European Solar ABS: Potential to Support Green Transition?

Asset-backed securities (ABS) based on solar photovoltaic (PV) panel financing collateral has been a growing part of the securitisation market in the United States for the past seven years, accounting for USD 8.6 billion issued in 2022 alone. This contrasts with Europe, where the securitisation market has yet to become a source of capital funding for the expansion of rooftop solar PV lending. In KBRA's view, the securitisation market could offer a vital source to recycle funds into new lending as the European Union (EU) targets an ambitious expansion of rooftop solar PV installations. In this report, KBRA explains some of the market dynamics, how the product is structured in the US, and how the European market may develop in the future.

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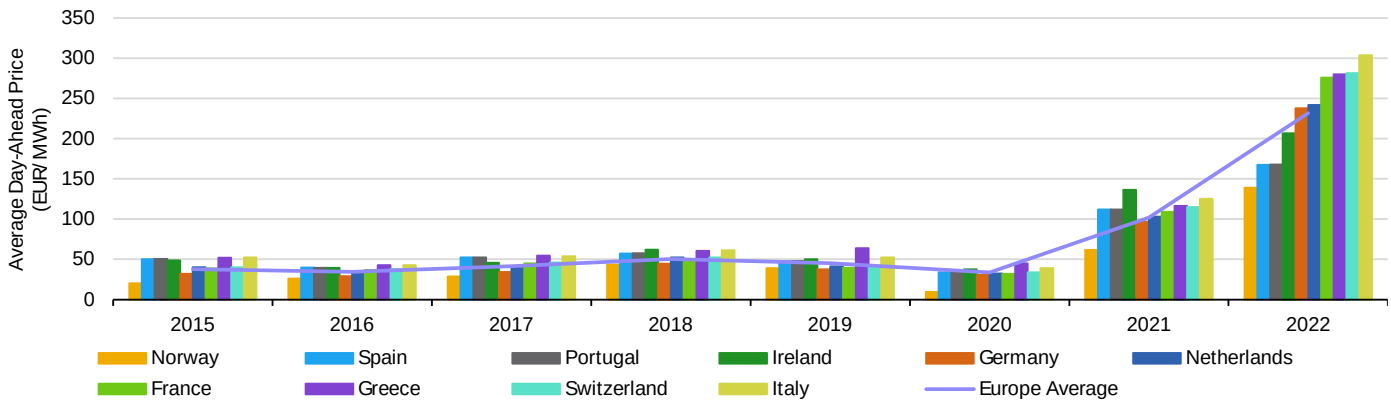
Key Takeaways

- Solar PV energy production is a key part of a transition to renewables and the EU's energy security roadmap.
- The EU could potentially produce up to 680 terawatts per hour (TWh) of solar electricity annually from solar PVs on rooftops, representing almost 25% of current electricity consumption.
- The US solar ABS market increased to USD8.6 billion issued in 2022 from USD1.4 billion in 2016, supporting the expansion of solar PV adoption with capital market funding of over USD27 billion.
- The EU's 2030 solar generation targets will require significant funding, of which solar ABS securitisation could offer support.

Energy Security and Increased Cost to Support Transition

Energy prices have since declined from their peak levels, but remain elevated in historical terms. High energy prices, in KBRA's view, supports the expansion of renewable energy projects as it shortens the payback time required for the upfront installation costs. Electricity wholesale prices in Europe reached a peak in August 2022 with day-ahead prices of over EUR500 per megawatt hour (MWh). Depending on the country, average prices during 2022 ranged from EUR139/MWh (Norway) to EUR304/MWh (Italy) (see Figure 1). Broadly, electricity prices have more than doubled over 2021 levels, which had already more than doubled versus historical levels between 2015 and 2020. This increased cost of electricity should support the economic incentive to increase solar PV installation. In addition, there is a drive to improve energy security in the wake of the impact of the Russia-Ukraine war, including using energy supplies as political leverage.

Figure 1: Average Daily Energy Prices Across Europe

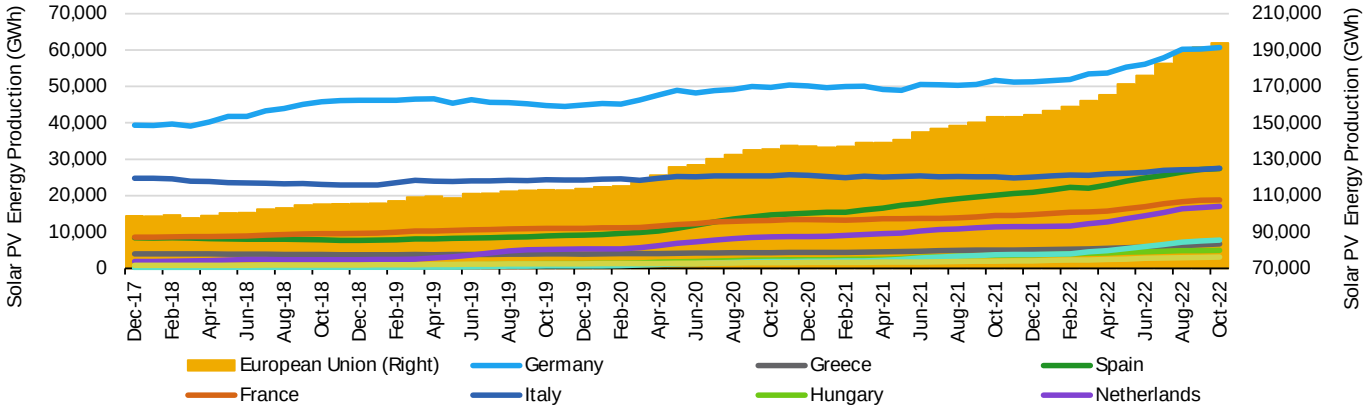


Source: EMBER

Solar Adoption Grows

The uptake and growth of solar PV technologies varies across different European countries. For example, Italy has historically shown a high level of solar adoption, producing 24,811GWh in December 2017 and rising to 27,492GWh on a rolling 12-month basis as of October 2022. In contrast, the Netherlands has gone from 1,878GWh in December 2017 to reach 17,039GWh as of October 2022. Meanwhile, the cumulative increase across the EU totalled 193,879GWh compared to 98,950GWh during the same period (see Figure 2).

Figure 2: Solar Energy Production on a Rolling 12-Month Basis, Dec 2017-Oct 2022

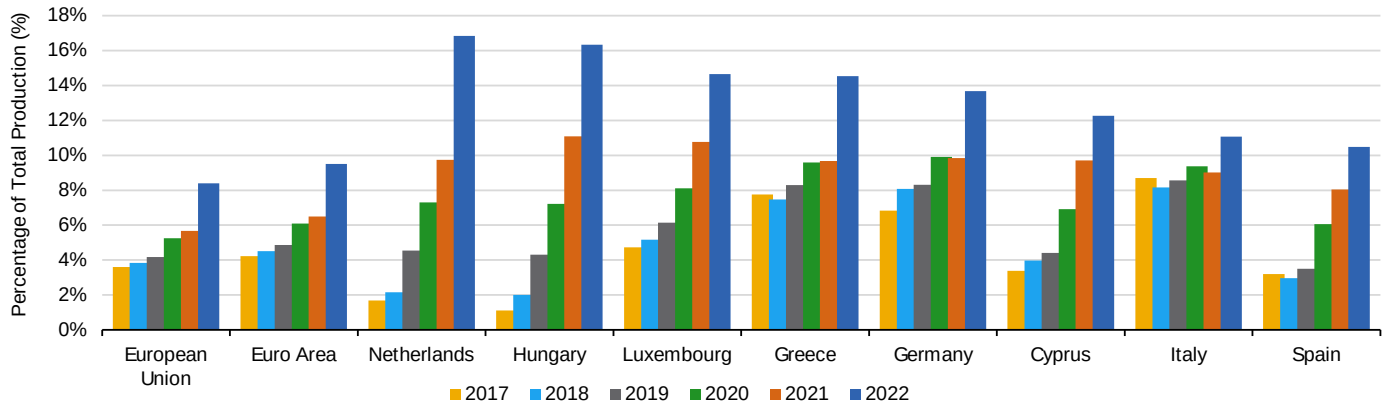


Source: Eurostat

Solar Generation Gains Larger Share of Energy Mix

Solar PV generation as a percentage of electricity generation across the EU trended higher to reach 8.4% in 2022 versus 3.6% in 2017. On a country basis, the Netherlands is Europe's largest solar energy producer at 16.8%, followed by Hungary (16.3%), Luxembourg (14.7%), Greece (14.5%), and Germany (13.7%) (see Figure 3).

Figure 3: Solar Generation as a Percentage of Total Production, Jan 2017-Oct 2022



Source: Eurostat

EU Push to Increase Rooftop Solar Adoption

Russia's invasion of Ukraine on February 24, 2022, helped to highlight the EU's high energy dependency—it imports over 60% of its energy needs from external countries, and much of this comes from Russia.[1] Primary energy production in the EU decreased between 2010 and 2020, partly because of the bloc's energy decarbonization efforts (see The Russia-Ukraine Conflict and Europe's Energy Dependency). Further, more than one-half of the EU's overall current energy supply comes from nonmember countries. In 2020, renewable energy sources accounted for around 40% of the EU's total production, followed by nuclear energy (30.5%).[2] In fact, during the 2010-2020 period, the production from renewable energy was the only source of energy to have increased (39.2%).

In order to reduce its reliance on Russian energy supplies, the European Commission introduced its REPowerEU plan on 18 May 2022. Under the EU solar energy strategy adopted, the Commission aims to increase the use of solar through its EU Solar Rooftops Initiative, one of three solar energy initiatives[3] that focuses on the expansion of rooftop solar PV panels on commercial and residential buildings.

[1] https://ec.europa.eu/eurostat/cache/infographs/energy/bloc-2c.htm

[2] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_production_and_imports

[3] https://energy.ec.europa.eu/topics/renewable-energy/solar-energy_en

According to a Commission-sponsored scientific study,[4] rooftop solar PV could potentially produce 680TWh of solar electricity annually, representing nearly 25% of current EU electricity consumption. The EU initiative seeks to address:

- An increase in renewables generation to 45% versus the previous 40% target by 2030.
- Limit the length of permitting for installations to a maximum of three months.
- Adopt provisions to ensure that all new buildings are "solar ready."
- Introduce compulsory installation of rooftop solar PV on new public and commercial buildings over 250m^2 by 2026, existing buildings by 2027, and new residential buildings by 2029.
- Allow consumers in multi-apartment buildings the right to access the solar energy generated without undue costs.

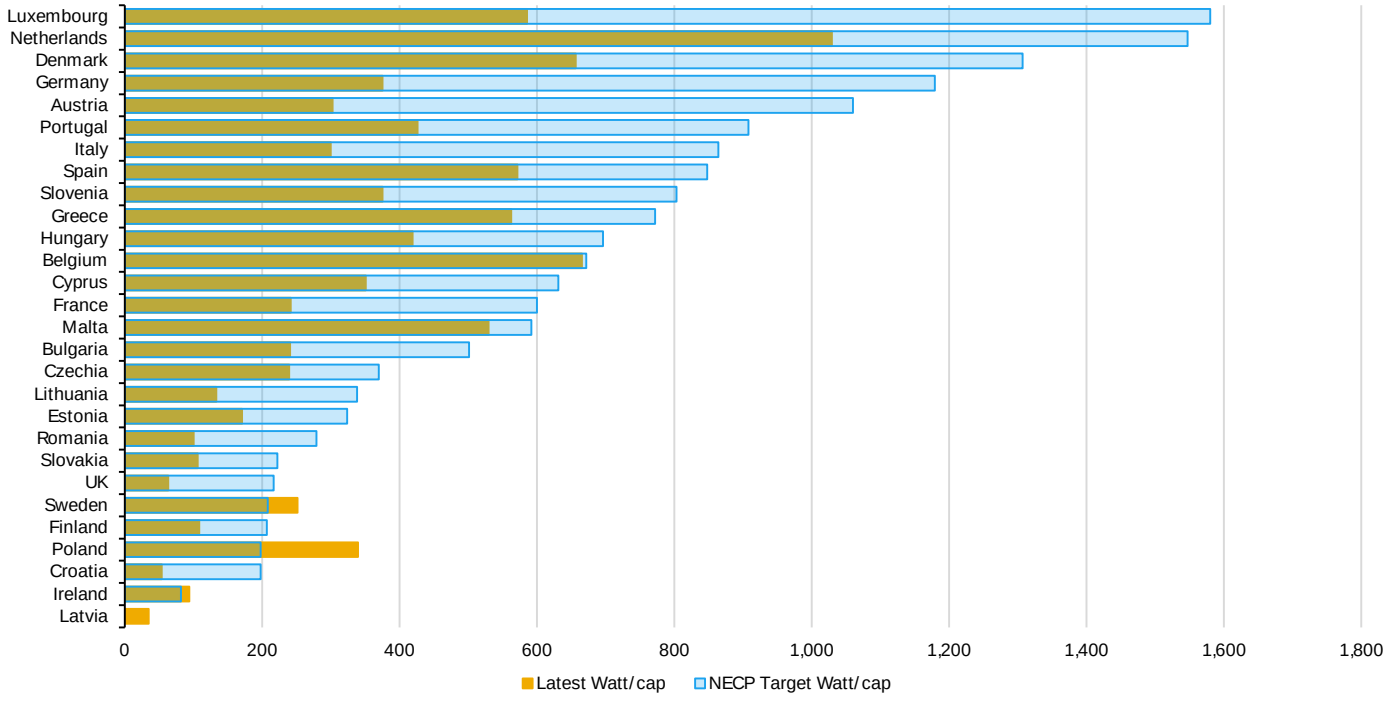
The goal is to bring over 320GW and 600GW of solar PV online by 2025 and 2030, respectively. This should add 58TWh of electricity generation by 2025. In 2022, the top 10 EU countries for solar installations added a combined 36GW. Of this list, Germany accounted for 7.9GW, Spain (7.5GW), Poland (4.9GW), the Netherlands (4GW), France (2.7GW), Italy (2.6GW), and Portugal (2.5GW).

As the region looks towards reducing its overall carbon emissions, each country is required to publish a 10-year national energy and climate plan (NECP) to meet the EU's energy and climate targets for 2030. The NECPs include energy efficiency, greenhouse gas emissions, grid interconnections, research and innovation, as well as targets for the expansion of the use of renewables. Further, as part of NECPs, countries have detailed targets for solar PV.

The most ambitious country in terms of planned solar energy generation is Germany, which targets installed capacity of 215GW (recently increased by 15GW in April 2022) by 2030. This figure is roughly equivalent to the country's total overall installed power generation capacity (217GW) in 2020. Germany reached a total of 65GW of solar capacity by the end of 2022, which represents 28.8% of the 225GW of total installed electric capacity. Italy has the next highest target at 71.2GW of solar capacity, followed by the UK (50GW), and both Spain and France at 40GW.

However, while these numbers are significant, most important is the ability of households, businesses, and individuals to benefit from renewable electricity generation. Therefore, it is useful to look at the installed capacity on a per capita basis. On this basis, the most ambitious countries are the Netherlands, which aims to achieve 1,547W/capita, Denmark (1,307W/capita), Germany (1,179W/capita), and Austria (1,060W/capita) (see Figure 4).

Figure 4: Country Level Solar NECPs and 2022 Installed Capacity Watt/Capita



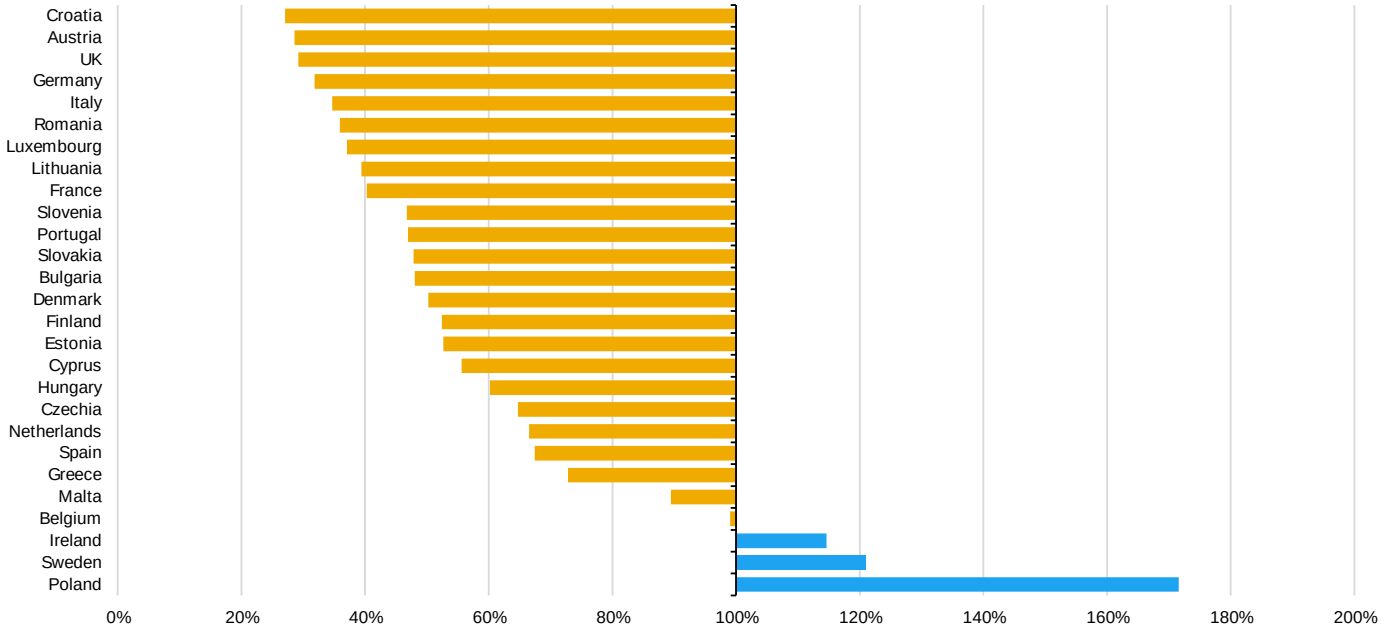
Sources: SolarPower Europe, European Commission Country NECPs, UK Government

Most countries remain well below their stated solar energy targets but the drive to increase renewable energy as a part of energy security plans should spark a push to not only meet targets earlier than planned but their expansion. Overall, EU member states' solar energy production ranges from 27% (Croatia) to 172% (Poland) of their 2030

[4] Bodis, K., Kougias, I., Jaeger-Waldau, A., Taylor, N. and Szabo, S., A high-resolution geospatial assessment of the rooftop solar photovoltaic potential in the European Union, RENEWABLE and SUSTAINABLE ENERGY REVIEWS, ISSN 1364-0321 (online), 114, 2019, p. 109309, JRC113070. https://publications.jrc.ec.europa.eu/repository/handle/JRC113070

targets. Countries with ambitious plans for high megawatt (MW) levels of solar energy generation are generally only one-third of the way to their 2030 solar NECPs—this includes Germany (32%), Austria (29%), Italy (35%), and the UK (29%). In contrast, four countries—Poland (172%), Sweden (121%), Ireland (115%), and Belgium (99%)—initially set low targets and are now well above their original goals and may look to set new plans given the events of the past year (see Figure 5). In Latvia's case, the country did not set a target but has seen growth in solar PVs.

Figure 5: Distance From Solar NECP Target



Note: Latvia is excluded as it does not have an explicit NECP target for solar.
Sources: SolarPower Europe, European Commission Country NECPs, UK Government

European Adoption

Businesses and higher-income households have historically been the early adopters of rooftop solar as they have available funds to support the upfront installation costs before recouping their initial investment with lower energy bills. In order for EU countries to meet NECP targets, additional financing options are needed. Some countries have historically provided support to assist in the transition, including feed-in-tariff subsidies, VAT tax breaks, grants, and more. However, in order to increase the widescale adoption of solar rooftops, financing will be needed to assist the conversion of older residential and commercial properties to generate and use solar rooftop energy. The US solar ABS securitisation market could provide a blueprint in this area as it has proven to be a supportive factor in the growth of this market.

US Solar Activity

In the U.S., solar PV has experienced an average annual growth rate of 33% over the past decade. Thanks to strong federal policies like the solar Investment Tax Credit, rapidly declining costs, and increasing demand across the private and public sector for clean electricity, the country has more than 135GW of solar capacity installed nationwide as of Q3 2022, which is enough to power over 23 million homes.

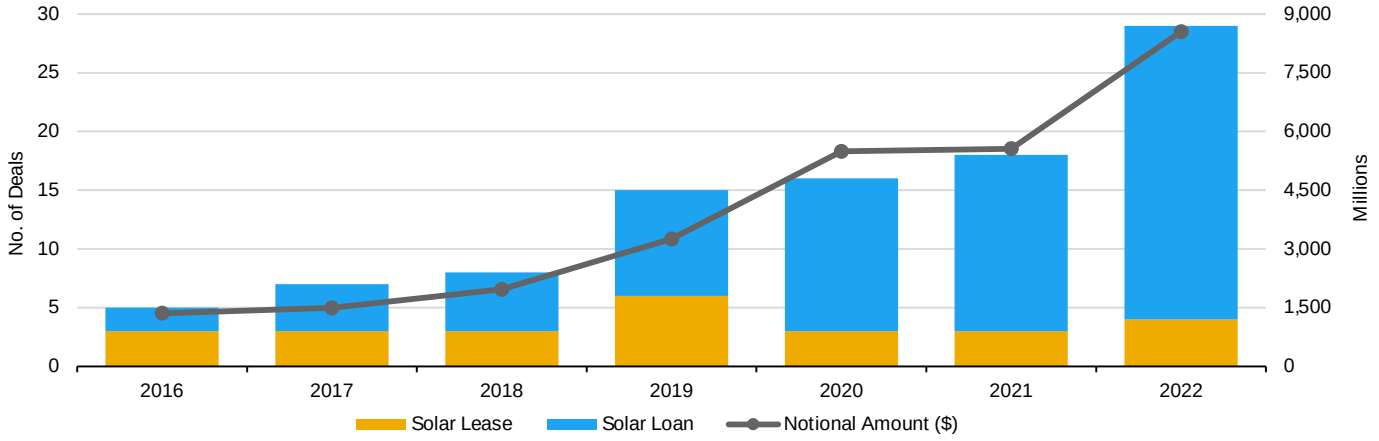
According to a Solar Energy Industries Association study, the U.S. solar market installed a record 23.6GW of solar capacity in 2021, up 19% from 2020. This includes residential, nonresidential, and utility solar installations. Residential installment was up 30% from 2020, reaching a record 4.2GW. In fact, 2021 was the fifth consecutive year of record growth. The average residential solar installation is approximately 5kW. As a result, every 1GW of installed capacity is approximately equal to solar panels on 200,000 households. Residential customers continue to be motivated by rising household electricity bills brought on by rising gas prices.

US Solar ABS Issuance

KBRA has rated 98 solar ABS transactions as of year-end 2022, totalling over USD27 billion which includes:

- 25 solar lease transactions (USD6.7 billion)
- 73 solar loan transactions (USD21 billion), each of which are described further below.

Figure 6: KBRA-Rated Solar Transactions



Source: KBRA

In addition, KBRA has rated transactions in the following related sectors:

- 31 residential PACE transactions (USD6 billion)
- 40 solar project finance transactions (USD10 billion), including three in Europe.

Solar Collateral

There are some unique features/concepts associated with solar collateral such as:

- Technology of solar panels
  - The reliability of solar panels and their energy efficiency, the level of deterioration in performance over time, and the cost and timing of their replacement.
- Contracts and agreements
  - Structure of the contracts, any elements within the loan or lease unique to solar agreements, and potential penalties for noncompliance.
- Market participants
  - Business models of the entities within a transaction, the underwriting practices of the lender or lessor, and the potential for consolidation of the market.
- Regulations
  - State laws that may impact the product, loans, and leases. In addition, the tax structure of the financing and potential incentives, as well as the relevant judicial process and the impact on financing.

US Solar Loan Versus Lease

The purchase of solar equipment in the U.S. is financed through either a solar loan or through power purchase agreements (PPAs) and leases. Under a solar loan, the customer is borrowing for the purpose of purchasing a residential solar energy system, installation, and permitting and in some cases additional products such as solar storage systems or EV charging stations. The loan is typically secured by the solar energy system through a legal filing of a claim against these assets. Under solar lease and PPA transactions, the leasing company retains ownership of the solar equipment and leases it to the homeowners.

Lease contracts require a flat payment each period, regardless of production during that period. To protect the customer against significant deterioration in production, lease contracts have performance guarantee provisions. These require the originator to compensate the customer in the event that production is below the guaranteed amount at a predetermined rate per kWh. Under a PPA, the customer pays for the power produced by the PV system during that period at a predetermined per kWh rate (subject to an annual escalator in many instances).

US Solar ABS Performance

KBRA publishes a monthly solar loan ABS index, which is widely tracked by the market in the U.S. The solar loan index includes credit performance metrics from all U.S. publicly rated securitised solar loan collateral pools and is weighted by each collateral pool's outstanding balance at the end of each month. The indices are calculated based on the performance data available in that month. New transactions are added as they are issued, after an initial seasoning period of six months, while older transactions season and generally reduce in size.

The latest KBRA US Solar Loan Index shows that delinquencies over the past year are increasing as US homeowners face challenging times with increased living costs and higher interest rates. However, they have yet to surpass their prior peak levels from 2019 and 2020. As of January 2023, 30+ day delinquencies are elevated at 1.1%, with the 60+ day delinquency rate at 0.48% and 90+ day delinquencies at just 0.18%. Delinquencies over 30 days previously peaked at 1.1% in April 2019 (see Figure 7).

In terms of annualized net losses, they stand at an average of 1.40% in December 2022, an increase over prior-year levels of 0.67% in January 2022. These levels are still well below their peak of 2.58% in July 2020 (see Figure 8).

Figure 7: US Solar Loan Index, Delinquencies

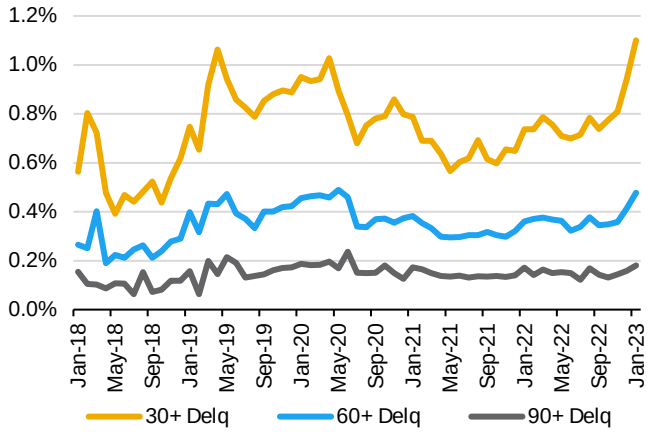
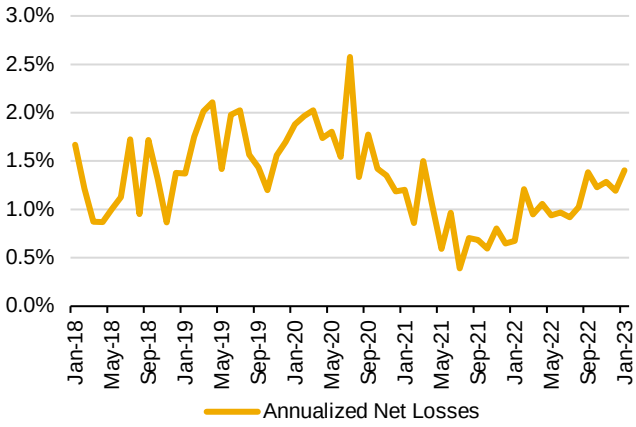


Figure 8: US Solar Loan Index, Annualised Net Losses



Source: KBRA Solar Loan Index

European Solar ABS Potential

As Europe aims to support solar PV expansion rapidly, securitisation can play a positive role in the market. The appeal of solar ABS securitisation is its ability to allow lenders to recycle funds into new lending. In the US, the asset class has grown from its infancy in 2016 to a mature and well-established asset class with a stable development in performance to date. There is an opportunity for Europe to follow a similar trajectory in developing a deep and well-functioning asset class, providing structural and efficient financing to support the increasing need for residential and commercial rooftop solar development.

The value proposition where consumers can achieve meaningful savings compared to utility bills on a monthly or lifetime basis is made more appealing by increased energy prices. Households that use solar PV systems are also at a reduced risk from volatile energy prices and can contribute to a country's energy security and independence.

Challenges Remain

Given the nascent development of solar lending in Europe, there is a need for an analysis of appropriate historical data to support assumptions around probabilities of default. This can be challenging as most lenders do not have a developed track record. Further, the loans are typically longer dated, given the nature of the proposition. This will differ across jurisdiction and originator markets.

Across Europe, while the Commission is pushing forwards the agenda of increasing rooftop solar PV adoption, the implementation will differ between EU member states. As a result, the differing regulatory environment and national incentives can impact the value proposition and cash flows. For example, differing regulations can drive the decision-making on whether to offer a lease, loan, or for a lender to avoid the market. Given the very different national markets, analysis for a solar ABS securitisation will need to take into account national regulations, consumer protections, national incentives, etc. As a result, it is most likely that a single jurisdiction transaction would be first to come to market, making it difficult for smaller markets.

The current economic backdrop is a challenge to the market with increasing affordability challenges. While elevated power prices decrease the payback timing of an installation, elevated interest rates increase the cost of what is a relatively long-term product. This may discourage adopters from taking on debt to fund the installation or decrease the rate of adoption in some markets.

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