Property Taxes and Solar PV Systems: Policies, Practices, and Issues

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July 2013

Prepared by

Powered by SunShot U.S. Department of Energy

NORTH CAROLINA Solar Center

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Abstract

Property taxes represent a potentially significant cost for solar photovoltaic (PV) system owners. Many U.S. states have adopted policies specifically addressing how solar PV systems should be valued for property tax purposes. However, other states have not adopted such policies, and even explicit policies sometimes fail to fully address the myriad of different circumstances present in the current PV market landscape, or give rise to additional questions and problems of their own. The frequent lack of clarity presents challenges for both owners of PV systems and government officials involved in the administration of property taxes, as each seeks to ascertain the appropriate treatment for solar PV systems and understand the implications it holds. This report investigates current state and local property taxation practices as they apply to solar PV systems, as well as the various issues associated with assessing and taxing them under PV-specific and general property tax laws. It concludes with recommendations for increasing the clarity, transparency, and predictability of the property tax policies and practices with respect to solar PV systems, and the methods that may be employed towards this end.

Disclaimer

This material is based upon work supported by the **U.S. Department of Energy under Award Number DEEE0003525.** The guide was produced by the **North Carolina Solar Center**, and **Meister Consultants Group, Inc.** with the support of the following organizations as part of the SunShot Solar Outreach Partnership: ICLEI-Local Governments for Sustainability; International City/County Management Association (ICMA); Solar Electric Power Association (SEPA); Interstate Renewable Energy Council, Inc. (IREC); The Solar Foundation (TSF); American Planning Association (APA); and National Association of Regional Councils (NARC).

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Acknowledgements

The authors wish to thank the following individuals for providing insight and feedback in reviewing this report: Josh Huneycutt, Monica Andrews, and Ammar Qusaibaty, U.S. Department of Energy SunShot Initiative; Geoff Klise, Sandia National Laboratories; Jamie Johnson, Solar Power Electric; Larry Clark, The International Association of Assessing Officers; Ann Deal, ICMA-CM; Kim Kooles, North Carolina Solar Center; Sandra K. Adomatis, SRA, LEED GA; Alexander Winn and Andrea Luecke, The Solar Foundation; and Wilson Rickerson, Meister Consultants Group, Inc. The authors are also grateful to professionals from various state and local government departments across the country that provided extra insight into property assessment issues in their jurisdictions, including: Keilah Folkertsma, Peter Levine, Angie Berry, Ed Parker, Cary Halfpop, Roland Simmons, Frank Dudley, Paul Jacobs, and Kory Hofland.

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1 Introduction

The potential property tax impacts associated with the installation of solar photovoltaic (PV) systems can be a source of concern and uncertainty for property owners. In some circumstances, property taxes can represent a significant ongoing cost for PV system owners. They consequently may prove to be a determining factor in whether or not an installation is made, or play a substantial role in determining the financial benefits realized by owners of existing PV systems. The fundamental questions for PV owners are whether the PV property or any value it adds to an existing property (as part of the appraisal process) are taxable, and if so, how that tax is determined. The responsibility for providing answers to these questions falls on state and local officials involved in the administration of the property tax system. These officials operate within the confines of state property tax laws, regulations, standard appraisal practices, and judicial precedents, and are charged with making sure that those laws are applied fairly and consistently for all property owners.

In a significant number of jurisdictions, there is currently uncertainty over how PV systems should be valued and taxed for property tax purposes. Because property taxes can figure significantly into the operating costs of PV projects, this uncertainty can affect PV project viability, while also having implications for local revenue. Thirty-four states have property tax laws that apply specifically to PV, but some of these laws do not address the full range of PV system and ownership types that are currently present in the market, and the remaining 16 states have no explicit policies. In addition, the IRS, for purposes of federal income taxes, treats solar PV in an independent and entirely different way. The lack of consistent taxation protocols creates challenges for PV property owners, property tax officials, and the PV industry. Property owners and PV installers need clarity in order to make informed decisions, while property tax officials must ensure that any determinations they make are justified and maintain the core principals of consistency and fairness.

No comprehensive review of PV property tax policy currently exists. This report is intended to remedy the lack of easily-accessible information on different approaches to valuing and taxing PV installations for both officials involved in the administration of property taxation and PV industry stakeholders. Property tax administrators includes state officials, who play a role in establishing the broad components of property tax policy and provide guidance to local officials, and the local officials who must translate state-level policies into assessments and tax levies. PV industry stakeholders include, for example, residential homeowners, commercial business owners, developers of utility-scale PV power plants, and entities that engage in PV leasing or retail power purchase agreement contracts. The intent of this resource is to clarify the current property tax landscape, reduce the risks associated with property tax uncertainty, and lay the foundation for updated property tax policies in the future.

This report does not make judgments about whether property tax policy should or should not be used as an incentive mechanism, for instance, through the establishment of an exemption for PV systems.

Instead, the goal is to highlight different approaches currently in use, identify how those approaches impact property owners and property tax administration, and describe the issues that should be considered in policy development discussions. The report contains the following sections:

- Section 2 provides an overview of PV technology and markets and the basic structure of property assessment and taxation processes in order to establish a foundation of common terminology and concepts for subsequent sections.
- Section 3 explores specific issues that create uncertainty in one or more states: the classification of PV as real or personal property, the clarity of terms and definitions in existing exemption or special assessment laws, issues with PV on exempt property, issues with PV on specially-assessed farmland, and difficulties associated with valuing PV under the three generally accepted approaches. This section is intended to supplement the individual state summaries in Section 4, exploring issues that are not comprehensively addressed on a state-by-state basis in a more discussion-oriented format.
- Section 4 provides descriptions of the valuation and assessment methodologies currently in use in each state, and in some cases, local jurisdictions. These summaries are intended to provide current or prospective PV property owners with the information they would need to estimate potential property tax burdens, and to provide property tax officials with information on current practices and experiences in other states and jurisdictions.
- Section 5 provides a series of recommendations for improving property tax policy with respect to PV in the interest of promoting greater transparency and consistency in valuation, assessment, and taxation.
- Appendix A contains a table of 2013 property tax legislation directly relevant to PV, as of July 2013.
- Appendix B contains estimates of the property tax burden that would be experienced by different types of PV facilities under existing rules in select states, stated in terms of average $/MW and $/MWh. The purpose of including this information is to facilitate an understanding of the role that property tax policy can play in determining the financial viability of PV projects, and allow for state comparisons to be made based on common electricity industry metrics. It includes notes describing the methodology used for these estimates, including information on the assumptions and data sources used to in their calculation.

2 Solar PV and Property Tax Basics

Most PV industry participants are not experts in property assessment and taxation, and most people in the property assessment community are not experts in solar PV technology and markets. A productive discussion of PV and property tax issues is predicated on a certain amount of common understanding and knowledge among stakeholders. Section 2.1 below is devoted to providing the property assessment and tax community with basic information on PV technology and markets, as both ultimately influence the circumstances under which they may encounter PV in their jurisdictions. Section 2.2 is written to provide PV industry participants with background information on how the property assessment and taxation process works so that they may better understand how their property is valued by assessors. Collectively, these sections provide a foundation for subsequent sections of this report addressing the policy environment in each state, and issues that may be encountered in interpreting and applying state property tax laws to PV systems.

2.1 Solar PV Technology and Markets

The following section is intended to provide readers with basic information on solar PV technology and an understanding of the forces that govern consumer adoption of PV and influence how the U.S. PV market is developing. It focuses on details that may play a role in determining how PV is addressed under state property tax laws, but it must be noted that the diversity of the market is such that the facts and circumstances of any given installation may fall outside these generalized descriptions.

2.1.1 Solar PV Technology

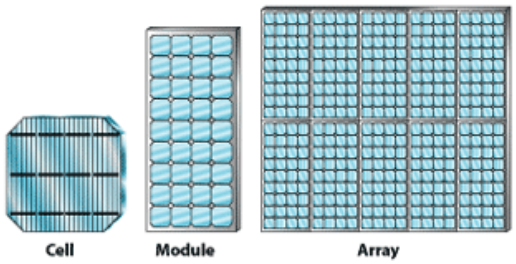
Solar PV is a technology that directly transforms solar energy into electricity.[i] The basic component of a solar PV system is a PV cell. PV cells are connected together and, in most cases, mounted on frames to form PV modules or panels (Figure 1[1]). The PV module is generally the smallest discrete piece of equipment that a consumer can purchase, and on its own is capable of supplying only a small amount of electricity. Most PV systems or installations are composed of multiple modules wired together to create an array. Module designs differ, but a typical solar module measures from 10 to 20 square feet and module designs measuring 3 feet by 5 feet are common.

The size of a PV system is described in terms of the maximum amount of electricity that it can generate at any given moment during ideal conditions. The terms for this are the *rated capacity* or *nameplate capacity* of a system, denominated in watts (W), kilowatts (kW) or megawatts (MW). A kW is 1,000 W and a MW is 1,000 kW (or one million watts). PV systems can be installed on dramatically different scales depending on a number of factors (e.g., aims of the owner, available space, etc.). The U.S. power grid supplies *alternating current* (AC) electricity to consumers while PV panels produce *direct current* (DC) electricity, so almost all PV systems are equipped with one or more *inverters* that convert the DC

[i] Solar installations that provide thermal energy (e.g., for water or space heating) are outside of the scope of this report.

electricity to AC electricity. Rated capacity is usually used to refer to DC rating rather than the AC rating. The AC rating of a system is always lower than its DC rating because inverters are not 100% efficient and losses occur in the conversion process.

Figure 1: Solar PV Cell, Module, and Array



A typical home rooftop PV system ranges from 3 kW to 10 kW. Many PV systems are mounted on the roofs of existing structures such as residential or commercial buildings, but in some cases, they are mounted on the ground on structures specifically purposed for supporting the equipment. Ground-mounted systems are often, but not exclusively, seen in large-scale installations composed of thousands of individual modules and can be many MW in size.

The physical characteristics of a PV system may differ depending on the needs of specific sites. Systems installed on sloped roofs (e.g., a residential rooftop) typically use racking systems that are affixed to the structural elements of a building, such as the roof rafters. Systems on flat roofs can be similarly attached, or they can also be held in place by the weight of the panels themselves or by ballast material, such as concrete blocks, if necessary.[2] Ground-mounted arrays may be secured in a variety of ways, such as concrete footings, poles or beams driven into the ground, or even weighted ballasts.[3]

Building Integrated PV (BIPV)

Currently, most building-mounted PV systems are simply attached to new or existing structures. However, there are some types of PV technology that can be integrated directly into the building envelope, serving as the building "skin" and providing power at the same time. The general term for this type of system is Building Integrated Photovoltaics (BIPV). BIPV can be incorporated into the sides of buildings, awnings, batten and seam metal roofing, shingles, or skylighting systems. As with other PV systems, BIPV can serve as a grid-tied or off-grid system.

In theory, BIPV systems could have a lower total system cost because they do not require a separate mounting system and because they can replace expensive architectural elements (e.g., granite cladding on the sides of buildings[ii]).[4] In practice, though, BIPV systems are often more costly and less efficient

[ii] See: Eiffert, P. (2003). Guidelines for the economic evaluation of building integrated photovoltaic power systems *International Energy Agency PVPS Task 7: Photovoltaic Power Systems in the Built Environment*. Golden, CO: National Renewable Energy Laboratory.

than more traditional crystalline PV technologies. The higher cost and lower efficiency translates to a higher cost of energy, which has led most consumers to opt for traditional PV modules. BIPV has made inroads into certain niche markets, such as on buildings where aesthetic concerns are paramount or buildings that are otherwise unsuitable for rack-mounted designs.

2.1.2 Solar PV System Configuration

Solar PV systems can be classified as being installed either *behind-the-meter* or *in front of the meter*. The meter in question is the electric meter that measures an electric customer's purchases of electricity from the grid to serve on-site electric demand. Systems installed behind-the-meter are considered to be connected on the customer side of the meter, and front-of-the-meter installations are connected on the utility side of the meter. In this report, we refer to systems installed in front of the meter as *grid-supply* systems.

Behind-the-Meter Configuration

A behind-the-meter arrangement describes a PV system for which electricity generated is primarily intended to support on-site needs rather than exported to the grid. In practice, the on-site need for electricity at any given time differs from the amount of electricity being produced by the system, so the customer is actually pulling electricity from the grid at certain times and exporting electricity to the grid at other times. From a utility billing standpoint, the ebb and flow of electricity to and from the customer is most often accounted for by an arrangement called *net metering*. Most PV installations located on a residential or commercial building site are connected behind-the-meter. Behind-the-meter installations can be owned by the host property owner or by a third party. We use the term *customer-sited* throughout this report to refer to behind-the-meter PV systems.

Net Metering

Under a net metering arrangement, an electric customer is billed by a utility for the net consumption of electricity during a billing period. This arrangement is typified by the use of a single bi-directional electricity meter that rolls forward when the customer is pulling electricity from the grid and rolls backward when the customer is exporting electricity to the grid. Generally, in order to be eligible for net metering, a system must be sized so that it will not produce more electricity than is needed to meet on-site demand over the course of a year. Some net metering arrangements use a single meter with multiple registers or multiple meters in order to arrive at the customer's net consumption or exports during a billing period, as opposed to a single bi-directional meter.

Through this netting process, the electric customer receives value for any electricity exports during a billing period at the retail electricity rate. Retail value of electricity exports during a billing period is the defining characteristic of net metering. It is differentiated from arrangements where electricity pulled from the grid is billed at one rate and customer electricity exports are valued at a different rate. This arrangement is typically referred to as *dual metering* and is less beneficial for the customer because the rate applied to exports is often a wholesale (i.e., lower) rate. Most states now require investor-owned utilities (IOUs) to offer net metering to their customers and, in some cases, state net metering laws also apply to electric cooperatives and publicly-owned utilities.

At the end of a billing period, the customer may be compensated for exports in a number of ways, as determined by state law or at a utility's discretion where a state law does not apply. Some net metering policies allow kilowatt-hour (kWh) credits to be rolled forward to future billing periods; in others, any net exports during a billing period are multiplied by the specified rate and translated into a dollar value that can be applied to future bills. Many states allow net metering credits to be carried forward indefinitely, but in some states, utilities provide customers with a payment for net exports at a regular interval (e.g., annually or quarterly) or upon request. This type of account reconciliation, of which annual reconciliation is the most common, essentially sets the customer credit account back to zero. Regardless of the mechanics of reconciliation transactions, net metering arrangements are not generally considered to involve a "sale" of power from the customer to the utility.

Net metering has historically required that a single net-metered system be physically connected behind a single electricity meter. However, recently some states have begun to allow greater flexibility for customers by permitting electricity production to be applied "virtually" to a meter or collection of meters that are not physically connected to the PV system. This practice is generally termed *meter aggregation* or *virtual net metering* and its details vary from state to state. We use the term *meter aggregation* to refer to an arrangement where a single electric customer is permitted to use electricity generation from one or more "central" systems to offset consumption across more than one meter. We use the term *virtual net metering* to describe any arrangement where electricity production from a system does not physically offset use at a meter, but is instead applied virtually to one or more meters through the utility billing system. The advent of virtual net metering and meter aggregation has the potential to blur the line between behind-the-meter-systems and grid-supply systems.

Grid-Supply Configuration

Though behind-the-meter installations dominate the solar market in terms of the number of installations, recent years have seen a major increase in installations on the utility side of the meter. Systems installed on the utility side of the meter do not directly offset on-site use and instead are characterized by a sale/purchase arrangement between the system owner and a purchaser (usually a utility). The contract governing the sale of electricity is termed a *power purchase agreement* (PPA). Grid-supply arrangements may take place at many different scales, but are most common for large-scale installations designed to sell electricity at wholesale.[iii] However, in some jurisdictions, even small systems on residential or commercial rooftops operate under this type of arrangement. For systems installed on the same site as a customer's electricity load (e.g., a residential home), the payment might be applied to the customer's electricity bill (as opposed to being issued as a check for payment). Grid-supply systems may also be owned by the property owner or owned by a third-party.

[iii] For large wholesale power production facilities, there is often no on-site electric demand. Consequently, while there is no utility meter to serve as a reference for the connection, the facility serves the same purpose as one for which a meter to measure on-site use is present (i.e., export electricity to the grid for sale).

2.1.3 Solar PV Ownership Models

As referenced above, in some cases, the owner of host property on which a PV system is installed may not actually own the PV system itself. This is often referred to as *third-party ownership*. Where this occurs, the owner of the PV system either: (1) sells electricity produced by the PV system to the host (a retail PPA); (2) leases the PV system to the host; or (3) simply leases the host site from the property owner and sells electricity produced by the PV system to another party. One further variation on these commonly used arrangements is the "community solar" model, which occupies a unique space with respect to PV system ownership and configuration.

Retail PPAs and Leases

In a retail PPA or system lease model, the site host consumes the electricity produced by a system owned by another party. Any incentives that exist are typically claimed by the owner of the PV system. Retail third-party PPAs and system leases are frequently attractive to host customers because the arrangement transfers some or all of the up-front costs associated with the system and the maintenance responsibilities to the third-party owner. Moreover, the third-party or its partner investors are often able to take advantage of certain tax incentives that the host may not be able to, or may be able do so in a more efficient manner. For instance, a PV system owned by a homeowner cannot normally be depreciated, but a system owned by a third-party business and installed on a residential site can. Similarly, governments or non-profits cannot take advantage of federal income tax credits whereas a for-profit third-party owner can.[iv]

The customer, in turn, makes periodic payments to the system owner based on the electricity produced by the system at an agreed-upon rate or the equipment lease rate. Electricity purchase or leasing rates are typically designed so that the payments owed are less than what the customer would have paid for electricity without the use of the PV system. In other words, ideally the customer experiences immediate electricity cost savings without incurring the up-front cost of the system and continues to save over time. The rates paid by the customer typically escalate (1–3% annually) for the term of the agreement, which is generally at least 15 years. In practice, not all third-party ownership arrangements offer immediate savings for the customer, and the impact experienced by the customer will change based on how electricity prices change in relation to leasing or PPA rates. The customer may have the option of purchasing the system at the fair market value at the end of the agreement or, in some cases, at an earlier point. The host customer typically executes a lease or easement agreement with the third-party owner in order to grant the system owner access to the site.[5, 6]

Availability of Retail Third-Party PPAs and Leases

Currently, third-party ownership arrangements are more common in some states than others. State policies, incentives, and electricity prices play a major role in determining where providers of these services can make attractive offers to customers. In some jurisdictions, for example, retail PPAs are not

[iv] PV system leases are most often structured as operating leases rather than capital leases, allowing ownership to remain with the lessor rather than the lessee for tax purposes.

viable because existing utility regulations governing the sale of power to retail customers prevent their use, or present other obstacles.[v, 7] In other cases, PV incentives may not be claimed for systems under lease or PPA arrangements.[vi] However, state policies in this area are evolving and are generally doing so in the direction of accommodating retail PPA and lease options for electric customers.

Property Leases

In some cases, third-party ownership takes place under a slightly different model where the electricity produced by the system is sold to a party other than the site host. In this model, the site host simply leases property, either a rooftop or land, to the owner of the system and benefits solely from the lease payments rather than directly from electricity produced by the system. The owner of the system could be a utility or a non-utility power generator. The property subject to lease could exhibit any number of characteristics that have implications for property taxes. For instance, the property could be owned privately or publicly, be subject to an existing property tax exemption, or be agricultural land under a special farmland assessment program. Property leases are most often seen with large-scale projects (i.e., solar farms), but have also been used for smaller non-residential rooftop systems. Currently, property leases have not been used to any meaningful degree on residential rooftops.[vii]

Community Solar

Community solar programs often take the form of community members claiming proportional ownership rights in or purchasing "shares" of a larger PV system. Participants typically either use the virtual net metering credits produced by the system, or receive a utility bill credit that corresponds to their ownership stake in the PV system. These types of programs allow individuals who could not otherwise participate in solar programs (e.g., renters or houses that are heavily shaded) to "invest" in a solar project. State and federal laws governing the sale of investment shares or securities often complicate the implementation of community solar programs. For this reason, in some current examples, a local utility owns the project and sells the output as "shares" to its customers.

2.1.4 Solar PV Policies and Incentives

The decision to purchase and own a PV system depends on a number of factors and not all PV owners have the same motivations. Many have an economic motivation of some type, such as electricity bill

[v] See the Database of State Incentives for Renewables and Efficiency (DSIRE) 3rd-Party Solar PV PPA map for information regarding state-by-state feasibility (http://www.dsireusa.org/documents/summarymaps/3rd_Party_PPA_map.pdf)

[vi] PV System leases are currently not an attractive option for tax-exempt entities because federal tax credits cannot be claimed on systems leased to a tax-exempt entity. From 2009 to 2011 an equivalent cash grant in lieu of tax credit that did permit this arrangement was in place, but this program is no longer available for new projects. For further information see e.g., "Solar Energy with No Money Down." *Solar Today*. September/October 2010. http://www.solartoday-digital.org/solartoday/20100809?pg=45#pg44

[vii] At least one example of residential rooftop leasing exists. Duke Energy Carolinas currently leases 7 residential rooftops as part of a larger site leasing program (see http://www.duke-energy.com/north-carolina/renewable-energy/nc-solar-distributed-generation-program.asp). The authors are not aware of any other programs that employ residential site leases.

savings or revenue from electricity sales, though the idea of being "green" or less dependent on the local utility may also be factors. Because PV generally remains a higher-cost resource than other electricity options, growth in the PV market is often attributable to a variety of federal, state, and utility incentives and policies. Electricity rates also play a substantial role: the value of the electricity produced by a PV system is directly related to what a consumer pays for electricity or the value of that electricity sold in a wholesale market. Incentives may either reduce the up-front cost for the purchaser of a PV system or provide additional revenue over the lifetime of the system or a specific time period.

Table 1 contains descriptions of major federal programs and Table 2 provides examples of different state incentives.[8] Tax incentives include personal and corporate income tax credits, deductions, and exemptions. Cash incentives can include rebates, performance-based incentives, grants, and loans. These incentives influence the rate of PV adoption in general, as well as the characteristics of a local PV market, because many incentives apply only to certain types of PV installations. Understanding the various incentives at play is helpful in understanding the motivation of PV system owners, and how these motivations drive individual PV projects. The examples provided in Table 2 were chosen to highlight several different incentive types in different states. Many states not represented in the table offer incentive programs and some incentive types are not represented in the table. Individual financial incentives and policies for solar PV installations number in the hundreds.

Table 1: Major Federal Incentives for Solar PV Systems

Incentive Program	Description	Eligible Sectors	Link to DSIRE Summary
Federal Modified Accelerated Cost-Recovery System and Bonus Depreciation	Eligible PV systems are assigned a class life of 5 years over which the property may be depreciated.	All business income tax payers	http://dsireusa.org/incentives/incentive.cfm?Incentive_Code=US06F&re=1&ee=1
Federal Business Energy Investment Tax Credit	Businesses may take a tax credit equal to 30% of the cost of the solar PV system.	All business income tax payers	http://dsireusa.org/incentives/incentive.cfm?Incentive_Code=US02F&re=1&ee=1
Federal Residential Renewable Energy Tax Credit	Individuals may take a tax credit equal to 30% of the cost of the solar PV system.	All personal income tax payers	http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=US37F&re=1&ee=1

State Renewable Portfolio Standards and SRECs

Beyond the examples in Table 2, one further policy, the renewables portfolio standard (RPS) demands a more complete description due to its complexity. Renewable Portfolio Standards require electricity suppliers and utilities to use or procure renewable energy or renewable energy credits (RECs) to account for a certain percentage of their retail electricity sales according to a specified schedule. Some states have also established *set-asides* or *carve-outs* for solar or distributed generation (DG) resources, requiring that a certain percentage of the RPS requirement be met with solar or DG resources. A total of

29 states plus the District of Columbia have a mandatory RPS, and 17 states plus the District of Columbia have a solar or distributed generation carve-out.[viii] Compliance with these targets is demonstrated through the purchase of *solar renewable energy certificates* (SRECs). An SREC represents 1 MWh of electricity generated from a qualifying solar resource. SRECs can be bought and sold as a commodity separate from the electricity produced by a system.

Table 2: Examples of State and Utility Incentives for Solar PV Systems

Incentive Program	Description	Eligible Sectors	Link to Summary
California Feed-In Tariff	State law requires utilities to offer a feed-in tariff to customers. Customers with systems of up to 3 MW may enter into a 10-, 15-, or 20-year contract with the utility. The utility pays the customer a set amount per kWh of production.	All utility customers	http://dsireusa.org/incentives/incentive.cfm?Incentive_Code=CA167F&re=1&ee=1
Illinois Solar and Wind Energy Rebate Program	Residential and commercial solar PV systems can receive $1.50/W of installed capacity, up to 25% of the project costs or $10,000. Nonprofits and public sector entities can receive $2.60/W or 40% of project costs up to $10,000.	Commercial, Industrial, Residential, Nonprofit, Schools, Government	http://dsireusa.org/incentives/incentive.cfm?Incentive_Code=IL05F&re=1&ee=1
New Jersey Solar Energy Sales Tax Exemption	Purchasers are not required to pay sales tax on all major types of solar energy equipment.	All consumers	http://dsireusa.org/incentives/incentive.cfm?Incentive_Code=NJ01F&re=1&ee=1
North Carolina Renewable Energy Tax Credit	Individuals and businesses may take a tax credit of 35% of system costs up to $10,500 for residential projects and $2.5 million for non-residential projects.	All taxpayers	http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=NC19F&re=0&ee=0
Colorado Xcel Energy Solar Rewards Program	System owners receive production incentives of $0.07–$0.11/kWh for 10 – 20 years in exchange for renewable energy credits (RECs).	All utility customers	http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=CO12F&re=0&ee=0
Massachusetts SREC Program	Systems of 6 MW or less generate SRECs that can be sold to energy suppliers required to meet a state mandate. Price fluctuates according to market supply and demand.	All owners of qualifying systems	http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MA98F&re=0&ee=0

Utilities in states with RPS requirements may purchase SRECs from PV generators in order to meet their RPS requirements, in effect creating an additional incentive for system owners. The mechanics of how this takes place differ from state to state. In states such as New Mexico and Colorado, utilities procure SRECs from behind-the-meter systems through standard offer purchase arrangements with a specified price and term. In these states, SREC procurement from larger grid-supply projects usually takes place

[viii] For summary information on state RPS and solar/DG carve-out policies, see the DSIRE maps describing state standards (http://www.dsireusa.org/summarymaps/index.cfm?ee=0&RE=0).

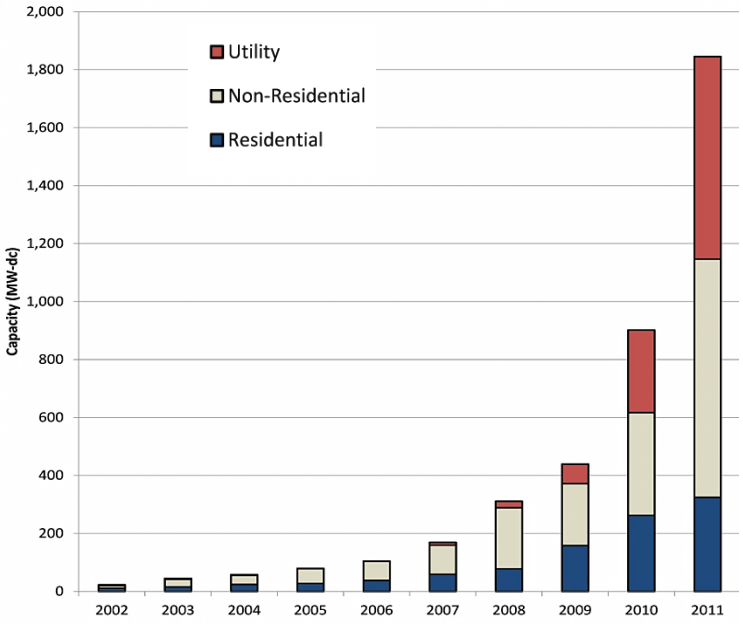
through a competitive RFP process and typically also includes an electricity sales contract. In other states, such as Maryland and Pennsylvania, SREC owners must make their own efforts to find purchasers via open trading markets. In states with open trading markets, the value of an SREC fluctuates according to supply and demand. Some states (e.g., Delaware and New Jersey) have chosen to address the issue of SREC price uncertainty by developing programs that offer long-term contracts for SRECs, while Massachusetts has devised an auction mechanism that establishes an SREC "floor price." [9] However the system is designed, SRECs may be a key component of the value a PV system has to its owner, though in some cases this value is difficult to predict beyond the immediate future.[ix]

2.1.5 The U.S. Solar PV Market in Brief

The market for solar PV is growing rapidly in the U.S. both in terms of the number of new installations and the total installed electricity generating capacity. By the end of 2012, there were approximately 7,221 MW of solar PV installed in the U.S. Solar PV installations in 2012 reached 3,312 MW, an increase of 76% over the amount of generating capacity installed in 2011 (1,887 MW). This represents a continuation of the explosive growth that took place in past years, which saw an increase of 123% from 2010 to 2011 (848 MW to 1,887 MW); an increase of 95% from 2009 to 2010 (435 MW to 848 MW); and similarly impressive growth rates in prior years (see Figure 2).[10]

Notwithstanding the dramatic pace of overall industry development, market growth remains somewhat concentrated in a few states, largely due to supportive state policy environments. The top three states (California, Arizona, and New Jersey) represent more than 65% of the total capacity installed during 2012.[11] Though this detail is important in understanding the general nature of the PV market (i.e., development is uneven from state to state), it must be emphasized that new PV installations are occurring in every state each year and numerous other states have also been significant

Figure 2: Annual Installed Grid-Connected PV Capacity by Sector (2002–2011)

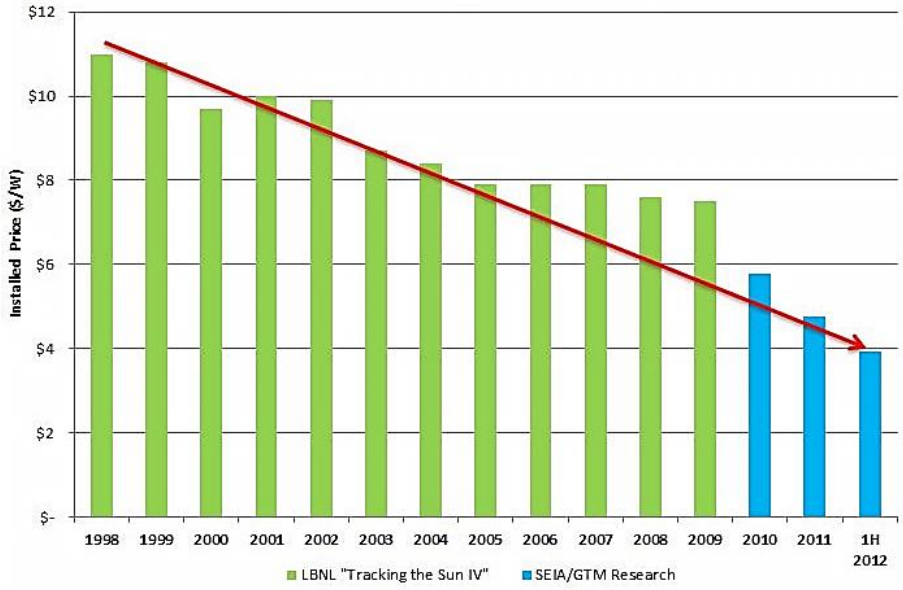


[ix] Property tax laws rarely specifically address RECs or their potential value. One exception, though, is Colorado, which considers RECs to be intangible personal property which may not be valued separately by assessors (see Section 4 for further details).

market participants.[x] Through 2011, a total of 25 states had installed at least 10 MW of cumulative PV generating capacity, and installations totaling more than 100 MW had been completed in 8 states.[12] Moreover, it is estimated that by the end of 2012, there were more than 300,000 individual grid-connected PV installations operating in the U.S. The bulk of cumulative installed generating capacity resides in the non-residential (40%) and utility sectors (40%) as opposed to the residential sector (20%).[13] However, data through 2011 indicates that roughly 85% of individual installations were located on residential sites.[14]

Beyond overall growth, two other significant trends are also shaping the PV market: declining system costs and the increasing role of third-party ownership. Installed costs for PV system costs have declined significantly and continuously, with particularly sharp declines during the past four years. Figure 3 displays long-term blended industry averages, while Figure 4 displays more detailed quarterly averages for different sectors. The effects of project size figure substantially in these numbers, as smaller residential systems are more expensive on a $/W basis than larger commercial systems, and commercial systems are more expensive than utility-scale systems.[15, 16] While all sectors have experienced significant cost reductions in recent years, the rate of these reductions has been higher for larger systems, particularly utility-scale systems. Overall, system cost reductions have been driven by technological advances, significant increases in module manufacturing capacity, an increasingly efficient and competitive industry, and a reduction in non-hardware costs known as *soft costs*.

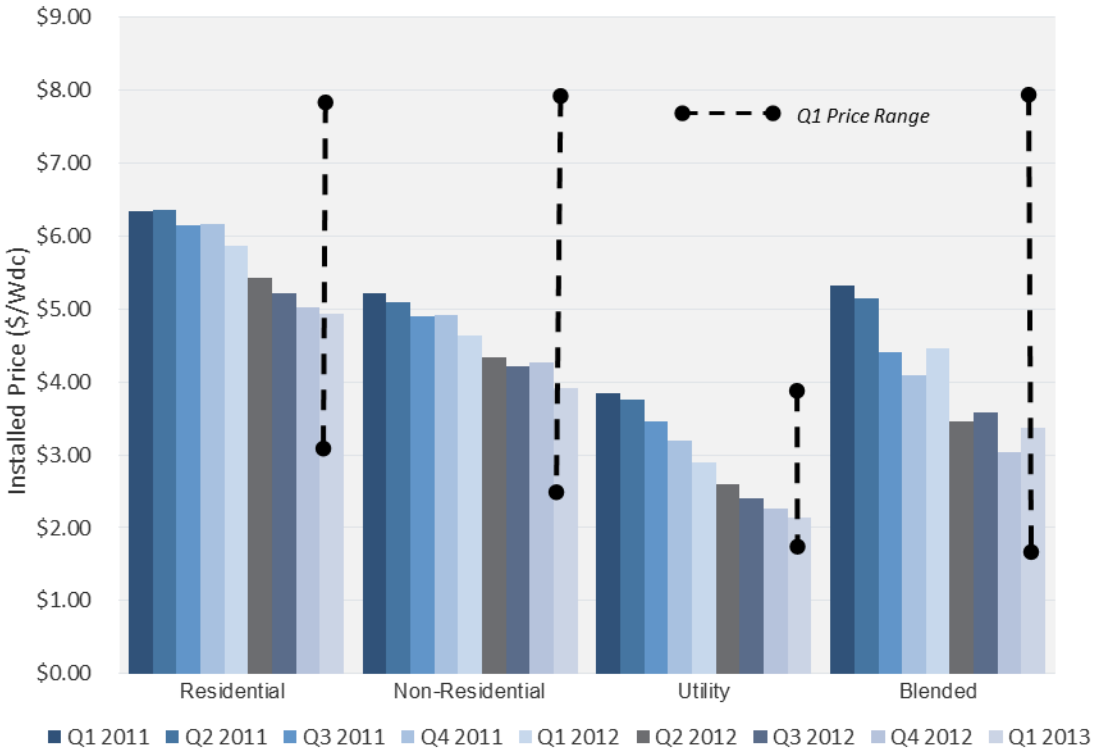
Figure 3: Blended Average Solar PV Installed Costs (1998–Q2



[x] Market concentration can be evaluated in a number of ways. Assessments of cumulative installed capacity display a slightly different picture of overall market concentration than quarterly numbers because they are somewhat less sensitive to the completion of individual large projects. The concentration is also markedly less significant when analyzed on a per capita basis. This removes a bias that favors more populous states, but introduces a different bias in that large installations in states with relatively low populations can dramatically impact the results.

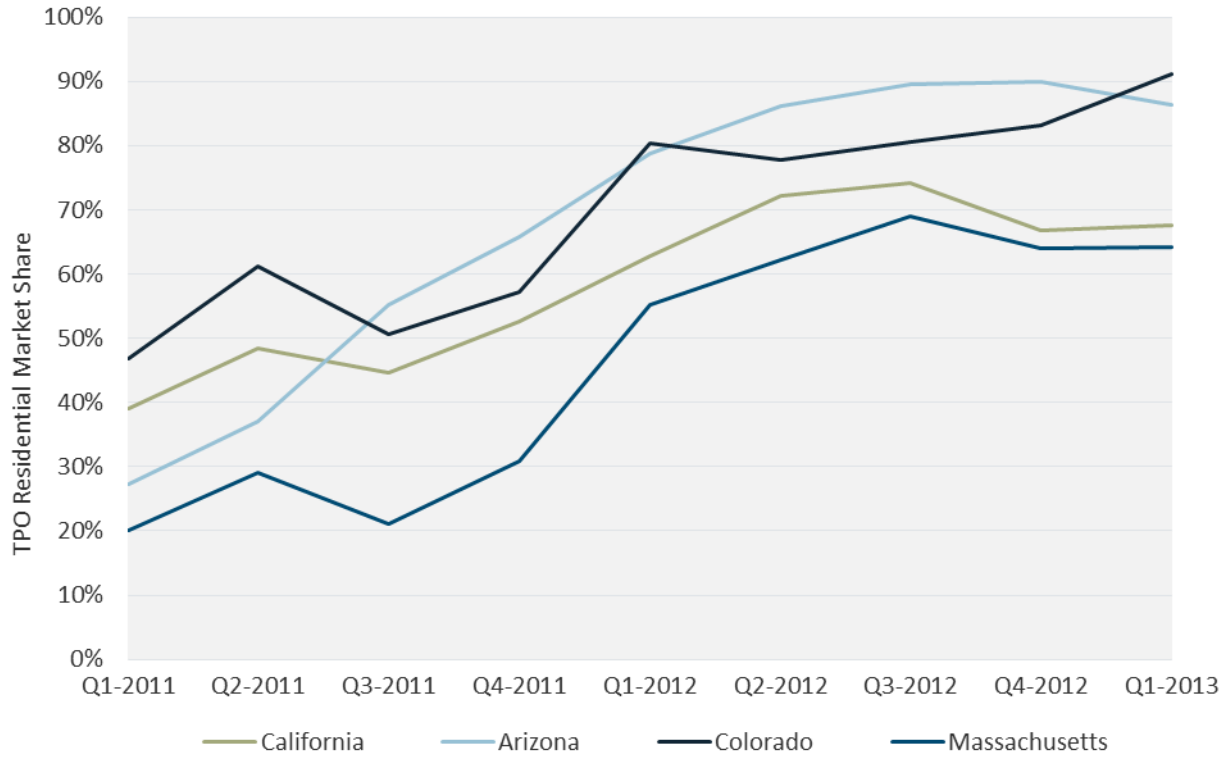
Soft costs include those associated with customer acquisition, site labor, installer profits, permitting, utility interconnection, and financing. The magnitude of these costs has been estimated at 23% of total costs for residential systems, 17% of total costs for commercial systems of 250 kW or less, and 5% of total costs for commercial systems larger than 250 kW.[17] The industry has been less successful at reducing soft costs than it has at reducing hardware costs, though a series of new soft cost reduction initiatives that have been launched at the federal, state, and local levels.

Figure 4: Average Installed Price by Market Segment, (Q1 2011–Q1 2013)



The second important trend, the increasing use of the third-party ownership model, has dramatically changed the behind-the-meter PV market. As noted previously, third-party ownership arrangements are not prevalent or viable in all states, but where they are employed, they are capturing a steadily increasing segment of the market. Third-party ownership has long been the model of choice in the non-residential sector, but has also made substantial inroads in the residential sector since 2010. As shown in Figure 5 below, in 2012, third-party ownership accounted for over 80% of new residential installations in Arizona and Colorado and over 60% in California and Massachusetts. In the first quarter of 2013, more than 90% of new installations in Colorado are owned by third parties. Similar trends are emerging in other states, such as New Jersey and Hawaii, as well.[18, 19]

Figure 5: Percentage of Third-Party Owned Residential Installations (Q1 2009–Q2 2012)



2.2 Property Taxes: Methods and Process

The following is a generalized description of how property assessment and taxation takes place in the U.S. It is intended as an introductory primer for those not familiar with property tax policy and should be read with the understanding that: (1) state laws governing property taxes are diverse and may depart from the general principles described here in certain ways and (2) it does not purport to address many of the finer details of state law (e.g., levy limits, equalization). Section 4 of this report contains more detailed descriptions of property tax policies in all 50 states and the District of Columbia as they relate to PV installations.

2.2.1 Property Assessment Basics [xi]

In the U.S., property taxes are one of the most significant sources of local government revenue. In many states, the percentage of local revenue raised through property taxes exceeds the amount raised from other sources, often comprising well over 50% of local collections. The money raised by local taxing

[xi] The descriptions of assessment methodologies and their suitability for different types of property were sourced primarily from the Official Standards of the International Association of Assessing Officers (IAAO, see http://www.iaao.org/sitePages.cfm?Page=219). Other information contained in this section is based on a survey of state property tax laws, regulations, and assessor guidelines unless otherwise referenced.

districts through property taxes is most often used to fund local government services, and tends to be particularly important for funding public schools.[20, xii] The amount of property tax owed is fundamentally tied to the value of various types of property, which is established by the practice of property assessment.

Property Classification

The classification of a property is one of the most important considerations in determining if and how it will be taxed. The classification may determine the primary methods used to value the property, whether any exemptions apply, and the applicable assessment rate. For classification purposes, property is generally broken down into two broad classes: *real property* and *personal property*. Though state definitions differ somewhat in the details, real property is generally defined to include land and all permanent improvements to the land. The definition of personal property generally includes anything that is not real property (see Section 3.1 for further details on property classification framework).

Within these broad categories, states sometimes establish numerous sub-classifications. Tangible personal property is often separated into the classifications of non-business personal property, which is almost always exempt from taxation (excepting motor vehicles), and business personal property, which is usually taxed but is exempt in some states.[xiii] Personal property may also be further disaggregated into categories for commercial property, industrial property, and utility property. Real property classifications follow similar patterns in that property might be classified into further categories such as residential, utility, commercial, industrial, etc.

Approaches to Valuing Property

There are three generally accepted methods of assessing or appraising property to determine its value: the sales comparison or market approach, the cost approach, and the income approach. All three are based on the principle of substitution, meaning that the value of property is determined by what a buyer would pay for property of equal usefulness.[xiv] Assessors are typically required to consider all three approaches when determining the value of a specific piece of property, but in many cases, one method is more suitable than the others. In practice, this means that assessments of certain types of property rely more heavily on one approach or combination of approaches. Each general approach also has variations that are intended to account for the myriad of different circumstances that may be present in an assessment.

[xii] The role of property taxes in local government finance and public school funding is ever-changing and the finer details are beyond the scope of this report. For an excellent summary of the issues at hand and state policy circa 2004, see the National Conference of State Legislatures publication *A Guide to Property Taxes: The Role of Property Taxes in State and Local Finances*.

[xiii] Personal property may also be considered either tangible or intangible. Intangible personal property includes assets or items of value that are not physical in nature (e.g., stocks, bonds, contracts, and agreements). State property tax laws differ on the taxability and treatment of intangible personal property.

[xiv] Valuation literature often uses the term “utility” to describe the relative usefulness of property. We avoid using the term “utility” in the context of property valuation because this report frequently uses it to refer to providers of electric service.

Sales Comparison or Market Approach

A comparable sales or market-based assessment determines property value using sales of similar properties within the immediate vicinity of the property being assessed. This approach is used frequently to determine the value of real property, which includes the value of the land as well as the value of permanent improvements such as residential owner-occupied homes. It is less suitable for properties that do not sell often, serve a special purpose and are not comparable to other properties, or are used for the generation of income. Many different characteristics contribute to the value of a property in either a negative or a positive manner and their level of influence can be subjective. Since few properties are exactly identical, the assessor must often make adjustments to the valuation based on the differences between otherwise similar properties and/or aspects of a sale (e.g., personal property transferred under a sale or financing terms) that influence the price paid by a buyer.

Cost Approach

The cost approach determines the value of property based on how much it would cost to replace the property in question with property of equal usefulness. It is often used for personal property such as machinery and equipment, as a supplement to the comparable sales approach for real property improvements where adequate sales data does not exist, and for specially purposed properties. With respect to property improvements, it tends to be more reliable for newer construction using relatively standardized designs and materials. It cannot be used to value land itself because land is not replaceable or reproducible. As a result, when it is used to value improvements to land, the value of the land must be arrived at separately (typically using comparable sales) in order to arrive at a value for the property and improvements as a whole.

The cost approach is implemented by applying depreciation and inflationary trends to the original acquisition cost of the property in question, or to a representative current cost for the same type of property.[xv] The accuracy of this method hinges on the accuracy of cost data and the estimate of accrued depreciation. Many states publish guides or manuals for assessors to use in making the requisite calculations.[xvi] These guides typically contain useful life estimates for hundreds of individual types of property, depreciation tables, and inflationary trending factors – but often not for PV.[xvii] The combination of depreciation and inflationary trending results in a "percent good" factor that is multiplied by the starting cost basis to determine the remaining value of the property. While property remains in service performing its intended use, such as a PV system that is still generating electricity, it

[xv] Sometimes the term *replacement cost* is used to refer specifically to a valuation that utilizes a representative current cost for replacing a certain type of property, which is differentiated from a method that uses the original cost. In other cases the terms are used interchangeably or the cost approach is used to refer to one or the other. Reproduction cost is differentiated from replacement cost, in that it refers to the cost associated with creating an exact replica of the property in question, rather than a substitute of equal usefulness.

[xvi] See, for example, the Iowa Real Property Appraisal Manual (http://www.iowa.gov/tax/locgov/propmanual.html) and Florida's Tangible Personal Property Appraisal Guidelines (http://dor.myflorida.com/dor/property/tpp/).

[xvii] Some states publish guidelines or appraisal manuals that address PV installations, though review of these publications indicates that in most cases PV property is not specifically mentioned.

cannot typically be depreciated beyond a certain residual or floor value. Assessors are generally permitted to make adjustments to depreciation schedules as needed to accommodate the unique characteristics of a given piece of property, and may also make further adjustments for *abnormal obsolescence* of the property. Obsolescence refers to the tendency of property to become obsolete and hence less desirable to a purchaser. Abnormal obsolescence reflects a loss of value that would not be captured in standard depreciation calculation based on the estimated economic life of the property.

It is important to note that the accrued depreciation estimated by an assessor may not correspond to the depreciation reported for income tax purposes. In fact, for a PV system, the accrued depreciation for property tax purposes is almost always lower (i.e., the remaining value is higher) than PV system owners can claim for income tax purposes under the federal Modified Accelerated Cost Recovery System (MACRS). A related point of potential confusion is that some states refer to the federal *class life* of equipment for the purpose of determining average economic life for property tax purposes. For PV, this class life is not the same as the *recovery period* used in calculating federal depreciation. The recovery period for PV systems under MACRS is generally five years, while the class life is 12 years.[21]

Income Approach

The income approach is used for properties intended to generate income or for which income is motivation for their purchase, such as rental housing and commercial or industrial properties. It may also be appropriate for leased equipment because the lease generates income for the lessor. The income approach essentially measures the value of a property based on the present value of the cash flows it will produce over its life. This incorporates both expected revenue and expected costs, discounted over time. The ratio of annual operating income to market value is usually referred to as the *capitalization rate*. The selection of the proper capitalization rate depends on various market characteristics, including, but not limited to lending rates, desired investor returns, and the expected property tax rate. The result of an income-based valuation depends heavily on the assumptions used in its generation.

While the capitalized income approach can, in theory, be used to value any type of property, it is usually less appropriate for valuing property that is not used to generate income (e.g., owner-occupied residential homes). However, an argument can be made that PV systems do produce income, even if it accrues in the form of energy cost savings rather than as a "sale" of electricity. Moreover, an income-based approach supported by sufficient data is likely more credible than a market valuation based on insufficient sales.

Assessment Implementation

In general, property tax policy is set at the state level, but the actual assessment of property and collection of taxes usually takes place at the local level through a local assessor's office. One major exception to this general rule is the assessment of public utilities and other industries that pay property taxes in multiple local jurisdictions. For example, in most states, IOUs are assessed centrally by a state agency (e.g., the state Department of Revenue). States differ on where the line between local and central assessment falls; therefore, some types of utility property (e.g., office buildings) and some types

of “utility” property (e.g., power generation facilities not owned by an IOU) frequently remain within the purview of local assessor’s offices. Local assessment responsibility falls at the county level in most states, but a number of states assess property at other levels of government (e.g., the township or municipal level).

Most states set minimum education, experience, and continuing education requirements for assessment personnel and some require professional certifications or designations. States may offer voluntary or mandatory training programs for local assessment officials. Training and certification programs for assessors are generally similar or identical to those used by private appraisers. However, while federal law generally requires professional certification for private appraisers, no such federal requirement exists for assessors.[22]

Real property assessments are updated on periodic cycles that are usually defined by state laws, ranging from one year to more than five years. State laws are generally written to define the maximum period between reassessments, so local jurisdictions may reassess property more frequently than the state defined maximum. Outside of the standard reassessment cycle for all properties, improvements made to a property typically trigger a reassessment as well. Personal property is reassessed every year. Owners of personal property are generally required to file annual reports describing their personal property assets with the assessing jurisdiction. Assessors employ a variety of methods to discover whether changes have been made to a parcel of property or whether personal property has been properly reported. Discovery may include a physical inspection of the property, a review of permitting documents, or a search of new business listings. Penalties may be assessed on property owners that fail to properly report real property improvements or items of personal property.

2.2.2 Translating Property Assessments to Taxes

While the value of a property is the fundamental basis on which property taxes are levied, other elements of the property tax system also influence the ultimate amount owed in taxes by the property owner. These include the applicability of exemptions or abatements, the assessment rate, and the property tax rate.

Property Tax Exemptions and Abatements

In many states, certain entities are exempted from paying property tax in order to achieve specific state policy goals. This is done in a number of ways through property tax laws. In some states, exemptions may be created through the enactment of laws. Other states only allow those exemptions identified in the state constitution. Exemptions are often granted for property that is used to serve some beneficial or public purpose, such as public schools, governments, and charitable or religious organizations. Many states also allow exemptions intended to support economic development (such as the construction of a new manufacturing facility) or allow local governments to do so at their discretion. In other cases, property may not be wholly exempt from property taxes, but is granted a partial exemption or is assessed at a reduced rate in relation to value. A total of 34 states offer exemptions, exclusions, or some form of special assessment for PV systems (see Section 4 for a state-by-state analysis of property assessment and taxation policies that may affect PV installations).[23]

The Challenge of Implementing an Exemption for PV

All exemptions create a dividing line between property whose value is taxable and property whose value is not taxable. Exemption laws for PV typically require that the value of a PV system or the value added by a PV system to a property, or both, be disregarded for the purpose of assessment. It is tempting to look upon an exemption as providing a simple solution to the problem of accurately valuing a PV system or the value it may add to a property. Unfortunately, the reality is that an exemption may merely delay, but not remove, the fundamental valuation challenge for the assessment official.

The reason for this is that all properties are reassessed on periodic cycles, the maximum time between reassessments being dictated by state law. When a new PV system is installed on a property, an exemption can typically be implemented by simply ignoring its presence. In this case, the prior valuation of the property without the PV system is known, so leaving the valuation unchanged reflects the fact that it is considered to add no value to the assessment. However, when a reassessment takes place, this is no longer an option. The value of the property will almost certainly change, and in order to properly separate the exempt portion of value from the taxable portion of value, the assessor must be able to arrive at a value for the PV system, or the value that it adds to a property.

The City and County of Denver, Colorado, where a significant number of PV systems exist, is currently tackling this challenge as part of an upcoming reassessment. Colorado law exempts from property taxes both residential, customer-owned PV systems and PV systems of 100 kW or less owned by third-parties and sited on residential property (see Colorado section for details). The Denver Assessor's Office has historically implemented this exemption by simply disregarding the presence PV installations on residential properties, a practice which is common in other jurisdictions as well. However, an upcoming real estate reassessment, which is done every two years in Denver, will require a change in that strategy.

The Denver Assessor's Office is now in the process of assembling information on PV installations and creating a uniform method of recording the features that influence value, such as size, age, and system ownership. The prevalence of third-party owned systems in Denver adds additional complications, as Colorado law exempts PV systems themselves from property taxation, but not the value added to a property by a PV system (see Section 3.2.3 for a more detailed discussion of this issue). The Assessor's Office has indicated that building permits may supply at least some pieces of this information, such as age and location, but that information on other elements may need to be obtained through different means.[xviii] For instance, system size might be estimated using aerial photography to discover the number of panels on a given property, and utility records may indicate the ownership arrangement.[xix] Problems with property discovery are by no means unique to PV installations, as reported sales prices in many cases do not indicate all items included in a property transfer (e.g., appliances, furniture). However, they do represent a potentially significant problem for PV systems because of their relative cost/value in relation to other individual features of a property.

As of this writing, the discovery process is ongoing. Even with the necessary information on PV systems in the local area, it remains to be seen whether sufficient paired sales exist to arrive at the contributory value of PV for all properties. Valuations of properties that cannot be estimated based on paired sales will likely take place using the replacement cost approach employed for non-residential systems in Colorado.[24]

[xviii] Local permitting requirements and systems vary, so the amount of information that may be gleaned from permitting databases may vary as well.

[xix] It is worth noting that the ability to ascertain system ownership information through utility data may be the exception rather than the rule. Xcel Energy (the electric utility serving Denver) offers different incentives for customer-owned vs. third-party owned systems so their records should indicate this detail. In other jurisdictions utility records may not indicate system ownership because net metering and interconnection arrangements take place between the utility and electric customer without regard to ownership of the PV system. In some cases, the assessor may have a difficult time getting access to utility data on PV installations due to prohibitions on disclosure of customer data, or simple reluctance to do so on the part of the utility.

Exemption provisions sometimes contain clauses allowing for or requiring the exempt property owner to make a payment in lieu of taxes (PILOT). The purpose of a PILOT is to reduce the tax burden on the property owner, while preserving some of the forgone revenue that would have been paid in property taxes. PILOTs are common for large industrial facilities, including energy generation facilities, though not all states permit them. States that do allow PILOTs often prescribe limiting terms for their use by local taxing jurisdictions (e.g., type of facility, term, and level of reduction).

Assessment Rates

Where property is taxable, determining the amount owed is accomplished by multiplying the assessed value of the property by the applicable tax rates. The assessed value of a property may be equivalent to the full cash value or market value. Alternatively, it may be set at a percentage of this value, either by statute, the state Constitution, or at the local level. This percentage of the full cash value or market value is usually referred to as the assessment ratio or rate. Where an assessment ratio is used (i.e., a rate less than 100%), different types of property are often assessed at different ratios. For instance, a residential owner-occupied home may be assessed at 10% of its value, while personal property may be assessed at 15% of its market value, and property owned by an electric utility may be assessed at 25% of its value.

Property Tax Rates

Property taxes may be levied by a number of different local government entities, so the overall rate experienced by the property owner is highly specific to the location.[xx] At the very least, the taxes owed typically reflect levies by counties, municipalities, and school districts. They may also include a state levy, levies for specific local government expenditures (e.g., a bond issuance), fire districts, and other special districts that provide local services. Exemptions, exclusions, and local option provisions are sometimes applicable only to taxes levied by certain governmental entities.

Property tax rates are generally designed to raise the amount of revenue needed for local services beyond that which can be raised from other sources (e.g., other local taxes, fees, or grants). The property tax rate is calculated to generate the balance of required revenue based on the assessed value of taxable property within a district. Thus, if revenue needs remain static, a change in valuation does not necessarily translate to an equivalent change in local property tax collections. Instead, it influences the rate of the levy in an upward or downward direction. Increased valuation may therefore allow the taxing district to reduce the levy rate for all property owners, while valuation decreases may contribute to levy rate increases. Notwithstanding this general rule, there are also cases where some property tax components are established at a pre-determined rate (e.g., state education taxes in Montana and Michigan). This relatively straightforward process is complicated by the numerous state laws that may limit increases in assessed value, local property tax rates, or growth in local revenue.

[xx] Property tax rates are often established as “mill rates,” which refer to the dollar amount levied per $1,000 in assessed value. For instance, a 10 mill levy results in a tax of $10 on every $1,000 in assessed value.

Property tax valuation methods and rates vary significantly on a state by state basis, as well as within local jurisdictions in each state. Section 4 conducts a state-by-state review of solar PV property tax policies.

2.3 Property Tax Impacts

The impact that property taxes have on the financial viability of new and existing solar PV projects can be significant. Property taxes can add anywhere from $1/MWh to $120/MWh to PV system project costs, sometimes affecting project economics in ways that can unintentionally prohibit the development of PV. These impacts are not easily visible because such calculations often require an arduous analysis that must include reliable information on how installations will be classified and valued, the availability of applicable exemptions, and local property tax rates, all over an extended period of time. As profiled in this report, some of this information is not necessarily readily available, and treatment varies from state to state and even from one local jurisdiction to another in the same state. Where it is available, after making the requisite calculations, the amount owed during any given year is not particularly meaningful unless placed in the context of cash flows from a specific project. This makes it difficult to compare the relative burden that property taxes place on different kinds of PV facilities in different states and local jurisdictions.

In order to shed light on how property taxes impact solar PV projects, we have estimated how property taxes would affect a series of hypothetical projects in a number of states, stated in terms of average $/MW of generating capacity and $/MWh of energy production over 20 years (Table 3; Appendix B). Table 3 provides examples in Colorado, North Carolina, Ohio, and Washington; Appendix B provides further data fields and state examples. The **Installed Cost Estimate $/W** field is an estimate of the cost of a PV system in that state for the type of facility described in the **Property or Assessment** type field. The **Average $/MW range** field shows the amount of property tax due per MW of installed PV. This allows a direct comparison of how state laws, assessment methodologies, and property tax rates translate to differential property tax burdens in different states. The **$/MWh** field provides an estimate of the amount of property tax due for each MWh of electricity a PV system produces. This accounts for the fact that systems in some locations will produce more electricity than those in other locations, while also showing how they relate to the "value" of electricity produced as indicated by electricity price benchmarks. Appendix B includes a percentage comparison of the value of electricity to the cost of property taxes, illustrating the value of electricity production that is "lost" to property taxes.

The estimates use the following assumptions and data sources:

- Electricity production estimates utilize data from the National Renewable Energy Laboratory (NREL) PVWatts™ calculator under default values for system orientation and overall energy conversion efficiency. [25] The values used are averaged for different locations within a state and were constructed as ranges (+/- 10%) to yield a low, middle, and high estimate for annual energy production.

- Electricity production from a PV system is assumed to degrade at a standard rate of 0.5% annually.
- Electricity price data used in Appendix B is sourced from the U.S. Energy Information Administration.
- Installed system costs were taken from data published by Lawrence Berkeley National Laboratory and the NREL's Open PV database as appropriate for the type of system in question.
- Property tax rates were estimated as ranges based on surveys of public reports from state agencies.

Table 3: State Property Tax Cost Comparisons

State	Property or Assessment Type	Installed Cost Estimate $/W	Property Tax Rate Range	Average $/MW Range	Average $/MWh Range
CO	Behind-the-meter commercial, 2 MW-AC or less	N/A (standardized cost)	5–10%	$11,166–$22,332	$7.00–$17.10
CO	Behind-the-meter commercial, 2 MW-AC or less (w/inflation)	N/A (standardized cost)	5–10%	$13,289–$26,578	$10.17–$20.35
CO	10 MW grid-supply	N/A (standardized cost)	5–10%	$7,368–$14,736	$4.62–$11.28
CO	10 MW Grid-Supply (w/inflation)	N/A (standardized cost)	5–10%	$8,767–$17,534	$5.49–$13.43
NC	All non-utility, non-residential projects (with 80% special assessment reduction)	$4.45	0.49–1.54%	$2,471–$7,754	$1.78–$6.83
OH	PILOT for facilities of 250 kW-AC or larger	N/A (standard fee)	N/A	$7,000	$5.89–$7.20
OH	Non-PILOT projects larger than 250 kW-AC that generate electricity for sale	$6.00	3.82–10.69%	$36,652–$102,557	$30.58–$104.58
WA	Facilities treated as personal property; includes facilities not owned by the owner of the underlying real property.	$6.27	0.80–1.39%	$18,594–$32,157	$16.32–$34.49

As an example, for PV systems put to a business use, North Carolina exempts 80% of the appraised value from property taxes. Systems for personal use are considered non-business personal property that is exempt from property taxes. For taxable systems, the state uses a standard 18-year trended original cost depreciation schedule to value PV systems. Therefore, using an original cost of $4.45/W and accounting for depreciation of the system over time and the 80% exemption, a PV system owner would owe an average of $2,471–$7,754 in property taxes per MW installed each year for 20 years. Given an average system output in North Carolina and an average system degradation rate, this is equal to an

average of $1.78–$6.83 per MWh produced each year for 20 years. These taxes are relatively low compared to a facility in Washington that is treated as personal property, which would average between $16.32 and $34.49 per MWh.

In contrast to North Carolina and Washington, Colorado values commercial behind-the-meter installations of 2 MW-AC or less using a depreciated cost approach based on a standard reference cost ($1,173/MW in 2013 with annual adjustments) rather than the original cost. For larger projects, it uses a similar cost-based system, but varies the reference cost by system size and incorporates an adjustment system intended to equalize annual payments due over time. Finally, Ohio exempts PV systems of 250 kW-AC or less from property taxes, and creates a PILOT option for larger systems that generate electricity for sale. Where utilized, the PILOT generally prescribes a flat fee of $7,000 per MW, rendering local property tax rates irrelevant. However, it is possible that some systems would not be granted a PILOT, subjecting them to taxation under the depreciated original cost approach used for utility property. Section 4 contains further descriptive information on property taxation of PV systems in these and other states, and Appendix B contains further examples of potential cost impacts.

3 Issues with PV and Property Taxation

For the most part, property law is within the realm of state law, rather than federal law, and disputes are generally handled in state courts. State laws often then guide or grant authority to local municipalities to set local tax policies, including property taxes. While the preceding section was intended to summarize the basic elements of property tax policy that affect the treatment of PV systems, this section explores specific issues with property tax policy implementation and includes illustrative state examples as appropriate.

3.1 Real vs. Personal Property Distinctions

3.1.1 Classification Importance and Considerations

Property law covers the set of rules defining a person or an entity's relationship to "things," which are classified as either being *personal property* or *real property*. The distinction between real property, also known as real estate or realty, and personal property, also known as personalty, frequently figures into how property is assessed and taxed in several ways. First, and perhaps most critically, the classification of property as real or personal property may determine whether or not it is taxable. Excepting vehicles, personal property not used for the generation of income (e.g., typical household furnishings) is almost always exempt from property taxes, and business personal property (or certain types thereof) is exempt from property taxes in a number of states. Moreover, some states use different assessment ratios for personal property than they do for real property, and personal property tax rates also sometimes differ from real property tax rates. Finally, the classification may prove important in determining how the property itself is valued. Assessments of real property and permanent improvements tend to lean more heavily on comparable sales valuation (though sometimes in combination with cost-based approaches), while personal property is valued far more often using the cost approach or income approach as appropriate. Cost-based approaches used for items deemed to be real property improvements may also use longer economic lifetimes than those typically used for personal property. Ultimately, these different elements of state policy can profoundly influence the tax burden of a property owner.[xxi]

State laws more or less agree on the general characteristics that differentiate real property from personal property, though definitions are not identical from state to state, and often the finer language in state laws and court precedents play a pivotal role in determining the classification of individual items or types of property. Notwithstanding these variations, the generic definitions are useful in understanding how differentiations are made in practice. In general legal terms, real property is defined as "land or anything attached to, or erected on it, excluding anything that may be severed without injury to the land." Personal property is defined as "any movable or intangible thing that is subject to ownership and not classified as real property." [26]

[xxi] The individual state practices in this area are profiled in brief in Section 4 of this report.

The International Association of Assessing Officers expands upon these general definitions to provide additional details and examples, as follows:

> "Real property is the rights, interests, and benefits connected with real estate. Real estate is the physical parcel of land, improvements to the land (such as clearing and grading), improvements attached to the land (such as paving and buildings), and appurtenances (such as easements that cross the parcel or give access to the parcel). Personal property is defined by exception: property that is not real is personal. The salient characteristic of personal property is its movability without damage either to itself or to the real estate to which it is attached."
>
> "Personal property is divisible into two classes—tangible and intangible. Examples of tangible personal property are material items such as animals, marine vessels, aircraft, motor vehicles, furniture and fixtures, machinery and equipment, tools, dies, jigs, patterns, and stock in trade (including inventories held for resale, supplies, and materials in process). Examples of intangible personal property are representations of rights of ownership to property—cash, shares, annuities, patents, stocks, bonds, notes receivable, insurance policies, accounts receivable, licenses, contracts, franchises, money market certificates, certificates of deposit, and copyrights—as well as goodwill." [27]

In other words, personal property is essentially any item of property that falls outside the definition of real property. These definitions also illustrate an important characteristic of property differentiation. An item of personal property can cease to be personal property and become real property when it is attached to the land. Whether this is the case for PV can depend on the physical characteristics of an individual installation (i.e., how it is attached), and its degree of "permanence." Generally, an item of what would otherwise be personal property, such as machinery, is not considered to be a real property improvement if it is not intended to remain at the site throughout its useful life.

The property classification of solar PV can be challenging because it often exhibits characteristics of both real and personal property and individual projects differ in their characteristics. Individual components of a system, such as the panels and inverters, are typically readily removable, being bolted on rather than welded in place. However, PV systems are often "attached" to the land or real property improvements such as buildings. For instance, some (though not all) racking systems penetrate the roof of a building, and ground-mounted systems may be attached by pilings driven into the ground or concrete foundations. Their removal may therefore cause injury that necessitates repairs and some of the components removed may not be reusable. Ownership arrangements may also be important. A PV system lease or retail PPA contract will likely contain clauses that provide for system removal under certain circumstances (e.g., non-payment, sale of home). One the other hand, removal and/or reinstallation for any reason would entail significant costs, and is not likely in the interest of either the lessor or the lessee except as a last resort.

In practice, the criteria for distinguishing whether an item is real or personal property can depend on the definitions of a myriad of explicitly, or vaguely, defined terms such as "improvement," "fixture," "intent of owner," "means of attachment," or "contribution to highest and best use of the property." These

definitions serve as a guide, but there are often other legal and tax implications as to how phrases like "injury to the land" and "used in a taxpayer's trade or business" are defined. Case law provides numerous examples of how these types of terms are interpreted given a certain set of facts and circumstances, sometimes in reference to property taxes, but also for other purposes (e.g., sales and use taxes). As a consequence, there is no real broadly applicable "bright-line" test for determining whether an item of property is real or personal in nature. Though individual states frequently do identify important criteria based on their underlying laws, the elements of these tests can remain somewhat subjective. The following examples profile the how several states and the U.S. Internal Revenue Service distinguish real property from personal property, and, in some cases, how conflicting interpretations have been dealt with.

3.1.2 State Classification Examples

New Jersey

In New Jersey, business personal property taxes were repealed effective October 1, 1993, excepting petroleum refinery equipment and telecommunications equipment, which remains taxable (§ 1, L. 1993, c. 174). State law explicitly defines a three-part test for identifying the proper classification ((N.J.S.A. 54:4-1(a); -1(b)), as follows:

> "Real property taxable under this chapter means all land and improvements thereon and includes personal property affixed to the real property or an appurtenance thereto, unless:
>
> (a) (1) the personal property can be removed or severed without material injury to the real property;
>
> (2) the personal property can be removed without material injury to the personal property itself; and
>
> (3) the personal property is not ordinarily intended to be affixed permanently to real property; or
>
> (b) the personal property is machinery, apparatus, or equipment used or held for use in business and is neither a structure nor machinery, apparatus or equipment the primary purpose of which is to enable a structure to support, shelter, contain, enclose or house persons or property."

Legal conflicts over the constitutionality and interpretation of Section (b) (See *General Motors Corp. v. City of Linden*, 150 N.J. 522 [1997]) and resulting interpretation of the tax court has held that "if an item of machinery, apparatus or equipment is taxable under the (a) test of the Business Retention Act . . . it could not be excluded from taxation under the (b) test" (17 N.J. Tax at 130, fn 2, referenced in ABA Property Tax Deskbook, 2011–2012, 17th Edition). As a result, compelling arguments could be made as to how PV should be treated depending on the specific circumstances of a business operation and how the PV system is affixed to a property. In theory, a PV system could be removed without causing any material injury to the equipment or the roof, except in the case of BIPV. The issue has not yet been

formally confronted, though it could be inferred from New Jersey's real property exemption law that installations that provide energy for on-site use are in fact considered real property (N.J. Stat. § 54:4-3.113a et seq.). After all, if they were not, the exemption would be rendered meaningless. In contrast, as described in Section 4, grid-supply projects are currently being dealt with on a case-by-case basis, with most of the property associated with an installation being considered personal property on the basis that many components are easily removable without the potential for injury. Pending legislation could change this practice, subjecting grid-supply PV projects to a standardized valuation methodology and obviating the need for such determinations.

Illinois

Personal property is not subject to property taxes in Illinois; though corporations, partnerships, trusts, S corporations and public utilities pay a personal property replacement tax on income generated or invested capital.[28] Illinois law defines real property as "The land itself, with all things contained therein, and also all buildings, structures and improvements, and other permanent fixtures thereon…" (§ 35 ILCS 200/1-130). This aspect of state law proved to be significant when commercial wind energy development began in the mid-2000s. At issue was whether a wind turbine was real property, personal property, or some combination of both (e.g., the tower is real property but the blades are personal property). Individual counties arrived at different determinations on the matter and, as a result, assessed values could vary by as much as 75% from one county to another.[29]

In response to the need for clarity and consistency on the matter, in 2007, Illinois enacted legislation (Public Act 095-0644) essentially classifying commercial wind turbines as real property (at least in part), and supplying a standardized method for their valuation. The standard valuation methodology calculates the fair cash value of wind energy devices of 500 kW or larger, the "2007 real property cost basis," at $360,000 per MW of nameplate capacity. To determine value each year, the chief county assessment officer applies an inflationary increase pegged to the U.S. Consumer Price Index (CPI) to produce a trended real property cost basis. This value is then depreciated on a straight-line 25 year schedule with a floor value of 30% of the trended real property cost basis. The fair cash value includes the land on which the turbine is located and the portion of the turbine that is considered "real property." Because Illinois assesses property for tax purposes at one-third of its fair cash value, the assessed value for each wind energy device is $119,988 per MW ($360,000*.33).[30]

Nevada

Both real property and personal property are taxable in Nevada, but items of personal property may generally be depreciated more quickly than improvements to real property, which by law are depreciated 1.5% annually for up to 50 years (NRS 361.277). Nevada law defines real property to include "All houses, buildings, fences, ditches, structures, erections, railroads, toll roads and bridges, or other improvements built or erected upon any land…" (NRS 361.035). The statues do not elaborate further on the topic, but the regulations adopted by the Nevada Tax Commission provide that real property includes *fixtures* (NAC 361.11715). The term *fixture* has a detailed definition, but essentially refers to an item of personal property that is permanently affixed to land or a real property improvement (NAC

361.1127). The language related to defining permanence has proved controlling in the deliberations of the Nevada Department of Taxation (DOT) on property tax abatement applications of two large grid-supply PV projects. In both cases the abatement applicants had listed some property items as personal property on their applications, which the DOT determined was not appropriate.[31, 32]

The reasoning behind these determinations is instructive in understanding how such a decision may be made. Under Nevada property tax regulations (NAC 361.1127), an item of property is considered to be a permanent attachment if:

> "1. Either:
>
> (a) An item is attached to, imbedded in, or permanently resting upon land or an improvement, or is attached by other means that are normally used for permanent installation, and cannot be removed without substantially damaging the item or the land or improvement with which it is being used; or
>
> (b) The use or purpose of an item that is not otherwise physically annexed to land or an improvement is so adapted that it is:
>
> (1) A necessary, integral, or working part of the land or improvement;
>
> (2) Designed or committed for use with the land or improvement; or
>
> (3) So essential to the land or improvement that the land or improvement cannot perform its desired function without the nonattached item; and
>
> 2. A reasonable person would consider the item to be a permanent part of the land or improvement, taking into account annexation, adaptation and other objective manifestations of permanence."

The 2012–2013 Nevada Personal Property Manual refers to 1.(a) above as physical annexation and 1.(b) above as constructive annexation, with 2. above referring to intent that underlies both. The DOT analysis focuses on constructive annexation, specifically 1.(b)(3) above, reasoning that all of the PV system components are "attached" or otherwise essential to the desired function of the facility. In one case, it also considers applicant statements that the project will have a 50-year project life and a 30-year renewable land lease to establish the "permanent nature" of the facility.[33]

New York

Personal property is not subject to property taxes in New York (NYCL Real Property Tax Law § 300). Real property is defined in great detail, but among other things, includes a "power generating apparatus…but shall not include movable machinery or equipment…" (NYCL Real Property Tax Law § 102). No significant determinations have been made regarding the proper classification of PV facilities; however, the issue has been addressed for wind power installations. In the case of wind power, in 1993, the New York Office of Real Property Tax Services (ORPTS) issued an opinion that a commercial wind farm should be

considered real property and therefore subject to taxes "when the intent of permanence of installation can be inferred from its use in generating electricity to be sold to a utility company." [34]

The opinion is based on a prior court decision which laid out the principles for determining real property, stating that to be considered real property, an item must:

1) be actually annexed to the real property or something appurtenant thereto;

2) be applied to the use of the real property; and

3) be intended as a permanent accession to the freehold.

The ORPTS opinion considers the first two criteria met because wind turbines are anchored to the ground, and electricity generation comprises a use of the real property. It considers the third criteria met by the "very nature" of the wind turbines as wholesale electricity generators, which infers they will likely remain in place throughout their useful lives.[35] Given that a wholesale wind power facility was treated as real property, it could follow that a wholesale PV facility would also be treated as real property. As the analysis above focused on the intended permanence, rather than the other real property criteria, it is difficult to know whether the ORPTS would perhaps have a different view of a PV facility that is less firmly "anchored" to the ground.

U.S. Internal Revenue Service (IRS)

While not controlling in any state context, the tests used by the IRS provide yet another example of the issues at play. Under IRS rules, any addition to real property that is viewed as permanent in nature will, under most circumstances, be considered to have become part of the real property. A PV system may be real property if it is "inherently permanent" and is personal property if it is "an accessory to the operation of a business." These two terms are mutually exclusive. The IRS establishes whether an item of property is "inherently permanent" using the following questions: (1) "Is the property capable of being moved, and has it in fact been moved? (2) Is the property designed or constructed to remain permanently in place? (3) Are there circumstances that tend to show the expected or intended length of fixation, that is, are there circumstances that show the property may or will have to be moved? (4) How substantial a job is removal of the property, and how time-consuming is it? (5) How much damage will the property sustain upon its removal? (6) What is the manner of affixation of the property to the land?" (IRS Rev Rul 80-151). Some inherently permanent assets as identified by the IRS include: commercial buildings, HVAC systems, cellular towers, LED billboards, and railroads.[36] The similarity of solar PV to any of these assets could be used as an argument that PV should be classified as real property (at least in the eyes of the IRS).

On the other side of the spectrum are the characteristics that typify personal property, which in the IRS rules includes any item that is "an accessory to the operation of a business" (IRS Rev Rul 80-151). One way this is determined is through an analysis of the "passivity" of the property. Property that is active rather than passive in nature (e.g., machinery) is considered an accessory to the business, and hence personal property. While a detailed discussion of this topic is beyond the scope of this report, a passivity

analysis would examine how an item of property functions, it characteristics of operation, and how it is connected (or not) to the business of the user.[37]

A further important question is whether a PV system should be viewed as a collection of individual components or equipment which can be classified separately, or as an integrated system. A PV system is made up of numerous components including the panels, racking system, roof attachment materials, inverter, electric meter, and wiring. Whether or not any of these components can be viewed as separate pieces of property or the system should be viewed as an integrated whole could determine how permanent the system is. In theory, if a person moved from the property, they could take the PV system with them or take only certain parts of the system leaving behind the wiring or roof racking for the new owner or tenant.[xxii] On the other hand, each of these components is essential to the operation and intended use of a PV system and presumably is designed precisely to fit the needs of the individual site (i.e., it might be inadvisable or impractical to move different components to a new site). If a PV system is viewed as an integrated system, it would follow that all pieces of the system should be classified in the same way.[38]

3.1.3 Classification Methods in Summary

The preceding examples display a number of similar elements, but also variations based on underlying state laws and regulations. A classification analysis would therefore include an investigation of several characteristics, as follows:

1. Whether the property classification is explicitly stated or implied by state law or regulation
2. The potential for injury to the PV property or to the underlying real property upon removal of the equipment
3. The physical character of the facility, including the degree to which various components are "attached" to each other or the underlying real property
4. The details of other indicators of the permanence of the facility, such as any associated contracts or leasing arrangements
5. The degree to which a system functions as an integrated whole rather than a collection of independent pieces of machinery and equipment, including whether it is uniquely adapted for a specific site or use
6. Whether or not a system is being put to a business use of some type

Despite state definitions that display common themes, different determinations may be reached under different circumstances for various reasons. In some cases, this may be due to fundamental differences in the nature of one facility compared to another, but in others, these differences could be the result of more subjective judgments based on divergent interpretations of underlying laws or weighting of different classification factors. Unfortunately, there are no easy answers to the question of whether PV systems are real or personal property. Absent a state law or administrative determination, the answer will typically be: "It depends." For many property owners, particularly those in states where

[xxii] BIPV systems are, by definition, integrated into the structure of a building, making it difficult to argue that they are not real property. Other components, such as the inverter, may still pose classification challenges.

classification could dramatically affect property tax burdens, this is not a very satisfactory response. Due to the potentially significant impact that classification can have on taxation of PV property, overall, there is a pressing need for clarity among property tax regulations in many states.

3.2 Clarity of the Terms Governing State PV Exemptions and Special Assessments

It is reasonable to think that any state property tax law that specifically addresses PV is an improvement over the alternative (i.e., attempting to sort out the proper treatment under general property tax laws). Unfortunately, however, even PV-specific laws sometimes present interpretation challenges, giving rise to the possibility that they will be implemented in different ways in different jurisdictions. The sources of these interpretation challenges are varied. The following section details several elements that have been found to be problematic in one or more states. In some cases, these uncertainties have given rise to clarifying statutory changes or state-level guidance, while in others, they remain unaddressed.

3.2.1 References to a Comparable Conventional System

Many state laws have their origins in the late 1970s and early 1980s, a time when "solar" was far more likely to refer to solar thermal systems than PV. In these older laws, the language authorizing an exemption or special assessment sometimes dictates that solar energy installations are valued at no more than the value of a "conventional" system. This is the case in Illinois, where solar improvements are valued at no more than the value of a "conventional heating and cooling system," though the law does specifically provide that solar electricity generation devices qualify for the exemption by including them within the definition of a qualifying "solar collector" (§ 35 ILCS 200/10-5 et seq.).

For solar water heating, this language is reasonably clear, in that the conventional system in question can reasonably be concluded to be a non-solar water heating system. The language is harder to interpret in the context of PV. Presumably the "conventional heating and cooling" system is utility-provided electricity or natural gas, but PV generation can only be used indirectly for heating or cooling. Moreover, a generous interpretation could potentially apply the special assessment to large grid-supply PV facilities if one assumes that conventional electricity generation (e.g., coal, nuclear, natural gas) is the valuation reference. While such an interpretation could be in conflict with the presumed intent of the law, the lack of clarity creates uncertainty as to the scope and impact of the special assessment for both large- and small-scale PV generation systems in the Illinois context.

3.2.2 Grid-Supply Vs. Behind-the-meter Systems

To the extent that they address PV, many state property tax laws draw lines between behind-the-meter generators that supply energy for on-site use and generation projects that sell electricity at wholesale or directly to the grid. These two types of PV project typically operate on dramatically different scales and display fundamentally different intents on the part of the owner (i.e., reducing on-site energy costs vs. being in the business of electricity sales). However, not all state laws are clear about if, or where, a line should be drawn. This can be problematic when the distinction fails to account for variations in state PV markets that deviate from the general rules for behind-the-meter and grid-supply projects. These issues

are grouped into three categories: lack of differentiation, ambiguous wording, and consideration of PV market variations.

Lack of Differentiation

Utility-scale PV is a relatively new phenomenon and has not yet been built in many states. However, the rapid growth of large grid-supply PV projects (see Figure 2 in Section 1) creates the potential that they will be encountered with increasing frequency in more states and local jurisdictions. Large grid-supply PV facilities will likely have considerable impacts on local revenue, and policies affecting their assessment may invite scrutiny and create conflict.

California is probably the most prominent example of a state where disputes have arisen over the applicability of property tax exclusions to large grid-supply PV projects. The language of the underlying law (Cal Rev & Tax Code § 73) fails to specifically exclude grid-supply systems from the overall PV exclusion, and recent guidelines issued by the California Board of Equalization (BOE) maintain that the exclusion does in fact apply to "utility-scale systems." [39] The BOE's stance has been met with opposition from several local governments. Both Inyo and Riverside County made comments on draft versions of the guidelines, arguing the intent of the underlying law does not support the inclusion of grid-supply projects (i.e., solar farms).[40, 41] In a subsequent letter to the BOE, an Inyo County official opined that allowing the exclusion to apply to utility-scale projects would deprive local governments of significant (and much-needed) local revenue.[42]

The potential for disagreements of this type is not limited to California. Exemptions in place in Minnesota (Minn. Stat. § 272.02), Wisconsin (Wis. Stat. § 70.111(18)), and New York (NYCL Real Property Tax § 487) do not specifically identify whether grid-supply facilities are eligible for the special treatment, though the New York law is a local-option law that also permits local taxing jurisdictions to enter PILOTs. None of these states have experienced the type of controversy that has occurred in California, likely because large-scale PV development in those states lags behind that in California.[xxiii] A similar conflict has occurred regarding wind power projects in Kansas, where by law all wind power projects are exempt from local property tax. However, in reality, most wind project developers in Kansas offer some form of payment (similar to a PILOT) to the local community in exchange for receiving all of the necessary local permits and approvals. While wind development may be ahead of PV on the national scale, the potential certainly exists for a newly proposed PV projects to excite contention. The New York law seems to represent a compromise that allows local taxing jurisdictions to choose the method that best suits their goals.

[xxiii] A recently completed 2 MW grid-supply project in Minnesota has in fact been determined to be exempt, though it does not appear that the exempt status has resulted in any contention.

Ambiguous Language Where Differentiation Exists

Most states with PV-specific property tax laws do distinguish between behind-the-meter and grid-supply projects. However, careful attention must be paid to the associated definitional language. Failure to do so may result in implementation practices that deviate from the intent of the law or create confusion over how the law should be applied. The exemption laws in Iowa and Maryland illustrate this importance, as both use language for which the meaning is not immediately apparent and easily prone to multiple interpretations.

Under Iowa law, a solar energy system must supply energy to "storage or a point of use" in order qualify for a five-year exemption from property taxes (Iowa Code § 441.21(8)). The meaning of the phrase "point of use" is not explicitly defined, but the Iowa Department of Revenue (DOR) considers the point of use to be at the site where the system is located. Historically, the DOR took the position that the exemption did not apply to systems that *export any electricity* to the grid, rendering a typical net-metered system ineligible for the benefit. This interpretation was revised in a 2009 opinion, providing that while the primary use of the system must be to supply energy for use on-site, a transfer of excess energy to the grid does not exclude a system as long as this primary use is maintained.[43] Thus, what many would regard as an overly narrow interpretation of the law was ultimately remedied, but clearer statutory language would have obviated the need for this revision.

Maryland's real property tax exemption for PV systems illustrates the opposite end of the ambiguity spectrum. In Maryland, the exemption language defines qualifying solar energy property as systems that "generate electricity to be used in a structure or supplied to the electric grid" (Md Code: Property Tax §7-242). Thus, though it addresses the reality of net metering by explicitly permitting electricity exported to the grid, it creates the impression that a grid-supply system classified as real property qualifies for the exemption. However, as described in Section 4, in Maryland, grid-supply electricity generation systems are not considered real property, but are instead considered personal property and hence remain subject to personal property taxes. Unfortunately, this distinction could easily be lost in a casual reading of the exemption statute, creating the potential for confusion and dispute if a solar developer were to presume that the exemption applied to both real and personal property.

Attention to PV Market Variations

In many states, the intended use of a system can be inferred from its configuration relative to the grid. A typical system installed on the site of a residential or commercial building is most often installed behind-the-meter to supply energy for on-site use. In contrast, grid-supply systems are usually medium- to large-scale solar farms (often using a ground-mounted design as opposed to being placed on a rooftop) owned by a business engaged in the sale of electricity. However, there are a number of states and local jurisdictions where this general rule of thumb does not hold true owing to variations in the underlying policy or incentive environment that influence project characteristics. Two policy variations in particular, virtual net metering and buy-all, sell-all incentive arrangements (i.e., feed-in tariffs, or FiTs), deserve special attention. These types of policies blur the line between grid-supply and behind-the-meter

generation, as well as between business and personal use of the facility itself. The circumstances in Massachusetts and Indiana illustrate how these variations may affect property owners.

In Massachusetts, the 20-year property exemption afforded for PV systems is only available for systems that supply the energy needs of taxable property (M.G.L. ch. 59 § 5 (45)). While a traditional net-metered system meets this statutory requirement, net metering policy in Massachusetts has evolved since the time the exemption was enacted and now permits virtual net metering in a very flexible manner. Virtual net metering facilities must be located behind a customer meter (i.e., they serve some on-site energy demand), but net metering credits may be transferred to other customers for the purpose of offsetting energy demand on different sites. Moreover, a net metering credit transaction in many cases resembles a sale, perhaps not of electricity itself, but certainly the ability to benefit from that electricity.

Virtual net metering systems exist in a gray area between being a behind-the-meter system and being a grid-supply system. While the Division of Local Government Services within the Massachusetts Department of Revenue has issued limited information to assessors on exemption eligibility (i.e., grid-supply projects are not exempt), it does not address the complications presented by virtual net metering.[44] As a result, consistent treatment of virtual net-metered systems, even those where the credits are applied to other accounts of the same customer rather than sold to multiple account holders, remains elusive.

Resolution of these issues will, in many cases, require legislative action. One example of such action is in Indiana, where a PV equipment exemption was enacted in 2012 (Ind. Code § 6-1.1-12-26.1). Indiana's law is well-designed to accommodate systems that participate in either net metering or a FiT (i.e., grid-supply), without including systems that do not provide on-site benefits to the property owner. It does this by explicitly stating that both net-metered and FiT systems are eligible, while also excluding any entity that sells power at wholesale or retail unless the owner or host is an electricity customer that consumes the equivalent of the electricity generated by the system on-site on an annual basis. The detailed delineation of eligibility is important in Indiana because two state utilities, Indianapolis Power and Light and Northern Indiana Public Service Corporation (NIPSCO), have offered FiT programs.[45]

3.2.3 Exemption of the System vs. Exemption of Value Added

An exemption or special assessment law can essentially be defined in two ways. Under one option, the system itself can be exempted. Under the other option, the value added by the system to a piece of property can be exempted. While it is tempting to think of the two options as being functionally identical, in practice, the value of the equipment may be different from the value it adds to a parcel of property. In a traditional ownership arrangement, the value of the system and value added by the system reside with the same property owner. This makes it them difficult or impossible to separately evaluate, though they may still be different. One might look upon the value of a PV system as being represented by its depreciated cost or ability to generate income, while the value added to the property by the PV system is represented by the premium that a buyer would pay for a property equipped with a

PV system compared to an identical property not equipped with a PV system. The difference is most easily understood in the context of a third-party ownership arrangement, where the rights and obligations associated with these distinct values reside with different owners.

In a third-party ownership arrangement, the system itself has value to the third-party owner because it generates income from lease or electricity purchase payments. It also affects the value of the host property because it changes overall electricity costs. In other words, if it reduces overall energy costs for the host property, it also increases (in theory) the value that the property would bring in a sale, while the reverse would be true if the arrangement increases overall energy costs. To the extent that it exists, any value added is reduced from what it would be if the system was owned by the host property owner, because it reflects a sharing of the value of the system between the two parties. In effect, the relative value provided to the host property owner can be seen as being provided by the lease or PPA contract that encumbers the property and results in the energy cost savings.[xxiv] However, this only holds true if the lease or PPA can be transferred to a subsequent owner, which may not always be the case.

The significance of this value division in the context of state policy is most apparent where the host customer is exempt from property taxes (such as a church or non-profit organization that signs on to a PPA agreement with a developer). Under these circumstances, an exemption of the value added by a PV system is meaningless, since the host property itself is not subject to property taxes. However, if the system itself remains subject to property taxes, then the owner (developer) is deprived the financial benefit of the exemption. This may, in turn, have the effect of increasing the lease payments or the power purchase rate experienced by the host customer because either must be adjusted by the system owner to account for additional operating costs. During 2011, legislation was enacted in Oregon (H.B. 2563) for the specific purpose of addressing this issue. As amended, Oregon's exemption statute provides that both the alternative energy system (which includes PV) and the "real market value" added by the system are exempt from property taxes (ORS § 307.175).

The potential effect may be muted where the reverse is true and the system, rather than the value added by the system, is exempt from property taxes. Many characteristics of a property influence the price that it might bring in a market sale, and it can be challenging to isolate the contribution of individual property characteristics to market value. For example, in the City of Denver, 88% of all new residential systems in 2012 were leased rather than purchased outright by the host property owner. In Colorado, residential PV systems are exempt from property taxes, though the value added by a PV system is taxable. While the Denver Assessor's Office has attempted to ascertain whether leased systems added value to host properties, it has been unable to reliably demonstrate that any increase exists. The current thinking is that to the extent it does exist, any contribution is so small that it becomes lost in the multitude of other subjective valuation considerations.[46]

[xxiv] Similarly, a deed instrument that preserves an ocean view also adds value to a property, and a zoning permit that allows the development of a property in a certain way also influences its value.

3.3 Issues with PV on Exempt Real Estate

PV systems installed on real property or real property improvements (i.e., the roof of a building) that are already exempt from property taxes may present special issues for assessment. These special challenges are generally not related to the valuation and taxation of the PV system itself or the value added to the property, but to whether the PV installation in some way jeopardizes the existing property tax exemption.[xxv] This broad issue is similar to that described in Section 3.4, which covers PV installations in the context of a special farmland assessment.

3.3.1 Exemptions Background

States and local taxing districts grant property tax exemptions for a number of reasons, but they commonly exist for property that serves a public or beneficial purpose. This may include schools, government buildings, libraries, places of worship, or property devoted to a charitable purpose (e.g., used by a non-profit). State laws vary, but usually require that a property be used for an exempt purpose, be owned by an exempt entity, or both. Often the language governing the use of the property is limiting, requiring the property to be used "exclusively" for an exempt purpose. What this means in practice is not always clear. The individual facts and circumstances, actual language of the law, and any judicial precedents are all very important in determining taxability. Where questions arise over whether a given piece of property is eligible for an exemption, state laws typically prescribe that disputes be resolved in favor of taxation.

These two characteristics, an exclusive use requirement and default determination of taxation, may place owners of exempt property in a tenuous position when PV is installed on the property. While the risks are likely greatest where the system is owned by a third-party, they may also exist even where the system is owned by the host property owner. The danger in either case is that the exempt property could be viewed as being used for the generation of income, violating an exclusive use requirement. Where exemption status is granted on the basis of ownership, the danger is diminished or removed entirely.

3.3.2 Systems Owned by an Exempt Landowner

In most cases, a typical net-metered facility that supplies on-site energy to an exempt property should not create conflicts with respect to an existing exemption. The PV system, by virtue of being owned by an exempt entity and supplying electricity for on-site use, is presumably being used in conjunction with an exempt use. However, systems that exist under a buy-all, sell-all arrangement or generate SRECs for sale could be seen by some as being used with a view towards profit. It appears that this potential complication is theoretical, and likely not cause for immediate concern because such systems typically

[xxv] An exception to this is in Massachusetts, where the property tax exemption for PV equipment applies only to systems located on taxable property (M.G.L. ch. 59 § 5 (45), meaning that a third-party owned system located on tax-exempt property remains subject to property tax. This issue is specific to Massachusetts, as the language of the Massachusetts law is not replicated in other states.

do not exhibit the characteristics of a true "business" as defined by state Departments of Revenue (or equivalent).

For instance, in North Carolina, property owned by an educational institution, operated on a not-for-profit basis, and used exclusively for educational purposes is exempt from property taxes (N.C. Gen. Stat. § 105-278.4). While the installation of PV on such property has never been specifically addressed, the North Carolina Department of Revenue has indicated that business vs. non-business use should be determined according to the tests described in its 2011 guidance to assessors on solar electric energy systems.[47] This guidance states that business use is only implied if the owner recognizes income from the property (e.g., files a federal Schedule C) or depreciates the capital expense of the system.[48]

Thus, in North Carolina at least, one can conclude that the installation of a PV system under a host-owner model should typically not impact an existing property tax exemption. While it is possible that assessment officials in other states would apply different tests, the logic used in North Carolina could be used to present a compelling argument against a loss of exempt status. An exempt property owner might also argue that as long as any revenue realized from the system is used to support an exempt purpose, the use of the property remains exclusively devoted to that purpose.

3.3.3 Third Party Ownership: Land or Roof Leases for Grid-Supply Projects

As with any other PV system, a third-party owned system on exempt property could be installed as a grid-supply project or behind-the-meter to provide energy for on-site use. A grid-supply project involving a third-party owner typically leads to the third-party owner executing a roof or land lease with the property owner at a market rate and selling the electricity produced by the system to an outside entity (e.g., a utility).[xxvi] The property owner benefits only from rental payments associated with the PV system rather than energy produced by the system.[xxvii] Land lease transactions may present a risk to existing use or purpose exemptions because they result in a situation where the property is clearly being used with a view towards profit by the third-party owner (and arguably the lessor as well), while also likely changing the physical character and use of the land. Under these circumstances, it is hard to argue that an exempt use is being maintained, and revocation of the exemption would impose a significant financial impact. That said, exceptions exist in some states under some circumstances, so exemption forfeiture, while perhaps likely, should not necessarily be considered a given.

[xxvi] If the arrangement offers the third-party owner a below-market rate, it may be considered a taxable leasehold interest for which the lessee owes property taxes. It may be more challenging to determine the market rate for roof space rentals than for land rentals. Assigning a market value for the rental of roof space also leads to the interesting conclusion that roof space suitable for PV (or other uses) has a value in and of itself.

[xxvii] The rental rate could be based on system performance (e.g., 5% of revenue), but since the electricity is sold for use off-site, the lessor still does not directly benefit from the electricity produced by the system.

In Ohio, for instance, real property generally must satisfy an exempt use requirement and may not be leased or otherwise used with a view towards profit (see for example ORC §5709.07 relating to schools, churches and colleges).[xxviii] Consequently, the lease of exempt property to a for-profit private entity (e.g., a lease of land for a solar farm) will generally cause an exemption to be lost. However, an exception to this general rule has historically existed for state college or university property, as long as the lease payments are used to support the institution. A recent Ohio Supreme Court Opinion has unsettled the issue by deciding that while a secondary use of the property to produce income is not fatal to the exemption, the primary use must remain operationally connected to university activities.[49] A somewhat similar situation exists in Pennsylvania where certain properties, such as those owned by universities, hospitals, and charitable organizations, may be used to generate revenue, provided the revenue is used to support the entity or its charitable purposes (53 P.S. § 8812).

Ascertaining the proper treatment of a roof lease arrangement is somewhat more challenging, as the addition of the PV system does not fundamentally alter the use of the structure in the same way that it would alter a parcel of land. For instance, if a piece of property is exempt by virtue of its use as a house of worship, leasing the roof for the installation of a PV system in no way detracts from that use. The answer likely rests on how strictly the term "exclusive use" has historically been interpreted by property tax officials and the courts, and whether these interpretations permit some form of secondary or incidental use. There is a lack of clear examples of how this has played out in practice, as roof-leasing arrangements are relatively uncommon. At least one governmental entity in North Carolina, Gaston County, has entered into such an arrangement.[50] However, in North Carolina, property owned by a unit of government is exempt by ownership, rendering the issue moot in this case (N.C. Gen. Stat. § 105-278.1).

3.3.4 Third-Party Ownership: Systems that Provide On-site Generation

The other model of third-party ownership is a behind-the-meter arrangement where the PV system owner leases the PV system, or sells electricity from the PV system, to the host property owner. This generation is most typically used to meet on-site needs, but where buy-all, sell-all incentive programs exist, the electricity is resold to a utility.[xxix] Many entities afforded a property tax exemption are also exempt from income taxes, making them unable to directly utilize federal tax benefits for solar. Consequently, for tax-exempt entities, third-party ownership is typically a very attractive option. While leases of exempt property for grid-supply projects are comparatively rare, retail third-party ownership

[xxviii] The Ohio Revised Code does not require exempt school property to be owned by the school. However, the public school exemption may not be applied to real property that is leased to a school with a view towards profit, an issue recently addressed by the Ohio Supreme Court. In a 2010 decision, the Ohio Supreme Court decided that a commercial building leased by a private company to a charter school did not qualify for the public school exemption despite its use for an exempt purpose, because the lessor entered into the arrangement with a motivation for profit. See *Anderson/Maltbie Partnership v. Levin*, 127 Ohio St.3d 178, 2010-Ohio-4904 (http://www.supremecourt.ohio.gov/rod/docs/pdf/0/2010/2010-Ohio-4904.pdf)

[xxix] The latter arrangement is not common, as most utilities offer net metering rather than buy-all, sell-all arrangements, and the buy-all, sell-all arrangement does not fit the business model of many third-party owners.

of PV among tax-exempt entities is common. Any complications associated with third-party ownership and the exemption status are therefore important to address.

As in the grid-supply scenario considered in the prior section, under a retail third-party ownership arrangement, the property is clearly being used with a view toward profit by the third-party owner. However, the circumstances are somewhat different because a strong argument can be made that no profit motive exists on the part of the host. In addition, assuming that performing an exempt purpose requires electricity, the installation of a PV system supports this purpose, or even enhances it by reducing energy costs and allowing that money to flow towards a beneficial purpose. Unfortunately, it is difficult to say how great the forfeiture danger is in the hypothetical, since state laws, court precedents, and the pattern of facts in an individual situation will undoubtedly all play a role in any decision.[xxx] The issue has been addressed in a few states, which suggests that at the very least, some perceived risk exists and additional clarity may be needed.

For example, in 2011, Oregon enacted legislation (H.B. 2563) amending prior PV exemption language to provide that real property on which a PV system is affixed is exempt if the property is otherwise exempt from taxation and the system is also exempt. Not all clarification attempts have come to fruition. In Ohio, a bill to clarify that a third-party owned PV installation would not threaten an existing property tax exemption was reportedly being contemplated during 2011, but does not appear to have ever been introduced.[51] The perceived need for the legislation originated from several communications between an interested party and the Ohio Department of Revenue (DOR), where the DOR indicated that loss of the exemption was a possibility, but that it was precluded by statute from issuing an opinion on the matter.[52] Likewise, the California Board of Equalization's (BOE) final solar exclusion guidelines adopted in December 2012 omit this detail, though the draft version issued in September 2012 provided that retail third-party owned systems sited on the exempt properties of certain non-profits do not violate the exclusive use requirement.[53] The BOE elected to remove this section of the guidelines in its final adoption in favor of clarifying it in a subsequent letter to assessors.[54]

Ultimately, regardless of the arrangement used, careful attention is necessary to verify that any exclusive use requirement can be maintained with the addition of a PV system. Property owners may be able to request an administrative ruling to this effect, but as evidenced by the situation in Ohio, in some cases a legislative solution is necessary. The growing prevalence of PV, and in particular the growing presence of third-party owned PV, should compel policy makers to consider measures that reduce the uncertainties that PV can create for owners of exempt properties.

[xxx] Even a careful analysis of a specific case could prove underwhelming. For instance, a third-party owned PV system could be one of several questionable characteristics of a property that together collectively prompt the loss of an exemption. Is the PV system to blame? Or do SREC sales by the host add to the risk? Any number of characteristics, including or not including those cited above, could influence the outcome.

3.4 Issues with Special Farmland Assessments and PV

The installation of PV systems on specially assessed farmland can give rise to a number of questions for landowners and assessors. In the agricultural context, one of the primary questions is whether and under what circumstances the special assessment can be maintained with the installation of a PV system. Laws in New Jersey and North Carolina display some important differences that highlight where issues may arise, their implications, and how they can be addressed by policy makers.

3.4.1 Special Farmland Assessment Background

Property tax relief for agricultural landowners is a common theme among state property tax laws. Many states use special assessments for land devoted to agricultural production (and, in many cases, timber production and other activities), which have the effect of reducing the property value to a level significantly less than its market value. This valuation employed is often termed a *use* or *productivity value*, differentiating it from the market value.[xxxi] The general intent of such policies is to insulate agricultural producers from valuation increases brought on by increased demand for farmland for non-agricultural purposes. Were it not for these special assessments, agricultural producers in developing areas could find themselves subject to dramatically increasing property tax burdens that adversely impact the economic viability of their farms. In effect, a productivity or use-based valuation can be thought of as employing the income approach to valuation based on the current use of the land. This may differ markedly from the value that would be arrived at by assessing the land according to its "highest and best" use under a comparable sales approach.[xxxii]

The creation of a special farmland assessment necessitates the creation of eligibility definitions for qualifying farmland. State laws differ substantially in this respect, but sometimes include limitations related to minimum acreage, minimum revenue from the sale of agricultural products, and specific activities that are considered to be an "agricultural" use. The special assessment is typically applied only to the land itself that is devoted to agriculture, rather than improvements to the land like residences or outbuildings. Because special farmland assessments are generally intended to preserve the ability of the landowner to continue to farm the land, it is lost if a landowner ceases to use the land for a qualified agricultural use. Moreover, many state laws contain provisions that subject the landowner to penalties if such a change in use occurs. Penalty provisions do not exist in all states, but where they are applied,

[xxxi] Rather than offer a special assessment, some states allow the property owner to claim tax credits if property taxes exceed a certain percentage of household income.

[xxxii] The highest and best use could, for instance, be the development of a residential subdivision or a shopping center. The use a comparable sales approach to farmland valuation where development pressure exists can contribute to a situation where agricultural land owners are "priced-out" of their land and forced to sell it. This, in turn, may contribute to inflation in the market value of other agricultural properties, creating a cycle of valuation increases, financial distress, and further sales.

they often take the form of *roll-back taxes*, where the landowner is held liable for taxes that would have been owed in prior years had the land been subject to market valuation.[xxxiii]

3.4.2 Farmland Assessment and Solar PV in Context: New Jersey and North Carolina

New Jersey

In New Jersey, state law allows special farmland assessment for land that comprises at least five contiguous acres under active agricultural use. The minimum acreage does not include the area under a farmhouse, but does include the land that underlies agriculture-related improvements such as grain silos, barns, ponds, and irrigation ditches. In addition to the acreage requirement, gross sales of agricultural products must average at least $500 per year for the first five acres and at least $5 per acre for each acre over five acres over the preceding two years.[xxxiv] Rental income is not considered income from agricultural products for the purpose of meeting this benchmark. Changes to land use that render the land ineligible for the special assessment are met with roll-back taxes equivalent to the difference in taxes paid under the special assessment to those paid under a market valuation for the year of the change in use and the two preceding years (N.J. Stat. § 54:4-23.1 et seq.).

In 2010, legislation was enacted (S.B. 1538) to accommodate the limited use of specially assessed farmland for the production of renewable energy, including PV generation. In order to remain eligible for the special assessment, agricultural land devoted to renewable energy production must meet a number of minimum criteria, as follows:

- The power generated by a PV system must be used primarily, but not exclusively, to meet on-farm energy needs.
- A conservation plan must be filed and approved by the local conservation district.
- The land underlying a PV system must be used to the greatest extent practical for the production of shade crops, pasture, or grazing.
- A maximum of one acre of land may be devoted to energy production for every five acres of land devoted to agricultural operations.
- Facilities are limited to the lesser of ten acres in area and two MW in generation capacity.

The law also provides that income generated by a PV facility is not considered agricultural income for the purpose of meeting the minimum requirements for special assessment. This distinction is important because New Jersey employs an SREC-based incentive system. Revenue from the sale of SRECs is often significant and in some cases may exceed the value of energy cost savings associated with the system. As a counterpoint, the law also provides that the normal income requirements do not apply where the land is being used for qualifying renewable energy production (N.J. Stat. § 54:4-23.3c).

[xxxiii] The practice of assessing roll-back taxes is sometimes referred to as deferred taxation, where the amount otherwise due under a market-based valuation is deferred until the land is disqualified from claiming the preferential assessment.

[xxxiv] The law contains additional requirements in addition to those most relevant for our purposes.

In effect, the law is designed to provide opportunities for agricultural landowners to benefit from on-site renewable energy generation in a manner similar to other property owners. Agricultural landowners are electric ratepayers, and like their non-agricultural counterparts, they contribute funding to New Jersey's various renewable energy incentive programs. Moreover, reductions in on-site energy costs can further enhance of the economic viability of agricultural production. The associated restrictions represent a compromise between extending these opportunities and maintaining the core principle that justifies the preferential assessment (i.e., maintaining the viability of agricultural operations).

North Carolina

North Carolina's basic laws on special farmland assessments are similar to those in place in New Jersey. The minimum acreage requirements in North Carolina are 10 acres for cropland and 5 acres for horticultural land. As in New Jersey, the land underlying a farmhouse is not included in this acreage calculation, but the land underlying improvements related to agricultural production is eligible for the special assessment. In addition, a tract of land must meet the size requirements and have produced at least $1,000 in average gross income over the preceding 3 years to qualify for the special assessment. The income requirement cannot be met with income generated by rental or from leasing of the land. Roll-back taxes apply for the year of disqualification and the previous three years if the land is rendered ineligible for the special assessment (N.C. Stat. § 105‑277.2 et seq.).

In contrast to New Jersey, North Carolina does not have any laws specific to specially-assessed farmland equipped with PV or other renewable energy systems. The various provisions of the New Jersey law are instructive in identifying issues that might be present in North Carolina and other states that have yet to clearly address PV or other renewable energy generation in the context of special farmland assessments.

While in both states any land used for the development of a grid-supply solar farm (leased or otherwise) seems clearly disqualified from the special assessment (or for inclusion in meeting minimum acreage requirements), it is not clear in North Carolina how a PV system that produces energy to supply farming operations would be viewed. The definition of agricultural land (N.C. Stat. § 105-277.3) provides that it "includes land under improvements used in the commercial production or growing of crops, plants, or animals." While a PV system can probably not be reasonably viewed as being used in the "growing" of crops, a stronger argument could be made that it contributes to the commercial production of crops, plants, or animals. This would be particularly true if the underlying land remains in cultivation of shade tolerant crops, is used for grazing, or if the growing operations of the farm are such that they require significant inputs of electricity. Unfortunately, it is not possible to conclude one way or another based on the information currently available.

Classification considerations may be particularly important for landowners with relatively small parcels of qualifying land, as a small difference in acreage devoted to agricultural production could render the landowner's total holdings ineligible for the special assessment. The installation of a PV system could also conceivably affect the qualification of land in relation to income requirements. For instance, even if land underlying a PV system continues to be considered land engaged in agricultural production, income

may be lost if it is no longer practical for crop cultivation, or if shade crop or grazing produces less income than that realized under other agricultural uses. The New Jersey law addresses this by removing the income requirement for land that underlies a qualifying PV installation. Finally, while it does not appear to be a major issue in either North Carolina or New Jersey, restrictions related to the contiguousness of qualifying land also bear attention because a PV system might be constructed in such a way that it separates individual agricultural tracts from one another.

The specter of roll-back taxes or similar penalties, which in some cases may extend 5 years or more, makes careful consideration of the applicable laws exceedingly important. In recognition of the significant benefits that on-site PV generation may hold for farm operations, policy makers should consider whether farmland assessment laws present unreasonable impediments or uncertainty to agricultural landowners, and if so, how they may be revised to accommodate PV installations (or other on-site generation) while maintaining the core principles and intent that fostered the law.

3.5 Issues with Valuing Solar PV Using Traditional Methods

Any assessor or appraiser will acknowledge that value is inherently a somewhat subjective measure, and that the accuracy of any analysis is heavily dependent on the accuracy of the underlying data and assumptions involved. This holds true for any type of property; while PV may present a new valuation challenge, it does not necessarily present one that is fundamentally unique from the myriad of other challenges faced by valuation professionals.[xxxv] The same generally accepted valuation methodologies can be applied to PV as they are to other types of property. The difficulty is in defining the most suitable method or methods to use, and ensuring that the proper inputs are present. The various difficulties that exist for each method are summarized in this section.

3.5.1 Comparable Sales/Market Approach

It is safe to assume that energy costs play into the decisions made by at least some property owners. However, one cannot assume that a hypothetical buyer will value the improvements in the same way or at the same level as the property owner that originally made them. A PV system is therefore one of many subjective considerations that influence the market value of a property. The same is true for the addition of a pool or granite countertops in a home, or floor to ceiling windows in a commercial office building. The comparable sales approach attempts to identify this contributory value in the context of the property as a whole.

The suitability of the comparable sales approach generally rests on the ability of the assessor to identify an adequate number of similar properties to be included in the evaluation. Properties equipped with PV systems can present challenges to the use of this approach because it is a relatively new and uncommon

[xxxv] For instance, appraisers and assessors may also experience difficulties in evaluating energy efficient or "high-performance" homes, which may include solar PV and as well as a variety of other value-added design characteristics and materials such as improved indoor air quality, reduced heating and cooling loads, passive solar gain, and sustainably produced or recycled materials (see e.g., Andy Kerr. "Getting the Green for Your High-Performance Home." Home Power, 153, February & March 2013).

type of improvement in many jurisdictions. Consequently, there may not be adequate sales of otherwise comparable properties for the assessor to use in an analysis. Moreover, even in jurisdictions where PV is prevalent, it may not be specifically listed as a property attribute in the databases used to find sales of comparable properties, or the listing may not include important details of the system. In other words, adequate sales may in fact exist, but they may not be visible to the analyst, or provide the necessary data. In combination, these factors can make it difficult or impossible for the assessor to determine what, if any, value is contributed to the property by a PV installation using a comparable sales approach.

These difficulties should not be interpreted to mean that PV does not contribute to the value of a property at sale, simply that this value can be hard to identify. In fact, while existing literature in this area is somewhat limited (in large part due to the difficulties identified above), data suggests that the value added can be significant. For instance, one study by Lawrence Berkeley Lab estimates sales price premiums for PV-equipped California homes at 14–22 times the value of annual energy savings.[55] Another study indicates that homebuyers have historically discounted energy efficiency savings at a 5% after tax mortgage interest rate, which translates to an increase in sale price of roughly 20 times the annual value of energy savings.[56] While these findings are certainly worthy of discussion, they must be interpreted with caution. Other studies have found value to annual energy cost savings ratios both higher and lower than those identified here, and the authors of the California study emphasize that the findings only directly apply to a small geographic area and its set of associated market conditions.

The comparable sales approach might also be applied directly to the PV system itself or its individual components rather than the value it adds to the property as a whole. Again, this approach is likely to be confounded by a lack of adequate comparable sales. At the current time, PV systems are not typically used by one party for an extended period of time and then sold separately to another. [xxxvi] Moreover, each system is a somewhat unique collection of equipment designed and adapted to a specific site, making comparisons difficult. This challenge exists for many types of specialized equipment, and is complicated by the fact that even where sales do exist, they may be subject to other factors such as liquidation or bankruptcy that exert a significant influence on the sale price.

3.5.2 Cost Approach

The cost approach attempts to measure the value of a PV system itself, as indicated by its cost or the cost to replace it, rather than the value it might add to the sale of a property. Several factors can complicate the application of a cost-based valuation to PV property. First, where original cost less depreciation is used, the assessor must determine what the original cost actually is and whether it should be adjusted to reflect the various up-front incentives used to support PV systems. Up-front incentives may reduce the net cost of a PV system by 50% or more, so any omissions on the part of the property owner (i.e., reporting net rather than gross costs), or adjustments made by the assessor, can have a significant impact on the cost basis and determination of assessed value. On one hand, it could be argued that part of the value of the equipment is its eligibility for these incentives (i.e., they should

[xxxvi] This could change, as some financing transactions used by the solar PV industry are designed with future sale transactions in mind.

not be subtracted out). On the other hand, the value of tax incentives may not be transferrable to another purchaser.[xxxvii] The seller's inability to redeem this value upon sale of the property might therefore be considered a form of obsolescence, meriting an addition to the accrued depreciation of the equipment.

A related issue is whether further adjustments should be made over time as incentives change, as revisions to incentive programs influence the net cost of replacing the property. The diverse and frequently changing nature of state and utility incentive programs may render any cost adjustment system complicated to the point of being impractical. The use of general market replacement costs is an alternative to the use of original cost less depreciation. Using generalized cost estimates also presents issues because the costs of an individual PV installation may vary significantly from industry averages, and PV costs as a whole are currently decreasing rapidly. Absent frequent adjustments, generalized cost estimates are likely to quickly become outdated. While some public industry cost data is available, the type of highly detailed data (e.g., state specific, differentiated by system size) best suited for this purpose is typically proprietary or quite costly. For instance, the quarterly Solar Market Insight reports published by Greentech Media (GTM) Research and the Solar Energy Industries Association (SEIA) are priced at $4,000 per report or $10,000 for an annual subscription, though the Executive Summary, which contains less granular data, is available free of charge.[57]

The value of a PV installation arrived at through a market replacement cost estimate may differ considerably from one arrived at using depreciated original costs. Figure 6 illustrates how these two approaches compare to one another for a hypothetical PV system installed in 1999 at an installed cost of $10 per watt. The depreciated cost calculation uses the 18-year Percent Good table established by the state of North Carolina for valuing PV systems. The market replacement cost line reflects representative average installed cost estimates from Lawrence Berkeley National Lab *Tracking the Sun* reports and more recent estimates from GTM Research. The striking detail here is that by 2012, the original depreciated cost of a 12-year old PV system is 50% greater than the market replacement cost (i.e., a brand new system) and nearly 4 times higher than the value arrived at if depreciation is applied to market cost estimates.

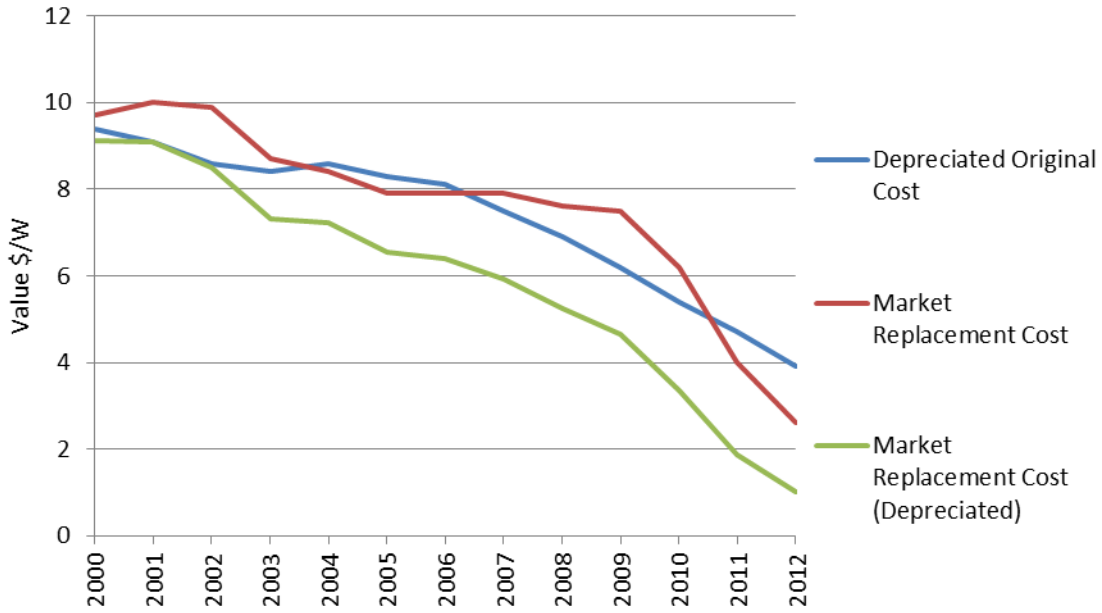
Estimating obsolescence and the accrued depreciation can be challenging for any type of equipment, including PV. The three generally accepted forms of depreciation – physical deterioration (i.e., normal wear and tear), functional obsolescence (impairment of use), and economic obsolescence (loss in value due to external forces) – can all apply to PV.[xxxviii] In normal operation, the energy production capacity of PV equipment degrades over time (physical deterioration), technological improvements may render a

[xxxvii] For instance, the federal business investment tax credit for solar can only be claimed on new equipment and vests over a period of five years. A sale of the PV property before the credit has fully vested results in recapture of the unvested portion of the tax credit. In this scenario, the unvested portion of the tax credit is in effect lost as a component of the value of the system because the seller is forced to repay the unvested portion and the tax credit is not available to the buyer.

[xxxviii] For a more complete description of the components of depreciation, see for instance the North Carolina Department of Revenue *Personal Property Appraisal Manual, Section VIII: The Appraisal of Business Personal Property* (http://www.dornc.com/publications/appraisal_assessment.html).

PV system obsolete (functional obsolescence), and many outside influences may affect the value of a PV system (economic obsolescence). Economic obsolescence is probably the source of the greatest uncertainty. For instance, the institution of an additional standby charge in a net metering tariff, fluctuations in the value of SRECs, or unanticipated shading can all profoundly influence the profitability of a PV project. These types of changes are often difficult to anticipate and may necessitate significant adjustments to the accrued depreciation of a PV system.

Figure 6: Value Comparison under Cost Approaches



3.5.3 Income Approach

The use of the income approach is typically limited to properties that are actively used for the generation of income such as a rental property or leased equipment. This has implications for its use in valuing PV property because some would question whether income generation is a primary motivation for the installation of some PV systems. For leased systems owned by a third-party business or systems for which the electricity produced is sold to another party, income is likely to be a motivator. While it can be argued that the value of energy savings produced by a behind-the-meter, customer-owned PV system is a form of income, not all would agree with this assertion. The underlying policy and incentive environment may complicate such a determination, in that some states and utilities offer programs that allow for sales of electricity (i.e., FiTs or other buy-all, sell-all arrangements) or provide opportunities for the sale of SRECs. To further complicate matters, the revenue generated by a PV system as a result of these programs may be reported for income tax purposes. Whether this qualifies PV installations as income-producing property is a matter of debate, and the recognition of PV systems as income-producing property also has implications for other aspects of property tax law.

Beyond suitability considerations, using the income approach may currently be impractical to implement on a broad scale for small installations due to the time and effort required to assemble the necessary

information. If used, the income approach requires extensive and detailed project-level information such as system energy production, operation and maintenance costs, electricity or PPA rates, potential revenue from SRECs, and tax rates over an extended period of time. At present, this type of information may be challenging to assemble in a consistent and comprehensive manner, though it is not necessarily unobtainable and in fact appears likely to become more readily available over time. For instance, some information might be supplied by permitting systems (though modifications may be necessary), and the Appraisal Institute has published a Residential Green and Energy Efficient Addendum for use by appraisers in recording information on PV systems and other green attributes.[58] As with a comparable sales analysis, the challenge for an assessor is not so much obtaining this information for one property, but doing so for many properties that must all be treated equally. Even where attribute collection systems are in place, forecasting the value of avoided electricity purchases and SREC revenue can present a challenge to the use of the income approach for some facilities. Standardized estimates could be used, though the methodology behind their generation would need to be robust enough to stand up to reliability disputes.

In recognition of the need to provide a standardized, relatively simple approach to estimating the value of PV systems, Energy Sense Finance and Sandia National Laboratory have developed an income-based, spreadsheet-based tool called *PV Value*™.[xxxix] The tool allows for a variety of user inputs, such as system size, age, orientation, discount rate, zip code (to estimate utility rates), and ownership model. It also provides default values for some of these inputs, obviating the need for the user to, for instance, estimate utility rate escalation over time, and includes an instructional guide for users.[59] While this is an improvement over the alternative (i.e., a custom discounted cash flow analysis spreadsheet for each project), out of necessity, the simplified approach sacrifices granularity in some areas. Future refinements of the model will take place to address these needs, but some issues (e.g., forecasting SREC prices where they represent significant value) are likely unresolvable, and efforts to increase the resolution of value estimates could diminish its simplicity. To-date, *PV Value*™ is not being used at a broad level in the assessor community, though this may be due to the fact that the tool itself is relatively new and many assessors may not even be aware of its existence, rather than any fundamental aversion to its use. In fact, the creators report that it is being promoted for use by the State of Vermont, and interest has been expressed by appraisal professionals in other jurisdictions.[60]

[xxxix] PV Value™ is a trademarked name of Jamie Johnson and Energy Sense Finance.

4 State Survey of Property Tax Policy and Solar PV

The diverse nature of state property tax policy can present considerable challenges for PV industry participants. Each state policy environment must be evaluated individually in order to understand what, if any, property tax burden may be realized with the construction of a PV system.[xl] Moreover, it is not unusual for uncertainties to exist based on a lack of any applicable state laws or guidance specific to PV systems. The following summaries are intended to describe important policy details in each state in order to provide the PV industry with basic information necessary for assessing potential property tax impacts, and public officials (e.g., policy makers and property tax officials) with information on the practices employed in other states. The summaries attempt, at a minimum, to identify the following elements to the extent that reliable information could be obtained:

- The terms and applicability of any PV specific state law or administrative guidance to different types of PV installations
- How PV property itself would typically be classified (i.e., real or personal property)
- Assessment ratios for different types of property (e.g., residential, commercial, utility)
- What, if any, property is assessed centrally by a state agency rather than at the local level
- The methods that will typically be used to value PV property or property equipped with a PV system

In some states, a lack of clear policy or gaps in existing policy make generalizations of state policies difficult. In fact, the issues identified in the previous section show up frequently as areas of uncertainty. Where no clear guidance is available, the report attempts to ascertain likely practices based on specific project examples, practices employed for other forms of renewable energy such as wind turbines, and discussions of hypothetical scenarios with state and local property tax professionals. Care has been taken to expressly indicate areas where there is ambiguity, and to separate any commentary or interpretations made by the authors from definitive guidance and determinations made by property tax officials.[xli]

[xl] Variations in local property tax rates create further complications, as they figure prominently in the magnitude of any additional taxes owed in connection with a PV installation. While some information on "average" state rates exists in the public domain (e.g., reports published by the Tax Foundation), this report does not address levy rates themselves in detail because average rates can be misleading. A state average rate may differ substantially from the overall levy rate in a specific location. Moreover, due to variations in assessment ratios for different types of property, effective tax rates per unit of value ($) often differ markedly from specified tax rates. Comparisons of tax rates between states and local jurisdictions are of limited value, unless they are supported by an extensive and detailed analysis.

[xli] Many of the state policies profiled here do not apply exclusively to PV, but also to other types of solar, renewable energy, or alternative energy facilities. Explicit references to PV should not be taken to mean that a particular state policy applies only to PV installations.

4.1 State Property Tax Policy Summaries

State summaries are listed in alphabetical order. States highlighted with an asterisk (*) have pending legislation, as of July 2013, that could result in changes to current practices. Summaries of pending legislation, as well as enacted legislation and failed legislation in 2013, are provided in Appendix A.

Alabama: Alabama has no laws or specific guidance related to the assessment and taxation of PV systems. State law defines several classes of property, each with a different assessment rate. Utility property is assessed at 30% of value; agricultural, forest and single family, owner-occupied residential property is assessed at 10% of value; and all other property not otherwise classified is assessed at 20% of value (Code of Ala. § 40-8-1). Business personal property, while not considered a separate class of property, falls within the "other" property category, and consequently is assessed at the same 20% rate as commercial real property (Ala. Admin. Code 810-4-1-.04). The property of "electric power or light companies" and "public service or public utility corporations" is assessed centrally using a unitary process by the Alabama Department of Revenue (Code of Ala. § 40-21-1).

The statutory definition of real property includes land, structures, and "all things annexed or attached thereto which would pass to a vendee by the conveyance of the land or property" (Code of Ala. § 40-1-1). This suggests that PV property would generally be classified as real property. However, in instances where the owner of the underlying real property does not own the PV system (i.e., cannot convey it with a sale of the property), it is possible that the PV property would be considered personal property. If determined to be personal property, it would be assessed according to the procedures identified in the Alabama Personal Property Appraisal Manual. The Manual prescribes the use of depreciated original cost for valuing personal property.[xlii] Further information on current assessment practices for solar PV systems was not available from state or local officials.

Alaska: Under Alaska law, all incorporated municipalities are permitted to levy property taxes, but only a small percentage actually does so. Most municipalities with more than 1,000 residents levy property taxes and most with lower populations do not. In municipalities that levy property taxes, both real and personal property are potentially taxable, though some jurisdictions have exempted certain types of personal property, such as business machinery and equipment, from property taxes.[61]

Alaska law also grants municipalities the specific option to exclude, exempt, or partially exempt residential renewable energy systems, including PV systems, from property taxes. A local exemption must be ratified by voters in an election and may not reduce the assessed value of any single residence by more than $20,000 (Alaska Stat. § 29.45.050). To the knowledge of state personnel, no cities or boroughs have opted to adopt this particular exemption.[62]

[xlii] The authors were unable to obtain a copy of this Manual, but a number of county assessment web sites indicate that it prescribes the use of depreciated original cost for personal property valuations (see e.g., http://www.mc-ala.org/Departments/Appraisal/Personal/Pages/Default.aspx).

Where property taxes are assessed, municipalities generally use a trended cost system of valuation.[63] Local practices may vary, but in at least two of the larger jurisdictions (the Matanuska Susitna Borough and the Fairbanks North Star Borough), solar panels are not currently included in assessments because increases in property value cannot currently be reliably demonstrated. In the Matanuska Susitna Borough, most systems encountered are located in off-grid remote locations, which are only recognized as having or not having power without any distinction made as to the source of that power. A Matanuska Susitna assessor noted that the treatment could change if systems become more prevalent and a change in market value can be recognized as a result of the PV additions to property.[64] The city of Fairbanks has several systems installed on commercial buildings, and the systems are considered real property improvements.[65] It is possible that in other jurisdictions, commercial systems could be deemed business machinery or equipment. If that is the case, they could be eligible for the local exemptions that exist for this type of property in some municipalities.

Arkansas: Arkansas does not have any property tax provisions that are specific to PV. The assessment rate for all property, including personal property, is set at 20% of its value. The only property tax exemptions permitted in Arkansas are those enumerated in the Constitution. Any law enacted by the legislature that contravenes this is automatically void, so the legislature cannot grant property tax exemptions except through the enactment of a Constitutional amendment.[66]

The Tax Division of the Arkansas Public Service Commission (PSC) assesses utility property, which includes generating facilities that are *engaged in the business of* selling electricity to utilities for resale or to the public *(*A.C.A. § 26-26-1601). Valuation of utility property is done on a unitary basis using all three generally accepted appraisal methods. These are typically weighted at 30% for cost, 10% market sales/stock, and 60% for capitalized income.[67] By law, the capitalization rate may not be less than 6% under the income approach. Deferred income and investment tax credits may not be deducted out of operating income, but may be reflected as cost-free debt in determining the capitalization rate. Likewise, the cost method is defined to utilize original cost minus depreciation for functional or economic obsolescence (A.C.A. 26-26-1607). Costs and depreciation are supplied by the business to the PSC in accordance with Generally Accepted Accounting Principles (GAAP).[68]

Available information on how residential or commercial systems are assessed is limited. According to the Pulaski County Assessor's Office (Little Rock), residential or commercial improvements would generally be considered real property improvements. Residential PV installations would not currently add value to properties due to a lack of comparable sales. For commercial buildings, the PV system would likely be incorporated into the overall assessment of the building and depreciated in line with the rest of the building if the two are similar in age. If this is not the case, the PV system would likely be valued using the replacement cost estimates developed by the Marshall & Swift Company.[xliii] In a third-

[xliii] Marshall & Swift is a for-profit company that has developed detailed replacement cost estimates and depreciation values for residential and commercial structures and associated property components. These estimates are frequently used by real estate professionals and others for valuing property. Recent versions of the manual have included a Green Building section which contains some limited cost information on PV systems and other renewable energy devices.

party ownership arrangement, the value of PV would likely be determined as the depreciated original cost.[69] The Arkansas Commercial Personal Property Appraisal Manual does not contain a recommended asset life for PV or other electricity generating equipment.[70] In situations like this, the assessor would determine an appropriate schedule in consultation with the property owner according to the circumstances of the individual installation.

Assessment offices in two other counties (Garland and Saline) where at least several PV installations have been made were not aware of the existence of PV installations within their respective jurisdictions. Both counties contract out appraisals to private companies and were unable to supply substantive comments on whether PV property is being valued in property assessments.

Arizona: Under Arizona law, PV facilities located on residential or non-residential property that produce energy intended "primarily for on-site consumption" are considered to have no value and add no taxable value to a property (A.R.S. §42-11054). Arizona law also provides that through 2040, PV facilities that produce energy "not intended for self-consumption" fall under central assessment by the Arizona Department of Revenue (DOR), and are valued at 20% of the depreciated cost of the equipment (A.R.S. § 42-14155). In other words, the value is reduced by 80% from what it would otherwise be. The Arizona DOR was unable to provide a definitive determination of how third-party owned systems under leases or retail PPAs would be addressed. The status of third-party owned projects is currently the topic of ongoing discussions.

For central assessments, Arizona uses a 30-year straight-line depreciation schedule and a 10% floor. An assessment ratio is applied to the full cash value (which has already been reduced by 80% as described above) to arrive at an assessed value upon which property taxes are levied.[71] The assessment ratio for different classes of property is defined by statute. For 2013, the assessment ratio for utility and commercial or industrial properties is 19.5%, but it declines in future years, reaching 18% in 2016 (A.R.S. §42-15001).

California: Under California law, the value of PV equipment that is subject to local assessment is excluded from the value of the real property (Cal Rev & Tax Code § 73). This provision will sunset at the end of 2016, but any property that gains the exclusion prior to 2016 will continue to qualify for it. While the exclusion has no specified time limit, it lasts only until a change in ownership of the PV property, at which point the property is reassessed and may increase in value. In 2011, ABX1-15 clarified that sale-leasebacks and other commonly used financing structures that involve a change in ownership of the PV property do not *automatically* trigger a reassessment.[xliv] The exclusion applies to all locally assessed properties, including behind-the-meter and grid-supply facilities without differentiation.[72] When a property does lose the exclusion, it would generally be assessed at its full market value (Cal Rev & Tax

[xliv] A reassessment is not triggered by a sale-leaseback transaction which meets the three-month window established in the Federal Internal Revenue Code, or when a tax investor obtains more than a 50% interest in the system or project company under a partnership flip structure. However, in partnership flip, if and when the developer obtains greater than a 50% interest in the project or project company (i.e., ownership "flips"), a reassessment is triggered and the exclusion is lost.

Code § 51).[xlv] Whether the loss of the exclusion will typically translate into any significant changes in market value is unclear because few examples currently exist.[73]

Under most circumstances, electricity generating property owned by a regulated utility is centrally assessed by the California Board of Equalization (BOE), while other electricity generating property is assessed locally. The exceptions to this generalization are: (1) facilities less than 50 MW can be assessed locally even if they are owned by a regulated utility; and (2) facilities of 50 MW or larger, that are owned by a non-utility, and are not are considered qualifying facilities (QFs) under the federal Public Utility Regulatory Policy Act (PURPA), are assessed centrally if the owner is a state-assessee for another reason (18 CCR 905). Centrally-assessed properties are not eligible for the exclusion generally available for PV facilities and other active solar energy devices. The BOE uses a composite of all three accepted valuation methodologies. The weighting of the valuations arrived at under each approach is determined on a case-by-case basis.[74]

Colorado: By law, customer-sited PV systems located on residential property and owned by the resident are exempt from property taxes as household furnishings. This exemption is also extended to include "independently owned" (i.e., third-party owned) residential customer-sited PV systems up to 100 kilowatts (kW) (CRS 39-3-102). All customer-sited PV facilities and most PV facilities of 2 MW-AC or less, including community solar gardens,[xlvi] are locally assessed as personal property. All other systems are centrally assessed by the state as public utility property (CRS 39-4-101).[xlvii]

A standardized cost-based valuation formula is used for PV facilities that are locally assessed, which includes all non-residential, customer-sited systems. The valuation is arrived at by multiplying the system capacity (AC) by a standard capital cost threshold value ($1,173/kW for 2013, though this changes from year to year), adjusting for depreciation using a 20-year economic life, and then multiplying the result by a level of value (LOV) factor that is administratively determined based on property type. The threshold value is calculated to be the equivalent of a non-renewable energy facility – in this case a natural gas turbine. The "percent good" value arrived at through the calculation of accumulated depreciation does not correspond directly to straight-line depreciation. PV property is considered Category 14 property, which had a level of value of 1.00 for 2012. Assessors must also use comparable sales and income capitalization methods to value PV property, but the valuation may not

[xlv] California law permits the assessed value of a property to deviate from the full cash value in instances where the property has suffered a decline in market value.

[xlvi] The term "community solar garden" is a construct of Colorado law rather than a common industry term. In summary, it refers to certain solar facilities where energy production from the system is applied virtually to the electric accounts of multiple "subscribers" whose electric meters are not physically connected to the system. The general term "virtual net metering" is often used to describe this arrangement.

[xlvii] It is not entirely clear how a customer-sited facility larger than 2 MW-AC would be assessed in Colorado. The statutory language assigns state assessment to solar facilities that are both larger than 2 MW and which are not intended to serve on-site use (C.R.S. § 39-4-101). However, the definition of locally assessed property is limited to facilities of 2 MW-AC or less (C.R.S § 39-5-104.7). Since Colorado law does not place a capacity-based size limit on net metering facilities, it seems possible that such a scenario could arise.

exceed that arrived at using the cost-based formula.[75] RECs are classified as intangible personal property and may not be valued separately by the local assessor (CRS 39-3-118). Colorado uses an assessment ratio of 29% for items of personal property (CRS 39-1-104).

Centrally-assessed PV property is valued using an income-based approach that is intended to result in the same level of overall property tax collections over 20 years as the cost-based method (CRS 39-4-101 et seq.).[xlviii] The cost-based calculation employs a standard threshold capital cost, which ranges from $362/kW–$1,173/kW in 2013 based on AC generating capacity, as follows:

- 0–1.99 MW: $1,173/kW (locally assessed)
- 2–5 MW: $890/kW
- 5.001–10 MW: $774/kW
- 10.001–50 MW: $584/kW
- 50.001–100 MW: $463/kW
- 100 MW or larger: $362/kW

As in the case of locally-assessed PV property, the threshold cost is intended to approximate the capital cost of non-renewable generation. For facilities placed in service after 2011, an additional valuation component will be considered for transmission lines associated with a facility. This "delivery capital cost threshold" has not yet been determined for 2013. The cost calculation is used in conjunction with an income-based calculation to develop a value for an administratively-determined "tax factor," which is multiplied by gross electricity sales revenues to generate the facility valuation.[76] The 29% assessment ratio also applies to centrally-assessed PV property.

This approach to valuation evens out the property tax burden experienced by a facility owner over time, reducing it in early years and increasing it in later years. However, it does not reduce the overall level of taxes paid over the life of the project. In other words, it remedies the typical "front-loaded" characteristic of property taxes that are based on a replacement cost valuation. If revenue is constant over the life of the project (e.g., there is no escalation of the PPA rate), the burden is fully equalized for all years. If PPA escalation occurs, taxes are lower in earlier years and increase over time as revenue increases.

Connecticut: Connecticut offers a property tax exemption for "Class I" renewable energy systems installed on or after October 1, 2007, and sited on residential premises. Class I renewable energy systems include PV systems of up to five MW in capacity. In order to be eligible for the exemption, a PV system must serve a farm, single-family home or multi-family dwelling limited to four units. In addition,

[xlviii] This "income-based" approach to valuation should not be confused with the more general income capitalization method of valuing property, as it does not conform to traditional appraisal theory. Rather, it resembles a hybrid method that combines the relative simplicity of the cost method, with an adjustment that modifies the property valuation to align taxes owed with project revenue.

commercial and industrial PV will be eligible for the property tax exemption in future years (see below). Any person claiming the exemption must file with the assessor or board of assessors in the town in which the PV system is located a written application claiming the exemption before the first day of November in the first assessment year. A new application is not required for subsequent assessment years unless the PV system is modified in a way that would require a building permit (Conn. Gen. Stat. § 12-81 (57)).

The majority of municipalities utilize a city or town assessor, while a smaller number utilize a board of assessors (Conn. Gen. Stat. § 12-62(a)). As a result of 2013 legislation (S.B. 203), PV systems installed for business or industrial uses will be eligible for an exemption beginning in October 2013 or 2014 depending on the installation location. Prior to this date, systems are likely to be assessed and taxed as personal property using a cost-approach to valuation. Case law states that the most reasonable approach is original cost, a "reasonable" depreciation rate, and a floor or residual value set "at twenty percent of original costs as an allowance for inflation." [77]

The Connecticut General Assembly has prescribed a set of schedules for depreciating personal property that may be adopted by municipalities via a local ordinance. The law provides that most tangible personal property be depreciated to 95% of acquisition cost basis in the first year, 90% in the second year, and decline in value at 10% annually until reaching 30% in year eight and thereafter. Separate depreciation schedules are provided for machinery or equipment used in the manufacturing process, data processing equipment, or "other technologically advanced equipment" (Conn. Gen. Stat. § 12-63). It is not clear whether PV equipment could be considered manufacturing equipment or "advanced equipment," though such an argument could be made. The state uses a uniform assessment rate of 70% for both real and personal property (Conn. Gen. Stat. § 12-62a). In some jurisdictions, personal property tax rates differ slightly from real property tax rates, though in others (e.g., Hartford) the rate is the same for all types of property.

The property tax situation with respect to non-residential PV installations was somewhat unsettled until the issue was taken up as a priority by the legislature during the 2013 legislative session (see Appendix A). S.B. 203, enacted in June 2013, extends the property tax exemption to commercial and industrial PV installed on or after January 1, 2014 for assessment years beginning in October 2014. In addition, commercial and industrial PV installed on or after January 1, 2010 in New Haven is eligible for the exemption beginning in October 2013. Other municipalities can offer the exemption beginning in October 2013 if approved by the local legislative authority. The exclusion of non-residential PV facilities from the exemption prior to S.B. 203 was characterized by some as an oversight, and in fact, several towns offered written letters of forgiveness to commercial businesses stating that their PV system will not be subject to local property taxes.[78]

Delaware: Delaware does not have any property tax laws specific to PV. In Delaware, property tax is assessed at the county level, and no provisions exist for central assessment of any type of property. By law, no tangible or intangible personal property is subject to a tax by a county or local government (Del. Title 9 § 8102). In Sussex and Kent counties (two of Delaware's three counties), all PV equipment is considered to be personal property, and therefore not subject to property taxes.[79, 80]

For larger commercial and utility projects, it is important to note that wiring used to distribute electricity is taxed as real property, unless the electricity is being used for manufacturing, assembling, processing, or refining operation (Del. Title 9 § 8101). County assessment ratios vary from 50-100%, and most local taxing districts utilize the county assessment ratio. The appraised values used in county assessments date back several decades, though some local jurisdictions levy taxes on more recently determined market values.[81]

District of Columbia: Prior to 2012, the District of Columbia did not have any property tax laws specific to PV installations. In December 2012, legislation (Council Bill 19-749) exempted all systems that exclusively use solar energy from personal property taxes. The law makes no distinctions between customer-sited and grid-supply PV systems, though it does apply only to personal property taxes. To the extent that a system is determined to be real property, it could remain subject to property taxes. In what is presumably an effort to offset any potential lost revenue to the general fund as a result of the exemption, the bill requires that $120,000 be transferred from the District Renewable Energy Development Fund to the general fund each fiscal year.

Property tax rates depend on the class of property, of which there are five. Residential real property (Class 1) has a current tax rate of $0.85 per $100 of assessed value, while commercial properties have rates of $1.65 (Class 2a) and $1.85 (Class 2b) per $100 of assessed value. The designation as Class 2a or Class 2b property is determined by overall property value, with the Class 2a rate applicable to property value of $3 million or less, and the Class 2b rate applicable to value above $3 million. These rates are substantially lower than the rate for personal property, which is taxed at $3.40 per $100 of assessed value, and from which PV property is now exempt.[82]

Information on how PV property is being classified from the District Office of Tax and Revenue Real Property Administration was not readily available. However, individuals familiar with solar development in the District were able to provide some limited information about current practices. Based on these correspondences, it appears that valuations of residential structures before the law was passed have not been increased subsequent to the installation of PV property due to the lack of comparable sales and the perceived impracticality of using a replacement cost approach (i.e., significant variation of installed costs).[83] One individual opined that third-party owned systems would likely be considered business personal property, but believed that to this point, classification and valuation practices have been somewhat inconsistent.[84] A standard personal property classification for PV systems would be significant in that PV systems are now exempt from personal property taxes.

Florida: The Florida Constitution was amended in 2008 in order to revive a PV property tax exemption that expired in 1990, and now contains a provision that allows any value attributable to the installation of PV to be excluded from residential (but not non-residential) assessments. However, it could not be implemented until the legislature enacted a corresponding provision in state law, which it did in May 2013 (H.B. 277).[xlix, 85] As enacted, H.B. 277 provides that an increase in the value of residential real property attributable to the installation of a PV system installed on or after January 1, 2013 may not be considered in a property assessment.

The state has not issued any specific guidance related to PV property. Nevertheless, state officials did indicate that PV systems owned by the underlying property owner would likely be considered real property improvements, while third-party owned systems would likely be considered tangible personal property. Ultimately, the classification and any determination of added value are left to the local assessor and could vary based on the details of a project.[86, 87] A 1992 advisement letter issued by the Florida DOR offers a certain amount of additional clarity in this area by providing an analysis of the circumstances where leased property should be assessed to the lessee (i.e., the lessee is considered to be the property owner).[88] A determination of ownership based on the criteria identified in the letter could conceivably influence the property classification. The likely classification of third-party owned residential PV systems as personal property could be significant in that the exemption provided by H.B. 277 applies only to real property improvements. No official determinations have been made, so the treatment of third-party owned residential PV systems under H.B. 277 remains uncertain.

In Florida, tangible personal property is typically valued using a cost-based approach, though other approaches may be considered. The Florida Tangible Personal Property Appraisal Guidelines do not contain an inflationary index or recommended economic life for PV equipment. They do, however, contain inflationary factors for electric power equipment and list an economic life of 16 to 21 years for "other" power production equipment. Notably, in a discussion of historical cost, the manual specifically mentions the federal business energy tax credit in reference to adjustments that might need to be made to costs reported in accounting records. The cost basis used is described as reflecting "the total cash outlay necessary for the acquisition of the property." With respect to leased equipment, the guidelines state that the economic life should generally correspond to that used for non-leased equipment, but do note that exceptions may be granted where a loss in value is apparent as a result of the equipment being leased.[89] Whether this type of adjustment would be used for leased PV systems is unclear; however, it seems plausible that an argument could be made that PV equipment in place has suffered a loss in value because of the potentially significant costs of removal. Florida allows an exemption for up to $25,000 of the assessed value of tangible personal property per personal property tax return (Fla. Stat. § 196.183).

[xlix] The 2008 Constitutional amendment removed the portion of the Constitution on which the prior exemption was based, rendering the 2008 legislative enactment ineffective. Consequently, the legislature had to implement the 2008 Constitutional amendment in order to make available exemption is available for PV property owners, which they did in May 2013 (H.B. 277).

In terms of local practices, Alachua County (Gainesville) considers PV systems owned by the host property owner to be real property, while systems owned by a third-party are considered tangible personal property. The appraiser is able to identify the system ownership arrangement from permitting and tangible personal property filings.[90] When valuing PV, the appraiser uses a standard capacity-based system that allows for depreciation over time. All systems of less than 11 kW receive an original basis value of $3.25 per watt; systems between 11 kW and 49 kW receive an original basis value of $3.00 per watt; and systems larger than 49 kW receive a basis value of $2.50 per watt. Depreciation is applied on a ten-year straight-line schedule with a 20% floor value.[l] This system is used to value all PV property, but only increases the assessed value of a property where the system is being used for the purpose of income generation. In other words, for a typical residential system, the value would be noted but not added to the assessment. For commercial grid-supply projects enrolled in the local FiT program offered by Gainesville Regional Utilities, the value would be reflected as an increase in the value of the real property, or as taxable tangible personal property.[91] In Martin County, solar and other renewable energy improvements are not valued separately for assessment purposes and it is assumed that the value of these devices is reflected in the market when these properties sell.[92] In contrast, in Lee County, PV systems are generally considered to be personal property and are assessed using the cost approach with a 25-year depreciation schedule.[93]

Recently, there have been several utility-scale PV installations that further provide insight into how assessors evaluate large, grid-supply PV projects. The PSEG Solar Source project is currently assessed on Duval County's tangible personal property tax roll. Both the cost and income approaches were used to establish a valuation of the solar installation.[94] The 15 MW-DC project was commissioned in 2010 and had a taxable value of $39.1 million in 2012, resulting in a tax bill of roughly $700,000. As in Duval County, the FPL DeSoto (County) Next Generation Energy Center is considered tangible personal property. A combination of the cost and income approaches was used for the assessment. The depreciation used in the cost approach is based on the rates approved by the Florida Public Service Commission and a 30-year economic life.[95]

Georgia: Georgia does not have any laws that specifically address the assessment and taxation of PV systems. The state uses a general assessment rate of 40%, but agricultural property is assessed at a rate of 30% (O.C.G.A. § 48-5-7).[li] Both real property and personal property are taxable in Georgia (O.C.G.A. § 48-5-3), though personal property valued at less than $7,500 is exempt from property taxes (O.C.G.A. § 48-5-42.1), as are household furnishings, equipment, and appliances not held for commercial use (O.C.G.A. § 48-5-42). The Georgia Department of Revenue (DOR) develops proposed valuations for public utilities and furnishes them to local assessor offices (O.C.G.A. § 48-5-510 et seq.). Grid-supply systems that are not owned by regulated public utilities are assessed locally.[96]

[l] This system and the value that it applies to PV was arrived at through an income and cost analysis of PV projects performed by the Alachua County Appraiser's Office. The office is also in the process of completing a comparable sales analysis to further justify the chosen method.

[li] The language of the law requires agricultural property to be assessed at 75% of the rate used for other properties, which leads to an assessment rate of 30%.

The Georgia Administrative Code contains general valuation procedures for both real and personal property. However, the general nature of these regulations provides little insight into how PV property or properties equipped with PV would be classified and valued in practice. The definition of "real fixtures," which includes personal property permanently attached to land or buildings and "heating and cooling, and lighting fixtures," could be interpreted to mean that PV systems should be considered real property improvements (Ga. Comp. R. & Regs. r. 560-11-10-.02).

While the proper classification remains unaddressed by formal guidance, DOR personnel suggested that residential systems would likely be considered exempt personal property unless a paired sales analysis demonstrates a contributory market value. Non-residential systems (leased or otherwise) would likely be considered taxable personal property. Valuation of business personal property is typically undertaken using a replacement cost methodology, though other methods may be used as well. The original cost would not currently be adjusted for incentives or tax credits that reduce the effective cost of the system to the owner. The general issue of original cost basis and treatment of tax credits is currently the subject of ongoing litigation, though the dispute in question does not relate to PV property.[97]

Georgia's personal property appraisal procedures provide that the economic life of the property should be determined by its classification in Tables B-1 and B-2 of IRS Publication 946. Ranges of class lives are grouped together to assign composite depreciation conversion factors and a residual/floor, which is generally set at 20% (Ga. Comp. R. & Regs. r. 560-11-10-.08). However, while IRS Publication 946 assigns a recovery period of 5 years for property eligible for federal business energy investment tax credit, it does not specify a class life for such property.[lii] It is thus slightly unclear which economic life group a PV system would fall under in a cost-based valuation. Based on the various asset classes that might apply, it seems likely that PV property would fall under Group III. This group applies to property with a class life of 13 years or longer and uses a 16-year schedule with a 20% floor value. The Georgia DOR indicated that an economic life of 25 to 30 years would probably be used for centrally-assessed grid-supply PV facilities, which is roughly on par with that used for other types of power generation facility.[98] Though local practices may differ, at least one locally-assessed grid-supply facility (located in Bulloch County) has been assessed as Group III property using a cost-based approach.[99]

Hawaii: Hawaii currently does not have any statewide property tax laws that pertain to PV. Property tax authority was transferred from the state to the counties in 1981. All four counties in Hawaii grant a property tax exemption to customer-sited PV systems. The counties differ with respect to details, but generally, systems used primarily for on-site, personal consumption are also permitted to transfer, market, or sell excess generation as long as that amount is less than 25% of total energy output produced.

In Maui County, an exemption is not granted for systems that transfer, market, or sell electricity on a commercial basis, when the amount is greater than 25% of total energy output produced (Maui County

[lii] IRS Publication 946 assigns a default class life of 12 years for property that does not have an assigned class life. It is not clear whether an assessor would use this figure, or arrive at the appropriate economic life through other means. Conversations with the Georgia DOR indicate that a longer economic life would likely be used.

Code 3.48.520). Where the exemption does not apply, the cost approach is used and depreciation is determined manually.[100] Likewise, Hawaii County does not permit an exemption for commercial systems where 25% of the electricity produced by a system is transferred, marketed or sold (Hawaii County Code 19-82). Where the exemption does not apply, the cost approach is used to value the system, with an adjustment made for market conditions.[101]

The City and County of Honolulu grants an exemption to all alternative energy systems, including those designed primarily to export energy (Honolulu Code 8-10.15).[102] Kauai County allows an exemption for commercial alternative energy systems that sell more than 25% of energy generated to a public utility company, with two distinct options (Kauai County Code 5A-11.30). Under one option, the PV equipment is 100% exempt and the land is assessed for limited industrial use, resulting in a 50% exemption. Under the other option, property owners receive full 100% exemptions on the PV equipment and land but must make a PILOT of 1% of the gross revenue generated from electricity sales.[103]

Idaho: Idaho does not have any property tax laws that are specific to PV installations, though it does offer a property tax exemption for grid-supply wind and geothermal electric generators (Idaho Code § 63-3502B). In lieu of property taxes, wind and geothermal producers pay a tax of 3% of gross energy earnings. The method of taxation is only used for generators that are not rate-regulated by the Idaho Public Utilities Commission (PUC) (Idaho Code § 63-3501). The Idaho State Tax Commission sets property tax values for "operating property," which includes the real and personal property of public utilities and non-utility generators. Valuation of operating property is done on a unitary basis using all three generally accepted approaches to valuation.[104] A change in law would be required to apply the taxation method used for wind and geothermal electric installations to grid-supply PV systems.

Idaho assesses real, personal, and operating property at its full market value (Idaho Code § 63-203).[liii] Information on local assessment practices is limited as PV systems are not common in Idaho and no official determinations have been made at the state level. That said, the relevant definitions suggest that behind-the-meter systems used to meet on-site consumption would be considered real property improvements, while systems designed to export power would be considered personal property.[105, liv] At the local level, in Latah County, PV systems are generally assessed as an improvement to real property. Few sales of PV systems exist in this jurisdiction, so it is not currently possible for the assessor to assign a contributory market value of PV systems to a property. The county maintains a database of the solar system costs and typically assigns a portion of the original system cost (e.g., 20%) to the

[liii] Idaho offers a homeowners exemption for owner-occupied homes of 50% of the value up to $75,000, adjusted annually to reflect changes in cost of living (Idaho Code § 63-602G). Idaho law also contains an exemption on up to $100,000 of personal property value that is triggered if receipts to the state general fund during a fiscal year exceed receipts during Fiscal Year 2008 by 5% or more (Idaho Code § 63-602KK).

[liv] The controlling language in this case appears to be the definition of a "fixture" (Idaho Code § 63-201), which includes "systems for the heating, air conditioning, ventilation, sanitation, lighting, and plumbing of such building." Other sections of law, such as those governing exemptions of some personal property, could also play a role in how PV systems are treated in Idaho.

property in their depreciated cost approach for appraisals. The depreciation would be determined according to the market adjustment schedule that applies to the real property as a whole.[106]

Notwithstanding the Latah County Assessor's treatment of PV as a real property improvement, it remains possible that some systems, such as leased systems, would be classified as business personal property. If this occurs, it appears possible that PV property would be assigned a 20-year economic life under a replacement cost methodology, though an assessor may employ other valuation methods as well. The 20-year economic life derives from the economic life estimate used for electrical generating machinery and equipment under the Idaho Tax Commission's 2011 Idaho Property Valuation Schedule. This schedule employs trending factors developed by the Marshall and Swift Valuation Service, so the percent good values do not correspond directly to a straight-line depreciation schedule. This class of equipment falls within the general averaged group for the purposes of trending, resulting in a floor value of 32% in 2011.[107]

Illinois: Under Illinois law, solar improvements on any property are assessed at no greater than the value of a conventional heating or cooling system (§ 35 ILCS 200/10-5 et seq.). While the law does include PV and electricity generation in the section defining eligible solar energy systems, "conventional" electricity supply is not defined. It would appear that all customer-sited facilities qualify for an exemption if the "conventional" heating and cooling system in question is interpreted to be grid-supplied electricity. The Illinois Department of Revenue could not provide any further guidance on this issue, or how wholesale PV facilities should be assessed.[108] Illinois does not levy taxes on business personal property; therefore, a wholesale PV facility or any portion of the facility that is determined by a local assessor to be personal rather than real property would not be subject to property taxes.

For grid-supply facilities, an Illinois law allowing local governments to designate "Enterprise Zones" in the interest of local economic development could impact the property tax costs experienced by the project owner. The designation of an enterprise zone permits local taxing districts (e.g., a school district) to offer an abatement of property taxes for improvements on real property or on a particular class of property (in addition to conferring a variety of other benefits). The taxing district may enter into a separate agreement with the property owner for the payment of fees to offset the foregone property tax revenue. One benefit to this approach for school districts is that while an increase in property valuation would be accompanied by a reduction in state aid, an abatement coupled with a fee agreement results in no such reduction. Another section of Illinois law allows taxing districts to offer more limited abatements for several types of commercial or industrial improvements, including electricity generating facilities.

Though limited information exists, at least one grid-supply solar installation is evidently being treated, at least in part, as a real property improvement. A 20 MW solar farm developed by Invenergy in La Salle County has been estimated to have a value of $15 million, which translates to an assessed value of $5

million using Illinois's 33.3% assessment ratio.[lv] At an estimated overall tax rate of 6.74%, the overall annual property tax burden on the facility is roughly $337,000. One taxing district has offered an Enterprise Zone property tax abatement to the project owner and executed a fee agreement that provides the district with 50% of the revenue it would have collected without the abatement.[109] Data on the final valuation from the La Salle County Assessor's Office was unavailable at the time of this writing.

Indiana: Under Indiana law, PV systems installed after December 31, 2011, that do not provide electricity for sale at wholesale or retail qualify for a deduction from real, personal, or distributable property taxes. The deduction amounts to the functional equivalent of a full exemption for the value of the PV system or value added to the real property by the system. The "sale" limitation is qualified to permit facilities that are enrolled in a net metering or FiT program to receive this treatment, and the exemption also includes devices hosted or owned by a customer if the customer consumes an equivalent amount of electricity, even if the electricity is sold to a public utility. This would appear to include dual-metered facilities (i.e., those that exceed the state's 1 MW net metering cap) and specifically includes those owned by a public utility that directly serve the utility's business operation site (IC 6-1.1-12-26.1). The deduction is not automatic; property owners must file a form claiming it with the local County Auditor (IC 6-1.1-12-27). Indiana does not use an assessment ratio, so apart from the deduction described above (or others that may apply), property taxes in Indiana are levied based on the property's "true tax value" (IC 6-1.1-1-3).

Public utility property (termed *state distributable property*) used directly to provide utility service is assessed centrally by the state Department of Local Government Finance (DLGF). Although the current assessor's handbook does not specifically address PV as it does some other generation technologies, a 2008 clarification providing that commercial wind farms are state distributable property suggests that a grid-supply solar farm generally falls under state assessment as a "light, heat or power company" engaged in the business of furnishing electricity (see IC 6-1.1-8-2). Land and buildings not used directly to provide utility service are assessed locally. Thus, the local assessment would include a substation building, but not the electric equipment in the building.[110] The land underlying a grid-supply PV farm would likely be assessed as industrial or secondary industrial land, which is the designation used for land underlying a wind farm.[111]

However, as a result of 2013 legislation (H.B. 1374), not all grid-supply facilities fall under state assessment. Effective July 1, 2013, the legislation provides that a taxpayer may elect to have property that would otherwise be considered state distributable property to instead be treated as locally-assessed personal property if it is located within a single taxing district. The legislation also explicitly provides that this option applies to facilities enrolled in a net metering or FiT program.

The depreciated cost of the state-assessed PV property itself is determined by the federal depreciation schedule used by the owner and is not reduced by the ITC or a Section 179 expensing deduction.

[lv] Cook County is an exception to this general rule. In Cook County, industrial property is generally assessed at 36% of its market value. The ability to deviate from the statutory assessment rate is conferred on Illinois counties with 200,000 or more inhabitants that classify property for taxation.

Therefore, the beginning cost basis for computing the assessed value is essentially the original installed cost. A gross additions deduction equal to 60% of the depreciated value is permitted during the first year after the property is placed in service. The total value of all of a taxpayer's distributable property may not fall below 30% of the original cost, except where abnormal obsolescence exists. The gross additions deduction in conjunction with the floor value results in the solar property being valued at no more than 40% of its original cost and no less than 30% of its original cost during the first year.[112] During subsequent years, the deduction for gross additions no longer applies, but the system continues to be depreciated according to the federal depreciation schedule (see 50 IAC 5.1-6-1 et seq. for the language governing valuation).

If a facility is assessed and taxed as personal property, the assessed value could be somewhat different. Personal property valuation is based on the original installed costs, without any subtraction for the ITC, Section 179 expensing, or bonus depreciation. For the calculation of accrued depreciation, property is grouped into four "pools" based on the depreciable life used for federal income tax purposes. It is somewhat unclear which pool a solar PV installation would fall under because while the MACRS recovery period is six years, the IRS class life is 12 years. If the MACRS recovery period is used, a facility would fall within Pool II, which allows property to be valued at 40% of the original cost in the first year, escalates to 56% in the second year, and declines at a varying rate to 15% in the seventh year and beyond. Thus, unlike distributable property, the depreciation allowed is not tied directly to the amount claimed for federal income tax purposes. The total value of a taxpayer's personal property within a single district may not fall below 30% of the total original cost, but as described above, individual items of personal property can be depreciated beyond floor (see 50 IAC 4.2-4-1 et seq. for the language governing valuation).

Indiana also allows local taxing jurisdictions an option for local abatements in Economic Revitalization Areas (IC 6-1.1-12.1), which to this point have been granted to a number of wind farms in the state.[113] Abatements may be authorized according to a number of different schedules defined in the abatement law or under an alternative schedule established by the local governing body. Regardless of the schedule used, the abatement may not extend beyond 10 years. It stands to reason that the developer of a grid-supply PV farm would likewise seek a tax abatement, though no such proposals have been made to the knowledge of the authors. The abatement may not be claimed on property for which the owner has already claimed the property tax deduction available for behind-the-meter and FiT projects.

Iowa: Under Iowa law, the value of PV systems intended to provide energy for on-site use is disregarded for property tax purposes for five years (Iowa Code § 441.21(8)). The Iowa Department of Revenue has clarified that the somewhat vague language in the exemption law should be interpreted as permitting net-metered systems to qualify for the exemption.[114] The exemption includes PV systems on residential, agricultural, commercial, and industrial properties and does not include an explicit requirement that the system be owned by the owner of the underlying real property.

With respect to grid-supply facilities, Iowa generally imposes an energy replacement tax in lieu of property taxes on electricity generation property (Iowa Code § 437A.6). However, exceptions granted under the law mean that it may not apply to a PV facility. *Self-generators* are eligible for an exemption

from the replacement tax, which, by the definition of self-generator, would include an owned or leased PV system that generates electricity for on-site use rather than for sale. The law permits unscheduled electricity deliveries to the electric utility (i.e., a net metering or dual-metering arrangement) from such facilities (Iowa Code § 437A.3(27)). In addition, *low capacity factor facilities*, defined as facilities with a capacity factor of 20% or less (Iowa Code § 437A.3(17)), are not subject to the replacement tax. For grid-supply facilities that are not excluded, the replacement tax amounts to $0.0006/kWh (0.06 cents/kWh). A typical PV installation would fall within the definition of a low capacity factor facility, rendering it subject to local assessment rather than the energy replacement tax.

A grid-supply PV facility that is not subject to the replacement tax is subject to general property taxes, as are behind-the-meter PV facilities after the five-year exemption period has passed. The classification of a PV facility would be determined by the classification of the property that it serves.[115] In Iowa, all residential, commercial and industrial real estate is assessed at market value (Iowa Code § 441.21(1)), while personal property is not taxed.

Due to the low amount of installed PV currently in Iowa, uncertainty remains about how it would be valued and taxed. However, the Iowa Department of Revenue (DOR) has indicated that customer-sited PV would likely be considered an improvement to real property and valued using a cost approach. This would be the case regardless of whether the system is owned by the real property owner, or leased to the real property owner by another entity.[116] The DOR currently does not have an established cost or depreciation schedule for PV property, though it has recently added a pre-computed cost schedule for wind turbines to the Iowa Real Property Appraisal Manual.[117]

While assessment practices for wind farms may be considered a good proxy for determining how a grid-supply PV facility would be assessed in some states, their usefulness in Iowa is limited because wind farms are subject to a local option special assessment law while solar PV farms are not (Iowa Code § 427B.26). When the local option is exercised, wind farms are valued at a gradually rising percentage of their net acquisition cost for 20 years, beginning at 0% in the first year and rising at 5% annually to a maximum of 30%. Though this treatment could certainly be used for a grid-supply PV farm as well, it would require a change in law because the existing law is specific to “wind energy conversion property.” The Iowa Real Property Appraisal Manual uses the cost approach as the basis for arriving at fair market value, thus it is likely that the cost approach would be used for grid-supply PV facilities in the absence of any such change in law. However, this does not preclude the assessor from using other methods.[118]

Kansas: Under Kansas law, PV and other renewable energy systems are exempt from property taxes with no apparent limit on system size, zoning, or limitations pertaining to on-site use (Kansas Statutes 79-201). Large wind farm projects are exempt from property taxes, though some wind developers have negotiated agreements to provide contributions to local governments for the purpose of supporting local economic development, culture, or safety projects. The exemption applies to generating equipment only, while the underlying property remains subject to tax at normal rates. Tax is assessed at the county level by officials who are familiar with the renewable energy property tax exemption, but exemptions must be approved by the Kansas Court of Tax Appeals (Kansas Statutes 79-213). An application made to the court takes effect when the site begins generating electricity.[119]

Kentucky: Kentucky does not have any property tax exemptions specific to PV installations. While solar installations are assessed on a case-by-case basis, conversations with state and local officials suggest that residential PV projects are likely to be treated as real property, while any PV system owned by a business is likely to be treated as personal property.[120, 121, 122] Real property valuation may employ the cost, sales comparison, or income approaches depending on the availability of market data and the preferred method of the Property Valuation Administrator (Ky. Rev. Stat. 132). These residential installations are subject to a state real property tax – set at a rate of 12.2 cents per $100 of assessed value in 2012 – as well as a local property tax levies.[123]

PV projects providing on-site power generation to commercial entities are often assessed as taxable personal property, though panels may be treated as a manufacturing asset that is exempt from local property taxes but not state property taxes (Ky. Rev. Stat. 132.200). The 2012 tax rate for this classification is set at 15 cents per $100 value.[124] The Department of Revenue (DOR) suggests the use of a market-based approach for the initial valuation of personal property, although additional data points may be used, such as the original cost and condition of the property and the estimated replacement value. In a cost-based valuation, PV would be classified as a Schedule B property under a Class III economic life in the North American Industry Classification System (NAICS). This classification applies the original cost of the panels, and decreases the reported value by predefined annual factors until reaching a floor value of 20% in the thirteenth year after the property is place in service.[125] Other components of the system, such as wiring and racking, may be classified as Schedule A property and be taxed at a different rate.

Any PV facility generating wholesale electricity is classified as an electric power company, and is taxed under the public service corporation property tax regulations (Ky. Rev. Stat. 136.120 et seq.). The installation is assessed centrally by the DOR. The DOR appraisers employ the cost, sales comparison, and income approaches to calculate three separate valuations, as a method of verification. These three valuations are reconciled into a single, reasonable valuation, which is assigned to the project and taxed accordingly.

Louisiana: In Louisiana, any equipment attached to an owner-occupied residential building or swimming pool as part of a solar energy system is considered personal property that is exempt from taxation (La. R.S. § 47:1706). A solar energy system is defined as "any device that uses the heat of the sun as its primary energy source and is used to heat or cool the interior of a structure or swimming pool, or to heat water for use within a structure or swimming pool." Though this definition does not appear to be particularly applicable to PV systems, the law also states that solar energy systems include, but are not limited to, systems utilizing solar collectors and “solar cells.” The law does not require that the owner of residential building own the PV property.

The Louisiana Constitution prescribes assessment ratios for different property classifications. Land and residential improvements are assessed at 10% of market value, public service properties (excluding land) are assessed at 25% of fair market value, and all other properties including personal property are assessed at 15% of market value (LAC 61:V.101). Public service properties, which include electric power

companies, are assessed centrally by the Louisiana Tax Commission (La. R.S. § 47:1853). The definition of an electric power company appears to include both utility and non-utility generators (La. R.S. § 47:1853).

Based on the classification of residential solar energy systems as personal property in Louisiana, it seems reasonable that PV systems installed on non-residential properties would also be classified as personal property. Moreover, in June 2013, the Louisiana Department of Revenue (DOR) issued a revenue ruling related to the state sales and use tax, determining that residential PV systems held for lease or rental (i.e., third-party owned systems) are "moveable property," a designation equivalent to tangible personal property.[126] However, the outcome of such a determination is slightly uncertain as Louisiana law defines real property to include "all structures and other appurtenances thereto, as pass to the vendee by the conveyance of the land or lot" (La. R.S. § 47:1702). Presumably, the ownership of a PV system owned by the underlying real property owner would pass to the purchaser of a property, which suggests that the residential classification as personal property may not apply to non-residential properties. On the other hand, a third-party owned non-residential system may be considered tangible personal property on the basis of the June 2013 DOR ruling. State and local officials were unable to provide further information on the proper classification or typical local practices.[127, 128]

Louisiana's administrative regulations governing property taxes provide some insights into how PV property would be assessed, though they contain no guidance specific to PV or other renewable energy property. The regulations deem the income approach suitable for assessing personal property that is commonly leased, and for which a reliable income estimate can be identified (LAC 61:V.111). While it is unclear if non-residential PV property would be considered personal property, to the extent that it is classified as such, the income method may prevail.

The regulations also provide that the cost approach is typically the most suitable method for valuing general business assets such as machinery and equipment. The economic life tables provided in the regulations contain asset lives for gas and diesel electricity generating equipment (10 years) and steam-based electricity generating equipment (25 years), but not other electricity generation technologies. A composite multiplier table that blends depreciation with inflationary cost indices is included for assessors to use in calculating market value based on original acquisition costs. For PV property, the actual economic life used in this calculation would be determined according to the assessor's best judgment, and adjusted for obsolescence if necessary (LAC 61:V.2501).

Where a cost approach is employed for leased equipment, the same principles must be applied (LAC 61:V.2101). It is not clear from the regulations whether acquisition cost would or should be adjusted to account for up-front incentives such as tax credits or equipment rebates. This detail would be addressed at the local level between the assessor and the property owner. It is unclear whether such adjustments have taken place in practice, though one assessor thought this could be a possibility under certain circumstances.[129]

Maine: Maine currently has no property tax laws or explicit guidance for PV installations. While some assessors have decided to treat PV equipment as real estate, at least one assessor chooses to ignore the installation when valuing a property.[130, 131, 132] For the assessors that choose to value the installation,

either the cost valuation method, market valuation method, or the income valuation method may be used, at the discretion of the assessor.

Maine does exempt many types of business personal property from property taxes through its Business Equipment Tax Exemption Program. Generally speaking, the exemption includes new personal property used for a business purpose that is depreciable for federal income tax purposes. The property of public utilities is specifically excluded from eligibility, as are certain other types of property and property owners. Among the other restrictions is a limitation that excludes property used to produce energy primarily for sale. For the purpose of this exclusion, energy is considered "primarily for sale" if in the preceding year "two-thirds or more of the useful energy is directly or indirectly sold and transmitted through the facilities of a transmission and distribution utility." Also excluded is property located at retail sales facilities of 100,000 square feet or larger that is used primarily in a retail sales activity (36 MRSA § 691 et seq.). These restrictions render grid-supply facilities ineligible for the exemption, and could also have the effect of excluding PV installations located on certain commercial properties (e.g., a big-box store). According to one state official, leases and retail PPA arrangements could potentially avoid this exclusion, but would need to be evaluated according to the individual circumstances present.[133] For instance, it is unclear whether a retail PPA arrangement would run afoul of the exclusion for facilities that generate electricity primarily for sale, because the electricity would be used on-site rather than transmitted through the distribution grid of the utility.

For the most part, property is assessed and taxed by municipal governments. Assessment ratios vary from 70% to 110% of the valuation. In certain cases, municipalities have joined together to create Primary Assessing Areas that are assessed by a single board or chief assessor. Property in Maine that does not fall within a municipality and is considered to be within an unorganized territory is assessed and taxed by Maine Revenue Services (36 MRSA § 302-304). While no grid-supply PV facilities have been constructed in Maine as of this writing, it is worth noting that commercial-scale wind farms are currently being treated as personal property and are typically valued used a cost-based approach.[134, lvi]

Maryland: Under Maryland law, PV equipment that is used to generate electricity for use on-site in a structure or for supply to the electric grid is exempt from real property taxes (Md Code: Property Tax §7-242). As written, the exemption encompasses both residential and non-residential customer-sited systems regardless of ownership type. This language could be interpreted as applying to grid-supply systems as well, but current practices suggest that this is not the case because grid-supply PV facilities are largely considered personal property. Wholly separate from the exemption described above, Maryland law also permits counties and municipal corporations to offer property tax credits for the installation of solar energy and energy conservation devices (Md Code: Property Tax §9-203). Where authorized, the property tax credit operates as a reduction in property taxes owed on the property as a

[lvi] Maine also permits the use of Tax Increment Financing (TIF) Districts, which have been utilized for several wind farms. A TIF arrangement can benefit the property owner by allowing him or her to retain some of the money that would have been owed in property taxes, while insulating the tax district from adverse effects on state aid that could result from higher property values.

whole in a fashion similar to an income tax credit.[lvii] In contrast to most other states, Maryland assesses all property at the state level.

The definition of "public utility" excludes independent power producers, exempt wholesale generators, and small power producers. While these terms are not explicitly defined, they indicate that electricity generators fall outside of the definition of utility property and are instead classified as non-utility business personal property. Machinery and equipment used to generate electricity for sale is considered a subclass of personal property and receives a general exemption of 50% of its value (Md Code: Property Tax § 7-237). Local governments are also permitted to exempt wholesale electricity generation equipment from real and personal property taxes and enter into PILOT agreements. If not under a PILOT, a wholesale PV facility would be valued using a cost methodology based on the original equipment cost, a 30-year straight-line depreciation schedule and a 25% floor.[135]

With some exceptions, counties are required to set a single tax rate for all real property, and a personal property tax rate that is 2.5 times the rate for real property (Md Code: Property Tax § 6-302). Maryland has both state and local property taxes, but business personal property is exempt from the state property tax (Md Code: Property Tax § 7-301). Some counties and other local taxing districts have likewise exempted business personal property from taxes. In other cases, towns or other taxing districts may still levy taxes on personal property where the county has elected not to tax it. Non-utility electricity generation facilities occasionally comprise a special circumstance for property taxation purposes. Garrett County has generally exempted personal property from taxes, but excluded non-utility electricity generation equipment from the exemption. The Town of Williamsport in Washington County applies a higher tax rate to non-utility electricity generation facilities than it does for other types of business personal property.[136]

Maryland does permit PILOT agreements under certain circumstances, though the state laws authorizing PILOTs are sometimes location- and purpose-specific. One broadly applicable PILOT provision, which authorizes local taxing districts to enter into PILOTs for public leasehold property (Md Code: Property Tax § 7-301), has been exercised by Washington County for a solar farm. The 25 MW project being constructed by EPG Solar in Washington County will reportedly make a PILOT of $5,000 per MW, in addition to land lease payments (the project is on county-owned land) and other negotiated arrangements between the county and the project developer.[137]

Massachusetts*: Massachusetts offers a 20-year property tax exemption for PV and other solar energy systems that are used as a primary or auxiliary power system to supply on-site energy needs of taxable real estate (M.G.L. ch. 59 § 5 (45)). There is an open question as to whether the exemption applies to on-site net-metered systems that occasionally put power back onto the grid. It is unclear based on the statute if on-site use can be defined as meeting on-site electricity load across a month or calendar year or if the exemption is lost if any power flows back into the grid at any time. For the time being, the

[lvii] At least four counties currently offer property tax credits for PV, and two others formerly authorized them but have now discontinued their programs (for details, see http://www.dsireusa.org/solar/incentives/index.cfm?re=0&ee=0&spv=1&st=1&srp=0&state=MD).

interpretation is up to local assessors. The exemption applies only to the value added to the property by an eligible system and does not constitute an exemption for the full amount of the property tax bill. The limitation of the exemption to systems installed on *taxable real estate* is significant in that it means that any system located on tax-exempt property is not eligible for the exemption. If the system is owned by an exempt entity (e.g., a unit of local government) it remains exempt, but the same would not hold true if the system is owned by a profit-oriented third-party (e.g., a retail PPA provider).[138] The exemption likewise does not apply to grid-supply PV facilities.

The classification of a PV system as real or personal property is determined by the local assessor and depends on the characteristics of the individual project.[139, 140] A question and answer document issued by the Massachusetts Department of Revenue in 2012 provides a certain amount of guidance about how this judgment should take place. In summary, the publication provides that PV panels and associated machinery and equipment can be assessed as real property if they are intended to remain on the site for their entire useful lives, are designed specifically for the site in question, or could cause damage to the land or equipment if they are removed. On the other hand, if the equipment is easily removable or intended to be removed and replaced periodically, they can be separately assessed as personal property. Personal property is typically assessed using a cost-based approach to valuation.[141] Massachusetts does not provide any standard depreciation tables or economic life estimates for items of personal property, so depreciation is determined manually by the assessor.

Municipalities have several options for taxing PV facilities that are not eligible for an exemption. The first option is to value and assess property taxes on the facility in the same manner as other taxable property. In this case, the PV facility would be assessed at its full market value as either real or personal property; the underlying land would be considered industrial in nature.[142] The second option is a negotiated PILOT agreement, which is permitted where the facility owner meets the definition of a "generation company" or "wholesale generation company" (M.G.L. c. 59, § 38H(b)). These terms collectively refer to companies that generate electricity for either retail or wholesale purposes (M.G.L. c. 164, § 1). The third option is a tax increment financing (TIF) agreement, where a municipality may offer to abate real and personal property taxes for up to 20 years for projects located in certain areas that have been designated as targets for economic development (M.G.L. c. 40, § 59). The various requirements and restrictions associated with TIF agreements (e.g., job creation, designation of economic development target areas) likely make them inapplicable for most PV projects.

The proper assessment and taxation method of PV installations was the subject of a certain amount of controversy and confusion in Massachusetts during 2012.[143, 144] One bill proposal (S.B. 2200) contained a section that would have exempted any behind-the-meter PV system capable of producing no more than 125% of on-site energy needs from property taxes, and mandated that all other facilities be subject to a PILOT of 5% of gross receipts from electricity sales (including virtual net metering credits). This section of the bill was opposed by the Massachusetts Municipal Association and was ultimately removed prior to its final passage.[145] A number of bills prescribing a variety of different treatments have been proposed during the 2013 legislative session (see Appendix A).

Michigan*: Michigan does not have any general form of property tax exemption or other policy for PV systems. However, it formerly allowed an exemption for new "alternative energy personal property," including "alternative energy systems" such as PV (MCL § 211.9(i)). The exemption required a certification from the Michigan Next Energy Authority and was only available against taxes levied from 2003 through 2012. In other words, the exemption disappeared at the end of the 2012 property tax year regardless of the date that a facility is placed in service.[lviii] Michigan's Constitution requires that property be assessed at 50% of its true cash value (Michigan Const. Art. IX, § 3).

In December 2008, the Michigan State Tax Commission (STC) issued guidance to assessors indicating that where residential, agricultural, or commercial PV systems are designed to provide energy for use directly by the owner of the system, the system should be classified as a real property improvement. The guidance further states that solar arrays owned by a party other than the owner of the underlying land should generally be considered personal property. With respect to valuation, for behind-the-meter systems, the STC has issued a valuation multiplier table for use in estimating the value of wind energy systems and solar arrays as they age. The table is intended to reflect both changes in replacement cost and accrued depreciation; however, the table itself is only suggested for use in the 2009 assessment year. The memo also references a U.S. Department of Energy estimate that solar array costs range from $6–$8 per watt, though it does not provide any further suggestions for how this information could or should be used.[146] This guidance is advisory in nature; the ultimate determination of classification and value rests with the local assessor based on the individual facts and circumstances of a project.

Though the guidance indicates that third-party owned PV is typically personal property, it is not entirely clear which type of personal property PV would fall under.[lix] The classification and sub-classification is important because certain levies apply only to certain property types. An industrial personal property designation would exempt a facility from the 6 mill state education tax (MCL § 211.903) and up to 18 mills of local school district operating millage (MCL § 388.1211). A commercial business personal property designation would only exempt a facility from up to 12 mills of the local school district operating millage (MCL § 388.1211), and does not confer any exemption from the state education tax. While no guidance specific to PV systems has been issued, a 2008 STC memo concluded that because state law considers electricity generation to be an industrial activity (MCL § 211.34c), the most reasonable sub-classification of wind energy property is industrial personal property. It also stated that the underlying land should be classified without regard to the wind turbines, unless the land is owned by the owner of the wind turbine and not used for any other purpose.[147] As written, this guidance applies

[lviii] It is unclear whether certified facilities will continue to receive the exemption for property taxes owed during 2013, as 2013 taxes may be considered to have been "levied" on December 31, 2012. This exemption also has a local option aspect to it, in that school districts and local taxing units are permitted to adopt resolutions to deny the exemption for the purposes of property taxes within 60 days of the certification.

[lix] While the December 2008 memo seems clear on this point, it is seemingly at odds with prior guidance (State Tax Commission Bulletin No. 8 of 2002) providing that free-standing improvements on leased land should be considered real property (see http://www.michigan.gov/treasury/0,1607,7-121-1751_2228_2230_6214-48863--,00.html).

only to wind energy systems, though the reasoning used seems equally applicable to grid-supply PV systems.

With respect to valuation, it is noteworthy that the STC's 2008 guidance to assessors states that it "anticipates that property owners will often perform some or all of the installation of alternative energy systems themselves. For this reason, the Commission considers it inappropriate for the assessor to rely on taxpayer-provided costs unless the assessor has first verified that such costs reflect local market costs for a complete installation of the system." This distinction between market costs and reported costs could prove significant. In one instance, a 147 kW system completed in 2010 and enrolled in the Consumer's Energy FiT (Kalamazoo Solar) was valued at roughly $7.3/watt in 2010, which the project owner contends is more than twice what it paid for the system.[148] This valuation, which was disputed by the property owner, was upheld in December 2012 by the Michigan Tax Tribunal.[lx] Though a full depreciation schedule is not available for this project, the stated valuations for 2010-2012 place the facility at 97.1% of its initial 2010 value for 2011, and 96.4% of its initial 2010 value for 2012.[149]

Minnesota: PV systems are exempt from property taxes with no apparent limit on system size or limitations to on-site use. The underlying real property remains subject to tax (Minn. Stat. § 272.02). The lack of any limitations indicates that any and all PV systems, including large-scale solar farms, are exempt from property taxes. The Minnesota Department of Revenue (DOR) noted that this detail has not been an issue thus far due to the lack of large-scale solar development in the state, but that the law does in fact appear to apply to all PV systems regardless of size or configuration.[150] This exempt status was confirmed with the completion of a 2-MW solar farm in the town of Slayton, Minnesota. The Murray County Assessor's Office indicates that the PV system itself is indeed considered exempt (per guidance from the Minnesota DOR), and that the underlying land will be subject to tax as commercial real property.[151, lxi]

Mississippi: Mississippi does not have any property tax laws that apply specifically to PV installations. The Mississippi Constitution defines five classes of property and the assessment ratio applicable to each class. Single-family, owner-occupied residential real property is assessed at 10% of market value; public utility property is assessed at 30% of market value; real property that does not fall under either category above is assessed at 15% of market value; and non-utility personal property except for motor vehicles is assessed at 15% of market value (Miss. Const. Art. 4, § 112). Electricity-generating property owned by public utilities is assessed centrally by the Mississippi Department of Revenue (DOR) (Miss. Code § 27-35-301). This designation does not include non-utility wholesale power generators, which are assessed locally.

[lx] The Michigan Tax Tribunal also concluded that the assessor erred in classifying the system as real property, and that it should instead be classified as personal property.

[lxi] It is worth noting that wind farms, which are also exempt from property taxes in Minnesota, are subject to a modest tax on energy production that varies by system size ($0.12–$1.20/MWh). Systems of 250 kW or less are also exempt from this tax, which is considered to be a form of personal property tax.

While not specific to PV facilities, Mississippi law does permit county and municipal taxing jurisdictions to offer exemptions or enter fee agreements with certain types of "new enterprises." Upon a local authorization, an exemption of up to 10 years is available against municipal and county (but not school district) taxes for manufacturing and other types of facilities (Miss. Code § 27-31-101). It is not entirely clear whether a wholesale power production facility would qualify as a manufacturing facility. However, a separate section allows local jurisdictions to adopt PILOT agreements of up to 10 years in length with any private company that develops a project with a minimum capital investment of $100 million. The PILOT must be equivalent to at least one-third of the property tax that would have been owed in its absence. In contrast to the industrial exemption, the PILOT applies equally to school district taxes in addition to municipal and county taxes (Miss. Code § 27-31-104).

Mississippi does not appear to have a formal definition for "real property," making it difficult to ascertain how PV systems would be classified. However, Mississippi DOR staff suggested that residential systems owned by the residential property owner would likely be considered real property, but that leased systems or other non-residential systems would likely be designated as business personal property. In either case, a replacement cost methodology would typically be used based on the original acquisition cost unadjusted for any applicable tax credits.[152]

Generally speaking, utility property that falls under centralized assessment, and personal property that is assessed locally, cannot be depreciated below a 20% floor value while the equipment remains in operation. For personal property appraisals, the Mississippi DOR annually supplies depreciation schedules to local assessors based on average industry class lives established by the Marshall Valuation Service. For "industrial" equipment, the original cost new serves as the pricing basis, which is then multiplied by the appropriate inflation factor (also from the Marshall Valuation Service) and then depreciated according to the equipment age. For general business property, the process is similar, except the Mississippi DOR provides annually revised pricing information that is already trended for inflation (CMSR 35-006-002).

Missouri: Missouri had no statewide policy addressing the assessment and taxation of PV systems until July 2013. However, effective August 28, 2013, H.B. 142 exempts solar energy systems not held for resale from state, local, and county level property taxes. This language suggests that any type of solar system, from a residential PV system owned by homeowner to a large grid-supply PV facility owned by an energy developer, qualifies for the exemption. However, it is difficult to definitely say how broadly the law will be interpreted, or if certain circumstances (e.g., a system purchase option for a leased system) could render the exemption unavailable. For informational purposes, the summary information below describes policies and practices as they existed prior to the enactment of H.B. 142, which could remain relevant for any system that does not fall under the exemption.

Statewide, residential real property is assessed at 19% of its true value, agricultural real property is assessed at 12% of its true value, and most other real property (including utility, industrial, and commercial) is assessed at 32% of its true value. Personal property is generally assessed at 33.3% of its true value (R.S. Mo. § 137.115). Electricity generating property of an "electric power and light company," which does not include municipal utilities or electric cooperatives, is assessed centrally as

distributable property by the State Tax Commission (R.S. Mo. § 138.420). Land associated with distributable property is also assessed centrally (R.S. Mo. § 153.034).

The definition of an electrical corporation in the Public Service Commission law includes any entity that generates electricity for sale to others. However, a recently added section of the Missouri Assessor's Manual (July 2012) addressing the assessment of wind energy facilities states that facilities which generate electricity for distribution on the network of another company should be locally assessed. The Manual goes on to state the Missouri Tax Commission's opinion that wind energy facilities should be classified as commercial real property. It further notes that at point in time, wind energy facilities are being valued by counties using the cost approach and percent good values of 40% for the first two years, 37% for the next two years, and 35% for the remaining life of the project.[153] While it is not possible to know whether a grid-supply PV farm would receive exactly the same treatment as a wind farm, it seems reasonable to believe that it would be addressed in a similar fashion. Thus the assessment ratio would likely be set at 32% for real commercial property and depreciated in a manner similar to that described above.

For grid-supply PV facilities, it is also relevant that 2011 legislation allows for the creation of "renewable energy zones" eligible for the tax benefits of the state's Enhanced Enterprise Zone program. Local governments may act to designate Enhanced Enterprise Zones through resolution or ordinance. If they do so, they must offer an abatement for *real property improvements* of at least 50% for 10 years, and may offer up an abatement of up to 100% for 25 years after the area is originally designated as an Enhanced Enterprise Zone (R.S. Mo. § 135.950 et seq.). Even prior to the 2011 enactment that pertains specifically to renewable energy, at least one wind farm received a property tax abatement under the Enhanced Enterprise Zone program as it existed at the time.[154]

For customer-sited facilities, available information is limited by the relative lack of solar installations in Missouri. The real and personal property analysis contained in the wind energy portion of the Assessor's Manual suggests that customer-sited installations would be considered real property improvements. This treatment could not be definitively confirmed by state or local assessment officials. As in many other states, the lack of comparable sales presents a challenge to assessors in valuing PV property as a fixture to real property.[155, 156] However, one official did note that the valuation of "special" properties not conducive to a comparable sales valuation might be undertaken using a replacement cost approach.[157] If this method is used, it seems likely that a PV system would add value, but the value cannot be estimated at this time with the available information.

Montana: The property tax situation for PV systems in Montana is somewhat complicated due to the structure of existing general property tax laws and those that pertain more directly to PV installations. Montana is also one of two states (the other being Maryland) where all property is assessed centrally by the state – in this case, the Montana Department of Revenue (DOR). There are several property tax abatements in Montana applicable to PV systems of different sizes.

One law provides property owners with a tax abatement for non-fossil energy generation systems, where a certain portion of the appraised value of a capital investment in a PV system is exempt from

taxation for 10 years after the installation. Systems installed on a single-family residence may receive an abatement of up to $20,000 of value added and a system installed on a multi-family residence or non-residential structure may receive an abatement of up to $100,000 of value added (MCA 15-6-224). The language of the law does not appear to require the PV system to be owned by the real property owner or require the energy to be used to serve on-site needs. However, other property tax laws suggest that the exemption is intended for systems owned by the real property owner and that provide energy for on-site use. A consultation with the Montana DOR indicated that this exemption may represent something of a backstop rather than an incentive for residential PV systems because such systems would be considered personal property, which is not taxable unless used in a business context.[158]

For 2012, the assessment rate for residential, commercial, and industrial land and improvements (Class 4 property) was 2.63% of market value, though this changes from year to year (MCA 15-6-134). Single-family residential homes and commercial properties also receive annually-varying percentage-of-value based exemptions that further reduce their taxable value. The residential exemption is 44% on value of up to $1.5 million during 2012, increasing to 47% in 2014 and thereafter. The commercial exemption is set at 19% for 2012, increasing to 21.5% in 2014 and thereafter (MCA 15-6-222). To the extent that taxable property value increases after the non-fossil energy generation exemption is lost (after 10 years), a portion of the value attributable to the PV system would remain exempt as a component of the property itself. Other local option exemptions exist for improvements made to commercial and industrial buildings.

Grid-supply PV systems with a nameplate capacity of less than 1 MW-DC are eligible for a five-year exemption from property taxes (MCA 15-6-225). Systems that are larger than 1 MW-DC are eligible for a local option abatement of taxes levied by local high school and elementary school districts. If adopted by a local government, during the first five years after a construction permit is issued, the property is taxed at 50% of its taxable value. In subsequent years, the tax reduction decreases and the taxable value percentage is increased in equal increments until the full taxable value is attained in the tenth year and each year thereafter (MCA 15-24-1402). It should be noted that the abatement does not apply to state property tax levies. The major components of state-levied taxes are a 33-mill charge for elementary education equalization (MCA 20-9-331), a 22-mill charge for high school education equalization (MCA 20-9-333), a 40-mill charge for general education equalization (MCA 20-9-360), and a six-mill charge for the state university system which expires January 1, 2019 (MCA 15-10-108).

Electricity generation property owned by public utilities (not including electric cooperatives) is assessed at 6% of market value. The valuation is done by the Montana DOR on a unitary basis (MCA 15-6-156). The public utility classification does not include a non-utility generator unless the property is situated in more than one county or state (MCA 15-23-101).

A non-utility grid-supply PV system, including one eligible for the exemptions described above, may fall under different classifications (and assessment rates) depending on ownership. It would, in many cases, fall under the classification of business personal property (Class 8 property), which includes all machinery and equipment held for lease or rent and any property not included in another class of property. Business personal property is assessed at varying rates in relation to market value, depending

on the overall value and other factors. Property valued in excess of $3 million dollars is assessed at 3% of market value (MCA 15-6-138). The valuation would typically be undertaken using a trended original cost approach. Inflationary trending and depreciation would be determined using various pricing guides, such as those published by the Marshall Valuation Service.[159]

Nebraska: Nebraska does not have any property tax laws that are specific to PV. The state assesses property at its full value, with the exception of agricultural property, which is assessed at 75% of its actual value. For real property, this is termed the *actual value*, while for personal property, it is termed the *net book value* (R.R.S. Neb. § 77-201). Assessments for "public service" entities, including companies organized for profit engaged in the business of electrical power, are performed centrally by the Nebraska Property Tax Administrator.[160]

The assessment of depreciable personal property is set at its net book value. The net book value is calculated as the federal adjusted basis (including cost, sales tax, freight, installation, testing charges, or other fees associated with the cost of the property) multiplied by the appropriate Nebraska net book depreciation factor. The Nebraska statutes define the depreciation factors for different classes of property based on the applicable recovery period (R.R.S. Neb. § 77-120). The recovery period for personal property corresponds to the federal MACRS recovery period, regardless of whether the property owner utilizes MACRS.[161, 162]

Though the issue is not specifically addressed by statute or regulation, it is likely that behind-the-meter PV systems owned by the host property owner will be considered real property fixtures and incorporated into the value of the underlying real property. In contrast, systems owned by a third-party are likely to be considered personal property as a *trade fixture*, which includes equipment used for a commercial activity. Trade fixtures remain personal property regardless of their degree of attachment to the underlying real property (Nebraska Admin. Code Title 350, Ch. 10). For PV systems deemed to be real property improvements, it is not clear whether assessors typically recognize any contributory value for the system. In many cases, comparable sales may not exist, but assessors might consider a cost-based approach under these circumstances.[163] For PV installations deemed to be personal property, the valuation would take place according to the net book value method described above.

Nevada: By law, all customer-sited residential and non-residential PV systems are exempt from property taxes (NRS § 701A.200). Grid-supply PV facilities of 10 MW or larger that meet certain other requirements are eligible for a property tax abatement of 55% for up to 20 years (NRS 701A.360 et seq.). Facilities located wholly within a county that do not transmit power across county lines are locally assessed. Based on a review of several abatement applications for large-scale PV projects, it appears that Nevada generally considers grid-supply PV facilities to be real property improvements rather than personal property (see Section 3.1.2 for further details). Consequently, the PV property is valued at its replacement cost less depreciation, with depreciation determined at a rate of 1.5% annually for a

maximum of 50 years. The cost of the improvements is not adjusted upward for inflation (although the land value may appreciate over time).[164, 165, lxii]

New Hampshire: While no broadly-applicable exemption or special assessment exists for PV property in New Hampshire, municipal governments are permitted to offer an exemption equal to the assessed value of the PV installations used to provide electricity for on-site use (RSA 72:61 et seq.). As written, the law does not differentiate between residential and non-residential systems, or place any limitations on ownership arrangement. These details are left to the discretion of a local governing body that adopts an exemption.

As of February 2013, 84 cities and towns had adopted this exemption.[166] An informal survey completed by the New Hampshire Office of Energy and Planning found that municipalities that have adopted the exemption show wide discrepancies in the implementation in this policy. Some municipalities treat the exemption as a predetermined tax deduction regardless of the assessment. Many others impose a cap on the exemption anywhere from $5,000 to $20,000. A handful of municipalities actually treat the exemption like a tax credit rather than a traditional exemption, contrary to the state legislation. The study also exposes variations found in how municipal entities are assessing the value of the installations. Different methods include the full installation cost, a predefined portion of the installation cost (i.e. 50%), market value, or the assessor's discretionary determination of value. A majority of the survey responses relied on the experiences of the assessors interviewed, with few municipalities reporting that they had written guidelines on how to value solar installations.[lxiii]

If a local government has not adopted the exemption, or the property does not fall within the limits of an exemption, PV property would be assessed and taxed under the general provision of the state property tax code. Most property in New Hampshire is taxed on its full market value (RSA 75:1). Grid-supply PV facilities would be assessed centrally by the state as utility property, which includes all facilities "employed in the generation…of electric power." Utility property is subject to state tax rate of 0.66% on the assessed value. While property taxed under the state utility property tax rate is exempt from paying the state education property tax, it remains subject to local taxes (RSA 83-F:1 et seq.). Central assessments employ all three traditional valuation techniques, but the availability of reliable data tends to result in greater reliance on the cost and income approaches. Values under these approaches are arrived at independently and reconciled to arrive at a final valuation, usually with greater weight applied to the income approach.[167] With respect to local taxes, New Hampshire law permits renewable energy facilities to enter into PILOT agreements with local taxing districts (RSA 72:74). PILOT agreements have been pursued by a number of wind farm operations in New Hampshire.[168] The existence of a PILOT does not exempt a facility from the state utility property tax.

[lxii] Nevada's Personal Property Manual defines class lives for numerous types of personal property. Items of personal property are valued at their replacement cost new less depreciation – the same as real property improvements. However, personal property typically may be depreciated more quickly than real property improvements (e.g., over 30 years for some types of electric power generation equipment).

[lxiii] The results of this survey have not been published in any formal report or other publication. The survey results were provided.

Facilities that fall within the definition of an "eligible customer-generator" are not considered utility property (RSA 72:8). The term "eligible customer generator" generally refers to a customer that owns or operates behind-the-meter renewable energy generation of up to 1 MW (RSA 362-A).[lxiv] Assessment methodology may vary by locality, but tends to be based on either the market method or the cost method.[169] Tax rates also vary by locality, but the total annual tax rates, including local, county, and state tax rates, range from 1-3% of the assessed value.[170]

New Jersey*: By law, customer-sited PV facilities of all types are exempt from property taxes (N.J. Stat. § 54:4-3.113a et seq.). New Jersey does not levy property taxes on business personal property, so for a grid-supply PV facility, the local assessing officer must make a determination of what constitutes real property and what constitutes personal property based on a three-factor test. The components of the test relate to: the intended permanence of the installation; the potential for injury of the property in question upon removal of the equipment; and the potential for injury of the associated real property upon removal of the equipment. The outcome of this determination may depend on the physical characteristics of the facility itself, although anecdotal evidence suggests that the vast majority of a PV installation will typically be classified as personal property, and therefore not taxed.[171, 172]

All New Jersey counties currently use a 100% assessment ratio, so property should, in theory, be assessed at its full true value.[173] In practice, the ratio of assessed value to true value differs markedly from district to district, as do the associated tax rates (i.e., lower valuations necessitate high tax rates). The issue of property taxation of grid-supply PV farms has not gone unnoticed by the New Jersey legislature. Bills were introduced during both the 2010–2011 (S.B. 2888) and 2012–2013 (S.B. 1270) sessions to provide for uniform assessments of so-called "commercial renewable energy system[s]" (see Appendix A for details).

New Mexico: Under New Mexico law, a residential PV system is not treated as a physical improvement to a home and therefore may not increase its value (N.M. Stat. § 7-36-21.2).[lxv] In theory, this exclusion only lasts until a change in ownership of the home, at which point, any value added by the PV system is taxable. However, assessment officials in Bernalillo County (Albuquerque) indicated that at this point in time, PV installations do not increase the assessed value of properties even where a home has changed ownership.[174]

There is a lack of any definitive information on whether third-party owned systems are typically identified by assessment officials or treated differently than customer-owned systems (e.g., as business

[lxiv] For facilities placed in service on or before July 1, 2010, the definition is limited to facilities with a peak generating capacity of 100 kW or less (RSA 362-A). The use of the word "operate" in this definition indicates that the definition includes leased systems. Related proceedings that the New Hampshire Public Utilities Commission (PUC) also indicate that PPA arrangements are permitted in New Hampshire, though the PUC did not explicitly state that the definition of customer-generator includes PPA systems (see PUC January 31, 2012 Letter, Docket DE 10-212, http://www.puc.state.nh.us/Regulatory/Docketbk/2010/10-212.html)

[lxv] For PV systems, the definition of a qualifying solar energy system includes only "solar panels that are not also windows." This could render the exclusion unavailable for certain types of building integrated PV (BIPV) installations.

personal property). In New Mexico, by law, business personal property generally must be valued under a cost approach that utilizes the original acquisition cost, straight-line depreciation over the class life established for a type of property by the IRS, and a residual value of no less than 12.5% (N.M. Stat. § 7-36-33). New Mexico's business personal property valuation guidelines do not explicitly address PV or other solar energy systems.[175]

New Mexico law provides that electricity-generating plants are centrally assessed by the New Mexico Taxation and Revenue Department "if all or part of the electricity is generated for ultimate sale to the consuming public." This includes systems not owned by a public utility (N.M. Stat. § 7-36-2). The language above suggests that PV systems under retail PPA arrangements could fall under central assessment, but this reading of the law could not be definitively confirmed with state officials. For property that does fall under central assessment, the state employs a replacement cost methodology using the original or acquisition cost and a 20-year straight-line depreciation schedule with a 20% floor.[176] New Mexico uses an assessment ratio of 33.3% for all types of property (N.M. Stat. § 7-37-3).

New York*: New York has two separate property tax laws that pertain specifically to PV property. By law, the value added by energy conservation improvements (including PV systems) that are owned by private individuals and installed on one- to four-family homes is exempt from property taxes (NYCL Real Property Tax Law §487-a). A separate law creates an option for local governments to allow a 15-year exemption from real property taxes for the increased value attributable to PV equipment installed by the end of 2014 (NYCL Real Property Tax § 487). Notably, the latter exemption does not require facilities to be customer-sited in order to qualify and contains no customer ownership requirement.[177, 178]

Local governments that have not exercised the opt-out provision are permitted to enter into a PILOT agreement with the property owner for which the payment does not exceed the amount of property tax payable without an exemption. The two laws are also differentiated by the fact that the latter does not allow an exemption from special *ad valorem* levies (i.e., additional tax obligations based on value) that may exist in some jurisdictions, while the former does. The PILOT option, created in 2002, has been used frequently for wind farm developments.[179] It seems likely that large-scale solar farm developments would also be addressed under a PILOT arrangement, though that may depend on the local jurisdiction.

It is also worth noting that New York City offers a property tax abatement for solar PV systems installed between August 5, 2008 and December 31, 2014. Depending on when a facility is or was placed in service, the total abatement ranges from 10% to 35% of the installed cost of the system, up to $62,500. It is unique in that it is claimed over four years against the total property taxes owed on the building, rather than against the value or value added by the system itself (NYCL Real Property Tax § 499-aaaa et seq.).

Where a jurisdiction has opted out of the exemption, it is also relevant that personal property is not subject to property taxes in New York (NYCL Real Property Tax Law § 300). In 1993, the New York Office of Real Property Tax Services (ORPTS) issued an opinion that a commercial wind farm should be considered real property and therefore subject to taxes "when the intent of permanence of installation

can be inferred from its use in generating electricity to be sold to a utility company." [180] While not specific to PV, this opinion is perhaps indicative of how the ORPTS would view a wholesale PV facility not eligible for an exemption or a PILOT.

North Carolina: Generally, under North Carolina law, 80% of the appraised value of a PV system is exempt from property taxes (N.C. Gen. Stat. § 105-275, section 45). However, the North Carolina Department of Revenue has determined that systems owned by individuals and not used to produce income or in connection with a business constitute non-business personal property that is excluded from taxation (N.C. Gen Stat. § 105-275, section 16). Consequently, a net-metered system owned by an individual for which the owner receives only net metering credits and does not claim depreciation is considered exempt non-business personal property. The determination of whether a system generates income hinges on whether the system owner files a Schedule C (the federal tax form for business income/losses for a solar proprietorship) and claims depreciation on the capital expense of a system. Therefore, a system where an individual owner recognizes income received from a utility company would be considered taxable business personal property.[181]

This distinction has a somewhat unique relevance in North Carolina because net metering has historically been a less attractive option than the NC Greenpower program for small residential systems. The NC Greenpower program operates under an arrangement where customers sell all of the electricity produced by a system to the utility rather than using it for on-site needs. Moreover, some North Carolina systems are eligible to sell SRECs that are eligible for the District of Columbia's renewable energy standard.[lxvi] There is anecdotal evidence that some residential PV system owners have filed depreciation claims under the justification presented above (power and/or SREC sales constitute a business). There is also the possibility that a residential owner of a home-based business would elect to claim depreciation on the portion of the system that could be considered to be put to business use. However, one complicating factor is that an assessor is unlikely to know what arrangement a system is under or whether it is being depreciated unless so informed by the system owner. Unlike business owners, homeowners do not file personal property tax forms and in some cases may be unaware they could be subject to business personal property taxes.[182]

For PV systems that are classified as business personal property and are not owned by a regulated utility, the appraised value is determined under a cost approach using an 18-year straight-line depreciation schedule, adjusted for inflationary effects using a trending factor. The product of the trending factor and the depreciation factor is multiplied by the full original cost (i.e., not accounting for federal tax incentives) to determine the appraised value, which has a 25% floor. The appraised value is then reduced by 80% under the special assessment to determine the assessed value. The property of regulated utilities is centrally assessed using a composite of the standard valuation approaches. The 80% reduction in the appraised value for PV systems is included in the cost approach.[183]

[lxvi] The District of Columbia has amended its RPS to remove this option for any facility located outside of the District that was not certified by the District Public Service Commission before February 1, 2011. A sizable number of facilities located in North Carolina continue to qualify because they were certified prior to this deadline.

North Dakota: Under North Dakota law, 100% of the value of a locally assessed PV installation is exempt from property taxes for five years after it is placed in service. The exemption includes any installation, machinery, and equipment in new or existing buildings or structures, designed to provide heating or cooling or to produce electrical or mechanical power (N.D. Cent. Code § 57-02-08(27)). After the expiration of the five-year exemption, a building or structure will be valued at its estimated market value, including the value of the PV system.[184] It is not clear at this time whether and by how much the market value of a home will be increased subsequent to the loss of an exemption.

Any business engaged in the generation and sale of electric power is assessed centrally by the North Dakota Board of Equalization. It is unclear whether a non-utility owned grid-supply system would fall under this definition, but it is worth noting that central assessment does specifically does apply to wind turbines (N.D. Cent. Code § 57-06). Consequently, while the exemption described above does not explicitly state that qualifying systems must be used to serve on-site needs, grid-supply facilities will not qualify if it is determined that they should fall under central assessment.

Facilities that are subject to central assessment may make an irrevocable election to be taxed on the basis of generating capacity and energy production rather than market value. For a PV facility of 100 kW or larger, the PILOT owed under this option amounts to the sum of $500 per MW and one mill per kWh of electricity production during a taxable period. The PILOT only operates in place of taxes owed on the generation facility itself, rather than the underlying real property or certain other improvements (e.g., an office building) that may been added to the property (N.D. Cent. Code § 57-33.2).

Ohio: Under Ohio law, all residential and non-residential PV facilities up to 250 kW-AC and built after January 1, 2010, are exempt from public utility tangible personal property and real property taxes (ORC § 5709.53). This includes PV systems owned by a party other than the site host (i.e., a third-party ownership arrangement). Larger facilities for which construction commences by the end of 2015 and which are placed in service by the end of 2016 are also exempt from real and personal property taxes, but owners (or lessees under a sale leaseback transaction) are required to make a PILOT. For PV projects, the PILOT rate is set at $7,000/MW. In order to qualify for the exemption, and hence the PILOT, facilities must be certified by the Ohio Department of Development. The application must be made by the end of 2015, though as noted above, the placed-in-service requirement extends one year beyond the deadline for the commencement of construction and PILOT application. The respective 2015 and 2016 deadlines stem from recently enacted H.B 59, which extended both by two years.

Under the PILOT, projects larger than five MW require a specific county approval, unless the county has already adopted a resolution declaring the county to be an “alternative energy zone,” in which case, all projects would automatically fall under the PILOT. In addition to making the PILOT, projects must also: 1) meet certain jobs-creation criteria; 2) provide for road and other infrastructure repairs (for projects of five MW or more); 3) provide training and equipment to local first responders (for projects of five MW or more); 4) establish partnerships with universities (for projects of two MW or more); and 5) with certain exceptions, make offers to sell the RECs produced by a project to Ohio utilities seeking to buy them (i.e., right of first refusal). A county is also permitted to require additional payments beyond the

standard $7,000/MW rate through the adoption of an "alternative energy zone" resolution or the specific approval of a project larger than five MW, up to an overall total of $9,000/MW (ORC § 5727.75).

The Ohio PILOT law was enacted largely in response to claims from the renewable energy community that the existing laws levied very high taxes on renewables and constituted a significant impediment to development. The former law classified any property used to generate electricity for sale to a third-party as public utility tangible personal property.[185] The true value of this type of property is calculated as the cost of the property as capitalized on the company's books, minus an annual allowance for depreciation. For electricity production equipment placed in service after October 4, 1999, the depreciated value is determined using a 30-year composite annual allowance to determine the percent good remaining.[186] By law, the assessment rate for electricity generation property is 24%, while distribution, transmission and energy conversion property is assessed at 85% of its true value (ORC § 5727.111). Some portion of plant costs may fall under the energy conversion property designation. The former treatment remains potentially relevant because if an exemption and PILOT is not granted, a PV project larger than 250 kW-AC that generates electricity for sale would continue to be classified as tangible utility personal property.

Oklahoma: Oklahoma has no state property tax laws that apply specifically to PV projects. Discussions with one county assessor and the Oklahoma Tax Commission suggest that PV projects would likely be assessed and taxed as real property improvements as a part of the value of the whole property.[187, 188] The Oklahoma Constitution establishes ranges for limiting the ratio of market value to assessed value. Real property must be assessed at 11–13.5% of its market value, while tangible personal property must be assessed at 10–15% of its market value (Okl. Const. Art. X, § 8). Assessment methodology varies by county, with some assessors using market data and other assessors valuing installations based upon its replacement cost new less depreciation. The Oklahoma Board of Equalization is charged with centrally assessing the properties of public service corporations, which include electric, light, heat and power companies (68 Okl. St. § 2808). These properties, which do not include non-utility generators, are assessed using a combination of all three traditional valuation methodologies and an assessment ratio of 22.85%.[189]

Notwithstanding the suggestions that PV installations are mostly likely to be assessed as real property improvements, it is worth noting that locally-assessed wind farms that generate electricity for sale are considered business personal property. Oklahoma's guidelines on business personal property valuation contain a section on commercial wind farms indicating that these facilities should be considered to have an economic life of at least 25 years and a residual value of 20% under a cost-based valuation.[190] This could be taken to indicate that a similar valuation schedule might be used for locally-assessed PV facilities that generate electricity for sale. While Oklahoma currently has no property tax exemption for PV installations, the state has implemented a property tax exemption for larger wind farms that meet certain investment criteria and have a minimum annual payroll (68 Okl. St. § 2902).

Oregon: Under Oregon law, the value added by PV and other alternative energy systems that are net metered or primarily intended to offset on-site electricity needs is exempt from *ad valorem* property taxes (ORS § 307.175). As Oregon's net metering law permits third-party ownership arrangements, the exemption applies to third-party owned systems as well (per a 2007 amendment). The exemption was

formerly scheduled to sunset with the start of the July 1, 2012 tax year, but legislation enacted during the 2011 legislative session (H.B. 2563) revised the sunset date to the start of the July 1, 2018 tax year. The Oregon Solar Incentive Rate Pilot Program is structured in such a way that small systems (100 kW or less) fall under an arrangement that resembles net metering and appears to not violate the exemption requirement for net metering or on-site use.[191]

Non-net-metered systems remain taxable if their primary purpose is the sale of electricity for consumption by others (ORS § 308.515). According to the Oregon Department of Revenue, rooftop systems would generally be considered real property, though the determination is based on intended use rather than the site of the installation. Projects that generate electricity for sale are considered utility property. Real property is assessed locally by county assessors while utility property is assessed centrally by the Oregon Department of Revenue.[192] In some cases, a PV facility may be able to receive a property tax exemption if it is located within a designated Rural Renewable Energy Development Zone (ORS § 285C.350 et seq.) or a Strategic Investment Zone (ORS § 285C.600 et seq. and § 307.123). The benefits in either case could be considerable, but various requirements exist for both.

All non-exempt property is assessed at 100% of its market value (ORS § 308.250). For non-exempt grid-supply PV systems determined to be utility property, all approaches to valuation are used. However, a state official indicates that assessments tend to rely heavily on the cost method because of the relative uniqueness and novelty of PV property. Under this method, the original cost is trended using the Marshall and Swift Manual and the PV property is depreciated under a 20–25 year straight-line schedule with a 10–20% floor value. In most cases, the book cost of the system is reduced by the value of non-transferrable incentives (e.g., a grant or a tax credit). Income-based approaches may be used as well and the appropriate weighting of different approaches would be left to the judgment of the appraiser.[193]

Pennsylvania: Pennsylvania does not have any property tax laws specific to PV installations and has not issued any formal guidance on the matter. Based on communications from several assessing jurisdictions, it appears that PV systems do not commonly add value to assessments. Residential properties equipped with PV would likely experience no immediate increase in value due to the lack of comparable sales or inadequacies in computer-aided assessment software. For non-residential customer-sited property or third-party owned systems, the property will likely be classified as industrial machinery and equipment, which by law is not subject to property taxes in Pennsylvania (53 P.S. § 8811(b)(1) and 72 P.S. § 5020.201(a)).[194, 195, 196, 197]

While the law itself does not specifically enumerate the status of electricity production equipment, the courts have indicated that "machinery and equipment used directly in, and for the sole purpose of, the generation of electricity…" qualifies for the exclusion.[198] For instance, the Lancaster County Property Assessment Office indicates that it has no plans to assess taxes on the solar equipment of the 6 MW Keystone Solar Project being developed by Community Energy Inc.[199]

Tangible personal property as a whole is not subject to property taxes in Pennsylvania.[200] To the extent that a system is determined to be real property (e.g., a residential homeowner-owned system) and a value can be assigned to it, it could be subject to property taxes in the future. This may not necessarily

immediately be the case though, because some taxing jurisdictions are permitted to offer abatements or exemptions for improvements made to real property.[lxvii] For instance, the City of Philadelphia (consolidated with Philadelphia County) offers a ten-year abatement for improvements to existing residential, commercial, or industrial properties.[201] Both Allegheny County and the City of Pittsburgh (the largest city in Allegheny County) offer three-year abatements for improvements made to existing homes that are valued at up to $36,009.[202]

Rhode Island: Rhode Island has two state laws that are relevant to the property taxation of PV systems. Under one law, Rhode Island limits the valuation of a PV system for municipal property tax assessment to no more than a conventional energy production facility that may be implemented onsite (R.I. Gen. Laws § 44-57-4). The breadth of this law is slightly unclear, but the way it is formulated suggests that it only applies to systems located on residential properties. The reason for this is that the exemption is written into a law governing an income tax credit for PV and other renewable energy systems. This income tax credit is only available for systems located on residential properties, though it may also be claimed by a business that owns the system (R.I. Gen. Laws § 44-57-3 and § 44-57-5). The method of determining the exemption value (i.e., what is the conventional system in question for PV) is not explicitly defined, but at least some assessors have interpreted the law to mean that the presence of a solar installation should be considered no different than the presence of a gas furnace, boiler, or generator.

A second law permits cities and towns to exempt "renewable energy systems" from property taxation through the adoption of a local ordinance (R.I. Gen. Laws § 44-3-21). While this statute does not specifically define "renewable energy systems," PV systems generally fall under the definition of renewable energy in Rhode Island law (see e.g., R.I. Gen. Laws § 44-57-4). A local unit of government could presumably elect to create more specific definitions of eligible systems, or limit any exemption to specific sectors (e.g., residential). Officials from the Rhode Island Office of Energy Resources and the Division of Taxation were uncertain if any local governments have adopted this exemption.[203, 204]

Where property is not exempt, it would be taxed according to general property tax laws. Property tax assessment and collection is conducted by each of the 39 local governments in the state. In contrast to many other states, local assessment includes the property of electric utilities. Assessment ratios vary by jurisdiction, but for real property may not exceed 100% of the fair cash value (R.I. Gen Laws § 44-5-12). The assessment ratio for personal property used in manufacturing may not exceed 50% of the full cash value (R.I. Gen Laws § 44-5-38).

Rhode Island breaks property into four classes and provides limits on the levy rates that may be applied to each class in relation to the others. The numerous exceptions and local permissions make generalities difficult, but typically, rates on one class of property may not exceed rates on other classes by more than

[lxvii] Property tax administration in Pennsylvania is governed by different statutes according to county and city population. Counties with populations of less than 800,000 (Second Class-A through Eighth Class counties) are subject to the same laws, while larger counties such as Philadelphia and Allegheny County occupy separate classes subject to a somewhat different set of underlying laws.

50%, except in some cases, personal property may be taxed at twice the rate of other classes. Property can generally be considered to be either residential of 4 units or less (Class I); commercial, industrial, or multifamily residential (Class II); tangible personal property (Class III); or motor vehicle property (Class IV), but the classification details and levy rate differences applied may vary from place to place (R.I. Gen Laws § 44-5-11.8 et seq.). Based on a review of the tax rates for different types of property in three large municipalities (Providence, Cranston, and Warwick), rates levied on residential (Class I) property tend to be the lowest, while rates on commercial/industrial property (Class II) are higher, and rates on tangible personal property (Class III) may be higher still. The proper classification of PV systems as real property (Class I or Class II) or as personal property (Class III) has not been specifically addressed through any law or regulation. However, under Rhode Island law, all "machinery, tools, and apparatus of every description" owned by an entity other than the real property owner are considered personal property (R.I. Gen Laws § 34-17-2). This suggests that third-party owned systems are properly classified as personal property, though the classification of other types PV systems is less certain.

The valuation of real property may be accomplished using the market approach, cost approach and the income approach at the discretion of the local assessor.[205] State law requires that tangible personal property be assessed based on the original cost using standard depreciation tables. For depreciation purposes, the state defines three categories of tangible personal property. It appears that PV would most likely fall under Category III property, which is used for property with a useful life of 13 years or longer. This is the category used for other types of electricity generating property, though in contrast to other types of generating facilities (e.g., gas turbines), PV is not specifically listed as an item of property. If assessed as Category III property, a PV system would be depreciated at 5% annually down to a floor value of 30% in Year 14 and thereafter. Tangible personal property assets may not be trended for inflation (R.I. Gen Laws § 44-5-12.1).

Local assessment practices for PV exhibit a fair degree of variation. One local assessor suggested that the system would be treated as tangible personal property regardless of whether the property is residential or commercial or if the property is using the electricity on-site or selling it to the utility.[206] The assessor from North Kingstown noted that in the case of the market approach, a PV installation would be treated as any reasonable conventional heating or generation source.[207] Another assessor from Narragansett has decided to ignore the presence of solar installations on residential properties and suggested that if solar were to be installed for on-site use on a commercial facility, the assessor would likely not increase the property valuation. In describing the reasons for this treatment, the assessor noted a lack of available market data on which to base a valuation, as well as a deliberate decision to promote economic activity by limiting taxation on commercial entities.[208]

South Carolina*: South Carolina does not have any property tax laws specific to PV installations. Both real and personal property is taxable in South Carolina and state law defines assessment ratios for different types of property. Primary residences are generally assessed at 4.0% of fair market value. Non-corporate agricultural land is assessed at 4.0% of market value, while agricultural land owned by a corporation (with certain exceptions) is assessed at 6% of market value. Utility property, manufacturing property, and personal property are assessed at 10.5% of market value. Commercial real property would

generally fall under a catch-all provision for "other" real property and be assessed at 6% of fair market value (S.C. Code § 12-43-220).

Property owned or leased by "water, heat, light, and power" companies is assessed centrally by the South Carolina Department of Revenue (DOR) (S.C. Code § 12-4-540). This term is not specifically defined in South Carolina law, but the definition of an "electric utility" in the public utilities code suggests that any entity engaged in the sale of electricity would be classified as such. The definition does not include installations for which the electricity is not resold for use by others (S.C. Code § 58-27-10). This distinction could be important, as both the Palmetto Clean Energy (PaCE) program (for small residential and commercial systems) and the Progress Energy SunSense program (for larger non-residential systems) operated under buy-all, sell-all arrangements where the full amount of customer generation is sold to the utility under a PPA.[209]

South Carolina's definition of real property, which includes land and "all structures and other things therein contained or annexed or attached thereto which pass to the vendee by the conveyance of the land or lot" suggests that PV installations would generally be considered real property (S.C. Code § 12-37-10). However, many items of machinery and equipment, including steam electric generating plants and equipment, are considered personal property (SC Code Regs. 117-1700.1).

Business personal property is assessed centrally by the DOR. The DOR indicates that leased equipment should be reported on personal property tax forms.[210] If treated as business personal property, a PV system would be depreciated on the same schedule used for South Carolina income tax purposes, down to a floor value of 10% of the original cost (SC Code Regs. 117-1840.1). It is unclear how different types of PV installations should or are being classified for property tax purposes by state or local officials.

South Dakota: South Dakota offers a partial real property exemption from property tax for renewable energy facilities of five MW or less, including PV installations. Under the law, the amount of the exemption is calculated as the greater of the first $50,000 of the assessed value or 70% of the assessed value of all real property used or constructed for the purpose of generating electricity using a renewable resource. The law makes no distinction between customer-sited and grid-supply facilities and contains no explicit system ownership criteria. All such facilities are locally assessed in the same manner as other real property (SDCL § 10-4-42 et seq.). The exemption only applies to the system, rather than to the value of the property as a whole.[211]

Though the exemption above applies only to real property, it is worth noting that with the exception of centrally-assessed property, personal property is exempt from property taxes (SDCL § 10-4-6.1). The definition of personal property includes "tools, implements, machinery, or equipment" that is used in a business activity. The determination of whether an item of property is real or personal in nature rests with the local assessor, and valuations typically utilize the Marshall & Swift or Vanguard appraisal manuals.[212]

The South Dakota Department of Revenue is tasked with assessing the operating property of light and power companies that furnish or distribute electricity for public use. Central assessments use all three generally accepted appraisal approaches (SDCL § 10-35-1 et seq.). It is somewhat unclear whether a

grid-supply PV facility larger than five MW would fall under central assessment. Wind farms larger than five MW that were placed in service on or after July 1, 2007 are taxed under an alternative regime in place of normal property taxes. The alternative tax amounts to $3/kW of generating capacity and 2% of gross receipts. Gross receipts are calculated under a formula that sets the electricity rate equal to $0.0475/kWh in 2008, and increases it at 2.5% annually (SDCL § 10-35-16 et seq.). Applying a similar methodology to large-scale PV farms would require a change in law.

Tennessee: In April 2013, legislation was enacted changing how solar PV facilities in Tennessee are valued and taxed. The recently enacted legislation (H.B. 62/S.B. 1000) specifies that the value of solar property may not "initially" exceed 12.5% of total installed costs. It also generally directs appraisals to take into account that the immediate value of solar and other "green energy" property is significantly less than its cost. The revised valuation protocol is retroactively effective for the 2013 tax year.

Even under the standardized valuation methodology described above, the assessed value of a PV system will vary based on its classification because the assessment rates defined in the State Constitution and replicated in state law vary for different types of property. The rate is 55% for utility property (real and personal), 40% for commercial or industrial real property, 30% for business commercial/industrial personal property and farm property, and 25% for residential real property (Tenn. Code § 67-5-801 and § 67-5-901). In Tennessee, real property includes machinery and equipment affixed to real property that cannot be removed without damage to the real property (Tenn. Code § 67-5-501). Correspondence with state and local officials suggests that rooftop systems owned by the real property owner would be considered improvements to the real property on which they are sited, whereas third-party owned systems would likely be considered commercial or industrial personal property. Ground-mounted systems will likely be considered personal property regardless of the ownership configuration, but the classification may vary based on the characteristics of a given installation and the judgment of the assessor.

Tennessee law provides explicit cost depreciation schedules for items of personal property. Though PV systems are not specifically identified in the law, it appears that they would generally fall under Group I, which applies to fixtures and general equipment not listed in another group. This type of property is depreciated on a straight-line basis down to a floor value of 20% in Year 7 and thereafter (Tenn. Code § 67-5-903). It is not clear at this time whether systems subject to the special valuation protocol described previously will be permitted to accrue depreciation adjustments in the same manner.

Prior to the 2013 amendments, Tennessee law allowed machinery and equipment associated with "certified green energy production" facilities to qualify as pollution control facilities for the purpose of property taxes. Pollution control facilities are valued at their salvage value, which is the market value that could be realized through the sale of the equipment when it can no longer be used for its intended purpose and may not exceed 0.5% of the acquisition value of the facility (Tenn. Code § 67-5-604). A green energy production facility includes any PV facility that produces electricity for use and consumption off the premises (Tenn. Code § 67-4-2004). This designation includes any system that participates in the buyback incentive programs offered by the Tennessee Valley Authority and participating local utilities that receives the appropriate certification as such from the Tennessee

Department of Environment and Conservation.[lxviii] In November 2012, the Tennessee Attorney General opined that this treatment violates the Tennessee Constitution on the basis that it constitutes an effective (and impermissible) exemption from property taxes.[213] The Attorney General's opinion presumably played a role in pushing forward the 2013 change, though efforts to make a similar change during the 2012 legislative session pre-date its issuance.

Texas: Under Texas law, the amount of the appraised value of a property that arises as a result of the addition of a PV system that provides energy for on-site use is exempt from property taxes. This exemption applies to residential, commercial, and industrial facilities, and does not impose any facility size limits (Texas Tax Code § 11.27). The language of the exemption is such that it appears to exempt only the value added to the underlying real property, rather than the PV system itself. In other words, it is possible that a third-party owned system that provides energy for on-site use would remain subject to property taxes.

When valuing a property with a solar installation present, the state comptroller has issued guidelines for how to properly account for the exemption. These guidelines advise that while it may be more efficient to value a property assuming the PV installation does not exist, this may not accurately represent the value added to the property, especially for those appraisers that traditionally use the market or income approaches. If market data is available, the guidelines recommend that the appraiser conduct a study for the region to determine what the sales premium is for properties with a PV installation, and exempt that value from all similar properties in that region. The guidelines also suggest that the income approach can be used on rental properties by comparing the net operating income between properties with and without PV installations, and exempting the difference.[214] Third-party ownership arrangements are not addressed by the guidance. Where taxable, all property is assessed as 100% of its market value (Texas Tax Code § 26.02).

This exemption described above does not apply to grid-supply PV facilities. Electricity generation plants are classified as industrial real property (Category F2).[215] Grid-supply PV facilities would presumably fall under this classification. All property is appraised annually by the chief appraiser of the county in which the property is located. As required by legislation enacted in June 2013 (H.B. 2500/S.B. 1278), beginning in 2014, appraisers must value solar installations used for commercial purposes using the cost approach. This applies only to systems installed on or after January 1, 2014 for tax years beginning January 1, 2014. The appraisal must use cost data from generally accepted sources, make appropriate adjustments for physical, functional, or economic obsolescence, use a useful life that does not exceed 10 years, and use a floor value of 20%. "Commercial purpose" is undefined, but the legislative analyses accompanying the bill indicate that it is only intended to address valuation issues for "industrial" grid-supply facilities.

[lxviii] The Tennessee Valley Authority (TVA) offers separate programs for small and large PV facilities (and other renewables) that operate as buy-all, sell all arrangements with 10–20 year contracts. The programs are offered by participating local utilities (electric cooperatives and municipal utilities) that purchase wholesale electricity from TVA and resell it to their retail customers. For systems of 50 kW or less, the program pays the participant the retail electricity rate plus an additional premium currently set at $0.12/kWh. Larger systems receive payments based on a seasonal time of day rate schedule.

Storage devices, power conditioning equipment, transfer equipment, and other necessary parts must be included in the valuation.

Beyond this now standardized valuation methodology, Texas law also currently permits school districts to limit the appraised value of certain renewable electricity generation projects for up to eight years in the interest of attracting new capital investments and supporting economic development (Texas Tax Code § 313.001 et seq.). Many commercial wind farms have availed themselves to this incentive, often making PILOTs as part of the abatement agreement.[216] It stands to reason that the owner of a grid-supply PV facility would do the same to the extent that it can meet the various eligibility requirements that exist under the law.

Utah: Utah does not have any property tax laws that are specific to PV. However, any solar equipment that is used primarily for agricultural or irrigation purposes is exempt from property tax under exemptions for those classes of personal property (Utah Code § 59-2-1101 and § 59-2-1111). Most classes of PV installation will be assessed at the county level, but the property of public utilities that operate as a unit across county lines is assessed centrally by the Utah State Tax Commission (Utah Code § 59-2-201). Appraisals of centrally-assessed properties use a unitary methodology, disregarding those assets assessed at the county level.[217]

Residential PV installations owned by the homeowner are assessed as part of the real property. Solar installed by a third-party owner is taxable to the third-party owner company as with other non-utility businesses. Third-party owned PV installations operated by non-utility businesses are classified as long life trade fixtures (Class 5 equipment) and assessed under a cost-based methodology. For this type of property, Utah's personal property valuation schedule establishes a roughly 10-year depreciation schedule. For the 2013 assessment year, the floor percent good value of 13% is reached in the ninth year since acquisition.[218] The acquisition cost is defined to include all costs required to place an item into service, such as the cost of the equipment, shipping, installation, and sales tax, but excludes engineering or architectural costs.[219]

Vermont: Vermont has two state laws governing the assessment and taxation of PV installations. One permits municipalities to exempt PV installation from local property taxes, while another governs the taxability and valuation of PV facilities as a whole, and in the context of state property tax levies (i.e., the state education tax). The local option law has existed since the 1970's while the statewide law was adopted only recently in 2012.

The statewide property tax law adopted in 2012 (H.B. 679) exempts all PV facilities of 10 kW-AC or less from real and personal property taxes beginning in 2013.[lxix] The exemption will last for only 10 years

[lxix] The 2012 exemption/fee law has interesting origins. In 2011, the state legislature recognized that the standard valuation process can result in an "onerous degree of tax burden" on solar developers. Section 12 of Act 45 of the 2011 session authorized a report from the Vermont Department of Taxes and the Department of Public Services to solicit recommendations for other property taxation methodologies would be more appropriate to promote the development of in-state renewable energy resources while maintaining revenues for the state education fund. The

through 2023, and the underlying land remains subject to tax. Facilities that exceed the 10 kW-AC capacity benchmark are subject to an annual fee of $4.00/kW in place of the state education tax levy. Unlike the full exemption for small facilities, the standard fee provision does not have a sunset date (32 V.S.A. § 8701 and § 3802). For reference, during 2012, the base state education tax levy was set at 1.38% for non-residential property and 0.89% for homestead properties, though in practice the actual rates are different from place to place due to equalization and other adjustments.[220] Facilities that pay the fee in lieu of the state education tax remain subject to local property taxes; hence, the local option law remains relevant.

Under the local option law, municipalities are permitted to exempt PV and other renewable energy facilities that produce energy for on-site use from real and personal property taxes, including the land on which a facility is located of up to one-half acre in size (32 V.S.A § 3845). Historically, few cities and towns have adopted such an exemption, presumably because they are required to find alternate sources to fulfill revenue requirements lost to the state education fund. This characteristic of Vermont property tax law is not unique to renewable energy installations; it exists for almost all locally-approved exemptions and stabilization measures.[221]

For projects located in municipalities that have not adopted the exemption, a PV facility is considered real property. In a report to the Vermont Legislature, the Division of Property Valuation and Review has recommended that an income-based method be used to value PV facilities for municipal taxation purposes, and notes that this method could be facilitated through the specification of a capitalization rate or range of rates for use by municipalities.[222] The legislature adopted a provision in line with this recommendation as part of the 2012 legislation, specifying that the Tax Commissioner must, from time to time, provide municipalities with recommended methods for valuing renewable energy installations. In 2013, the Vermont Department of Taxes issued a bulletin recommending the use of the *PV Value*™ tool developed by Sandia National Laboratories for this purpose, and providing further recommendations and instructions for its use.[223]

Virginia: Virginia allows local governments (cities, towns, and counties) to adopt exemptions from real and personal property taxes for both residential and commercial PV systems, though there is no statewide exemption in place (Va. Code § 58.1-3661). The law declares such property to be a class of property separate from other classes of real and personal property, and requires that the property be certified by the local building department in order to qualify for an exemption. Exemptions must have a term of at least five years, but can be longer at the discretion of the local government.[lxx] The local option law does not contain an on-site use requirement, but presumably a local government could elect to make this or other restrictions.

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adopted law corresponds to the report's recommendations with respect to solar facilities. The report is available here from the Vermont Department of Taxes.

[lxx] Loudoun County for example offers the exemption for a period of 10 years (see http://www.loudoun.gov/documents/4337/5119/5130/5132/Chapter+868-Certified+Solar+Energy+Equipment+Exemption.PDF).

For the purposes of an exemption, the value of a solar facility is no less than the "normal cost of purchasing and installing such equipment…" One interpretation of this language could be that the value is equal to its original acquisition cost unadjusted for depreciation, as is the case in Fairfax County and Loudoun County. In both counties, the cost is reported by the taxpayer and presumably reflects the invoice cost of installation.[224, 225, lxxi] The reported cost would presumably not contain an adjustment for a federal tax credit claim, but could possibly reflect an adjustment for a cash rebate that was passed through to the installer. Local practices could differ though, as it seems the "normal cost" could also be interpreted to mean an average replacement cost new that is not necessarily the same as the original cost borne by the property owner. Moreover, the state law also permits the calculated value (however arrived at) to exceed this normal cost. The authors were unable to find any examples of local jurisdictions where any cost measure other than the original acquisition cost is used.

By law, real property is assessed at 100% of its fair market value (Va. Code § 58.1-3201). In the counties contacted by the authors, it was believed that PV systems owned by the same real property owner would likely be considered real property improvements. Thus far, a lack of adequate sales has prevented these assessors from evaluating whether PV systems have contributed to any increases in property value. The status of leased systems is unclear from both an exemption eligibility standpoint and a classification standpoint. The language of the state local option exemption law permits exemptions for both real and personal property, and several local laws mimic the language. However, the lack of practical experience with this model prevented the officials contacted from making definitive judgments about how it would be treated.[226, 227] A similar lack of clarity is apparent for utility-scale installations, and it was thought by one official that any such proposal would likely trigger higher-level conversations.[228]

With respect to utility-scale systems, Virginia law dictates that "electric suppliers," including owners of electricity generating equipment, are generally assessed centrally by the Virginia Corporation Commission. However, facilities of 25 MW or less have been excluded from the definition of electric supplier and are assessed locally (Va. Code § 58.1-2600).[229] Virginia law does not currently authorize local jurisdictions to enter PILOT agreements with for-profit commercial entities, though PILOTs are permitted for property owned by tax-exempt or governmental entities.[230]

To the extent that any installation is not exempt and is considered to be business personal property, taxation practices may vary from place to place. A review of local personal property taxation practices shows similarities and differences. Depreciated cost is used in all of the jurisdictions consulted, but the schedules used vary significantly.[lxxii] In contrast to personal property taxation methods found in other states, inflationary trending was not apparent in any Virginia jurisdictions and individual items of

[lxxi] In Fairfax County, the exemption takes the form of a property tax credit, the amount of which is arrived at by multiplying the value of the system by the property tax rate for a given year. The exemption in Fairfax County is available for the statutory prescribed minimum of 5 years.

[lxxii] Some subclasses of business personal property may be taxed at different rates in certain counties, though PV systems would seem to fall under general business property and fixtures or machinery and equipment. These items are taxed at the same rate in all of the jurisdictions reviewed by the authors.

personal property were not typically assigned different economic lives for the purpose of calculating depreciation.[lxxiii]

Washington: Washington does not have any property tax laws that are specific to PV installations. Both real and personal property are subject to property taxes, though most personal property owned by individuals (i.e., not for business purposes) is exempt (RCW 84.36.110). Washington does not use an assessment ratio, so both types of property are assessed at 100% of their market value. However, state property tax data indicates that assessments tend to fall slightly below true value (e.g., personal property assessments averages 95% of true value in 2012).[231] The property of "electric power and light" companies that operate in more than one county (or across state borders) is assessed centrally by the Washington Department of Revenue (DOR). This term refers to entities that operate electricity generation facilities and furnish electrical energy (RCW 84.12.200).

Generally, intra-county PV systems would be assessed locally. Systems that are owned by the owner of the real property on which they are located would typically be assessed as improvements to the real property. Systems located on leased property would likely be assessed as a trade fixture (personal property) or a leasehold improvement.[232]

In 2013, the personal property valuation guidelines published by the DOR were updated to include PV for locally-assessed systems. Using this index, the value of a PV facility classified as personal property would be calculated based on its original cost, trended upward for inflation, and depreciated at 8.5% annually under a declining balance method. A PV facility reaches a 15% floor value (used for most equipment) in its 27th year. The guidelines suggest that assessors consider the impact of the federal investment tax credit (ITC) when assessing the historical cost of equipment, but do not specify that the amount of the ITC be subtracted out (as they do with wind turbines).[233]

West Virginia: West Virginia has no statewide property tax policy for PV systems, though it has implemented special assessment rules for wind energy systems. West Virginia law defines four distinct classes of property depending on their use or purpose and their location as follows (W. Va. Code §11-8-5):

- **Class I** includes tangible personal property used exclusively for agricultural purposes and all intangible personal property.
- **Class II** includes all property occupied by the owner and used exclusively for residential purposes.
- **Class III** includes all real and personal property exclusive of Classes I and II that is situated outside of municipalities.
- **Class IV** includes all real and personal property exclusive of Classes I and II that is situated inside of municipalities.

[lxxiii] The counties reviewed were Fairfax County, Albemarle County, Prince William County, Stafford County, Loudoun County, and Frederick County. Business personal property tax information is available on county web sites, typically under the heading of "Business Taxes."

Local assessors are charged with valuing residential and commercial real and personal property, while assessments of industrial real and personal property (i.e., manufacturers) are performed by the West Virginia State Tax Department, and the operating property of electric utilities is assessed by the West Virginia Board of Public Works. By law, all real and personal property in West Virginia, excepting farms and timberland, is assessed at 60% of its market value (W. Va. Code §11-1C-1). West Virginia employs both state and local property tax levies. The state tax rate for different classes of property is specified in state law (0.0025–0.01%), while maximum tax rates for different property classes are specified for county, school district, and municipal levies (W. Va. Code §11-8-6a et seq.).

Available information on current assessment practices for PV facilities is limited. It seems that residential PV installations would fall under Class II, whereas larger business and commercial installations would fall under Classes III and IV depending on whether they are located within or outside of a municipality. Assessment officials in Morgan County indicated that PV facilities would be treated as personal property, but because there is little data around the sale and purchase of PV installations, the value cannot currently be estimated.[234] Any assessments must be conducted in accordance with the Guide for County Assessors published by the State Tax Department. However, the guidelines do not contain any specific guidance on how PV property should be classified or valued, making it difficult to ascertain likely practices.[235]

Wisconsin: By law, PV systems in Wisconsin are exempt from property taxes (Wis. Stat. § 70.111(18)).[lxxiv] The exemption does not contain an on-site use requirement; therefore, it is available for all types of systems, even those that supply electricity to the grid at wholesale. In order to qualify for the exemption, the property owner must file an application with the local assessor by March 1 of the year following the January 1 assessment date for which the exemption is sought. The Wisconsin Property Assessment Manual contains some general guidance for establishing the contributory value of solar energy systems to a property under all three standard appraisal methodologies. Among other things, it estimates the life of an average system at 20 years, provides a brief summary of characteristics to consider when calculating depreciation, and notes that a lower capitalization rate may be appropriate for solar rental properties assessed using an income capitalization approach (i.e., resulting in a higher valuation).[236]

Certain types of utility property are exempt from property taxes, but are instead subject to gross revenue or *ad valorem* taxes. Private "light, heat, and power" companies and electric power cooperatives pay taxes on gross revenue while municipal utility projects are subject to *ad valorem* taxes. A solar farm appears to fall under the definition of a "qualified wholesale electric company," which is one type of entity that is considered to be a light, heat, or power company. However, qualified wholesale electric companies do not include entities that do not own, operate, or control electric

[lxxiv] A related section of the Wisconsin Administrative Code (Wis. Adm. Code Tax 12.50) states that the exemption applies to systems that are classified as real estate or personal property. However, the underlying land and improvements that are not part of the solar energy "system" that converts solar energy into electricity remain taxable. It is also worth noting that this section of the Administrative Code terminated at the end of 1995, though it remains listed in the code.

generating facilities with a total power production capacity of at least 50 MW.[lxxv] Consequently, in order for a solar facility to fall under this method of taxation, it would either have to be very large, or be owned by an entity with multiple facilities that collectively exceed the 50 MW trigger. In cases where this method applies, the tax would equate to 3.19% of gross revenues from electricity sales (Wis. Stat. § 76.28). The revenue raised is distributed to local governments under a formulaic system with multiple components.[237]

Wyoming: Wyoming does not have any property tax laws that pertain specifically to PV installations. Property used for industrial purposes is assessed at 11.5% of the fair market value, while other real and personal property is assessed at 9.5% of its fair market value (W.S. § 39-11-101). Most property is assessed locally, but the State *Ad Valorem* Tax Division establishes taxable values for electric utility companies (W.S. § 39-13-102). While the term "electric utility" is not specifically defined in the state's property tax law, the definition of a public utility used in other portions of the code includes "any plant, property, or facility for the generation, transmission, distribution, sale or furnishing to or for the public of electricity for light, heat, or power…"(W.S. § 37-1-101). Electric utility property is considered to be property used for industrial purposes (W.S. § 39-11-101).

Insight into how the assessment of a grid-supply solar farm would take place in practice can be gained from the methods used for assessing wind farms. Wind farms in Wyoming fall under central assessment, and are considered to be industrial property (assessed at 11.5% of market value).[lxxvi] The wind farm guidance indicates that the same classification would apply to solar facilities. A central assessment will utilize all three generally accepted appraisal methods, but the Wyoming Department of Revenue indicates that it does not consider the income-based or comparable sales approaches to yield reliable measures of market value for wind farms. It instead states a preference for valuing wind farms under an original acquisition cost less depreciation approach, utilizing a 20–25 year economic life time.[238] It remains to be seen whether a grid-supply PV facility would be assessed in precisely the same way, but based on the available information, it is plausible that similar procedures would be followed.

Though local practice may vary, in residential assessments, PV would be considered part of the structure rather than as an exempt personal furnishing in Laramie County.[239] For residential properties, Laramie County utilizes a replacement cost as a valuation basis, then applies adjustments based on market sales data.[240] Systems owned by a business would generally be assessed as personal property.[241] Wyoming's personal property valuation tables do not contain an economic life estimate for PV facilities. Personal property generally cannot be depreciated beyond a floor value of 20%.[242] The limit in depreciation is defined by regulation and may only be exceeded when the assessor has sufficient market data to indicate a different value (WCWR 011-000-009).

[lxxv] The definition also excludes entities that sell less than 95% of their net electricity production.

[lxxvi] Commercial wind farms are also subject to a $1/MWh tax on electricity production (Wyo. Stat. § 39-22-101 et seq.). This wind energy generation tax is separate and in addition to property taxes.

5 Conclusions and Recommendations

When designing PV property tax policies, policy makers must confront several challenges. One is the diversity of PV technology and how it is employed by its owners. Different technical configurations and ownership models may compel different property tax treatments, and these variations need to be understood by policy makers and reconciled with a range of potentially competing policy objectives (e.g., increasing local revenue vs. decreasing tax burdens). Another challenge is the rapid evolution of the U.S. PV market and the dynamic nature of state PV policies. The pace of change and development may eclipse. Finally, differences in the way that states currently apply general property tax policy may render property tax policies employed in some states infeasible in others.

This can make "best practices" difficult to identify and adopt. In recognition of this fact and the other challenges identified above, the conclusions and recommendations provided below are general in nature. As noted previously, they are intended as suggestions for improving clarity and consistency in state property tax policy relative to PV, rather than as endorsements of any specific state policy or incentive-oriented treatment. Greater clarity and consistency stand to benefit both the solar PV industry and the property assessment community, allowing property owners to make more informed decisions and assessment officials to make sound valuation judgments that avoid charges of opacity, inconsistency, or unfairness.

1. Understanding state PV market context is important for identifying the different circumstances in which property tax officials may encounter PV installations. Care should be taken in the crafting of language and terms that govern the applicability of any PV-specific policy, and any such policies should be crafted within the context of the current PV market and how it could or is likely to change. Where state policy changes intended to support greater PV market development are being considered, attention should also be given to the potential complications they could create for property tax administration. For instance, if a legislative measure is intended or expected to create opportunities for third-party ownership arrangements, officials may also wish to examine how these systems would be treated under existing property tax laws and whether additional clarification or other corresponding revisions to property tax laws are necessary.

   Furthermore, officials should consider how to address property taxation of PV systems under a number of different circumstances. This may include differentiating between behind-the-meter systems and grid-supply systems, establishing how third-party owned systems should be treated, addressing buy-all, sell-all arrangements for both small- and large-scale systems, and formulating policies that make clear how different types of projects will affect land subject to an existing exemption or special farmland assessment.

2. The implementation of formal measures for recording important pieces of information about individual PV installations should be considered at the state or local level. Data collected should include system size, date of installation, ownership structure, and site specific data needed to

estimate annual energy production, as all of these statistics can influence the value of the system or that which it contributes to a property. This information can be collected in a variety of ways, including through site inspections, permitting records, personal property statements from third-party system owners, utility databases, and state or utility incentive program records. The collection of data could also take place as part of an exemption or special assessment application process. It remains important to record this type of data even if PV systems or the value they contribute to a property are exempt because exemption laws may change, and the necessity of differentiating taxable value from exempt value remains even where an exemption exists.

3. The classification of PV systems as real or personal property can have a profound influence on how they are assessed and taxed. The physical and ownership characteristics of PV systems are often such that reasonable arguments can be made for either classification depending on the attributes of an individual system. Efforts should be made to explicitly identify, in as much detail as possible, the circumstances under which a PV system should be considered real or personal property, recognizing that even small systems installed on residential or commercial rooftops may not actually be owned by the underlying "real" property owner.

4. Cost-based approaches are the most commonly applied valuation method, due to the lack of necessary data needed to value PV systems using comparable sales or income-based approaches. Property tax officials should consider including specific guidance for assessing PV systems using cost-based approaches in appraisal manuals, as is commonly done for many other items of personal property. This advisory information should incorporate default estimates of the typical economic life of PV systems and guidance on how any original cost should be determined, especially if any up-front incentives such as rebates or tax credits are available. Officials may also wish to explore reasonable options for obtaining market cost information and providing it to local officials. To the extent that market cost information is provided, it should be updated frequently in order to keep it in line with current costs, and recognize that costs vary significantly for different types (e.g., size, location) of PV systems. The use of older and less granular market cost data should be avoided, as it is likely to produce inaccurate valuations. Officials may also consider investigating the extent to which functional and economic obsolescence might typically exist for PV systems and provide specific guidance to local officials about how these should be analyzed and addressed in valuations.

5. PV systems are capital-intensive by nature, but have very low operating costs because they do not require fuel inputs. With respect to property taxes, this may put PV systems at a disadvantage relative to fuel-intensive methods of electricity generation (e.g., coal, oil, or natural gas) if a valuation relies heavily on replacement cost or depreciated original cost. The ultimate result may be that the property tax owed per unit of energy produced ($/MWh) by a PV system is several times that owed by a fuel-intensive electricity generation facility. This disadvantage may be avoided by relying more heavily on other methods of valuation, such as capitalized income, or by establishing alternative taxation methods such as $/MW fees, taxes

based on electricity production, or provisions for negotiated PILOT agreements where they do not already exist.

Standardized fees or payment levels have the advantage of simplicity and transparency, while negotiated PILOT arrangements preserve more local control over revenue. Standardized $/MW fees may be appropriate for systems of any size, while energy production-based taxes and negotiated PILOTs are likely only appropriate for larger projects due to the transaction and administrative burdens they typically impose. In states where commercial-sized wind farms are prevalent, similar assessment methods may be used for PV farms or other large-scale PV installations. However, it should be recognized that even larger PV farms are typically substantially smaller than commercial wind farms, and that PV systems that generate electricity for sale may in fact include many small systems located on residential and commercial rooftops. It is advisable that energy production-based taxes for smaller systems be designed as levies on estimated production in order to avoid annual reporting requirements that may prove burdensome on both property owners and property tax officials.

6. Officials should consider adopting measures that facilitate the use of income-based and comparable sales approaches for valuing PV systems and properties equipped with PV systems, with a goal of using these methods to supplement rather than replace cost-based approaches. With respect to comparable sales, this will involve the collection of PV system information as outlined in recommendation two. With respect to the income-based approach, it could involve the creation or adoption of a standard analytical tool such as *PV Value*™.

In states or locations where PV systems remain comparatively rare, these costs may currently outweigh the perceived benefits of providing greater clarity. At the same time, however, early adoption of standard protocols could prove more cost-effective in the long-term. Regarding valuation, we must emphasize that simplicity and ease of implementation, even to the extent that it departs from the tenets of traditional appraisal theory, should be a significant consideration in policy formulation. Such simple measures (e.g., $/kW fees) might be pursued as interim solutions, though careful attention must be paid to maintaining fairness among existing and future PV property owners in the face of new, changing, or expiring policies. Any temporary policy will introduce differences in the way that otherwise identical PV systems are taxed, or render inaccurate any assumptions made by the property owner at project inception.

In recognition that the prevalence of PV is destined to increase over time, and dramatically so in the estimation of many, we believe that policies should strive for permanence and predictability. In the long-term, this may be best accomplished by instituting systems that improve the ability of assessors to consistently and accurately value PV using traditional appraisal methods. If, or how, this value is taxed will depend on the multitude of other policy goals that exist in states and local jurisdictions. These aspects of property tax policy should likewise strive for clarity, permanence, and predictability to the greatest extent possible.

Appendix A 2013 State Legislation

The bill summaries and statuses described below are current as of July 14, 2013. States with asterisks are in session as of this date. Unresolved legislation in all other states will not be enacted this year without a special session, but could be reintroduced in a future session.

State	Incentive Type	Bill Number	Summary	Bill Status	Date
CT	Exemption	HB5474	Expands the current exemption for PV and other renewables (currently limited to systems installed for private residential or farm use) to include systems owned by a non-municipal party and installed on a municipal building.	Introduced	01/22/13
CT	Local Option - Abatement	HB6326	Creates a local option for municipalities to abate up to 100% of the property taxes owed for any PV system installed for business or industrial use. The current statewide exemption for PV and other renewables is limited to systems installed for private residential or farm use.	Introduced	01/31/13
CT	Exemption	SB222	Creates a statewide property tax exemption for PV systems installed on business and industrial properties. The current statewide exemption for PV and other renewables is limited to systems installed for private residential or farm use.	Introduced	01/22/13
CT	Exemption; Local Option - Exemption	SB203	Creates a statewide property tax exemption for PV systems installed for commercial or industrial on-site use. The current statewide exemption for PV and other renewables is limited to systems installed for private residential or farm use. The exemption applies for systems installed on or after January 1, 2014 in assessment years beginning on or after October 1, 2014. Also permits a local option abatement for the same types of systems installed from 2010–2013, effective for the assessment year beginning October 1, 2013.	Enacted	06/3/13
CT	Exemption	SB146	Creates a statewide property tax exemption for PV systems installed for commercial or industrial use. The current statewide exemption for PV and other renewables is limited to systems installed for private residential or farm use. Applies the exemption to assessment years beginning on or after October 1, 2012.	In Committee	01/16/13
CT	Local Option - Exemption	SB949	Creates a local option for municipalities to authorize a 15-year exemption of the value added by any PV system to a commercial or industrial property. The exemption may only apply to facilities installed on or after July 1, 2011. The current statewide exemption for PV and other renewables is limited to systems installed for private residential or farm use.	In Committee	02/21/13

State	Incentive Type	Bill Number	Summary	Bill Status	Date
FL	Exemption	SB1064	Exempts the value added to a residential property attributable to the installation of a PV system installed on or after January 1, 2013, effective for assessments beginning in 2014. This bill would effectuate the terms of the Constitutional amendment approved by Florida voters in 2008.	Laid on the Table in favor of Substitute (HB277)	04/29/13
FL	Exemption	HB277	Exempts the value added to a residential property attributable to the installation of a PV system installed on or after January 1, 2013, effective for assessments beginning in 2014. This bill would effectuate the terms of the Constitutional amendment approved by Florida voters in 2008.	Enacted	05/30/13
IN	Property Tax Assessment	HB1374	Clarifies that customer generators are not subject to taxation as a public utility.	Enacted	05/07/13
MA*	Special Assessment	HB2677	Classifies all ground-mounted PV systems as personal property and establishes a standard depreciation schedule that values ground-mounted PV systems at 95% of its value in Year 1, on a straight-line schedule for Years 2–8 where a value of 30% is reached in Year 8, and at 25% of its value in Years 9 –20. Provides that the existing exemption for customer-sited systems on taxable property does not apply to ground-mounted PV systems.	Joint Hearing Schedule	04/09/13
MA*	Exemption; Standardized PILOT	SB1329	Revises the existing exemption for customer-sited systems located on taxable property to limit it to systems designed to produce no more than 125% of the property on which it is located. Systems not meeting these criteria are also exempted, but must make a PILOT equal to 6% of electricity sales, including net metering credits. Exemptions remain limited to 20 years. Makes certain other changes related to privately-owned systems that serve governmental customers.	Joint Hearing Schedule	04/09/13
MA*	Exemption; Locally Determined PILOT	HB2505	Revises the existing exemption for customer-sited systems located on taxable property to limit it to systems designed to produce no more than 125% of the property on which it is located. Systems not meeting these criteria are also exempted, but must make a PILOT equal to 0–20% (rate established locally) of electricity sales, including net metering credits. Exemptions remain limited to 20 years. Makes certain other changes related to privately owned systems that serve governmental customers.	Joint Hearing Schedule	04/09/13
MA*	Exemption; Partial Exemption; Locally Determined PILOT	HB2740	Repeals the existing exemption for customer-sited systems located on taxable property and replaces it with an exemption for all PV systems of 60 kW or less. For all other systems, 85% of the appraised value would be exempted, or the property owner could make a negotiated PILOT. Any exemption would remain limited to 20 years.	Joint Hearing Schedule	04/09/13
MI*	Exemption	HB4059	Creates a property tax exemption for all PV systems of 150 kW or less installed after enactment of the bill and before January 1, 2014.	In Committee	01/22/13

State	Incentive Type	Bill Number	Summary	Bill Status	Date
MI*	Exemption	HB4245	Creates a property tax exemption for PV and other renewable energy systems for which the majority of the energy produced is intended for on-site use by the owner. The law would apply universally to all qualifying systems, effective upon the enactment.	In Committee	02/12/13
MO	Exemption	HB142	Exempts solar energy not held for resale from property taxes at the state, local, and county level.	Enacted	07/03/13
MS	Exemption	HB1692	Creates a property tax exemption for the "true value" added to a property by a PV system installed after January 1, 2013. Does not explicitly limit the exemption to systems that provide energy for on-site use, and would be available for both the residential and commercial sectors.	Died in Committee	02/27/13
NM	Special Assessment	HB330	Creates a standard valuation system for PV systems that are not already exempt from property taxes. The system is based on original system cost, where the original cost is reduced by the value of the federal business energy investment tax credit. Depreciation would take place based on a 20-year useful life, and an assessment ratio of 20% would be applied. The system would apply through June 30, 2028.	Passed House as Amended; Senate Action Postponed Indefinitely (Died)	03/09/13
NM	Special Assessment	SB284	Creates a standard valuation system for PV systems that are not already exempt from property taxes. The system is based on original system cost, where the original cost is reduced by the value of the federal business energy investment tax credit. Depreciation would take place based on a 20-year useful life with a 20% floor value in relation to the cost after subtracting the value of tax credit. This system would apply through December 31, 2028.	Passed Both Houses; Pocket Veto by Governor	02/28/13
NV	Abatement	AB32	Requires entities taking advantage of the property tax abatement for large-scale renewables to submit an annual attestation that the facility is continuing to meet all the requirements. The bill also requires each board of county commissioners to adopt an ordinance setting forth its criteria for approving the abatement.	Left in Committee	04/13/13
NV	Abatement	AB239	Originally, this bill would have modified the existing 55% for 20 years abatement for facilities of 10 MW or larger, providing that for facilities from 10–49 MW, the abatement may not be larger than 55%, while leaving the standard 55% abatement in place for larger facilities. As amended, it only makes changes to abatement application and fees.	Enacted	06/11/13
NV	Abatement	AB388	Allows a property tax abatement for new businesses locating in the state for renewable equipment of 1 MW or larger intended to provide energy for on-site use. However, as noted in the Fiscal Analysis, such facilities already qualify for a 100% exemption from property taxes under existing law.	Amended in Committee	04/17/13

State	Incentive Type	Bill Number	Summary	Bill Status	Date
NJ*	Special Assessment; Exemption	AB2317	Applies uniform property tax assessment of $7,000/MW for PV and other renewable energy systems not used for on-site needs (i.e., grid-supply projects) and increases the assessment by 1% annually. Also exempts the owner of real property on which a system is located from any increases in property taxes. An existing exemption applies to facilities that serve on-site energy needs. New Jersey does not tax most business personal property, and to this point, anecdotal evidence points to most of the property associated with grid-supply PV facilities being considered exempt personal property.	In Committee	02/06/12
NJ*	Special Assessment; Exemption	SB1270	As amended, applies uniform property tax assessment of $7,000/MW for PV and other renewable energy systems not used for on-site needs (i.e., grid-supply projects) and increases the assessment by 1% annually. Also exempts the real property on which a system is located from any increases property taxes. An existing exemption applies to facilities that serve on-site energy needs. New Jersey does not tax most business personal property, and to this point, anecdotal evidence points to most of the property associated with grid-supply PV facilities being considered exempt personal property.	Amended in Senate	01/30/12
NY*	Exemption	AB1366; SB2529	Revises the existing 15-year local option solar and wind energy exemption to remove the 2015 placed-in-service deadline for 1–4 family residential solar systems.	In Committee	06/21/13
NY*	Local Option - Exemption	AB2609	Amends the existing 15-year local option exemption for PV to revise the exempt portion from the "incremental" cost of the system to the full cost, but also limits it to $50,000. Also extends the current placed-in service-date requirement from the end of 2014 to the end of 2023.	Introduced	01/16/13
NY*	Local Option - Exemption	SB2359	Amends the existing 15-year local option exemption for PV, to revise the exempt portion from the "incremental" cost of the system to the full cost, but also limits it to $50,000. Also extends the current placed-in-service date requirement from the end of 2014 to the end of 2023.	Introduced	01/16/13
OH	Exemption; Standardized PILOT	HB59	Extends the existing property tax exemption and payment in lieu of tax provisions from 2015 to 2017.	Enacted	6/30/13
OR	Local Option - Exemption	HB2291	Directs the Business Development Department to study the effectiveness of existing property tax exemptions that are available for facilities located in designated Rural Renewable Energy Development Zones.	Public Hearing Held	02/21/13
OR	Property Tax Incentive	HB2799	Lowers the minimum investment requirement for PV systems located in a Strategic Investment Zone to be eligible for a property tax exemption.	In Committee	02/15/13

State	Incentive Type	Bill Number	Summary	Bill Status	Date
OR	Exemption	HB2981	Creates an exception to employment and workforce requirements for property tax exemptions for systems in Rural Renewable Energy Development Zones if businesses invest at least $5 million and the governing body approves the exception.	Enacted	6/13/13
SC*	Special Assessment	HB3252	Prescribes that "solar energy real property" comprised of 20 acres or more be treated as agricultural property. Solar energy real property is defined to include PV electricity generation systems that produce more than 100 MWh annually. This treatment would take effect in tax years beginning after 2013. Agricultural property is assessed at a lower ratio to value, 4% or 6% depending on the owner, than utility or personal property (10.5%).	Introduced	01/09/13
TN	Special Assessment	HB62; SB1000	Amends the current property tax law to specify that the value of solar property may not initially exceed 12.5% of total installed costs, and directs that PV appraisals take into account the immediate value of solar is less than its cost.	Enacted	04/29/13
TX	Special Assessment	HB2500; SB1278	Requires appraisers to use the cost approach to value solar installations used for a commercial purpose and completed on or after January 1, 2014, effective for tax years beginning after January 1, 2014. The appraisal must use cost data from generally accepted sources, a useful life that does not exceed 10 years, and a floor value of 20%. Existing law allows an exemption of the value added by customer-sited solar installations, while this pertains only to installations used for a “commercial purpose” (i.e., presumably the sale of electricity).	Enacted	06/14/13
VA	Exemption	SB1286	Replaces the current local option to exempt PV systems from taxation to a statewide exemption from state and local property taxes.	Failed to Pass Senate Committee on Finance	01/22/13
WA	Other	HB1634	Increases the property tax levy limit for local taxing districts by the value resulting from new solar and other renewable installations that are locally assessed regardless of whether they are classified as real or personal property. Currently, locally-assessed solar facilities located on property not owned by the system owner are typically considered personal property subject to the levy limit. Existing law already provides such an addition for centrally assessed facilities.	In Committee	05/13/13
WV	Exemption	HB2430	As amended, defines solar energy systems located on buildings as personal property that is considered pollution control equipment and valued at its salvage value (5% of the original capital cost).	Amended in House Judiciary Committee	03/26/13

Appendix B State Property Tax Cost Estimates

See Section 2.3 for information on methodology and sources.

State	Property or Assessment Type	Installed Cost Estimate $/W	Property Tax Rate Range	Average $/MW Range	Average $/MWh Range	Electricity Price $/MW	Tax Owed as % of Retail Electricity Price	Calculation Notes
AZ	All centrally-assessed property; could include TPO systems.	$6.50	6–12%	$9,308–$18,616	$5.23–$13.28	$96.90	5.4 –13.7%	Overall retail state average electricity price used. It is unclear if this treatment is applicable to TPO systems (the issue is pending on-going discussions); if not, rates comparison should be in reference to wholesale prices.
CO	Behind-the-meter commercial, 2 MW or less	N/A (standardized cost)	5–10%	$11,166–$22,332	$7.00–$17.10	$91.30	7.7–18.7%	Assumes no escalation in the 2013 reference cost of $1,173/kW. Retail commercial average electricity price used.
CO	Behind-the-meter commercial, 2 MW or less (w/inflation)	N/A (standardized cost)	5–10%	$13,289–$26,578	$10.17–$20.35	$91.30	11.1–22.3%	Assumes an escalation in the reference cost of 2% annually, leading to an average reference cost of $1,396/kW over 20 years. Retail commercial average electricity price used.
CO	10 MW grid-supply	N/A (standardized cost)	5–10%	$7,368–$14,736	$4.62–$11.28	N/A	N/A	Assumes no escalation in the 2013 reference cost of $774/kW. Represents a wholesale sale, so comparison should be to a wholesale PPA price.
CO	10 MW grid-supply (w/inflation)	N/A (standardized cost)	5–10%	$8,767–$17,534	$5.49–$13.43	N/A	N/A	Assumes an escalation in the reference cost of 2% annually, leading to an average reference cost of $921/kW over 20 years. Represents a wholesale sale, so comparison should be to a wholesale price.
CT	All non-residential, as personal property	$7.30	1.5–7.4%	$32,861–$166,085	$26.51–$163.75	$164.50	16.1–99.5%	Costs reported for installations larger than 10 kW completed during 2011 and 2012 average $5.94/W. Using this figure, the property tax costs would be 20% lower. Retail commercial average electricity price used.
DC	Non-exempt personal (former law)	$6.80	3.40%	$86,122	$66.26–$80.98	$133.50	49.6–60.7%	Uses a 10% annual depreciation rate to a 25% floor from D.C. Code of Regulations (9-708). The first $225,000 in personal property is exempt. Overall retail state average electricity price used.

State	Property or Assessment Type	Installed Cost Estimate $/W	Property Tax Rate Range	Average $/MW Range	Average $/MWh Range	Electricity Price $/MW	Tax Owed as % of Retail Electricity Price	Calculation Notes
GA	All non-residential, as personal property	$4.38	1.75–4.61%	$15,944–$42,101	$11.43–$36.88	$90.60	12.6–40.7%	Georgia Power offers a solar buyback rate of $170/MWh for systems up to 100 kW. Against this reference, the % impact is lower (6.7–21.7%) though for these small systems, costs may be higher. Retail commercial average electricity price used.
IN	Centrally-assessed distributable property not subject to deduction	$5.37	0.71–6.96%	$11,590–$113,135	$9.25–$110.34	$76.70	12.1–144%	Indianapolis Light and Power offered a FiT incentive of $200–$240/MWh for solar PV facilities up to 10 MW. NIPSCO offered $260–$300/MWh for facilities up to 2 MW. The prices would make comparative impacts considerably lower. Overall retail state average electricity price used.
IN	Locally-assessed personal property not subject to deduction (assumes Pool II property, full depreciation to 15%)	$5.37	0.71–6.96%	$8,079–$78,862	$6.37–$76.04	$76.70	8.3–99.1%	Indianapolis Light and Power offered a FiT incentive of $200–$240/MWh for solar PV facilities up to 10 MW. NIPSCO offered $260–$300/MWh for facilities up to 2 MW. The prices would make comparative impacts considerably lower. Overall retail state average electricity price used.
IN	Locally-assessed personal property not subject to deduction (assumes Pool III property, full depreciation to 16%)	$5.37	0.71–6.96%	$9,641–$94,186	$7.60–$90.66	$76.70	9.9–118%	Indianapolis Light and Power offered a FiT incentive of $200–$240/MWh for solar PV facilities up to 10 MW. NIPSCO offered $260–$300/MWh for facilities up to 2 MW. The prices would make comparative impacts considerably lower. Overall retail state average electricity price used.
MD	Wholesale generation systems not subject to a PILOT (PILOT has limited applicability)	$3.52	0.44–5.67%	$5,034–$64,865	$3.89–$61.19	$122.70	3.2–49.9%	Overall retail state average electricity price used. These are wholesale facilities, so comparisons to wholesale prices are more appropriate than comparisons to retail prices.

State	Property or Assessment Type	Installed Cost Estimate $/W	Property Tax Rate Range	Average $/MW Range	Average $/MWh Range	Electricity Price $/MW	Tax Owed as % of Retail Electricity Price	Calculation Notes
NJ	Grid-supply facilities (real property portion)	$4.80	1.00–3.75%	$2,460–$9,225	$1.91–$8.77	N/A	N/A	Assumes that 90% of the cost of a grid-supply facility will be considered exempt business personal property. These are wholesale facilities, so price comparisons should refer to wholesale electricity prices. Assumes 20-yr straight-line depreciation with 25% floor. Assigning representative tax rates is difficult due to variations in general and effective tax rates among tax districts.
NJ	Grid-supply facilities under pending 2013 legislation (S.B. 1270)	N/A (standard fee)	N/A	$7,000–$8,330	$6.06–$7.40	N/A	N/A	These are wholesale facilities, so price comparisons should refer to wholesale electricity prices. Rate escalates from $7,000/MW at 1% annually, so the fee listed is a 20-yr average.
NM	Centrally-assessed property; unclear if this includes TPO systems under retail PPAs	$5.70	1.5–4.5%	$17,083–$51,249	$9.65–$35.37	$84.00	11.5–42.1%	Overall retail state average electricity price used. Some or all of the facilities taxed in this manner may be wholesale facilities, so wholesale prices may offer a better comparison in some circumstances. It is somewhat unclear whether retail PPA facilities are or should be assessed in the same manner.
NC	All non-utility, non-residential projects (with 80% special assessment reduction)	$4.45	0.49–1.54%	$2,471–$7,754	$1.78–$6.83	$81.60	2.2–8.4%	Retail commercial average electricity price used. In some cases, it may be appropriate to measure property tax burdens against wholesale rates. Progress Energy historically offered from $150–$180/MWh for systems of 500 kW or less. Duke offered a wholesale purchase for facilities of 5 MW or less averaging $80–$90/MWh.
OH	PILOT for facilities of 250 kW-AC or larger	N/A (standard fee)	N/A	$7,000	$5.89–$7.20	$97.30	6.1–7.4%	Retail commercial average electricity price used. The fee could be increased at local discretion up to $9,000 per MW. The fee could apply to facilities that provide retail or wholesale energy, so in some cases, a wholesale price metric is more appropriate. Specific additional requirements (varying by project size) exist for PILOT projects.

State	Property or Assessment Type	Installed Cost Estimate $/W	Property Tax Rate Range	Average $/MW Range	Average $/MWh Range	Electricity Price $/MW	Tax Owed as % of Retail Electricity Price	Calculation Notes
OH	Non-PILOT projects larger than 250 kW-AC that generate electricity for sale	$6.00	3.82–10.69%	$36,652–$102,557	$30.58–$104.58	$97.30	31.4–107.5%	Retail commercial average electricity price used. Sales from these facilities could be at wholesale or retail, so in some cases a wholesale price metric is more appropriate.
TN	All solar projects using 2013 (H.B. 62) limit on initial value. Assumes they are commercial/industrial real property	$5.30	2.0–5.0%	$5,300–$13,250	$4.03–$12.30	$86.10	4.7–14.3%	Overall retail state average electricity price used. TVA offers an incentive for systems of 50 kW or less; currently at approximately $190/MWh. Larger systems receive only a much lower wholesale rate (approximately $40/MWh with 5% annual escalation). Assumes facilities are commercial/industrial real property (40% assessment rate), but they could also be residential (25% rate) or personal property (30% assessment rate). With special valuation, assumes no depreciation is allowed.
WA	Facilities treated as personal property; includes facilities not owned by the owner of the underlying real property.	$6.27	0.80–1.39%	$18,594–$32,157	$16.32–$34.49	$73.70	22.1–46.8%	Assumes that the ITC is subtracted out of the valuation, which is possible but not guaranteed. Could apply to all TPO facilities as well as wholesale facilities. The state offers a widely ranging performance incentive from $120/MWh to $1,080/MWh depending on facility characteristics, while some utilities offer widely ranging incentives as well for small projects. Retail commercial average electricity price used.

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