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Taxing Residential Solar

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Introduction

Solar power is on the rise. A significant part of the increase in solar electricity production is attributable to homeowners putting panels on the roofs of their residences, so-called residential solar. Homeowners with solar systems engage in two-way trading with the electric utility that services their area. This trading raises federal tax issues that are important, complex, and unresolved. The tax treatment of homeowners who have residential solar systems depends on how their relationship with their local utility, which is the standby purchaser of their excess generation, is characterized. This characterization is generally a function of state law.

In some states, like Nevada, homeowners with solar systems have a single monthly transaction with the utility. In such a "net electric metering" (NEM) jurisdiction, if a homeowner's system doesn't generate enough electricity to meet her own needs in a given month, she buys from the utility to cover the shortfall. If instead she generates more than she needs, she sells the excess to the utility. To the extent the homeowner uses her own electricity, there is no transaction. There is only an avoided cost, like the avoided rent of a homeowner. In other words, the electricity both generated and consumed by a residential solar system, in a net metering jurisdiction, represents imputed income. As a general proposition imputed income is not taxed. To the extent that the homeowner purchases electricity, the cost is a nondeductible personal expense, as it is for consumers who purchase all of their power from the utility.

In other jurisdictions, such as Hawaii, homeowners with solar systems are deemed to sell all of the electricity they generate to their local utility, and even if the homeowner's generation and consumption are concurrent, to purchase from the utility in a distinct transaction all of the electricity the homeowner requires to run her household. The imputed income label doesn't capture the essence of the homeowner-

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utility relationship in "buy all, sell all" (BASA) jurisdictions like Hawaii the way it did in Nevada.

What is the consequence? Many questions are raised by residential solar systems generally, and by the distinction among regulatory regimes from jurisdiction to jurisdiction in particular. The principal issues are (1) whether the homeowner's avoided cost is taxable income, and if so (2) whether the homeowner is permitted to claim depreciation and other deductions relating to the solar system.

If courts resolve these questions based on present tax doctrine, it is likely that these questions will be answered differently from jurisdiction to jurisdiction, just as the courts assigned different tax consequences to income splitting by married couples depending on state-to-state differences in family law until the legislative enactment of joint filing effectively mooted the issue. It is also possible—indeed probable—that these questions will eventually be addressed by legislation or rulemaking.

To date, however, the tax issues raised by residential solar have not been addressed by policymakers nor have they been comprehensively analyzed by commentators. This neglect is a result of two factors. First, residential solar technology is relatively new, and use is in its incipient phase. Second, most jurisdictions historically have used NEM regimes like those in Nevada, where no tax consequences arise as a result of the trades between consumers and utilities.[1]

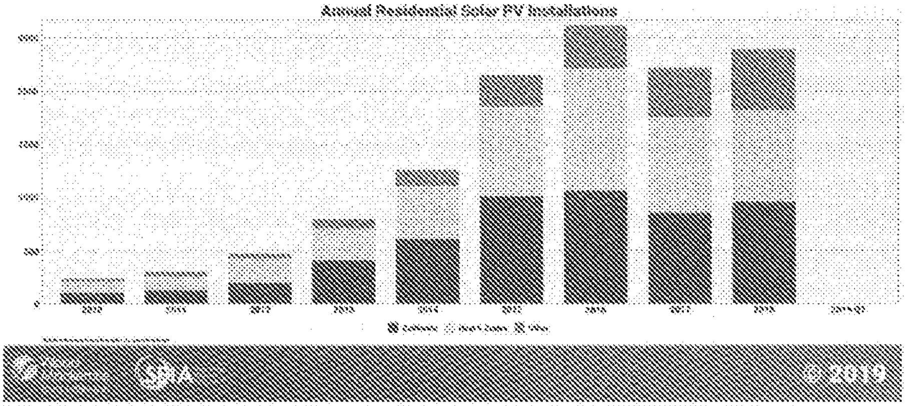
Neither reason will prove durable. The residential solar industry is experiencing explosive growth. In part because of this growth, and the engineering and business havoc the growth is wreaking on the utilities, states are beginning to move away from the Nevada-type regulation toward schemes like the one in Hawaii. In other words, states are starting to migrate away from integrating (or "netting") trading transactions with the utility and instead treating them more as independent and separate transactions.

Consider first the explosive growth shown in Figure 1.

[1] See Part II.D.1.

FIGURE 1

GROWTH IN RESIDENTIAL SOLAR INSTALLATIONS IN THE UNITED STATES SINCE 2010[2]



The explanation for the growth is basic economics. The price of electricity has continued to steadily rise for some time. Meanwhile, the cost of a residential solar system has been steadily falling.[3] These two trends operating together are pushing more and more jurisdictions in the United States into "grid parity."[4] This is the point at which the cost to homeowners of purchasing electricity from their local utility is no cheaper (and may in fact be costlier) than making it themselves with a residential solar system, taking into account all of the relevant costs relating to operating a system (such as capital costs or lease payments) and attendant benefits (such as the 30% federal tax credit).

Now consider the increasingly active state regulatory responses to this growth in residential solar market penetration. During the first quarter of 2019, twenty-seven states, plus the District of Columbia and Puerto Rico, took affirmative steps toward implementing or modifying their "deferred generation compensation rules."[5] In other words, more than half of the states have enacted changes to or are actively considering steps that shift state policy along the spectrum from Nevada-type NEM regulation toward Hawaii-type BASA regulation.

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[2] See Solar Industry Research Data, Solar Energy Indus. Ass'n, https://www.seia.org/solar-industry-research-data (last visited July 24, 2019).

[3] Catherine Rollet, Solar Costs Have Fallen 82% Since 2010, PV Mag. (June 3, 2020), https://www.pv-magazine.com/2020/06/03/solar-costs-have-fallen-82-since-2010/#:~:text=the%20levelized%20cost%20of%20energy,the%20International%20Renewable%20Energy%20Agency.

[4] See note 2.

[5] N.C. Clean Energy Tech. Ctr., The 50 States of Solar: Q1 2019 Quarterly Report Executive Summary 5 (April 2019), https://nccleantech.ncsu.edu/wp-content/uploads/2019/04/Q1_19_SolarExecSummary_Final2.pdf.

This means that the most obvious federal tax issue—whether the homeowner realizes taxable income on her system's output—is not likely to be brushed under the carpet as a quotidian example of imputed income for much longer.

Once the taxable income issue is brought out in the open, the ancillary issues—such as the availability of tax depreciation and the statutory source of the 30% tax credit—will be dragged along behind. Taxpayers will force these tag-along issues onto the policy agenda: If homeowners are taxed on the electricity they generate and sell to the utility, it is inevitable that many will attempt to claim the benefit of associated deductions. This will force affected homeowners and the IRS into a thicket of amorphous and complicated tax rules, including application of the "trade or business" standard to residential solar activities, and the determination of whether these activities are subject to various deduction limiting rules such as the passive activity loss rules. As we describe below, some generalizations are possible regarding the likely application of these rules in typical cases, but the rules are inherently fact bound. The situation calls for the establishment of clear rules, whether by Congress or Treasury.

Very often solar systems are leased from third parties, rather than purchased by homeowners outright. This adds yet another dimension to the federal tax issues raised by residential solar. The principal question raised by third-party ownership coupled with leasing is whether it makes any sense, at a policy level, to allow third-party owners more generous tax treatment for the systems they own and lease to homeowners than the tax treatment accorded homeowners who own their own systems. This is how the law generally applies, and it is difficult to justify.[6] It is the result of happenstance—not a deliberate choice. One implication is that the tax credits that are targeted to homeowners who adopt the technology are at risk of being diverted, at least in part, to the large and growing industry of solar installers, private partnerships, and "yield companies" who are the counterparties on residential solar leases.

This Article is nominally about residential solar systems, but most of what we say is equally relevant to other forms of "distributed generation," such as small wind turbines, geothermal heat pumps, fuel cells, and so forth. For the most part the specific technology that allows the homeowner to stand in a two-way relationship with the utility—in the jargon of the industry to become a "prosumer" rather than merely a consumer—does not impact the analysis. We focus on solar, rather than distributed generation more generally, because it is currently the most important subsector of distributed generation, and

[6] See Part IV.

most of the recent regulatory action at the state and local level has been solar specific. Tax policy with respect to distributed generation will be made, and will be made soon, and in all probability, it will be made first in the solar context.

We proceed as follows: Part I describes the background energy law and policy principles and explains the NEM, BASA, and hybrid regulatory approaches to residential solar. Part II analyzes the fundamental tax issue in the residential solar context: whether a homeowner's solar production, which reduces the homeowner's electric bill, constitutes taxable income or tax-free imputed income. Parts III and IV go on to consider the ancillary tax issues that arise where the homeowner's solar production represents taxable income. While Part III is focused on homeowners who own their solar systems, Part IV considers the leasing context. Part V makes policy recommendations to better rationalize the tax treatment of residential solar production.

I. Energy Law and Policy

This Part first explains how regulatory responsibility for residential solar has been divided between federal and state governments and, second, describes the basic parameters and some of the details of present policies. The federal regulator is the Federal Energy Regulatory Commission (FERC). The state regulators include state public utilities commissions and state environmental regulatory agencies. In a nutshell, direct regulation of residential solar is done at the state level, not by the federal government. The federal government does, however, influence regulatory policy indirectly.

The regulatory approaches implemented by the states run along a continuum. We describe in detail and illustrate how the approaches in various states work. A detailed understanding of the regulatory approaches is necessary to evaluate the tax characterization of the transactions between the homeowner and the utility, for reasons we explain in Part II.

A. *Federal-State Sharing of Regulatory Responsibility*

The Federal Power Act (FPA) assigns to FERC the exclusive authority to regulate "sale of electric energy at wholesale in interstate commerce."[7] The FPA leaves to the states the regulation of "any other sale" of electricity, including sales at retail.[8]

[7] Fed. Power Comm'n v. S. Cal. Edison Co., 376 U.S. 205, 205 (1964).

[8] F.E.R.C. v. Elec. Power Supply Ass'n, 136 S. Ct. 760, 762 (2016).

FERC has classified all of the transactions described in this Article as retail sales. This includes (1) electricity sales by the utility to the homeowner, (2) electricity sales by the homeowner to the utility, and (3) electricity sales by a third-party owner of a (leased) residential solar system to the homeowner on whose property the system is installed. The first type of transaction is the canonical form of retail sale in this industry. The second transaction—sale by the homeowner to the utility—is considered a retail sale assuming (as is typical) that the homeowner is buying more than she is selling in the long run.[9] The third transaction—sales of electricity by third-party system owners to homeowners—takes the form of lease payments, often referred to in the marketplace as "power purchase agreements."[10]

In sum, the relationships among the parties to transactions involving residential solar are primarily governed by state law and regulation. There are some areas of federal-state overlap,[11] but state governments are the most important regulatory players in the residential solar marketplace.

B. State Regulatory Schemes for Distributed Generation

State regulatory schemes span a continuum. NEM regulation is at one end. BASA regulation is at the other. Sometimes BASA regulation is referred to as "feed-in tariff" or "value-of-solar tariff" regulation. We will stick with BASA because it is a better description of the terms of trade. Most state policies presently in place (including policies described by regulators and interested parties as NEM or by jurisdiction-specific acronyms) are in fact hybrid regimes that exhibit features of both pure NEM and pure BASA. We first discuss pure versions of NEM and BASA and then turn to hybrid regimes.

1. Net Electric Metering

In an NEM jurisdiction, the solar system is located "behind the meter." This phrase is the solar industry's way of expressing the idea

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[9] Sun Edison LLC, 129 FERC ¶ 61,146 (Nov. 19, 2009) (concluding that the owner of a leased solar system was not making wholesale electricity sales to the homeowner-lessee). Note that *Sun Edison* was set in an NEM jurisdiction and the facts of the ruling indicate that the homeowner was a net importer of electricity over the applicable billing period. It is unclear whether the ruling would be extended to cases where one or both of these facts were changed.

[10] See Solar Energy Indus. Ass'n, note 2.

[11] Examples of overlap include 2005 legislation in which Congress required states to make a regulatory determination about "net metering" and "interconnection services" for distributed generation, 16 U.S.C. § 2621(d), and the EPA Clean Power Plan, which would require states to implement plans to reduce CO_2 emissions according to a rigid schedule, including by encouraging the adoption of alternative energy sources such as solar power.

that the meter marks the boundary that separates the parts of the electricity network that belong to the homeowner from those that belong to the utility.

Because the homeowner's system is behind the meter, the quantity of electricity she generates will be greater than the quantity she exports to the grid.[12] To the extent her production and demand are concurrent, she will use self-generated electricity. She will only trade with the utility when her demand and generation are not synchronized and in balance.

The utility charges the homeowner standard retail rates for net consumption of electricity. Net consumption is the difference between the volume of electricity she purchases from the utility and the volume the utility purchases from her. The netting of purchases and sales is significant for several reasons.

First, it means that the value placed on the homeowner's self-generated electricity is the retail rate. Specifically, under netting the homeowner purchases less electricity than would otherwise be the case. The cost savings here relate to billing that would have been at the retail rate. Further, some jurisdictions have tiered pricing of electricity for retail customers. Under tiered pricing, electricity prices increase progressively along a step function as demand increases. In jurisdictions like Nevada where net metering and tiered pricing are both features of state regulation, the homeowner's self-generated electricity reduces her total demand, and allows her to avoid paying the retail rates assessed at the higher tiers to which she would be subject without self-generated electricity.[13] Hence, the value placed on self-generated electricity (the homeowner's avoided cost) is not merely the retail rate, but the highest rates imposed under tiered pricing.

Second, it means that some (arbitrary) convention must be selected regarding the time interval over which purchases and sales are netted. In many NEM jurisdictions net metering is implemented by measuring net consumption monthly. In months when a homeowner's consumption outstrips production, the retail rate (or rates, in a tiered pricing jurisdiction) is applied to net consumption and billed to the customer. In months when a homeowner's production outstrips consumption, the utility might credit her account for the retail value of the excess production and allow her an offset against billings in subsequent

[12] Electricity is delivered to consumers in the United States through a complex network commonly referred to as the grid. For a short primer on how it works, see Energy Explained: How Electricity Is Delivered to Consumers, Energy Info. Admin., https://www.eia.gov/energyexplained/electricity/delivery-to-consumers.php#:~:text=IN%20the%20United%20States%2C%20the,customers%20all%20across%20the%20country (last updated Oct. 22, 2020).

[13] See Part II.C.1.

months. Often the homeowner is permitted to carry over credits from month to month until year end.[14] In some jurisdictions, credits from excess production trigger a cash payment by the utility to the homeowner at year end. In other jurisdictions, credits are forfeited.[15]

Third, netting of two-way trade between the homeowner and the utility supports the conclusion that there is one single integrated transaction between them in each netting period. This has important tax implications. One implication is that the homeowner is likely to avoid paying tax on the value of her self-generated electricity. As noted in the Introduction, nontaxability rests on the idea that the homeowner's use of self-generated electricity is a form of imputed income. The classic case of imputed income is rental costs that are avoided by owners of homes, cars, and household appliances, which are outside the scope of "gross income" under § 61 of the Internal Revenue Code. Likewise, the wealth accession (avoided electric costs) from the homeowner's use of her own solar system is tax-free.

Another implication is that the homeowner is not generating electricity as part of a "trade or business."[16] Rather, she is generating electricity to minimize her (nondeductible, personal) electricity bill. If the homeowner's solar electricity trading is not a "trade or business," the homeowner is denied tax deductions for the costs of trading, such as depreciation and maintenance expenses. She will, however, likely still be able to claim a 30% federal tax credit for the cost of purchasing the system, depending on the facts surrounding her ownership, as discussed below.[17]

2. *Buy All, Sell All*

BASA regulation is the polar opposite of NEM. The distinguishing feature of BASA regulation is that trade flowing from utility to cus-

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[14] See note 46.

[15] The policies of the states on the carryover of credits for excess production are summarized in map form in N.C. Clean Energy Tech. Ctr., Customer Credits for Monthly Net Excess Generation (NEG) Under Net Metering, Database St. Incentives for Renewables & Efficiency (July 2016), https://www.districtenergy.org/HigherLogic/System/DownloadDocumentFile.ashx?DocumentFileKey=cbf7f36d-5d20-2e5f-9ffc-9bdae0bf415f&forceDialog=0.

[16] IRC §§ 162(a), 167.

[17] The description in this paragraph assumes that the homeowner is a net electricity consumer, not a net producer. This is the usual case, given the legal limitations on system size. In the unusual case in which the homeowner's production outstrips her consumption over the netting period selected by a particular jurisdiction, the tax consequences to the homeowner depend on how the excess production is treated. If the utility pays the homeowner cash for the value of her excess production, the payment is taxable. This opens the possibility that the homeowner might be permitted to claim cost recovery deductions, at least in part, as discussed at length below.

tomer is explicitly separated from trade flowing in the opposite direction. Electricity generated by the homeowner's solar system is channeled to the grid in full. This is the "sell all" side of the trade. The utility pays the homeowner for the electricity according to a standard schedule of rates, known as a tariff. Meanwhile, in a distinct transaction, the "buy all" side, the homeowner purchases from the utility a quantity of electricity equal to her gross demand.

The separation of the purchases and sales under BASA regulation has several implications. First, it means that unlike net metering, the value assigned to the homeowner's self-generated electricity need not be equal to the retail rate the utility charges the homeowner for electricity flowing in the opposite direction. There is no prohibition on rate equivalency between the buy and sell transactions, but it is not a necessary implication of the structure, as is true under pure NEM (where there is netting of quantities flowing in opposite directions before value is assigned to the net flow).

Second, it is not necessary under BASA regulation to establish any system of periodic reconciliation of trade flowing in opposite directions. The homeowner pays for electricity she consumes from the grid. The utility pays for electricity the homeowner feeds into the grid. Because the transactions are independent, there is never a credit balance to carry forward to the next period. The utility is likely to synchronize the billing schedules on the buy and sell trades, and also to impose net billing on the customer as a condition of service, both of which simplify administration. Unlike NEM, though, netting is done under BASA to minimize transaction costs and record keeping, not because the trades in opposite directions are substantively linked.

Third, the homeowner should be taxable on "sell all" trades with the utility.[18] "Should be taxable" is meant as a prediction of how the issue is likely to be resolved by a court based on present doctrine; we are not arguing that this is either desirable or consistent with present practice. If she is taxed on her sales, she might be engaged in the "trade or business" of generating electricity for resale, a status that would trigger eligibility either to claim cost recovery deductions (if she owns her system outright) or to claim deductions for lease payments she makes to the system owner (if the system is owned by a third party).[19]

[18] This is the outcome we predict. Other tax experts who have weighed in on the issue agree. See, e.g., Memorandum from Skadden, Arps, Slate, Meagher & Flom LLP to the All. for Solar Choice (Aug. 9, 2013) (on file with the *Tax Law Review*); Memorandum from Edward D. Kleinbard to the Alliance for Solar Choice (Sept. 4, 2015) (on file with the *Tax Law Review*).

[19] IRC §§ 162(a), 167, 168.

Fourth, as was true under NEM, the homeowner will be able to claim a 30% federal tax credit for the cost of her system (assuming she is not a lessee). Most of the practical details of the credit will be the same under BASA as under NEM.

3. *Hybrid Regulation*

There is no jurisdiction of which we are aware that has implemented an entirely pure form of either NEM or BASA regulation. In practice, all regulatory schemes are at least to some extent hybrids. There are several dimensions of hybridity. In other words, there are various interrelated yet discrete aspects of the transactions between solar homeowners and utilities that alternatively might be integrated (as in NEM) or separated (as in BASA regulation). These include measurement, the boundaries of the legally cognizable "transaction" or "transactions" between homeowner and utility, pricing, creditability, and billing conventions.

Begin with measurement. There might be a single meter that spins "forward" when the homeowner draws electricity from the grid and "backward" when the homeowner supplies electricity to the grid. The meter would record only the net electricity used by the homeowner (which in concept might be negative if the homeowner generates more electricity than she used). It is also possible to employ separate meters (or a single, two-way meter) that measure and record flows of electricity to and from the grid separately.

The cognizable "transaction" specified in state or local law might be the purchase by the homeowner of the net amount of power consumed by the homeowner over some arbitrary time period. The time period might be the billing period (typically monthly), or some shorter or longer interval (such as an hour or a year). It is also possible that local law might cognize two independent transactions, separating the homeowner's purchases from her sales. This aspect of integration (or separation) is entirely formal; it has nothing to do with the engineering or physical processes of generating, transmitting, or using electricity from one source versus another. It is merely a description of the statutory or regulatory language used to describe these processes.[20]

The next two dimensions—pricing and creditability—are interrelated. Both are focused on the remuneration to homeowners for elec-

[20] California law is a good example. In truth, California's regime is a hybrid of NEM and BASA, but it is described by the California Public Utilities Code (PUC) as NEM, a term defined in the PUC as follows: "'Net energy metering' means measuring the difference between the electricity supplied through the electrical grid and the electricity generated by an eligible customer-generator and fed back to the electrical grid over a 12-month period." Cal. Pub. Util. Code § 2827(b)(6) (2019).

tricity supplied to the grid. How should electricity the homeowner exports to the grid be valued? Once value is determined, how does the homeowner cash out the value she creates?

As to determining value, one possibility is to use whatever retail rate schedule is used by the utility for garden-variety retail sales, including sales to customers without solar. If there is only one meter that measures net flows, the same value must be assigned to the net flow without regard to the direction.[21] Any attempt to assign different values based on the direction of trade would fail for lack of necessary information (one-way trade not being measured).

If, on the other hand, flows to and from the grid are measured then different values might be assigned based on the direction of trade. Indeed, this describes present practice: Some jurisdictions assign lower-than-retail prices to electricity generated by homeowners and exported to the grid; others assign retail prices. (There is another aspect to the problem of determining value, namely the possibility of implementing "time of use" rates to electricity, an issue we discuss in detail below.)

How does the homeowner cash out? The product of the quantity of electricity exported to the grid and price assigned to that electricity equals the remuneration owed to the homeowner. Although it is possible that the utility would be obligated to pay the homeowner in money, this is seldom done. Instead, the homeowner is usually granted a credit. The credits might be perpetual or expire after some interval (typically yearly); and they might be refundable at the end of the interval or, instead, only usable as a set-off to money the homeowner would otherwise owe the utility. In addition, a homeowner's use of credits might be limited to offsetting volumetric charges for electricity procured from the utility, as distinct from other charges, such as those for transmission and overhead.

From the homeowner's perspective, refundable and perpetual credits are better than credits with the opposite features, as they reduce or eliminate the risk that the homeowner will not be paid for electricity she generates in the final accounting. Perpetual, refundable credits are more consistent with treating the homeowner's buy and sell transactions separately; if the homeowner credits from sales to the utility can only be used to set off the cost of purchases (and then only temporarily), then as a practical matter the sales are more closely integrated

[21] This is true without qualification in the usual case that the homeowner is a net importer. If the homeowner is a net exporter, then her exports must be valued at a rate equal to her imports to the extent thereof; however, exports in excess of imports might be assigned a different, lower rate. This is the rule presently in effect in Nevada. See notes 37-39 and accompanying text.

with purchases than would be true for credits that were refundable or perpetual or both.

The last dimension of hybridity is the billing convention used by the utility to report to the homeowner—and potentially to interested third parties (including possibly the IRS)—information regarding the transaction or transactions between the utility and the homeowner. Bills are typically issued monthly and might be highly detailed, showing gross electricity flows in both directions using minute time blocks. Or they could be crude, showing only the net balance over the entire billing period. To some extent, this degree of detail in the billing records is linked to the measurement technology used in a given case. If there is a single crude meter that only measures net flows, then only a crude bill is feasible. If the metering captures gross flows in both directions, then more refined information might be included in the bill, but whether all the details available to the utility will be supplied to the customer depends on market practice, guided by idiosyncratic local regulations.

4. *Time of Use Rates*

Utilities in some states are implementing dynamic pricing for residential customers, known as time of use (TOU) rates. Where TOU rates are implemented, retail rates change throughout the day to better reflect utilities' costs of purchasing electricity at wholesale. Customers are charged more for electricity at times of peak demand, and less during off-peak hours. Implementing TOU rates depends on advanced metering that can record usage in short intervals.

TOU pricing complicates the implementation of NEM in its pure form, but generally does not complicate implementation of BASA regulation. Start with BASA regulation, the unproblematic case. If the homeowner's purchase and sale transactions are tracked separately and accounted for as completely distinct transactions—the defining feature of BASA regulation—then pricing trades at rates sensitive to fluctuations in the market value of electricity is straightforward. A choice has to be made whether to offer the homeowner a premium price for electricity she produces during hours of peak demand (the efficient choice is to do so) but as applied to the homeowner's status as an importer of electricity from the grid, TOU rates would apply to the homeowner with a solar array in the same way such rates would apply to every customer of a given utility in the same rate class.

Next consider the interaction of NEM and TOU pricing. NEM and the architecture of its implementation rest on two premises: (1) that electricity is a fungible commodity flowing back and forth between the homeowner and the grid (i.e., the utility), and (2) that the net flow between the homeowner and the grid should be measured over a relatively long time interval, such as a month. TOU pricing is fundamentally incompatible with both of these premises. TOU pricing means that on- and off-peak electricity are not fungible. TOU pricing requires frequent measurement, whereas NEM requires only a single measurement per billing period. TOU pricing and NEM are incompatible.

The result of combining what would otherwise be NEM regulation with TOU pricing is a form of hybrid regulation. Suppose net electricity flows were tracked with a greater frequency than is typical under net metering. For example, net flows could be measured every hour rather than monthly to assign a value to the net flow during each one-hour interval. Then over the monthly net metering period, the cash value (based on hourly TOU pricing) of the net flows during all of the one-hour blocks that month would be netted. Netting the cash value assigned to electricity flowing back and forth—where cash value depends on TOU rates—is different from netting quantity flowing back and forth. When cash value is assigned to a particular flow, it indicates that the exchange is a completed transaction in and of itself, not a subcomponent of some larger group of exchanges that collectively comprise a transaction.

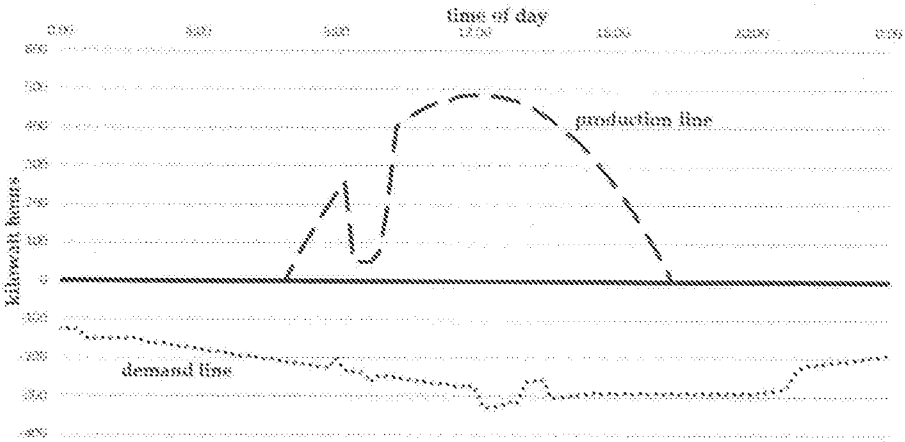
If TOU pricing is laid over NEM regulation, how many transactions are there between the homeowner and the utility during the billing period? There is no clear-cut answer. The range of choices depends in part on netting frequency. Say quantity-for-quantity netting is done hourly. From a pricing point of view, there are 24 hours × 30 days = 720 hourly blocks, each of which involves either a net flow to the homeowner or to the utility. The IRS might plausibly claim that each of these hourly blocks is classified as a discrete "transaction" for tax purposes and, accordingly, that any hourly block with a net flow of electricity to the utility results in taxable income for the homeowner.

From a billing and legalistic point of view, the homeowner is likely to respond, there is one monthly transaction that is the composite of these hourly blocks, which are held separate solely to implement TOU pricing, not to alter the legal relationship between the homeowner and the utility in any other way. An intermediate position would be that there are as many transactions as there are TOU categories. Suppose there is hourly netting but the TOU jurisdiction has only two rate categories, on-peak and off-peak pricing. Arguably, there is quantity-for-quantity netting among all on-peak flows, and the same for off-peak. From this perspective there are two transactions per month, one for on- and the other for off-peak, not 720. It is not apparent how to break the stalemate between competing points of view, all of which have some merit.[22]

C. *Illustrations*

Consider the scenario depicted in Figure 2, which shows a hypothetical example.

Figure 2
Hypothetical Household—Electricity Production and Consumption



The homeowner's total demand for electricity is shown by the demand line, broken down into fifteen-minute increments. By total demand we mean the quantity of electricity required to serve the homeowner's need without regard to whether the need is met by self-generated electricity, or by electricity supplied by the utility, or both in combination. This is the area between the horizontal axis and the demand line. The homeowner's solar-generated electricity is represented by the production line. Generation begins at sunup and persists throughout the day, with dips attributable to weather (such as storms and clouds; in the example there is an interruption in production be-

[22] A similar complication stems from so-called virtual net metering, which some jurisdictions allow for apartment buildings and other multiunit structures. With virtual net metering, the solar panels are installed not on any owner's property but on the roof, which is communal space. The total production from those panels reduces each unit owner's electric bill on a pro rata basis. Virtual net metering implicates tax concerns that are very similar to those triggered by the interplay of TOU pricing and NEM. As a descriptive matter, it is not true that trading in virtual net metering is being treated by the utility and the homeowner as a single integrated transaction. Rather, a more accurate description is that there are separate transactions that are combined to simplify bookkeeping.

ginning around 8 a.m.). Total generation is the area under the production line.

1. *Net Electric Metering*

In a net metering jurisdiction, determination of the homeowner's monthly volumetric charge for electricity involves four steps: (1) measure the area above the demand line; (2) measure the area beneath the production line; (3) figure the difference between these two amounts; and (4) apply the volumetric rate to the difference. In practice this can be implemented by using a single net meter. At the end of the month the meter will show a change from the prior reading, which represents the excess of demand over supply (if the change is positive) or vice versa (if negative, the homeowner is a net exporter for the month). This corresponds to step (3).

Notice two things about net metering. First, the shape of the demand line and the supply line is unimportant; the only thing that matters is the area under the lines. (Things are more complicated if the jurisdiction has TOU pricing, as explained above.) Second, and relatedly, it doesn't matter whether the homeowner's demand and her generation are simultaneous. There is no advantage, or disadvantage, from consuming self-generated electricity rather than grid-supplied electricity. It follows that the information requirements necessary to implement net metering are minimal: Only the overall difference between consumption and production over the entire billing cycle needs to be tracked.

2. *Buy All, Sell All*

In a BASA jurisdiction, the first two steps are the same: (1) measure the area above the demand line; and (2) measure the area below the production line. Step (3) is to apply the volumetric rates for electricity demanded and supplied to these two quantities. In a jurisdiction that has BASA regulation, the rates are likely to be higher for trade flowing from the grid to the homeowner than from the homeowner to the grid. This is the reason utilities favor BASA regulation, but is not an inherent requirement of this system of regulation.

Here, as with net metering, the shape of the lines doesn't matter, only the area beneath the lines matters (barring TOU pricing), and there is no benefit or penalty to simultaneous demand and generation. The information requirements necessary to implement BASA regulation are greater than was true for net metering, but the necessary information will be readily available in most or all cases.

Information requirements are greater because it is necessary to measure the total volume of electricity demanded by the homeowner and the total volume generated. This could be done with a two-way meter that tracked these quantities directly. It could also be done by using, in combination, (1) a "net meter" that tracks demand from and supply to the grid as a single data point, and (2) a meter that measures the volume of electricity generated by the homeowner's solar system. The "sell all" tariff rate would be applied to the quantity tracked by (2) (the generation meter), and the "buy all" tariff rate would be applied to the sum of (1) and (2) (generation plus net demand).

Take, for instance, a month during which the homeowner consumed 4 kilowatt-hours (kwh) and generated 3 kwh. It might be that both figures can be read off of a two-way meter. It might be though that a "net meter" reads 1 kwh, representing the difference between consumption and production. But the solar system will track its own production (invariably systems do this). Total consumption must be production plus net consumption, here 3 + 1 = 4 kwh. Thus the "buy all" trade is 4 kwh this month.

3. *Hybrid Regulation*

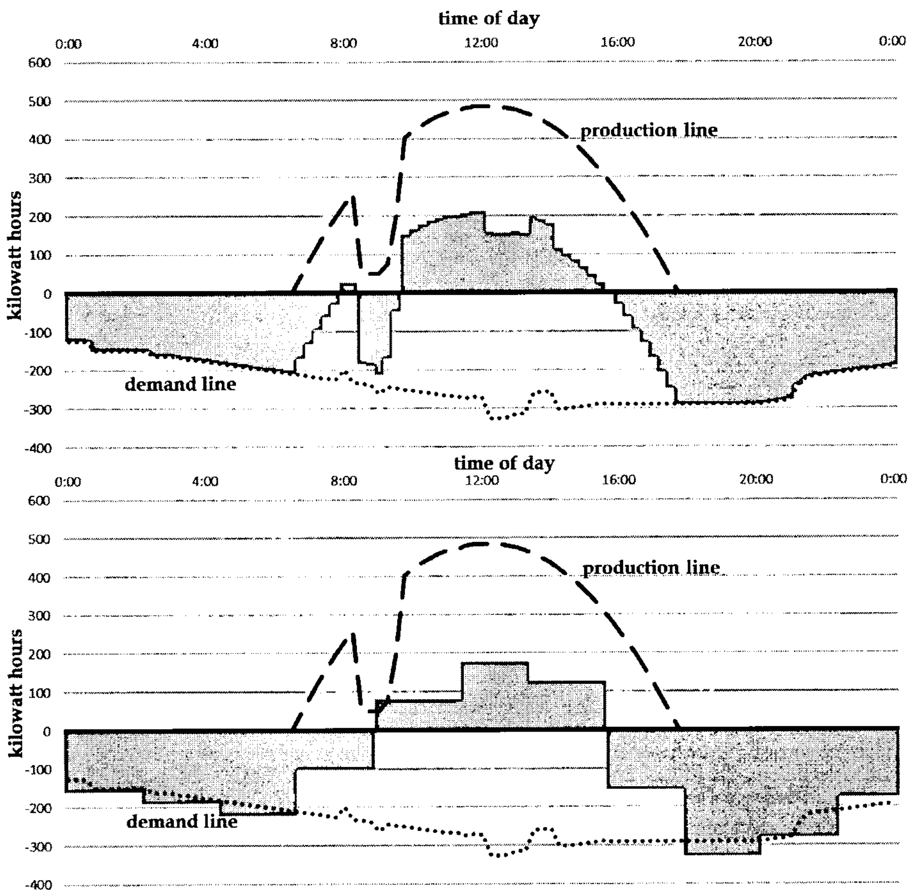
Suppose the jurisdiction in question has implemented TOU pricing and monthly net billing. For pricing purposes, the utility measures net flows between utility and homeowner using short blocks of time. To see the practical importance of the exact interval, suppose the time blocks are alternatively fifteen minutes or two hours. All time blocks in each monthly billing cycle are combined to one net amount, which is either billed to the homeowner or (if generation outstrips demand) results in a credit balance.

Under this version of hybrid regulation, the shapes of the supply and demand lines matter. Shape matters because it reflects the extent to which generation and consumption are simultaneous. The periodic netting—in contrast with BASA regulation—is premised on the idea that during intervals when the homeowner is both producing and consuming, her transaction with the utility is a purchase equal to consumption less production for that interval, or a sale if production outstrips consumption. This idea is grounded in the "behind the meter" understanding of homeowner-utility trading, as described above in the discussion of NEM, but here within each netting period, and the concept that the power the homeowner generates and immediately consumes does not involve a cognizable transaction.

Consider the scenario depicted in Figure 3. This shows two versions of the same scenario depicted in Figure 2 above with a new shaded area added to plot the difference between the supply and demand.

The top panel shows the net of production and demand throughout the day in fifteen-minute intervals. If two hour rather than fifteen-minute intervals were used, the picture looks similar, but in lower resolution, as in the bottom panel.

FIGURE 3
NET TRADE RECONCILED EVERY FIFTEEN MINS (TOP PANEL) AND EVERY TWO HOURS (BOTTOM PANEL)



Assuming fifteen-minute intervals, there would be purchases by the homeowner throughout the night and early morning. Beginning around 8 a.m. the homeowner's production begins to outstrip her consumption—making her a seller—but then there is a short dip in her production (owing to a storm, for example), which knocks her back into purchaser status. Given two-hour intervals, the picture looks similar, but note that the morning storm did not register as a change in the direction of trade. It was obscured by the intertemporal averaging inherent in the longer measurement interval.

D. *Summary and Comparison*

The best way to summarize the key differences among regulatory schemes is to examine why the homeowner would care which applies. The answer is that—roughly speaking (and aside from the tax consequences, which we will turn to below)—she wouldn't care, so long as rates on electricity flows in both directions are the same. If rates are the same in both directions (and the same throughout the day, i.e., if there is no TOU pricing), then the same volumetric charge will result from NEM, BASA, or some hybrid.

If there is a different rate for a homeowner's sales and purchases, then she cares. Assuming she pays the utility more for its electricity than the utility pays her for hers, the homeowner will rank regulatory regimes as follows (best to worst): (1) NEM, (2) hybrid, and (3) BASA. At least as a first cut (i.e., prior to examining the incidence of costs borne by the utility) this is a zero-sum game between the homeowner and the utility. Thus, the utility's ranking of regimes will be in the reverse order.

Net metering is best for a homeowner because, in effect, it gives the homeowner credit for constructive homeowner-to-utility sales at the rate used for trade flowing in the opposite direction. All homeowner-to-utility sales get this relatively favorable pricing until the homeowner's production outstrips consumption, at which time the rate applied to value the homeowner's self-generated electricity toggles down to the tariff rate for utility customers who are net exporters.

BASA is worst because the homeowner never gets the higher rate normally assigned to utility-to-homeowner flows for any of her sales to the utility. All of her sales are given the nominal homeowner-to-utility rate.

Finally, hybrid regulation must fall between the regulatory extremes given that it is a combination of the two approaches. Take the hybrid regime illustrated in the example (and depicted in Figure 3 above). The homeowner is permitted to net flows with the utility—just like in NEM—but she may only do so over relatively short time intervals. The shorter the interval, the more likely her generation will outstrip her demand, and concomitantly, the more likely her grid exports will be valued at a low tariff rate assigned to exports, rather than the retail rate implicitly assigned to imports during synchronized production and consumption.

II. Tax Characterization of Homeowner-Utility Trading

A. *Three Plausible Characterizations*

There is no direct authority on the tax treatment of the transactions between the homeowner and the utility when they have a dual relationship.[23] There are at least three plausible tax characterizations. We will refer to the three approaches as billing cycle integration, bifurcation, and short interval integration. They can be (and, if the issue is settled by the courts, we predict would be) linked to the three regulatory approaches described above in the pattern reflected in Table 1.

Table 1
Correspondence Between State Regulation and
Federal Tax Characterization

Regulatory Approach	***Tax Characterization***	***Example***
NEM	Billing Cycle Integration	Nevada
BASA	Bifurcation	Hawaii
Hybrid	Short Interval Integration	California

As described above and detailed more fully below, in practice all state regulatory schemes in place have some degree of hybridity—no jurisdiction of which we are aware has implemented NEM or BASA in their pure form. Our prediction then is really made along a sliding scale—the closer a given hybrid regime is to NEM or BASA, as the case may be, the more confident we are that a court would follow our predicted characterization. An important difficulty is that there are many dimensions along which regulatory rules can be compared; it is not always self-evident what it means for a hybrid regime to be "close" to NEM or BASA. We illustrate this point concretely below when we describe and evaluate several real-world regulations presently in place.

Billing Cycle Integration. The two-way trade between the homeowner and the utility should be characterized for tax purposes as an integrated transaction where the homeowner is purchasing the net electricity consumption over the billing cycle from the utility at the prevailing rate. In the unlikely event that the homeowner is a net supplier of electricity to the grid during a billing cycle, the transactions

[23] See Kleinbard, note 18, at 16.

would still be integrated, but the direction of the trade would be reversed, so the utility would be purchasing the net amount of electricity from the homeowner.[24]

Bifurcation. The diametrically opposite approach is to completely decouple or "bifurcate" the homeowner's sales to and purchases from the utility. Under this characterization the homeowner is treated as purchasing 100% of her consumption from the utility. The utility would be treated as purchasing 100% of the electricity generated by the homeowner, including both electricity that the homeowner exports to the grid during intervals when she produces more electricity than she needs as well as electricity the homeowner produces and consumes herself.

Short Interval Integration. An intermediate approach would be to view the homeowner as using her self-generated electricity to the extent of her own need, assuming her generation and consumption are simultaneous. The idea is that to this extent there is no electricity flowing to the grid and hence no transaction to tax, merely an avoided cost (imputed income). If the homeowner generates electricity beyond her own need and exports it to the grid, she would be seen as selling electricity to the utility. If the homeowner doesn't produce enough and she imports electricity from the grid she would be seen as purchasing electricity from the utility.

This approach requires measuring the balance of electricity flowing between the homeowner and the grid over some time period shorter than the billing cycle. If net flows are measured over the entire billing cycle, then there is no difference between billing cycle integration and short interval integration. The shorter the time intervals over which the net trade is measured, the greater the distinction between short interval integration and billing cycle integration.[25]

B. Is There a Correct Characterization in Principle?

We are of two minds on whether there is a fundamentally correct answer to the question of how homeowner-utility trading should be characterized for tax purposes. The best argument supporting the homeowner's right to net her own production against her use—to integrate—is based on property rights.

More specifically, the homeowner has a property right in her self-generated electricity. When the homeowner generates no more elec-

[24] Typically, the billing cycle is monthly. In many jurisdictions, including California, the determination of whether the customer is a net consumer or a net supplier is made over a one-year period. Cal. Pub. Util. Code § 2827(b)(6) (2019). Thus, the parameters of the "billing cycle" might plausibly be characterized as one month or one year.

[25] This is illustrated above. See Figure 3.

tricity than she consumes herself, she is—as a literal matter—not communicating ownership over "her" electrons to the utility through the grid for use beyond her premises. If this is a coherent perspective—which might depend on whether it is possible to distinguish "her" electrons from the mass flowing through the interconnected system—then perhaps it can (and possibly should) help us rank plausible tax characterizations in a meaningful way.

Consider an analogy to a homeowner who digs a well in her backyard. She draws water from the well for her own use. There is no sense in which she is first selling the water to the local water authority and then, in a separate transaction, repurchasing it. If she were treated this way, the sale to the water authority would be taxable and the repurchase would be nondeductible personal consumption. This would be analogous to our prediction that a homeowner in a BASA jurisdiction will be taxed on her sell-side trades. Taxing the homeowner with a backyard well this way flies in the face of common experience and, many would argue, common sense.[26] Countless additional examples can be imagined, such as the avid gardener enjoying the fruits of her own garden.

One persuaded by this line of reasoning might conclude that bifurcated tax characterization—deeming the homeowner to purchase from the utility electricity that she generates and uses on-site—is crediting the utility with an imaginary sale of electricity that never occurs. More importantly given the tax consequences, it is also attributing to the homeowner a (taxable) sale of the power even to the extent she is, in effect, selling to herself.

There are at least three counterarguments. First, in a jurisdiction where the homeowner is compelled to sell to the utility her entire production—including self-generated electricity she consumes—the sale by the homeowner is compelled by local law, not tax law. If there is a rights-based objection to the compelled disposition of self-generated electricity, that objection should have been (and likely was) ventilated in the policy debate surrounding adoption of the state utility regulation or statute that compels the sale. This counterargument does not contradict the idea that the homeowner has, at the instant of production, a property right in her self-generated electricity. Instead, it rec-

[26] See Marvin A. Chirelstein & Lawrence Zelenak, Federal Income Taxation 28 (14th ed. 2018) (noting that the imputed income exclusion "rests on no specific Code provision but simply 'results' from a long-standing administrative practice of the Internal Revenue Service, which never has attempted to draw imputed income into the tax base" and "[t]he Service's reasons, historically, may have included some doubt about the constitutionality of treating imputed income as 'income,' a concern about the valuation problems that would have to be surmounted if it were so treated, and perhaps a sense that the entire concept would be regarded by taxpayers as somewhat strange and theoretical.").

ognizes that even if such a right exists it is immediately vitiated by operation of the "sell all" aspect of the regulation. What would be nontaxable imputed income in an NEM jurisdiction is, in a BASA jurisdiction, transmuted into a market transaction with the utility by virtue of local law.

The second argument that cuts against the property-rights objection to bifurcation is more nebulous. The argument is premised on the fungibility of electricity. Say that there is no difference whatsoever between self-generated and utility-supplied electricity. Both flow together and mix in the distribution system. Flow through the system is measurable, but the original source of any particular electron is unknowable. (This is not quite true.)[27] If this is a correct description of the underlying physical phenomenon, then which electricity is self-generated and which is purchased from the utility is based on, and does not exist apart from, the legalistic netting convention in a given jurisdiction.

Look back at the example depicted in Figure 3. The weather event that reduced system production converted the homeowner from a seller to a buyer of electricity from about nine to ten in the morning assuming netting every fifteen minutes, but not if flows are netted over two hours or any longer interval. Even with identical facts, altering netting frequency changes the ownership of electricity and thus the direction of trade at certain times.

The property rights approach ranks more favorably characterizations that don't involve the homeowner selling her own electricity to herself. But which electricity is hers is endogenous to the regulatory and accounting characterization (in particular, netting frequency). Thus, the claim here is not that the rights-based argument is inherently incorrect; instead, the key idea is that property rights over electricity (deciding what unit of electricity was generated by or is owned by a particular person or entity) logically follows the selection of an accounting convention along the integration-bifurcation continuum. If this is right, then the property-rights argument is subordinate to the accounting convention: Property rights over electricity cannot be identified unless and until the accounting convention is specified.

The third argument against the homeowner's right to net is based on the value the homeowner derives from her connection to the grid.

[27] The claim that electricity is fungible is an overgeneralization. One qualification is in jurisdictions where TOU pricing is applied, such as in California. See Part I.B.4. In such jurisdictions, electricity is fungible within each time block, but not across blocks. Another qualification is that utilities, and households with solar, supply both real and also reactive electricity. For details on the difference, see Laurel Passera, Meet Solar's Imaginary Friend, Reactive Power, Interstate Renew. Energy Council (Mar. 12, 2014), https://irecusa.org/2014/03/meet-solars-imaginary-friend-reactive-power/.

In burnishing the property rights based argument in favor of netting we drew an analogy between the homeowner whose production and consumption net to zero and the homeowner drawing water from her backyard well. The analogy is inexact. If the homeowner with the well has no access to water from the local utility, she must either dig a well deep enough to ensure sufficient capacity at all times or accept the risk of occasional drought. If, instead, she was connected to the local water utility, she could rely on the utility as a standby source of supply should her well run dry. A shallower well, cheaper to dig and maintain, would then be feasible.

Likewise, the homeowner with a connection to the grid might calibrate the size of her solar array to her average requirement, and so her net production and consumption balance out long term. Compare this homeowner to one who is not on the grid: The off-grid homeowner must select an array (and battery) with capacity sufficient to supply her needs through the deepest trough in production during which she is unwilling to forgo a power outage. A larger, likely far larger, system will be necessary.

In effect, grid interconnection supplies the homeowner an implicit insurance contract. At the margin, the interconnected homeowner derives a benefit with a value that approaches the difference between a fully self-sufficient system and the smaller system that would be adequate when the grid serves as a backstop. This is likely a considerable sum. Recognizing the economic benefit to the homeowner of grid interconnection undercuts the idea that the homeowner's economic income can be accurately measured based solely on net flows measured over long periods, even assuming she has property rights in "her" self-generated electricity. If the consequence of a property-rights approach to defining the tax base is a mismeasurement of economic income, arguably it is the wrong approach to use when defining the tax base.

C. *Prediction: Federal Tax Characterization Will Turn on State Law*

If the issue is left to the courts, we predict that the federal income tax characterization of homeowner-utility transactions will turn on the regulatory regime that applies in the jurisdiction where the solar system is located. This would mean variable treatment from state to state, tracking the variability in regulatory schemes governing the homeowner-utility relationship, according to the pattern set out in Table 1. We defend this prediction below, and then briefly describe why the result might be different if the issue is resolved legislatively or by regulatory intervention by Treasury and the IRS, a topic that we revisit in Part V.

State-to-state variability in tax characterization of distributed solar is implied by the normal interaction of the federal tax law on the one hand and state law on the other. Federal tax law specifies the tax consequences of transactions. Generally, these consequences depend on the state law characterization of the rights and duties of the transacting parties.[28] Thus where there are relevant differences in state law regarding the rights and interests of the parties, differences in the federal tax characterization are likely.[29]

Familiar examples abound. Probably the most well-known are the income splitting cases decided in 1930, *Lucas v. Earl*[30] and *Poe v. Seaborn*.[31] In *Lucas*, the taxpayer-husband contractually assigned one-half of his income to his wife. He argued that this shifted to her the obligation to include the income on her tax return. In *Seaborn*, the facts were slightly different—the diversion of one-half of the husband's income was imposed by state community property law, not private contract—but the taxpayer's argument was the same. Given the steeply progressive rates then in effect and the absence of joint filing for married couples at the time, the splitting of income between husband and wife would have resulted in significant tax savings.

Writing for the Court in *Lucas*, Justice Holmes explained that "the import of the statute before" the Court, was that "the fruits [of the husband's labor couldn't be] attributed to a different tree from that on which they grew."[32] Several months later, *Poe v. Seaborn* was before the Court. The government argued that the federal tax consequence of the diversion from husband to wife in *Seaborn* was prefigured by the Court's holding in *Earl*.

The Court disagreed. Instead, the Court asked: "What, then, is the law of Washington as to the ownership of community property and community income including income of the husband's and wife's labor?"[33] The answer, found in the Washington State code, was that "all property however acquired after marriage, by either husband or wife, or by both, is community property."[34] This was a sufficient basis on which to distinguish *Lucas v. Earl*. The Court explained as follows:

> In the *Earl* case . . . [w]e held that, assuming the validity of the contract under local law, it still remained true that the

[28] See generally Boris I. Bittker, The Federal Income Tax and State Law, 32 Sw. L.J. 1075 (1979) (stating that before a federal tax effect may be determined, threshold questions of state law must first be established).

[29] See id.

[30] Lucas v. Earl, 281 U.S. 111 (1930).

[31] Poe v. Seaborn, 282 U.S. 101 (1930).

[32] Lucas, 281 U.S. at 115.

[33] Seaborn, 282 U.S. at 110.

[34] Id.

> husband's professional fees, earned in years subsequent to the date of the contract, were his individual income, "derived from salaries, wages, or compensation for personal services." . . . The very assignment in that case was bottomed on the fact that the earnings would be the husband's property, else there would have been nothing on which it could operate. That case presents quite a different question from this, because here, *by law*, the earnings are never the property of the husband, but that of the community.[35]

The statement that in Washington "by law" the husband's earnings are community rather than his separate property demonstrates that the legal rights and interests of the parties to a given transaction, as shaped by state law, are the starting point for figuring out the federal income tax characterization. Even when, as in *Earl* and *Seaborn*, the practical effects of the two transactions are otherwise identical, their tax characterization might be completely different based on subtle variations in state law.[36]

D. *Application*

Consider how this general approach to the interconnection between federal tax law and state law would apply to the regulatory regimes in place in Nevada, California, and Hawaii. Nevada is close to a pure NEM jurisdiction; Hawaii is close to a pure BASA jurisdiction; California refers to its regime as "net metering," but in practice it is a hybrid of NEM and BASA.

1. *Nevada*

Following a policy reversal in 2017,[37] Nevada permits most homeowners with residential solar to net electricity generated by their sys-

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[35] Id. at 117 (emphasis added).

[36] See note 28 and accompanying text.

[37] Nevada was a longtime NEM jurisdiction. In 2015, the Nevada legislature passed a law that required the PUC to examine its policy. In December 2015, the PUC created a major controversy by implementing a scheme much closer to BASA regulation. NV Energy and Solar Net Metering: The Past, Present and Future, Go Solar (Aug. 20, 2018), https://gosolargroup.com/solar-panels-reno-nv/nv-energy-and-net-metering/#:~:text=Nevada%20first%20started%20implementing%20net,power%20production%20at%20affordable%20returns.&text=that%20May%2C%20legislators%20passed%20Senate,Public%20Utility%20Commission%20(PUCN). This ultimately led to the enactment of the Renewable Energy Bill of Rights. Nev. Rev. Stat. § 701.540 (2017); Julia Pyper, Nevada Passes Bill to Restore Net Metering for Rooftop Solar, Greentech Media (June 5, 2017), https://www.greentechmedia.com/articles/read/ nevada-bill-to-restore-net-metering-for-rooftop-solar-passes-in-the-senate. This legislation reversed the 2015 PUC order and rein-

tems against energy drawn from the grid. The one-for-one netting is based on volume of electricity, not value assigned to a particular flow. When a homeowner generates less electricity than she draws from the grid in a given month, her bill is reduced by the difference between her total use and her own production. The timing of the use and production is irrelevant.

When a homeowner generates more power than she uses in a given month, the excess generates a credit. The credit, expressed in dollars, is the product of (1) the quantity of excess electricity fed back into the grid (production minus use, measured in kwh) and (2) a statutory percentage of the rate the homeowner would have paid for electricity if the homeowner were purchasing rather than selling electricity at the time the electricity is fed into the grid.[38] The percentage falls in the range of 95 to 75% of the retail rate for power, depending on when the homeowner enrolls in net metering.[39] The higher percentage is for early adopters, with the compensation rate stepping down as solar market penetration increases.[40]

The utility is required to offer the homeowner a "meter that is capable of registering the flow of electricity in two directions,"[41] and "may, at its own expense and with the written consent of the" homeowner, "install one or more additional meters to monitor the flow of electricity in each direction."[42] If the homeowner objects to the installation of the additional meters, and the two-way meter only measures net flows, neither the homeowner nor the utility will necessarily be aware of the composite "buy" and "sell" side trades that make up the net flow from (or to) the utility—only the net flow will register. This mundane detail is practically important given that any attempt to separate for taxation flows to and from the grid would founder for lack of sufficiently granular data regarding gross quantities being bought and sold.

We think the application of federal tax law to the Nevada regulatory scheme is unambiguous: One tax transaction is cognizable each month between the utility and the homeowner.[43] At a conceptual

stituted NEM regulation in close to its pure form. Net Metering in Nevada, Nev. Pub. Util. Comm'n, http://puc.nv.gov/Renewable_Energy/Net_Metering/ (last updated Sept. 8, 2020).

[38] If the homeowner is billed under a TOU schedule, the excess electricity credit generally must be added to the same TOU period in which it was generated. If, however, the subsequent bill lacks a corresponding TOU period—likely an artifact of seasonality in TOU schedules—the credit carryover is divided evenly among TOU periods in the carryover period. Nev. Rev. Stat. § 704.775(2)(c)(2) (2019).

[39] Id. § 704.7732.

[40] Id.

[41] Id. § 704.773(2)(a).

[42] Id. § 704.733(2)(b).

[43] At least one commentator argued that federal regulatory comity is likely to or should influence federal tax characterization of utility-homeowner trading. See Kleinbard, note 18, at 20-22. The argument appears based on the observation that in regulatory adjudica-

level, the fungibility of the quantities of electricity being swapped back and forth between homeowner and utility—treated as identical as a legal matter under the Nevada statute and in terms of pricing—implies that what is given up in the trade by the homeowner is indistinguishable from what is received. There are no "materially different" entitlements between what is given and received, to echo the phrase used by the Supreme Court in *Cottage Savings* to describe the hair-trigger realization rule under modern tax doctrine.[44] Thus, the subcomponents of the composite transaction each month, if considered individually, will not be cognizable for tax purposes.[45]

2. *California*

Under the California Public Utilities Code, as implemented by the California Public Utilities Commission, there is only one transaction per month between a homeowner with residential solar and the utility. The single transaction is payment for the market value of the net quantity of electricity flowing between utility and homeowner. Market value is the product of quantity and a set of standard tariff rates, which are graduated. The singularity of the transaction is explicit in California statutory law.[46]

California refers to its scheme as NEM regulation, but it is quite different from the purer version of NEM in Nevada. The rules, which

tions, FERC defers to state law characterization of the transactions. Therefore, the argument goes, the IRS should similarly defer to state law characterization. The argument is not persuasive for two reasons. First, FERC has not applied a principle of comity so much as it has applied the same "we take state law and regulation as we find it" approach that the Supreme Court has taken in tax cases to pin down the commercial substance of transactions. Second, different agencies often come to inconsistent conclusions on the same facts. The classic tax case of "regulatory arbitrage" is *Cottage Savings Assoc. v. Commissioner*, 494 U.S. 554, 566-67 (1991) (rejecting the argument that tax law should be interpreted in light of a Federal Home Loan Bank Board's characterization of swapped mortgage pools as "substantially identical"); id. at 569 (Blackmun, J., dissenting) ("I find it somewhat surprising that an agency not responsible for tax matters would presume to dictate what is or is not a deductible loss for federal income tax purposes. I had thought that that was something within the exclusive province of the Internal Revenue Service, subject to administrative and judicial review. Certainly, the FHLBB's opinion in this respect is entitled to no deference whatsoever.").

[44] Cottage Savings, 494 U.S. at 566-67.

[45] The one exception to the outcome would be for a homeowner in a net credit position at the end of a billing period. Nev. Rev. Stat. §§ 704.775(2)(c), 704.7732. Such a homeowner would have taxable income equal to the value of the net electricity exported to the grid.

[46] Cal. Pub. Util. Code § 2827(b)(7), (h) (2019). The account between the homeowner and the utility is reconciled monthly, and in months during which an "eligible customer generator" (the statutory euphemism for solar homeowner) has net exports, the credit is carried forward to the next month. If there is a credit at the end of the twelve-month billing cycle, the customer has the option to cash out or carry the credit into the next year. Id. § 2827(h).

are in effect a hybrid of NEM and BASA, work as follows. Homeowners installing solar panels are required to pay an interconnection fee and equip their system with a meter capable of measuring separately imports from and exports to the grid.[47] The homeowner is required, as a condition of interconnecting a solar system with the grid, to enroll in the TOU rate schedule (TOU rates are optional for nonsolar customers).[48]

The utility tracks the customer's usage and production in hour-long increments.[49] If, during a given increment, the customer draws more power from the grid than she produces, the difference (i.e., net energy) consumed is billed at the TOU rate applicable to that time block. If, on the other hand, the customer produces more power than she uses, the customer is credited, again based on the TOU rate applicable to that time block; importantly, however, if the homeowner is a net exporter for a given time block, the price the utility pays her for her net export is the TOU rate adjusted downward by subtracting nonbypassable charges (NBCs), as described below.[50]

The total volumetric rate for electricity for a given TOU increment is subdivided into rate components such as generation, distribution, transmission, public purpose programs*, nuclear decommissioning*, competition transition charges*, and other charges*.[51] Items on this list marked with an asterisk are NBCs. All rate components factor into the price charged to the homeowner during intervals when the homeowner is a net importer; however, when she is a net exporter, she is credited only for rate components other than NBCs—that is, she is compensated only for the share of the rate attributable to generation, distribution, and transmission.[52]

At the end of the monthly billing cycle, the charges and credits from the discrete time blocks are summed and netted, and reported to the homeowner on her monthly bill.[53] In California, the homeowner may pay her bill then, or may make a minimum monthly payment and

[47] Cal. Pub. Util. Code § 2827(c)(1) (2019).

[48] Cal. Pub. Util. Code § 2827(h)(2)(B) (2019).

[49] Cal. Pub. Utilities Comm'n, Resolution E-4792, at 14 n.20 (June 23, 2016), http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M162/K073/162073167.PDF.

[50] Id. at 13-19.

[51] Cal. Pub. Utilities Comm'n, Order Instituting Rulemaking to Develop a Successor to Existing Net Energy Metering Tariffs Pursuant to Public Utilities Code Section 2827.1, and to Address Other Issues Related to Net Energy Metering, D. 16-01-044, Conclusion of Law 4 (NEM 2.0 ruling), at 88-91 (Jan. 28, 2016), http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M158/K181/158181678.pdf.

[52] Id.

[53] Cal. Pub. Utilities Comm'n, Resolution E-4792 (June 23, 2016) [hereinafter Resolution E-4792], http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M163/K978/163978119.PDF.

carry a balance forward to succeeding months.[54] At the end of the billing year, the homeowner is required to settle her account by paying any balance at that time. If she has a credit balance (because the value of exports exceeds the cost of imports) she can choose either to roll the credit forward to the next billing cycle or to be paid "net surplus compensation," which is the product of the volume of net exports generating the year-end credit balance and a measure of the utility's wholesale cost for electricity over the prior twelve-month period.[55]

What is the time span of the relevant tax transaction in California? Is there one transaction per hour, or one per year? Plausible arguments can be made for both approaches.[56] The most straightforward, and to us best and most likely characterization of the time span for each "transaction" under the California scheme is hourly.[57]

This is the interval during which kilowatt-hours drawn from and exported to the grid are measured, compared, and treated (for pricing purposes) as fungible (at least in part).[58] If the homeowner is a net importer for a given hour, pricing of exports is set equal to imports, and the setoff is one-for-one.[59] If the homeowner is a net exporter during an hour, pricing of exports is equal to imports to the extent thereof, and then is reduced to account for NBCs. Thus, generation during an hourly block in excess of use is not (for pricing purposes) treated as part of the (net) transaction. Excess kwh production is priced differently and thus carries distinct entitlements to compensation compared with kwhs drawn from the grid.

It is also conceivable that the relevant transaction for tax purposes is the annual net. Section 2827(b)(6) of the California Public Utilities Code provides that "'Net energy metering' means measuring the difference between the electricity supplied through the electrical grid and the electricity generated by an eligible customer-generator and fed back to the electrical grid over a 12-month period as described in subdivisions (c) and (h)." Subdivision (h) elaborates that "the net energy metering calculation shall be made by measuring the difference between the electricity supplied to the eligible customer-generator

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[54] Cal. Pub. Utilities Comm'n, Decision Adopting Net Surplus Compensation (June 9, 2011), http://docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/137431.htm.

[55] Id.

[56] Under the billing approach first advocated by the utilities subject to regulation in California, it was conceivable that there would be completely separate accounting and pricing for buy- and sell-side trading (akin to Hawaii, as described below)—but this approach was rejected by the California PUC. Resolution E-4792, note 53, at 14 (explaining the utilities' proposed implementation of "net metering"); *id.* at 15 (rejecting the utilities' proposal as inconsistent with the directive to "net within the metered interval").

[57] Id. at 15.

[58] Id.

[59] Cal. Pub. Utilities Comm'n., note 51, at 88-89.

and the electricity generated by the eligible customer-generator and fed back to the electrical grid over a 12-month period." A form-driven, legalistic approach to resolving the scope of the exchanges that make up a given transaction might regard this statutory rule as dispositive of the tax question about where to mark the boundary between taxable transactions.

3. *Hawaii*

Hawaii's original solar regulation was classic net metering in something close to its pure form (similar to the present system in Nevada). In 2014, the Hawaii Public Utilities Code determined that this did not serve the public interest—the objection was that it was too generous to solar customers, to the detriment of customers without solar.

Beginning in 2015, Hawaii added two new programs referred to as customer self-supply (CSS) and customer grid supply plus (CGS+). CSS is tied together with customer storage (it is designed to encourage customers to invest in batteries to store daylight production to be fed to the grid during evening hours—an effort to harmonize supply and demand). For customers without storage, the program is referred to as CGS+. This is in effect much closer to BASA regulation than it is to net metering. (Homeowners with solar that enrolled in the NEM programs before the new rules were implemented are grandfathered.)[60]

We focus on the CGS+ scheme as a good example of BASA regulation. The utility must supply a two-way meter (or two one-way meters) capable of measuring gross flows in both directions. The utility charges the customer the retail TOU rate for gross draw from the grid. The homeowner is given credit for gross exports to the grid, subject to two provisos: (1) homeowner credit for gross exports to the grid is capped at gross draw from the grid; and (2) gross exports to the grid (subject to the cap) are valued at around one-third of the retail rate used to value electricity drawn from the grid. Exports to the grid in excess of the cap are carried forward from month-to-month and can be used in future months in which there is space under the cap (i.e., in a month when the customer's gross draw is greater than her gross export to the grid). Banked credits for exports to the grid carried to the end of the twelve-month billing cycle are forfeited.[61]

The effect of these rules is to create a sharp distinction between the homeowner's exports to the grid and her imports. Exports are disfavored in two ways. First, they are priced at a lower rate. Second, they

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[60] Haw. Pub. Utilities Comm'n, No. 2014-0192, Instituting a Proceeding to Investigate Distributed Energy Policies 9 (Oct. 20, 2017) (Decision and Order No. 34924),https://dms.puc.hawaii.gov/dms/DocumentViewer?pid=A1001001A17J23B15234B02181.

[61] Id. at 37.

are capped, in effect, at total annual imports: Even if the homeowner is a net exporter over the billing year, she is treated for billing purposes as though she generated an amount equal to her consumption.

The differential pricing and the cap interact to favor the utility in a way that might not be apparent at first. Suppose a homeowner in Oahu has solar and that the average rate for electricity sold by the utility in a given month is 30 cents per kwh. Under the tariff in effect for Oahu, applicable to customers of Hawaii Electric under CGS+, the rate assigned to exports to the grid is 10.8 cents per kwh. Suppose the homeowner both generates and uses 900 kwh in a month. If the same rate were used to value imports and exports, this homeowner's bill would be zero (not considering the monthly minimum or any fixed charges). But her charge is \$115.20 for the month. This is the difference between buy- and sell-side pricing per kwh and the volume of gross flows $((0.30 - 0.108) \times 900 = \$115.20)$.

If, instead, her production increased from 900 to 1000 kwh, the 100 kwh by which her exports exceeded her imports would not generate further reduction in her bill; instead, the excess export is carried forward to the next month and is usable in that month if, but only if, her imports exceed exports in the carry-over month. Any carryforwards that remain at the end of the annual billing cycle would be forfeited.

In our terminology, this is BASA regulation. The import and export transactions are distinct in terms of both measurement and pricing; they are only combined for purposes of billing and to disallow carryforwards at the end of the annual billing cycle.

In our view the IRS would likely succeed if it were to treat the sell all side of the homeowner-utility trading as taxable income. The best counterargument is that the resulting lack of uniform treatment is unseemly—an IRS victory here would undermine Hawaii energy policy (by making solar more expensive), and would single out Hawaiians for unfair treatment compared to residents in other jurisdictions that have different, albeit economically similar regulatory regimes in place.

These are the same types of arguments that were lodged against the Supreme Court's decisions in *Lucas v. Earl* and *Poe v. Seaborn.* Ultimately these arguments are persuasive, but at the level that should inform legislative or regulatory policymaking. That said, to us, it seems inappropriate for a court to consider meta-level policy arguments like these. Such arguments are collateral to the doctrinal question at hand—the important but comparatively small-bore question whether and to what extent homeowner-utility trading generates "income" within the meaning of § 61.

* * *

The upshot of our evaluation of Nevada, California, and Hawaii regulations in place is that under present federal income tax doctrine the characterization of homeowner-utility trading would likely vary state-to-state depending on the prevailing regulatory regime; it is even possible that in some states, like California and Hawaii, different characterization will apply to different homeowners depending on whether they enjoy the benefits of grandfathering under preexisting approaches that applied when their systems were installed but that are unavailable to homeowners installing new solar systems.

This prediction is based on the assumption that the issue will be resolved in the courts. It is quite possible, perhaps even likely, that policy will be laid down legislatively or administratively, rather than in the courts.

E. *Potential Legislative or Regulatory Intervention*

If Congress legislates, or if Treasury and the IRS promulgate regulations or issue a revenue ruling in an attempt to settle the tax treatment of residential solar, it seems likely that the solution would be to perpetuate the status quo as utilities and homeowners are acting now, that is, ignoring the utility-homeowner trading for both income and deduction (including cost recovery) purposes regardless of the precise state regulatory regime. This would be the most administratively expedient solution: It is a continuation of present policy, requires no new forms or protocols, and imposes no compliance burdens on homeowners, utilities, or the IRS.

It is also the resolution that would be supported by the solar industry (which is very organized and effective in its lobbying efforts). One subtle and generally unappreciated aspect of this choice, and quite possibly the reason it is supported by the solar industry, is that ignoring the utility-homeowner trading may result in a preference for third-party system ownership over direct ownership by homeowners. This preference creates a risk that the tax credits for solar systems might be absorbed by the solar panel installers and vendors, rather than the homeowners who were presumably the intended beneficiaries of the congressional largesse. The preference is discussed in depth in Part IV.

III. Ramifications of Tax Characterization—Homeowner Ownership

As previously discussed, to the extent that the homeowner's electricity sales to the utility are completely or partially integrated with her purchases from the utility, her economic income from the sales (in the form of avoided costs) is likely to be classified as imputed income and thus to be exempt from tax. On the other hand, to the extent that her sales and purchases are bifurcated and characterized as independent transactions, her sales are likely to generate gross income (even though the sales are typically realized in the form of mere reductions in her utility bills),[62] while her purchases will represent nondeductible personal consumption.[63]

In this and the next Part we examine the tax issues more carefully. In this Part, we show that homeowners who own (rather than lease) their solar system under a BASA regime will be subject to complicated and sometimes ambiguous tax rules, assuming the prediction we made in the prior Part linking tax characterization to state regulatory forms proves correct. In the end, the ultimate tax results will be less advantageous and more complicated and uncertain than in the NEM context.

In Part IV we extend the analysis by examining the federal tax consequences where the homeowner instead leases, rather than owns, the residential solar system. In such cases, which are commonplace, the tax consequences of both the lessor and homeowner-lessee must be considered.

A. *Road Map of Federal Tax Issues*

The key federal tax issues stemming from residential solar generation are (1) whether a solar owner recognizes gross income when she transacts with the utility company, (2) whether the solar owner can claim deductions for depreciation and other expenses that are attributable to solar generation, and (3) whether such deductions can be used to offset taxable income from other sources, such as wages or investment income.

In an NEM-type jurisdiction, the analysis is straightforward. As previously discussed, a homeowner with solar would likely not recognize gross income.[64] The homeowner-utility energy trading would be fully integrated and thus would generate tax-exempt imputed income. The underlying logic is that the homeowner is generating power for her own use—akin to pumping water from her backyard well or eating crops from her own garden—rather than generating electricity for sale

[62] IRC § 61(a)(3) (providing that gains from the sale of property are included in gross income). Because the taxpayer has no cost basis in the electricity she sells, her sales proceeds will be included in gross income in full. See IRC § 1001(a) (realized gains are equal to amount realized less adjusted basis).

[63] IRC § 262 (denying deductions for personal expenses).

[64] See text accompanying note 24.

on the market. Accordingly, she does not recognize any gross income. She also would not be able to claim any deductions. Under fundamental tax rules, expenses that are incurred in connection with personal consumption or that are attributable to tax-exempt income are flatly nondeductible.[65] Owners in NEM-type jurisdictions will be subject to these disallowance rules because they will not be engaged in an income-producing activity.

In a BASA-type jurisdiction, by contrast, the homeowner-utility trading is bifurcated. The homeowner should include in gross income the value of the electricity she generates and sells to the utility, regardless of the degree to which she purchases electricity from the utility.[66] This result depends on the view that the homeowner is selling on the market all the power that she generates in a transaction that is cognizable for tax purposes. Because the transaction is cognizable for purposes of measuring the homeowner's income, it should be cognizable to establish her ability to claim deductions, subject to the conditions discussed below.

In the intermediate characterization—which we referred to as short interval integration—the homeowner is again likely to be able to exclude from income the value of her self-generated electricity[67]—that is, the value of all electricity she produces during measurement intervals when her consumption outstrips her production; and, when she produces more than she needs, the value of her production to the extent of her own use. Only production in excess of consumption would be classified as taxable income. In this case the homeowner is both generating power for her own use *and* for sale to the utility, depending on the quantity and timing of her generation and consumption.

Whether the taxpayer in this intermediate case is permitted deductions (subject to the conditions discussed below) is a line-drawing problem. She is less obviously engaged in income-producing activity than the homeowner whose trading is fully bifurcated (as in a BASA-type jurisdiction) but is more likely taxable than the homeowner whose trading is fully integrated (as in an NEM-type jurisdiction). Consider the distinction between a farmer engaged in the full-time business of farming to grow crops for sale on the market, but who also eats his own crops, and an avid gardener who usually eats all she

[65] See IRC §§ 262, 265(a)(1); see also Boris I. Bittker & Lawrence Lokken, Federal Taxation of Income, Estates and Gifts ¶22.7 (3d ed. 2019); Joseph Dodge, Disallowing Deductions Paid with Excluded Income, 32 Va. Tax Rev. 749 (2013). There are certain specific statutory exceptions to this general rule. See, e.g., IRC § 163(h)(2) (allowing deductions for home mortgage interest payments).

[66] See text following note 24.

[67] See text accompanying note 25.

grows but given a bumper crop will wind up taking a stall at the local farmers market, rather than letting her surplus rot in the field.

Is the homeowner living in a hybrid jurisdiction more like the farmer or the avid gardener? The answer seems to depend on the extent of her sales to the utility, compared to her own use. As described above, the extent of her sales is determined in part by the timing of her production and demand, and in part by the netting interval used to reconcile production and demand. It is therefore likely subject to significant variation depending on a given homeowner's circumstances.

To determine whether and when they may claim deductions attributable to their systems, BASA-type owners (as well as hybrid owners who are sufficiently similar to BASA owners), must consider two sets of rules. First, in order to claim any deductions, the solar activity must constitute a trade or business.[68] Second, if the activity is a trade or business, the homeowner must apply the passive activity loss (PAL) rules.[69] Whether the solar activities constitute a trade or business will vary from case to case. In cases in which the solar activity is a trade or business, it is likely to be subject to the PAL rules. We discuss these rules in more detail below.

B. *Trade or Business Status*

The first issue the homeowner must consider is whether her solar activity is a trade or business. Absent trade or business status, depreciation and other deductions will not be allowed, resulting in tax on full gross income.[70]

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[68] Gregory F. Jenner et al., Tax Issues, in The Law of Solar, ch. 8, at 2 (5th ed. 2018), http://files.stoel.com/files/books/LawofSolar.PDF.

[69] IRC § 469.

[70] For-profit expenses that are not incurred in connection with a trade or business are nondeductible under current law until 2026. Historically (and after 2025), they were (and would be) deductible as miscellaneous itemized deductions subject to certain limitations. See IRC § 67(g) (suspending miscellaneous itemized deductions from 2018-2025).

Note that solar activities are, in concept, also potentially subject to additional deduction limiting rules, such as the hobby loss rules (§ 183), and rules limiting deductions in connection with the business use of a home (§ 280A). In practice, the hobby loss rules and the trade or business requirement are redundant; being subject to either one but not the other produces the same effect as being subject to both. If it is resolved that the taxpayer is engaged in a trade or business, the underlying activity is not likely to be classified as a hobby. Thus, if the taxpayer passes muster under the trade or business standard, the hobby loss rules won't likely apply. See Bittker & Lokken, note 65, ¶ 20.1 (qualifying as a trade or business "virtually ensures" nonapplication of § 183); id. ¶ 22.5 (explaining that "the chance of a conflict" between the standards for § 183 and § 162 is "minimal"); id. ¶ 22.5 n.16 (collecting cases). If the taxpayer flunks trade or business status, deductions are ruled out—at least until 2026—even before considering § 183.

Section 280A denies deductions "with respect to the use of a dwelling unit which is used by the taxpayer during the taxable year as a residence." IRC § 280A(a). This section is typically applied to home offices and partial rentals of personal residences (e.g., Airbnb).

The rule (really a standard) regarding the level of activity required to achieve "trade or business" status is not set forth in the statute or regulations. It comes from case law.[71] Where, as here, the activity involves the sale of property, case law has developed a multifactor test to distinguish between the sale of "property held by the taxpayer primarily for sale to customers in the ordinary course of [a] trade or business" and casual sales of property.[72] The former gives rise to ordinary income (or loss)[73] and self-employment income,[74] while allowing the taxpayer to claim trade or business deductions.[75] Casual sale characterization, on the other hand, results in capital gain (or loss) and non-self-employment income, but does not allow the taxpayer to claim trade or business deductions.

The usual posture in these cases is for taxpayers to argue in favor of casual sale treatment to enjoy lower long-term capital gains tax rates.[76] In the residential solar context, capital gain treatment would typically not be beneficial because the gains would be short-term capital gains, which are generally taxed at the same rate as ordinary income.[77] Thus, in the residential solar context, the usual posture of the parties is turned on its head, with the solar owner arguing for "sale to customers" treatment to obtain trade or business deductions.

The multifactor test established by the case law essentially boils down to two separate inquiries. The first, and more important, ques-

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Application of § 280A to residential solar deductions is unclear, but unlikely. Neither the courts nor the IRS has considered the issue. In our view, residential solar deductions should not be limited by § 280A because they are not deductions "with respect to the use of a dwelling unit." Id. While home offices and rentals result in the use of a dwelling unit as such, solar panel placement on the roof does not. We assume in the discussion that follows that § 280A does not apply in the residential solar context. If it did, all deductions attributable to the system would be completely disallowed and the result would be tax on gross income, similar to the results if the solar activity did not rise to the level of a trade or business or was characterized as a hobby, or both.

[71] Higgins v. CIR, 312 U.S. 212, 217 (1941); Bittker & Lokken, note 65, ¶ 20.1.2.

[72] IRC § 1221(a)(1).

[73] See IRC § 1221(a)(1).

[74] See IRC § 1402(a)(3)(C)(i).

[75] See IRC § 162 (allowing deductions for expenses incurred in connection with a trade or business).

[76] See, e.g., Guardian Indus. Corp. v. Commissioner, 97 T.C. 308 (1991) (taxpayer arguing that sale of property was casual sale, to obtain long-term capital gains treatment).

[77] See IRC § 1222 (defining short-term capital gains and losses as those resulting from the sales of property held for one year or less). Short-term capital gain treatment may nevertheless be somewhat advantageous in certain situations. If the homeowner has large capital losses or carryforwards (regardless of whether they are long- or short-term), they can be used to offset capital gains, but not ordinary income (except to the extent of $3000 per year). See IRC § 1211(b). In addition, short-term capital gains are not subject to employment taxes, though they are subject to the net investment income tax, which approximates employment taxes for taxpayers with adjusted gross incomes above $200,000 and $250,000 for single and married taxpayers, respectively. See IRC § 1411.

tion is whether the sales of property are frequent, regular, and substantial.[78] The second question inquires as to the degree of taxpayer effort to improve, market, and sell the property.[79] It is not entirely clear how solar owners would fare under this test. The sale of power is frequent and regular, as it would occur more or less continuously during the daytime. It is safe to say that rarely is there selling activity that is more continuous. The substantiality inquiry generally has focused on the absolute dollars of sales proceeds, which will vary from case to case. An owner of a very small system may sell only a few hundred dollars per year, while owners of larger systems could sell thousands of dollars annually. With respect to the taxpayer efforts inquiry, after installation, solar production will essentially be on autopilot, necessitating little if any direct taxpayer involvement.

While no cases are directly on point, the closest one seems to support trade or business status. In *Guardian Industries Corp. v. Commissioner*, the taxpayer sold silver waste material that was generated as a by-product of the taxpayer's photo-finishing business. Due to environmental regulations, the taxpayer was required to segregate the silver waste. The taxpayer contracted to sell its entire output of silver waste to a single refiner. The refiner provided containers, into which the taxpayer deposited the silver waste, and collected the containers from the taxpayer's business premises on a monthly basis. The Tax Court found that the monthly sales were sufficiently frequent, regular, and continuous to support "sale to customers in a trade or business" characterization. Even though the taxpayer engaged in minimal efforts to sell the silver waste—merely depositing the silver waste into the customer-provided containers—the court determined that the effort factor was insignificant in this context "because market conditions made it unnecessary for petitioners to engage in any sales efforts to dispose of the silver waste—refiners actively competed to purchase the silver waste." Accordingly, the Tax Court concluded that the silver waste was property primarily held for sale to customers in a trade or business.

Like the taxpayer in *Guardian Industries*, solar owners engage in minimal efforts—mostly arranging for the installation and maintenance of the system. While the market for silver waste did not necessi-

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[78] See Biedenharn Realty Co. v. United States, 526 F.2d 409, 416 (5th Cir. 1976) (noting that "the frequency and substantiality of taxpayer's sales" were the "most important of [the relevant] factors" and that, while "frequency and substantiality of sales are not usually conclusive, they occupy the preeminent ground in [the] analysis"); Guardian Indus. Corp., 97 T.C. at 320 (noting that "frequency and substantiality of sales often have been held to be the most important objective indicators").

[79] See Biedenharn Realty Co., 526 F.2d at 417 (discussing the taxpayer's efforts in improving, soliciting, and advertising with respect to the sold properties).

tate selling efforts, the energy regulatory environment absolutely precludes such efforts by the solar owner. By law, the solar owner generally must sell its entire output to the only available customer (the utility) for predetermined prices. Thus, the effort factor should, under the reasoning of *Guardian Industries*, be insignificant. And while the dollar amounts of annual sales by Guardian Industries—over $2,000,000 annually in the years in question—were much more significant than would be typical for solar, its selling activity was far more sporadic. Guardian Industries sold its products one day per month, while BASA-type solar owners continuously sell their products whenever the sun shines.

In conclusion, we think the better view is that for a typical homeowner living in a BASA-type jurisdiction, solar production activity is likely to qualify for trade or business characterization. However, due to the novelty of the fact pattern and the ambiguity of the multifactor test, the issue is not entirely free from doubt.

C. *Passive Activity Rules*

Solar owners in BASA-type regimes who are deemed not to be in a trade or business would face very harsh tax results. They would recognize gross income from the sales of energy to the utility but would not receive any deductions whatsoever for the costs incurred in generating those sales. Homeowners whose solar activities constitute a trade or business would be permitted deductions, though the timing of these deductions is subject to the PAL rules. Very generally, the PAL rules provide that taxpayers who invest in "passive activities" but who do not "materially participate" in those activities are only allowed deductions and credits to offset the gross income from such activities.

BASA-type selling will typically constitute a "passive activity" for purposes of these rules. If so, and if deductions and credits are limited by the rule, the deductions and credits will be carried forward and used in the first year there is sufficient income from electricity sales to absorb the loss carryover or in the year in which the BASA-type selling ceases.

The tax code defines "passive activity" as an activity in which the taxpayer does not "materially participate," and it then defines (unhelpfully) "material participation" as "regular," "continuous," and "substantial" participation. The tax code adds no more flesh to this bare-bones litany.

The regulations are much more detailed. They supply a list of the various ways the taxpayer may establish material participation, including by showing that "[t]he individual's participation in the activity for the taxable year constitutes substantially all of the participation in such activity of all individuals (including individuals who are not owners of interests in the activity). . . ." In the typical case, this could possibly describe the participation of a homeowner vis-à-vis her residential solar production after the first taxable year in which the system is operational. It would not apply to the first taxable year due to the labor effort required to install the system. After installation, energy production is essentially on autopilot, and the only activities would be checking to ensure that the system is not obstructed (by, e.g., a fallen tree limb) or broken and that electric bills properly account for sales. All of these activities, while extremely minimal, will be done exclusively by the homeowner, except in years where the system requires maintenance or repair.

The IRS, however, might still plausibly argue that this definition of material participation is not satisfied for two reasons. First, it could argue that the homeowner's activities should not be treated as any participation because the homeowner engages in no *marginal* activity. All conscientious homeowners ensure that their roofs are not broken or obstructed and check their electric bills for errors. Second, the IRS could highlight activity by individuals employed by the electric companies in maintaining the grid and engaging in administrative tasks, such as preparing and distributing monthly bills. If these activities are properly attributed to an owner's solar production and sales, then the owner's activities will not satisfy the "substantially all" test.

Thus, although BASA selling will constitute a passive activity in the year the system is installed, the analysis for subsequent years is more uncertain. It is quite possible that, depending on the specific facts and circumstances, a homeowner could routinely toggle between passive and active. If so, losses and credits from the passive years may be used against net income from the active years (and any remaining losses and credits may be used against passive income from other sources). Whether the homeowner is deemed passive throughout or toggles between passive and active, the ultimate overall tax results will generally be the same. The homeowner will generate neither tax benefits nor tax liabilities for the early years of operation. Then, once all deductions and credits are eventually used, the homeowner will have gross income equal to the gross proceeds of the sales of energy (which would generally be reflected as a reduction in the homeowner's electric bill).

D. Illustrations

To make things more concrete, we offer three illustrations of how the rules might play out given different permutations of state regulation, qualification (or not) for deductions under the trade or business standard, and application of the PAL rules. We do not evaluate every permutation of these factors. We selected those that we think are most likely to arise in practice, given present doctrine, as indicated in Table 2.

TABLE 2

Case	*State Regulation*	*Trade or Business?*	*PAL Rules Apply?*
(1)	NEM	No	No
(2)	BASA	No	No
(3)	BASA	Yes	Yes

To begin, consider case (1), a taxpayer living in an NEM-type jurisdiction. If our predictions are correct, the taxpayer will realize nontaxable imputed income and will not be allowed any deductions. She will, however, receive the 30% tax credit for the cost of the system. The PAL rules will not apply to defer use of the credit. Thus, if the taxpayer purchased a system at a gross cost of \$100*x*, the tax credit would be \$30*x*, leaving the taxpayer with a net cost of \$70*x*.

Tax compliance in this context would be straightforward: Aside from the onetime credit, there are no tax items generated. After the year of installation, no record keeping or reporting is required.

Next, consider case (2), a taxpayer living in a BASA jurisdiction who fails to establish that her solar activities constitute a trade or business. A taxpayer in this circumstance will have taxable income on the "sell all" transactions with the utility. The taxpayer will enjoy a 30% tax credit for the cost of the system. The passive activity loss rules will not defer use of the credit. Thus, like case (1), a system that costs \$100*x* gross would cost \$70*x* net of the credit. The taxpayer would not be permitted any depreciation deductions or other expenses attributable to the system. By requiring her to recognize gross income but denying her any deductions for expenses incurred in generating the gross income, the net effect is to overtax the taxpayer on her economic income.

Compliance in case (2) would be far more complicated than in case (1). The taxpayer would be required to include the "sell all" trades as part of her gross income. Because the taxpayer has no tax basis in the electricity she sells, the amount of her gross income is equal to the amount of the "sell all" proceeds (reflected, typically, as a reduction in the taxpayer's own electric bill).[80] Accordingly, the taxpayer's gains are "fixed and determinable" and required to be reported by the utility company to the IRS (and to the taxpayer) on Form 1099-MISC.[81] Inevitably, this would lead to controversies in which taxpayers claim that the income indicated in the third-party information reports is nontaxable.

Finally, consider case (3), a taxpayer living in a BASA jurisdiction whose solar activities constitute a trade or business, but who is subject to the PAL rules. The PAL rules might apply to the first year the system is placed in service, and then apply intermittently thereafter, or they might apply continuously.[82] The practical result is the same either way.

A taxpayer in this circumstance will have gross income on the "sell all" transactions with the utility. The taxpayer will enjoy a 30% tax credit for the cost of the system. The taxpayer would also be allowed depreciation deductions for the cost of the system (as well as other deductions for any other expenses incurred in maintaining the system). If, counter to our factual assumption in case (3), the benefit of the credit and depreciation deductions were *not* deferred by the PAL rules, a system that had a gross cost of $100*x* would cost even less than $70*x* net of the credit and depreciation benefits—that is, even less than in cases (1) and (2), where the tax benefit was attributable only to the credit.[83] (Recall that depreciation was ruled out in those cases, because the taxpayers weren't engaged in a trade or business.)

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[80] See IRC § 1001(a) (calculating gains as the amount realized less adjusted basis).

[81] See IRC § 6041(a) (generally requiring businesses to report payments of "fixed and determinable gains"); Reg. § 1.6041-1(c) (providing that income "is determinable whenever there is a basis of calculation by which the amount to be paid may be ascertained."); Rev. Rul. 80-22, 1980-1 C.B. 286 (ruling that gains are fixed and determinable if the taxpayer does not have any tax basis against which to offset the proceeds); Ltr. Rul. 201444001 (July 18, 2014) (ruling that gains are not fixed and determinable if the reporting person does not know the taxpayer's tax basis in sold property).

[82] See Part III.C. The taxpayer's credit and (under current rules) depreciation deductions would all be lumped into the year of installation. Accordingly, the taxpayer will have a very large amount of carried over losses and credits. These will be usable against the solar income in later years, regardless of whether the taxpayer is active or passive in those later years.

[83] The net cost would depend on the value of the depreciation deductions to the homeowner, which turns in part on the homeowner's marginal tax rate, which would vary. We assume here and throughout that a homeowner-owner will not benefit from the phantom depreciation rule we discuss below in the context of third-party ownership. See Part IV. The issue depends on whether the taxpayer in case (3) would claim the credit under § 25D (as we assume) or § 48, which is not free from doubt. If the taxpayer can claim the credit under § 48, then § 50(c) would allow for phantom depreciation, which would reduce the after-tax cost of the system even further than the approximately $50*x* reduction we describe below.

Unfortunately for the taxpayer, however, this is not likely the outcome. The credit and depreciation deductions are quarantined by the PAL rules. They will only be accessible to the extent of the gross income generated from "sell all" transactions with the utility.

Thus a \$100*x* system will entail a net out-of-pocket cost of \$100*x* dollars. There will be no credit setoff, and no depreciation deductions, to reduce the net cost of the system. Instead, the taxpayer will have a suspended tax asset (comprised of a credit and depreciation) that will shelter the first \$100*x* of gross income generated by the system. If the system breaks even, then all of the solar income will be sheltered, in which case the results are much the same as under an NEM regime, except for the fact that after-tax cost of the system was \$100*x* for the BASA owner but only \$70*x* for the NEM owner.[84] Where the system is eventually profitable (i.e., it ultimately generates more than \$100*x* in sell-all trading), BASA owners will be taxable in full on that profit. Similarly situated NEM owners would pay no tax on that profit.

Thus, NEM provides superior tax results for two main reasons. First, and most obvious, NEM owners never pay tax on their electricity "sales." This is less valuable than it might appear, however, because the BASA owner's depreciation deductions will shelter much of their income from "sell all" transactions. Second, the NEM owner's 30% credit is immediately available to offset other income, while the BASA owner's credit is quarantined and may be used only to offset proceeds from "sell all" transactions. Combined, these effects eliminate the benefit of the 30% credit to the BASA owner, provided that the system is break-even or better. In such cases, the credit simply offsets income that NEM owners never realize in the first place. On the other hand, NEM owners get to use the 30% to offset tax liabilities from other sources, such as from wages or investment income.

Compliance in case (3) would be more complex than in case (2). The utility would still be required to report the "proceeds" from the taxpayer's production on a 1099-MISC.[85] But the taxpayer now would also be required to calculate depreciation deductions and apply the PAL quarantining rules to those deductions as well as the 30% credit.

[84] One distinction is that in the NEM regime, the credit was available in full in the year of installation. In the BASA regime, the credit was quarantined by the PAL rules and, therefore, the benefit of the credit would be at least partially deferred.

[85] IRS, Instructions for Forms 1099-MISC and 1099-NEC, https://www.irs.gov/pub/irs-pdf/i1099msc.pdf (last updated Dec. 6, 2019).

IV. Ramifications of Tax Characterization—Third-Party Ownership

Part III established that, for homeowners who own their systems, NEM is superior to BASA from a tax perspective. For homeowners who lease their systems, the situation is more ambiguous. In addition, there are countervailing factors that create biases both for and against third-party ownership of residential systems vis-à-vis homeowner ownership. The composite effect of these factors is fact dependent: In any particular case, the net bias might tip in favor of or against third-party ownership, or they might mostly cancel each other out. A bias in favor of third-party ownership is likely to be the most prevalent scenario. We develop these conclusions below.

A. *NEM Versus BASA for Leased Systems*

Part III demonstrated why homeowners who own their own systems will tend to prefer NEM regulation over BASA regulation from a tax perspective. In the leasing context, the preference depends on whether the system is ultimately profitable or not.

To see this, first consider the circumstance where NEM and BASA lead to the same end result. Suppose a homeowner's solar activities break even before tax—the value of electricity generated by the system precisely equals the amount of the lease payments to the third-party system owner. Under NEM, there will be neither income nor any deduction. Under BASA, the "sell all" trades will generate income, but the lease payments to the third-party owner are likely to be tax deductible, assuming the homeowner is on the winning side of the trade or business determination. The PAL rules ought not impede deduction of the homeowner's lease payments, given that in the example the lease payments are no more than the income generated by the putative "passive activity."[86]

Now, assume the system generates a profit—the value of electricity generated outstrips the homeowner's lease payments. If this permutation arises in a BASA jurisdiction, the lease payments should still be deductible, but the deductions will not fully offset the income on the "sell all" trades. There will be some residual taxable income equal to the net profit from running the system. In an NEM jurisdiction, by contrast, this net profit would be tax-free imputed income.

[86] The PAL rules will affect the timing of the deductions. In cases where the lease payments are front-loaded relative to the stream of electricity bill reductions (a likely situation), the PAL rules will defer the deductions to match the system's income. The end result is identical to the result in a NEM regime: No net income will be reported.

Finally, consider the situation where the lease payments are greater than the value of electricity generated. In an NEM jurisdiction, there would be no tax consequences. In a BASA jurisdiction, if the taxpayer can establish trade-or-business status despite the fact that the system turns out to be unprofitable, the taxpayer will have passive activity losses that will be freed up when her solar production terminates (or will absorb passive activity gains from other sources).

B. Bias Against Third-Party Ownership

There is a potential structural tax bias in favor of homeowners owning their own systems, rather than leasing from third parties. The bias may exist because of the tax exemption for system yield that is afforded to the homeowner under present doctrine, as described in Parts II and III.[87] Homeowners who buy their systems by liquidating savings are, in effect, swapping out taxable yield on their savings for the tax-free yield generated by their system. If a homeowner leases a system, the homeowner does not make this substitution of taxable yield for tax-free yield.

To illustrate, consider two taxpayers, *Owner* and *Renter*. *Owner* purchases her system for cash. She raises the cash by liquidating bonds yielding 6% before tax. The bonds were held in her taxable brokerage account (not an IRA or 401(k)). *Renter* leases her system. *Renter* holds the same 6% bonds as *Owner*, in the same type of account, but does not liquidate them given that the up-front cost of her system is borne by the lessor.

Assume that *Owner*'s system yields 6% per year over its useful life, all things considered. In other words, the internal rate of return on *Owner*'s cash outlay to purchase the system was equal to the pretax yield on the bonds *Owner* liquidated to finance the acquisition.[88]

For *Renter*, assume that the benefit of the rental (avoided electricity cost) exactly equals the rental payments, so *Renter* breaks even on her system. Remember, though, that unlike *Owner*, *Renter* still owns her bonds, so she still enjoys a 6% pretax yield.

As a first cut, it seems that *Owner* and *Renter* are treated similarly. *Owner*, to simplify and generalize the conclusion of Part III, will not be taxable on system yield, and will not benefit from tax deductions for system-related expenses such as depreciation (other than to offset

[87] As noted above, there are situations where system yield is not exempt from tax. See text Part II.D.3.

[88] Imagine that the determination of *Owner*'s internal rate of return considers all relevant factors including the tax credit afforded when the system was placed in service, the avoided electricity cost during the period the system was operational, and other incidental cash flows.

taxable income from system yield). This will be true either explicitly (as in an NEM jurisdiction) or implicitly (as in a BASA jurisdiction, where the timing and amount of any income and deductions will generally be equal and offsetting).

Similarly, *Renter* won't have any tax cost or benefit from owning her system. In an NEM jurisdiction, she won't be taxed on system yield and will not be permitted to deduct rental payments to the third-party system owner. Her avoided cost is tax-free imputed income, and her lease payments are nondeductible personal consumption (just like *Renter*'s payments to the local utility for power she consumes). In a BASA jurisdiction she will realize income, but it will be sheltered by having equal and offsetting deductions for her lease payments.[89]

There is, however, an important difference between *Owner* and *Renter*. To frame an apples-to-apples comparison between the two, we posited that both *Owner* and *Renter* had bonds that could be liquidated to purchase a system. *Owner* made the choice to liquidate her bonds. *Renter* did not. Consequently, *Renter* was taxed on the 6% yield on her bonds throughout the life of the system, while *Owner* incurred no tax liability at all.

To facilitate comparison with the earlier examples in Part III, suppose the systems procured by both *Owner* and *Renter* cost \$100*x* gross and that the purchaser was allowed a 30% tax credit. Assume the third-party owner passes on the credit benefit to *Renter* by adjusting downward the required lease payments, as one would expect in an efficient and competitive market. The cost to *Owner* of buying the system was \$70*x*, net of the credit. Over the life of the system, then, she avoided paying tax on 6% annual interest on a \$70*x* bond investment. If the system has a useful life of twenty years and *Owner* is in the top tax bracket, the present value of her tax savings on this interest income would be nearly one-fourth of the up-front cost of the system.[90] *Renter*, meanwhile, is taxed on the interest income she earns on her bond investment, given that she is still invested in taxable bonds.

What about *Renter*'s transactions with the third-party lessor—in particular, is there some justification for assuming, as we do, that *Renter*'s lease payments exactly offset system yield? The market rate of return in the example is assumed to be 6%—this was the yield on

89 This describes the result assuming her solar activity is a trade or business and thus her lease payments are deductible business expenses; even if her solar activity is subject to the PAL rules, her deductions would be permitted to the extent of her income from the activity, which, on the facts of the example, means permitted in full.

90 A 6% yield on a \$70*x* bond is \$4.20*x* of interest per year, with annual compounding. If *Renter* is in the 35% bracket, her tax on this interest is \$1.47*x* per year. The present value of 20 installments of \$1.47*x* with 6% compounding is \$16.86*x*, which is 24.09% of the \$70*x* net cost of the system.

bonds liquidated by *Owner*, and held by *Renter*. Assume, plausibly, that this is also the lessor's cost of capital. If so, the lessor will break even if *Renter*'s lease payments for use of the system generate a 6% yield. If lessor's yield is less than 6%, lessor won't be able to cover its cost of capital.

Before considering additional factors like depreciation and the tax credit rules (which we address in the next Part), it makes sense that the lessor's yield will in fact be 6%: The assumption underlying the comparison between *Owner* and *Renter* was that they purchased identical systems; if *Owner*'s system generated a 6% yield, the same should hold for *Renter*. Yet, in the example, it was assumed that *Renter*'s lease payments exactly offset the reduction in her utility bills. Absent some hocus-pocus that causes the system yield to evaporate, the transaction between *Renter* and lessor should be zero-sum. In other words, absent contrary evidence, we should assume that the entire 6% yield shifted from *Renter* to her lessor via the lease payments, allowing the lessor to cover its cost of capital.

The key insight from this example is that there is a distinct tax advantage to taxpayers owning their own systems, rather than leasing them from third parties. This tax advantage is akin to the one enjoyed by homeowners (and owners of other consumer durables) who enjoy tax-free imputed income from the rental value of their homes (or other consumer durables). The unusual homeowner who purchases her house outright (no mortgage) is akin to *Owner* in our example: Both are swapping taxable investment income for tax-free imputed income.[91]

More typically, a homeowner purchases her house with borrowed money. Because home mortgage interest is deductible, the interest deduction will offset taxable income generated by assets that would (absent the taking out of the mortgage) have to have been liquidated were it not for the mortgage.[92] The distinction between solar and homeownership as an investment is that no deduction is permitted for solar-related interest.[93] It follows that the parity between all-cash buy-

[91] See Marvin A. Chirelstein & Lawrence Zelenak, Federal Income Taxation 216-20 (14th ed. 2018); William A. Klein, Borrowing to Finance Tax-Favored Investments, 1962 Wis. L. Rev. 608, 633-34 (1962).

[92] Klein, note 91. Or, if there were no such assets, the interest deduction would offset taxable income from other sources, such as wages.

[93] See IRC § 163(h). If the loan is secured by a mortgage on the home (and not merely on the solar panels) and if the installation is considered to "substantially improve" the home, then the interest would be deductible as home mortgage interest. See IRC § 163(h)(3). However, even in that case, the homeowner would receive a tax benefit from the interest deduction only if she itemizes her deductions in lieu of claiming the standard deduction. Because of various provisions in the 2017 Tax Act, fewer than 15% of tax filers itemize their deductions. See note 121.

ers and cash-strapped buyers who must finance (an artifact of the rules permitting a deduction for home mortgage interest) exists for homeownership, but not for solar.

In summary, the benefits of the taxable for tax-free swap will accrue to homeowners who own their systems, so long as they did not borrow to purchase them. Given that a typical residential solar installation in the United States costs between $10,000 and $15,000 (net of the tax credit),[94] it is likely that many purchasers do in fact borrow and thus do not benefit from the swap.

C. *Bias Toward Third-Party Ownership*

There are countervailing tax forces that push in the opposite direction, favoring third-party ownership over self-owned systems. These forces are the result of doctrinal tax details relating to tax credits and depreciation.

Begin with the credit rules. Like the homeowner who purchases her own system, the lessor who purchases a system for residential use by a lessee is permitted a 30% credit, but the statutory source of the credit is different. The credit for self-owned systems is granted by § 25D, which requires that the cost of the system be "an expenditure for property which uses solar energy to generate electricity for use in a dwelling unit located in the United States and used as a residence by the taxpayer."[95] If the third-party lessor owns the system this credit is foreclosed; the third-party lessor is the taxpayer, and the lessor is not using the dwelling unit as a residence.

The 30% Energy Credit under § 48 is however available to the lessor. The Energy Credit requires (among other things) that the property be eligible for depreciation; this, in turn, requires that the property be used in a trade or business.[96] If the property is owned by a third-party lessor, it will be part of the owner's leasing business. (If the property is owned by the homeowner, by contrast, qualification of solar activities as a trade or business is more contingent and uncertain, as indicated above.)

The IRS has indicated that when a taxpayer's self-owned systems generate no more electricity than the homeowner uses, the homeowner will qualify for the § 25D credit; on the other hand, if the system generates more than a minimal amount of electricity for export to the grid, the credit will be split between § 25D and § 48: The credit

[94] Sarah Matasci, Energysage, How Much Does a Solar Panel Installation Cost, https://news.energysage.com/how-much-does-the-average-solar-panel-installation-cost-in-the-u-s/ (last updated July 2, 2020).

[95] IRC § 25D(d)(2).

[96] IRC § 167(a)(1).

will be allowed under § 25D to the extent that the owner consumes her own power, and under § 48 to the extent that power is generated for sale to the utility.[97] Although the domains of the two credit regimes are not tightly linked, as a first approximation, the cost of most systems will be creditable under one of the two (and, occasionally, both) regimes.

Skating over the detailed qualification rules, none of which are likely to erect roadblocks, the credit is given for the cost of the system in the year it is placed in service. The credit for third-party owners (i.e., system lessors) is set to begin phasing out after 2020,[98] but this is among the expiring tax benefits that Congress has been habitually extending (often at the last minute, or even retroactively) for several years.[99]

Next consider the depreciation rules. Under present law (which begins to phase out in 2023), taxpayers engaged in a trade or business are permitted to immediately deduct their entire basis in "qualified property" in the year the property is placed in service.[100] The definition of qualified property generally includes residential solar systems owned by lessors. Importantly, the PAL rules, which quarantined the installation credit and depreciation deductions in the context of homeowner ownership, will often not apply to third-party owners, either because they are corporations or because they materially participate in the leasing business.[101]

What is the lessor's depreciable tax basis in the system it leases to the homeowner? Depreciable tax basis in property should, under general background principles, equal the buyer's cost in post-credit dollars. If, for example, a lessor purchases a system for $100x and enjoys a 30% tax credit, the lessor's post-credit cost is $70x, implying that the lessor's depreciable tax basis should be $70x. This is the conceptually correct rule. In fact, however, under current law the lessor is only required to reduce its basis in the system 50 cents for each dollar of credit it claims.[102] In the example, this means that rather than a $70x basis, the third-party owner's basis is $100x - $30x/2 = $85x. The extra $15x of depreciation represents phantom depreciation because the

[97] See Notice 2013-70, 2013 I.R.B. 47, Q&A 27.

[98] IRC § 48(a)(6).

[99] Molly F. Sherlock, Cong. Rsch. Serv., IF 10479, The Energy Credit: An Investment Tax Credit for Renewable Energy (2018) (Congressional Research Service report detailing history of § 48 credit); Solar Energy Indus. Ass'n, Solar Investment Tax Credit, https://www.seia.org/initiatives/solar-investment-tax-credit-itc (last visited Oct. 15, 2020).

[100] IRC § 168(k); see Additional First Year Depreciation Deduction (Bonus)—FAQ, IRS, https://www.irs.gov/newsroom/additional-first-year-depreciation-deduction-bonus-faq (last updated July 8, 2020).

[101] See Part III.C.

[102] IRC § 50(c). This applies only to credits claimed under § 48.

taxpayer gets deductions for amounts that were not actually incurred by her. If the third-party system owner is a corporation (taxed at 21%), the overall result is an immediate deduction worth 21% × \$85*x* = \$17.85*x*.

Altogether, then, the credit and depreciation rules for the third-party system owner push the third-party owner's after-tax cost down to \$100*x* - \$30*x* – \$17.85*x* = \$52.15*x*. This is a 48% discount to the system's pretax cost and, by one measure, a 25% discount to the after-tax cost of the system to the homeowner if she had purchased the system herself, rather than leasing it from the third-party owner.[103] If the third-party system owner is a pass-through entity (such as a limited liability company) owned by top-bracket individuals, the depreciation would be worth considerably more, hiking the third-party owner's discount (versus pretax cost) to over 60%,[104] and the discount to the homeowner's after-tax cost to 45%.[105]

In a competitive market, third-party system owners will compete on price, and the tax benefits described here will tend to drive down the price charged. For the homeowner leasing a system this will translate into lower lease payments, which—all else being equal—will make leasing a system relatively more attractive than it would have been absent these rules that, in practical effect, create a bias in favor of third-party system ownership.

This bias in favor of third-party system ownership described in this Part is not unique to solar. This bias exists whenever consumer durables are leased by a third-party owner (e.g., a leasing company) to an individual taxpayer for personal use. The quintessential example is a car lease, where the vehicle is not used in a trade or business.

In cases like this, if the car were purchased by the taxpayer, the price paid (including interest costs if the purchase is debt financed) would represent a nondeductible consumption expense. No depreciation would be allowed. If instead of owning the car herself, however, the taxpayer leased the car from a lessor, the lessor (as owner of the car) would get depreciation deductions, deductions denied to the taxpayer if she bought the car herself.

Although the phenomenon recurs in other contexts, the peculiar rule specifying that the depreciable tax basis of leased systems is re-

103 This assumes that the after-tax cost of the system to the homeowner is \$70*x*, i.e., the pretax cost in the running example net of the 30% tax credit, but not considering any depreciation deductions. Such deductions, it is assumed, would either be ruled out (if the homeowner is not in a trade or business) or would be embargoed and allowed only to the extent necessary to offset taxable income from "sell all" trades, as described above in Part III.

104 \$100*x* - \$30*x* – (\$85*x* * 37%) = \$38.55*x*.

105 (\$70*x* - \$38.55*x*)/\$70*x* = 44.93%.

duced by only one-half of the energy credit is unique to the energy credit. This "phantom depreciation" magnifies the value of the depreciation deductions that are available to a third-party lessor, and thus creates a greater schism between the after-tax economics of self-ownership and leasing than is likely to arise in the other contexts where only "real" depreciation is allowed to the owner.

D. *Reconciliation and Summary*

Which of the countervailing biases exerts a stronger pull depends on the particulars and will vary. A critical threshold issue is whether a prospective homeowner-owner would need to borrow to finance the installation or would instead use savings to pay for the installation in cash. If borrowing is necessary, then because the interest payments on the loan are nondeductible, third-party ownership would be more tax efficient. If borrowing is not necessary, then contextual factors driving the analysis will include the term of lease, system life, the discount rates for the homeowner and the third-party system owner, their marginal tax rates, and other idiosyncratic factors.

To develop an intuition about the relative magnitudes of the countervailing biases, first consider the bias in favor of self-ownership. The source of the bias is tax exemption for system yield, not afforded to most investments available as substitutes. This benefit accrues over the life of the system, and in each period equals the product of the system yield (measured in dollars, i.e., market value) and the owner's marginal tax rate. Now consider the bias toward third-party ownership. The source of this bias is incremental depreciation afforded the third-party owner but not the homeowner. This benefit, under present law, accrues in lump sum in the year the system is placed in service. It equals the product of the 121% of the post-credit cost of the system[106] and the system-owner's marginal tax rate. The extra 21% of depreciable basis results in the phantom depreciation described above.[107] If the system breaks even, the phantom depreciation will be available to shelter income from other sources.

If marginal tax rates for the third-party owner and the homeowner are the same, the bias favoring third-party ownership will generally be more valuable, given the phantom depreciation phenomenon and the fact that the depreciation benefit is concentrated earlier in time, com-

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[106] If x is the nominal (i.e., pre-credit) cost of the system, the post-credit cost equals $.7x$. The depreciable basis, however, equals $.85x$. See note 102 and accompanying text. Comparing depreciable basis to post-credit cost, we have $.85x/.7x = 1.214$.

[107] See note 102 and accompanying text.

pared to the avoided tax on system yield.[108] It is entirely plausible, though, that the homeowner will be in a higher marginal rate bracket than the third-party system owner. This will be true if the homeowner is a high-income individual and the third-party leasing company is organized as a corporation. The former will have a federal marginal tax rate as high as 37%; the latter will be subject to a flat rate of 21%.[109] If relative tax rates are in this configuration, then the time-value benefit of accelerated depreciation might be offset by the rate differential, which would devalue the depreciation benefit compared to the tax exclusion for system yield.

If homeowners were well advised, the expectation would be that system ownership would be situated with either the homeowner or a third-party lessor depending on which approach was to the best economic advantage, on net, to all involved. The homeowner and lessor would then divide the pie based on their negotiating prowess, leverage, and similar factors.

The analysis is sufficiently complicated and contingent on uncertain factors that it will be the rare homeowner who is able to work out this analysis on their own. Factoring the tax and financial inputs into an all-things-considered determination of what is best is analytically difficult even when the inputs are known (or values are assumed in illustration). In practice the difficulty is magnified by the uncertainty surrounding variability in rates of return, tax rates, maintenance costs, system yields, and so forth, over the system's useful life. Indeed, one might conclude that in the end even sophisticated homeowners will resort to making an educated guess about what ownership structure is optimal.

V. The Path Forward

The goals of tax policy in this context should be to improve administrability and to create tax neutrality along all of the dimensions of variation that exist in state regulatory forms and ownership structures. The idea of reducing administrative drag is straightforward. All else being equal, the law works better when compliance costs imposed on taxpayers and the IRS are minimized.

Neutrality is more difficult. Ideally, the rules would be structured so that there was no tax distinction along any margin of variation. NEM would be treated the same as BASA. Self-owned systems would be

[108] It is still possible, in some situations, for the conclusion to be reversed. For example, if the system generates much larger than expected profits over its life, the avoided tax on system yield could be large enough to surmount the effects of phantom and accelerated depreciation.

[109] IRC §§ 1, 11.

treated on a par with systems leased from third parties. Systems purchased for cash would be treated the same as those purchased on credit. Homeowners with concurrent production and consumption would be treated the same as otherwise similarly situated taxpayers with nonconcurrent, but equivalent production and consumption. It turns out, however, that ironing out tax-related distinctions along one margin creates new distinctions along another. This makes achieving perfect neutrality an impossible task.

In our view, the best approach is to adopt a rule exempting from tax income generated by residential solar. This accomplishes the goal of mooting the tax distinctions that would otherwise exist among regulatory forms and would improve economic efficiency compared to other plausible approaches.[110] It is also administratively simple. Unfortunately, it does not achieve neutrality across ownership structures, but—as we indicated—policy trade-offs are inevitable, and it seems to us that the biases that remain given a policy of tax exemption are the least bad alternative.

A. *Neutral Taxation of NEM and BASA*

Neutral, meaning uniform, tax treatment of NEM and BASA regulation is both desirable and feasible. The best way to iron out the inconsistency between NEM and BASA is a statutory rule exempting from tax income from sales of solar electricity. Indeed, proposals along these lines have already been floated. Here is the text of one such proposal, offered in May 2011 by Senator Mark Udall (D-CO):

> For any taxable year, gross income of any person shall not include any gain from the sale or exchange to the electrical grid during such taxable year of electricity which is generated by property with respect to which any qualified solar electric property expenditures are eligible to be taken into account under section 25D, but only to the extent such gain does not exceed the value of the electricity used at such residence during such taxable year.[111]

The benefits of uniform tax treatment of NEM and BASA regulation are manifold, and include the following: (1) improves adminis-

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[110] It also would avoid complications and uncertainties that would result in attempting to categorize hybrid regulatory approaches and TOU regimes, as well as virtual net metering. See Part I.

[111] Solar Uniting Neighborhoods (SUN) Act of 2011, S.1093, 112th Cong. § 4 (2011) (proposing new IRC § 139F); see also Solar Uniting Neighborhoods (SUN) Act of 2010, S.3137, 111th Cong. § 2 (2010) (Udall proposed amendment to § 25D, without the proposal for new IRC § 139F exemption).

trability; (2) removes federal tax treatment as a factor in the politics of state and local energy regulation; (3) eliminates a potential distinction between solar electricity and conservation measures that generate nontaxable imputed income; (4) removes bias that would be created in favor of homeowner battery use in preference to grid interconnection, which would be created by accounting for sales to the grid as taxable income; and (5) eliminates homeowner-level preference for simultaneity of production and use that would lead to inefficient system orientation. We will describe each of these benefits below in turn.

Uniformity could be achieved in other ways. Treasury could issue a regulation declaring that gross income does not include income from the "sell all" side of BASA trading, or Treasury and the IRS might issue a Revenue Ruling to the same effect. Using the regulation or ruling route is less definitive and more open to challenge than the statutory route, but of course the statutory route is more challenging politically. In the end, the practical distinction among the policy levers that might lead to a clear rule are probably insignificant compared to the benefits from the emergence of a rule in some form.

1. Administrability

The administrative benefits of uniform treatment of NEM and BASA regulation are straightforward.[112] A conclusive declaration that "sell all" trading does not generate income eliminates the line drawing problem of how hybrid regulation that occupies the middle ground between NEM and BASA should be treated; if NEM and BASA are subject to the same set of tax rules, then obviously so too is any intermediate form of regulation situated between the polar cases.

Exempting all trading of self-generated solar electricity from tax means that there is nothing to track, and nothing to report, on an ongoing basis. There would be no doubt that the homeowner flunks trade or business qualification; hence thorny questions about the availability and measurement of depreciation dissipate, as do ques-

[112] This assumes, consistent with our recommendation, that uniformity is achieved via exclusion of all sales, rather than uniform *inclusion*. Uniform *inclusion* of all solar-related income would require measurement and reporting of imputed income from self-generation, including income that is instantaneously generated and used on premises by the homeowner, with no export to the grid whatsoever. The difficulty in establishing reliable sources for the necessary informational inputs into tax compliance should be obvious, particularly given that the homeowner would stand to benefit if their concurrent generation and use of solar electricity were beyond detection. To see the problem, consider the difficulty if the IRS sought to impose tax on a gardener (or farmer) to the extent he ate a few cobs of corn from the back forty.

tions about the application of (and possibly, strategies to avoid) PAL limitations.[113]

All that is left in terms of administration is the requirement that the cost of the system be ascertained and reported. This is necessary to apply the credit rules under § 25D. The administrative apparatus for implanting the § 25D credit rules is already established and apparently well-functioning.

2. *State and Local Politics*

The solar industry has taken to using federal tax arguments as a cudgel in their fights with power companies over the content of state energy regulation. In California, for example, the Alliance for Solar Choice trotted out arguments that if the California Public Utilities commission were to implement BASA regulation the sky would fall on homeowners with solar.[114] The claim was that—suddenly, and contrary to all expectations—homeowners with solar would be subject to federal income tax on their trading with the local utility, upsetting the settled expectations regarding the (non)taxation of such trading.[115]

To the extent that such arguments hold sway, the tail is wagging the dog. Better for state regulators to design energy regulation based on considerations organic to sound energy policy (which do not include federal tax consequences). If federal tax consequences of the choices that energy regulators might make are added to the mix of considerations used to determine energy policy, the threat of taxation will likely distract and undermine clear focus on sound energy policy in forming state energy regulation. Excluding solar income from tax, our preferred approach, would eliminate this as a concern.[116]

3. *Solar Generation Versus Garden-Variety Conservation*

In lieu of or in addition to installing a solar array, a cost or environmentally conscious homeowner is likely to take other steps to improve

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[113] This was the impulse for the memoranda authored by Skadden, Arps and Ed Kleinbard, cited at note 18.

[114] See Krista Sherer, Solar Industry Reacting to Threats from Utility Lobbying, Tax Credit Changes, Healdsburg Trib. (Sept. 23, 2015), http://www.sonomawest.com/the_healdsburg_tribune/news/solar-industry-reacting-to-threats-from-utility-lobbying-tax-credit/article_9e33e86e-6247-11e5-8e90-d33af7f9b9a4.html.

[115] See note 18.

[116] Allowing federal tax law to warp the content of state-level policy would be unfortunate but not unprecedented. In the wake of the Supreme Court's determination that income splitting was permissible if accomplished statutorily, but not by contract, "there was a stampede at the state level to share in" the federal tax benefit. Boris I. Bittker, Federal Taxation and the Family, 27 Stan. L. Rev. 1389, 1411 (1975) (describing the spread of community property systems in response to *Poe v. Seaborn*).

the energy efficiency of their home. Such steps include improving insulation and sealing thermal leaks (e.g., weather-stripping doors and windows).

Implementing these strategies, like installing a solar array, generates imputed income. It is extraordinarily unlikely that the homeowner who adds insulation to her attic, to take a straightforward example, would be taxed on the resulting energy savings (a.k.a. imputed income).[117] But if taxing imputed income from conservation measures is the overarching policy (as would be the clear inference if self-generated electricity were subjected to tax) then she should be taxed.

Any attempt to implement this policy would be an utter failure. There is, for commonplace conservation measures like adding insulation, no reliable way of measuring the resulting imputed income. Even if imputed income could be measured, the incentive effects of implementing this policy—discouraging steps toward energy efficiency—would be comically perverse.

If one views the installation of solar panels and other steps homeowners might take to improve the energy efficiency of their homes as substitutes, the correct policy is to tax them similarly. Here, that means exempting the savings from all such technologies from tax. This leaves the homeowner to choose among the competing technologies according to what works best, alone or in combination, to improve energy efficiency, without regard to tax effects. If some technologies were taxed but not others, the choice would be skewed and would result in deadweight loss.

4. *Batteries Versus Interconnection*

Soon, perhaps sooner than one may imagine, unplugging from the grid will become a viable alternative to solar interconnection and two-way trading with the utility.[118] When this happens, it will raise the

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[117] If the taxpayer borrows to finance these improvements, the interest would be nondeductible. As previously discussed, nondeductibility of interest acts as a proxy tax on imputed income from consumer durables that are purchased on credit.

[118] Rajab Khalilpour & Anthony Vassallo, Leaving the Grid: An Ambition or a Real Choice?, 82 Energy Pol'y 207 (2015); Joern Hoppmann et al., The Economic Viability of Battery Storage for Residential Solar Photovoltaic Systems—A Review and a Simulation Model, 39 Renewable & Sustainable Energy Rev. 1101 (2014); see also Jeffrey Ball, The Race Is on to Build a Better Battery, Fortune (May 24, 2019), https://fortune.com/longform/race-build-better-battery/; Bottle the Sun—SunPower Home Solar Plus Storage, https://us.sunpower.com/bottle-sun-sunpower-home-solar-plus-storage (last visited Aug. 26, 2019); David Frankel & Amy Wagner, McKinsey & Co., Battery Storage: The Next Disruptive Technology in the Power Sector (June 5, 2017), https://www.mckinsey.com/business-functions/sustainability/our-insights/battery-storage-the-next-disruptive-technology-in-the-power-sector.

possibility that homeowners will unplug to avoid whatever onerous regulatory burdens are imposed on interconnection. One such burden would be the taxation of "sell all" trades under BASA. The obvious end run around the determination that "sell all" trades generate taxable income is to stop selling excess generation to the utility; rather, homeowners would—by a rule imposing tax—be encouraged to install batteries and store their excess power for later use on premises.

There is a case to be made that there is a positive externality created by pooling generation resources. If so, the implication is that remaining interconnected ("plugged in") should be encouraged and hence residential solar should be subsidized if it is interconnected with the grid but not otherwise. From this perspective, taxing "sell all" trades but not battery storage is unwise policy.

5. *Simultaneity of Production and Use*

Consider a homeowner installing a new system. She has a choice regarding how her system is oriented (known as the azimuth and tilt angles of the system).[119] If a homeowner is indifferent to the choice between exporting and own-use, she would ignore simultaneity and the quantity of her exports. Instead, she would set up her system to maximize the market value of production.

If on the other hand she is rewarded for using the electricity she generates (e.g., through tax exemption) she would set up her system to maximize the after-tax market value of production, considering her pattern of use and the premium placed on own-use.[120] The gap in value between the system's maximum and actual production is deadweight loss. Sensible policy would avoid this outcome.

B. *Neutrality Across Ownership Structures*

Neutral tax treatment of homeowner-owned systems and systems leased from third parties is desirable, as is neutrality between homeowner-owned systems purchased on credit or for cash. Unfortunately, neutrality among these dimensions is not feasible if imputed income from solar is tax-exempt.

As we demonstrated above, the determination of whether leasing or owning solar is most tax efficient under current doctrine is extremely

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[119] See generally A.Z. Hafez et al., Tilt and Azimuth Angles in Solar Energy Applications: A Review, 77 Renewable & Sustainable Energy Revs. 147 (2017) (reviewing tilt angles and azimuth angles).

[120] See Part II.A (discussing the implementation of short interval integration for hybrid regulation, where "sell all" is replaced with "sell some," i.e., sell only electricity in excess of own use).

fact-specific. While outright owners (those who do not borrow to buy the system) get the advantage of tax-free imputed income, lessors receive the benefit of depreciation deductions. The only blanket conclusion is that leveraged ownership fares worse than outright ownership and leasing.

These biases—whichever way they may cut—are unfortunate, but tolerable, for two reasons. First, it seems to us more important to iron out the inconsistent treatment of NEM and BASA regulation, which is far more visible, inefficient, and unfair than any bias regarding ownership structure. Given that policymakers must choose between these two margins of distortion, we think this is the least bad option.

Second, the biases are competing, leaving aside for now the leveraged owner. As a result, the net effect overall may be minimal in many cases. If so, this will be the happy accident where two wrongs make a right.

Finally, consider the leveraged owner. She won't experience any benefit from self-ownership. She is not swapping out taxable investments for her tax-exempt system yield, because the interest cost to purchase her system is characterized as nondeductible consumer interest. Now suppose the homeowner leases her system rather than buying on credit, with similar payment terms. If the third-party lessor's depreciation yields a tax benefit that is passed on to the homeowner in the form of lower lease payments (as would be expected in a competitive market), she will be encouraged to lease, rather than to buy her system. If she were to buy the system herself, she wouldn't enjoy any benefit from depreciation tax benefits.

It is not apparent why the tax law should put a thumb on the scale in favor of third-party ownership over leveraged homeowner ownership, but it does. The easiest way to ameliorate the bias, if one were so inclined, would be to grant an interest deduction for the financing costs of residential solar property, analogous to the home mortgage interest deduction granted to leveraged homeowners.

An important thing to recognize, however, is that the phenomenon we describe here—lowering the overall cost of consumer durables when ownership is situated with a commercial leasing company rather than the leveraged consumer—is commonplace. It is not limited to solar.

Consider car leases. The leasing company is permitted depreciation deductions for the cars in its fleet, deductions that would be denied to the lessees, assuming they are leasing their cars for personal use. Meanwhile, leveraged car owners cannot deduct interest payments on their car loans. This inconsistency is a persistent but unexceptional feature of the marketplace for personal use cars (and pleasure boats, refrigerators, and washing machines). There is no apparent reason why this is a problem worth fixing in solar, if it is permitted to arise everywhere else except in the context of homeownership.[121] This is especially true in light of competing concerns (such as ironing out the NEM-BASA distinction).

Finally, we recommend elimination of the phantom depreciation rule that allows third-party lessors to claim deductions for amounts in excess of their net-of-credit investment. While accelerated depreciation is a benefit available to owners of capital stock throughout the economy, phantom depreciation appears to be an accidental legislative quirk that benefits only energy lessors. If Congress wishes to subsidize residential solar with more than the current credit, it could use the additional revenue from eliminating the phantom depreciation rule to increase the installation credit or otherwise benefit all, rather than a subset, of residential solar activity.

VI. Conclusion

Residential solar systems raise basic and important federal income tax issues. The reason tax treatment of residential solar has not made its way onto the policy agenda thus far is that homeowners and utilities are taking the position that economic income to the homeowner—in the form of avoided cost to the extent of self-supplied electricity—is imputed income exempt from tax. This conclusion, which is probably correct in many jurisdictions under present law, depends, in part, on the prevailing practice of netting trade between the homeowner and the utility over a long interval, such as a month.

Recently, regulatory change has been brewing. This calls into question the prevailing practice of monthly netting which in turn will substantially increase the likelihood that the homeowner's economic income from operating a system would be classified as taxable income under current income tax doctrine. This in turn triggers myriad additional tax issues, such as the source of the available tax credit and whether and when depreciation deductions are available.

[121] Even in the homeownership context, the real value of the interest deduction has been greatly diminished in recent years, to the point that many homeowners do not get much, if any, benefit from the home mortgage interest deduction. The 2017 Act greatly expanded the standard deduction, while capping state and local itemized deductions, and capping the principal amount of the mortgage that is eligible for the interest deduction. The overall effect was to greatly reduce the number of taxpayers who claim the itemized deduction, from roughly one-third of filers to fewer than one-seventh. See Scott Eastman, Tax Found., How Many Taxpayers Itemize Under Current Law? (Sept. 12, 2019), https://taxfoundation.org/standard-deduction-itemized-deductions-current-law-2019/. Because the mortgage interest deduction is an itemized deduction, filers who do not itemize get no benefit from the deduction; for them, it is as if the deduction does not exist.

We offer a framework for thinking about these questions both when the homeowner owns her system herself and when she leases her system from a third-party owner. The general uncertainty and the possible state-to-state variability in the tax treatment of residential solar if taxed under present doctrine suggest that legislative or regulatory intervention might be wise. We offer an unbiased view on what good tax policy would look like and should hope to achieve.