that many utilities had signed to support the building of their nuclear power plants.

The typical PPA structure in the solar industry currently is take and pay. Solar project developers are unlikely to find buyers in current markets willing to undertake commitments to make fixed payments, whether the seller delivers any units of power or not. If the construction of the solar facility will be project financed, the developer typically looks for a creditworthy offtaker, possibly with obligations backed by guarantees, to attract lenders and equity investors.

CHALLENGES TO THE CONTINUED GROWTH OF SOLAR ENERGY

While interest in developing solar projects continues to be strong, there are concerns that solar energy may not continue to grow at historical rates. In addition to the political and other setbacks discussed earlier, the solar industry faces several other challenges that may take longer to address, including:

- The low price of natural gas (see *Low Natural Gas Prices*).
- The lack of a coordinated federal policy on renewable energy (and confusion caused by policies that vary significantly state by state), including the uncertainty caused by the boom-bust cycle of federal incentives and support (see *Stability in Federal Incentives*).
- Securing interconnections to the grid and complying with the requirements of local electric utilities for reliability (see *Interconnection to the Electric Power Grid*).
- The need to rationalize the permitting and environmental review of solar projects (see *Streamlining Permitting and Environmental Review*).
- The lack of stability and predictability of SRECs (see *Market Stability and Predictability of Solar Renewable Energy Certificates*).

Low Natural Gas Prices

The expanded use of hydraulic fracturing has dramatically increased the volume of natural gas produced in the US and resulted in a dramatic decrease in natural gas prices. In early 2012, the price of 1,000 cubic feet of natural gas fell below $2, the lowest price in a decade (see *EIA Natural Gas Futures*). Because natural gas has historically been used to set the marginal price of electricity in developed energy markets, low natural gas prices has translated into substantially lower electricity prices. These prices have made the power output from natural gas-fired power plants substantially more affordable than the unsubsidized output from renewable energy projects, which critics use to prove that renewable energy cannot stand on its own in the market. Furthermore, expanded use of natural gas erodes another major argument in favor of renewable energy; that renewable energy is better for the environment (see *Advantages of Solar Energy*). This is because natural gas-fired generation produces significantly less greenhouse gas emissions than coal-fired power plants (although it is still higher than a solar project). As a result, many project developers have announced that they are suspending or postponing renewable energy plants in favor of increased investment in natural gas plants.

Stability in Federal Tax Incentives

An unstable or uncertain outlook for federal investment tax credits poses a substantial challenge for solar project development. Project developers require access to the investment tax credit to support the economics of the project and an uncertain outlook threatens 30% of the project's economics. A lender or equity investor may be unwilling to undertake investment in the project without some certainty or assurance that the tax incentives are available for the project.

Interconnection to the Electric Power Grid

Any generator that proposes to connect to a local electric utility's distribution or transmission system must either:

- Comply with the utility tariff for interconnections.
- Enter into an interconnection agreement required by the local electric utility.

Typically, these interconnection agreements have been pre-approved by the electric utility's state public utility commission that regulates them. As a result, there is little to no room to negotiate these agreements. Negotiations of these agreements are usually limited to filling in the blanks for the project-specific details and technical information associated with the project.

Likewise, if the power plant is a wholesale power generation facility intended to be interconnected electrically to the transmission system operated by a local electric utility on behalf of the power region, the facility must enter into an interconnection agreement that has been approved by the FERC as part of a tariff filing of the utility or as part of the overall tariff documents approved by an RTO or ISO. For more on these issues, see *Interconnection Analysis* and *System Reliability Issues*.

It can take a long time to complete the necessary studies and analyses. It can also take as long as a year and more than $1 million to implement system upgrades. Project developers should plan ahead and undertake the preliminary interconnection review and application as early as possible, such as during the project scoping or permitting process, to ensure that the project schedule is not later delayed by unforeseen interconnection issues.

Some interconnecting utilities require that the project advance to a certain stage in the process before accepting interconnection applications. Project developers and their counsel should check local program rules and discuss early with the local electric utility to ensure an understanding of the specific interconnection rules applicable to individual projects.

Streamlining Permitting and Environmental Review

Unlike other renewable energy technologies, solar energy project permitting is usually not that challenging, except where large-scale concentrating solar thermal projects, larger solar PV or sensitive environmental (or resource) receptors are involved (see *Permitting Review*). However, it often takes a long time to complete the full permitting and environmental review that a project may require. The various local, state and NEPA reviews can take months and, depending on the location and size of the project, years. These delays may delay the number of solar projects that can come on line in any given year.

The federal government and some states have recognized the problem that this poses for solar project deployments and have sought to streamline the permitting and environmental process.

The federal government has implemented the following initiatives:

- The BLM has implemented a fast track review of renewable energy projects that meet certain eligibility requirements.
- The DOI has established a program to expedite the environmental review of projects for the purposes of leasing of rights of way on BLM-managed land. Under this program, referred to as a draft programmatic EIS, the DOI will work with the DOE to coordinate and facilitate permitting.
- The DOE has established the Solar America Board of Codes and Standards to standardize permitting requirements across the states and federal agencies (see *Solar America Board for Codes and Standards*).

In the case of the states:

- California adopted legislation that centralized the permitting process and reduced the permitting required at the local level for these projects (see *SB 226*).
- Governor Cuomo of New York announced an initiative to standardize and streamline the procedures for permitting and interconnection across the state (see *Governor Cuomo Announces Comprehensive NY-Sun Initiative to Expand Solar Development in New York*).

Market Stability and Predictability of Solar Renewable Energy Certificates

Another challenge to solar energy development and market growth involves the stability and predictability of state-specific market incentives, including SRECs or feed-in tariffs. These incentives send a signal to the market that valuation assumptions are supported by predictable and reliable program features that protect the economics of the projects. While states with RPS may include specific solar carve-outs or otherwise specify amounts of solar energy required, the price of SRECs tends to drop rapidly as solar deployments increase as the market responds to supply and demand for solar energy.

Some states, including New Jersey and Massachusetts, have developed SREC programs designed to provide some certainty in SREC values. One SREC is generated for each MWh of electricity produced by the solar facility. Other states, like California, have offered a feed-in tariff program that requires electric utilities to buy excess power produced from on-site renewable energy facilities such as solar PV at the retail rate (or some other rate above the cost to produce fossil-fueled generation).

Utility Imposed Mandates

In the absence of an RPS or specific targets for solar, some utilities have established their own mandates for energy procured from solar resources, which may take the form of purchases of energy from solar generating facilities, purchases of SRECs or both. A small number of utilities are promoting investments in renewables through feed-in tariffs, which typically specify a fixed quantity of qualifying resources eligible for above-market price power purchase contracts. Without state or utility procurement for solar projects, developers may find the market realities particularly challenging.

For more information on renewable energy, search for the following resources on our website.

Practice Note: Overview

- Renewable Energy: Overview (US) (http://uslf.practicallaw.com/4-518-1338)

Practice Note

- Understanding Hydraulic Fracturing: Issues, Challenges and Regulatory Regime (http://uslf.practicallaw.com/8-518-4410)