EXECUTIVE SUMMARY

Solar photovoltaics (PV) are one of the most dynamic renewable power generation technologies, with improvements in technology and increases in the scale of manufacturing continuously driving down costs.

Solar PV deployment has grown at an annual average compound rate of 44% between 2000 and 2016, from 0.8 gigawatts (GW) to 291 GW. Solar PV modules have high "learning rates"[1] of between 18% and 22% depending on the period analysed. With the rapid growth in deployment, module prices have declined by around 80–85% between the end of 2009 and 2016. Between 2010 and 2016, the global weighted average total installed cost[2] and the levelised cost of electricity (LCOE) of utility-scale solar PV projects fell by 65% and 67% respectively.

Although utility-scale solar PV projects regularly make headlines for record-low prices, small-scale rooftop solar PV systems represent an important part of the market and are bringing the benefits of modern electricity services to households that previously had no access to electricity, reducing electricity costs on islands and in other remote locations that are dependent on oil-fired generation, as well as enabling residents and small businesses to generate their own electricity.

The International Renewable Energy Agency's (IRENA's) regular PV cost and competitiveness indicators will highlight the growing competitiveness of rooftop solar PV and its potential to economically meet the electricity needs of households in different markets, as well as its potentially disruptive nature for utilities.

The IRENA Solar PV Cost and Competitiveness Indicators series compares solar PV costs to electricity rates. The aim is to help policy makers track the rapid improvements in the competitiveness of renewables.

With rapidly falling PV costs (IRENA, 2016), there is a clear need for up-to-date analysis of the evolving competitiveness of solar PV in different markets. The Solar PV Cost and Competitiveness Indicators (hereafter referred to as "the indicators"), developed by IRENA, complement our cost analysis of utility-scale renewable power generation technologies by informing governments, policy makers, regulators and others about recent trends in the competitiveness of rooftop solar PV. The goal of the indicators is to aid decision makers in designing, adopting or sustaining renewable energy policies to support solar

1 The learning rate concept is borrowed from industry and represents the percentage reduction in costs or observed prices for every doubling of cumulative installed capacity.

2 Total installed costs represent all the major hardware items (e.g., module and inverter) as well as the balance of system components (e.g., cabling, mechanical and electrical installation, permitting, profit margin, etc.). See IRENA, 2016 (page 31) for a detailed characterisation of the balance of system cost components.

PV deployment. The indicators initially will focus on the residential segment but eventually may be extended to the commercial rooftop segment.

The indicators are based on a simple and transparent analysis of reliable cost and performance data. The indicators consist of three key components:

1. PV installed cost trends in different countries (and locations within a country, where data are available).
2. The "effective electricity tariff" when the solar PV system is generating based on local retail electricity tariffs, including time-of-use tariffs where in place, calculated as a weighted average of the tariff in force while solar PV is generating.[3]
3. The location-specific LCOE of solar PV systems based on local irradiation and installed costs.

Notably, the IRENA indicators are not an attempt to identify the direct economic or financial benefits of solar PV in the market segments examined, either for the owner of the solar PV system or for the utility.[4] In particular, the indicators *exclude* the impact of any support measures for solar PV. The exception would be if net metering is in place with a selling price set at the electricity tariff schedule for that customer, and the balancing period was annual.[5] As a result, the actual economics of rooftop solar PV systems for individuals and businesses are in most cases better than the indicators presented here, although this relies on net metering being in place with a selling price based on the electricity tariff, not at lower levels, as is the case in Germany for instance.

To aid readers in understanding the relevance of the indicators, the support policies in place in different markets are highlighted in this report. This gives an understanding of the scope of support policies in the markets examined, but not of their quantitative impact on the financial situation of individual investors.

Rather than show the impact of support policies on the attractiveness of solar PV to individual investors, the indicators are designed instead to show policy makers the evolution of the cost trends of solar PV systems in different markets and to compare these to the effective electricity tariff faced by residential rooftop solar PV homeowners at the time of solar PV generation. They thus provide an indicator that allows policy makers and others to track competitiveness trends.

Future editions of this report may examine how support policies from the individual perspective impact the financial attractiveness in different market segments. However, even analysis of this nature would still require a range of caveats, because it would include assumptions for individual investors that would not necessarily be representative of the range of individual investor circumstances.[6]

The costs of electricity from residential rooftop solar PV are falling rapidly. In just over six years, these costs have fallen 45% for cities in California and 66% in German cities.

This is evident from median levelised LCOE[7] estimates for residential solar PV in cities in these two large, developed electricity markets between Q1 2010 and Q2 2016.

In the US state of California, in the metropolitan areas examined, the LCOE of residential solar PV is estimated to have decreased by an average of 45% between Q1 2010 and Q2 2016 (Figure ES 1). Over the same period, the estimated median LCOE in Germany declined by 66%. This rapid reduction saw the median LCOE of residential solar PV fall below the average effective electricity tariff that applies to these residential customers in six out of the nine cities analysed in this report. In those six cities, the median LCOE fell from between 75% and 104% *higher* than the average electricity tariff (in Munich and Cologne respectively) in Q1 2010, to between 3% and 37% *lower* in Q2 2016 (in San Diego and Munich respectively).

3 This is therefore different than the average effective electricity tariff faced by a household, as the generation profile of the PV system differs from that of the customer's consumption profile. It also does not take into account any benefit of reducing charges or electricity rates based on maximum power demand or lowering consumption levels into cheaper electricity tariff bands.

4 The detailed data required to accurately assess these values are beyond the scope of this analysis. For instance, this would require the actual cost of finance, exact location, roof slope and orientation, shading effects, system components and design, as well as feed-in tariffs (FITs), fiscal support policies, owners tax status, etc. This level of detailed local analysis is best conducted by national or sub-national institutions or agencies with the resources to accurately model all of these factors.

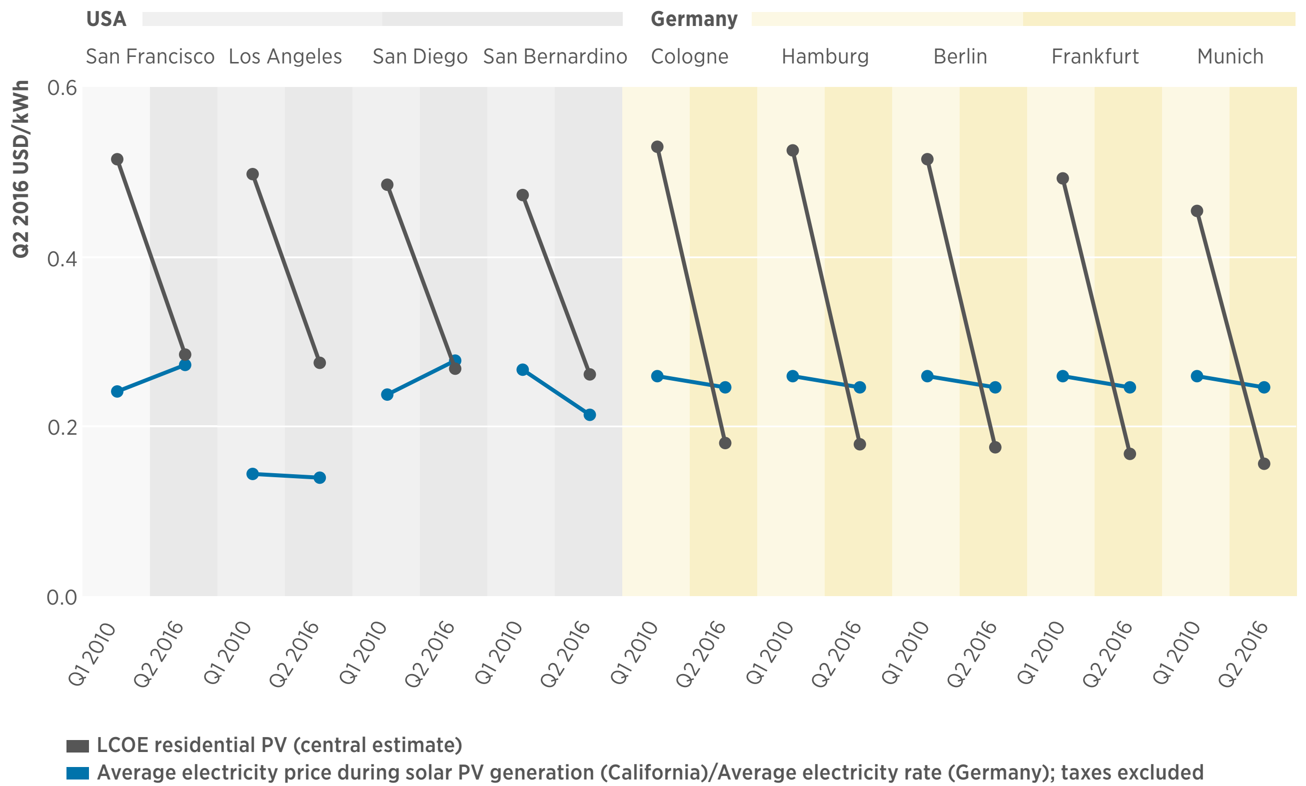
5 In this case, If no other support measures are in place, the indicators would provide a close approximation of competitiveness, assuming that the owners cost of capital matched the assumptions here.

6 Analysing the impact of support policies for individual investors or groups of investors is a very resource-intensive process. IRENA will initially focus its resources on expanding the coverage of the indicators to additional countries in its 151 Member States, but it stands ready to support partners who would like to use the IRENA methodology to examine the implications of support policies for individual market segments and investors.

7 All financial data in this report are expressed in real Q2 2016 USD and assume a 5% real weighted average cost of capital, unless expressly stated otherwise.

In California, different time-of-use electricity schedules are offered by the electric utilities serving different locations. IRENA has calculated the average effective electricity tariff when solar PV is generating in order to compare it to the LCOE. In Germany, the tariff structure is much simpler, and a fixed tariff is in place over all hours of the year. The federal weighted average price (tax components excluded) is used to guide policy makers.[8]

Figure ES 1: Median residential solar PV LCOE and median effective residential electricity rates in different metropolitan locations in California and Germany, Q1 2010 and Q2 2016



Electricity rates: San Francisco: E6; Los Angeles: TOU R-1B; San Diego: DR-SES; San Bernardino: TOU-D-T.

Source: IRENA analysis based on CEC and CPUC, 2016a; LADWP, 2016; PG&E, 2016; SDG&E, 2016; SCE, 2016; BDEW, 2016a.

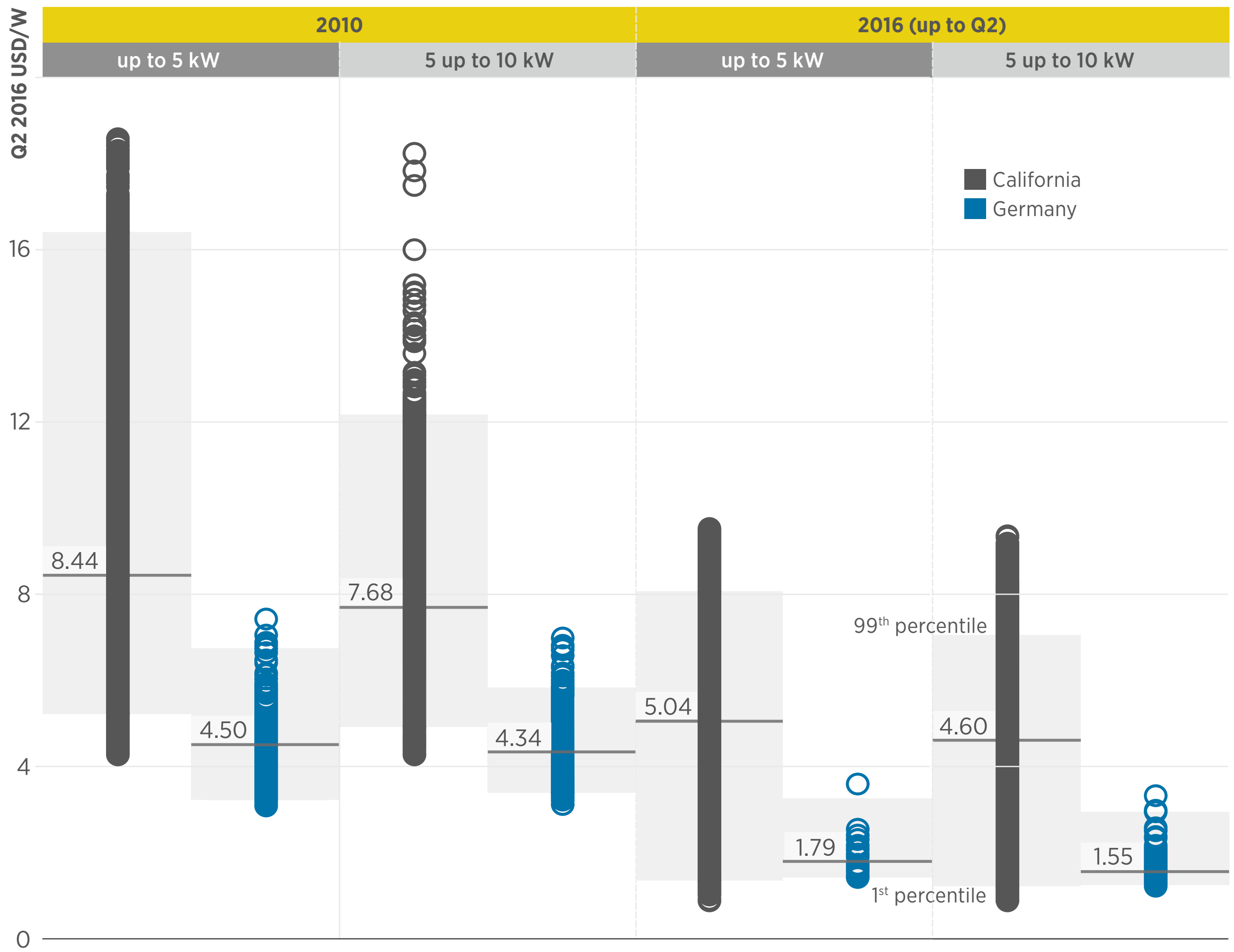
The rapid decreases in electricity costs from rooftop solar PV in California and Germany have been driven by reductions in the total installed costs of these systems. Between 2010 and 2016, the median residential PV system cost declined by around two-thirds in Germany and two-fifths in California.

Technology improvements in solar PV modules, manufacturing advances, economies of scale and reductions in balance of system costs have driven down PV installed costs globally (IRENA, 2016). Figure ES 2 highlights that between 2010 and 2016, the median total installed cost of solar PV systems in California decreased by around 40% in the smaller and larger residential system size classes. In Germany where the market is very competitive and represents best practice cost levels for small-scale solar PV systems, the decline has been 60–64% (60% in the “sub-5 kilowatt (kW)” class and 64% in the “5 to 10 kW” size category).

Total installed costs for systems in California continue to span much wider ranges than in Germany. Some of this difference can be explained by structural factors, but much higher balance of system costs in California cannot be easily explained (IRENA, 2015a). In 2010, residential rooftop systems (<5 kW) in California had total installed costs for the first and ninety-ninth percentiles from USD 5.2 per Watt (W) to USD 16.4/W, with a median of USD 8.4/W. In 2016, this spread for sub-5 kW systems had narrowed, and the first and ninety-ninth percentiles ranged from USD 1.4 to USD 8.1/W with a median value of USD 5/W. This compares to Germany where the first and ninety-ninth percentiles of system costs ranged from USD 3.2 to USD 6.7/W with a median of USD 4.5/W in 2010, falling to USD 1.4 to USD 3.3/W with a median of USD 1.8/W in 2016 for systems of less than 5 kW. A similar, but slightly narrower, pattern can be seen for larger systems in the 5–10 kW range.

8 Analysis of the relative competitiveness of solar PV when taxes are included is also presented in the section examining competitiveness in Germany, given that there is a significant difference in prices with and without tax.

Figure ES 2: Residential PV systems installed cost ranges by size in California and Germany, 2010 and 2016 (up to Q2)



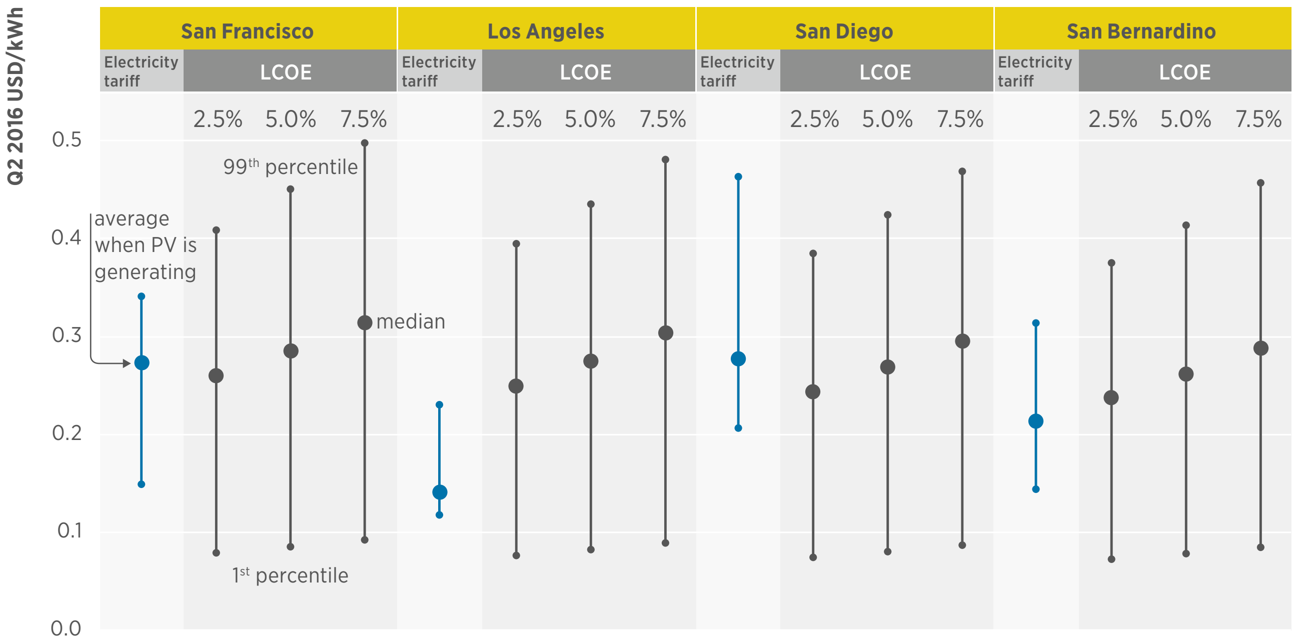
Source: IRENA analysis based on CEC and CPUC, 2016a; EuPD Research, 2017a.

Along with cost decreases, the IRENA Indicators highlight the highly nuanced nature of competitiveness trends for rooftop solar PV. The wide range of installed costs for such systems, notably in California, translates into a wide range of electricity costs from solar PV.

This is readily visible when examining the range of LCOEs for solar PV systems in different Californian cities. Figure ES 3 presents the range of LCOEs compared to the minimum and maximum rates in the TOU schedule for the location, as well as the average rate in effect while solar PV systems are generating in that location. In all cases, there are a range of systems with LCOEs above and below the average effective electricity tariff, yet a simple examination of average values masks this very broad range of individual outcomes.

In San Francisco and San Diego, the central LCOE estimate of residential solar PV systems assuming a weighted average cost of capital (WACC) of 5% is around or lower than the average effective electricity tariff in force when solar PV is generating. In Los Angeles and San Bernardino, lower electricity tariffs mean that the average residential solar PV system is still more costly than the average effective electricity tariff faced by residential solar PV owners when they are generating electricity. Yet, when the range of system costs is examined, a much more nuanced story develops. A large number of systems deliver electricity at a cost lower than the average effective electricity tariff, but lower than the lowest electricity rate in force, before considering the financial support available to these systems. Similarly, a range of systems have costs that exceed the average effective electricity tariff.

Figure ES 3: Residential rooftop solar PV LCOE ranges in California by city and cost of capital compared to electricity rates, Q2 2016



Electricity rates ranges

San Francisco: E6, Tier 1, summer, 'off-peak' to 'peak'. Los Angeles: TOU R-1B, high season, 'base' to 'high peak'.
San Diego: DR-SES, Summer, 'off-peak' to 'on-peak'. San Bernardino: TOU-D-T, summer, level I, 'off-peak' to 'on-peak'

Source: IRENA analysis based on CEC and CPUC, 2016a; EuPD Research, 2017a.

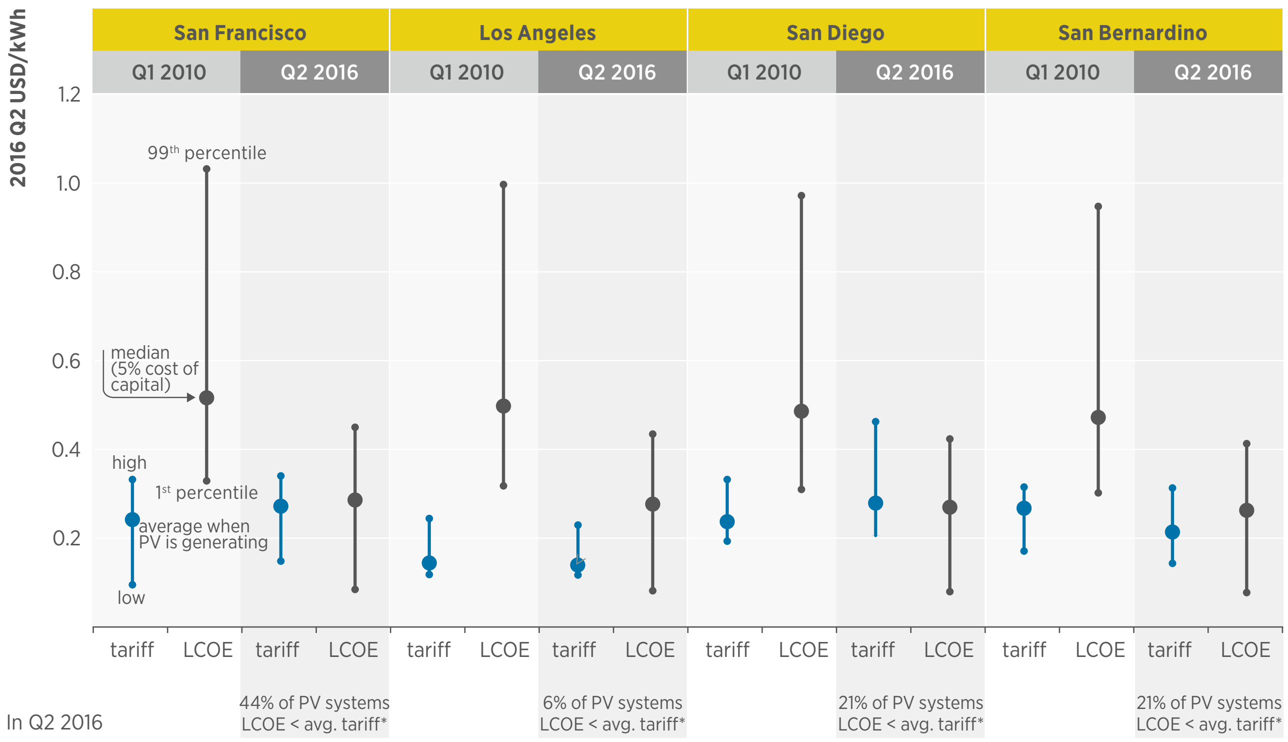
This highlights the importance for solar PV, and for renewables in general, of examining the full range of costs in order to identify the spread of projects or systems which are competitive. It also clearly shows the importance of having data on actual costs in the solar PV segment and market being examined. Without these data there is a real risk of an oversimplified conclusion about the relative competitiveness of solar PV for individual investors and also for policy makers considering how to design solar PV support policies.

In California's large metropolitan areas, rooftop residential solar PV systems are a potentially economic investment, even without financial support. This is due to the state's relatively high and complicated time-of-use tariffs.[9]

Utilities in the analysed locations in California all offer schedules that provide electricity at different prices depending on the time that the electricity is used and also sometimes depending on the level of consumption, day and time of year. These are known as TOU (time-of-use) rates. The simulated effective electricity tariff when solar PV is generating increased between Q1 2010 and Q2 2016 in three out of the four metropolitan areas as electricity tariffs rose (Figure ES 4).[10]

9 Data on the share of consumers on different tariff structures are not readily available, so the results are even more nuanced than is presented here.
10 The average electricity tariff for the month will typically be lower than this measure of the electricity tariff while solar PV is generating, because solar PV generation profiles overlap the peak tariff hours to a larger extent than consumption.

Figure ES 4: Residential rooftop solar PV LCOE trends in California by city compared to average effective electricity rates, Q1 2010 and Q2 2016



Source: IRENA analysis based on CEC and CPUC, 2016a; LADWP, 2016; PG&E, 2016; SDG&E, 2016; SCE, 2016.

* These percentages show the share of residential PV systems at the aggregated state level from data sample for California that yield LCOEs above the average electrical tariff in each of the displayed locations. It may differ from the share at the specific location level.

Taking into account the wide range of installed costs of solar PV in California, in Q2 2016 57% of residential solar PV systems in San Diego had an LCOE below the average effective electricity rate. This share was 44% in San Francisco, 21% in San Bernardino and 6% in Los Angeles. This does not include the financial support policies available to these systems. Factoring in this support (notably the federal investment tax credit) would significantly raise these percentages.

In San Francisco the median LCOE has fallen from USD 0.27 per kilowatt-hour (kWh) higher than the average effective electricity tariff in Q1 2010 to just USD 0.01/kWh in Q2 2016 (a 96% reduction in the gap).

In Los Angeles, from Q1 2010 to Q2 2016 the median LCOE gap over the average effective electricity tariff has fallen from USD 0.35/kWh in Q1 2010 to USD 0.14/kWh in Q2 2016 (a 62% reduction). In San Diego the median LCOE fell below the average effective electricity tariff in Q1 2015 and is USD 0.01/kWh (3%) lower than the average effective electricity tariff. In San Bernardino, the median LCOE of residential PV's differential with the estimated average electricity price has dropped from USD 0.21/kWh in Q1 2010 to USD 0.05/kWh in Q2 2016 (a 77% reduction).

Germany has one of the most competitive small-scale solar PV markets in the world, with very low installed costs offsetting the country's relatively limited sunshine. Rooftop PV power, which cost at least 75% more than average residential electricity prices in early 2010, has fallen in just over six years to at least 27% cheaper than the average residential electricity tariff.

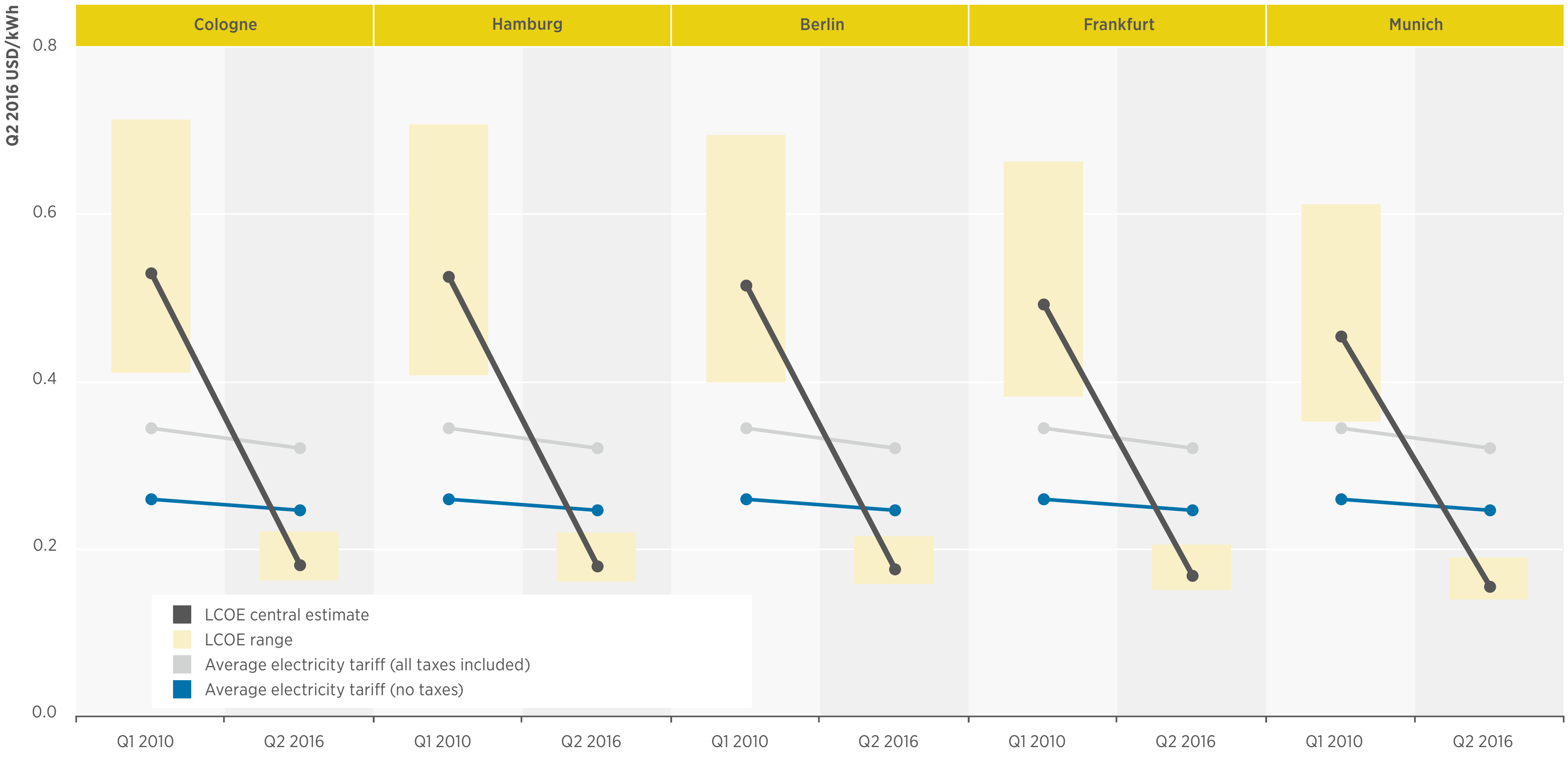
The median LCOE estimates in the German cities evaluated were in the range of USD 0.45 to USD 0.53/kWh in Q1 2010 (Figure ES 5), but had fallen to between USD 0.16 and USD 0.18/kWh during the second quarter of 2016 (an average 66% reduction). In Cologne, the LCOE range of residential PV systems, based on high and low installed cost estimates[11], decreased from USD 0.41 to 0.71/kWh in Q1 2010 to between USD 0.16 and USD 0.22/kWh during Q2 2016, while the central estimate decreased from USD 0.53 to USD 0.18/kWh. Similar results have been obtained for Hamburg,[12] while the residential PV LCOE range in Berlin decreased from between USD 0.40 and 0.69/kWh in Q1 2010 to between USD 0.16 and USD 0.22/kWh during Q2 2016.

11 Ranges are calculated using the first and ninety-ninth percentile of the evaluated installed costs time series.

12 Future editions of these indicators may incorporate region-specific installed cost estimates, rather than using the national range of costs. This will require the development of a model to estimate total installed costs by region in Germany, as the raw installed cost data for each quarter and each region is more or less statistically representative given different volumes of survey response rates in different quarters and regions.

With the highest irradiation of the evaluated German locations, Munich has the lowest PV LCOE levels, and the residential PV LCOE central estimate there has been calculated at USD 0.16/kWh during Q2 2016, with a range of between USD 0.14 and USD 0.19/kWh. In all locations, the LCOE ranges during Q2 2016 are below the electricity tariffs (even when the tax components are excluded).

Figure ES 5: Residential rooftop solar PV LCOE trends in Germany by city compared to average effective electricity rates, Q1 2010 to Q2 2016

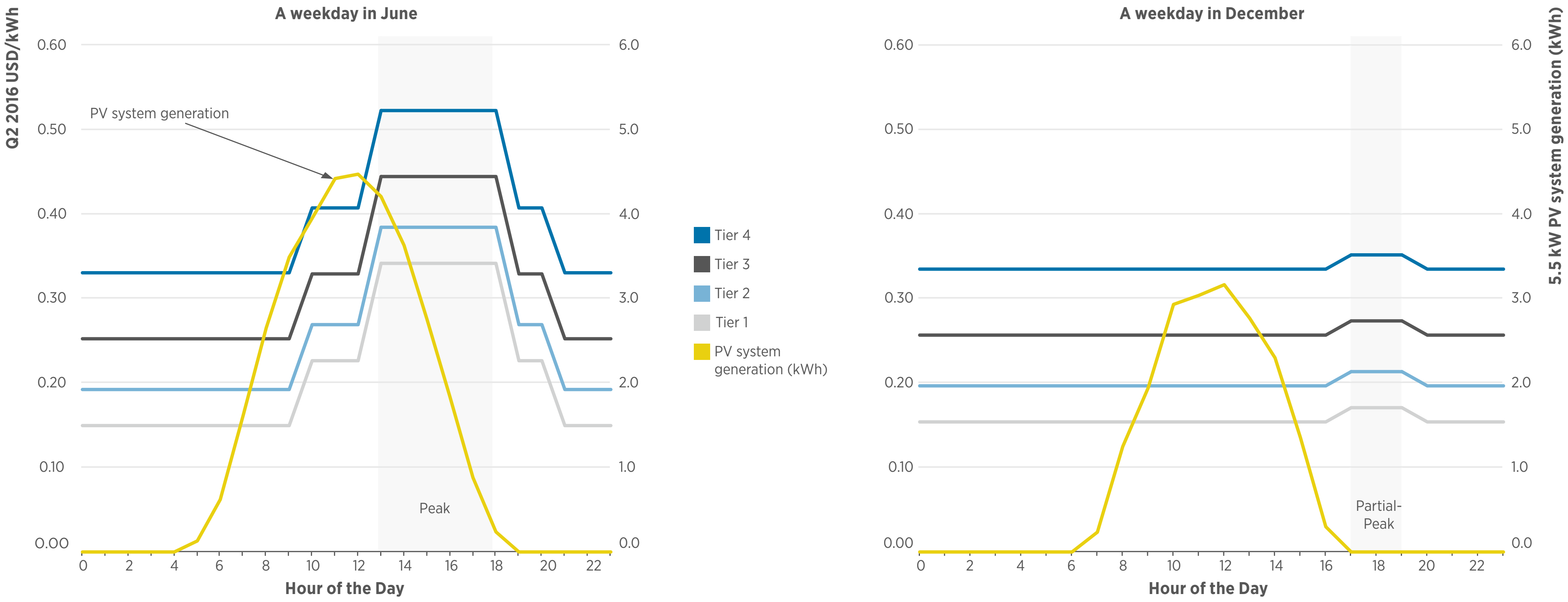


Source: IRENA analysis based on EuPD Research, 2017a ; BDEW, 2016a.

Time-of-use rate schedules can highlight the value of solar PV to the electricity system as a whole. However, if these are too complex, they can reduce overall market transparency about the economics of distributed generation and energy efficiency options.

Figure ES 6 highlights for San Francisco (on PG&E's residential schedule E-6[13]) that the higher summer electricity rates correspond well with high irradiation months and the overlap with the daily PV production profile. It also shows the higher electricity rates in effect as electricity consumption increases and shifts the householder into higher rate "tiers" (also called blocks). Most TOU schedules in California have an increasing charge per unit of energy as the consumption of energy increases above a set tier, but they also change according to season and can differ during weekends and public holidays. These rate structures can quickly become very complex.

Figure ES 6: Electricity rates by tier and PV generation profile in a weekday in June (left) and in December (right) in San Francisco, schedule E-6 (as of Q2 2016)



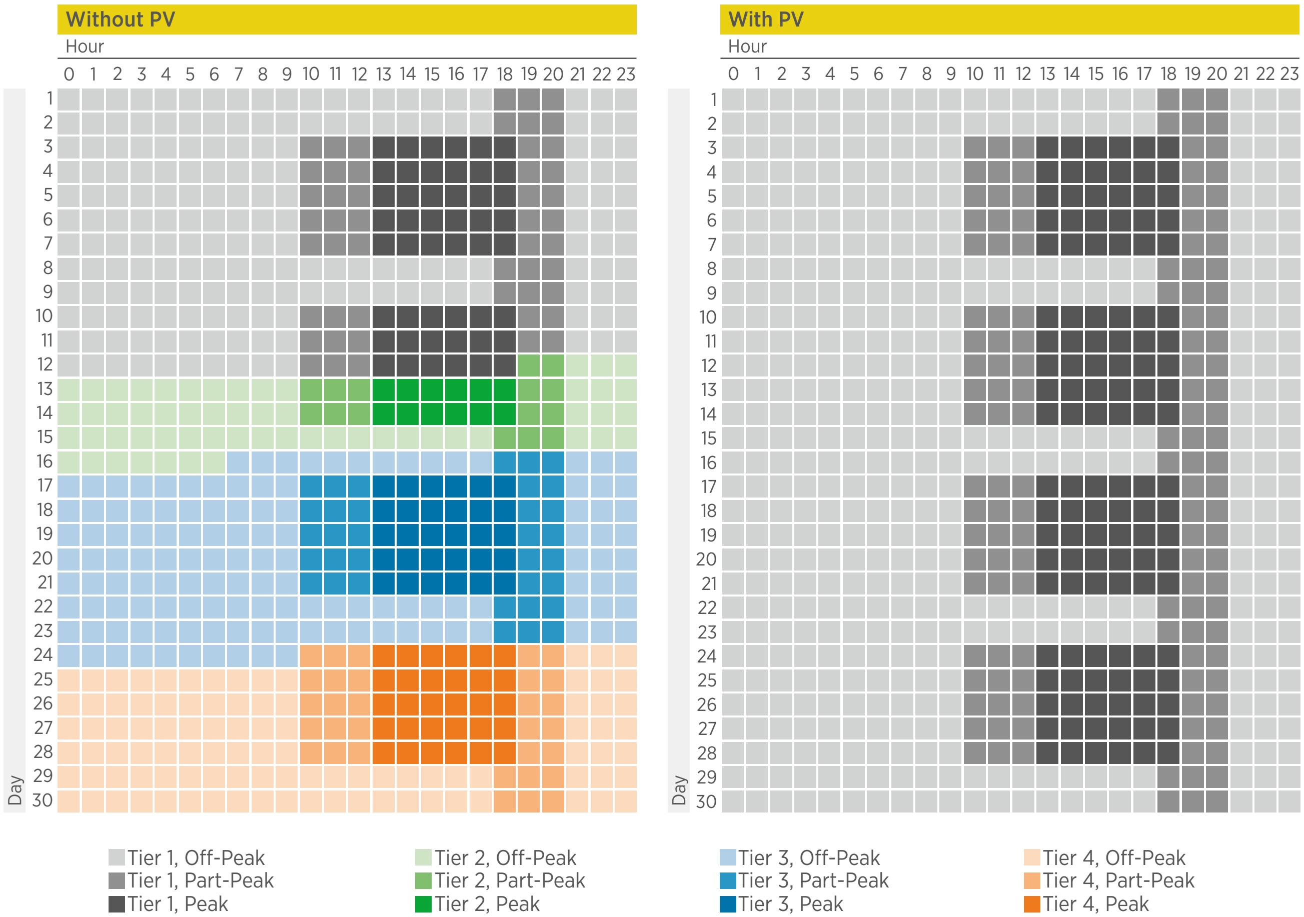
Source: IRENA analysis based on PG&E, 2016.

13 The E-6 schedule is a TOU schedule that varies by location, time of day, monthly consumption, season and day of the week. The E-6 was closed to new customers on 31 May 2016 (although enrolled customers can remain grandfathered if they wish), and a new simpler two-tier rate structure was introduced.

Detailed modelling has been conducted for California in each metropolitan area examined to ensure that the electricity rate that would be in force during the solar PV system operation is accurately captured. The calculation of the effective tariff in force when the solar PV system is generating has been calculated by mapping the hourly output of the PV system to TOU tariff rates over each hour in a year. Such an approach can lead to a better understanding of the value that PV-generated electricity can provide to households under a TOU electric plan (although examining specific economic benefits at the individual household level is beyond the scope of this report).

Under these TOU rate structures in place in California, the benefits of solar PV systems can go beyond the effective electricity tariff, as the solar PV system reduces a household's exposure to the higher-tier rates based on the monthly net consumption tier or block that the household falls under. As an example, Figure ES 7 highlights for San Francisco and PG&E's residential schedule E-6 the impact of solar PV on shifting the monthly electricity consumption from the higher tiers in the tariff rates. Instead of more than half of the month's hourly rates being in tiers 2 to 4, a household with solar PV would remain on the lower, tier 1, rates throughout the month due to the reduction in their net demand.

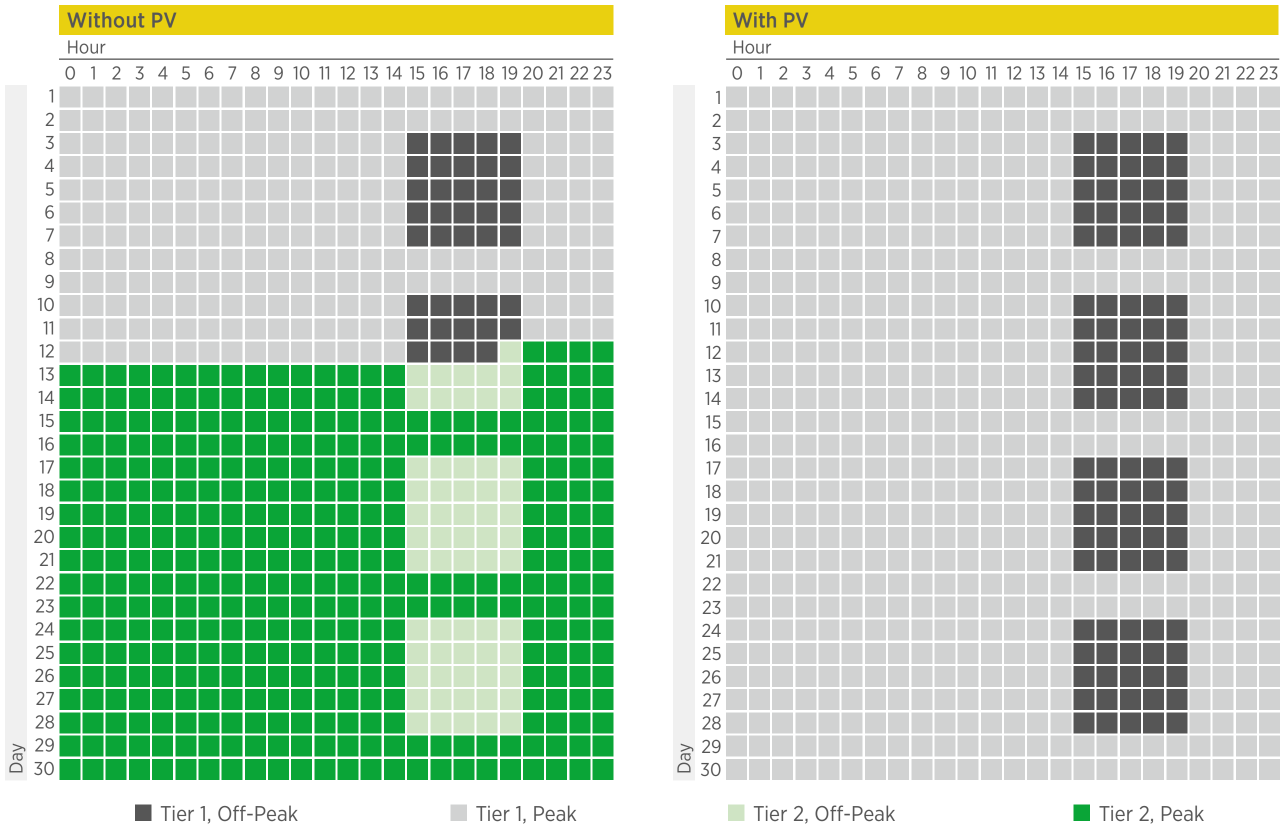
Figure ES 7: Quantity of hours by tier and TOU perid in June in San Francisco (schedule E-6) for a modelled household based on net consumption without (left) and with (right) a solar PV system, Q2 2016



Source: IRENA analysis based on PG&E, 2016.

In line with the "Residential Rate Reform" progress in California, new TOU schedules with simpler structures have been introduced. Starting in Q1 2016 this report also analyses PG&E's schedule E-TOU (option A) for San Francisco. In its option A, this schedule can be interpreted as having two tiers. This is a more simplified structure than the five-tier structure of the standard E-6 schedule. Schedule E-TOU option A also defines only two TOU periods (peak[14] and off-peak) as opposed to the three-period structure of the standard schedule E-6. Figure ES 8 shows that in this case, too, (for the example of June in San Francisco) the tiers and higher charges are avoided when a PV system is assumed.

Figure ES 8: Quantity of hours by tier and TOU period in June without (left) and with (right) a solar PV system on PG&E's residential schedule E-TOU (option A)



Source: IRENA based on PG&E, 2016.

Given that the IRENA indicators are not designed to analyse the financial benefits to individual consumers, the impact of shifting consumption into lower consumption tiers is not analysed in this report.[15] However, it serves to highlight how the complexity of the TOU rate structures can make calculating the benefit of solar PV to individual households extremely challenging.

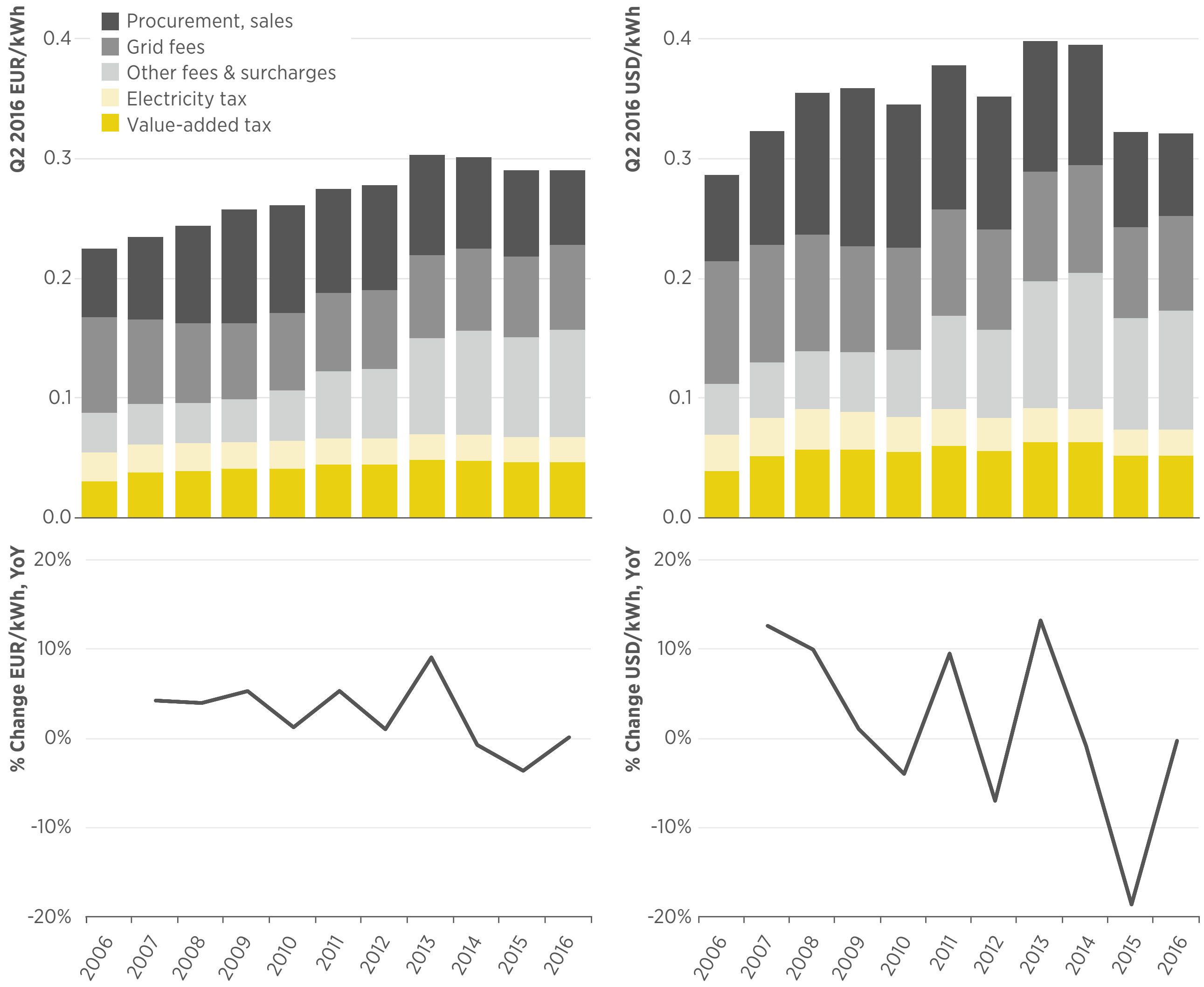
This complexity, which reduces the transparency of the economic benefits of solar PV systems, can act as a barrier to the uptake or solar PV systems without sufficient education and information programmes, as well as simple-to-use analytical tools, that can make these calculations accessible and understandable to the average household. It also can shift the share of benefits from households to others in the value chain that have better information, potentially reducing the support for ongoing programmes. In line with the Residential Rate Reform progress in California, new TOU schedules with simpler structures have been introduced to make costs more transparent to consumers.

14 During the summer season, the Peak Period in schedule E-TOU runs from 3 p.m. to 8 p.m. (for E-6 it runs from 1 p.m. to 7 p.m.). Other TOU definitions also vary.
15 Future editions of the IC&CI may look at the order of magnitude of these impacts for a hypothetical household, but even this type of detailed analysis can serve only as an indicator of the order of magnitude of the potential benefit.

In contrast to California, where TOU schedules are common, Germany has a simple electricity tariff that is essentially fixed over the year. Germany has some of the highest residential electricity prices in Europe, with an average of around EUR 0.29/kWh including all taxes and levies. Much of this is due to the level of taxes and levies borne by residential consumers.

This highlights a significant difference in the support policies for the energy transition in Germany and California. In Germany, the cost of supporting the accelerated deployment of renewable energy technologies is shared by most electricity consumers.[16] In contrast, in California the direct financial support is funded through taxation, at either a federal or state level. The German Association of Energy and Water Industries (*Bundesverband der Energie- und Wasserwirtschaft* – BDEW) data in Figure ES 9 show the federal weighted average rates (excluding "special" tariffs such as "green electricity tariffs", "heating tariffs", etc.). Some of the cost components vary by region according to local tariffs and specific grid areas, but unlike in the US, the variation is not large (typically in the order of 10%).

Figure ES 9: Household electricity prices in Germany by cost groups and year-on-year percentage change, 2006–2016



Source: IRENA analysis based on BDEW, 2016a.

16 The main exemptions are for medium-to-large industrial consumers that compete in international markets and whose competitiveness would be adversely affected by paying the EEG levy.

Although a detailed analysis of electricity price structures in Germany is beyond the scope of this report, Figure ES 9 shows the key cost groups in recent years, expressed in both real Q2 2016 EUR and real Q2 2016 USD per kWh, along with the year-on-year percentage changes for each. In real terms, electricity rates experienced by residential consumers (e.g., in EUR) peaked in 2013. In real Q2 2016 EUR terms, the electricity price (all taxes and levies inclusive) grew from EUR 0.23/kWh in 2006 to EUR 0.30/kWh in 2013, before declining to EU 0.29/kWh in 2016. The volatility of the USD/EUR exchange rate is readily visible when comparing the electricity prices in USD and EUR, notably the weakening of the Euro in 2015.

Although the electricity tariff rates faced by residential households in Germany are simple to understand, a myriad of cost components are in the "other fees and surcharges" grouping. In terms of contribution to the total electricity rate, the largest cost components within the "other fees and surcharges" group in 2016 are the "EEG surcharge" and the "concession levy" (5% of the total electricity tariff in 2006, 22% in 2016) and the "concession levy" (9% of the total electricity rate in 2009, 6% in 2016). The EEG surcharge (*EEG Umlage*) covers the costs of the support schemes for the programmes using a feed-in tariff, while the concession levy (*Konzessionsabgabe*) pays for the use of public rights of way (this money is paid by grid operators to municipalities).

Among all "other fees and surcharges" cost categories, the EEG surcharge changed the most between 2006 and 2016, increasing more than four-fold in that period. In real terms, the absolute EEG surcharge increased by EUR 0.05/kWh (USD 0.06/kWh) from EUR 0.01/kWh to EUR 0.06/kWh between 2006 and 2016. Recent projections estimate that the EEG surcharge will increase by slightly less than EUR 0.01/kWh up until 2022 to reach EUR 0.07/kWh, after which it will start to decrease and fall to EUR 0.05/kWh in 2030 (Agora, 2016).

ABBREVIATIONS

°C	Degrees Celsius
AC	Alternating current
BDEW	*Bundesverband der Energie- und Wasserwirtschaft* (German Association of Energy and Water Industries)
CA	California
CAISO	California Independent System Operator
CHP	Combined heat and power
CPUC	California Public Utilities Commission
CEC	California Energy Commission
CSI	California Solar Initiative
CSS	California Solar Statistics
DC	Direct current
DR-SES	Domestic time-of-use schedule for households with a solar energy system offered by SDG&E
DSO	Distribution system operator
E-6	Residential time-of-use electric schedule offered by PG&E (three different time periods and tiered pricing)
EEG	*Erneurbare-Energien-Gesetz* (German Renewable Energy Act)
E-TOU	Residential time-of-use electric schedule offered by PG&E (two different time periods and baseline credit)
EUR	Euro
FIT	Feed-in tariff
GW	Gigawatt
IITC	IRENA Innovation and Technology Centre
kW	Kilowatt
kWh	Kilowatt-hour
KWK-G	Combined Heat and Power Act (Germany)
LADWP	Los Angeles Department of Water and Power
LCOE	Levelised cost of electricity
NEM	Net energy metering
NREL	National Renewable Energy Laboratory (US)
O&M	Operations and maintenance
PG&E	Pacific Gas and Electric Company
PV	Photovoltaic
IC&CI	IRENA Cost and Competitiveness Indicators
R-1B	Residential time-of-use rate schedule offered by LADWP (three different time periods and associated pricing)
SAM	System Advisor Model (SAM), NREL
SCE	Southern California Edison
SDG&E	San Diego Gas & Electric
TOU	Time-of-use
TOU-D	Time-of-use domestic tiered rate schedule offered by SCE (three different time periods and associated pricing)
TOU-D-T	Time-of-use domestic tiered rate schedule offered by SCE (two time periods and four different pricing levels)
TSO	Transmission system operator
US	United States
USD	United States dollars
VAT	Value-added tax

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| About IRENA

The International Renewable Energy Agency (IRENA) is an intergovernmental organisation that supports countries in their transition to a sustainable energy future, and serves as the principal platform for international cooperation, a centre of excellence, and a repository of policy, technology, resource and financial knowledge on renewable energy. IRENA promotes the widespread adoption and sustainable use of all forms of renewable energy, including bioenergy, geothermal, hydropower, ocean, solar and wind energy, in the pursuit of sustainable development, energy access, energy security and low-carbon economic growth and prosperity. www.irena.org

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