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DE GAULLE FLEURANCE

observatory of energy transitions

Decarbonization of companies: the boom in **self-consumption**

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AVOCATS NOTAIRES

Aquereburu & Partners, AZB & Partners, Becker Büttner Held, Bpifrance, Brigard Urrutia, KiloWattsol, KMU Law Office SerenySun, Rokas Law Firm Athens Shakespeare Martineau et SiqueiraCastro

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INTRODUCTION

At a time of unprecedented rises in energy costs, increasing numbers of companies are choosing to adopt self-consumption solutions as part of their CSR strategy. The majority of these businesses are installing solar panels on their roofs or land to generate their own electricity. The fifth annual International Energy Transition Observatory, published by De Gaulle Fleurance Avocats Notaires reveals that this is a worldwide phenomenon, often driven by regulations that promote the development of renewable energies and self-consumption. Here we provide a round-up of this market trend in Germany, Brazil, Colombia, France, Greece, India, Togo, Turkey and the UK, with insights from the Observatory's contributors, including Aquereburu & Partners, AZB & Partners, Becker Büttner Held, Bpifrance, Brigard Urrutia, KiloWattsol, KMU Law Office, Rokas, SerenySun, Shakespeare Martineau and SiqueiraCastro.

Self-consumption can be either individual or collective. Individual self-consumption refers to an entity (a private individual or company) that installs a power plant (usually photovoltaic) on their own property and directly consumes the energy produced. Collective self-consumption refers to a group of people in the same area who directly consume the (usually solar) energy that they produce.

The surge in this practice is largely due to the cost of solar energy, which is expected to be the cheapest source of electricity in almost every country in the world by 2027. As a result, its contribution to global energy supply is set to reach 60% by 2060 (compared with 5% today). "The current energy crisis has created quite a shock, both for individuals and for businesses," says Xavier Daval, CEO of KiloWattsol. "Both solar energy and the notion of energy self-supply have gone from being just nice sounding concepts to being a real necessity as a hedge against skyrocketing market prices."

This same trend is evident in France, where the Arenh reform is expected to see the price of traditional electricity stabilise at €70 per MWh in 2026 (as opposed to €42 today). Industry estimates show that around 4 million homes will need to install photovoltaic power plants by 2035.

Another key driver is the development of CSR regulations, one of the aims of which is to reduce greenhouse gas emissions to achieve carbon neutrality by 2050, in line with the Paris Agreements. With this in mind, businesses are being encouraged to decarbonise their operations. Measures to encourage them to do so include tax breaks, bonuses and the ability to sell unconsumed surplus electricity at a guaranteed price, as

well as new mandatory requirements. In France, for example, regulations are gradually requiring landowners with buildings or car parks larger than 500 m2 to install photovoltaic panels on part of their surface area.

"Increasingly, owners and operators of buildings or industrial buildings/service sector facilities will choose the self-supply solution to meet their regulatory obligations," says Julien Lupion, head of the structured finance department at Bpifrance. "We are already seeing a great deal of enthusiasm about these projects."

Germany – Yola Traum, lawyer at Becker Büttner Held

Germany has been a pioneer in the development of self-consumption and has encouraged it for many years. In spring 2024, it relaxed regulations governing collective self-consumption by passing the solar energy legislative package (Solarpaket I). The scheme – previously confined strictly to use by property owners and their tenants – has now been extended to commercial buildings and ancillary structures such as garages.

Greece – Mira Todorovic Symeonides, Partner and Panagiota Maragkozoglou, Associate at Rokas Law Firm Athens

In Greece, self-consumption incentives are generous. With a budget of 238 million euros, subsidies for installations (up to 10.8 kW) amount to 65% for households and 40% for farmers, while subsidies for storage batteries (up to 50 kWh) range from 90% to 100%. With an additional budget of 30 million euros, farmers receive a subsidy covering 30% of the installation cost (up to 50 kWh). Furthermore, small and medium-sized enterprises or self-employed individuals who equip themselves are allowed to deduct twice the cost of their investment from their gross income.

Brazil – Humberto Negrão, partner at SiqueiraCastro

Brazil has two main self-consumption schemes. The first relates to projects generating less than 5 MW, where renewable energy producers still have to buy electricity from a distribution company, but at a discounted rate. Similar to the Value of Solar system frequently used in the United States, these self-suppliers will also soon be eligible for a bonus that recognises the positive externalities of their installation. The second self-consumption scheme applies to users with a monthly consumption of more than 500 kW who use the energy produced by a power plant owned by an independent electricity producer. They benefit from certain reductions in sector-specific charges that they lose when they want to sell their surplus electricity.

Colombia – Claudia Navarro Acevedo, partner at Brigard Urrutia

The Colombian government encourages projects that promote the self-consumption of electricity, through tax breaks, the option to sell surplus energy and government funding. Renewable energy projects attract the most support. Only individual self-consumption currently exists. However, regulations on collective self-consumption, in the form of energy communities, are expected to be introduced in 2024.

France – Sylvie Perrin, Frédéric Paquet, partners, Claire Haas, Alexandra Nowak, lawyers, Béatrice Boisnier, legal counsel, at De Gaulle Fleurance

In France, despite the various measures introduced to promote the development of self-consumption and solar energy, there are still a number of barriers to overcome. Most notably, collective self-consumption does not benefit from the same tax advantages as individual self-consumption. It can also be more difficult for these projects to secure financing. "For years, banks have provided financing for projects involving power-purchasing agreements, granting them 20-year terms and guaranteed rates," says Donald François, founder of SerenySun. "Now they will need to learn about community self-supply projects, which is an entirely new model. This means seeking out self-suppliers who can enter and exit the project when they wish, at prices that, rather than remaining fixed over 20 years, instead obey the law of supply and demand."

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India – Bahram N. Vakil – Co- Founder & Senior Partner, Anuja Tiwari – Senior Partner, Siddhanth Mitra – Associate lawyer at AZB & Partners

In India, self-consumption has also grown considerably, involving a wide variety of energy sources, including hydro, steam, diesel, gas, wind and solar. Energy-intensive industries such as aluminium, cement and chemicals have set up their own power plants, either to supplement the electricity purchased from the

utilities, or for emergency use to protect against unreliable grid power, for example in the event of restrictions, breakdowns or power cuts. In 2022, regulations made it easier to switch to self-supply from renewable energy sources.

United Kingdom – Isaac Murdy, Sushma Maharaj, Peter Mayhew, Daniel Clarke, lawyers at Shakespeare Martineau

The adoption in the UK in 2020 of the Smart Export Guarantee Scheme, which allows self-suppliers to sell the electricity they do not use, has played a key part in driving growth in the self-consumption market, with the number of projects in 2023 increasing almost threefold within a year. In addition to these regulatory changes, technological innovation has been instrumental, with the emergence of peer-to-peer energy exchange platforms using artificial intelligence (AI) and blockchain. In 2018, residents of Hackney were able to automatically exchange solar energy produced in their area with each other. Smart meters use AI to predict consumption demand, while blockchain is used to schedule and offset exchanges.

Togo – Moamar Tidjani, lawyer at Aquereburu & Partners

Togo is aiming to achieve a 100% electrification rate by 2030, 75% of which will come from renewable energy sources. Since 2018, any individual or legal entity has been allowed to generate electricity from renewable energy sources for their own consumption, and has the right to sell any surplus.

Turkey – Mert Mustecaplioglu, Partner, Özge Kaplan, consultant and Zeynep Nisa Aydın, trainee at KMU Law Office

Since 2019, regulations have governed individual self-consumption and apply to unlicensed renewable electricity production facilities. Self-suppliers have the right to sell surplus electricity to the public operator at guaranteed prices. They receive additional subsidies if they use at least 55% Turkish components in their installations. The Turkish energy market regulator must approve any installation producing more than 5 MW.

EXECUTIVE SUMMARY

Key Figures

- +85%: This is the growth of solar power in Germany in 2023.
- 684,000 new self-consumption systems were installed in Brazil, totaling 8.3 GW in 2023.
- 5,729 small self-consumers (<1MW) were installed in Colombia in 2023.
- 200,000 new self-consumption projects were initiated in France in 2023 alone, marking a 77% increase compared to 2022.
- 421 MW. This is the total self-consumption capacity of households, businesses, municipalities, and energy communities in Greece in 2023, representing a 100% increase compared to 2022.
- 9,711 new companies in India set up their own power plants to meet their energy needs in 2022 alone.
- 92,946 self-consumption installations were recorded in the UK in March 2023, nearly tripling in one year.
- 75%: This is the target share of renewable energy in Togo by 2030.
- 6,548 MW of installed self-consumption capacity was recorded in Turkey by the end of 2020, just one year after the relevant regulation came into effect.

Interview with

XAVIER DAVAL, CEO of

kiloWattsol
SOLAR EXPERT

"Solar power will be the energy source of this century".

You are an advisor to companies on energy self-supply projects in some fifty countries, on 5 continents. How has the market evolved in the past 15 years, since the creation of your company?

I like to compare the growth of the solar market to mushrooms appearing after the rain. At first the ground was barren and dry, but then once the rainclouds of solar power have passed over the land, all kinds of new projects start to pop up. It starts out small, just a few projects here and there - but then, very quickly, they multiply to infinity. It's a global ripple effect that has spread into every country, one by one.

We are no exception to this rule; in 2006 it arrived in Europe and in France. The growth of solar energy worldwide increased 15-fold between 2011 (31 GW) and 2023 (413 GW)! Today, solar accounts for 5% of total power generation globally. And we estimate that by 2060, that share will rise to 60%!

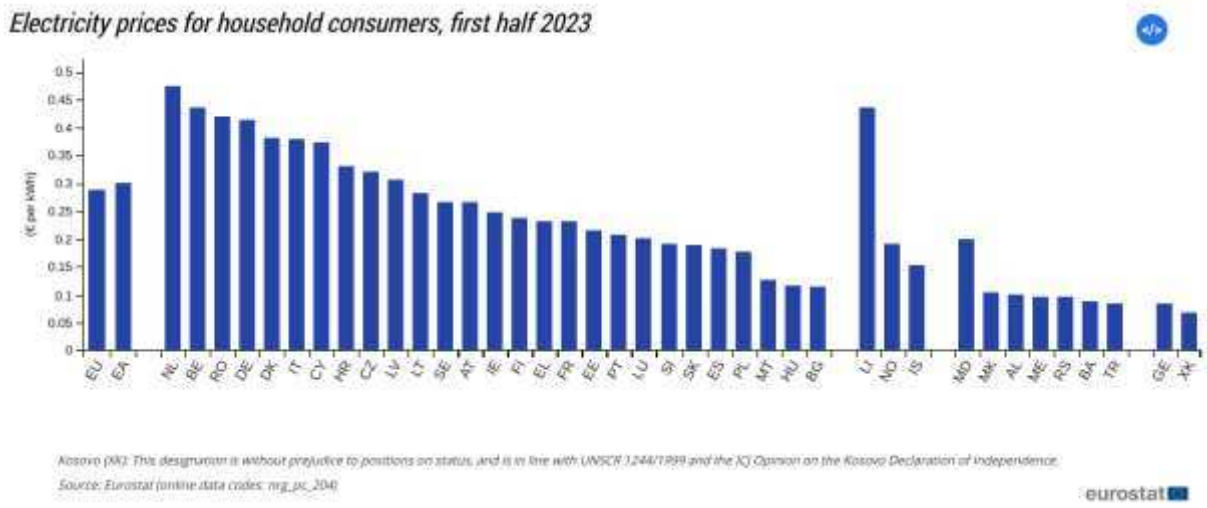
The fundamental explanation for this is the low cost of this type of electricity generation; by 2027, it will be the cheapest source of electricity in almost every country in the world.

What difficulties do you encounter in convincing consumers to move towards energy self-supply?

With the continued decline in the price of panels, solar is gradually becoming the most economical source of electricity. This is especially true in countries that get a lot of sunshine. Though electricity has always been a central issue for high energy-use businesses (i.e., companies whose activity requires significant electricity consumption), it's not something that most other consumers generally think much about.

But the current energy crisis has created quite a shock, both for individuals and for businesses. Both solar

energy and the notion of energy self-supply have gone from being just nice sounding concepts to being a real necessity as a hedge against skyrocketing market prices. You can observe this trend even more clearly in countries where the price of electricity was already particularly high. For example, in 2023 alone, solar power generation in Germany and Italy grew respectively by 85% and 82%.



https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Electricity_price_statistics

Is it more difficult to develop these projects in France than abroad? Should we take inspiration from other countries? If so, why?

Our country has made photovoltaics into a white elephant. Whereas most European countries only need a few short months to get these kinds of projects off the ground, here they routinely take several years!

Solar power allows us to solve a complex equation, whilst reconciling our impact on the climate and our energy use. The challenge now is to see how we can organize collectively to make the most of the energy of the sun, which by nature is intermittent and more or less abundant depending on the time of day and the season. The key is how this resource is shared amongst consumers with differing profiles: businesses, which will need it on weekdays, and individuals, who will use it more on weekends.

This is why community self-supply is such an important issue, because that's how this resource can be pooled effectively to achieve the best possible balance with the least burden on the public.

Spain is an energy self-supply pioneer. Citizens mobilized in favour of energy self-supply and against the "impuesto al sol" or "sun-tax." In 2018, they won. Because when individuals or businesses buy solar panels, they're contributing to the energy transition of their country - and we need to encourage these kinds of individual initiatives, which have a positive impact on society as a whole.

What are the prospects for the market towards 2030?

In the past two years, energy self-supply has made dramatic progress in France. In 2023, 12.5% of all grid-connected generation is in a self-supply configuration (in whole or in part), representing an installed capacity of 2.26 GW; that's more than 200,000 new grid-connected self-supply projects. Most of the self-supply installations consist of small plants with an output of less than 6 kWp (71%).

With the Arenh reform, the price of traditional electricity is expected to stabilize at 70 euros per MWh in 2026 (as opposed to 42 Euros today!). This inflation will certainly amplify the growth of solar power and self-supply. Industry estimates show that around 4 million homes will need to be configured this way by 2035!

The gears will continue to turn, and eventually all privately operated solar installations and a good part of the roofs of SME businesses will be used to supply the power for their own buildings.

Solar energy self-supply is now a well-known approach. What about other types of power? Do you think that self-supply projects based on other types of power generation could also become more widespread?

No. Solar power will be the energy source of this century. Prices have been going down for 20 years and will continue to go down. From 2050, solar will become the world's leading energy source. The uses of solar cells will multiply as well, with solar cars, solar facades on buildings, solar phone cases, etc. It will become a generalized, decentralized and autonomous power recharge source.

Other energy sources don't have that potential: after all, you'll never be able to go around with a portable river or a portable wind turbine.

Interview of

DONALD FRANCOIS, Founder of

SerenySun Energies

You were the founder of SerenySun, which has become a leader in the self-supply sector. What are the advantages of self-supply, whether individual or collective?

There are multiple advantages. Thanks to self-supply, public electricity networks, which were once the exclusive domain of energy companies, are now opening up to businesses, local governments, and individuals, who can now also produce and share their own renewable energy. It has brought about a real democratization of the sector!

With self-supply, economic actors can take their energy future into their own hands. Self-supply helps increase their awareness about the availability, scarcity and costs of this resource. It allows for an optimized consumption of electricity, to promote energy moderation and the energy transition.

Self-supply also protects the consumer from fluctuations in energy prices. The projects we're building already allow us to offer kilowatt-hours at a rate more attractive than the market rate. And we expect that trend to continue. Over the next 10-15 years, the price of traditional energy is not expected to see any significant drop in Europe, so the kind of locally produced renewable energy with direct distribution that self-supply provides will make even more sense.

With the community self-supply (CSS) approach, a community of different actors generate and share energy drawn from a natural resource available to all (wind, sun, etc.). It helps reduce inequalities, because it makes this energy accessible at controlled rates to people who may be unable to afford to equip themselves with their own solar panels to reduce their electricity bills. It's a real revolution, with major social, ecological, and territorial impacts!

From the producer's point of view, community self-supply helps promote the generation of renewable energy by finding new outlets for it in a context where public assistance and power purchasing agreements are

gradually disappearing.

What technical, regulatory, or fiscal obstacles have you observed to be likely to dissuade businesses, local authorities and individuals from establishing self-supply systems?

There are still multiple obstacles. The primary obstacle is regulatory instability. Some progress has recently been made. But it remains to be seen whether even that will be maintained. A debate is ongoing, particularly with regard to certain new permits that the public authorities would like to establish for participants in community self-supply arrangements. These permits are akin to those required of major energy suppliers, even though these projects face entirely different kinds of challenges and risks! This would clearly constitute a barrier to entry for self-supply stakeholders.

From a tax perspective, community self-supply is still at a disadvantage compared to individual self-supply. I believe this disadvantage should be eliminated given the possibilities for ecological, economic and social progress afforded by CSS.

Obstacles also exist in terms of financing. For years, banks have provided financing for projects involving power-purchasing agreements, granting them 20-year terms and guaranteed rates. Now they will need to learn about community self-supply projects, which constitute a new model. It will be necessary to seek out self-suppliers able to enter and exit the project when they wish, at prices that, rather than remaining fixed over 20 years, instead obey the law of supply and demand.

Do some self-supply projects involve energy donations? If so, who are the beneficiaries? Could that approach become more widespread?

We are starting to see some examples of this. In the context of small residential CSS operations, some producers do decide to donate their unused excess electricity.

Furthermore, stakeholder local authorities such as Greater Besançon are now considering the development of large-scale, economically sound CSS projects, while providing power very inexpensively or for free to the homes of certain social housing tenants. It could be possible to do it if others pay a little more for their electricity. In this way CSS could offer an effective solution to help those in energy poverty.

Do you expect the coupling of electricity storage with these self-supply projects to become more widespread? Why? What might be the obstacles to that?

That's what's next for these direct distribution self-supply projects. It would allow even greater progress to be made. Previously the obstacle to storage was economic: in France, it cost more to store this electricity rather than to draw power directly from public networks. Today, those prices are equivalent. Soon it will be even cheaper.

It remains to be proven whether this storage is actually environmentally neutral (or even positive), and in any case whether it could be more interesting than SMRs or other kinds of nuclear power plants.

With the rise of electric vehicles, we already have a significant quantity of batteries here in our country. The challenge we face is how to take advantage of this existing installed storage capacity so we can not only power vehicle batteries but also perhaps buildings as well, in the context of a CSS operation.

What are the lead times required to develop a self-supply project? Is it difficult to find participants and to organize an SME?

We now have more and more legal precedent and models to base ourselves on in organizing these kinds of projects. In terms of completion times, we are now at around 12 to 18 months. And for projects with lifespans averaging 30 years, this really isn't much time at all. That time is mostly required for building the production sites and obtaining the various permits... But currently the principal concern is still just finding participants. There is a lot of education to be done to mobilize companies, public actors, individuals, etc. and explain to them the benefits of a CSS operation. Local authorities could be key drivers of this mobilization.

Europe is aiming for carbon neutrality by 2050; what kind of growth do you expect in the self-supply market between now and then?

I see the market growing significantly. CSS will play a significant role in achieving those goals by 2050. All the more so because this approach to energy generation will soon be able to draw as well upon new natural and local resources: heat networks, geothermal, methanation, biogas, etc.

The development of self-supply will also have a positive impact on behaviour because self-supply users naturally reduce their energy consumption. That's why we should keep encouraging this model of decentralized renewable energy generation, which benefits everyone!

Interview with

JULIEN LUPION, *Head of the structured finance department at*

bpifrance

How is the financing of self-supply projects evolving in France? Are self-supply projects considered "bankable" at this point? What types of projects do you finance most often?

For more than 20 years, Bpifrance has been part of the financing landscape for renewable energy (RE) projects. We finance several hundred RE projects per year in France, including wind farms, solar parks, biomass plants, and more. 3 or 4 years ago, we started to occasionally finance individual self-supply projects.

We have seen growth in the market, with increasing interest being shown by consumers and by project developers, some of whom have become specialists and third-party investors in these types of initiatives. They have in turn been able to implement projects that meet bankability requirements. So we've financed a good number of project portfolios with a relatively substantial self-supply component.

These individual self-supply projects are mostly of intermediate size, between 100 kW and 1 MW, consisting of photovoltaic power plants installed on roofs or on parking shades, at service sector sites and at industrial sites.

At first we faced two primary issues in terms of bankability. First of all, there was the matter of contractual arrangements: we had to define the relationship between the third-party investors, the owner/operator of the building/land and the self-supplier and come up with a contractual framework allowing a risk allocation acceptable to financiers. That contractual framework has now been standardized.

A 2nd issue then arose: the financing of these projects depends on the income of the person consuming the electricity, i.e., a private actor. These projects are no longer remunerated by the State and EDF via a power purchasing agreement, as they were in the traditional approach for financing RE projects. Developers found a solution to reassure financiers by creating project portfolios including both public and private remuneration

schemes. With this abundance of resources, financiers could accept counterparty risk more readily.

In the future the challenge will be how to obtain financing for projects that are not necessarily part of these portfolios.

What are the various financial products used to finance these projects? How do you finance these projects? What types of financing are used?

These are the same financial products as are used for traditional photovoltaic projects; essentially, it's what is known as senior term debt, which can be amortized over 10, 15, or even 20 or more years. We have duplicated these products with some slight modifications. In an individual self-supply project where the third-party investor is the developer, the user or owner of the building are not the ones investing in the power plant themselves. Therefore, the use of different financial products is not necessarily required.

In your opinion, are there any obstacles to financing these projects?

The main obstacle is the unit size of these projects, which can be quite small. However, in order to provide financing via senior term debt, a critical mass volume is necessary, aggregating several individual self-supply projects. Until this threshold size is reached, cash flow requirements may become difficult for the developer to bear.

Do banks have any specific limitations when it comes to financing for these projects?

There are no particular limitations, other than the unit size of the projects and the bankability issues we discussed earlier.

How do you see this market evolving in the next 10 years?

The individual self-supply market will certainly see massive growth, both in the residential sector for individuals and in the service/industry sector, which we cover. Increasingly, owners and operators of buildings or industrial buildings/service sector facilities will choose the self-supply solution to meet their regulatory obligations. We are already seeing a great deal of enthusiasm about these projects.

A new trend is now taking shape in the market where it will no longer just be the developers alone making investments on behalf of the building owners. The latter will choose to invest directly in the photovoltaic

installations, and the financing for a real estate project, for example, will include financing for solar panels as well.

Furthermore, we will likely start to see growth in group self-supply and community energy systems. Interest in these projects is spiking right now, even though some barriers still need to be overcome; the contractual schemes, in particular, are still far from being standardized. Nevertheless, with a dynamic market this segment is likely to grow, and appropriate financing arrangements will likely be found.

SiqueiraCastro

Brazil

Introductory note:

In Brazil, two modalities of self-consumption exist depending on the installed capacity of the asset.

« Distributed generation » (*geração distribuída* in Portuguese) refers to energy generated in small renewable plants by consumers who are supplied by their local Distribution Company. Distributed generation presumes that the consumer obtains his energy from the distribution company. In this case, only renewable plants of up to 3 (non-dispatchable source) or 5 (dispatchable source) MW installed capacity are eligible. On the other hand, when a consumer utilizes the energy produced by an independent power producer's plant that he owns, this operation is subject to certain discounts in sector charges. This is referred to as « self-production » (*autoprodução* in Portuguese). Self-Production presumes that the consumer has exercised his right to exit the regulated tariffs and is able to choose a different supplier. No restrictions on installed capacity of the plant apply in this case; however, only consumers with a minimum 500 kW monthly consumption (or those connected to a higher tension) can choose a different supplier. Throughout this document, we will refer to « distributed generation » as **DG** and « self-production » as **SP**. ANEEL is the *Agência Nacional de Energia Elétrica*, the regulator of the Brazilian Power Sector. CCEE is the *Câmara de Comercialização de Energia Elétrca*, an entity that mixes functions of TSOs and energy exchanges – where energy contracts have to be registered and the balance of each agent is calculated and liquidated.

The Origins of self-consumption

Origin of self-consumption

Is self-consumption of electricity a practice-based model or the result of the implementation of a regulation? Can you describe.

DG is a regulation-based model that was later passed into law. It began with ANEEL Resolution no. 482/2012, later expanded by ANEEL Resolution no. 687/2015. Nowadays, Law no. 14.300/2022 and ANEEL Resolution

no. 1.000/2021 are the applicable regulation.

Regarding SP, several Decrees[1] provide for the sector charges benefits and Law no. 11.488/2007 provides for the possibility that a consumer be considered a self-producer not by having the plant himself, but rather by owning shares in an SPV.

The different models

Different models of self-consumption

Are there different models of self-consumption (individual and collective, for example)? Can you describe.

DG: distributed generation can be either individual or collective. It can also happen locally or at a different site, provided this different site is (a) within the area served by the same distribution company, and (b) corresponding to a consumer unit owned by the same consumer or the same collective.

In this regard, Law no. 14.300/2022 will designate such different modalities as local self-consumption ("autoconsumo local") as opposed to remote-self consumption ("autoconsumo remoto"), and shared generation ("geração compartilhada") for collective projects.

SP: self-production can be divided between self-production "proper" or "classical", meaning ownership of a power plant by the consumer himself; and "self-production by analogy" when a consumer is shareholder in an SPV as allowed in Law no. 11.488/2007 mentioned above.

Is there a difference between self-consumption operations and Power Purchase Agreements? Can you describe.

Yes. DG is only applicable in the context of consumers still supplied by the local distribution company through regulated tariffs. A PPA would require the consumer to exit the regulated tariff.

SP may or may not require a PPA in order to be operationalized. If a consumer is a "self-producer by analogy", i.e. a shareholder in an SPV, a PPA will need to be registered to operationalize the transfer of energy between both profiles before the Power Trading Chamber. On the other hand, if the consumer and the power plant are modelled within the same agent before the Power Trading Chamber, a PPA is not necessary.

[1] Namely, Decrees no 5163/2004 article 74, no. 5025/2004 article 13, no. 6353/2008 article 4 and Law no. 10848/2004, article 1, § 10.

Individual and collective self-consumption

What is the regulatory difference between individual and collective self-consumption?

DG: Some grandfathering clauses apply differently to individual and collective self-consumption as per article 26 of Law no. 14.300/2022. Individual self-consumption with projects above 500 kW requires the presentation of a completion guarantee to the local distribution company.

State support

Are there any State support mechanisms? Are they direct or indirect?

DG: before the passing of Law no. 14.300/2022 and for 12 months thereafter, DG projects whose connection was already requested have the right to compensate the energy they generate for the full price of the regulated tariff. Projects not subject to this rule are allowed to compensate only the portions of the tariff that relate to energy, and not those related to wheeling charges. This is the main support mechanism that helped DG achieve its attractiveness in recent years. Other than that, certain states have tax incentives in the form of sales tax breaks for projects up to a certain size. Moreover, Law 14.300/2022 allowed DG projects in the REIDI program, which incentivizes investments in infrastructure by means of a tax break applicable to CAPEX.

SP: SP is exempt from certain sector charges. This is the main driver behind the interest in such projects. They can as well qualify for wheeling charges discounts that apply to energy sourced from renewable plants.

Both support mechanisms described above are indirect in nature.

Is it different for individual and collective self-consumption?

DG: the transitional period in Law no. 14.300/2022 article 27 (regarding the gradual introduction of wheeling tariff charges to self-consumers) is different depending on whether a project is geared for individual or collective self-consumption.

What are their impacts on the development of SELF-CONSUMPTION market?

DG: the possibility of compensating energy generated against the whole regulated tariff and not just its energy components allow DG projects to reach higher returns on investment, which, coupled with the lowering costs of solar panels, brought many investments into the segment.

SP: the possibility of being exempt from certain sector charges applicable to consumers is the main driver

behind consumers' interest in investing in SP projects.

Projects specifications

The electricity production plants

What type of electricity production plant is eligible for SELF-CONSUMPTION?

DG – According to ANEEL Resolution no. 1000/2021, DG is allowed for projects that use (a) renewable sources; or (b) combined cycle power plants that observe the minimum efficiency requirements of ANEEL Resolution no. 1031/2022. Furthermore, such projects are limited to (a) 5 MW installed capacity for dispatchable sources; and (b) 3 MW installed capacity for non-dispatchable sources.

SP: any type of plant is eligible, however "self-production by analogy" is only applicable to plants that began operation after 15th June 2007 (the date when this modality of self-production was created by Law no. 11.488/2007).

What is the most commonly used energy source?

Solar energy is the most commonly used energy source for DG. More recently, the market has sought to invest in self-production of solar and wind sources.

What is the average size of the projects?

DG: usually 5 or 3 MW considering the installed capacity limits provided by law.

SP: It varies. Projects usually span several SPVs.

Volume of SELF-CONSUMPTION projects

How many SELF-CONSUMPTION operations are set up in 2023 and 2022 in your country (number and GW)?

DG: 684 thousand new systems for a total of 8,3 GW in 2023. 797 thousand new systems for a total of 8,3 GW in 2022. Source: ANEEL[2] .

SP: studies point out that energy traded by self-producers increased from 2428 av MW to 2915 av MW

[2] Link for the dashboard here.

monthly between 2022 and 2023[3] . A more specific number of new projects has not been found.

Are they mainly individual or collective?

DG: mainly individual and used by residential consumers (see PowerBI linked above).

SP: distinction not applicable, although it is known that most new projects are in the "self-production by analogy" category.

The Land

Are projects being developed in all types of areas (urban, rural)? Can you describe.

DG: In both urban e rural areas.

SP: rural areas due to the large scale of the projects.

Are there any land constraints? Can you describe.

There exist limitations for the purchase of rural land by foreign entities provided by Law no. 5.709/1971.

City-level ordinances may possess restrictions (e.g. zoning laws may prevent industrial uses of certain areas) but this requires a case by case analysis.

What type of lease is used by producers?

SP projects and larger scale collective DG projects generally use lease agreements to secure land usage rights given the restriction for foreign purchase of rural land. Contracts for the assignment of the land usage rights are also common (contrato de superfície and cessão de direito real de uso, in Portuguese).

The self-consumers

Who are the self-consumers?

DG: mainly residential consumers, followed by the commercial and service sector and rural producers.

[3] https://www.greener.com.br/mercado-livre-e-autoproducao-de-energia/.

SP: mainly industrial consumers.

What is their field of activity?

SP: steel and mining are the fields with the most self-producers[4].

DG: (excluding residential consumers) - pharmacies, supermarkets, government entities and rural producers.

What is the size of the self-consumer companies?

Varied given the possibility of going into larger projects as the companies grow larger.

Do public entities carry out self-consumption operations?

DG: yes, with frequent public-private partnerships for the implementation of distributed generation solutions.

What are the main reasons for choosing self-consumption?

Reduction in costs and sector charges as well as long term price stability/certainty.

The market players

Who offers self-consumption solutions? ENR producers or suppliers? Or asset managers?

DG: smaller systems can be offered by independent players, while larger projects are usually offered by project developers.

SP: energy producers, project developers and asset managers.

[4] https://www.ccee.org.br/en/dados-e-analises/consumo.

The contractual models and the possibility of selling the electricity

Contractual models used

PPA, leasing, other?

DG: for collective self-consumption projects a contractual matrix involving inclusion of the consumer into an association, consortium or cooperative has to be implemented. Individual self-consumption is usually done through sale of the asset to the consumer, although certain larger scale projects for commercial consumers may involve leasing arrangements.

SP: PPAs are used the most in recent years, under the "self-production by analogy" mechanism – the consumer buys a stake at the SPV and enters into a PPA with it. Lease of assets arrangements are also known to be used.

Possibility of selling electricity

Can the electricity be sold or simply consumed? Can you describe.

DG: the electricity can only be sold in certain situations where the local distribution company institutes a request for bids. Otherwise, the credits accumulate with the consumer to be used in up to 5 years. Moreover, see section below on regulatory constraints for the discussion centered around whether collective DG can or cannot constitute a sale of electricity.

SP: Yes, it can be sold, although with loss of self-producer benefits (i.e. sector charges will apply normally in case of commercialization of energy). A general authorization for such commercialization can be found in ANEEL Resolution no. 921/2021, Article 6th, sole paragraph.

Are the members of a collective self-consumption operation grouped into a particular entity?

DG: in the case of collective DG projects, a consortium, cooperative or association is created to allocate credits for the energy generated. The developer is usually the front facing member of the consortium/association/cooperative and oversees relationship with the local distribution company.

SP: no.

The selling price of the electricity

What is the price according to the sector (wind, solar etc.)?

SP: Competitive pressure has reduced prices to around BRL 150.

Surplus electricity

Is it possible to sell the surplus electricity produced to a third party? Is there an aid scheme for selling this surplus? Can you describe.

DG: only in the situations foreseen under Law 14.300/2022, articles 23 and 24 - request for bids from the local utility. Otherwise, the credits accumulate with the consumer to be used in up to 5 years. Moreover, see section below on regulatory constraints for the discussion centered around whether collective DG can or cannot constitute a sale of electricity.

SP: yes, with loss of sector charges benefits in this case. Energy can be sold either by the consumer entity or by the generator entity.

Self-consumption and Power purchase agreement

What justifies producers/consumers opting for self-consumption and not for PPAs?

SP: Sector charges benefits.

DG: competitive prices against regulated tariffs when the consumer in question is not big enough to be allowed to choose a different supplier (by legal fiction, DG is not considered to be a sale of energy by a different supplier).

Regulatory

Regulatory constraints specific to SELF-CONSUMPTION

DG: the main applicable regulatory restriction is that the consumer who carries out DG must purchase energy from the distributor at regulated rates and, therefore, does not (or cannot) exercise the right to purchase energy from another supplier. As mentioned above, by legal fiction, DG is not considered a sale of energy by a different supplier. This requires the adoption of structures whereby a sale is not legally considered to have occurred, even in the case of collective self-consumption agreements. This restriction determines the form of the contractual matrices used in DG projects, as participation in the collective DG project cannot be at

prices of R$/MWh.

Another regulatory restriction is the maximum permitted installed capacities (5 or 3 MW), as well as complementary provisions against the "subdivision" of projects to circumvent such restrictions.

SP: the main regulatory constraint that applies to SP projects is that consumers can only qualify to "self-production by analogy" if their units have a load of at least 3 MW. Moreover, there are restrictions on the performance of energy swaps to sell attributes of the energy to the market.

Regulatory advantages to SELF-CONSUMPTION

The main regulatory advantage is the benefits with regards to sector charges for SP.

Finance and tax

Financing part

Which tax system applies? Is the tax system advantageous? Can you describe. What financial product is proposed by the financiers for the financing of SELF-CONSUMPTION projects? Corporate finance, project finance? Asset finance?

DG is generally financed through corporate finance and SP projects are usually part of a project finance scheme based off the long-term PPA entered with the offtaker who becomes shareholder to the project.

Future trends

Future trends

What are the future trends?

Future trends for DG include: M&A acquisitions of projects eligible to the grandfathering clauses of Law no. 14.300/2022.

Moreover, a system analogous to the frequently used in the US "Value of Solar" method is to be implemented by the Ministry as mandated by Law no. 14.300/2022, article 17 § 1. In this system, although new projects will not be allowed to compensate the full regulated tariff but rather only its energy components, they will be eligible to a bonus factor that captures positive externalities of the DG projects (such as avoidance of transmission investments etc).

Finally, the probes of the Federal Court of Auditors – TCU and of the regulator ANEEL into arrangements that might represent "sales of energy" in disguise and subdivisions of larger projects can possibly change the

dynamics of the segment, especially in the case of collective DG projects.

Future trends for SP include: implementation of projects for green hydrogen exporters. Possibility of reduction of sector charges benefits of self-producers to maintain sustainability of the system as a whole.

Brigard Urrutia

Columbia

The Origins of self-consumption

Origin of self-consumption

Is self-consumption of electricity a practice-based model or the result of the implementation of a regulation? Can you describe.

The self-consumption of power has been a practice authorized by the Energy and Gas Regulation Commission ("CREG" as for its acronym in Spanish"), since Resolution CREG 054 of 1994, and 024 of 1994. Besides, it is also addressed in laws 142 and 143 of 1994.

Not whatsoever, it was further developed through Law 1715 of 2014, which is the renewable energy statute in Colombia, and in CREG resolutions 024 of 2015 and 174 of 2021. This way, the Colombian government incentivized and facilitated schemes to promote self-consumption of power in Colombia and even, allowed them to deliver surplus energy to the Grid.

The different models

Different models of self-consumption

Are there different models of self-consumption (individual and collective, for example)? Can you describe?

In Colombia, the activity of individual self-consumption is extensively regulated. On the other hand, Until the year 2023, the concept of collective self-consumption was not considered in Colombia.

In fact, the definitions and regulations outlined in Law 143 of 1994, Law 1715 of 2014 (amended by Law 2099 of 2021), Decree 2469 of 2014, as well as Resolutions CREG 024 of 2015 and 171 of 2021, solely addressed individual self-consumption.

Regarding this concept, the regulation also distinguishes between large-scale self-consumers and small-scale self-consumers.

Therefore, systems of self-consumption with a capacity equal to or exceeding 1 MW will be classified as large-scale self-consumers, whereas systems with a capacity below 1 MW will be considered small-scale self-consumers.

Furthermore, through article 235 of the National Development Plan, the concept of Energy Communities was introduced in Colombia, subject to regulation by the National Government. Subsequently, with Decree 2236 of 2023, this concept was developed, indicating that they may operate under the designation of "Collective Self-Consumers". This means that the implementation of the collective self-consumption is currently on the way, awaiting the implementation of the regulation which have been already put into place.

Is there a difference between self-consumption operations and Power Purchase Agreements? Can you describe.

The Decree 1073 of 2015 establishes that a person can be a self-consumer, by using assets owned by third parties. This means that a third party can handle the construction, operation, and maintenance of the self-consumption asset and enter into an agreement with the self-consumer agent. Typically, these agreements are Power Purchase Agreements (“PPAs”), depending on the negotiation held by the parties.

However, when self-consumption systems are not constructed and operated by third parties, there might not be contracts involved.

Individual and collective self-consumption

What is the regulatory difference between individual and collective self-consumption?

According to article 1 of Decree 2236 of 2023, collective self-consumption activity and the collective self-consumer are defined as follows:

“Collective Self-consumption: Activity carried out by an energy community primarily to meet its own energy demand. In the event that surplus energy is generated from this activity, it may be delivered to the grid under terms established by the Energy and Gas Regulation Commission (CREG) for this purpose”.

“Collective Self-consumer: Users or potential users of energy services who form an energy community to engage in collective self-consumption activity”.

As evident, the primary characteristic of the collective self-consumer is that they must be energy communities, meaning a group of users or potential users organized under an agreement among natural persons and/or legal entities (public or private). They may cooperate through a contract or associative

agreement to engage in the following activities: generation, commercialization, and efficient use of energy through the utilization of Non-Conventional Renewable Energy Sources ("FNCER" as for its acronym in Spanish), renewable fuels, and distributed energy resources. The rules and liquidation pursuant to which these energy communities operate is still pending to be issued, therefore, in principle, such energy communities are free to establish the rules and regulations which apply to their relationship.

On the other hand, self-consumption (always understood as individual self-consumption) is primarily defined in Law 1715 of 2014 as follows:

"Self-consumption: Activity carried out by natural or legal persons to primarily produce electricity for their own needs. In the event that surplus electricity is generated from this activity, it may be delivered to the grid under terms established by the Energy and Gas Regulation Commission (CREG) for this purpose.

Thus, the main differences in these definitions are that the collective self-consumer must be part of energy communities, which are restricted to producing energy only from FNCER, distributed resources, and renewable fuels. In contrast, individual self-consumers can produce energy from any source, including thermic, and can be either legal entities or natural persons.

State support

Are there any State support mechanisms?

Yes, there are mechanisms and programs in place to incentivize the development of self-consumption activity in Colombia, as will be explained in the answers below.

Are they direct or indirect?

There are indirect mechanisms through tax incentives, as well as direct mechanisms where the government funds' investments for the development of self-consumption initiatives.

Is it different for individual and collective self-consumption?

There are mechanisms that incentivize both collective and individual self-consumption indiscriminately. However, there are also specific mechanisms aimed at promoting the development of collective self-consumption.

Can you describe the different support mechanisms?

Investments in FNCER benefit from tax incentives that will be described later. Typically, self-consumption systems involve solar installations and other services related to renewable energy, which generally qualify for tax incentives. These tax incentives will be explained in answers below.

Additionally, collective self-consumers such as energy communities can obtain financing and guidance directly from the government.

What are their impacts on the development of SELF-CONSUMPTION market?

Tax incentives have promoted the development of self-consumption systems, particularly encouraging the adoption of solar photovoltaic systems.

Projects specifications

The electricity production plants

What type of electricity production plant is eligible for SELF-CONSUMPTION? What is the most commonly used energy source?

In Colombia, solar photovoltaic systems have been developed as the primary form of self-consumption, largely due to the tax incentives offered for FNCER. However, the agents are able to use different kind of power production technologies, regardless of the fact that due to the incentives, self-consumers are encouraged to prefer renewable and unconventional energy production technologies.

What is the average size of the projects?

As indicated in previous responses, small-scale self-consumption refers to systems with a capacity of less than 1 MW, while large-scale self-consumption encompasses all systems larger than 1 MW.

In Colombia, most small-scale self-consumption projects belong to the residential sector or small industries. The most common large-scale self-consumption projects have capacities ranging from 5 MW to 19.9 MW. This is because, according to Resolution CREG 024 of 2015, self-consumption systems with a capacity exceeding 20 MW, which are interested in delivering surplus energy to the grid, are required to participate in centralized energy dispatch, represented by a generating agent.

However, in certain industries such as mining and the oil sector, self-consumption systems with capacities

between 50 MW and 200 MW have been evidenced.

Volume of SELF-CONSUMPTION projects

How many SELF-CONSUMPTION operations are set up in 2023 and 2022 in your country (number and GW)?

According to CREG, by the second half of 2023, Colombia had 164 MW of large-scale self-consumption in 26 plants with capacities ranging from 1 MW to 17 MW. On the other hand, large industries have self-consumption systems larger than 20 MW. Small-scale self-consumption has 5,729 users delivering surpluses to the system, with a total capacity of 143 MW.

Are they mainly individual or collective?

Up to now, the focus has been almost exclusively on individual self-consumption. As mentioned earlier, collective self-consumers were established in 2023, and to date, many aspects of their regulation remain pending.

The Land

Are projects being developed in all types of areas (urban, rural)? Can you describe.

Self-consumption projects can be developed in various types of areas. However, in Colombia, there is an institution called the Territorial Planning Plan ("POT" as for its acronym in Spanish), which specifies the permissible land uses in municipalities. Therefore, it is important to review whether this instrument allows for the construction of this type of infrastructure in all municipalities.

However, self-consumption mechanisms and technology have been installed on both rural and urban land, which usually depends on where the demand is located.

Are there any land constraints? Can you describe.

In addition to approval from the POT, it is necessary to obtain construction and urbanistic permits from local authorities. Furthermore, if the property is not owned by the self-consumption agent, it will be necessary to enter into a lease agreement with the owner.

What type of lease is used by producers?

The self-consumption activity does not require authorization from energy sector entities. However, regarding land use, it is important to verify the required environmental instruments (which can vary depending on the project's size). Additionally, if the project may affect any ethnic community, a prior consultation process will be necessary. During this process, agreements for mitigation or compensation must be reached with these communities.

The self-consumers

Who are the self-consumers?

In general terms, self-consumers are large energy consumers who find it more cost-effective to install their own self-consumption system rather than purchasing the large quantities of energy they need for their production processes. Also certain actors require, for complying with worldwide business guidelines established by their parent-companies and/or business groups, the installation of these kind of technologies so that they are able to comply with decarbonization strategies in said organization or business group.

What is their field of activity?

Primarily, industrial activities benefit from self-consumption. However, there has been a notable interest among companies engaged in extractive industries such as mining, oil, and gas.

What is the size of the self-consumer companies?

Self-consumption projects have been presented in various sizes, encompassing a range of scales.

Do public entities carry out self-consumption operations?

Yes, Ecopetrol (the most important O&G company in Colombia) and its corporate group have been the largest developers of self-consumption systems in Colombia for their extractive activities. However, other entities, as part of efforts to combat climate change, have installed small-scale photovoltaic solar self-consumption systems.

What are the main reasons for choosing self-consumption?

In Colombia, there are three main reasons that justify investments in self-consumption systems.

Firstly, certain areas of the country experience issue with continuity and quality of energy supply from the grid. In this regard, self-consumption systems provide reliability to users.

Secondly, most self-consumption systems are derived from renewable energy sources, which helps promote a positive reputation for companies.

Finally, the energy purchased from the market is subject to tariff structures (for regulated users) and charges (for non-regulated users) that can vary based on various circumstances. In this sense, self-consumption systems ensure a stable energy price.

The market players

Who offers self-consumption solutions? ENR producers or suppliers? Or asset managers?

The activity of self-consumption, particularly in terms of its construction and operation, is currently outside the regulatory framework. Therefore, power generating and marketing companies have created a new business line where they offer consumers the construction and operation of self-consumption systems. However, all these arrangements are outside the scope of regulation and oversight by sector entities. There are certain public utility companies which have envisioned the creation and incorporation of these kind of solutions (such as EPM, Enel, Promigas and others), therefore offering these solutions to several type of clients.

Additionally, there are companies that are not market agents and, through Engineering, Procurement, and Construction Agreements (“EPC”), Operation and Maintenance Agreements (“O&M”), and PPAs, contracts, offer the construction, operation, and energy sales services to self-consumers. Examples of such companies include multinational corporations like Green Yellow or Total Energies.

The contractual models and the possibility of selling the electricity

Contractual models used

PPA, leasing, other?

As indicated in previous responses, the contractual model for developing self-consumption projects with third-party assets is through PPAS. It is common for these agreements to be structured under a "pay-as-

produced" model or with a minimum consumption obligation, ensuring that the investment payment is guaranteed.

Possibility of selling electricity

Can the electricity be sold or simply consumed? Can you describe.

In general terms, self-consumption systems are designed for energy consumption. However, there is the possibility of selling power through the following means:

1. Large-Scale Self-consumer: Energy can be sold to the market through PPAs or through the Spot Market, provided it is represented by a generating or marketing agent.

2. Small-Scale Self-consumer: Energy can be sold through energy credits, where the marketer serving the user is obligated to purchase surplus energy and offset it against the energy supplied to the same user in the billing month.

3. For marginal producers: They can sell energy to their economic affiliates through bilateral contracts, provided that the energy is transported through private networks. This concept will be explained below.

Currently, the mechanisms for selling energy by energy communities have not been regulated. It is not clear how power will be sold to community members or third parties.

Are the members of a collective self-consumption operation grouped into a particular entity?

According to Decree 2236 of 2023, energy communities are composed of potential users or users. Similarly, this regulation specifies that energy communities will be established through a private document.

In order to receive public resources and assistance from sector entities, energy communities must register in the Energy Communities Registry.

The selling price of the electricity

What is the price according to the sector (wind, solar etc.)?

In general, the price per kWh of solar self-consumption systems can be around COP $250- 350. These are the most commonly used systems. However, this value can vary from project to project depending on multiple factors affecting the investment. The same applies to other technologies like small hydroelectric plants.

On the other hand, for self-consumption systems based on fossil fuels, the price tends to be highly fluctuating

due to dependencies on fuel price variations. This also includes transportation costs, which can vary depending on the region of the country.

Nevertheless, it is common practice to include clauses specifying that the price per kWh of the self-consumption system cannot exceed the market price. If it does, the market value would be charged instead.

Surplus electricity

Is it possible to sell the surplus electricity produced to a third party? Is there an aid scheme for selling this surplus? Can you describe.

Regarding this point, it is important to clarify the regulations surrounding energy self-consumers at different scales:

1. Large-Scale Self-consumers: As per Resolution CREG 024 of 2015, large-scale self-consumers can only sell their surplus energy in the Wholesale Electricity Market (“MEM” as for its acronym in Spanish”) if they are represented by a generating agent or marketing agent. Therefore, the agent representing the surplus is responsible for selling it.

2. Small-Scale Self-consumers: Small-scale self-consumers sell their surplus energy through energy credits in the market. This means that the marketer serving the self-consumer is obligated to purchase any surplus energy produced by the system and offset it against the energy supplied to the user in the billing month.

3. Marginal Producers: Articles 14, 15, and 16 of Law 142 of 1994 established the concept of "marginal producer." This refers to self-consumers who, through private networks, sell surplus energy to their economic affiliates. In this case, marginal producers can freely determine the selling price.

4. Collective Self-consumers: According to Decree 2236 of 2023, collective self-consumers can sell their surplus energy to the system. However, to date, the regulatory framework for how they can commercialize energy with members of the energy community, or third parties has not been defined.

Self-consumption and Power purchase agreement

What justifies producers/consumers opting for self-consumption and not for PPAs?

Normally, self-consumption systems allow for cheaper energy compared to PPAs in the MEM. When entering into PPAs with market agents for energy purchase, although fixed prices are negotiated, these prices always include the costs of the production chain, such as generation, transportation, and the intermediary role of the marketing agent. However, in self-consumption systems, most of these costs either do not exist or are

substantially reduced.

Regulatory

Regulatory constraints specific to SELF-CONSUMPTION

A regulatory disadvantage of energy self-consumption is the limited scope that does not accommodate other modern concepts within this framework. This means that the definitions and scope of application are quite restricted. For example, it does not consider the possibility of using batteries to store energy during peak hours for sale during off-peak hours, thereby flattening the demand price curve.

Furthermore, there is a regulatory requirement for a self-consumer to measure the energy delivered to the system using the same meter that measures the energy received from their marketing agent. Therefore, if a single user has different connection points to the system, they would only be authorized to deliver energy through one of them.

Regulatory advantages to SELF-CONSUMPTION

The main regulatory advantage is the ease of selling energy surplus to the grid. Specifically, for surplus sales, it is not necessary to establish as utility companies and comply with all their regulatory burdens. It only requires approval for a connection point, completing a procedure with the network owner to inject surplus energy, and adjusting energy meters to be bidirectional.

Additionally, it is advantageous that self-consumers are not subject to the energy tariff formula and can negotiate prices freely.

Finance and tax

Which tax system applies? Is the tax system advantageous? Can you describe.

Law 1715 of 2014 aims to promote the development and use of FNCER, mainly those of a renewable nature, in the national energy system, through their integration into the MEM. The law establishes certain incentives for investment in non-conventional energy projects, as follows:

1. Section 11 of Law 1715 establishes that the investor is entitled to deduct from its income 50% of the total investment made in a qualifying project.

2. Section 137 of the CTC establishes a general rule limiting the depreciation deduction for income tax

purposes.

The aforementioned section also provides that the depreciation rate to be deducted annually will be the one determined according to the accounting technique, as long as it does not exceed the rates set in the tax regulation. In the case of machinery and equipment, for example, the maximum annual tax depreciation rate is set at 10%.

Now, one of the tax benefits established by Law 1715 is the benefit of accelerated depreciation of assets, applicable to machinery, equipment, and civil works necessary for the reinvestment, investment and operation of renewable energy generation projects.

3. Section 12 of the Law provides another benefit related to the exclusion of VAT on the acquisition of goods and services for the development of energy generation projects.

The regulation provides that national or imported equipment, elements, machinery, and services destined to pre-investment and investment for the production and use of energy will be excluded from VAT.

This benefit will also be applicable to all services rendered in Colombia or from abroad that are needed for the project.

4. The Section 13 of the Law establishes an VAT exemption from the payment of import duties on machinery, equipment, materials destined exclusively for reinvestment and investment in renewable energy generation projects.

This benefit shall apply when the acquisition of the assets and goods is through importation into Colombia.

This exemption must be requested to the Colombian Tax Office at least 15 working days prior to the importation of the assets and goods, in accordance with the certification issued by the UPME.

Financing part

What financial product is proposed by the financiers for the financing of SELF-CONSUMPTION projects? Corporate finance, project finance? Asset finance?

Various financial instruments are offered by financiers to support self-consumption projects, with the specific product often tailored to suit the specifics of each project. The proposed financial product may vary depending on the size and the stage of the project.

For larger projects in early stages, the most common product is project finance. This form of financing entails structuring the project's capital and operating costs in a manner that aligns with its long-term cash flow projections and potential revenue streams.

On the other hand, for more mature projects developed by consolidated companies with solid financial statements, corporate financing takes precedence. Such financing typically leverages the company's balance sheet strength and creditworthiness to obtain capital on favourable terms.

Asset financings are not common for these types of projects.

What are the specific constraints for the banks to finance SELF-CONSUMPTION project?

The primary concern of banks when financing these projects is the potential interruption of revenue sources. The main income source for a self-consumption system is the contract through which the system operator and asset owner sell energy to the self-generating user.

Therefore, any provisions that involve contract termination, project unavailability, penalties, and other related aspects are the issues that most concern banks.

Future trends

Future trends

What are the future trends?

Modifications are expected to facilitate and promote the commercialization of energy surpluses in the energy market. Additionally, regulations for collective self-consumers are anticipated to be issued in 2024 to establish rules regarding: (i) legal framework; (ii) surplus energy marketing scheme; (iii) oversight regime by public entities; (iv) incentives; among others.

France

The Origins of self-consumption

EU Regulatory Framework:

- **Directive (EU) 2018/2001** on the promotion of the use of energy from renewable sources adopted on December 11, 2018, and referred to as **"RED II".**

The directive lays down rules on the self-consumption of renewable electricity for the first time at EU level and stresses the need to establish a regulatory framework. It acknowledges the growing importance of self-consumption of renewable electricity and the opportunity to empower jointly acting renewables self-consumers to advance energy efficiency at household level and help fight energy poverty through reduced consumption and lower supply tariffs.

More importantly, its article 21 recognizes the right to self-consumption through i) the generation of renewable energy for consumers' own consumption, ii) storage, without having to pay any duplicate fees and iii) sale of excess production through renewables power purchase agreements, electricity suppliers and peer-to-peer trading arrangements without being subject to disproportionate constraints and costs,

It allows consumers to use an aggregator and receive subsidies for the electricity they produce themselves and feed into the grid and maintains their rights and obligations as final consumers.

Cases in which non-discriminatory and proportionate charges can be imposed are limited, leading to assume that additional costs and dissuasive taxes could disappear.

Article 21 also enshrines collective self-consumption operations but allows Member States to differentiate between individual renewables self-consumers and jointly acting renewables self-consumers, as long as the distinction is proportionate and duly justified.

It allows for renewables self-consumer's installation to be owned or managed by a third party and requires Member States to put in place an enabling framework to promote and facilitate the development of renewables self-consumption.

- **Directive (EU) 2023/2413** as regards the promotion of energy from renewable sources adopted on October 18, 2023, referred to as **"RED III".**

RED III provides additional incentives towards the development of self-consumption. Member States are required to encourage self-consumers and renewable energy communities to actively participate in electricity markets by providing flexibility services through demand response and storage.

Article 15a on mainstreaming renewable energy in buildings requires the introduction of appropriate measures to increase the share of electricity and heating and cooling from renewable sources produced on-site or nearby, as well as renewable energy taken from the grid in the building stock. Such measures may include substantial increases in renewables self-consumption.

Pursuant to Article 16d, permit-granting procedure for the installation of solar energy equipment with a capacity of 100 kW or less, including for self-consumers of renewable energy and renewable energy communities, can't exceed one month.

- **Directive (EU) 2019/944** of June 5, 2019, on common rules for the internal market for electricity.

The directive highlights that consumers should be able to consume, store and sell self-generated electricity to the market and to participate in all electricity markets. Legal and commercial barriers as well as administrative burdens should be removed.

The directive also indicates that all customer groups (industrial, commercial and households) should have access to electricity markets to trade their flexibility and self-generated electricity.

Article 2 of the directive introduces the definition of active customers and article 15 specifies that Member States are required to ensure that active customers are entitled to sell self-generated electricity.

Origin of self-consumption

Is self-consumption of electricity a practice-based model or the result of the implementation of a regulation?

The notion of individual and collective self-consumption is connected to network decentralization. As early as 2013, the French Court of Auditors noted inconsistencies in the long-term development strategy for France's electricity distribution system, which aimed to perpetuate the system's centralization and national grid by relying primarily on nuclear power.

The requirements of the energy transition have since led to the development of renewable energies and the partial decentralization of energy in France.

Attractive feed-in tariffs for solar-generated electricity kick-started the development of the photovoltaic sector in 2006[5]. Solar power plants were mainly installed for the full sale of the energy produced to make the most of these advantageous tariffs. The reduction in tariffs that ensued led to the development of individual self-consumption installations in 2016, followed by collective self-consumption operations in 2018.

The French regulatory framework for self-consumption was established by decree no. 2016-1019 of July 27, 2016, on electricity self-consumption, which was adopted in application of law no. 2015-992 of August 17, 2015, on the energy transition for green growth. The decree added articles L.315-1 and L.315-2 to the French Energy Code, which define individual and collective self-consumption respectively.

Impact of the European regulation

For member of the European Union, did self-consumption exist in your country before directive 2018/2001? Was it regulated? If so, how? Has the directive led to the creation of a specific legal regime? Can you describe.

Self-consumption initiatives had already started developing in France before a legal framework was put in place. They did not benefit from the type of State aids that regulations provided afterwards.

In conjunction with the creation of theis European legal framework on self-consumption stemming from the "Winter package" presented by the European Commission on November 30, 2016, and including proposed amendments to Directive 2009/28/EC, the French legal framework was put in place through the adoption of the aforementioned decree of 2016.

The different models

Different models of self-consumption

Are there different models of self-consumption (individual and collective, for example)? Can you describe?

In France there are:

- individual self-consumption, which allows self-producers to consume the electricity they produce themselves,
- collective self-consumption, which enables one or several producers to sell electricity to one or

[5] Autoconsommation collective, principe et état des lieux en France en 2021 – Encyclopédie de l'énergie.

several self-consumers within a perimeter close to the production plant.

Is there a difference between self-consumption operations and Power Purchase Agreements? Can you describe.

Yes, there are several differences.

Firstly, individual self-consumption operations benefit from a specific advantageous tax regime. There is no specific tax regime for PPAs. In addition, self-consumption projects can benefit from two types of state support, depending on the power of the installation ("feed-in-tariff" for the purchase of surplus electricity produced by the state for installations with a power output of less than 500kWp, and the possibility of benefiting from a contract for difference for winners of tenders organized by the state for projects over 500kWp).

Secondly, PPAs are not subject to distance constraints, contrary to individual self-consumption operations (which require the installation to be on the same site as the consumption site) and collective self-consumption operations (which require all members participating in the operation to be located within a maximum radius of 20 km).

Lastly, individual self-consumption operations are not contracts for the sale of electricity but correspond either to the purchase of an installation to consume the electricity produced, or to a rental contract for an installation.

Individual and collective self-consumption

What is the regulatory difference between individual and collective self-consumption?

Individual self-consumption is governed by article L.315-1 of the French Energy Code. It is defined as “the fact that a producer, known as a self-producer, consumes all or part of the electricity produced by his installation on the same site. The part of the electricity produced that is consumed is done so either instantaneously, or after a period of storage”.

Collective self-consumption is governed by articles L.315-2 et seq. of the French Energy Code. A self-consumption operation is collective “when electricity is supplied between one or more producers and one or more final consumers linked together within a legal entity, and whose extraction and injection points are located in the same building, including residential buildings. A collective self-consumption operation can be qualified as extended when the supply of electricity is carried out between one or more producers and one

or more final consumers linked together within a legal entity, whose extraction and injection points are located on the low-voltage network and comply with the criteria, in particular geographical proximity, set by order of the Minister responsible for energy, after consultation with the Energy Regulation Commission".

State support

Are there any State support mechanisms? Are they direct or indirect? Is it different for individual and collective self-consumption? Can you describe the different support mechanisms? What are their impacts on the development of self-consumption market?

Firstly, the French government created the Photovoltaic Self-Consumption Bonus, also known as the Investment Bonus, by tariff order of May 9, 2017, for individual photovoltaic self-consumption installations with a maximum output of 100 kWp allowing for the sale of the surplus electricity.

Secondly, installations used for individual and collective self-consumption with a capacity of less than 500kWp can sell surplus electricity that is not self-consumed to EDF Obligation d'Achat (EDF OA), an entity of EDF SA, created to carry out the public service mission of managing the purchase obligation entrusted to EDF by law. This State aid mechanism is established by a decree dated October 6, 2021, known as the "S21 decree", which provides advantageous tariffs.

Thirdly, there is a call for tenders for the construction and operation of electricity production installations located in mainland France that use renewable energies, with at least 50% of their production being self-consumed, and with a capacity of between:

- 500 kWp and 10 MWp for individual and collective self-consumption projects within the same building.
- 500 kWp and 3 MWp for extended collective self-consumption projects.

Winners of the call for tenders benefit from a contract for difference with EDF OA (and therefore ultimately with the French government).

The French government has encouraged the development of self-consumption by offering these various support mechanisms.

Projects specifications

The electricity production plants

What type of electricity production plant is eligible for SELF-CONSUMPTION? What is the most commonly used energy source?

In principle, all plants are eligible for self-consumption operations. In practice, however, this mainly concerns photovoltaic projects. The first self-consumption projects were individual self-consumption projects for residential use. We are seeing the development of larger-scale individual self-consumption projects for businesses.

We are also seeing an increase in collective self-consumption projects, which is also encouraging the development of larger-scale projects. Over 95% of collective self-consumption projects are photovoltaic. France ranks 3rd in Europe, behind Germany and Switzerland for its collective self-consumption photovoltaic power plants. There are seven run-of-river hydropower projects in France (paddlewheel, turbines); wind power projects are under study, but none is active yet[6].

What is the average size of the projects?

In France, the self-consumption fleet is mainly made up of small power plants of less than 6 kWp (71%).

Volume of SELF-CONSUMPTION projects

How many SELF-CONSUMPTION operations are set up in 2023 and 2022 in your country (number and GW)?

The French fleet[7] represents 2.2 GW in Q4 2023 (over 400,000 installations) :

- 200,000 new grid connections for individual self-consumption in 2023 representing an increase of 77% between 2022 and 2023.
- 259 collective self-consumption operations in 2023, compared with 149 in 2022 (6 in 2018)

Are they mainly individual or collective? The projects are mainly individual self-consumption projects.

[6] « Autoconsommation collective & nouvelles perspectives offertes par les communautés d'énergie » - Think Smartgrids.
[7] https://observatoire.enedis.fr/thematique/autoconsommation/indicateurs.

The Land

Are projects being developed in all types of areas (urban, rural)? Can you describe.

Projects can be developed in any territorial zone. Haute-Garonne, Gironde and Isère are the departments with the highest installed individual self-consumption capacity in France (between 73 and 91 MW).

Are there any land constraints? Can you describe.

There are no specific land constraints beyond obtaining the required administrative authorizations. Third party investors require more complex contractual structuring though in the event the self-consumer is not the owner of the building or the land on which the PV plant will be installed. Ownership of the plant needs to be secured for the duration of the lease granted by the landowner.

What type of lease is used by producers?

The main contracts used are long term leases (emphyteutic leases). However, we are also seeing an increase in the use of civil leases and loan for use for smaller projects.

The self-consumers

Who are the self-consumers?

Self-consumers include both private individuals and companies. It is also worth noting that French regulations are gradually requiring landowners with buildings or parking lots larger than 500m2 to install photovoltaic panels on a proportion of their surface area. This obligation indirectly encourages the development of self-consumption operations.

What is their field of activity?

Self-consumers operate in a wide variety of fields, although it is worth noting that supermarkets and hypermarkets make massive use of self-consumption due to the surface area of their buildings, which makes it easier to set up photovoltaic projects. Those who resort to self-consumption are (i) those who have the land to do so, (ii) those whose electricity consumption is high, (iii) those who have obligations to solarize their roofs or parking lots, or (iv) those who have CSR commitments.

What is the size of the self-consumer companies?

All sizes, as long as their electricity consumption justifies it, or they meet the criteria of legal requirements.

Do public entities carry out self-consumption operations?

Local authorities account for over 60% of collective self-consumption operations. Approved social housing is also well represented. Projects involving companies on industrial estates are emerging. Collective self-consumption's patrimonial model allows the same entity to simultaneously be producer, consumer and the legal entity organizing the operation. A municipality can be the legal entity organizing the operation.

What are the main reasons for choosing self-consumption?

The main reasons are the possibility of benefiting from a fixed electricity supply cost over the long term, reducing electricity bills and contributing to the energy transition.

The market players

Who offers self-consumption solutions? ENR producers or suppliers? Or asset managers?

Developers and producers offer self-consumption solutions to individuals and legal entities, both private and public.

Property management companies also offer self-consumption solutions, particularly when developing new projects.

Alongside these players, we should also mention the lenders (banks, investment funds) who help finance these projects.

The contractual models and the possibility of selling the electricity

Contractual models used

PPA, leasing, other?

The model differs between individual and collective self-consumption operations.

Individual self-consumption involves either the purchase of a production asset or the lease of a production asset.

In the case of collective self-consumption, the contract is a power purchase agreement.

Possibility of selling electricity

Can the electricity be sold or simply consumed? Can you describe.

In an individual self-consumption operation, the self-consumer can consume its whole production or sale the surplus electricity. In a collective self-consumption operation, electricity is sold between the producers and the self-consumers.

Are the members of a collective self-consumption operation grouped into a particular entity?

A legal entity called a "Personne Morale Organisatrice" (PMO) is created to organize the operation. This PMO often takes the form of an association. It determines the distribution key between participants and manages relations with the grid operator.

The selling price of the electricity

What is the price according to the sector (wind, solar etc.)?

Business models range from a) CAPEX of the project + cost of developing services and O&M over time to b) price integrating variations in the cost of energy over time.

Surplus electricity

Is it possible to sell the surplus electricity produced to a third party? Is there an aid scheme for selling this surplus? Can you describe.

If the photovoltaic plant is eligible for the S21 decree mentioned above, surplus electricity can be sold to EDF OA.

Failing this, the self-producer can sell his electricity to an aggregator, who will then value the electricity, or sell it through a PPA. In practice, however, a certain volume of surplus electricity is required to be of interest to the third-party buyer.

Self- producers can also choose to donate their surplus electricity to third parties. In France, the practice of donating electricity to neighbors or associations is gaining ground. However, this must be done in compliance with tax regulations.

What justifies producers/consumers opting for self-consumption and not for PPAs?

Producers will opt for self-consumption if the self-consumer is located on the same site as the production facility (individual self-consumption) or at a limited distance as determined by regulations (collective self-consumption). Beyond certain distances, only PPAs can be signed. PPA can also be concluded with a facility on the same site as the consumption site (PPA on site). These contracts may be of interest for accounting purposes.

For the self-consumer, in addition to the distance rules, there is a tax incentive in favor of self-consumption (see tax section).

Regulatory

Regulatory constraints specific to SELF-CONSUMPTION

Individual self-consumption operations require that:

- The producer and the consumer must be the same entity, unless a third-party investor is used. Since 2019, with the integration of the notion of “third-party investor” into French law, the self-producer no longer needs to own his production asset to enter an IFA scheme. Under a third-party investor scheme, the power plant is financed, installed and, where applicable, managed and maintained by the third-party investor, who makes it available to the self-consumer under a lease agreement. However, the aforementioned article L. 315-1 provides a framework for the third-party investor's involvement. It states that “The third party may be entrusted with the installation and management, including maintenance, of the production facility, provided that he remains subject to the instructions of the self-producer. The third party itself is not considered a self-producer. It should be noted that the third-party investor cannot sell electricity.

- The production facility must be located on the same “site” as the consumption site. The notion of “site” is not defined by the legislator and may have raised questions.

However, we understand from the combined reading of the French Energy Code and ENEDIS' technical reference documentation that an operation may fall within an IFA scheme if there is a single point of connection (extraction + injection) to the public distribution network, enabling consumption and injection onto the network. In this respect, a “site” does not mean a single point of installation, but a single point of connection to the public electricity distribution network, which could involve several extractions and/or injection installations.

Collective self-consumption operations require:

- the presence of one or more producers and one or more consumers.
- the extraction and injection points are located in the same building, including residential buildings, or, in the case of extended collective self-consumption operations, that these points are located within a radius of 2 km. A waiver can be requested to extend this distance to 10 km in suburban areas and 20 km in rural areas.
- The cumulative peak power of the generating facilities is less than:
  - 3 MW in mainland France
  - 0.5 MW in non-interconnected areas
- All members of the operation are brought together within an organizing legal entity.

Regulatory advantages to SELF-CONSUMPTION

The regulatory advantages of self-consumption include the possibility of applying for government tenders and selling surplus electricity to EDF OA.

There are also tax advantages, as described below.

Finance and tax

Tax

Excise duty

The Excise duty on electricity is levied due to any electricity consumption.The standard tarif of Excise duty on electricity is set at 20,5 € / MW for year 2024 and 2025.

Nevertheless, self-consumption activities benefit from an Excise duty exemption for the self-consumed electricity provided certain conditions are met:

- Partial self-consumption concerns REN installation which power is less than 1 Mwc. Accise duty is therefore set at 0 € level for the self-consumed electricity with the possibility to sell the production surplus (therefore the accise duty is leviable provided the surplus is sold to an end user),
- Total self-consumption operations benefits from an exoneration of Excise duty for the self-consumed electricity provided (i) their production does not exceeds 240GW / year and (ii) the produced electricity is

fully consumed (no selling of the surplus).

Those Excise duty exemptions are maintained in the event of a third investor scheme.

On the other hand, the electricity underdrawned in order to operate the installation is subject to Excise duty on an ordinary basis (20,5 € / Mw).

VAT

No VAT applies on the self-consumed electricity.

The resell of the electricity may benefit from a VAT reverse charge process provided the buyer is not an end user. If the buyer is an end user, the VAT is invoiced by the self-producer at a 20% level on a standard basis.

IFER (network infrastructure taxation)

The IFER is notably levied on windfarm installation and photovoltaic plant which power is at least 100 Kw.

The tarif is 3,394 €/KW (installed power) for photovoltaic plant during the first 20 years of exploitation and 8,16 € beyond,

The tarif is 8,16 €/KW (installed power) for windfarms.

Total self-consumption operations benefit from an IFER exemption.

Financing part

What financial product is proposed by the financiers for the financing of SELF-CONSUMPTION projects? Corporate finance, project finance? Asset finance?

Infrastructure investment funds are aiming at financing portfolios of self-consumption projects. There is a reduction on the French market of profitable REN projects and the variety of small self-consumption projects provide a good repartition of risks.

Equity and corporate finance are also available to existing producers willing to extend their business activities to self-consumption.

Finally, banks and leasing companies provide asset finance funds over an average of 6 to 9 years and project finance for an average of 15 to 22 years.

What are the specific constraints for the banks to finance SELF-CONSUMPTION project?

Apart from land matters and specific constraints in relation to civil leases and/ or Loan for Use which are similar constraints than for non-self-consumption projects, few matters such as:

- Credit risk of the self-consumer and guarantees;
- Substitution capabilities for the use of the site;
- Interaction with the Land-owner (if different from the self-consumer);
- Accounting issues for the self-consumer;
- Price construction of the leasing of the plant and services provides to the self-consumer;
- Security interest over the rentals and potential sale of the electricity surplus;
- Negociation of non-availability of the plant.

Future trends

Future trends

What are the future trends?

Developers and consumers are increasingly interested in collective self-consumption operations. In addition, in France, it is compulsory to install photovoltaic panels on roofs and parking lots above a certain surface area. These obligations encourage the development of self-consumption projects of all kinds.

Germany

The Origins of self-consumption

Origin of self-consumption

Is self-consumption of electricity a practice-based model or the result of the implementation of a regulation? Can you describe.

Self-consumption has a long tradition in Germany, particularly in industry. In 2014, the year when self-consumption was first defined by law, the operation of power plants for own supply in industry and commerce already accounted for more than 11% of final electricity consumption in Germany[8].

The vast majority relying on conventional energy sources.

Originally, self-consumption may have been driven by the desire to increase the security of supply, but soon self-consumption became attractive from an economic point of view, as many electricity price components are not charged for self-generated electricity.

The German renewable energy law (Erneuerbare-Energien-Gesetz - EEG) from 2000 and its subsequent revisions have been instrumental in incentivizing renewables self-consumption and the integration of electricity generated from renewable sources by self-consumers[9].

[8] Study from Prognos, „Letztverbrauch 2015 Planungsprämissen für die Berechnung der EEG-Umlage“, Berlin, 08.10.2014.

[9] Bundesnetzagentur (2016). Finaler Leitfaden zur Eigenversorgung nach dem Erneuerbare-Energien-Gesetz (EEG). Retrieved from: https://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Sachgebiete/Energie/Unternehmen_Institutionen/ErneuerbareEnergien/Eigenversorgung/Finaler_Leitfaden.pdf?__blob=publicationFile&v=1.

For member of the European Union, did self-consumption exist in your country before directive 2018/2001? Was it regulated? If so, how?

Self-consumption in Germany has been regulated before directive 2018/2001 (RED). It was mainly regulated with regard to the levying of the surcharge to be paid by electricity suppliers and final consumers to finance the roll-out of renewable energies (EEG-surcharge).

Before 2014, self-consumption was treated inconsistently. It was generally fully exempted from the EEG surcharge. The law then progressively reduced these exemptions, while promoting self-consumption by households, even temporarily with a direct subsidy.

The EEG 2014 for the first time defined self-consumption (Eigenversorgung) and laid down the principle that all electricity delivered or generated for own consumption is subject to the EEG surcharge. Objective behind was to share the expansion costs of renewable energies appropriately among all players in the energy sector[10]. However, an important number of full or partial exemptions remain.

Self-consumption was defined in § 5 no. 12 EEG 2014 as the consumption of electricity by a natural or legal person in direct spatial connection with the power plant, when the electricity is not fed into the grid and this person is the operator of the power plant. The definition made no distinction between the energy sources used to generate the electricity for own consumption. The definition sets the conditions for self-consumption:

1) The operator of the power plant and the final consumer must be one and the same person.

2) There must be a direct spatial connection between the power plant operated by the self-consumer and the electrical appliances of the self-consumer.

3) The electricity must be consumed on the same site as the power plant, without the electricity being transmitted through a grid. The surplus electricity fed into a grid is excluded from self-consumption[11].

Self-consumption based on renewable energy sources benefited from a reduced EEG-surcharge (or an exemption of EEG-surcharge for off-grid systems and small installations[12]). Apart from EEG, self-consumption of electricity from renewable sources was supported by incentives such as the exemption of the electricity

[10] Deutscher Bundestag, Drucksache 18/1304, Gesetzentwurf EEG 2014, 05.05.2014, Page 93.
[11] Bundesnetzagentur (2016). Finaler Leitfaden zur Eigenversorgung nach dem Erneuerbare-Energien-Gesetz (EEG). Retrieved from: https://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Sachgebiete/Energie/Unternehmen_Institutionen/ErneuerbareEnergien/Eigenversorgung/Finaler_Leitfaden.pdf?__blob=publicationFile&v=1.
[12] §°61 a Nr. 4 EEG 2017.

tax, grid fees, offshore surcharge[13], CHP surcharge[14], and concession fee for the electricity self-consumed. Surplus electricity fed into the grid benefited from a feed-in remuneration for 20 years for installations < 100 kWp and a fixed market premium on top of the market price for installations > 100 kWp and < 750 kWp.

Has the directive led to the creation of a specific legal regime? Can you describe.

The directive 2018/2001 did not let to the creation of a specific regime in Germany. With the implementation of the directive, Germany has adapted the existing regime, notably by reducing the charges on renewables self-consumption. The EEG 2021 exempted renewables self-consumers with an installation with a maximum generation capacity of 30kW (instead of 10kW) and own consumption of max. 30 MWh/a (instead of 10 MWh/a)[15]. The EEG surcharge has been abolished from 1 January 2023[16].

The different models

Different models of self-consumption

Are there different models of self-consumption (individual and collective, for example)? Can you describe?

In Germany, there is only one model of self-consumption. Self-consumption only covers the consumption of electricity consumed by a natural or legal person in direct spatial connection with the power plant when the electricity is not fed into the grid and this person is the operator of the power plant. Multi-person constellations fall outside the scope of self-consumption.

However, the "Landlord-to-Tenant electricity" model in Germany (Mieterstrom) is a form of collective consumption of electricity from renewable sources and comply with article 21 para. 4 RED[17]. Under this model, a landlord can install and operate a PV system on its building and supply the tenants with the electricity produced by the PV system.

Moreover, there are also non-regulated models for the collective consumption of electricity generated on

[13] Offshore surcharge (Offshore-Netzumlage) is a surcharge introduced in 2013 to finance the costs of connecting offshore wind installations to the main electricity grid in Germany.
[14] CHP surcharge (KWK-Umlage) is a surcharge for using the grid introduced in 2002 to finance the costs of grid operators supporting CHP.
[15] §°61 b para. 2 EEG 2021.
[16] PVP4Grid Consortium (2018). PVP4Grid - Deliverable 2.4 Report. Retrieved from : https://www.pvp4grid.eu/wp-content/uploads/2018/08/4.-PVP4Grid_D2.4_Report_Final_DE.pdf.
[17] § 42a of the German Energy Industry Act (Energiewirtschaftsgesetz – EnWG).

site (e.g. On-site PPAs).

Is there a difference between self-consumption operations and Power Purchase Agreements? Can you describe.

In Germany, self-consumption must be distinguished from a power purchase agreement (PPA). In the case of self-consumption, it is the same person who produces and consumes the electricity produced. In the case of a PPA, the producer of electricity is a distinct person from the consumer of the electricity. The producer sells and the consumer buys the electricity produced by the power plant operated by the producer.

Individual and collective self-consumption

What is the regulatory difference between individual and collective self-consumption?

As mentioned above, there is no legal regime for collective self-consumption. However, it is possible to compare the legal regime for self-consumption with that for "Landlord-to-Tenant electricity". The "Landlord-to-Tenant electricity" model was designed to end the discrimination of tenants regarding PV self-consumption and enable them to benefit from the advantages of the energy transition (including cheaper and clean energy). Tenants benefit from the same advantages as self-consumers for the electricity delivered to them without using the grid (exemption from grid charges and surcharges, as well as from electricity tax and concession fees). In contrast to self-consumers, the tenants buy the renewable electricity. They benefit from a guarantee on electricity costs: the price of the electricity supplied by the landlord cannot exceed 90% of the default supplier's tariff. To make the model attractive to landlords, the Landlord-to-Tenant Electricity Act provides for a landlord-to-tenant electricity premium. To obtain this premium the "Landlord-to-Tenant electricity" contract must comply with §°42a EnWG:

- The electricity must be produced by a PV system installed on, at or in a residential building[18].
- The electricity is directly supplied to the tenants without using a public grid (within the residential building or within a block of residential buildings) or being stored before consumption.
- The tenancy agreement cannot oblige tenants to purchase tenant electricity; they must have the right to choose between tenant electricity and electricity from a utility company.
- The tenant electricity contract must cover the full supply of electricity to the tenant, also when the

[18] § 21 para. 3 s. 1 EEG.

PV installation is not producing electricity.

- The tenant may not be bound by the tenant electricity contract for longer than one year and may terminate it independently of the tenancy agreement.

- The price of the electricity must be at least 10% cheaper than the local basic supply tariff.

Self-consumption and the "Landlord-to-Tenant electricity" model benefit both from similar incentives. However, these are two distinct models, self-consumption, unlike the "Landlord-to-Tenant electricity" model, requires a unity of person between producer and consumer. Under the "Landlord-to-Tenant electricity" model, the benefits are shared between the producer (premium) and consumers (tax exemptions and electricity price guarantee).

The recently adopted legislative package for solar (Solarpaket I) sets the course for accelerating the expansion of photovoltaics and reduces bureaucracy to make the electricity supply largely climate-neutral by 2035. It will facilitate collective consumption in residential buildings. The "Landlord-to-Tenant electricity" model will be extended to commercial buildings and ancillary facilities such as garages. The subsidies are granted on condition that the electricity is supplied without using the grid. Moreover, Landlords will be largely exempt from supplier obligations and in particular from the obligation to supply the residual electricity.

State support

Are there any State support mechanisms? Are they direct or indirect? Can you describe the different support mechanisms? Is it different for individual and collective self-consumption?

Self-consumers and tenants under the "Landlord-to-Tenant electricity" model do not pay grid charges and surcharges, electricity tax and concession fees for the electricity delivered/consumed without using the grid.

Under the "Landlord-to-Tenant electricity" model, tenants benefit from a guarantee that the price of the electricity supplied by the landlord cannot exceed 90% of the default supplier's tariff. The landlord benefits from a landlord-to-tenant electricity premium for the electricity supplied. This premium is paid by the grid operator. For PV systems with a commissioning date between 01.02.2024 and 31.07.2024 and an installed capacity of up to 10kW the premium amounts 2,64 ct/kWH; up to 40kW: 2,45 ct/kWH and up to 1.000 kW: 1,65 ct/kWH[19]. The premium can also be claimed if a system operator does not assume responsibility as an electricity supplier themselves but leaves this to a third party.

[19] Bundesnetzagentur - EEG-Förderung und -Fördersätze 15.05.2024, Retrieved from: https://www.bundesnetzagentur.de/DE/Fachthemen/ElektrizitaetundGas/ErneuerbareEnergien/EEG_Foerderung/start.html.

Both self-consumer and landlords under the “Landlord-to-Tenant electricity” model can also receive subsidies for the surplus electricity fed into the grid (see response below).

What are their impacts on the development of SELF-CONSUMPTION market?

In Germany, PV systems without self-consumption (”full feed-in”) receive higher remuneration than PV systems with self-consumption (”partial feed-in”). Attractive returns are possible due to the sharp drop in prices for PV modules, the sharp rise in electricity consumption costs and the increased remuneration for full feed-in. The greater the difference between the purchase costs for electricity and the electricity production costs of the PV system, the more worthwhile self-consumption becomes[20].

Projects specifications

The electricity production plants

What type of electricity production plant is eligible for SELF-CONSUMPTION?

All equipment that generates directly electricity, regardless of the energy source used, are eligible for self-consumption. It covers not only renewables but also conventional plants, CHP plants and electricity storage systems in their generation function.

The individual generator is to be regarded as the defining element of an electricity production plant. For PV systems, each individual photovoltaic module that generates the electricity is considered an electricity production plant. Other technical or constructional equipment used to generate electricity but not generating the electricity itself, such as engines, turbines or facilities for the supply of primary energy sources, are not covered by the term "electricity production plant"[21].

What is the most commonly used energy source?

Solar power is the most used source for self-consumption. In fact, self-consumption is increasingly becoming the basis for the economic operation of photovoltaics (PV) systems.

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[20] Fraunhofer (2024), Recent Facts about Photovoltaics in Germany, retrieved from Fraunhofer website: Recent Facts about Photovoltaics in Germany (fraunhofer.de).

[21] Bundesnetzagentur (2016). Finaler Leitfaden zur Eigenversorgung nach dem Erneuerbare-Energien-Gesetz (EEG). Retrieved from: https://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Sachgebiete/Energie/Unternehmen_Institutionen/ErneuerbareEnergien/Eigenversorgung/Finaler_Leitfaden.pdf?__blob=publicationFile&v=1.

Grid parity for solar power was achieved much faster than expected[22].

What is the average size of the projects?

Photovoltaic systems generated around 59.9 TWh electricity in 2023, of which 53.5 TWh was fed into the public grid and 6.4 TWh was used for self-consumption[23].

From a total of around 3.93 million PV units in operation in Germany at the end of the first quarter of 2024, around 2.81 million are "partial feeders" according to the Federal Network Agency (Bundesnetzagentur)'s market data register (Marktstammdatenregister), i.e. they consume some or all of the PV electricity generated or provide the electricity to a third party without using the grid. The average size of these PV units is not meaningful[24].

According to the "Landlord-to-Tenant electricity" data register, approximatively 8,750 PV units at the end of the first quarter of 2024 are used for "Landlord-to-Tenant electricity" projects and are on average 20kWp[25].

Volume of SELF-CONSUMPTION projects

How many SELF-CONSUMPTION operations are set up in 2023 and 2022 in your country (number and GW)? Are they mainly individual or collective?

Self-consumption project:

Year	Capacity	Number
2022	4.480.972 kWp	382.000
2023	10.031.679 kWp	1.025.800

"Landlord-to-Tenant electricity" project:

Year	Capacity	Number

[22] IHK München (2018). Faktenpapier Strom-Eigenerzeugung. Retrieved from: https://www.ihk-muenchen.de/ihk/Klimapolitik/faktenpapier-strom-eigenerzeugung-data.pdf.
[23] Frauenhofer (2024), Electricity generation in Germany in 2023, Prof. Dr. Bruno Burger Freiburg, Germany, Retrieved from: Microsoft PowerPoint - Electricity_Generation_2023_en_c.pptx (energy-charts.info).
[24] Information provided by the German Solar Association (BSW) on 07.05.2024 based on the market data register (Marktstammdatenregister) of the Bundesnetzagentur.
[25] Ibid.

2022	27.814kWp	1.435
2023	46.694 kWp	2.790

The Land

Are projects being developed in all types of areas (urban, rural)? Can you describe.

Self-consumption and "Landlord-to-Tenant electricity" projects are being developed in all types of areas.

Are there any land constraints? Can you describe.

There are no specific land constraints for PV systems.

What type of lease is used by producers?

Lease agreements for land with terms of 20 to 30 years.

The self-consumers

Who are the self-consumers?

Self-consumers can be both businesses or private households who mainly generate PV electricity for their own consumption and feed surpluses into the public grid.

Do public entities carry out self-consumption operations?

Public entities carry out self-consumption operations.

What are the main reasons for choosing self-consumption?

The decision to invest in PV systems is primarily driven by its expected economic performance[26]. The conviction to contribute to the energy transition is also a major driver in the choice of self-consumption.

[26] Frauenhofer ISI, Study on Self-consumption of solar electricity – Modelling profitability and market diffusion of photovoltaics and battery systems in the residential sector 2018

The market players

Who offers self-consumption solutions? ENR producers or suppliers? Or asset managers?

Type of service provider for self-consumption: For systems under 100 kWp, no service provider is required during operation. The electricity is consumed directly on site on a pro rata basis and the surplus is remunerated via the EEG feed-in tariff paid by the grid operator. For systems over 100 kWp, they are direct marketers.

Type of service provider for “Landlord-to-Tenant electricity”: As a rule, a professional energy supplier is required here, as not only the renewable electricity but also the grid electricity for the remaining demand is supplied to the tenants.

The contractual models and the possibility of selling the electricity

Contractual models used

PPA, leasing, other?

Contracts used for self-consumption: EPC contract or leasing contract for the PV system and lease agreement for the site.

Contractual model used for “Landlord-to-Tenant electricity”: Landlord-to-Tenant electricity contract.

Possibility of selling electricity

Can the electricity be sold or simply consumed? Can you describe. Are the members of a collective self-consumption operation grouped into a particular entity?

Self-consumer can sell and feed in the surplus electricity into the grid.

In “Landlord-to-Tenant electricity” model the Landlord sells the electricity to the tenants. No particular entity needs to be created by the tenants. The transaction is done under a “Landlord-to-Tenant electricity” between every tenant and the landlord.

Surplus electricity

Is it possible to sell the surplus electricity produced to a third party? Is there an aid scheme for selling this surplus? Can you describe.

Self-consumers can sell the surplus electricity and benefit from the EEG subsidies. The following support mechanisms apply to surplus electricity generated by a PV system and fed into the grid:

- For PV systems with a capacity of up to 100 kW, the operator receives a feed-in tariff for the electricity fed into the grid. The feed-in tariff is guaranteed for 20 years. The actual feed-in tariff for PV systems with a capacity of up to 100 kW and a commissioning date between 1. February and 31. July 2024 is 8,11 ct/kWh.

- For PV systems with an installed capacity up to 1000 kW in direct marketing, the operator receives a market premium. The amount of the variable market premium is determined based on the respective "value to be invested" for the PV system. The actual market premium for a PV system with a commissioning date between 1. February and 31. July 2024 and with an installed capacity of 10 kW is 8,51 ct/kWh and with an installed capacity between 100 kW and 1.000 kW, it is 6,14 ct/kWh.

- For PV systems with an installed capacity of more than 1000 kW that participate in tenders, the value results from the awards granted.

- For PV systems with an installed capacity of more than 1,000 kW that do not have to participate in tenders (e.g. citizen renewable energy communities), the values to be applied have to be calculated from the award values of previous tenders since 1 January 2023. The average of the highest bids awarded in the previous year is used for this purpose[27].

Regulatory

Regulatory constraints specific to SELF-CONSUMPTION

For businesses, the requirement for self-consumption concerning the identity of the producer and the consumer is a significant barrier, as several subsidiary companies are often located within a single site (or within one building). In such cases, the absence of a shared social identity between the system operator and the electricity consumer often hinders the utilisation of the benefits of self-consumption. This barrier shall be removed with the new solar legislative package.

Regulatory advantages to SELF-CONSUMPTION

A significant regulatory advantage is the declining feed-in tariff since the EEG 2012, which simultaneously

[27] §°48 (1a) EEG and Bundesnetzagentur (2023). Erneuerbare Energien - EEG-Förderung und -Fördersätze. Retrieved from: https://www.bundesnetzagentur.de/DE/Fachthemen/ElektrizitaetundGas/ErneuerbareEnergien/EEG_Foerderung/start.html.

stimulates self-consumption due to the higher electricity prices in contrast to the levelized cost of electricity production[28].

Finance and tax

Financing part

What financial product is proposed by the financiers for the financing of SELF-CONSUMPTION projects? Corporate finance, project finance? Asset finance?

PV systems are usually financed via subsidised credits from the German development Bank KFW, solar loan or solar leasing[29].

Future trends

Future trends

What are the future trends?

The spread between electricity procurement costs and feed-in tariffs has widened in recent years. This trend is likely to continue in the future, which means that the incentive to consume solar power oneself will remain high from an economic perspective.

Another aspect that could further favour self-consumption is the increase in the annual PV expansion corridor and the lower base degression[30].

With the new solar legislative package, it is to be expected that more and more commercial tenants will also want to purchase electricity under the "Landlord-Tenant Electricity" model. The newly introduced shared building supply model (gemeinschaftliche Gebäudeversorgung) will be an alternative to the Landlord-Tenant Electricity model, especially for smaller apartment blocks (2-12 residential units), but also for commercial properties[31]. This new model is intended to enable shared self-consumption with PV electricity with minimal bureaucracy. The transfer of PV electricity within a building is to be exempt from supplier obligations and the

[28] ibid

[29] PVP4Grid Consortium (2018). PVP4Grid - Deliverable 2.4 Report; retrieved from : https://www.pvp4grid.eu/wp-content/uploads/2018/08/4.-PVP4Grid_D2.4_Report_Final_DE.pdf.

[30] Kegel, J., Naumann, M., Busch, S., Schreiber, S., & Fichtner, W. (2022). "Prosumerverhalten und Energiewende: Energiesystemebene." Retrieved from :. https://www.ioew.de/fileadmin/user_upload/BILDER_und_Downloaddateien/Publikationen/2022/Kegel_et_al_2022_Prosumerverhalten_und_Energiewende_Energiesystemebene.pdf.

[31] BSW (2024), Opinion on the new legislative package for solar, retrieved from 20(25)485 NEU_Stellungnahme_BSW_Solar_Solarpaket I (bundestag.de).

operators of the PV system (building owners or third parties) are to be exempt from the obligation to supply residual electricity. No additional support for the partial feed-in tariff is planned in contrast to the tenant electricity model, which continues to exist independently.

ROKAS

Greece

The Origins of self-consumption

Origin of self-consumption

Is self-consumption of electricity a practice-based model or the result of the implementation of a regulation?

In 1996, the European Parliament along with the Council enacted the no.96/92/EC Directive on the common rules for the internal electricity market. The said directive constituted part of the first energy package of legislative measures aiming at the regulation of the internal electricity market. According to article 2 thereof, a self-producer is any natural or legal person producing electricity mostly for own use.

In this framework, self-consumption started to apply in Greece as a result of the above directive transposed into the Greek legislation by virtue of Law no. 2773/1999, article 2 of which, as applied then, repeated the above definition of the self-producer. The same law specified other relevant provisions for RES (including the surplus of self-consumers from RES or HE CHP), including the priority right granted by the system operator in terms of load dispatching.

Subsequent provisions of EU directives and regulations on self-consumption were transposed into Greek legal system.

European regulation

For member of the European Union, did self-consumption exist in your country before directive 2018/2001? Was it regulated? If so, how?

As mentioned above, the self-consumption in Greece had already been regulated by the law 2773/1999 i.e. before the EU Directive 2018/2001.

Subsequently, separate legislation was developed for RES and HE CHP including the self-producers. Thus, the

Greek law 3468/2006 regulating renewable energy sources (hereinafter the "RES law") distinguishes between autonomous producers from RES (not connected to the grid) and self-producers from RES or HE CHP mostly for its own use, inputting the sur-plus to the grid without charge. Further, law no. 3734/2009, amending article 14 of the above RES Law, authorises the relevant ministries to establish and further regulate by virtue of a joint ministerial decision, of a special program for the development of photovoltaic systems on roofs including the possibility to absorb electricity from the grid, and to conduct of set-off between the produced and consumed energy.

The development of photovoltaic systems in practice by self-producers by means of net-metering, i.e. by means of a set-off conducted between the produced and injected to the grid electricity and the consumed electricity at the self-producer's installations on an annual basis was enacted by virtue of the ministerial decision no.ΑΠΕΗΛ/Α/Φ1/οικ.24461(Government Gazette B' 3583/31.12.2014), issued pursuant to Article 14A of the RES law, as added thereto by virtue of Article 6 par.2 of Law no. 4203/2013, enabling the installation of photovoltaic plants as well as small wind turbines by self-producers. According to the said legislative framework, the electricity injected to the network by the plant of the self-producer was set-off with the electricity absorbed by the self-producer's installations, while the electricity surplus after the conduct of the set-off was injected to the network without any compensation paid to the self-producer. The above ministerial decision laid out the way of conduct of net-metering as well as the type, content, and the procedure of conclusion of the electricity net-metering contracts signed between the self-producers and the suppliers. The said ministerial decision was modified by subsequent ministerial decisions (no.175067/2017, 15084/382/2019, 74999/3024/2021, 121503/5016/2021, 18393/686/2023).

Another significant landmark is the enactment of Law no. 4414/2016, which regulates the virtual net-metering for legal persons with common or public interests as well as for the ones registered in the Farmers and Agricultural Holdings Registry. The virtual net-metering is defined as the set-off between the produced electricity from self-producers RES plants and the total consumed electricity in the installations of the self-producers, of which at least the one is not located at the same or adjacent place or is fed by a different provision. The said law provided for the issuance of a ministerial decision to regulate net-metering as well as virtual net-metering in more details. Thus, the above ministerial decision no. 175067/2017 was issued, and subsequently amended number of times.

Furthermore, Law 5037/2023, which transposed the EU Directive no. 2018/2001 into the Greek legislation, and modified, inter alia, the above article 14 of the RES law, provided for the amended definition of the self-consumers, net metering, virtual net metering and introduced the term for the jointly acting self-consumers and net billing. It authorized the Ministry of Environment and Energy to issue a decision regulating all details of the procedure, conditions, time, prices etc. However, such decision has not been issued and the above has

not been implemented yet.

The different models

Different models of self-consumption

Are there different models of self-consumption (individual and collective, for example)? Can you describe?

In Greece law no. 5037/2023 provides for both the individual as well as the collective self-consumption. As noted above the respective ministerial decision has not been issued yet to regulate details, particularly regarding the collective self-consumption, thus the law provides only the main terms and conditions.

Generally, as provided by article 14 of the RES law, as amended by article 63 of Law no. 5037/2023, the RES consumers are entitled to act as RES self-consumers either individually or through aggregators and to be engaged in activities including but not limited to the self-production, the storage, the sale of the energy surplus (mainly through PPAs and contracts with suppliers or traders), the conduct of virtual net-billing and the installation of a production plant of a capacity of up to 100% of the agreed capacity of the consumption installation and without injection to the grid.

Despite the fact that according to article 14 A of the RES law, as amended by article 64 of Law no. 5037/2023, net-metering is allowed to individual self-consumers without there being a specific reference to certain categories thereof while only the virtual net metering was limited to certain categories and up to certain quantities, by virtue of the recently enacted Law no. 5106/2024, net-billing should be established as the main self-consumption scheme, while net-metering (physical or virtual) shall only be allowed to RES plants qualified as a) beneficiaries of the Program under the name: “Photovoltaics on the roof”, b) plants with a maximum capacity of 30kW, developed by farmers registered with the Farmers and Agricultural Holdings Registry, c) plants developed by general governmental bodies, d) plants developed for the coverage of the energy needs of citizens and households characterized by energy poverty.

As far as the collective self-consumption is concerned, this is met either under the form of joint self-consumption or the form of energy communities.

The Law no. 5037/2023 introduced for the first time the possibility of joint self-consumption facilitating the installation of photovoltaic systems in apartment buildings for both domestic and commercial consumers, where the self-consumers can act jointly through teams of at least two self-consumers in the same building, having appointed a joint representative against third parties.

The Energy Communities were regulated for the first time by the law 4513/2018. There have been a number of energy communities established in Greece in the meantime. The law was subsequently amended by the

5037/2023 replacing the provisions on the energy communities by introducing only two categories of Energy Communities: the Renewable Energy Communities (REC) and the Citizens Energy Communities (CEC). Contrary to the previous form of Energy Communities, the surplus of use distributed to their members will amount to a 20%, while minimum 10% shall be withheld for the formation of an ordinary reserve and the rest 70% will be used for the formation of an extraordinary reserve which further may be used for the activities of the community including but not limited to investment in RES, payment of studies, supporting of vulnerable members etc. Further they are entitled to conduct net-billing and net-metering, as long as their production plants set-off the energy produced with the energy needs of energy-poor citizens and households. They may also conduct virtual net-metering under some conditions.

Is there a difference between self-consumption operations and Power Purchase Agreements? Can you describe.

The self-consumption conducted through net-billing entails that the (surplus) of electricity which is not used is sold, either through competitive procedures for receiving of state aid (in which case PPAs in the form of contracts for difference would be concluded), or to one of the markets organized by the energy exchange (DAM, intraday, forward), or directly to consumers (PPAs). It may be sold either directly, by the community or through an aggregator. The differences, if any, would be clear upon issuing of the ministerial decision which should regulate the procedure and the conditions of the net-billing of self-consumers.

Individual and collective self-consumption

What is the regulatory difference between individual and collective self-consumption?

The difference lies at the fact that while in the former one the imposed restrictions relate to the permitted capacity and the categories of natural or legal persons that are allowed to conduct net-metering, in the latter one and especially in the case of energy communities there are other limitations imposed too, including the number of members and their proximity to the location the energy community is active.

State support

Are there any State support mechanisms?

Pursuant to article 2 par. 32b of the RES law, as amended by Article 40 of Law no. 5037/2023, a state support mechanism may include but it is not limited to investment aid, tax exemptions or reductions, tax refunds,

support schemes for the obligation to use renewable energy, including those using green certificates, and direct price support schemes including guaranteed purchase prices and the payment of premiums, to be implemented.

In addition, by virtue of article 63 par. 4 of Law no. 5037/2023, according to which the Ministry of Environment and Energy can decide upon the announcement of programmes for the installation of photovoltaic systems and storage systems by self-consumers with funding, in particular from European Union funds and the National Development Programme.

The ministerial decision no. 7129/720/23 (Government Gazette 2903 B'/02.05.2023) was issued regarding a program called "Photovoltaics on the roof", according to which the households are provided subsidies for the installation of photovoltaics with storage units and the farmers are provided equivalent subsidies with the installation of storage units being optional, both for the purpose of self-consumption in the form of net-metering. A basic requirement for the eligibility is the previous conclusion of the connection agreement with the Hellenic Electricity Distribution Network Operator. The subsidy of the photovoltaic system amounts to a 65% for households and 40% for farmers, while the subsidy of the battery is from 90% to 100%. The maximum eligible installed capacity of the photovoltaic systems per installation under the Program to be financed is defined 10.8 kW, while the capacity of the storage system (if a storage system exists), shall not exceed the 50 kWh. The said program with a budget equal to €238,000,000 is financed by the Recovery and Resilience Fund.

Greece has adopted the National Recovery and Resilience Plan 2.0 approved by Ecofin by virtue of its Executive Decision no. 10152/06.07.2021 and in accordance with EU Regulation 2021/241. The Recovery and Resilience Fund which was founded in Greece by virtue of Law 4822/2021, aims at both the lending as well as the funding of projects among which RES projects.

Another program financed by the Recovery and Resilience Fund is the "Photovoltaics in the field" with a total budget equal to €30,000,000 and effective date the 9th of April 2024, regulated by the same as above ministerial decision. Through the program, the installation of photovoltaic power plants with a capacity of up to 50kW is supported for professional farmers, farmers with special status and agricultural enterprises. Beneficiaries would receive aid of 30% of the cost of the photovoltaic plant and up to €350 per kWp, with the amount of the subsidy not being cumulated in the de minimis aid received by farmers.

Additionally, with reference to collective self-consumption, there is a program of total budget equal to €41,795,000, launched and financed by ESPA (i.e. the Partnership Agreement on the Development Framework which is the main strategic plan for the country's development with the assistance of significant resources from the European Union's European Structural and Investment Funds), for the support towards the three forms of energy communities within 5 districts of the country. The action concerns expenses for

the installation of RES plants for self-consumption with through net-metering or virtual net-metering and the applications deadline elapsed on 28.03.2024.

Are they direct or indirect?

Direct.

What are their impacts on the development of SELF-CONSUMPTION market?

All the above-described state support mechanisms are relatively new. Therefore, their impacts on the market are not clear yet although one may conclude that they certainly increased the interest and the number of the self-consumers in the market.

Projects specifications

The electricity production plants

What type of electricity production plant is eligible for SELF-CONSUMPTION?

While according to article 6 par.2 of Law no.4203/2013, by virtue of which article 14A was added to L.3468/2006, self-producers were entitled to the installation of photovoltaic plants and small wind turbines plants, article 13 par.7 of Law no. 4414/2016 amended the above article 14A and therefore self-consumption was extended to other technologies, namely biomass/biogas/biofuel plants, small hydroelectric plants and HE CHP plants, while by virtue of Law no. 4513/2018 and the Ministerial Decision DAPEEK/15084/382/2019, it is now possible to install storage units in combination with self-production systems.

What is the most commonly used energy source?

Electricity produced by photovoltaic plants.

What is the average size of the projects?

The projects vary in terms of size. There are self-consumers in industry that are quite big but not necessarily RES. They may be of HE CHP or not. There are projects of self-consumers from RES such as the Athens airport (currently the self-consumption photovoltaic plant of 16 MW along with another photovoltaic plant of 8 MW produce the 2/3 of the energy needs of the airport in electricity, while additional 45 MW from photovoltaic

park planned for 2025 are going to cover the 100% of the energy needs thereof, maximizing the self-consumption with the use of storage units). And there are a lot of small RES self-consumers such as households or farmers.

Volume of SELF-CONSUMPTION projects

How many SELF-CONSUMPTION operations are set up in 2023 and 2022 in your country (number and GW)?

According to available information:

In 2023, self-consumption by households, farmers, businesses, municipalities and energy communities doubled, reaching 421 MW, while the capacity of self-consumption projects operating by energy communities was more than tripled (from 4.2 MW in 2022 to 14 MW in 2023).

In 2022, 119.1 MW of commercial and domestic photovoltaics were connected, in terms of self-production.

Are they mainly individual or collective?

Individual.

The Land

Are projects being developed in all types of areas (urban, rural)? Can you describe.

Such projects are developed in all kinds of areas, except for the land constraints such as forest or agricultural land, as described below.

Are there any land constraints? Can you describe.

The photovoltaic systems used by self-consumers for net-metering can be installed on buildings or on the ground, or other structures, including those of the primary sector in accordance with the applicable urban planning legislation. In general, according to the Greek legislation, the installation of photovoltaic systems is now allowed on land plots outside the zone planning unless it is specifically restricted, according to the ministerial decision no. 49828/2008, in combination with the ministerial decision no. 40158/2010.

Thus, according to article 24 of Law no. 4643/2019, in combination with article 56 par.6 of Law no.2637/1998 as in force, the production of electricity from photovoltaic plants is prohibited on the agricultural land of high productivity. Exceptionally, small photovoltaic plants with installed capacity up to 1MW are permitted as long

as cultivation activity is exercised and if they do not exceed 0.8% of the total cultivated area of each regional unit. According to the respective ministerial decision (ΥΠΕΝ/Δ ΑΠΕΕΚ/104605/4389/2022), each region was obliged to perform the calculation and provide the exact maximum limit of the permitted per region total capacity of photovoltaic plants in agricultural land of high productivity.

Photovoltaic panels are exceptionally allowed in Natura areas. They are completely prohibited in the Absolute nature protection and the Nature conservation zones while in the Habitat and species management zones and in the Sustainable natural resources management zones they are allowed under certain conditions, upon a environmental impact study and respective administrative decision

Exceptionally, according to article 34 of Law no. 4872/2021, the installation of photovoltaic systems is allowed in forest land which was in the past cleared or conceded for agricultural or horticultural use by an administrative decision (i.e. whose use changed into the said use), and which, after the exploitation by the RES producer, should again be used for agriculture, with the exceptions related to the agricultural exploitation of article 47 of Law no.998/1979 as in force, in which cases a new administrative decision is required.

What type of lease is used by producers?

Long-term lease given that the set-off contract is concluded for 25 years and if it is about net-billing which entails the sale of the energy surplus, then the lease would be commercial.

The self-consumers

Who are the self-consumers?

Self-consumers are citizens, businesses, farmers, energy communities and local government organizations.

What is their field of activity?

Self-consumers can belong to any field of activity.

What is the size of the self-consumer companies?

There is no specific size constraint regarding self-consumers companies, except for the case of Renewable Energy Communities, the members of which, in terms of companies, can only be small or medium ones.

Do public entities carry out self-consumption operations?

Yes.

What are the main reasons for choosing self-consumption?

The main reason is the hedge of the energy cost, as well as the saving of energy, the energy autonomy, the long-term economic benefit as well as the increase of the resale value of the property where the self-production system is installed.

The market players

Who offers self-consumption solutions? ENR producers or suppliers? Or asset managers?

The energy suppliers (which, anyway, conclude with the self-consumer, after the signing of the connection agreement between the latter one and the grid operator, an energy set-off contract) provide self-consumption solutions by means of providing to the self-consumer support, consisting of financing through bank loan agreements, as well as assistance in the licensing, installation and maintenance procedures and through the state programs described above.

The contractual models and the possibility of selling the electricity

Contractual models used

PPA, leasing, other?

The most common the agreement on set-off as described above. PPAs in the form of a CfD (known in Greece as Feed-in-premium) applicable for RES producers, should be available for self-consumers in compliance with the amendments of the law described above. The same applies to PPAs selling the electricity directly to other consumers.

Possibility of selling electricity

Can the electricity be sold or simply consumed? Can you describe.

The law provides the possibility for selling electricity through the scheme of net-billing or even virtual net-billing and the sale of energy on the market, to consumers etc (as described above). But the implementation is currently on hold until the issuance of the above ministerial decision. Subsequently, in practice, for now,

there is only net-metering.

The selling price of the electricity

What is the price according to the sector (wind, solar etc.)?

The ministerial decision, regulating among others, the selling price of electricity for net-billing has not been published yet, but it is anticipated soon given that net-billing is planned to be the dominant scheme in energy self-consumption, except for few cases entitled to still conduct net-metering.

Surplus electricity

Is it possible to sell the surplus electricity produced to a third party? Is there an aid scheme for selling this surplus? Can you describe.

Yes, it is possible through net-billing (to be implemented after issuing of the above ministerial decision), however, there is no aid scheme supporting this model to date.

Self-consumption and Power purchase agreement

What justifies producers/consumers opting for self-consumption and not for PPAs?

It remains to be seen.

Regulatory

Regulatory constraints specific to SELF-CONSUMPTION

There are certain constrains and limitations regarding the capacities and quantities for net-metering (according to the recent amendments) as well as virtual net-metering (which anyway was not open for all categories). Given that these are new provisions and that issuing of the ministerial decision is pending it remains to be seen how these constrains will apply in practice.

Regulatory advantages to SELF-CONSUMPTION

Except for the state aid schemes already launched and the provisions of the new law providing for the implementation of net-metering to the specific categories mentioned above, there are no other explicit

regulatory advantages currently applied.

Finance and tax

Which tax system applies? Is the tax system advantageous? Can you describe.

There are certain advantages for some categories such as the purchase of small roof PV installations or for small PV production by farmers:

a) small roof PV installations: the cost of the purchase is used to reduce, equally distributed for over a period of 5 years, the taxable income of individuals up to the proportionate tax for each tax year, with a maximum total expenditure limit of €16,000, in compliance with article 31 of Law no.5073/2023.

b) farmers that have installed RES plants with capacity less than 500kw, are charged for income from such plant at the reduced income tax rate for agricultural works, as long as they are registered with the Registry of Farmers and Agricultural Holdings during the financial year in which that income was earned, according to article 2(1)(f) of Law no.3874/2010, as in force. Accordingly, as set out by article 40 of Law no. 4387/2016, the professional farmers of at least 5 years, as well as natural persons falling within subsidy programs of agricultural development of new farmers installing photovoltaic systems of a total capacity less than 500kw are not any more obliged to pay social security contributions as commercial enterprise, but as farmers.

c) the subsidy programs such as the "Photovoltaics on the roof" provide that the VAT paid on the electricity is considered as eligible expense.

d) According to the joint ministerial decision no. 139818 ΕΞ 2022, the small and medium-sized enterprise or the self-employed person which install a photovoltaic system at their place of business to reduce energy costs, are allowed to deduct from their gross income not only the cost of the investment but the double thereof.

With reference to VAT or any subsidy program in support of net-billing, the relevant ministerial decision is expected to regulate such matters.

Financing part

What financial product is proposed by the financiers for the financing of SELF-CONSUMPTION projects? Corporate finance, project finance? Asset finance?

Project finance.

What are the specific constraints for the banks to finance SELF-CONSUMPTION project?

Taking the example of a certain bank, -which incidentally selects to finance net-metering as long as the beneficiary is a company with a turnover of up to €5,000,000-, it provides financing for up to 80% of the total budget through partial disbursements of the capital. The financing covers expenses including but not limited to infrastructure as well as purchase and installation of relevant equipment, VAT included, except for cases where the beneficiary is discharged thereof. A basic requirement in case that the installation of the photovoltaic system within the same or adjacent to the consumption installations area fed from the photovoltaic system takes place in a leased property is the term of validity of the lease to be longer than the one of the financing, i.e. more than 10 years. Additional requirements for the request of the financing is the previous technical study and financial offer for the installation of the equipment, the submission of application for connection to the grid before HEDNO, as well as the receiving of the binding connection terms. Last but not least, a prerequisite is the purpose of self-consumption through net-metering, meaning that if the purpose is the installation of photovoltaic systems for the sale of produced energy, then there is the program of financing of photovoltaic systems.

The said program offers two options, either the loan for the financing of 80% of the total budget of the investment for infrastructure, purchase and installation of equipment and connection expenses, or the leasing for the financing of 100% of the equipment value, which shall exceed the €100,000. During the leasing, which is up to 18 years, the ownership of the equipment remains to the bank, while upon the termination thereof, the beneficiary is enabled to pay a consideration and obtain the ownership. Both the loan and the leasing are addressed to small or medium companies with a turnover equal up to €5,000,000, or new companies or start-ups aiming at investing in photovoltaic systems, or to professional farmers, or to energy communities. The securing of financing either through lending or through leasing takes place via the assignment of the electricity sale agreement concluded between the beneficiary and DAPEEP, or the assignment of the electricity sale agreement concluded between the beneficiary and aggregators, or the assignment of the insurance agreement of the engineering equipment.

In a general framework, it can be said that the Greek banks in cooperation with the RRF undertake the co-funding of natural or legal entities aiming at the green transition, including but not limited to the purchase or lease of buildings and equipment. The co-funding should consist of a maximum funding by the RFF at a 50%, a minimum funding by a co-funding loan at a 30% and a minimum private participation by the investment operator at a 20%.

Future trends

What are the future trends?

According to the new Law no. 5106/2024, the program under the name “Apollon” is expected, to reduce the energy costs of vulnerable households, Local Authorities of the first and second degree, Local and General Improvement Organisations, Municipal Water and Sewerage Enterprises and their successors, through the installation of Renewable Energy Sources (RES) plants with or without a storage plant and the application of virtual net-billing. The implementation of the program is carried out per region and per Energy Community of Citizens (ECC) in individual phases, including, among others, the establishment of ECC, the invitation to tender for the selection of projects for each ECC, the conclusion of the necessary contracts with the beneficiaries, the holders of the selected plants, the supplier and the RES and Guarantees of Origin Operator and the putting into operation of the respective plants as well as the implementation of virtual net-billing.

Photovoltaics in Businesses, a new subsidy scheme regarding businesses, is anticipated to support zero feed-in systems, i.e. systems which do not inject the surplus of energy to the grid, with or without storage units, depending on the ability or not of the company to consume at the same time the energy produced.

AZB & PARTNERS
ADVOCATES & SOLICITORS

India

The Origins of self-consumption

Origin of self-consumption

Is self-consumption of electricity a practice-based model or the result of the implementation of a regulation?

In the 1990s, surging electricity demand overwhelmed the existing electricity system. In order to tackle the unreliable grid power, the Indian Government realized a new approach was needed. They encouraged industries to generate their own power by working together. captive power plants (**CPP**), with their advantages, emerged as a promising solution.

Over the years, power intensive industries such as aluminium, cement, chemicals, fertilizers, iron & steel, paper and sugar etc. have set up their own captive power plants, either to supplement the electricity purchased from the utilities, or for emergency use to protect against unreliable grid power such as power restriction/failure/cut. Since industries needed steady electricity to keep their businesses running and potentially save money. This led to the rise of CPPs.

As the Indian Government realized the growing trend of captive and group captive consumer(s) of electricity, they came up with necessary regulations which principally governed the captive and group captive consumer(s) of electricity. The Electricity Act, 2003 (**Act**) and the Electricity Rules, 2005 (Rules) therefore introduced reforms that recognized captive power generation as a legitimate option. This Act provided a regulatory framework for industries to establish captive plants.

Finally, with the introduction of the Act and Rules, various economic benefits and procedural exemptions were provided to captive and group captive consumer(s). This coupled with the need for stable supply of power in an unreliable grid structure led to a growth of self-consumption in India.

Different models of self-consumption

Are there different models of self-consumption (individual and collective, for example)? Can you describe?

The Act and Rules recognizes two main categories of power generation for self-consumption:

(i) Captive; and

(ii) Group captive consumers.

Captive Consumer:

As per the Act and Rules, a single entity is allowed to be a captive consumer. However, they must own at least 26% (twenty six percent) of the equity stake in the captive power generating plant and must consume a minimum of 51% (fifty one percent) of the electricity generated by the plant annually. This ownership stake and consumption level needs to be maintained throughout the year in order to maintain their status as a captive consumer.

Group Captive Consumer:

As per the Act and Rules, a group of two or more entities can be considered a group of captive consumers. However, collectively, they must hold a minimum of 26% (twenty six percent) ownership in the generating plant and together, they must consume at least 51% (fifty one percent) of the electricity generated annually. Further, each member's consumption should be proportional to their ownership share, with a maximum allowed variation of 10% (ten percent).

The key differences between captive and group captive users are:

Number of Entities: A Captive consumer is a single entity, while group captive consumers involve association between multiple entities.

Ownership Structure: Both require a minimum of 26% (twenty-six) ownership in the captive power plant; however, group captive consumers have the option of partaking in a collective ownership structure.

Consumption Proportionality: Individual consumption for a group captive consumer needs to be proportionate to their ownership share, with a 10% (ten percent) maximum variation. However, this isn't applicable for a single captive consumer.

Is there a difference between self-consumption operations and Power Purchase Agreements? Can you describe.

Captive model power plants can be set up in two different ways, namely:

(i) CAPEX (Capital Expenditure) model; and

(ii) ESCO (Energy Service Company) model.

CAPEX Model:

Investment: In the CAPEX model, the entity itself owns and finances the entire captive power plant. This includes the upfront cost of buying equipment, land acquisition (if needed), and construction.

Ownership and Control: The entity has complete ownership and control over the captive power plant. Including management decisions such as fuel choices, operation schedules, and maintenance practices.

Operational Responsibility: The entity is responsible for the operation and maintenance of the captive power plant.

Risk Management: The entity bears all the risks associated with the project, including cost overruns during construction, fluctuations in prices of resources, and plant performance issues.

ESCO Model:

Investment: In the ESCO model, a third-party developer (ESCO company) finances, installs, owns, and operates the captive power plant.

Ownership and Control: The entity does not own the captive power plant but enters into a long-term Power Purchase Agreement (PPA) with the ESCO company.

Cost Structure: The entity pays the ESCO company a pre-determined tariff for the electricity generated by the captive power plant.

Operational Responsibility: The ESCO company is responsible for the operation and maintenance of the captive power plant.

Risk Management: Risks associated with project construction, resource price fluctuations, and plant performance are borne by the ESCO company.

Therefore, in case of a CAPEX model, a captive or group captive consumer(s) will not be required to enter into a PPA for self-consumption, however, if the entity/consumer(s) chooses to enter a ESCO model, then in that case they will be required to enter into a PPA as the captive power plant is not completely owned by the

captive/group captive consumer(s).

Individual and collective self-consumption

What is the regulatory difference between individual and collective self-consumption?

As mentioned above, the key differences between captive and group captive consumers are:

Number of Entities: A Captive consumer is a single entity, while group captive consumers involve association between multiple entities.

Ownership Structure: Both require a minimum of 26% (twenty-six) ownership in the captive power plant; however, group captive consumers have the option of partaking in a collective ownership structure.

Consumption Proportionality: Individual consumption for a group captive consumer needs to be proportionate to their ownership share, with a 10% (ten percent) maximum variation. However, this isn't applicable for a single captive consumer.

State support

Are there any State support mechanisms? Are they direct or indirect?

While there are no direct support mechanisms offered to captive and group captive consumer(s), the Act and Rules provides various exemptions to captive and group captive consumer(s). A brief overview of such exemptions is provided below:

Exemption from Cross-Subsidy and Surcharges: Unlike grid power consumers who pay charges such as cross-subsidy surcharge and additional surcharge, captive and group captive consumer(s) are exempt from these cross-subsidy and additional surcharges.

Open Access: The Act grants captive and group captive consumer(s) open access for the purposes of carrying electricity from their captive generating plant to their destination of use.

Is it different for individual and collective self-consumption?

No, the Act and Rules do not differentiate the exemptions which are provided to captive and group captive consumer(s).

What are their impacts on the development of SELF-CONSUMPTION market?

The distribution companies (DISCOMs) in India have felt the major brunt on the development of the self-consumption market. A brief overview of the impacts on such DISCOMs has been provided below:

Loss of Revenue: Captive and group captive consumer(s) represent lost revenue for DISCOMs, as they are not purchasing electricity from the grid. This has been straining the revenue sources for DISCOMs as more and more consumers are shifting to the captive structure.

Reduced Cross-Subsidy Revenue: Since captive and group captive consumer(s) do not rely on the grid, they are not subject to cross-subsidy charges that help finance lower tariffs for domestic and agricultural consumers.

Projects specifications

The electricity production plants

What type of electricity production plant is eligible for SELF-CONSUMPTION?

The Act and the Rules do not explicitly restrict the type of production plant that can be used for captive and group captive consumption in India.

What is the most commonly used energy source?

As per the All-India Electricity Statistics (containing data for the year 2021-2022) (Report), published by the Central Electricity Authority of India (CEA), the growth of the self-consumption of electricity mainly uses the following energy sources:

(i) Hydro;

(ii) Steam;

(iii) Diesel;

(iv) Gas;

(v) Wind; and

(vi) Solar.

What is the average size of the projects?

While we do not have information available on the average size of the projects. As per the Report, we have provided a brief overview of the total installed capacity for the energy sources mentioned above:

(i) Hydro: 134.60 MW (one hundred and thirty-four point six zero);

(ii) Steam: 45203.73 MW (forty-five thousand two hundred and three point seven three);

(iii) Diesel: 18648.78 MW (eighteen thousand six hundred and forty-eight point seven eight);

(iv) Gas: 5685.25 MW (five thousand six hundred and eighty-five point two five);

(v) Wind: 3192.05 MW (three thousand one hundred and ninety-two point five); and

(vi) Solar: 3769.03 MW (three thousand seven hundred and sixty-nine point three).

Volume of SELF-CONSUMPTION projects

How many SELF-CONSUMPTION operations are set up in 2023 and 2022 in your country (number and GW)?

As per the Report, during the year 2021-2022, a total number of 9,711 (nine thousand seven hundred and eleven) generating industries have set up self-consumption power plants in India. Further, as per the Report, a total of 209310.77 GWh (two lakh nine thousand three hundred and ten point seven seven) have been generated during the year 2021-2022.

Are they mainly individual or collective?

We do not have an official statistic which provides the breakup between captive and group captive consumer(s) for the total GWh which has been generated during the year 2021-2022.

The Land

Are projects being developed in all types of areas (urban, rural)? Can you describe.

We do not have an official statistic which provides in what type of areas these projects were built during the year 2021-2022. However, in our practice, we have noticed that captive and group captive producer/consumer(s) usually set up their CPPs in industrial areas as compared to rural areas.

Are there any land constraints? Can you describe.

While constraints in land are prevalent in India, it is not solely restricted to captive or group consumer(s) but also equally constraining on third party sellers/consumers of electricity in India. A brief overview of the major land constraints is listed below:

Acquisitions: While land is more readily available in rural areas, acquiring it is a complex process. As it is difficult to ascertain land ownership rights in rural India, it becomes a very lengthy and cumbersome procedure to get clear land rights in the name of the relevant power producer. This in turn leads to negotiations with multiple landowners which then becomes a hurdle leading to major delays in setting up power projects.

Regulatory Restrictions:

Environmental Regulations: Depending on the source (coal, gas, solar) and chosen location, specific environmental clearances are also required for setting up power plants. These can impose restrictions on land use based on proximity to sensitive ecological zones or protected zones.

Land-Related Clearances:

State Pollution Control Board (SPCB): The SPCB might require a separate clearance for land use, based on potential air and water pollution concerns.

Other Restrictions: Power producers are also required to obtain No-Objection Certificates (NOC) from various authorities for setting up the power plants. These NOCs are required from authorities such as the CEA, local bodies like the municipality or gram panchayat, fire department, etc.

Therefore, keeping in mind all the abovementioned constraints, it becomes clear that land continues to pose a constraint on power producers including captive and group captive producers.

What type of lease is used by producers?

While there are no specific type of leases which are used by captive or group captive power producers, the most commonly used method of obtaining land for CPPs are:

Common Lease: The landowner leases the land to the power producer for a specific period. In this type of a framework, an underlying lease agreement is drawn up which outlines the terms and conditions of the lease, including:

(i) Lease Duration: The period for which the land is leased, typically ranging from 15 (fifteen) to 25 (twenty-five) years.

(ii) Lease Rent: The annual or periodic rent paid by the power producer to the landowner.

(iii) Development Rights: The lease might specify the lessee's rights to develop the land for building the power plant and associated infrastructure.

Sale and Leaseback: While leasing land is the most common method to opt for power producers, in some cases, the power producer chooses to purchase the land from the owner and then lease it back for a long term. This can be a way for the landowner to access immediate capital while still retaining some control over the land through the lease agreement.

The self-consumers

Who are the self-consumers?

Typically, in India, consumers requiring high and constant need of electricity are the major self-consumers. A detailed list of such consumers have been specified below.

What is their field of activity?

As per the Report, the major field of activity of self-consumers for the year 2021-2022 are:

(i) Aluminium;

(ii) Automobiles;

(iii) Cement;

(iv) Chemical;

(v) Collieries;

(vi) Electrical Engineering;

(vii) Fertilizer;

(viii) Food Products;

(ix) Heavy Engineering;

(x) Iron & Steel;

(xi) Jute;

(xii) Light Engineering;

(xiii) Mineral Oil & Petroleum;

(xiv) Non-Ferrous;

(xv) Paper;

(xvi) Plastic;

(xvii) Rubber; and

(xviii) Sugar.

What is the size of the self-consumer companies?

While we do not have an estimate on the size of such self-consumer companies, since setting up a captive and/or group captive power project is a capital-intensive structure, most of the entities which partake in setting up captive structures are high capital and revenue generating companies.

Do public entities carry out self-consumption operations?

While there are no restrictions on the participation of public entities to carry out a captive or a group captive structure, it is very rare to come across public entities carrying out self-consumption. This is mainly due to reasons which are attributable to financing/funding, need of technical expertise and requirement of transparency and accountability.

What are the main reasons for choosing self-consumption?

As mentioned above, due to exemption from cross-subsidy surcharge, additional surcharge, grant of open access and the need of a stable supply of power in an unreliable grid, we generally notice a switch of industries opting to choose a captive/group captive model.

The market players

Who offers self-consumption solutions? ENR producers or suppliers? Or asset managers?

There are various key players in India who offer captive consumption solutions to captive and group captive consumer(s). A brief overview of such players has been listed below:

Engineering, Procurement, and Construction (EPC) Companies:

These companies offer a complete turnkey solution, handling all aspects of the captive power project from design and engineering to procurement of equipment, construction, and commissioning of the power plant.

Certain examples of such players are Larsen & Toubro, Bharat Heavy Electricals Limited, Tata Group, Sterlite Power Transmission Limited, and Sterling & Wilson.

Equipment Manufacturers :

Companies specializing in the manufacturing of power generation equipment, like solar panels, wind turbines, gas engines, or biomass conversion technology.

Certain examples of such players are Siemens Limited, Suzlon Energy, and Regen Powertech.

Independent Power Producers (IPPs):

IPPs also develop and operate CPPs for industries under long-term PPAs.

Major Consultants:

Engineering and financial consultants play a crucial role in feasibility studies, project financing, and regulatory approvals for captive and group captive projects.

Certain examples of such players are KPMG India, Deloitte Touche Tohmatsu India LLP, and PwC India.

The contractual models and the possibility of selling the electricity

Contractual models used

PPA, leasing, other?

The contractual models opted to sell captive produced electricity are as mentioned below:

PPA

As mentioned earlier, captive or group captive consumer(s) usually opt for a PPA structure in case the project has taken a ESCO model. In the abovementioned model, the power producer enters into a PPA with the captive or group captive consumer(s) which is usually a long term PPA.

CAPEX

In terms of a CAPEX model, there is no requirement for a PPA for the sale of power as the captive or group captive consumer(s) is consuming electricity from the power plant which has been set up and owned by them.

Sale To Third Party

In terms of a ESCO model, while a PPA is entered into between the power producer and the captive or group captive consumer(s) (for the amount of required aggregate consumption as mentioned above), the power producer is free sell the remaining power generated from their power plant to third party consumers through open access.

Possibility of selling electricity

Can the electricity be sold or simply consumed? Can you describe.

As mentioned above, in terms of a ESCO model, the power producer, apart from selling electricity to the captive or group captive consumer(s) for the required aggregate amount, is also free to sell the surplus power through third party open access without any restriction on the choice of consumer.

The selling price of the electricity

What is the price according to the sector (wind, solar etc.)?

While under the CAPEX model, tariff determination and selling price of electricity is not required, under the ESCO model, the power producer apart from supplying electricity to the captive or group consumer(s) also has the choice to sell power to third party open access consumers. In that case, the tariff is bilaterally determined between the power producer and the consumers, including captive or group captive consumer(s).

Determining factors such as (i) cost of capital; (ii) equity investment (only applicable in case of captive or

group captive consumer(s)); (iii) input costs; (iv) cost of land procurement; and (v) average returns, are kept in mind while bilaterally determining the selling cost of electricity to the consumers.

Surplus electricity

Is it possible to sell the surplus electricity produced to a third party? Is there an aid scheme for selling this surplus? Can you describe.

As mentioned above, in terms of a ESCO model, while a PPA is entered into between the power producer and the captive or group captive consumer(s) (for the amount of required aggregate consumption i.e., 51% (fifty one percent)), the power producer is free sell the remaining power (i.e., 49% (forty nine percent)) generated from their power plant to any third-party consumers through open access.

Self-consumption and Power purchase agreement

What justifies producers/consumers opting for self-consumption and not for PPAs?

As mentioned earlier, the reason why captive or group captive power producer/consumer(s) opts for self-consumption is because of the various benefits and reliability they derive from the captive model.

Exemption from Cross-Subsidy and Surcharges: Unlike grid power consumers who pay cross- subsidy surcharge and additional surcharge, captive and group captive consumer(s) are exempted from the payment of these cross-subsidy and additional surcharges.

Reliable Power Supply: Captive and group captive consumer(s) can remove their reliance on unreliable grid supply and have a more efficient and constant supply of power from their captive projects.

Choice of Power Source: Captive and group captive consumer(s) and producers have the choice to choose what type of energy sources drive their CPPs. This in turn provides them an opportunity to opt for a more cost-efficient source. Moreover, industries are also given the option to opt for renewable energy sources which can help reduce their carbon footprint and meet their sustainability goals.

Long term contracts: Usually captive or group captive consumer(s) sign PPAs for a long term (usually 15-25 (fifteen to twenty-five years)) this provides as an advantage to both the producer and the consumer(s) as the provider has a secured long term revenue source and the consumer(s) are also provided a long term and reliable source of power.

Regulatory constraints specific to SELF-CONSUMPTION

As mentioned above, the Act and Rules provides for the following constraints on captive/group captive consumer(s):

Captive Consumer:

As per the Act and Rules, a single entity is allowed to be a captive consumer. However, they must own at least 26% (twenty six percent) of the equity stake in the captive power generating plant and must consume a minimum of 51% (fifty one percent) of the electricity generated by the plant annually. This ownership stake and consumption level needs to be maintained throughout the year in order to maintain their status as a captive consumer.

Group Captive Consumer:

As per the Act and Rules, a group of two or more entities can be considered a group of captive consumers. However, collectively, they must hold a minimum of 26% (twenty six percent) ownership in the generating plant and together, they must consume at least 51% (fifty one percent) of the electricity generated annually. Further, each member's consumption should be proportional to their ownership share, with a maximum allowed variation of 10% (ten percent).

(Collectively as Captive Requirements)

The Captive Requirements are required to be met by the captive consumer(s) to maintain the captive status of the generating plant. These Captive Requirements are required to be maintained by the captive consumer(s) throughout the financial year and not just at the end of the financial year.

Regulatory advantages to SELF-CONSUMPTION

The following advantages are provided to captive/group captive consumers:

Exemption from Cross-Subsidy and Surcharges: Unlike grid power consumers who pay charges such as cross-subsidy surcharge and additional surcharge, captive and group captive consumer(s) are exempt from these cross-subsidy and additional surcharges.

Open Access: The Act grants captive and group captive consumer(s) open access for the purposes of carrying

electricity from their captive generating plant to their destination of use.

Further, under the Electricity (Promoting Renew¬a¬ble Energy through Green Energy Open Ac¬cess) Rules, 2022, (Green Rules) captive and group captive consumer(s) are allowed to directly access green energy through open access from the grid, without any restrictions or cap. Additionally, the Green Rules provide for an approval of such access within 15 (fifteen) days failing which it automatically gets approved. This is a big win for captive and group captive consumer(s), especially in states where getting permission for clean energy projects was previously difficult.

Finance and tax

Which tax system applies? Is the tax system advantageous? Can you describe.

Under the taxation laws of India, namely, the Central Goods and Sales Tax Act, 2017, supply of electricity is treated as an 'exempt supply', both under the goods exemption notification and the service exemption notification.

Moreover, as there is no outward supply to separate consumers and captive and group captive consumer(s) infuse equity into the project for their own use, the taxation regime in India does not tax the generation and distribution of such electricity.

This coupled with the exemption provided to captive and group captive consumer(s) from paying cross-subsidy surcharge and additional surcharge provides an advantageous tax regime for the development of CPPs.

Financing part

What financial product is proposed by the financiers for the financing of SELF-CONSUMPTION projects? Corporate finance, project finance? Asset finance?

In our experience, we usually come across project financing as the most commonly used method for financing captive/group captive power projects.

Under the project finance model, the lenders provide funding for a long-term project relying primarily on the project's cash flow, assets, and the project itself as a collateral.

What are the specific constraints for the banks to finance SELF-CONSUMPTION project?

In terms of financing of captive/group captive projects, various constraints are faced from financers/lenders of the projects. These include and are not limited to:

(i) Restrictive framework: The framework which is formulated for project financing of captive/group captive projects are very restraining in nature. The consumers and producers enter into restrictive agreements whereby the consent of lenders is required for activities such as assignment of rights/liabilities, sale or acquisition of assets, altering the memorandum/articles of association, etc. Drawing up these agreements lead to multiple negotiations which ends up acting as a constraint on the part of the lender to enter into such financial arrangements.

(ii) Risk assessment: Lenders require extensive diligence of the project developer/consumer(s) and of the project as a whole in order to determine the viability of the project. This usually is a lengthy and drawn-out process which has to be undertaken and it acts as a deterrence.

(iii) Cash flow: As mentioned above, the lenders usually use the cash flow as a collateral to the loan. In this case, the lender's cash flow faces a risk as they are reliant on constant drawing of power from the captive or group captive consumer(s) instead of having the option of generating revenue from sale in the open market.

Future trends

Future trends

What are the future trends?

Some future trends in the captive/group captive model in the Indian power market are as follows:

(i) Regulatory and Policy developments: As mentioned above, there have been various regulatory and policy developments in the Indian sector which acts as a key contributor in the growth and future of captive/group captive projects in India.

(ii) Technological advancements: With the advent of new technologies, the future of captive and group captive projects are more likely to grow. Technological advancements like smart grids which provide for more operational efficiencies and advancing energy storage solutions like battery storage solutions provide a more stable source of power and enhanced utilization of resources. These advancements therefore become driving forces towards opting for captive/group captive models.

(iii) Need for renewable energy: As industries are now focusing to meet their renewable purchase obligations, we see a shift and a major demand for renewable energy sources. The need to meet these targets

along with the regulatory waivers granted to captive/group captive consumer(s) is paving a path for consumers and producers to choose the captive/group captive model in India.

Togo

The Origins of self-consumption

Origin of self-consumption

Is self-consumption of electricity a practice-based model or the result of the implementation of a regulation?

Self-consumption of renewable energy, in Togo, is the result of the implementation of the provisions of the law on the promotion of electricity production based on renewable energy sources N°2018-010 of 08/08/18.

This law sets the legal framework for the realization of facilities, equipment, materials and movable and immovable property necessary for the production, storage, transmission, distribution, marketing and consumption of electricity based on renewable energy sources in Togo.

European regulation

For member of the European Union, did self-consumption exist in your country before directive 2018/2001? Was it regulated? If so, how?

Yes, self-consumption existed in Togo before Directive 2018/2001 of December 11, 2018. It was regulated by the law of July 24, 2018 on the promotion of electricity production based on renewable energy sources in Togo.

This law sets out the general legal framework for the implementation of projects to generate electricity from renewable energy sources, either for self-consumption or for commercialization. Among other things, it defines the legal regimes for the installations and equipment needed to produce, store, transport, distribute, market and consume electricity from renewable energy sources in Togo. From now on, any individual or legal entity in Togo may generate electricity from renewable energy sources for their own consumption or for commercial purposes.

Has the directive led to the creation of a specific legal regime? Can you describe.

The directive governs the relationship between European Union member countries and member states, and lays down specific rules for biofuels, bioliquids and biomass fuels. It sets out the rules for calculating the minimum share of renewable energies in the transport sector. It also sets sustainability and greenhouse gas emission reduction criteria for biofuels, bioliquids and biomass fuels.

The different models

Different models of self-consumption

Are there different models of self-consumption (individual and collective, for example)? Can you describe?

The 2018 Renewable Energy Act talks about self-consumption in general without distinguishing between individual and collective self-consumption.

According to the law, self-consumption is the consumption of Energy produced by an individual or legal entity for its own needs.

However, it does wink at the sale of energy to end consumers.

Is there a difference between self-consumption operations and Power Purchase Agreements? Can you describe.

Self-consumption operations consist of the operation of production facilities not in the public domain, produced locally from approved sources and not intended for the purpose of supplying electricity.

Power purchase agreements are contracts between a seller or producer of electricity and a buyer or customer. They facilitate the sale and purchase of electrical energy.

Unlike self-consumption operations, electricity purchase contracts are designed to supply electricity.

Individual and collective self-consumption

What is the regulatory difference between individual and collective self-consumption?

Individual self-consumption means that the producer of an energy product uses it for his or her own needs, while collective self-consumption means selling the energy to other end-users without going through public bodies.

State support

Are there any State support mechanisms?

The law of August 08 N°2018-010 relating to the promotion of electricity production based on renewable energy sources has put in place several support mechanisms for renewable energy producers and players.

Are they direct or indirect?

These mechanisms are both direct and indirect.

Is it different for individual and collective self-consumption?

These mechanisms are different, particularly as regards the granting of licenses and the conclusion of concession agreements.

Indeed, any self-generator or operator of an individual renewable energy plant for self-consumption can benefit from the right of access to the national electricity distribution network and the right to sell surpluses exclusively to the national electricity network operator.

Can you describe the different support mechanisms?

To support the production of renewable energies, the State:

- Establishes a policy for the promotion, production and marketing of these energies;
- Grants concessions, licenses, authorizations, permits and approvals;
- Provides training and scientific research in renewable energies and technology transfer;

What are their impacts on the development of SELF-CONSUMPTION market?

The impact of state support mechanisms on the self-consumption market is positive and significant, as they enable the increased use of renewable energies.

The granting of production titles to the various players will enable the country to be self-sufficient within a few years, and thus to embrace the massive and seamless use of renewable energies.

The electricity production plants

What type of electricity production plant is eligible for SELF-CONSUMPTION?

Electricity production facilities eligible for self-consumption are based on renewable energy sources (solar energy, biomass, hydroelectricity, wind power, wave energy, geothermal energy and all kinds of renewable energies that can be transformed into electricity).

Examples of electricity production facilities eligible for self-consumption include:

1. a company's own installations, either through the use of a promoter responsible for installing electricity generation equipment based on renewable energy sources, in accordance with an agreement signed between the company and the promoter, subject to the said company obtaining the authorizations required by the present law and its implementing texts;
2. sale, in whole or in part, exclusively to the national electricity distribution system operator, who is obliged to purchase it in accordance with the provisions of this law, its implementing texts and the texts in force in the electricity sector;
3. sale to end consumers outside the national distribution network or ;
4. export in whole or in part.

What is the most commonly used energy source?

The main source of energy used to generate electricity is hydroelectric power, followed by thermal power.

However, the energy source most commonly used by households in Togo is biomass. Biomass is mainly used for cooking and heating.

What is the average size of the projects?

The average project size depends on the size of the area to be covered (appliances to be taken into account) in order to determine the power to be used and the meter model (three-phase, for example).

Volume of SELF-CONSUMPTION projects

How many SELF-CONSUMPTION operations are set up in 2023 and 2022 in your country (number and GW)?

In 2022 in Togo, the project "Accelerating access to renewable energies for the economic empowerment of rural populations" was implemented. Its aim was to set up infrastructures to supply solar photovoltaic energy to ten villages excluded from the conventional electrification network, through the construction of mini-central plants with capacities ranging from 20 to 30 kva, depending on the size of the village.

Several results were achieved, including the installation of multifunctional solar platforms that enabled 1,550 heads of household in 10 target villages, including 35% of female-headed households, to increase their income by diversifying their activities based on access to solar energy and the processing of agricultural products (palm nut kneading, rice husking, etc.).

Another project is that of Rural Electrification in Togo (ProEnergie) to support electrification adapted to the climate, taking into account social and economic aspects. The project, which began in 2020 and is due to end in 2024, has several objectives. These include: strengthening the systems of AT2ER and the Direction Générale de l'Energie (DGE) as part of the national strategy; improving the management tools for the climate-adapted village electrification approach; and facilitating the availability of tools for electricity supply.

In addition to supporting AT2ER and DGE, ProEnergie promotes the productive and climate-friendly use of electricity. Incentives have been introduced to make the energy sector more attractive to private-sector companies. This facilitates access to energy for the population. ProEnergie contributes to improving the working conditions of local entrepreneurs and the living conditions of rural communities.

Are they mainly individual or collective?

These are mainly collective self-consumption projects.

The Land

Are projects being developed in all types of areas (urban, rural)? Can you describe.

Projects are developed in all types of areas, both rural and urban.

Contour Global Togo SA, an independent power producer, holds a 25-year concession signed on October 19, 2006 with the Togolese government for the rehabilitation, extension and operation of the Centrale Thermique de Lomé (CTL),

Kékéli Efficient Power, a company incorporated under Togolese law and a subsidiary of the French group ERANOVE, signed a concession agreement with the Togolese state on October 22, 2018 for the design, construction and operation of a 65 MW combined-cycle power plant. The agreement was concluded for a 25-year term.

On November 26, 2019 the Togolese State and AMEA Togo Solar SA signed a concession agreement for the design, construction and operation of a 50 MW photovoltaic solar power plant. The duration of the concession is 25 years.

Are there any land constraints? Can you describe.

Land constraints can be related to :

- Certain rules to be taken into account in relation to land codes and regulations;
- Availability of space for setting up production facilities;
- In the case of leasing, obtaining authorization from the lessor.

What type of lease is used by producers?

The leases used are professional leases.

The self-consumers

Who are the self-consumers?

Self-consumers are any natural or legal persons who consume electrical energy for their own needs.

What is their field of activity?

Several sectors of activity can be targeted, such as the service sector (transport, industry, etc.), but they can be divided into two main groups: households and businesses.

What is the size of the self-consumer companies?

Company size depends on the production capacity generated. For example

- Lomé B power plant: 10 MW production capacity
- Centrale Sulzer: current production capacity of 12.5 MW
- Centrale Kara: current production capacity of 3.5 MW
- Sokodé power station: current production capacity 0.6 MW
- Kpimé hydropower plant: current generating capacity of 1.6 MW

Do public entities carry out self-consumption operations?

Yes, public companies can carry out self-consumption operations.

What are the main reasons for choosing self-consumption?

- Electricity independence;
- Reduced electricity consumption costs;
- Participation in the development and promotion of renewable energies;
- Participation in achieving the Sustainable Development Goals by using clean, sustainable energies;

The market players

Who offers self-consumption solutions? ENR producers or suppliers? Or asset managers?

ENR producers or suppliers offer self-consumption solutions, and asset managers support self-consumption activity with a view to coordinating and securing consumption states.

The contractual models and the possibility of selling the electricity

Contractual models used

PPA, leasing, other?

There are several contractual models, depending on the type of financing.

First, for full financing from public funds for installation projects:

- Projects intended for injection into the national grid and entrusted to the national grid operator;

signature of a concession contract between the State and the national grid operator.

- Projects entrusted to a public operator, other than the national distribution network operator, or to a private operator are subject to the signature of a concession agreement between the State and the public or private operator, on the one hand, and a power purchase/sale contract between the national distribution network operator and the operator, on the other;

Secondly, for financing installation projects from private funds:

- Projects intended for injection into the national electricity distribution network by a private operator are subject to the signature of a concession agreement between the State and the private operator on the one hand, and an electricity purchase/sale contract between the national electricity distribution network operator and the private operator on the other;

Lastly, projects to install renewable energy-based electricity production, distribution and marketing units to meet the needs of end-users outside the national electricity grid, particularly in the context of rural electrification, are subject, in accordance with the principles and procedures of the public procurement code, to obtaining a license issued by joint order of the minister responsible for renewable energies and the minister responsible for finance, on the proposal of the body responsible for promoting renewable energies, after consulting the authority responsible for regulating the electricity sector.

Possibility of selling electricity

Can the electricity be sold or simply consumed? Can you describe.

Firstly, electricity can be sold to the national electricity distribution system operator or to end consumers of electricity generated from renewable energy sources.

Secondly, the State, by decree of the Council of Ministers, may, under defined conditions, delegate the public service of generating and distributing electricity from renewable energy sources for sale to natural or legal persons, who must provide the public service in accordance with the provisions of this law and the public service delegation contracts.

In addition, sales may be made to end consumers outside the national grid or distribution network.

Are the members of a collective self-consumption operation grouped into a particular entity?

In Togo, there is not yet an entity like in France, bringing together the members of a collective self-consumption operation.

The selling price of the electricity

What is the price according to the sector (wind, solar etc.)?

The price set for electricity consumption depends on several parameters, taking into account power, services, charges and the type of meter used.

However, tariffs are set by decree and depend on whether they are for low or medium voltage.

Surplus electricity

Is it possible to sell the surplus electricity produced to a third party? Is there an aid scheme for selling this surplus? Can you describe.

Any self-producer or operator of an individual renewable energy electricity production facility for self-consumption may benefit from the right of access to the national electricity distribution network and the right to sell surpluses exclusively to the national electricity network operator, in accordance with the conditions laid down by decree in the Council of Ministers.

Self-consumption and Power purchase agreement

What justifies producers/consumers opting for self-consumption and not for PPAs?

Producers/consumers opt for self-consumption rather than power purchase agreements because the aim of self-consumption is to promote renewable energies, and above all because it enables independence and reduces long-term costs.

Power purchase agreements, on the other hand, make consumers dependent and are sometimes costly. They vary according to consumption.

Regulatory

Regulatory constraints specific to SELF-CONSUMPTION

Constraints mainly concern the monitoring and detection of infringements, with a view to imposing sanctions.

For example, the Ministry in charge of Renewable Energies can withdraw the rights of the beneficiary of the concession agreement or license on the proposal of the body in charge of promoting renewable energies

after the opinion of the authority in charge of regulating the electricity sector, and after summoning the producer of electricity from renewable energies to allow him to make his observations in the cases set by the 2018 law.

It also provides for the payment of fines when infringements are committed on electricity production facilities, depending on the case.

Regulatory advantages to SELF-CONSUMPTION

The advantages of self-consumption are as follows:

- The legal framework put in place will be favorable to the development of renewable energies and the diversification of the electricity production mix;
- The promotion and development of all means of producing, storing, distributing and consuming electricity from renewable energy sources for domestic and industrial needs;
- Diversification of sources of electric power generation;
- Contributing to the promotion of employment;
- Contributing to environmental protection by reducing greenhouse gas emissions;

Finance and tax

Which tax system applies? Is the tax system advantageous? Can you describe.

The tax regime applicable during the operating phase, which covers the period of the concession agreement and the license and concerns only projects for the installation of renewable energy production infrastructures intended for sale, is as follows:

- Industrial and commercial profits (BIC) tax at the customs cordon for the first fifteen (15) years of operation.
- Corporate income tax (IS)
- Flat-rate minimum tax (IMF)
- Professional tax (TP)
- Property tax on built-up properties (TFPB): exemption for property under concession or license.
- Tax on dividends for non-domestic shareholders

- Payroll tax (TS): stabilization at the reduced rate of 2%.
- 0% registration duty on contributions made when creating or increasing the capital of a development-investment company holding a concession or license.

Financing part

What financial product is proposed by the financiers for the financing of SELF-CONSUMPTION projects? Corporate finance, project finance? Asset finance?

The financial products offered by the funders are project financing.

What are the specific constraints for the banks to finance SELF-CONSUMPTION project?

These include:

- Investment security, in the sense that renewable energy projects are sometimes costly projects that may require guarantees;
- Borrowers' inability to repay;

Future trends

Future trends

What are the future trends?

Togo's initiative to achieve a 100% electrification rate by 2030, with a 75% share of renewable energy, is a program that advocates the development of sustainable energy solutions worldwide. The government intends to achieve this objective through a combination of conventional grid extension and off-grid technologies (mini-grids and solar kits). The aim is total access to energy services and a substantial increase in the share of renewable energies in the national energy mix. The question of cost is also crucial. With this in mind, Togo is making sure that both individual solar kits and the energy they produce are affordable for those on the lowest incomes.

The country is therefore focusing on renewable energies, in particular solar, biomass and hydroelectricity.

Turkey

The Origins of self-consumption

Origin of self-consumption

Is self-consumption of electricity a practice-based model or the result of the implementation of a regulation?

Self-consumption of electricity is regulated under the implementation of Unlicensed Electricity Generation in the Electricity Market Regulation dated 12/05/2019. The purpose of the Regulation is described as "to set out the procedures and principles that apply to the individuals and legal entities, who are entitled to generate electricity without the need to obtain license and to establish a company, for the purposes of enabling consumers to meet their electricity requirements from their generation facilities, incorporating the small scale generation facilities to the national economy for supply security and ensuring the efficient use of the small scale generation resources".

For member of the European Union, did self-consumption exist in your country before directive 2018/2001? Was it regulated? If so, how? Has the directive led to the creation of a specific legal regime? Can you describe.

Türkiye, as a candidate member to European Union since 2005, adopt methodically EU legislation into its own legal system. The directive 2018/2001 also influenced Turkish Energy Legislation, Unlicensed Electricity Generation in the Electricity Market Regulation was adopted by the Energy Market Regulatory Authority ("EPDK") and Türkiye was introduced with self-consumption opportunity.

Different models of self-consumption

Are there different models of self-consumption (individual and collective, for example)? Can you describe?

Self-consumption was introduced for consumer facilities to be able to meet their own power consumption through facilities of their own. In other words, the underlying reasoning of license-exempt generation is self-consumption, and not the trading of the power generated. However, unlicensed power generation facilities also have the right to sell the excess power limited to the total consumption amount of the associated consumption facility. The selling price is determined by EPDK in accordance with the applicable retail energy price.

- Collective self-consumption concept is not currently accepted. Consumption facilities should belong to the same company to be able to benefit from the right to sell the excess power generated by the generation facility.

Is there a difference between self-consumption operations and Power Purchase Agreements? Can you describe.

They are two different concepts. As explained above self-consumption is for consumer facilities which generates unlicensed electricity to be able to meet their own power consumption. However, Power Purchase Agreements are concluded between license owner power generators and buyers are power wholesalers, distribution companies and eligible consumers. Distribution companies and wholesalers are licensed energy companies whose purpose is specific to this activity. However, there is no limitation regarding the activity areas of eligible consumers. They can be in many different sectors, industrial enterprises, banks, energy companies, organized industrial zones etc. Eligible consumers are the energy consumers below the eligibility threshold or directly connected to transmission system or the legal entities under the organized industrial zones. Eligibility threshold is annually 1000 kWh in 2023.

Individual and collective self-consumption

What is the regulatory difference between individual and collective self-consumption?

Collective self-consumption concept is not currently accepted under Turkish Law.

Are there any State support mechanisms?

Yes, Renewable Energy Resources Support Mechanism ("YEKDEM"). It is a support mechanism that has emerged to support renewable energy production to reduce fossil fuel energy production in the short term and bring it to a point close to completion in the long term, as is the case in many European countries. Renewable energy production resources evaluated within the scope of YEKDEM in Turkey are HES (Hydroelectric), GPP (Geothermal), RES (Wind), SPP (Solar) and BES (Biogas and Biomass) productions. While each state finances this support mechanism differently, this mechanism in Turkey is financed by integrating it into electricity sales tariffs. While the first supporting mechanism started in 2010, a fixed support price per kWh was determined for each energy source for 10 years. The price policy to be applied to the facilities participating in YEKDEM is specified in the YEK regulation.

Are they direct or indirect?

The support mechanism encompasses the incentives provided by the Renewable Energy Law and its applicable regulations and is comprised mainly of feed-in tariffs and domestic component incentives. Project companies wishing to opt into the support mechanism must apply to EPDK by the deadline announced in the year preceding the designated opt-in year, which will be announced by EPDK. Settlement of power sales under the support mechanism is coordinated by the Energy Market Management Company ("EPİAŞ").

Feed-In Tariff

The feed-in tariffs listed below are valid for a period of 10 years for renewable energy generation facilities that will become operational by June 30, 2021 and have opted into the support mechanism

Power Source of Generating Facility	Feed-in Tariff (US$ Cent/kWh
Hydraulic	7.3
Wind	7.3
Solar	13.3

Biomass	13.3
Geothermal	10.5

A presidential decision dated January 30, 2021, introduced the following new feed in tariffs, denominated in Turkish Lira (TL), valid for 10 years for renewable energy generation facilities that have opted into the support mechanism and become operational between July 1, 2021 and December 31, 2025.

Power Source of Generating Facility	Local Content Premium (TL/kWh)	Applicable Feed-in Tariff
Wind	0.08	0.32
Solar	0.08	0.32
Biomass (Landfill gas)	0.08	0.32
Hydraulic	0.08	0.40
Biomass (Thermal disposal)	0.08	0.50
Biomass (Biomethanization)	0.08	0.54
Geothermal	0.08	0.54

The rates specified above will be adjusted on a quarterly basis. The decision also caps the US$ Cent feed-in rates for each power source category as shown above.

The Regulation on Unlicensed Electricity Generation was amended in May 2021 to stipulate that the President will determine rates and other principles related to the feed-in tariff scheme for unlicensed generation facilities that become operational after June 30, 2021.

Domestic Component Incentives

In addition to feed-in tariffs, the Renewable Energy Law provides incremental price incentives for licensed generators that use certain domestically manufactured mechanical and electromechanical components in their facilities. Similar to the feed-in tariff incentive, these incremental price incentives apply to renewable energy generation facilities that commence operations before June 30, 2021, and opt into the support mechanism. At least 55 percent of the components used in an electricity generation facility must be locally manufactured to benefit from related incentives. Incentives for using domestically manufactured components are available for five years following the commencement of electricity generation at a facility. The presidential decision dated January 30, 2021 also introduced new domestic component incentives, denominated in Turkish Lira, that will apply to renewable energy generation facilities that commence operations after June 30, 2021. The incremental price incentives will also be adjusted on a quarterly basis.

Other Incentives

Other incentives granted under the Renewable Energy Law and other applicable laws include:

• Access and use of state-owned land. An 85 percent reduction on permit costs, rent and other costs of gaining rights to access and use of state-owned land will be applied for a 10-year period starting from the license issuance date for generation facilities operational by December 31, 2025. These facilities are also exempt from paying the Forest Villagers Development Fee and the Forestation and Soil Erosion Control Fee.

• Grid connection priority. the Electricity Transmission Company ("**TEİAŞ**"), the state-owned electricity transmission company, will give grid connection priority to renewable energy generators.

• License fee discounts. The pre-license application fee for renewables will be 10 percent of the non-renewable energy prelicense fee.

• Annual license fees. For a period of eight years after the provisional acceptance date, generation facilities based on renewable energy and local resources are exempted from annual license fees.

• License amendment fees. A discount will also be available on the fee for the amendment of license.

• Authorizations. Renewable energy projects may be developed in protected areas such as national parks, natural parks, natural protection zones, protected forests and wildlife developments sites if the required permits from the relevant authorities are obtained.

Is it different for individual and collective self-consumption?

Collective self-consumption concept is not currently accepted under Turkish Law.

Can you describe the different support mechanisms?

Collective self-consumption concept is not currently accepted under Turkish Law.

What are their impacts on the development of SELF-CONSUMPTION market?

By virtue of the support mechanisms, renewable energy investments become more interesting from a financial point of view and attracts more the attention of the investors. Türkiye's focus on renewable energy over the last 10 years distinguished it from other countries. The global total of renewable energy installed capacity has increased by 8.8% since 2011 and reached 3,372 GW in 2022. In the same period, renewable energy installed capacity in Türkiye had a annual growth rate of 10.3% and reached 56.4 GW.

Projects specifications

The electricity production plants

What type of electricity production plant is eligible for SELF-CONSUMPTION? What is the most commonly used energy source?

Solar, wind, biomass, hydraulic, geothermal.

What is the most commonly used energy source?

Solar.

What is the average size of the projects?

Self-consumption is mostly used by small and medium size production facilities in Türkiye. According to the data provided by the website of the Ministry of Energy and Naturel Resources average size of the projects are approximately 300kWh.

Volume of SELF-CONSUMPTION projects

How many SELF-CONSUMPTION operations are set up in 2023 and 2022 in your country (number and GW)?

No official data publicly available. However, according to the data provided by the website of the Ministry of Energy and Naturel Resources "in the first 9 months of 2020, 1.9% of the total electricity production was met by unlicensed production facilities, and as of the end of September 2020, the total installed power was 6,548 MW".

Are they mainly individual or collective?

Individual. Collective self-consumption concept is not currently accepted under Turkish Law.

The Land

Are projects being developed in all types of areas (urban, rural)? Can you describe.

Yes. Specially, solar energy self-consumption projects are supported in the organized industrial zones. Other than the support mechanisms explained above banks and leasing companies are promoting special financing offers which includes long-term and low interest rate lending, leasing.

Are there any land constraints? Can you describe.

Although unlicensed self-consumption generators are exempted from many formalities imposed on licensed generators, they must still obtain approval from the distribution company for grid connection, system usage and secure land use rights and environmental clearance.

What type of lease is used by producers?

Sale and leaseback

The sale and leaseback is one of the most common methods used in financial lease agreements to support self-consumption projects. In practice, immovable property, machinery and equipment are the assets most frequently subject to this type of financial leasing method.

Hire purchase

Hire-purchase transactions are not specifically regulated. However, simple sale contracts with instalment payment options and financial lease agreements can be arranged under the Financial Leasing, Factoring and Financing Companies Law. In sale contracts with instalment payment options, although the buyer pays the price in several instalments, the property is delivered to the buyer without awaiting the completion of the instalment payments. In financial leasing transactions, the financial leasing company owns the property (immovable or movable) and leases it to the lessee. In practice, the lessee, owning all usage rights over the property, has the right to purchase the property at the end of the lease term. Financial leasing is generally considered to favour lenders, since it enables the lenders to retain title over the property.

Retention of title

It is possible for the owner of a movable property to transfer it to a third party by retaining its ownership through an agreement with the transferee. This type of transaction is used as security when giving non-cash credits, such as sale agreements with deferred payments. It requires the notary public located at the transferee's place of residence to notarise the relevant documents, and registration with the relevant registry of the sale and the retention of title. Failure to satisfy these perfection requirements results in the retention of title being null and void.

Purchase money

Although purchase money transactions are not specifically regulated, sales contracts with an option to make the payments in installments is contractually allowed under Turkish law. The property is delivered to the buyer without completion of the instalment payments. To mitigate any risks for the default of the debtor, the property is either pledged or mortgaged in favour of the seller. To secure payments at the due installment dates, in practice, more than one promissory note with different dates of maturity is issued. In case of failure to fulfil these payment obligations, the pledged property will be sold through execution offices.

The self-consumers

Who are the self-consumers?

Both domestic and foreign individuals and entities.

What is their field of activity?

There is no limitation regarding the activity areas of self-consumers. There can be in many different sectors, industrial, enterprises, banks, energy companies, organized industrial zones etc.

What is the size of the self-consumer companies?

There are no size criteria for self-consumers. However, they may have an installed capacity of five MW or less. A generation facility (whether only self-consumer or trader) with an installed capacity exceeding 5 MW must be licensed by EPDK.

Do public entities carry out self-consumption operations?

Yes.

What are the main reasons for choosing self-consumption?

Profitability, reputation and influence of the Paris Agreement and governments target declared recently to reach “net-zero” by 2053.

The market players

Who offers self-consumption solutions? ENR producers or suppliers? Or asset managers?

ENR producers and suppliers.

The contractual models and the possibility of selling the electricity

Contractual models used

PPA, leasing, other?

The sale of the excess power generated by the self-consumption facilities are realized under a basic template contract of the EPDK in which the price is pre-determined in accordance with the applicable retail energy price.

In respect to the financing contractual models that are being used please see above information provided regarding (i) the sale and leaseback, (ii) hire purchase, (iii) retention of title and (iv) purchase money. In

addition, netting and set-off mechanisms, as well as indemnities and comfort letters or bank letters of credit, are also used in practice.

Possibility of selling electricity

Can the electricity be sold or simply consumed? Can you describe.

It is consumed and the surplus right of the generators are sold. As explained above, in principle, self-consumption was introduced for consumer facilities to be able to meet their own power consumption through facilities of their own. In other words, main ration of the regulation is self-consumption, and not the trading of the power generated. However, unlicensed power generation facilities also have the right to sell the excess power limited to the total consumption amount of the associated consumption facility. Unfortunately, collective self-consumption is currently not introduced under Turkish law.

That being said, prior to March 2016, the unlicensed generation legislation did not explicitly prohibit (or allow) setting up multiple generation facilities, each having an installed capacity of 1 MW or less (the then-applicable threshold), thereby reaching a total installed capacity which would normally require a generation license. Domestic and foreign investors have used this structure and set up multiple facilities, each having an installed capacity of 1 MW or less, for trading purposes. However, due to amendments made to the legislation in March 2016, the total amount of installed capacity a single person may directly or indirectly own in unlicensed wind or solar generation facilities within a substation may not exceed the applicable threshold. Investors are not able to establish separate special purpose vehicles, each holding a separate unlicensed project, to be operational in a substation. Unlicensed generation facilities which secured a “call letter” (a letter issued by the distribution company allowing the facility to connect to the grid) prior to March 2016 are exempt from this restriction. However please note that, this concept is not a self-consumption concept, this is an unlicensed generation opportunity which was (and still for the ones secured a “call letter” prior to March 2016) being used by investors for trading purposes.

The selling price of the electricity

What is the price according to the sector (wind, solar etc.)?

Feed-In Tariff

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The rates specified above will be adjusted on a quarterly basis. The decision also caps the US$ Cent feed-in rates for each power source category as shown above.

The Regulation on Unlicensed Electricity Generation was amended in May 2021 to stipulate that the President will determine rates and other principles related to the feed-in tariff scheme for unlicensed generation facilities that become operational after June 30, 2021.

Surplus electricity

Is it possible to sell the surplus electricity produced to a third party?

Not to a third party but to the state as explained above.

Is there an aid scheme for selling this surplus? Can you describe.

Yes, by feed in tariff rates. Please see above.

Self-consumption and Power purchase agreement

What justifies producers/consumers opting for self-consumption and not for PPAs?

Since it is unlicensed electricity generation self-consumption is a much easier process for consumers. However, Power Purchase Agreements are concluded between license owner power generators and eligible consumers. Eligible consumers are the energy consumers below the eligibility threshold or directly connected to transmission system or the legal entities under the organized industrial zones. Eligibility threshold is annually 1000 kWh in 2023.

Regulatory

Regulatory constraints specific to SELF-CONSUMPTION

Unfortunately, the legal framework and the feed-in tariff mechanism change too often in Türkiye. This situation is perceived as instability by investors and creates uncertainty in investment plans.

In addition, even though self-consumers are exempted many formalities imposed on licensed generators, they must still obtain approval from the distribution company for grid connection, system usage and secure land use rights and environmental clearance which may require some bureaucracy in practice.

Regulatory advantages to SELF-CONSUMPTION

First, no generation license requirement needed. Moreover, the legal procedure is quite simple, and investors are highly supported.

Finance and tax

Which tax system applies? Is the tax system advantageous? Can you describe.

There are three general categories of taxes in Turkey: income taxes, taxes on wealth and taxes on expenditure. In addition, there are social security contribution requirements for both employers and employees. Income taxes are applicable to real persons as well as corporations. While the corporate tax rate is flat, personal income tax is levied at progressive rates on an individual's annual taxable income, the highest rate being 40 percent. The tax rate pertaining to the corporate income in Turkey was set at 25 percent. Taxes on wealth include real property tax, motor vehicles tax, inheritance tax and gift tax. Real property tax ranges between 0.1 percent and 0.6 percent of the registered value of the real property. The rate of motor vehicles tax depends on the age and engine capacity of the vehicle. Inheritance and gift taxes are levied at a rate of 1 percent to 30 percent. Taxes on expenditures include value added tax, special consumption tax, stamp tax and banking and insurance transaction tax. Unless there is a specific exemption, KDV is levied at a rate that varies between 1 percent and 20 percent on the purchase (including importation) of various goods and services.

Financing part

What financial product is proposed by the financiers for the financing of SELF-CONSUMPTION projects? Corporate finance, project finance? Asset finance?

Equity

It is the classically known and most preferred investment model. The return on your investment is always faster compared to other options. Since it is made with own resources, financial interest differences are not paid and investment costs are reduced.

Bank credits (Classical Lending)

Almost all banks in Türkiye offer financing packages for self-consumption power plants. Many projects have been implemented partially or completely with bank loans. With proper feasibility, the project can be brought to a self-paying structure and then turn into a profit.

Leasing (Financial Lease)

Instead of purchasing the power plant, the investor ensures its use by leasing for a long term. In projects to be carried out via leasing method, only power plant equipment can be rented. Since leasing companies do not pay project planning and installation costs, they must be supported by equity capital or standard debt financing. Different types of lease models are explained above.

These financing models are used more on licenced generation project financing not for self-consumption. A generation facility (whether only self-consumer or trader) with an installed capacity exceeding 5 MW must be licensed by EPDK.

What are the specific constraints for the banks to finance SELF-CONSUMPTION project?

(i) High interest rates now in Türkiye due to the high inflation, (ii) project realization risk in respect to the existence of many experienced subcontractor engineering companies, and (iii) bureaucratic administrative and judicial procedures during enforcement phase if needed

Future trends

Future trends

What are the future trends?

Renewable energy has become one of the preferred sources of energy supported by the Turkish government, creating a new opportunity to investors interested in the Turkish electricity market. Turkey enacted renewable energy legislation in 2005 to encourage and support the use of renewable energy resources for electricity generation, for decreasing carbon emissions, protecting the environment and developing a manufacturing industry for the equipment and other facilities needed for the use and expansion of renewable energy resources. In October 2021, Turkey ratified the Paris Agreement and declared a target to reach “net-zero” by 2053.

The Energy Efficiency Law also marks one of the first legislative texts referring to “hydrogen,” which is now

globally accepted as a cleaner and more efficient resource for power generation, and an alternative energy resource which should be encouraged. Secondary legislation with respect to the procedure and principles for developing hydrogen power plants should be set forth by the Ministry of Energy and Natural Resources. Other than a few pilot projects, hydrogen has yet to become an alternative resource to be added to the Turkish energy mix, but sure will be considered as a future trend soon.

United Kingdom

SHAKESPEARE MARTINEAU

The Origins of self-consumption

Origin of self-consumption

Is self-consumption of electricity a practice-based model or the result of the implementation of a regulation?

We understand self-consumption of electricity to mean generating your own electricity on-site (e.g. through renewable energy sources such as roof mounted or ground mounted solar panels (possibly with battery) and/or small wind turbines etc.) and using such electricity on-site.

There is no regulatory requirement for companies or individuals to consider or implement self-consumption.

In GB, most consumers purchase electricity for their needs from licensed electricity suppliers (who, in turn, purchase electricity from electricity generators and supply customers by contracting with grid owners to use the the electricity transmission and distribution grids).

However, in the past few years, volatile energy prices have made self-consumption more cost effective for consumers, lowering their electricity bills and enabling them to contribute to sustainability goals.

When consumers purchase electricity from licensed electricity suppliers, their electricity bill will contain commodity costs which refer to the direct costs involved in the generation of the electricity used, but, also, non-commodity costs such as the costs of governmental renewable subsidies and costs in relation to use of the transmission and distribution networks etc.

Consequently, domestic consumers and businesses are increasingly deciding to install on-site renewable energy installations so as to avoid the higher electricity costs charged by licensed suppliers, and also, to take advantage of governmental renewable incentive schemes – e.g. the Smart Export Guarantee Scheme. However, customers and businesses must ensure that their projects fall within the prescribed electricity licence exemption regulations, and that any equipment is approved and installed by the relevant bodies in

order to be eligible for renewable incentives.

The different UK models

Individual self-consumption

Are there different models of self-consumption (individual and collective, for example)? Can you describe?

Individual Self-Consumption

As stated above, persons can generate and supply electricity to themselves in the UK – typically via rooftop solar photovoltaic (PV) systems with battery or small wind turbines, or if appropriate, ground mounted solar PV – and, many domestic and commercial consumers are installing on-site renewables to reduce their energy costs and receive payments under the Smart Export Guarantee Scheme. See also Small Supplier below.

Collective Self-Consumption

- On-Site Supply

A person can (without having to obtain an electricity licence) supply electricity that it has generated itself, either exclusively, or, in combination with electricity that has been supplied to it by a licensed electricity supplier. It must provide the output from its generating station only to certain categories of consumers on the 'same site', or, who are not on the same site, but receive the supply from the generation station over private wires. If two or more generating sets are operated by the same person, or by associated bodies corporate, they will be treated as a single generating station if they are on 'the same site'.

- Small Supplier

A person, without being required to have an electricity licence, can supply self-generated electricity up to 5 MW (of which not more than 2.5 MW can be supplied to domestic customers).

This licence exemption could apply to collective self-consumption for a number of low-demand consumers, or individual self-consumption for a more energy intensive process.

- Community Energy Schemes

Another example of collective self-consumption is community ownership schemes, where the energy project (e.g. solar or wind) is controlled or owned by a group of people identifiable as a 'community' – e.g. community co-operatives and community not-for-profit companies, and the power is consumed in the community through specific local supply arrangements (facilitated by licensed electricity suppliers).

- Peer to Peer Trading Schemes

Another example may be peer to peer energy trading platforms, made possible by the introduction of artificial intelligence (AI) and blockchain technology. 2018 saw the UK's first live energy trades trade on the blockchain as part of a trial in Hackney. The trial enabled local residents to automatically trade solar energy generated on the estate with each other. This combined smart metering with AI to predict consumption demand as well as blockchain technology to schedule and clear the trades.

These sorts of collective self-consumption arrangements will require different regulatory considerations and contractual structures – and so bespoke legal advice will be required in the context of each individual set of circumstances.

Is there a difference between self-consumption operations and Power Purchase Agreements? Can you describe.

Yes. With self-consumption operations, individuals or businesses own and operate electricity generating plant (e.g. renewable energy systems) on their own premises – and the energy generated is consumed by them on-site. However, power purchase agreements are used where a renewable energy developer owns the generating plant/renewable energy system and sells electricity to consumers for use at its site in accordance with the terms of the power purchase agreement – e.g. solar PV rooftop projects as explained below.

State support

Are there any State support mechanisms? Are they direct or indirect?

The following support schemes provide financial incentives directly to renewable energy projects which promote self-consumption of electricity:

- Smart Export Guarantee Scheme – see above;
- Feed-In Tariffs (FITs) Scheme – this scheme came into force on 1 April 2010 but closed to new applicants from 31 March 2019 subject to certain grace periods. The scheme, administered by Ofgem, accredits electricity generated from small-scale low carbon sources (solar PV, hydro, anaerobic digestion and wind power with a total installed capacity of 5MW or less and 2kW or less for micro CHP). Under the scheme prescribed licensed electricity suppliers make guaranteed payments (for electricity generated on -site and for any unused electricity that was exported to the grid) to electricity producers for a fixed period of time. Eligible projects pre March 2019 that were receiving FITs will continue to receive FITs for the remainder of the relevant fixed period of time.

Is it different for individual and collective self-consumption?

Yes. Domestic and commercial consumers and community energy companies who generate electricity themselves (up to 5MW for solar PV, wind, hydro and anaerobic digestion and 50kW for micro CHP) and sell excess electricity to the grid can get payments under the Smart Export Guarantee Scheme. However, commercial and domestic consumers who are supplied electricity by small exempt generators and suppliers will not benefit from payments under the Smart Export Guarantee Scheme, but, will benefit in that they will have received lower priced electricity than purchasing electricity from the grid.

What are their impacts on the development of SELF-CONSUMPTION market?

The Smart Export Guarantee Scheme was launched in January 2020 (year 1). The third year of the Smart Export Guarantee Scheme (i.e. April 2022 to March 2023)) saw a total of 92,946 installations with a combined capacity of 495, 981 kW registered to one of the available tariffs. This is a significant increase from 34,020 installations with a combined capacity of 155, 755kW registered during year 2 (April 2021 to March 2022) . Accordingly, this Scheme is increasingly supporting the deployment of low-carbon electricity generation and the transition to net zero.

Projects specifications

The electricity production plants

What type of electricity production plant is eligible for SELF-CONSUMPTION? What is the most commonly used energy source?

Various types of electricity production plant are eligible for self-consumption.

In our experience, the following are most commonly used:

Solar Photovoltaic (PV) systems – this installation produces electrical energy using photovoltaic modules which transform solar radiation into electricity. These systems can be mounted on the roofs and houses or commercial buildings or installed on the ground.

Wind turbines – these can generate clean electricity in diverse locations from urban centres to rural areas. Wind blows over the turbine blades causing them to rotate, in turn, producing electricity.

Micro-CHP – this is a technology that generates heat and electricity simultaneously from the same energy source. The main output from a micro-CHP is heat, with some electricity generation. They were traditionally powered by gas or liquefied petroleum gas but, increasingly, some models are powered by bio-liquids

including biodiesel.

What is the average size of the projects?

- 5MW for solar PV, wind, hydro and anaerobic digestion generators and 50kW for micro-CHP generators so as to be able to benefit from payments for export of excess electricity under the Smart Export Guarantee Scheme; and
- Small generation plants so as to be able to fall within the generation licence exemption regime in the Class Exemption Regulations.

Volume of SELF-CONSUMPTION projects

Are they mainly individual or collective?

We are unable to assess the number of commercial and domestic electricity consumers who are supplied by small exempt generators and suppliers – and especially given their electricity licence exempt status.

The Land

Are projects being developed in all types of areas (urban, rural)? Can you describe.

Yes.

Urban – residential solar, commercial buildings with solar, small scale wind rooftop turbines (if enough wind); and

Rural – ground mounted solar, onshore wind, small scale wind turbines (assuming there is enough wind in the relevant location), batteries to store excess electricity generated from renewable sources which can then be used when renewable generation is low and during periods of high demand.

Are there any land constraints? Can you describe.

There is limited space to develop urban energy projects. In addition, projects will need to comply with local planning regulations, land use regulations and environmental regulations. Projects will also need to secure relevant easement and other land rights so as to connect the project to the local electricity grid and also a grid connection agreement with the relevant electricity distribution grid operator.

What type of lease is used by producers?

The type of lease will depend on whether the project is (i) a rooftop solar project or (ii) a solar farm (using a ground mounted solar system).

Rooftop Solar:

The way that the rooftop solar equipment should be installed and documented will depend on the circumstances of each project. Solar operators conventionally seek to agree a rooftop lease with a building owner (landlord) in order to generate and sell power to the building occupier (via a power purchase agreement between the solar operator and the occupier) with any surplus power sold to licensed electricity suppliers via the local distribution grid. The landlord would benefit from a base rent and, perhaps, a percentage of the generating revenue received by the solar operator, without having to bear the capital expense of the generating equipment.

Most landlords will need to retrofit solar panels onto existing buildings and, when retrofitting in this way, a wide range of issues will need to be considered including: whether the landlord can install panels freely or whether the landlord has leased the roofspace in its leases with tenants; early termination and termination payments calculated on a sliding scale to compensate solar operators for lost income; roof access; roof repairs not being fettered by airspace lease; maintenance obligations for the solar panels and recoupment of these costs via service charges; removal of the solar panels; decommissioning costs; transfer of the solar panels; equipment warranties and guarantees; lender's requirements e.g. if the building is mortgaged, etc.

Solar Farms:

Solar farm leases are structurally different to those agreed for rooftop solar. Solar farms often involve the redevelopment of land by the solar farm developer, and, the construction of major infrastructure, which will be subject to agreements with the local planning and grid. authorities. The lease (usually over 20 years) granted to the solar developer will ordinarily be granted pursuant to the terms of a standalone option agreement or agreement for lease – and often a combination of both. The landowner will attach conditions to a grant of lease with which the solar developer must comply: e.g. the payment of rent for the land (and also battery rent); the grant of planning permission; the positioning of substations; decommissioning obligations and costs; and reinstatement of land obligations etc. The solar developer will want to retain certain rights and reservations so that it has flexibility to facilitate future development of the project (e.g. access, grid access, grid easements etc.).

The requirements of the developer's funders will also need to be considered as funders will require rights to allow them to step in and remedy a breach so that their investment is protected.

The self-consumers

Who are the self-consumers?

Urban – households, offices, schools, shopping centres, industrial parks, hospitals, universities, hospitals, factories, warehouse operators – just as some examples.

Rural – farm operations, households – and any of the above examples in "Urban" if applicable.

What is the size of the self-consumer companies?

This information is not publically available.

Do public entities carry out self-consumption operations?

Yes – on a case by case basis.

The market players

Who offers self-consumption solutions? ENR producers or suppliers? Or asset managers?

Many individuals and companies self-fund their own on-site renewable energy solutions.

Alternatively, there are many companies (some of which are licensed suppliers) that specialise in offering bespoke solar energy solutions to consumers e.g. solar panel installations, energy storage systems and smart energy management technologies which optimise energy consumption so as to reduce domestic and commercial customers' reliance on grid electricity. In our experience, such companies will usually propose a pricing model which guarantees a return on their investment but which, subsequently, leaves most of the risk and benefit for future energy price variations with the purchaser.

Certain asset managers may invest in and provide financing to such companies who are offering such self-consumption models as part of their investment portfolios.

Renewable energy asset managers may also be contracted e.g. by corporate and industrial customers to monitor and optimise the performance of their on-site renewable energy assets so as to maximise self-

consumption/returns via electricity sales to the grid.

The contractual models and the possibility of selling the electricity

Possibility of selling electricity

Can the electricity be sold or simply consumed? Can you describe. Are the members of a collective self-consumption operation grouped into a particular entity?

As stated above, the electricity can be consumed, or it can be sold as explained above either to licensed suppliers under the Smart Export Guarantee Scheme, or to customers as explained in "The Different Models" above via a power purchase agreement.

There is no equivalent of PMO in the UK. However, see above at "The Different Models" as regards community energy schemes.

The selling price of the electricity

What is the price according to the sector (wind, solar etc.)?

This varies significantly.

Licensed suppliers are currently offering rates anywhere from 2p/kWh to 27p/kWh for self-generators/consumers who are exporting power back to the grid under the Smart Export Guarantee Scheme; and Feed-In Tariff rates anywhere from 4p/kWh to 26p/KWh.

Our recent experience suggests that the market price for power delivered from on-site solar PV should be of the order of 15p/kWh to 25p/kWh. Alternatively, the price could be an agreed discount below an agreed reference price for grid supplied electricity. This has increased from 10p/kWh to 15p/kWh reflecting high demand/increased costs for PV panels as well as higher current wholesale energy market prices.

Self-consumption and Power purchase agreement

What justifies producers/consumers opting for self-consumption and not for PPAs?

The main justification is cost - producing your own electricity on-site for your own consumption will reduce reliance on more expensive grid-supplied electricity. It will also enable the ability to receive payments under governmental renewable incentive schemes – see above.

However, some domestic and commercial consumers may not want to pay the upfront costs of installing

renewable energy systems for self-consumption and so may prefer to enter into a power purchase agreement with a company who will finance and install, e.g. solar panels on their roofs and recoup the costs of their investment and make a reasonable return on such investment by entering into a power purchase agreement with such consumers for the sale of the power to them for a fixed period of time.

Regulatory

Regulatory advantages to SELF-CONSUMPTION

To take advantage of payments under the governmental renewable incentive schemes - see above.

Finance and tax

Financing part

What financial product is proposed by the financiers for the financing of SELF-CONSUMPTION projects? Corporate finance, project finance? Asset finance? What are the specific constraints for the banks to finance SELF-CONSUMPTION project?

Given the comparative affordability of small-scale self-consumption projects (e.g. rooftop solar installations), as well as advances in technology and market competition leading to significant reductions in cost (average cost of £7,000 - £10,000 for a typical UK domestic installation); some individuals may choose to self-fund (e.g. from savings), in particular when coupled with government initiatives (see “Smart Export Guarantee Scheme” above).

Homeowner loans, either unsecured or secured on the person’s property are equally readily available.

Other examples include installers who are willing to subsidise/offer credit to individuals to have a solar installation installed in exchange for periodic repayments and a share of any export payments received. Although now increasingly less common, there were also ‘rent-a-roof’ schemes, in which installers (often backed by private investors/funds) would offer free solar panels to consumers because they made their money back by claiming then lucrative Feed-In Tariff payments.

For commercial enterprises to finance self-consumption projects (again typically rooftop solar), as with individuals, there are some businesses which have sufficiently healthy balance sheets to be able to fund such projects from their own finances (whilst benefitting from certain tax deductions in doing so). For those which cannot self-fund, asset finance, hire purchase or leasing solutions are also available. These are typically provided by specialist providers rather than mainstream credit institutions. One of the most popular means

of funding self-consumption projects remains, however, a PPA. PPA providers might secure funding for their operations from a number of sources, primarily infrastructure/asset financiers as well as private equity/venture capital providers. Each funding arrangement will depend on the circumstances of each individual case, but will, invariably, comprise debt alongside an equity (and/or quasi-equity) component. Although the potential long term revenue streams for such self-consumption assets is attractive to some funders, mainstream funders (e.g. 'high street' banks) are unlikely to have much appetite in this space given the inevitably wasting nature of the asset in contrast to the potential for capital appreciation in more conventional 'bricks and mortar' (i.e. real property-based collateral).

Future trends

Future trends

What are the future trends?

The UK is committed by law to achieve net-zero emissions by 2050, compared to 1990 levels. Therefore, it would be hard to see how renewable energy production for self-consumption will not continue to grow.

Furthermore, we are likely to see the reduction of energy consumption from the grid in favour of locally produced power at community level and supply of such power within the relevant community.

In addition, smart metering, smart appliances and smart energy systems will mean that there will be more accurate tracking of consumers' consumption patterns and electricity demand which will make it easier to ensure generation is prepared to match such demand, and thus make for a more stable and efficient energy grid.

Technological advancements in AI and blockchain will most likely enable increased peer to peer trading where consumers can participate in energy trading and sharing schemes.

Contributors

AQUEREBURU & PARTNERS

AQUEREBURU & PARTNERS, is a tax and law firm domiciled at 777, Avenue Kleber DADJO (Immeuble ALICE). Located in the heart of the commercial area, it is a multidisciplinary firm with a rich and solid base thanks to the professional experience of its team.

Indeed, AQUEREBURU & PARTNERS is the result of the transformation of the AQUEREBURU Coffi Alexis law firm, created in 1985.

Registered with Bar Association of Togo since April 4th, 2007, AQUEREBURU & PARTNERS comprises seven (07) lawyers, Five (05) Jurists, one (01) legal assistant and translator and around twenty (20) collaborators

It makes its know-how available to its clients both in the sub-region and in Europe, relying, if necessary, on a network of correspondents and experienced consultants.

In order to better achieve its objective, which is the total satisfaction of its clients, the Firm has been engaged since August 12, 2005 in the ISO certification process, which resulted on May 18, 2010 in its certification to the ISO 9001 version 2008. On 25 May 2018, it successfully migrated from the 2008 version to the 2015 version of the ISO 9001 standard.

AQUEREBURU & PARTNERS is also winner of the TOGO and UEMOA Quality Excellence Awards in 2010.

Its commitment to the Quality approach enables it to aspire and claim a high level of satisfaction from its national, regional and international customers. This is what once again earned him the prestigious "WORD QUALITY COMMITMENT" Gold Award, which was presented in October 2016 in Paris by the International Business Initiative Directions (BID).

The Firm has six (06) different departments namely:

1. Banking-Finance and Tax Department;
2. Social and Criminal Law Department;
3. Commercial Law and Arbitration Department ;
4. Civil Law Department ;
5. Public, Sports and Health Law Department ;
6. Maritime and Intellectual Property Law Department.

These departments intervene in various areas of law including **financial arrangements, infrastructure, natural resources,** telecommunications**, public works**, **debt collection and enforcement**, tax and business law, administrative law, **commercial law, maritime and transport law**, sports law, corporate law, banking law, insurance law, community law, social law, **environmental law**, criminal law, **intellectual and industrial property law**, **legal and tax audit**.

On behalf of local and foreign private companies, the firm provides legal assistance in the various stages of their investment projects (due diligences, project preparation, negotiation and drafting of contractual documentation). This assistance is aimed in particular at setting up partnerships and joint ventures, incorporating local companies and defining the financial, social, tax and legal conditions of the business, in compliance with national and regional regulations such as the Uniform Acts of the Organization for the Harmonization of Business Law in Africa (OHADA) and community laws (Economic and Monetary Community of Central Africa - "CEMAC", the Economic and Monetary Union of West Africa - "UEMOA").

Our Firm also assists financial institutions in their investments for the negotiation and drafting of contracts, for equity investments or for financing obtained from foreign banks or public bodies. In this respect, it has solid experience in the field of financing and is involved in the due diligence required for the arrangement and implementation of financing, the drafting of financing agreements, the documentation for the establishment of securities and payment guarantees, etc.

AZB & Partners was founded in 2004 with a clear purpose to provide reliable, practical and full–service advice to clients, across all sectors. The Firm brought together the

practices of CZB & Partners in Mumbai and Bangalore and Ajay Bahl & Company in Delhi. Having grown steadily since its inception, AZB & Partners now has offices across Mumbai, Delhi, Bangalore, Pune, and Chennai.We have an accomplished and driven team of 650+ lawyers committed to delivering best-in-class legal solutions to help every client achieve their objectives.

Becker Büttner Held

Becker Büttner Held, also known as BBH, has been operating since 1991. At BBH, lawyers, auditors and tax advisors work hand in hand with the engineers, consultants and other experts of our BBH Consulting AG. We provide advice to more than 7,000 clients and are the leading law firm for the energy and infrastructure industry.

BBH is known as “the” law firm of public utilities. But we are far more than

that – in Germany and also in Europe. The decentralised utilities, the industry, transport companies, investors as well as political bodies, like the European Commission, the Federal Government, the Federal States and public corporations appreciate BBH’s work.

About the BBH group

The BBH group consists of the law firm Becker Büttner Held (BBH), the audit firm BBH AG Wirtschaftsprüfungsgesellschaft, the business consulting firm BBH Consulting (BBHC), the project developer for urban neighbourhoods BBH Immobilien and BBH Solutions.

What makes the BBH group special is our interdisciplinary advisory approach: lawyers, public auditors and tax advisors work hand in hand with engineers, business experts and IT professionals.

Together, we develop solutions tailored to suit your business needs in every situation.

Bpifrance finances and supports businesses at every stage of their development through credit, guarantees, innovation assistance, and equity investments. In doing so, Bpifrance supports the public policies implemented by the State and the Regions.

Bpifrance assists businesses with their development projects, ecological and energy transitions, innovation, and international expansion. It also manages export financing on behalf of the State.

Bpifrance offers tailored support solutions for startups, micro-enterprises, SMEs, and mid-sized companies in collaboration with consulting firms and recognized training organizations.

Thanks to Bpifrance and its 50 regional offices, entrepreneurs benefit from a close and efficient partner to support the sustainable growth of their business."

Founded in 1934 and with over 85 years of experience, Brigard Urrutia is recognized as a leading law firm in Colombia and one of the most prestigious in Latin America. Brigard Urrutia provides legal advice and assistance in all areas of business law and representation in a wide range of matters, including transactional and non-transactional advice, litigation and dispute resolution. In addition, Brigard Urrutia has experience as a service provider for an important national and international client which includes leading domestic and foreign financial institutions, multinational corporations, private equity/venture capital funds, state-owned enterprises, governments and multilateral agencies. The firm frequently advises on complex cross-border matters, and its attorneys have been involved in many of Colombia's groundbreaking landmark transactions. The firm has a multidisciplinary team of more than 150 attorneys specialized in various practice areas of business law, who follow the most rigorous ethical principles and the highest standards of professional excellence. All its partners and associates are fluent in at least one language other than Spanish, and many are admitted to practice in foreign jurisdictions. Brigard Urrutia also has a management team that is constantly innovating through solutions, best practices, and trends to attain optimal customer experience levels. As part of its transparency policies and institutional values, it has a corporate governance structure that allows the firm to implement the best international practices. These practices help guarantee compliance of internal and external rules and achieve the objectives set forth in its strategic plan. The firm provides its clients a privileged access to top tier law firms in most countries through global networks. These networks allow Brigard Urrutia to be at the forefront of best practices and global trends in the field of legal service provision, taking advantage of the experience of colleagues in other jurisdictions. The firm is member of Lex Mundi, Pacific Rim Advisory Council, World Services Group, The Interlex Group, Ius Laboris - Global Human resources lawyers and Club de Abogados, among others.

De Gaulle Fleurance Avocats Notaires is a leading player in the world of business law. We support our clients with all their operations, both in France and abroad. To that end, De Gaulle Fleurance Avocats Notaires is also:

- **200 people** dedicated to client relationships built **on excellence, responsiveness, and creativity;**
- **A full-service practice** to address all the challenges of the legal and notarial world;
- **Professionals recognised by the business community** (Chambers, The Legal 500, Best Lawyers);
- Offices in **Paris, Brussels, Geneva,** and **Abu Dhabi;**
- **An international culture** and the ability to mobilise a network of correspondents on every continent.

Kilowattsol

Founded and managed for over 15 years by Xavier Daval, KiloWattsol and its experienced and international team of analysts assists solar market companies with their challenges. Our core expertise resides in mastering all technical, scientific and business aspects of solar projects.

As an independent solar expert, KiloWattsol's priority is to understand and answer its client specific needs so that they can use solar technologies to their best advantage.

KiloWattsol' approach benefits from an extended track-record and is recognized by the biggest investors in the market.

KMU Law Office

KMU Law Office is a Turkish full-service law firm. The firm has developed specific expertise in a wide range of industries including energy, finance, luxury and cosmetics, media, and technology.

Drawing on a team comprising solution-oriented lawyers, the firm advises local and international investors in various fields of business law.

Main practice areas include:

- Mergers & Acquisitions / Corporate
- Banking & Finance
- Projects (Energy & Infrastructure)
- Intellectual Property, Telecommunications, Media & Technology
- Dispute Resolution
- International Trade
- Real Estate Transactions & Financing
- Employment
- Public Law & Environment

Established in 1977, Rokas has grown substantially to develop an international network of independent law and business consulting firms which spread across Central and SE European countries.

Through this broad network, Rokas has managed to provide its local and international clients with full comprehensive legal advice on a number of major projects conducted in the region, with the primary goal being the restructuring of local economies and the commencement of economic growth.

Viable sectors such as insurance, energy, telecommunications, infrastructure and project finance have been in the field of our expertise. Our team of experts has been active in advising numerous foreign and local companies on their mergers and acquisitions.

Our team understands that agile project management is the key differentiator for clients looking to expand their business in Southeastern Europe, ensuring they receive high-quality legal and business consulting services.

Developing short energy circuits, SerenySun accompanies the development of Renewable Energy communities, to accelerate the energy transition by democratizing access to a decarbonized energy.

SerenySun participates in the decentralization of energy model, serving companies and territories.

Here are the main benefits : energy resilience, territorial anchoring, control of the energy costs, social link, inclusion.

By developing renewable energy communities integrating collective self-consumption, SerenySun makes it possible to produce and share green and local energy by federating mixed audiences in the same territory. Some of SerenySun's differenciating factors are its inclusive approach, its modeling tools for self-consumption, and its technological platform (SerenyCloud Microgrid Ready) that allows intelligent allocation of energy among community participants.”

On paper we're a full-service law firm, providing legal services to companies, organisations, government departments, families and people throughout life and in business. But we offer so much more than that. Expertise, commerciality and relationships are at the very heart of what we do. Our purpose is clear and our ambitions are unlimited: we want to unlock potential in our people and clients, inspiring confidence, growth and development. We provide creative solutions and advice that helps fulfil commercial and personal goals. In the energy sector we have unrivalled experience acting on some of the most significant infrastructure and industry transition projects which have taken place since the UK privatisations of the early 1990s; projects where our operating model of sector specialist-led multi-disciplinary teams has proven to deliver very real benefits to our clients. As a firm we are regularly ranked in the top tier for Energy & Natural Resources by Legal 500. Our energy sector team is made up of lawyers from multiple disciplines across the firm, all of whom act for clients active, or with an interest, in the sector. That multi-disciplinary team is led by a small core team of specialist energy lawyers. The knowledge our core team brings across the many dimensions of the energy landscape allows us to give clear, concise advice with a strong commercial fair.

For 75 years, SiqueiraCastro have played a prominent role in the evolution of the Brazilian legal and economic sectors. Today, the firm is one of the largest in Latin America, with a team of over 1,000 members spread across 18 Brazilian cities. Always focused on innovation, the SiqueiraCastro has expanded its services to all areas of business law and evolved to offer its clients more than legal work. The firm provides business strategies with legal intelligence.

This intelligence is its greatest asset. Through in-depth and multidisciplinary knowledge – inside and outside the legal universe – the firm can aggregate expertise to all its business solutions. More than law experts, SiqueiraCastro knows about their client's businesses. They believe in an agile, uncomplicated law that aligns with the companies' business and needs to speed up demands, optimize the work, and help clients make confident decisions. The firm's structure is solid, and a strong culture of collaboration and partnership guarantees the integration of their different offices, generating efficiency, proximity, and flexibility. In addition, their international alliances and partnerships give them the necessary insight regarding global trends, making their firm a safe and reliable access door for foreign companies that intend to invest in Brazil.

Also, the firm knows it is necessary to go beyond the business world. It has been recognized for its unique and permanent look at initiatives that positively impact society to improve plurality, fight for less social and regional inequality, and promote greater access to justice.

One of its cultural pillars is the offer of pro bono legal services, carried out consistently and permanently, to contribute to the transformation of the country and society. Furthermore, they financially support social welfare actions and programs to improve the quality of life for those who need it most throughout Brazil.

The sum of all these aspects defines SiqueiraCastro: a human approach with local flavour in a world without borders, always offering outstanding business consulting with legal intelligence throughout Brazil and abroad.

Offices

Siqueira Castro has an unrivalled network of offices in Brazil: Aracaju, Belém, Belo Horizonte, Brasília, Curitiba, Fortaleza, João Pessoa, Maceió, Manaus, Natal, Porto Alegre, Porto Velho, Recife, Rio de Janeiro, Salvador, São Luís, São Paulo and Teresina.

Alliances & networks

The firm is the Brazilian member of the ADVOC International association of independent law firms and indeed coordinates the network in Latin America.