Clean Coalition
Making Clean Local Energy Accessible Now

Net metering & feed-in tariffs: Understanding the tax implications of distributed generation policies

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About the Clean Coalition

The Clean Coalition is a nonprofit organization whose mission is to accelerate the transition to renewable energy and a modern grid through technical, policy, and project development expertise.

The Clean Coalition drives policy innovation to remove barriers to procurement and interconnection of distributed energy resources (DER)—such as local renewables, advanced inverters, demand response, and energy storage—and we establish market mechanisms that realize the full potential of integrating these solutions. The Clean Coalition also collaborates with utilities and municipalities to create near-term deployment opportunities that prove the technical and financial viability of local renewables and other DER.

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1. Executive summary

Policies designed to support customer-sited distributed generation (DG) are evolving. For years, net energy metering (NEM), or "net metering", has been used widely across the country, but many states are now studying or transitioning to successor NEM policies.[1] As new tariffs or standard contracts are developed, it is essential that policymakers consider the potential tax implications of each option because this may affect the ability of the NEM successor policy to continue to drive successful deployment of customer-sited solar photovoltaic (PV) systems.

For this reason, the Clean Coalition conducted an analysis to compare the tax impacts on a residential customer-generator under a feed-in tariff (FIT) program as opposed to net metering. The Internal Revenue Service (IRS) has not ruled that energy sold to a utility under a FIT is taxable gross income. However, in this analysis, the Clean Coalition analyzed the implications for the customer-generator if the IRS were to determine that the revenue from energy sales under a FIT constitute taxable gross income. Under this scenario, we evaluated the tax implications for a typical California residential customer, served by Pacific Gas & Electric (PG&E), with a solar system size of 5 kilowatts (kW) at an installed price of $\$3/W_{DC}$.

The conclusion is that any new income tax liability from energy sales under a FIT would be largely offset by associated deductions available under a FIT at rates up to $0.15 per kilowatt-hour (kWh).

Table 1: Income & potential tax liability for 20 years relative to FIT rate

FIT price ($/kWh)	Total Gross Income - 20 Years	25% Federal Tax	Federal Income Tax Deduction[2]	9.3% CA State Tax	CA State Income Tax Deduction[3]	Net Total Tax	Net Tax NPV[4]
$0.10	$15,000	$3,750	$3,916	$1,395	$1,550	$0	$0
$0.15	$22,500	$5,625	$3,916	$2,093	$1,550	$2,252	$114

[1] *See* N.C. Clean Energy Tech. Ctr., The 50 States of Solar (Q3 2015), *available at* https://nccleantech.ncsu.edu/wp-content/uploads/50-States-of-Solar-Q3-FINAL_25.pdf.
[2] Federal tax savings through depreciation and deductions over 20 years are equal to $3,916, which is based on a PV system with an installed cost of $15,000, $12,744 MACRS 5-year depreciation basis, and $4,469 maintenance costs over 20 years. The analysis derived operation and maintenance costs from the National Renewable Energy Laboratory (NREL) System Advisor Model (SAM), which gave a figure of $20/kW-y for the first year rising with inflation, plus the costs of replacing the inverter. The Net Present Value (NPV) of the federal tax savings is equal to $3,530, with a 5% discount rate and 5-year MACRS depreciation.
[3] State tax savings mirror the federal deductions and result in a NPV of $1,165.
[4] The figures assume 5-year MACRS depreciation and a 20-year NPV with a 5% discount rate applied to the annual net tax liability.

2. Background

Before comparing the tax implications of NEM and FIT on residential PV systems, it is useful to clearly define these two policies and the potential tax consequences of each.

NEM

Under NEM, generation from a DG system is first used to meet on-site load. When generation from a NEM system exceeds on-site load, the excess energy is exported to the grid and the customer is credited at the full retail value of electricity for each kWh delivered. When a NEM system is not producing enough power to meet on-site load, the customer buys power from the electric utility at the standard retail rate.

Rarely does the output of a NEM system precisely match on-site consumption. Therefore, a NEM customer exports excess power to the electric grid at some times and imports power from the grid at other times. As a result, a customer is billed only for the *net* electricity used during each billing period.[5] In California, utilities annually "true-up" NEM customers' bills to reconcile all electricity charges and credits for the prior 12-month billing cycle. If any remaining charges exist at this time, the utility will invoice the customer. Alternatively, the utility will issue payment for any excess electricity generated, which is known as Net Surplus Compensation (NCS).[6] Customers may opt to either accept payment for NCS or receive a credit that will apply to the next 12-month true-up period.

FIT

Under a FIT, a customer-generator sells all power produced to the local utility at a long-term, fixed-rate and continues to buy all their energy at the retail rate. The FIT rate can be set based on any number of factors, including the benefits and costs a DG system places on the grid. In some FITs, customers can apply the fixed-rate credits against their bill, but the FIT credits are usually above or below the retail rate.

Tax treatment under a residential FIT compared to NEM

With NEM, a customer is simply credited at the retail rate for energy exported to the grid. Through this accounting mechanism, there is no sale of energy to the utility, which means no potential taxable income.

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[5] Cal. Pub. Util. Comm'n, Net Energy Metering (NEM), http://www.cpuc.ca.gov/PUC/energy/DistGen/netmetering.htm (last visited Nov. 23, 2015).
[6] NCS is based on the rolling average of each utility's Default Load Aggregation Point price from 5am to 7pm. Cal. Pub. Util. Comm'n, Net Surplus Compensation, http://www.cpuc.ca.gov/NR/rdonlyres/C085BDE6-7DC1-4FD8-8208-52300A082672/0/FAQs_NSC_91411.pdf (last visited Nov. 23, 2015).

Unlike NEM, a FIT approach may involve the customer directly selling electricity to the utility. Although the IRS has not ruled as such, it is possible they will determine that the sales from the utility to the customer-generator—and from the customer-generator to the utility—are separate and distinct transactions subject to state and federal income tax.[7] If the IRS makes this determination, then payments received by a customer-generator from the utility for the sale of electricity under a FIT may fall within the definition of taxable gross income.

Taxing energy sales under this scenario would appear to lessen the economic desirability of the FIT approach. However, the impact is mitigated by tax deductions associated with the DG system, which this analysis investigates. It is also worth noting that using specific language to structure a FIT may avoid tax issues altogether. For example, Austin Energy's Value of Solar Tariff refers to "credits" and never uses the terms "sales" or "cash."[8] In this way, a FIT approach could be viewed in the same manner as behind-the-meter systems such as those enrolled in NEM programs—with no sales that could potentially be construed as taxable gross income.

Regardless, in the following analysis, we assumed that the IRS has ruled that energy sales under a FIT constitute taxable gross income, and we investigated the financial impacts of taxing energy sales under a FIT.

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[7] *See, e.g.*, Memorandum re: U.S. Federal Income Tax Consequences for Residential Solar Feed-In Tariffs from Sean Shimamoto & Emily Lam, Skadden, Arps, Slate, Meagher & Flom LLP, to The Alliance for Solar Choice (Aug. 9, 2013), *available at* http://www.rabagoenergy.com/blog/files/tasc-arizona-tax-memo-on-fits.pdf.

[8] *See* Karl R. Rábago, *The 'Value Of Solar' Rate: Designing An Improved Residential Solar Tariff*, Solar Industry Magazine (Feb. 2013), *available at* http://www.solarindustrymag.com/issues/SI1302/FEAT_04_The%20Value%20Of%20Solar.html.

3. Details of the analysis

Through this analysis, we sought to understand the tax implications for a typical California residential customer under a FIT in comparison to a NEM program—with the IRS hypothetically determining that the FIT energy sales constitute taxable gross income. To do this, we modeled the following:

- Electricity consumption and PV generation for a typical California customer;
- Federal and state tax treatments;
- Rate structures for the customer, including the compression of California rates from four tiers to two tiers by 2019; and
- The scheduled expiration of the investment tax credit (ITC) at yearend 2016.

A typical California customer

Our analysis examined a California residential customer located in San Jose, California, which is located in PG&E's service territory. The customer was based in this location because Santa Clara County, home to the City of San Jose, boasts one of the highest numbers[9] of solar PV and net-metered residential customers in the state—and the most in PG&E's service territory.[10]

Electricity consumption and PV generation

A typical California customer's annual electricity consumption is 9,030 kWh, which is based on the National Renewable Energy Laboratory (NREL) System Advisor Model (SAM) results for San Jose.[11] For tax purposes, we used the 2013 median household income in California of $61,094.[12] Finally, we applied the 2015 California[13] and federal tax rate schedules.[14]

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[9] Cal. Solar Energy Indus. Assoc., New Report: Ranks Top U.S. Cities for Installed Solar—California Leads the Way, http://calseia.org/industry-news/2015/6/20/new-report-san-jose-ranks-4th-among-major-us-cities-for-installed-solar (last visited Nov. 23, 2015).
[10] Pac. Gas & Elec., PG&E Earns Top Place in Solar Industry Report for Seventh Year in a Row, http://www.pge.com/en/about/newsroom/newsdetails/index.page%3Ftitle%3D20150429_pge_earns_top_place_in_solar_industry_report_for_seventh_year_in_a_row (last visited Nov. 23, 2015).
[11] Nat'l Renewable Energy Lab., System Advisor Model, https://sam.nrel.gov/ (last visited Oct. 15, 2015) (modeling local residential customer annual load data). *See also U*.S. Energy Info. Admin., Household Energy Use in California (2009), *available at* http://www.eia.gov/consumption/residential/reports/2009/state_briefs/pdf/CA.pdf.
[12] U.S. Census Bureau, State & County QuickFacts: California, http://quickfacts.census.gov/qfd/states/06000.html (last visited Nov. 23, 2015).
[13] Cal. Franchise Tax Board, 2014 California Tax Rates and Exemptions, https://www.ftb.ca.gov/forms/2014_California_Tax_Rates_and_Exemptions.shtml (last visited Nov. 23, 2015).
[14] Tax Found., 2014 Tax Brackets, http://taxfoundation.org/blog/2014-tax-brackets (last visited Nov. 23, 2015).

For PV system production, using TMY3 local solar irradiance data for San Jose, we modeled 1600 kWh_{AC}/kW_{DC} for a first-year annual production of 8,657 kWh_{AC}. In line with measured solar PV degradation, our model shows PV production declining by 0.5% annually. Therefore, we used 7,500 kWh as the average annual PV system output over 20 years.

Federal, state, and local tax treatments

The tax liability investigated in this analysis is income tax applied to the sale of electricity under a FIT. On both the state and federal level, this involves accounting for income tax liability, deductible depreciation and maintenance costs, and the ITC. Where applicable, we factored into the analysis the current 30 percent ITC for solar systems on residential[15] and commercial[16] properties. It must be noted if the IRS determines that electricity sales under a FIT constitute taxable gross income, then DG system owners may not be eligible for the residential ITC. Instead, they would be eligible for the commercial ITC. We also examined the impact of the ITC's scheduled expiration at yearend 2016 using 2019 as the post-ITC scenario.

Local incentives are not factored into the analysis because they apply to NEM and FIT scenarios equally.[17] For example, the California State Board of Equalization offers property tax exclusion for solar PV systems.[18]

Current rate schedule

Under California's existing NEM tariff, customers pay for the net amount of electricity used over a 12-month period, in addition to any monthly non-generation charges.[19] The analysis below applies PG&E's E-1 residential schedule and Region X Tier levels, outlined in Figure 1 below.[20]

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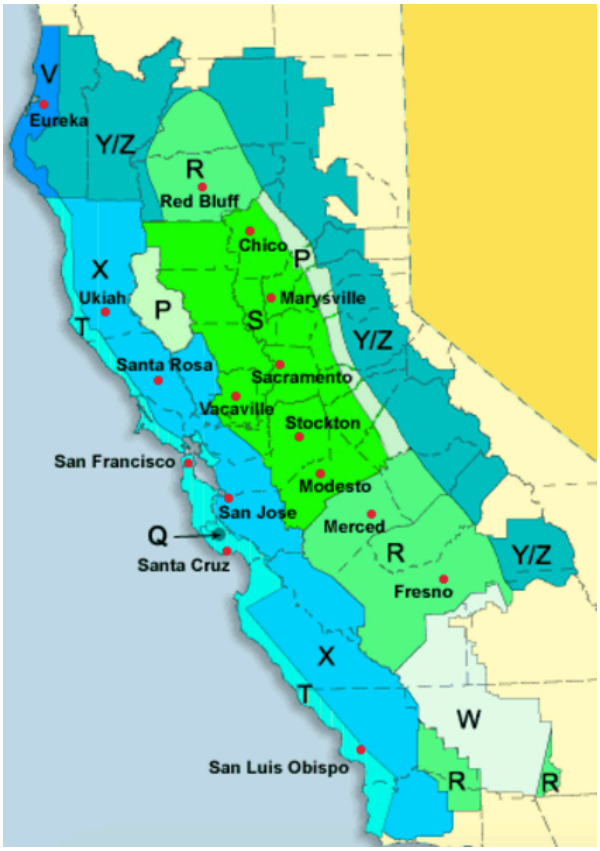
[15] 26 U.S.C. § 25D.
[16] 26 U.S.C. § 48.
[17] For a guide to state, federal, and local incentives, see Database of State Incentives for Renewables & Efficiency, http://www.dsireusa.org/ (last visited Nov. 23, 2015).
[18] *See* U.S. Dep't of Energy, Property Tax Exclusion for Solar Energy Systems, http://energy.gov/savings/property-tax-exclusion-solar-energy-systems (last visited Nov. 23, 2015).
[19] Pac. Gas & Elec., Electric Schedule NEM (filed Apr. 16, 2015), *available at* http://www.pge.com/tariffs/tm2/pdf/ELEC_SCHEDS_NEM.pdf.
[20] This schedule is applicable to single-phase and polyphase residential service in single-family dwellings and in flats and apartments separately metered by PG&E. Pac. Gas & Elec., Electric Schedule E-1 Residential Services (filed Aug. 17, 2015), *available at* http://www.pge.com/tariffs/tm2/pdf/ELEC_SCHEDS_E-1.pdf; Open Energy Information U.S. Utility Rate Database, http://en.openei.org/wiki/Utility_Rate_Database (last visited Nov. 23, 2015) (accessed through NREL System Advisor Model). Region X includes the cities and counties with the largest number of installed PV systems.

Figure 1: Baseline quantities by territory for single-family dwellings[21]



In Region X, energy consumption is charged as follows:

- Tier 1 (baseline): $0.1323/kWh
- Tier 2 (101-130% of baseline): $0.1504/kWh
- Tier 3 (131-200% of baseline): $0.3238/kWh
- Tier 4 (201-300% of baseline): $0.3638/kWh

Future rate schedule

Over the next few years, California will transition to a two-tier rate structure, eventually resulting in a 25% differential between the tiers in 2019. In the 2019 scenario, our model accounts for this new, two-tier rate schedule using estimated values of $0.18/kWh and $0.23/kWh.

[21] Pac. Gas & Elec., Understanding Baseline Quantities, http://www.pge.com/en/myhome/saveenergymoney/financialassistance/medicalbaseline/understand/index.page (last visited Nov. 23, 2015).

ITC and post-ITC scenarios

Beginning in 2017, the ITC is scheduled to step down from its current 30% to 10% for commercial customers and expire entirely for residential customers. We modeled two different scenarios—2015 and 2019—to understand how the expiration of the ITC may affect the tax implications for a residential customer under a FIT compared to NEM.

In our 2015 scenario, a 30% ITC credit is applied to the customer under both NEM and FIT scenarios. However, for the 2019 scenario, the NEM customer receives no ITC benefits, while a FIT customer receives a 10% credit.

Model assumptions

For this analysis, we utilized NREL's System Advisory Model (SAM), which "makes performance predictions and cost of energy estimates for grid-connected power projects based on installation and operating costs and system design parameters."[22] This model was particularly useful as it has options to analyze projects for both a NEM approach, where electricity is bought and sold at the retail rate, and a FIT approach, where electricity is purchased at the retail rate and bought at a fixed, long-term rate.

System costs

We modeled results for a 5 kW PV system, which is roughly the average size of a residential solar PV array in the United States.[23] Our analysis assumed an installed cost of $\$3/W_{DC}$ for 2015, reflecting pricing trends in the marketplace.[24] For the 2019 post-ITC scenario, we estimated that declining costs would result in an installed system cost of $\$2/W_{DC}$.

System financing

With respect to the financing structure of the DG system, we analyzed a system purchased outright by the customer without the use of loans. This is because the financial results are highly sensitive to the specific terms of a loan and may therefore mask the tax implications, which are the focus of this analysis. As evidenced in the evolution of the NEM market, solar providers are adept at developing options to address various financial scenarios. Financing, lease, and power purchase options are all

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[22] Nat'l Renewable Energy Lab., System Advisor Model, https://sam.nrel.gov/ (last visited Nov. 23, 2015).
[23] *See* Solar Energy Indus. Assoc., Solar Photovoltaic Technology, http://www.seia.org/research-resources/solar-photovoltaic-technology (last visited Nov. 23, 2015).
[24] Conservative pricing was applied, as higher installed costs will result in larger tax deductions and tax credits where applicable. SolarCity and Vivint Solar report average installed costs for residential systems for Q1 and Q4 2014, inclusive of general administrative sales and costs, in the range of just over $\$4/W_{DC}$ to just under $\$3/W_{DC}$. SolarCity, Slide deck from investors earnings call: FY 2014 & Q4 2014 (Feb. 18, 2015); Vivint Solar, Slide deck from investor earnings call: Q4 2014 (Mar. 4, 2015).

available to residential customers. These options shape not only who receives the income under a FIT, but also which costs are deductible against that income. For example, costs associated with loans may be tax deductible.

Full suite of assumptions

In sum, the model runs assumed the following:

- PV system size: 5 kW_{DC}.
- Initial annual PV system production: 8,657 kWh.
- Degradation of PV system production: 0.5% annually.
- Average annual PV system output over 20 years: 7,500 kWh.
- PV system installed cost: $3/W in 2015; dropping to $2/W in 2019.
- Annual household electric usage: 9,030 kWh.
- The 30% residential ITC applies to NEM systems, and the 30% commercial ITC applies to FIT systems in 2015. For systems modeled in 2019, the residential ITC is assumed to expire, and the 10% commercial ITC applies to FIT systems.
- Mortgage deductions not applied to NEM systems.
- Tax liability: 25% federal tax liability and 9.3% California state tax liability.
- System paid for in cash and not financed, which results in a more conservative estimate because the interest on the financing would be a business expense that could decrease tax liability.
- Depreciation calculated using the 5-year Modified Accelerated Cost Recovery System (MACRS) depreciation for the FIT systems; no depreciation value applied to NEM systems.[25]
- Annual electricity rate increase of 2%.[26]

[25] U.S. Internal Revenue Serv., Overview of Depreciation, https://www.irs.gov/publications/p946/ch01.html#en_ US_2013_publink1000107298 (last visited Nov. 23, 2015).
[26] The assumed rate increase is approximately equal to the inflation rate. USInflation.org, US Inflation Rate, http://usinflation.org/us-inflation-rate/ (last visited Nov. 23, 2015). While electricity rates vary by region, long-term national pricing trends do not indicate that retail electricity rates have increased in excess of inflation, and the real price of electricity is lower than it was before 1995. Further, current growth in residential electricity prices is expected to slow in 2015. U.S. Energy Info. Admin., Growth in residential electricity prices highest in 6 years, but expected to slow in 2015 (Mar. 16, 2015), http://www.eia.gov/ todayinenergy/detail.cfm?id=20372.

4. Results

If energy sales under a FIT are subject to income tax, any tax liability will be offset by the value of applicable tax deductions at a FIT rate up to approximately $0.15/kWh for the typical customer described above.

The extent to which depreciation of a DG system offsets taxes on energy sales depends on two key variables. First is the system costs eligible for deduction. If the costs of installing and maintaining the DG system are reduced, then the value of income deductions is lower and vice versa. The second key variable is the FIT rate. When a lower price is paid for energy, the amount of taxable income is reduced and vice versa. Below, we first illustrate the impact of the FIT rate—the price paid by the utility for the energy produced by the customer for a system installed in 2015. In future years, declining costs of solar PV, changes in current incentives, and changes in applicable rate design will also influence the results. Examples of these impacts are provided.

Various FIT rates

The tax on income received under different FIT rates is compared to the income tax deduction value in the table below. In our case study example, a 5 kW system produces approximately 7,500 kWh annually over the first 20 years of operation. The total gross income from this system and the net present value (NPV) of the income, assuming a 5% discount rate for 20 years, are calculated at four different FIT prices for comparison.

Table 2: Income & potential tax liability for 20 years relative to FIT price

FIT price ($/kWh)	Total Gross Income - 20 Years	25% Federal Tax	Federal Income Tax Deduction[27]	9.3% CA State Tax	CA State Income Tax Deduction[28]	Net Total Tax	Net Tax NPV[29]
$0.10	$15,000	$3,750	$3,916	$1,395	$1,550	$0	$0
$0.15	$22,500	$5,625	$3,916	$2,093	$1,550	$2,252	$114
$0.20	$30,000	$7,500	$3,916	$2,790	$1,550	$4,824	$1,717
$0.25	$37,500	$9,375	$3,916	$3,488	$1,550	$7,397	$3,320

[27] Federal tax savings through depreciation and deductions over 20 years are equal to $3,916, which is based on a PV system with an installed cost of $15,000, $12,744 MACRS 5-year depreciation basis, and $4,469 maintenance costs over 20 years. The analysis derived operation and maintenance costs from the NREL SAM, which gave a figure of $20/kW-y for the first year rising with inflation, plus the costs of replacing the inverter. The NPV of the federal tax savings is equal to $3,530, with a 5% discount rate and MACRS 5-year depreciation basis.
[28] State tax savings mirror the federal deductions and result in a NPV of $1,165.
[29] The figures assume 5-year MACRS depreciation and a 20-year NPV with a 5% discount rate applied to the annual net tax liability.

At a FIT rate of $0.15/kWh, the total potential federal and state income tax liability on FIT earnings over 20 years is $7,718, which is decreased to $2,252 after subtracting state and federal income tax deductions. The net present value of the net tax on the system is then $114. Therefore, at a FIT rate of just under $0.15/kWh, the state and federal income tax burden will be completely offset by state and federal income tax deductions. FIT rates above $0.15/kWh would increase the tax burden on the system owner but would also improve the payback period as discussed below.

NEM and FIT payback periods

Moving beyond the initial tax analysis, we also investigated payback periods for different compensation scenarios. The analysis concluded that for the same typical PG&E customer under the current rate structure, a NEM system results in a 5.4-year payback period. A FIT rate of just under $0.25/kWh is required to yield the same payback period as that realized under the identical NEM system.

Table 3: PV system payback periods under FIT and NEM (2015)

Scenario	Applicable ITC	Installed cost	Total installed cost	System NPV	Payback period (years)
NEM (2015)	30%	$3/W	$15,000	$13,928	5.4
15¢ FIT (2015)	30%	$3/W	$15,000	$1,730	8.7
20¢ FIT (2015)	30%	$3/W	$15,000	$5,336	6.4
25¢ FIT (2015)	30%	$3/W	$15,000	$8,942	5.2

Although the payback period of the systems are comparable at a $0.25/kWh FIT, the NEM system has a higher NPV over the course of 20 years. This is because the value of energy avoided increases under NEM as retail electricity rates rise over time, whereas FIT systems operate under a non-escalating rate.[30] However, as shown below, this differential is reduced by coming changes to California's retail rate design.

NEM and FIT—with ITC expiration and rate-tier changes

The model runs described above assessed the tax implications for a residential customer under NEM compared to a FIT applying current rate structures. By modeling systems in 2019, the particular analysis takes into account any impacts from the scheduled expiration of the ITC. Further, California is transitioning to a two-tier rate structure

[30] In this example, customers are billed entirely based on kWh usage. Alternate tariff structures applied in other jurisdictions include capacity—or "demand"—charges or non-avoidable "ready to serve" standby charges, which would not be reduced by NEM but could be offset by increased energy sales to the utility. The application of time of use (TOU) differentials, load modification, or the incorporation of energy storage systems would also influence customer costs and the NPV of systems.

beginning in 2017, which will eventually result in a 25% differential between the tiers when fully implemented in 2019.[31] In our 2019 scenario, we modeled this new rate structure using estimated values of $0.18/kWh and $0.23/kWh as the two tiers. For 2019, we assumed that installed PV system costs would decline to $2/W.

Under the two-tier rate structure, the resulting 8.2-year payback period under NEM is longer than the 7.9 years achieved under the $0.15/kWh FIT in 2019. Also, as reflected in the table below, a reduction in the ITC value may be offset by reductions in installed costs. In the 2019 scenarios, the payback periods actually shorten due to modeling installed costs of $2/W.

Table 4: PV system payback periods under FIT and NEM (2015 and 2019 with rate change)

Scenario	Applicable ITC	Installed cost	Total installed cost	System NPV	Payback period (years)
NEM (2015)	30%	$3/W	$15,000	$13,928	5.4
15¢ FIT (2015)	30%	$3/W	$15,000	$1,730	8.7
15¢ FIT (2019)	10%	$2/W	$10,000	$2,823	7.9
2-tier NEM (2019)	0%	$2/W	$10,000	$5,289	8.2

Hybrid self-supply plus FIT approach

The SAM model only allowed for analysis of NEM and buy-all/sell-all FIT systems. However, a middle ground exists and was recently implemented in Hawaii.[32] Under this hybrid self-supply plus FIT approach, generation from a customer's system is first used to satisfy simultaneous on-site load, and the customer avoids purchasing energy at the retail rate from the utility. The customer captures the full value of avoided energy purchases, which may currently be higher than the FIT rate or may become higher over time. Any energy not consumed on-site at the time of generation is sold to the utility at an established FIT rate, and the customer continues to buy energy from the utility at the retail rate to meet load not served by the DG system.

Under this hybrid self-supply plus FIT approach, the NPV and the payback period would be about halfway between the corresponding FIT and NEM systems. For the 2015 model runs, a hybrid approach where the customer sells 50% of energy produced would yield a NPV of approximately $7,829 and a payback period of roughly 7.1 years.

[31] Cal. Pub. Util. Comm'n, Decision on Residential Rate Reform for Pacific Gas and Electric Company, Southern California Edison Company, and San Diego Gas & Electric Company and Transition to Time-of-Use Rates, D.15-07-001 (July 13, 2015).
[32] The Hawaii Public Utilities Commission recently adopted this hybrid option in a decision to end its NEM tariff. Haw. Pub. Util. Comm'n, Decision & Order No. 33258 (Oct. 12, 2015).

Table 5: Hybrid Self-Supply Plus FIT - Comparative Tax, NPV and Payback

Scenario	Gross Income - 20 Years	Net Total Tax	Net Tax NPV	System NPV	Payback period (years)
NEM (2015)	$0	$0	$0	$13,928	5.4
Self-Supply + 15¢ FIT Hybrid (2015)	$11,250	$1,127	$57	$7,829	7.1
15¢ FIT (2015)	$22,500	$2,252	$114	$1,730	8.7

In practice, the results would tend toward the NEM example if daytime load coincided with generation, or toward the FIT example if on-site load did not coincide with generation. Solar panels installed in a more westerly orientation typically support greater matching of generation and load.

Full results of our model runs are available in Appendix B.

5. Conclusions

The analysis revealed that tax deductions applied to a FIT system with a rate up to $0.15/kWh largely offset 20 years of gross income tax liability. However, to achieve a payback period similar to that of an identical NEM system, the FIT rate must increase to approximately $0.25/kWh. Even then, the NEM system would have a higher NPV over 20 years because of the increased value caused by avoiding rising retail energy prices. Finally, for systems operating under California's new rate structure in 2019, a $0.15/kWh FIT yields a payback period similar to the NEM system, but with just over half the NPV.

6. Appendix A—Notes on modeling

Calculations were performed utilizing the NREL SAM v2015.6.30 for PV output and financial results.

Rate schedules and tier levels

Financial results based on hourly and monthly PV output reducing typical metered utility load under current PG&E residential rate tariff for Zone X tier usage, which is the largest applicable heating and cooling population zone.

Tier	Rate ($/kWh)	Tier Cap/Day*	Description
1	$0.1323	11 kWh	Up to the Baseline amount
2	$0.1504	14.3 kWh	Electricity usage from 101% to 130% of Baseline
3	$0.32377	22 kWh	Electricity usage from 131% to 200% of Baseline
4	$0.36377	No kWh cap	Electricity usage above 200% of Baseline

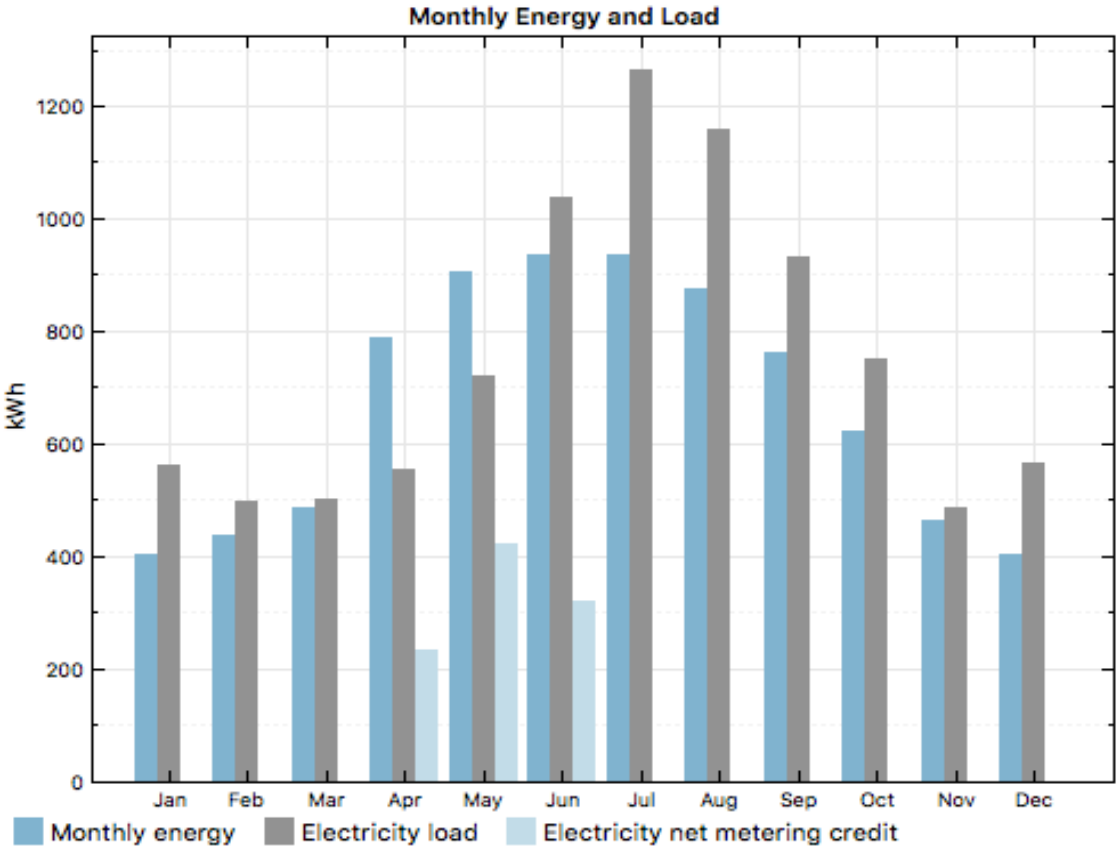
* Average daily use per billing period. Baseline usage levels vary by region.

Alternate two-tier California rate structure and estimated rate application

A new rate structure has been adopted by the California Public Utilities Commission and will go into effect starting in 2017. Below are our estimates for the new two-tier rate structure, which will result in a 25% differential between the tiers when fully implemented in 2019.

Tier	Rate ($/kWh)	Tier Cap/month	Description
1	$0.18	Up to 14.3 kWh	Up to the 130% Baseline amount
2	$0.23	Above 14.3 kWh	Electricity usage above 130% of Baseline

Modeled energy production and load summary



Average monthly load

Month	Energy (kWh)	Peak (kW)
Jan	562.64	1.32
Feb	496.99	1.28
Mar	501.33	1.33
Apr	554.05	1.83
May	719.08	2.45
June	1,039.04	3.05
July	1,263.35	2.13
Aug	1,158.94	3.09
Sept	932.61	2.87
Oct	749.80	2.40
Nov	487.22	1.21
Dec	564.80	1.35
Annual	9,029.85	3.12

7. Appendix B—Model outputs

The complete NREL System Advisory Model outputs used in this analysis are available online.