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Context

One of the requirements for solar electricity¹ to achieve broad adoption and cost competitiveness with traditional forms of energy generation in the United States is widely accessible and low cost financial capital. The Department of Energy's SunShot goals, which would result in solar energy contributing to 14% of the nation's total electricity production by 2030, would require approximately \$250 billion of solar electric generation deployment (DOE 2012). Currently, solar electric generation projects are primarily financed by institutions deploying private capital, which often require a high return on their investment. As a result, there has been a growing interest in financial policies and structures that would help migrate financing of renewable energy projects from private sources of capital to public capital markets (Mendelsohn 2012).

One investment vehicle that has been discussed by legal and financial experts in the project finance community to accomplish this is a real estate investment trust (REIT). While REITs have historically provided capital for buildings, they have recently been used to help finance other types of property, such as cellular towers and transmission lines.² The purpose of this study is to examine the fundamental physical, functional, and operational characteristics of a photovoltaic (PV) system in the context of the characteristics of "real" property as defined by the tax code, to help determine whether REITs can own PV systems. This work has been reviewed and informed by real estate, tax and project finance attorneys as well as experts in PV technology and deployment, however should not be viewed as an exhaustive study of the legal and tax issues surrounding the topic.

Inherent to answering this question is whether PV systems possess three fundamental properties: permanence, passivity, and being integrated as a system. These three properties are associated with real property as follows: The Internal Revenue Service (IRS) stipulates that if a system is *inherently permanent*, then it is realty,³ and if it is an *accessory to the operation of a business*, it is not. *Inherently permanent* and *an accessory to the operation of a business* are mutually exclusive terms. Therefore, to establish whether a piece of property should be considered realty, it must be determined which term best applies based on the facts and circumstances of the particular situation. *Passivity* is one characteristic that helps determine whether an asset is an accessory to the operation of a business, and thus non-real property. It is also important to determine what pieces of a PV system should be characterized as real property. If a PV system is *integrated*, one could make an argument that all of it should be classified in the same way. Therefore, establishing whether a PV system is inherently permanent and passive will help inform whether it is real, and establishing whether it is integrated as a system will establish whether all of it should be treated in the same way. Further research should be performed to explore possible outcomes of treating PV systems as real property, and whether or not it would be practical for REITS to own them.

¹ This paper will focus its attention on photovoltaic (PV) energy systems. However, many of the same conclusions can be applied to concentrated solar power (CSP) or solar water heating (SWH) systems.

² REITs can provide capital in the form of debt or equity. A REIT that provides mostly debt is typically referred to as a "mortgage REIT"; one that provides mostly equity is referred to as an "equity REIT." This nomenclature is for descriptive purposes only, as they remain the same classification of investment vehicle.

³ Realty, real estate, and real property are all used interchangeably.

Introduction to REITs

The REIT structure was designed to bundle and securitize real estate assets in order to attract capital from a wide range of sources. A REIT is a tax designation status that eliminates most corporate taxes so long as the REIT distributes 90% of its taxable income to investors.⁴ The REIT structure has several attractive features compared to traditional sources of financing for PV. Many of these have the potential to lower the cost of capital for projects, increase the pool of potential financiers, and allow a large number of locations well cited for solar to be more easily developed.

Key Benefits

Some key benefits of REITs include:

- A REIT typically owns a portfolio of assets, providing diversification benefits by spreading risk over a large number of projects.
- REIT ownership, structured as transferrable shares, provides access to a wider range of investor classes, such as pension funds and foreign and retail investors.
- A REIT can be listed and traded on public exchanges, thus making it a more liquid investment.
- REITs currently own a large amount of commercial real estate that could host solar assets.

Internal Revenue Code Section 856 outlines the definitional requirements of a REIT (CFR 856-1). In short, to be considered a REIT, an entity must pass both an:

- Income test⁵: 95% of a REIT's income must come from approved sources (such as rent)
- Asset test: 75% of its assets must be real property.

There are only two types of property according to the IRS, real and personal, and the terms are mutually exclusive. If a solar asset is designated to be personal property, it would be limited to being 25% or less of a REIT's assets and might limit the percent of income a REIT receives from the solar asset.⁶ The following sections will explore the fundamental characteristics of PV systems in relation to the properties of permanence, passivity, and being integrated as a system.

Permanence

Real property must have the quality of *inherent* permanence. Section 1.856-3(d) of the Income Tax Regulations, "provides that 'real property' includes land or improvements thereon, such as buildings or other *inherently permanent* structures thereon (including items which are structural

⁴ A REIT can deduct its distributions against income for tax purposes, which ideally lowers a REIT's net income to close to zero. However, a REIT still has to pay taxes on the remaining net income.

⁵ Technically there are two "income" tests; 75% of their income must come from certain approved sources, and 95% must come from a broader set of sources.

⁶ Most REIT managers structure their investments to be well over the 95% of income and 75% of asset requirements so that any unforeseen fluctuation does not disqualify the entity.

components of such buildings or structures)” ((CFR 856-3)). The IRS has attempted to clarify whether an asset is “inherently permanent” with the following questions: (1) “(I)s 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?” (Rev Rul 80-151). Examples of assets that have passed this test include: commercial buildings, HVAC systems, cellular towers, LED billboards, and railroads.

While solar assets can and have been moved without damaging the property, particularly in ballasted rooftop systems,⁷ they are designed and constructed to remain in place permanently, or at least for the useful life of the asset (which can exceed 25 years). A solar system is uniquely integrated into each building or property. System size, panel orientation and tilt, capacity of the inverter, length of wiring runs, and a host of other decisions are made based on the characteristics of the site. PV panels are typically mounted in a manner that allows for replacement or removal, but this is principally for maintenance, and when performed represents a small portion of the full system. In addition, due to concerns of theft, systems are increasingly being designed to make it difficult to extract the panels.

In addition, given the high upfront cost, recouping an investment in a PV system is usually predicated on the long-term revenue streams produced by the asset while incurring only modest costs over that same timeframe. If a business were to move a PV system, either located on a roof or ground-mounted, it would only retain the value of the physical assets. The National Renewable Energy Laboratory (NREL) estimated the cost of hardware for installing a system to be between 50%–70% of the total cost of a system in 2010 (Goodrich et al. 2012). The business would also incur the cost of removing the system and either selling the assets (which are worth significantly less due to their inability to receive an investment tax credit or local incentive⁸) or paying the cost of building the system elsewhere. Thus, the net resale value of a system after it is installed is considerably less than the cost of the installed hardware. For this reason, PV systems tend not be put on old roofs or moved to new locations once installed. Historically, modules had been the majority of PV system costs; now that the price of modules has fallen dramatically, the majority of the value of a system is no longer in the modules, further reducing any economic incentive to remove the energy-generating system.

⁷ A ballasted rooftop system does not physically attach the system to the roof. Rather, a weight, such as cinderblock, is placed on the racking system so that the system does not move. This differs from modules, which are physically bolted to the roof, or poles being driven into the ground for a ground-mounted system.

⁸ A person or business can only receive an investment tax credit or local incentive on new solar equipment. Moreover, many local solar programs require that an incentive be returned if a system is removed in the first 5–20 years.

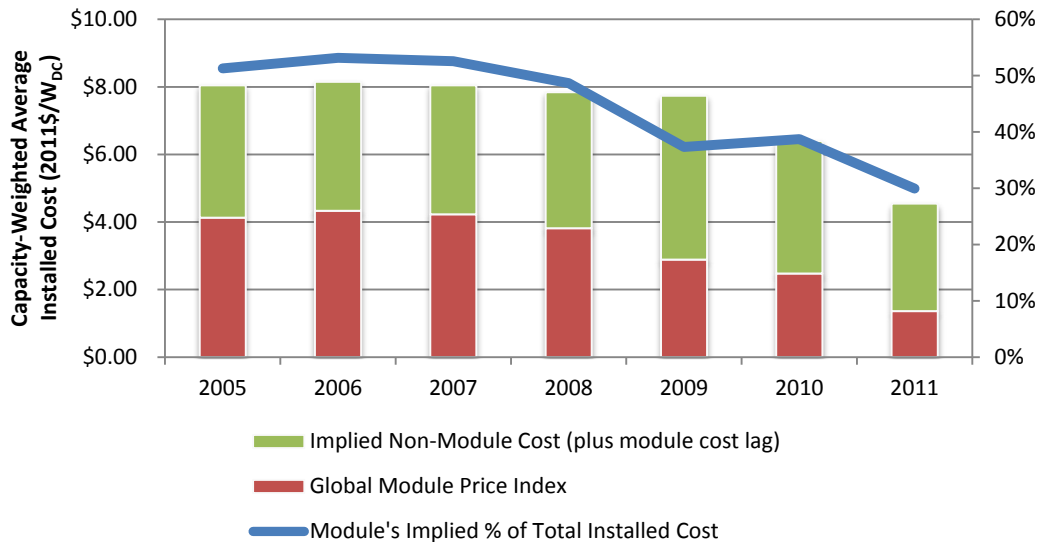


Figure 1. PV module price compared to total U.S. system costs

Sources: Barbose et al. 2011; SEIA and GTM Research 2012; U.S. Bureau of Labor Statistics (for inflation adjustment) 2012

In Figure 1, the PV module's implied percent of total installed system cost decreases from 51% in 2005 to 30% in 2011. Current module prices are below the 2011 value indicated, many being sold at or below \$1/W. Therefore, although one could remove the panels and sell them, most of the value is not in the module.

Power purchase agreements (PPAs) and lease agreements between building/land owners and third-party solar asset owners include end-of-term removal options. However, in the vast majority of cases the intent is not to decommission the system but rather to renew the contract or provide the host with a buyout option for its fair market value at contract termination.⁹ Those arrangements are structured in this way for tax purposes that do not change the intended or preferred outcome.¹⁰ The IRS has made similar judgments in instances with cellular towers and billboards on buildings (IRS 7/22/11; IRS 10/28/11; IRS 1/27/12). These assets could be moved, but they are not intended to be moved.

Therefore, while a PV installation can be physically moved from one location to another without causing significant damage, the system design, installation, associated contracts, permits, and project economics are all predicated on the asset remaining in a single location for the entirety of its useful life.

⁹ PPAs often have early buyout clauses between six years and the end of the transaction in addition to end-of-term buyout options.

¹⁰ Lease accounting follows certain procedures to ensure that the agreement is treated as a *lease* and not a *sale of the asset* (PPAs typically follow the same procedures). The IRS established safe harbor guidelines to help determine whether something should be classified as an operating lease or sale. Among these are the following guidelines relating to permanence: (1) the contract length cannot be more than 80% of the life of an asset; (2) the owner must have a claim for the residual value of the asset; and (3) the lessor must have the ability to offer the services of the asset to someone else. If it does not pass these tests, the leasing of the asset could be treated as a *sale of the asset*. If the asset is sold, then the lessor would have no right to the depreciation or investment tax credit.

Passivity

The IRS has determined on several specific instances that if an asset is passive in nature—such as a billboard, a tower, or a transmission line—then it is not an accessory to the operation of a business, which viewed in conjunction with its inherent permanence, makes it realty. The reason passivity of an asset is relevant is because it differentiates that asset from a “machine,” which is cited as an example of an “accessory to the operation of a business.”¹¹ In Private Letter Ruling (PLR) 147229-06 (March 13, 2007), a case involving a REIT that owned transmission systems, the IRS cites a previous ruling that a railroad track, but not the rail cars, represents real property. In that ruling, the IRS states, “similar to the tracks and other railroad components described in Rev. Rul. 69-94, the System is a passive conduit that allows (electricity) created by a generation source to flow through the system to end-users. The System itself does not include any machinery or equipment that creates or generates (electricity)... Based upon the information submitted and representations made, we conclude that the System is an inherently permanent structure that is not an accessory to the operation of a business” (IRS 6/22/07). The following will discuss three ways in which a solar system can be considered passive: how it functions; the characteristics of operating it; and whether it is involved in the underlying business of the user.¹²

How a PV System Functions

Historically, traditional energy property, such as a coal-fired plant, has not been viewed as realty due to the active nature of its processes producing electricity. A solar system operates like all energy-generating technologies in that it performs the activity of generating electricity. It has a fuel source, sunlight, which it converts into electricity. Energy is never made, it is only converted. However, a PV system is unique in that it does not require any moving parts.¹³ Energy from other electric-generating assets is *required to be converted into mechanical energy (with moving parts) before it is turned into electrical energy*. Wind turbines and hydro-electric plants convert wind or water energy into mechanical energy and then into electric energy. Concentrating solar power (CSP) systems, coal plants, nuclear power plants, and natural gas facilities convert thermal energy into mechanical energy and in turn convert that into electric energy. Only a PV system does not turn energy into mechanical energy. Rather, PV cells convert radiation energy directly into electrical energy.

¹¹ The exception to this is a machine that is a structural component of a building. “In the case, however, of a building or inherently permanent structure that includes property in the nature of machinery as a structural component, the property in the nature of machinery is real property” [Treas. Reg. 1.263A-8(c)(4)]. The term “structural component” of a building is not defined, however, can be interpreted to be a fundamental portion of a structure that is embedded and not easily removed, such as a roof or a window. While most traditional PV assets would not be characterized in this way, more advanced PV technologies are now being incorporated into windows, facades, or roofs.

¹² This paper does not attempt to resolve which form of passivity is most pertinent to the determination of realty but rather to characterize the properties of a PV system so that others can make an informed decision. In addition, while PV technology is contrasted to all other forms of electric generation, this is not to say that other renewable energy (RE) generation assets are also not passive in these respects (e.g., like PV, the fuel source for all RE has *not* been collected through industrialized processes and transported to the site of the electric generating asset).

¹³ Though not required, many utility-scale PV systems have moving parts if they use actively tracking structures, which adjust the tilt of the panels based on time of day and wind conditions. This process is performed to produce more energy, per panel, or to prevent wind damage. PV system inverters sometimes have moving parts as well to cool the equipment, though many use passive cooling techniques, depending on the climate.

In addition, unlike other electric-generating assets, a PV module produces direct current (DC) electricity, which must be turned into alternating current (AC) electricity to be used by most electricity systems. The conversion is done by an inverter, which is composed of electrical components and a transformer. It may have moving parts (e.g., a fan for cooling), but its primary function is performed with no mechanical activity. An inverter, which regularly monitors the electric load to which it is connected, is an essential part of most PV systems. If the inverter cannot detect an electric grid, power does not flow. Inverters are most comparable to transformers, which are part of a transmission system. While PLRs cannot be used or cited as a precedent, it should be noted for reference purposes that in PLR-147229-06 (March 13, 2007) the IRS ruled that a REIT could own a transmission asset because it was real property (IRS 6/22/07).

Characteristics of Operating a PV System

A PV system is operated differently than most electric-generating assets in that it usually does not require an operator to be on-site every day. Like many energy-generation facilities, operating it has become automated but requires oversight, management, and maintenance. One metric that has been quantified to evaluate how much effort is necessary to maintain an energy-generating facility is its operations and maintenance (O&M) costs (which includes various labor, replacement and other costs). O&M is often perceived as relatively inexpensive for PV systems compared to other forms of power generation. While this is true of PV on a capacity basis (\$/kW installed), it is not so on an energy basis (\$/kWh).

Table 1. Operations and Maintenance Costs across Electric-Generating Technologies

	Combined O&M (\$/kWh)	Rank (per kWh)	Combined O&M (\$/kW)	Rank (per kW)
Hydro	\$0.0042	1	\$32	3
Natural Gas, Advanced Combined Cycle (CC)	\$0.0050	2	\$38	4
Natural Gas, CC	\$0.0052	3	\$40	5
Wind, Onshore	\$0.0072	4	\$28	2
Coal	\$0.0081	5	\$61	6
Natural Gas, Advanced Combustion Turbine	\$0.0087	6	\$70	8
Natural Gas, Conventional Combustion Turbine	\$0.0094	7	\$75	9
Natural Gas, Distributed Generation	\$0.0094	8	\$76	10
Natural Gas, Adv. CC	\$0.0103	9	\$78	11
Nuclear	\$0.0131	10	\$103	13
Photovoltaic	\$0.0134	11	\$26	1
Coal, Integrated Gasification CC	\$0.0146	12	\$109	14
Coal, Carbon Capture	\$0.0180	13	\$134	15
Biopower	\$0.0206	14	\$150	16
Wind, Offshore	\$0.0226	15	\$87	12
Solar Thermal	\$0.0233	16	\$63	7
Natural Gas, Fuel Cell	\$0.0454	17	\$346	17
Biopower, Landfill	\$0.0590	18	\$429	18

Source: Energy Information Agency, Annual Energy Outlook (AEO). O&M costs from AEO 2011; capacity factors from AEO 2009.

In Table 1, PV has the lowest O&M costs on a capacity basis. However, because PV has a low capacity factor, on a per-kilowatt-hour basis, the technology falls in the middle of the group as it relates to O&M costs.

The Underlying Business of the User

PV systems differ from many other forms of electric generation because they are designed modularly and can either be built large enough to generate as much electricity as a typical power plant or just enough to supply part of a building's electrical needs. PV systems can be sited on a building owner's property or roof or on a large parcel of land. The PV system can also be the property of the underlying building/land owner (host-owned) or a third party can own the system (third-party owned).

As noted above, in determining whether something is an accessory to the operation of a business, the IRS cites a machine as an example. Presumably, the machine's function is directly related to the business in which it is owned, such as a bottling machine at a beverage manufacturing plant. This would be in contrast to the building, which provides the place for the business to function. In the case of host-owned PV, as long as the business of the system owner is not related to selling electricity, the PV system functions more like a building than a bottling machine. If the owner is an electric utility that is selling the electricity produced by the system, then the PV system's function of producing energy would be directly related to the underlying business.

Third-party owners typically contract PPAs or leases to generate revenue from their PPA systems. These contracts are either with the site host or an electric utility. In a PPA, the electricity produced by a PV system is sold for the life of the contract. In a lease, the lessee makes payments for the right to use the PV system for the life of the contract. In both instances, there is often an "operator" that monitors the systems and performs maintenance when necessary. If a third-party owner uses a PPA to generate revenue, its business is selling electricity produced by the PV system. In this instance, it would be difficult to argue that the PV system's function of generating electricity is not actively involved in the business. If, however, a third-party owner uses a lease¹⁴ to generate revenue, it would be easier to argue that its business is leasing property and not selling electricity.

Passivity Summary

A PV system functions, is operated, and participates in the operation of a business in ways that are both similar and different than other electric-generating assets. The IRS will have to determine which qualities it sees as most important in determining whether a PV asset is passive in nature and thus not an accessory to the operation of a business.

¹⁴ The property can either be leased to the end-user or to a third-party operator, which in turn sells the electricity to an end-user. Historically, there have been lease provisions in other industries that entitled the lessor to a percentage of revenue generated from the asset.

Integrated as a System

In certain instances, the IRS has concluded that assets must be separated into different classifications: some as real property and the rest as personal property. PLRs concerning LED billboards [IRS PLR-111324-11 (July 19, 2011) (IRS 10/28/11) and IRS PLR-125828-11 (October 24, 2011) (IRS 1/27/12)] and cellular towers [IRS PLR-130186-10 (April 6, 2011) (IRS 7/22/11)] were able to separate out the assets into two categories: inherently permanent structures, such as the tower or billboard structure; and property that was an accessory to the operation of a business, such as the non-permanent signs or cellular equipment.

Revenue Rule 75-424, 1975-2 C.B. 269 (IRS 1/27/12), concerns whether various components of a microwave transmission system are real estate assets. In the ruling, the IRS determined that the transmitting and receiving tower itself was real property. However, the transmitting, multiplex, and receiving equipment, which did not require external support to operate, were accessories to the operation of a business and, therefore, were not real property.

A PV system, in many instances, also has a mounting structure that is separate and distinct from the rest of the equipment. However, the performance of a PV system would deteriorate dramatically without it.¹⁵ With regards to the remainder of the system, removing any of the components of value (e.g., modules, inverters, or wiring) disrupts the ability of the system to function. More so, if the solar asset is not connected to the grid or a source of energy load, electricity will not flow.

A solar system's inability to function unless all of its parts are connected and working properly creates a strong argument for it being viewed as an integrated system. A single asset, such as a PV module or inverter, cannot perform its function separately; therefore, the system as a whole should be viewed as either inherently permanent property or property accessory to the operation of a business.

¹⁵ However, the racking system represents a small percentage of the total cost of the system; therefore, going to the trouble of creating a REIT just for racking assets would not appear to be a worthwhile endeavor.

Conclusion

Based on this initial examination, it would appear that PV systems have many of the qualities associated with inherently permanent assets. Furthermore, while a PV system is similar to all other electric-generation assets in many respects, it is distinct in that it does not require energy to be converted first into mechanical energy in order to then produce electricity. The inverter, which converts the DC electricity produced by the solar modules to AC electricity, is the most active component of an installation (along with the tracking system if one is included). However, an inverter is comparable to transmission assets in many respects, and the IRS has concluded in certain instances that transmission assets are real property. While a PV system does not usually require direct management on a daily basis, it does require oversight, monitoring, and maintenance, which has a cost in-line with most electric-generating assets. In addition, a PV system also may or may not be actively involved in the business that owns the system. Finally, the majority of the assets that make up a PV system would appear to meet the “integrated as a system” characteristic given the limited viability of these individual components to function independent of one another. Whether or not the IRS determines that when taken together, these qualities of a PV system characterize it as *inherently permanent* or an *accessory to the operation of a business* is beyond the scope of this analysis. The intent of this study is to provide a technical perspective to help inform the decision-making process.

If a PV system were deemed to be real property, there would still be potential obstacles to REITs owning PV assets. Among these are the ability of a REIT to fully monetize the investment tax credit as well as take advantage of depreciation and the potential differences between how state and federal authorities treat the asset (currently many states treat PV as personal property to exempt it from property taxes). In addition, the reclassification of PV as realty has the potential to disrupt current financing practices in the solar market today.

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