TURKEY'S SOLAR ENERGY SECTOR

BUSINESS MODEL RECOMMENDATIONS FOR GROWTH AFTER 2020

Prepared by:

solar 3GW

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INTRODUCTION

Who are we?

In an effort to solve the climate crisis, we are stakeholders in Turkey's solar energy sector who have come together with the understanding that renewable energy should be the sole source in the areas of power generation, transportation and heating.

Our Aim

We aim to raise our country's awareness of climate change and solar energy in order to keep up with the "energy revolution" that is taking place in our century simultaneously with the whole world. In this way, we aim to create the necessary technical and regulatory infrastructure to connect a regular solar energy capacity to our grid every year.

Our Mission

Ensuring that at least 3 GW of solar power is connected to the grid each year by converting aged capacity or creating entirely new capacity.

Our Vision

Supporting the growth of capacity in a stable and sustainable framework by creating solutions that are technologically innovative and legally beneficial to all stakeholders.

> *Our aim is **3 GW** of solar power every year*

Content

Abbreviations and sources

Abbreviations

SPP: Solar Power Plant
Green PPA: Green Power Purchase Agreement
RERA: Renewable Energy Resource Areas
EPC: Engineering, Procurement and Construction (referring to contracting companies)
OSB: Organized Industrial Zone
EMRA: Energy Market Regulatory Authority
TEİAŞ: Türkiye Elektrik İletim A.Ş.
EBRD: European Bank for Reconstruction and Development
IRR: Internal Rate of Return
EİGM: General Directorate of Energy Affairs
YEKDEM: Renewable Energy Support Mechanism

Resources

Enerji.gov.tr
Teias.gov.tr
Epdk.org.tr
Irena.org
Ise.fraunhofer.de
Solarpowereurope.org
Enerjiatlasi.com
Emo.org.tr
The 2019 U.S. Energy & Employment Report
Renewable Energy and Jobs -2018 IRENA Report
Solar 3GW stakeholders opinions and models

1 EXECUTIVE SUMMARY

Solar3GW recommends the following 3 models for the development of the solar energy market in Turkey;

PROSUMER	COMMERCIAL
• Improved Prosumer Model	• The Green Power Purchase Agreements (YETA) • Tender-Free, Incentive-Free, Licensed Business Model

- Of these recommended models, the Prosumer Model is already available on the market while it is recommended to improve it within certain development points.
- The Green PPA that is recommended as commercial and “Tender-Free, Incentive-Free, Licensed Model " are models that are **flexible**, **modern** and **appropriate to the dynamism of the private sector**.
- These models are expected to shape the future of the solar energy market in line with the carbon-neutral ground after 2021. The supply will be formed in a such a way as to respond to the demand that occurs under market conditions, which in turn will help the market balance naturally and efficiently.

The solar energy sector in our country has been developing with momentum in recent years in parallel with its rapid development in the world. Incentives provided under YEKDEM (Renewable Energy Resources Support Mechanism) and the rapidly decreasing cost of panel and labor have recently played an important role in the remarkable development of the solar energy market.

The total installed capacity of solar energy reached about 6 GW as of the end of 2019 and reached about 7 GW as of May 2021. Most of this installed capacity comes from unlicensed projects. However, at the end of 2016, a change was made to allow unlicensed projects to be implemented on a self-consumption basis, and the pace of market development slowed down due to the fact that no new licenses were issued.

Solar power is a resource that, by its very nature, lends itself to a wide range of installations, from small to large, providing cheap electricity at the current point it has arrived in today. An important way to make the most of this resource is to pave the way for business models related to this resource. In this way, solar power will be able to provide the expected economic benefit.

In the report, a total of 5 business models are mentioned in two main divisions. These two main divisions break down the business models into two including prosumer and commercial models. Of these business models, the “prosumer model", “Licensed, tendered and incentivized model" and "RERA model" (Renewable Energy Resource Areas) are already existing models in the market, while the "Green PPA Model" and "Tender-Free, Incentive-Free, Licensed model" are not a market practice yet..

Solar3GW mainly proposes three models for a healthy and consistent development of the market; the improved prosumer model, the Green PPA through Additionality Model and the Tender-Free, Incentive-Free, licensed model. All three models have features that can be reconciled with the demand for electricity and are compatible with the free market dynamics.

The “Prosumer model" can be designed to be in the same or separate generation and consumption points in the same distribution area. According to the unlicensed SPP legislation, it can be installed in areas not limited to the roof and facade only. such as suitable land, sea, lake etc., It is an important step to make it mandatory under this model to provide solar energy for the energy consumption of all buildings that are newly built and rebuilt as part of the urban transformation.

The "Green PPA (Power Purchase Agreements) model" makes it possible to meet the increasing demand for electricity through solar energy, which is a sustainable and clean source of energy. With this model, the party that needs electricity and the party that supplies electricity are brought together without using public funds and these power plants which come to the market through a concrete demand are financed by a predictable mechanism. The clean energy generated is delivered to consumers with fixed price guarantees. The model does not affect pricing in the free market because it does not include incentives.

With the "Tender-Free, Incentive-Free, Licensed model", installations will be shaped and realized as projects entirely by the private sector according to the grid availability and the needs of each region. Because this model is a tender-free model, it eliminates lengthy bureaucratic processes that require the coordination of many different government agencies, such as capacity allocation, and uses public funds at a minimum level.

For commercial models to be sustainably included in the market mechanism, certain steps should be taken, such as providing collateral like credit insurance or a state guarantee, releasing financial Green PPAs in accordance with capital market legislation, revising the related regulation so that unlicensed projects can be traded under Green PPAs and creating the regulatory infrastructure necessary for the Tender-Free, Incentive-Free, Licensed SPP.

These three models proposed by Solar3GW are fully in line with our country's policy aimed at increasing the use of clean energy sources, allowing a highly efficient use of solar energy in the fight against climate change. With these models, which can operate without any incentives within the dynamics of the free market, our country's electricity market will evolve in a direction that meets the needs of the time.

2 INTRODUCTION

HIGH POTENTIAL ADVANTAGE IN SOLAR ENERGY

Turkey has the potential to double the growth it has shown so far due to both its radiation values and its favorable and convenient geographical location.

TRAINED WORKFORCE/EXPERIENCE

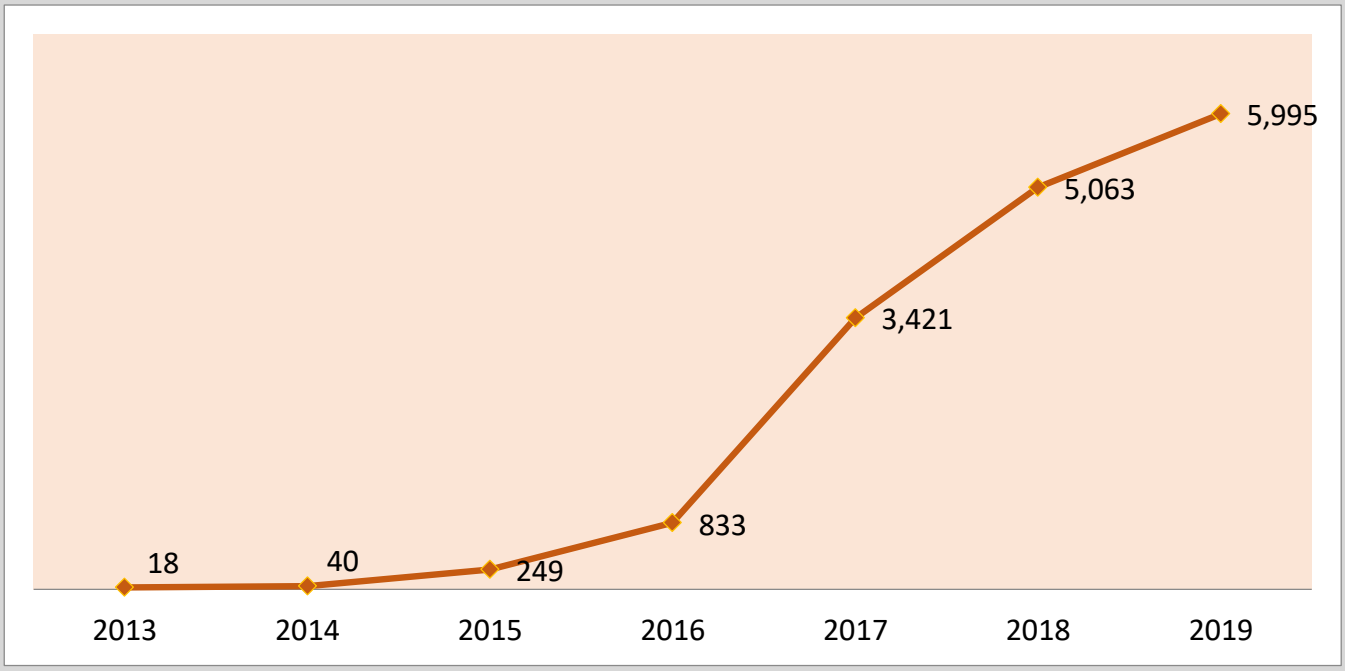
Turkey has a very significant volume of trained human resources and know-how, especially given the high growth from 2015 to 2019.

GROWTH ABOVE THE TARGET

The installed capacity of solar energy has grown beyond expectations, causing the targets set each time to be updated.

Turkey's Solar Energy Sector

SOLAR ENERGY INSTALLED CAPACITY DEVELOPMENT (MW), 2013-2019



Source: TEIAS

The growth was fastest in 2015-2019, when the Unlicensed Electricity Generation Regulation (the "Regulation") opened the way for investors to a large extent compared to licensed production.

In the solar energy sector, growth has slowed from 2018 onwards, due to changes in legislation on unlicensed power generation as of 2017.

Solar energy has become widespread in Turkey, mainly with land-type and industrial-type roof installations.

The growth of licensed solar energy investments with a capacity limit of 600 MW also remained very limited compared to unlicensed one.

Turkey's energy sector has witnessed how quickly this resource can grow beyond the targets if the right conditions are created.

In the RERA SPP 1 project, which was tendered in 2017, the installation of the factory was completed and land installations have been started as of 2020. With this capacity, the installed SPP power will increase by another 1,000 MW.

3 BUSINESS MODELS

Solar Energy Sector
Business Models

DEFINITIONS AND DISTINCTIONS

Basically, two business models can be distinguished which, from the investor's point of view, do or do not aim for a commercial profit from the sale of electricity. A model that does not aim for commercial profit from the sale of electricity, but benefits the people and institutions themselves by ensuring that the cost of electricity is fixed and predictable in the medium and long term by generating electricity from the sun is presented as a prosumer model; models that are recommended as business models aiming for a commercial profit and have different conditions are presented as commercial business models. Commercial business models are examined under two groups as market-driven and tender-based in terms of their structure.

In this study, a single business model is considered under the prosumer model, and four separate business models are considered under commercial business models. The models mentioned are the options that are considered applicable in the market according to a certain regulation. Not all of them are currently being actively implemented.

APPLICABLE BUSINESS MODELS OF THE SOLAR ENERGY SECTOR IN TURKEY

I- PROSUMER BUSINESS MODEL

This model is considered to have two options including the following:

- Generation and consumption are at the same point and in the same distribution zone
- Generation and consumption are at different points and in the same distribution zone

II-COMMERCIAL BUSINESS MODELS

a. **MARKET-DRIVEN**
   a. **Green PPA through Additionality Model:** Green Power Purchase Agreements. It is a model in which the corporate consumer secures the energy supply through the preferred project developer with long-term agreements prior to installation.
   b. **Tender-Free, Incentive-Free, Licensed Model:** the SPP model that is given a connection opinion with application based on the grid capacity and requirements alone and which will sell the electricity it produces in the free market.

b. **TENDER-BASED**
   a. **Tendered, Licensed Model:** The SPP model in which capacity is set and tendered by the state, and the investor offering the lowest price sells the electricity at the price specified in the tender once SPP is established.
   a. **The RERA Model (RERA SPP-3):** The SPP model, in which the components are used in the declared regions and the capacities, again at the declared local content rate, are installed in areas with renewable resources designated by the investor and the electricity is sold at the price specified in the tender.

Of these described business models, Solar3GW proposes 2 models, namely the Prosumer Model and the market-driven model;

1. Improved Prosumer Model
2. The Green PPA through Additionality Model
3. Tender-Free, Incentive-Free, Licensed Model

	Market Practice	Solar3GW Recommendation
Prosumer Model	Yes	✓
The Green PPA through Additionality Model	None	✓
Tender-Free, Incentive-Free , Licensed Business Model	None	✓
Tendered, Incentivized, Licensed Model	Yes	✗
RERA Model	Yes	✗

1-PROSUMER BUSINESS MODEL

Driving Forces

1. Preventing Losses
2. Contributing to reducing the current account deficit
3. Contributing to ensuring competitive advantage of enterprises
4. Providing benefits to carbon markets
5. Positive impact on the environment
6. Positive impact on employment

Barriers and restrictions

1. Financial difficulties
2. The time-consuming process of physical application
3. TEIAS transformer center capacity limits
4. Having roof and facade limitations for the prosumer model
5. Grid operator failing to communicate capacities in a clear and up-to-date manner

1. Preventing Losses

When we look at the transmission and distribution grid in Turkey, we see that it suffers significant losses from the point where electricity is generated to the point where it reaches the end consumer.

Given the average of the losses of the past decade, the following figures emerge;

Internal need during generation: 4.6%
Transmission Loss: 2.2%
Distribution Loss: 12%

Considering these data, it will be possible to avoid losses arising from transmission and distribution grids with the spread of the prosumer model. Installed capacity figures may increase or decrease, however, the installed capacity serving the annual 1,650 MW self-consumption considered within this model seems quite possible when supported by appropriate policies and financing requirements under the conditions of Turkey. It is thought that the 1,650 MW capacity for self-consumption purposes will come with demand from household and commercial segments. In installations where generation and consumption are at the same point, the ratio of the avoided loss to generation will be 15.8%, and if generation and consumption are in the same distribution zone but at different points, the ratio of the avoided loss to production will be 6.8%. With this model the amount of lost generation that will be prevented by the power plants to be installed will be 362.7 GWh/year in total every year.

Table 1: Distribution of the recommended annual capacity and the amount of avoided annual losses for the Prosumer Model

Annual installed capacity for self-consumption		1,650 MW
Generation and Consumption are at the Same Point	Residential Installed Power	165 MW
	Residential-The Amount of Losses Avoided	45.8 GWh
	Commercial* -Installed Capacity	660 MW
	Commercial-The Amount of Losses Avoided	196.6 GWh
Generation and Consumption are at a Separate Point	Installed Capacity	825 MW
	The Amount of Losses Avoided	120.3 GWh
Total Amount of Avoided Losses/Year		**362.7 GWh**

1-PROSUMER BUSINESS MODEL

Details of the model for the prevention of losses

	AC(MW)	DC(MW)
The Annual Target of Solar3GW's Installed Capacity (AC)	3,000	3,900
Prosumer Model Installed Capacity Target	1,650	2,145
Commercial Models Installed CapacityTarget	1,350	1,755

	Generation and Consumption are at the Same Point		Generation and Consumption are at Separate Points
	Household Type	Commercial and Industrial Type	
Installed Capacity AC (MW)	165	660	825
Installed Capacity DC (MW)	214.5	858	1,072.5
Annual Production (kWh)	289,575,000	1,244,100,000	1,769,625,000
Avoided Loss Percentage	15.8%	15.8%	6.8%
Avoided Loss Amount	45,752,850	196,567,800	120,334,500

TOTAL AMOUNT OF AVOIDED LOSS
362.655.150 kWh

Source: TEIAS, Solar3GW Analysis

2. Contributing to reducing the current account deficit

Because our country is highly dependent import in energy, it pays significant prices for it every year and its current account deficit is therefore increasing. The use of renewable resource is of utmost importance in order to prevent external dependence on energy. Solar power plants offer a cheap and local electricity resource which allows households, businesses and industrial organizations to meet their own electricity demands and their own electricity supplies in the prosumer model. With this advantage, it is obvious that there will be positive contribution to reducing the current account deficit by substituting the import energy resources in our country. In the statistics published by TEİAŞ showing the development of Turkey's Electricity Generation by the resources of generation, it is noted that the electricity generated by imported sources accounts for 52.9% of the total generation. With the recommended model, in a 10-year period the coal import may be decreased by 60% or natural gas import by 64% for energy.

3. Contributing to ensuring competitive advantage of enterprises

Savings on electricity, which is one of the most important expenses of enterprises, also provide a cost advantage to these organizations in the long term based on the products they sell and services they offer to domestic and international market, increasing their competitive advantage. The potential savings they make in this area increase the profitability which in turn increases the market strength of the enterprises, paving the way for new investments. Furthermore, the factories, businesses which have suspended their activities due to pandemic continued to produce and sell electricity with minimum maintenance and repair requirement, therefore contributing to the reduction of their commercial losses.

4. Providing benefits to carbon markets

As of now, Turkey is voluntarily participating in the carbon market; however, in the future, when it switches to the mandatory carbon offset market and the volume is concentrated there, each installed SPP capacity will provide an economic benefit to the country. Turkey has the potential to become one of the leading players in the carbon market. In times of fluctuating electricity consumption, it will be especially important to do business in the carbon market for the producer. Since Turkey, which has a large export volume and has the potential to further increase this volume complies with the 'Green Deal' which includes the EU's master plan to reduce carbon emissions, it is possible for Turkey to make its export sustainable and further increase it in the long term. If companies with a certain export revenue weight in their balance sheet carry out their activities in a way to reduce carbon emission they will be able to maintain their competitive advantages.

5. Positive impact on the environment

Every 1 GWh generated from solar energy causes only 23 Tons-CO_2/GWh* greenhouse gas emissions.
In comparison, natural gas causes 499 Ton-CO_2/GWh and imported coal causes 888 Ton-CO_2/GWh greenhouse gas emissions. Considering these values, the importance of the environmental impact of solar energy becomes clear. The thermal applications in terms of environmental protection would lead to significant positive results in the direction of reduction of air pollution. With the proposed prosumer model, if they replace the power plants generating electricity with natural gas, 22 Million Tons CO_2 greenhouse gas emission will be avoided.

Source:EMO*

6. Positive impact on employment

In our country, in 2019, 30,450 people became a part of the workforce in the solar energy sector. Taking into account the 932 MW installation made during the same year, it is seen that on average 33 people are employed per MW.
In case of an annual installation of 1,650 MW that appears very possible for self-consumption and is shared in the economic impact analysis, it is estimated that this sector will have a contribution of 54,450 thousand people to employment. This figure is representative of temporary and permanent employment in both installation and operation processes. As long as the sector continues its installations for self-consumption, demand for employment on the installation side will also continue. Provided that the total installed capacity remains the same, it is known that a large number of small-scale SPPs generates more contribution than a small number of large-scale SPPs. It is clear that the model will contribute significantly to employment as long as it is supported by appropriate policy conditions.

When compared with other energy sources;

- This means 2.2 times more contribution than dam type hydro power plants
- 2.8 times more than coal plants
- 2.9 times more than wind plants
- 3.5 times more than natural gas plants
- 3.8 times more than nuclear power plants
- 36 times more than geothermal plants

*Source: IRENA, US Energy & Employment Report

6. Its positive effect on employment (continued)

From another point of view, as the way is paved for agrivoltaics projects, efficient agricultural products under appropriate lighting conditions are obtained and the need for electricity is met from solar energy to sustain livestock farming activities, hence, the producer is provided with support for rural development and employment.

During this period of increased economic concerns and employment problems across many sectors, companies in the renewable energy sector have hardly been affected by these negative development, and an increase in the demand for employment in value chain businesses such as production, implementation and consulting have been observed.

1. Financial difficulties

Obtaining a collateralized loan and the equity requirement can be a deterrent for investors. Even if the investor provides equity, s/he also has to guarantee the amount of financing either with the company or with different types of sureties, which may mean blocking the collateral limits that companies can use for their own business.
Instead, if there is a collateral or cost-effective surety insurance support for projects above a certain size in the state's prosumer projects, the financing of these projects can be completed even in the form of 100% external financing, paving the way for the projects.

2. The time-consuming process of physical application

All the application process and procedures of this business model can be designed with a remotely accessible system. The process and procedures related with the board meeting held concerning the connection approval applications in particular must be performed entirely in a digital setting. In this way, first of all, time would be saved on 1 month application waiting period, 3 weeks of evaluation and announcement of results. After the results are declared positive, the fastest way should also be preferred during the time of writing a connection approval to the connection agreement and delivering it to the investor. Organizing this process as an e-government application will be able to ensure both the follow-up of the model and a healthy and transparent progress that is consistent with the nature of the process in the midst of pandemic which we, as a whole world have had to go through and may have to go through again.

3. TEIAS transformer center capacity limits

TEIAS is looking at the availability of transformer centers for consumers who will build a production facility for self-consumption. However, in facilities that will instantly completely consume what they produce and including even those whose production will constantly lag behind the meter, it examines the connectable total renewable installed capacity in the transformer; currently, if the transformer capacity is full with other renewable facilities that is connected to the transformer center which has been applied to, no connection permission is granted to the these new power plants that will make 100% self-consumption. It should be explained to TEIAŞ that the facilities that will instantly consume what they produce and not feed energy to the grid will actually provide relief to the grid and necessary commitments should be made to the grid operator in this regard. TEİAŞ may check if the requirements that would also technically guarantee that these commitments are fulfilled electrically and the equipment is supplied and commissioned during the commissioning of the facility. On the other hand, with the developing technology, when the grid operator designates the necessary rules in installations even for SPPs which will not completely consume what they produce but feed the grid and control them during the commissioning, it will be able to reduce the impact of these power plants on the grid (capacitive loading, sudden load fluctuations etc.) and thus place fewer restrictions on the capacities of SPP that can be connected to the transformer centers.

4. Roof limitation for the prosumer model

The installations that are limited to roof impose restriction on areas that may be used within the prosumer model, limiting the development potential of the sector within the framework of this model. Without classification according to need, the unlicensed legislation should be revised in order to install SPP in areas such as roof, facade and land, sea, lake etc.

5. Grid operator failing to communicate capacities in a clear and up-to-date manner

The process conducted by the grid operator cannot be followed up by the investor, the investor only receives a notification involving the results. The functioning of the process this way leads to the failure to sufficiently understand and fix what goes wrong in the system and thus resulting in time losses. For the proper functioning of the sector, it is necessary that the process to be carried out by the grid operator is made more visible to the investor with an amendment in legislation and that the transformer capacities are communicated in a clear and up-to-date manner on a regular basis.

1-PROSUMER BUSINESS MODEL

• As of the end of 2019, Turkey has reached an installed capacity of 6 GW with a very rapid growth and is considered one of the most important markets in Europe both in terms of its experience and potential.

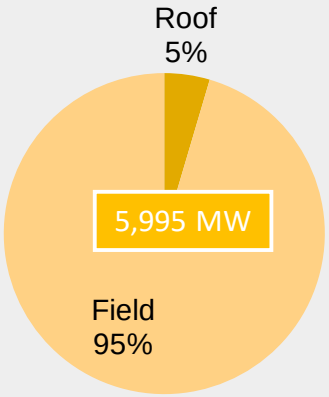
• The presence of a large number of organized industrial zones, factories, businesses and suitable residential rooftops allows Turkey to occupy one of the most advantageous positions in the region in terms of economies of scale.

• Of these businesses, the number of shopping centers alone is over 400 while a large number of public institutions including large hospitals and courthouses, recently built and planned to be built has an important potential for the model.

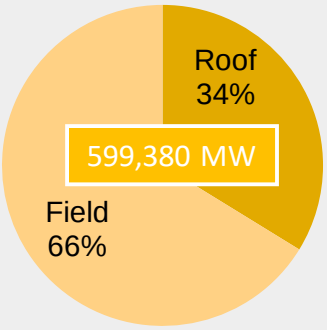
• From the point of view of housing, all regions located outside the large urban centers have a favorable potential for the production of household electricity. Considering the detached houses with a suitable roof, it seems possible for Turkey to achieve a potential of at least 600 MW in this segment.

• In the future, the market will grow exponentially as electricity becomes a product that everyone can buy, sell and share.

Roof Installations-Field Installations,2019,Turkey



Roof Installations-Field Installations,2019, Global



Source: PV Installations Tracker IHS Markit

• On the other hand, there are about 15,000 electric vehicles and 10 million private cars in our country and it is expected that the number of electric vehicles will gradually increase with the developments in the market. With attractive business models, the development of car charging stations, and use of the overhead canopies of the unused parking lots, it is expected to reach a significant market size through the prosumer model.

2-PROSUMER BUSINESS MODEL

RECOMMENDED BUSINESS MODEL FLOWCHART

Solar3GW Recommendation

Prosumer Business Model Flow

Application
Investor

- Investor analyzes what the facility needs.
- Determines the SPP capacity in accordance with the consumption need and connection capacity.
- Determines the area where the SPP capacity will be installed without roof and facade restrictions, taking into account the land in the same distribution zone
- Applies for self-consumption digitally (e-government etc)
- Digitally uploads the documents required in the application to the system.

Application
Grid Operator

- EDAŞ reviews the application made digitally in the same environment.
- If all the uploaded documents are submitted as is laid out in the regulation, it uploads the connection approval to the system.

Application
Investor

- When the applicant thinks that s/he can meet all the criteria, s/he informs the grid operator via the system that s/he accepts the connection option.
- Signs the connection opinion and the connection approval electronically or using a mobile signature

Project
Investor

- Receives a project admission number via the system. Submits the project drawn up in accordance with the connection opinion with the admission number received to the grid operator by mail for approval.

Project Approval
Grid Operator

- The deficiencies of the project, if any, will be notified via the system. If there is none, the project is registered as approved in the system.
- A copy of the approved project is sent to the investor via mail.

Connection agreement

- The connection agreement is uploaded to the system by the grid operator.
- Connection agreement is signed with electronic signature or mobile signature by the investor.

Commissioning of Facility

- The applicant who has obtained the self-consumption permission makes the facility ready for commissioning within the construction period granted.
- In line with the approved projects, the system is put into operation by making commissioning of the facility.

The process runs transparently through the system created (e-government etc.) The roof or facade requirement at the installation point should be removed by introducing a regulatory amendment in the system. Similarly, in the prosumer model, the requirement that the generation and consumption points be in the same place provided that they are in the same distribution zone must be removed.

Why is this business model necessary, what benefit does it have for the sector?

- The investors who want to meet the electricity consumed in accordance with the connection capacity with the Prosumer Model will find the opportunity to install systems that they cannot install because there is not enough space on the roof and facade.
-A regular economic growth is ensured while securing the continuity of the sector.

1-PROSUMER BUSINESS MODEL

RETURN ON INVESTMENT

Recent increases in electricity consumption prices, coupled with the significant reductions in solar energy system costs, has greatly increased the attractiveness of the Prosumer Model in terms of return period. Although the installations intended for self-consumption vary depending on the scale, the depreciation periods have decreased from 7-8 years to 4-6 years, especially due to the high electricity consumption costs of commercial and industrial facilities. In 100% equity financing, the return period can be reduced by up to 4 years at current electricity prices, while even with 100% financing spread over a long period of time, a return on investment for the facility owner is achieved in attractive periods. In addition, according to the Regulation on Unlicensed Electricity issued on May 12, 2019, SPP capacity is allowed under the connection capacity for the Prosumer Model and an electricity that is produced more than consumed can be sold to the distribution system at valid tariffs for 10 years. Furthermore, there is a VAT exemption practice in case of obtaining an incentive certificate.

In addition, as seen in other developed markets, the Prosumer Model will also enable for secondary market products such as roof leasing, energy efficiency financing and carbon loans in the coming period. Thus, profitability will not be limited only to the investment process, but will also continue in the secondary markets and derivatives markets. Investment banking and solar energy portfolio investment products have also been established in Turkey recently.

From another point of view, in the long term, the return on profit increases even more from a broader perspective when it is reflected in the cost of the product produced or the service provided, as indicated in the impact analysis.

In past examples that sold electricity with YEKDEM, the project IRRs varied between the range of 9.4% and 12.7%, while in the scenario where the unit price of electricity increases by 10% annually in TL in the Prosumer Model **IRR is within the range of 16.4% to 18.1%***

In the proposed prosumer model, if the electricity prices are raised annually by 20% instead of 10% the **IRR value which is 16.4% jumps to 18.2%**.

•The related project IRR values takes the equity as 25% and loan as 75%.

In the form of equity financing and monthly offset, it is possible to get a return in 4 to 6 years. Due to processes of up to 6 to 9 months such as connection agreement, connection approval, supply and practices and admission of the facility at the beginning of the investment process alone, the investor must plan the financing process for at least 4 months without any return.

System Size	Return (Year)*
0-10 kW	7-9 years
10-500kW	6-8 years
500 kW and above	4-6 years

*These return periods may vary depending on the type of financing, cost, the Corresponding Tariff and coordinate at which the installation is made.

In the current financing conditions, Turkish banks provide financing in the form of international funds, commercial loans, project financing loans, as long as the investor is able to secure financing, and also leasing opportunities are also available.

However, in addition the removal of 18% VAT ratio in case of local panel use, low interest loan financing for those who want to make solar photovoltaic installations will increase the prevalence of this business model. It will be an incentive for domestic panel manufacturers.

1-PROSUMER BUSINESS MODEL

1 Investors

a. Owners of Industrial Facilities
b. Business owners (Shopping mall, hospital, supermarket etc.)
c. Public Institutions
d. House owners

2 Supply Chain

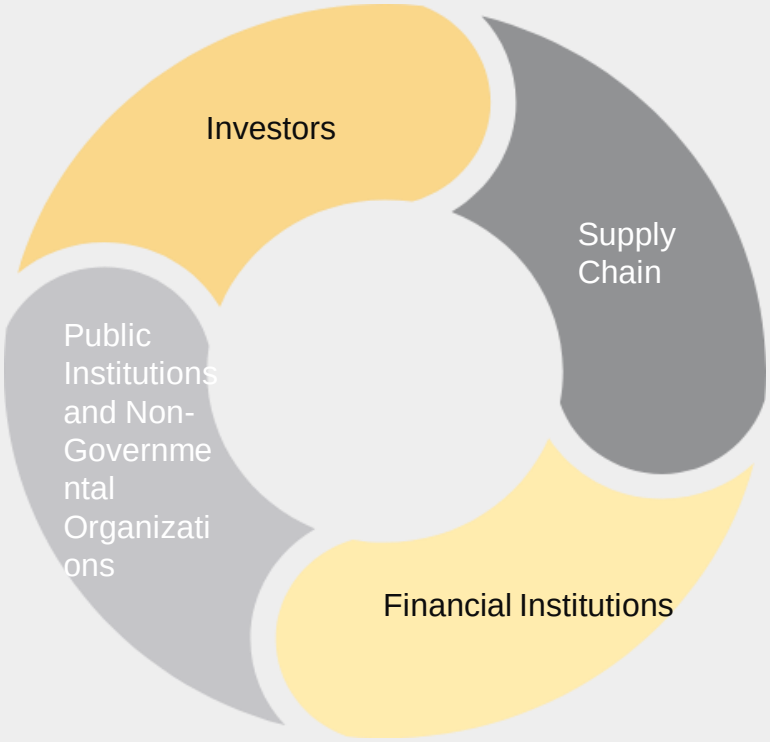
a. Panel Manufacturers
b. Inverter Manufacturers
c. Manufacturers of Metal Parts (Steel, Aluminum)
d. Cable Manufacturers
e. Electrical Panel Manufacturers
f. Connector Manufacturers
g. Transformer producers
h. High Voltage Switchgear Manufacturers
i. Remote Monitoring System Companies
j. Engineering Companies
k. Application Companies
l. Wholesale Companies
m. Retail Sales Companies
n. Audit Firms
o. Testing Companies
p. EPC Companies
q. Logistics Companies
r. Customs Clearance Companies
s. Insurance Companies
t. Excavation Companies
u. Private Security Companies
v. Crane Companies

3 Financial Institutions

a. National Banks
b. International Funds
c. EBRD

4 Public Institutions and Non-Governmental Organizations

a. EMRA
b. Ministry of Energy
c. TEIAS
d. EDAŞ
e. Associations



Although the stakeholders of the Prosumer Model and the Commercial Business Model are almost the same as each other, as the investor profile of the Prosumer Model has more of a sub-segment scope as residential, commercial and industrial, it has a broader scope in terms of the end user.

1-PROSUMER BUSINESS MODEL

The legislator has demonstrated its will for the continuation of the Prosumer Model by clearly drawing the lines of this model in the regulation amendment dated May 2019. Actually, it has given the consumer who will install SPP the chance to offset the electricity s/he produces and consumes on a monthly basis for self-consumption (instead of the previous hourly deduction); this is, of course, a great advantage for SPPs that only produce at certain hours. In addition to this, in the event of an excess electricity generated at the end of the monthly offset; the possibility of selling this excess electricity at the tariff price belonging to the consumer's own subscriber group was also introduced to further improve the feasibility.

Ensuring sustainable energy supply security has been the ultimate goal of Turkey's energy policy. This goal, which is reiterated in all strategy documents, has been defined as the first goal in the Strategic Plan of the Ministry of Energy and Natural Resources 2019-2023. The first objective of this aim has been determined as "ensuring the increase of the ratio of the installed capacity of electricity based on domestic and renewable energy sources to the total installed capacity from 5**9% to 65%** .

Although the strategic plan supports the proposed business model as a goal and objective and it complies with the prosumer business model proposed by us, there is a need to update the targeted quantities. Solar installed capacity, which is expected to be added to the system for 4 years after 2019 in accordance with the strategic plan is **5,250 MW**.

The strategic plan indicates 2020 as the target year to introduce the necessary changes in terms of updating the legislation on the unlicensed electricity generation, depending on the practice and developments in the aim set for the same goal. Therefore, the timing of the necessary legislation change to make the new business models we will recommend overlaps with the Strategic Plan of the Ministry of Energy and Natural Resources.

1-PROSUMER BUSINESS MODEL

This prosumer business model is based on the current unlicensed electricity generation legislation in terms of its scope. The relevant legislation infrastructure is as follows;

- Electricity Market Law No. 6446
- Law No. 5346 on the Use of Renewable Energy Sources for the Purpose of Generating Electrical Energy
- Regulation on the Production of Unlicensed Electricity in the Electricity Market

However, in order for this proposed model to fully provide the benefits included in the impact analysis, a number of improvements and revisions to the current legislation are needed. These revisions are as follows;*

- Generation and consumption points can be located at separate points provided that they are in the same distribution zone.
- Revising the legislation on unlicensed electricity generation for the installation of SPP in fields, agricultural lands for agricultural applications. Roof, facade and land, sea, lake, etc., without classifying according to the need for the prosumer model.
- Increasing the capacity of TEIAS transformer center
- Making it obligatory for all buildings that will be newly built in rooftop solar energy systems and reconstructed by urban transformation to consume solar energy
- Removing the capacity query in the regulation for systems that will be installed within the framework of the Prosumer Model that will meet its own internal needs .
(Medium and large-sized rooftop SPPs are officially subject to a capacity query, although they do not constitute a specific capacity at the TEIAS transformer center to which they are connected. This situation is an obstacle ahead of the investor both in terms of the procedure and the implementation of the project.)

* A number of improvements have been made to the 'Improved Prosumer Model' with the amendment of legislation published in the Official Gazette on May 9.

2-COMMERCIAL BUSINESS MODELS

In this section, as mentioned in the beginning section, 4 separate business models for commercial purposes are included;

A. MARKET-DRIVEN

a. **The Green PPA through Additionality Model:(Power Purchase Agreements):** A model in which the corporate consumer secures the power purchase through its preferred project developer with long-term agreements prior to installation.

b. **Tender-Free, Incentive-Free, Licensed Solar Power Plant (SPP) Model:** A model for which connection opinion is given upon application based on the grid capacity and requirements alone and will sell the electricity it produces in the free market.

B. TENDER-BASED

a. **Tendered, Licensed Solar Power Plant (SPP) Model**: The SPP model for which capacity is set and tendered by the state in declared regions, and the lowest-bidding investor sells the electricity at the price specified in the tender once SPP is established by the investor.

b. **The RERA Model (RERA SPP-3):** The SPP model, in which the components are used in the declared regions and the capacities, again at the declared local content rate, are installed in areas with renewable resources designated by the investor and the electricity is sold at the price specified in the tender.

These models are evaluated under the same section headings.

Driving Forces

1. Contributing to reducing the current account deficit
2. Providing benefits to carbon markets
3. Positive impact on the environment
4. Positive impact on employment
5. The effect of on grid stabilization

Barriers and restrictions

1. Limits that can be set by the grid operator
2. Financing difficulties
3. Failure to obtain a license application by EMRA
4. The Green PPA regulatory infrastructure not being ready
5. Failure to evaluate unlicensed projects within the scope of the Green PPA
6. Commercial and cultural barriers to signing a long-term contract

The Models to Which The Articles Apply	The Green PPA	Tender-Free, Incentive-Free , Licensed Business Model	Tendered, Licensed SPP	RERA (RERA SPP-3)
	1,2,4,5,6	1.3	1.3	2

1. Contributing to reducing the current account deficit

With the activation of market-driven models, electricity generated from solar energy at zero marginal cost can be rapidly increased and replaced by energy generated from imported high-cost thermal resources. Moreover, a market-driven design whose method is correctly determined and rules are well established would undoubtedly optimize both the costs and efficiency. Produced from an unlimited source, without the cost of raw materials, solar power would also reduce the cost of the current deficit burden on energy as initial installation costs are amortized in shorter periods of time with gradually decreasing prices.

2. Providing benefits to carbon markets

As of now, Turkey is voluntarily participating in the carbon market; however, when it switches to the mandatory carbon offset market in the future and the volume is concentrated there, each installed SPP capacity will provide an economic benefit to the country. Turkey has the potential to become one of the leading players in the carbon market. In times of fluctuating electricity consumption, it will be especially important to conduct business in the carbon market for the producer. The most important and concrete application in this context is the carbon tax practice on the border that it wishes to put in place within the EU's green deal. In this direction, the agenda is for the EU to impose a carbon tax on products from certain sectors it imports from its neighboring countries where there is no mandatory carbon scheme during import.

3. Positive impact on the environment

Every 1 GWh generated from solar energy, only 23 Tons-CO_2/GWh* causes greenhouse gas emissions. In comparison, natural gas causes 499 Tons-CO_2/GWh, and imported coal causes 888 Tons-CO_2/GWh greenhouse gas emissions. Considering these values, the importance of the environmental impact of solar energy becomes clear. The thermal applications in terms of environmental protection would lead to significant positive results in the direction of reduction of air pollution.

Source:EMO*

4. Positive Effect on Employment

SPP investments make a significant contribution to the workforce as a whole, even more during the construction phase. The security, operation and maintenance of these established facilities is a serious business opportunity in the country side as opposed to the cities. In our country, in 2019, 30,450 people became part of the workforce in the solar energy sector. Taking into account the 932 MW installation made during the same year, it seen that 33 people are employed per MW. In case of an annual installation of 1,350 MW which is considered very likely for the commercial business models and shared in the economic impact analysis, it is believed that this sector's contribution to employment will be around 44,550 people. As long as the model is supported by appropriate policy conditions, it will make a significant contribution to the employment.

5. The effect of on grid stabilization

SPP installations, when coupled with proper grid practices will help ensure the stabilization of the grid, contrary to what is claimed. Solar energy taking the load off during peak hours which is called peak shaving, also balances the load on the energy grid. To be able to take advantage of this benefit, the ability of the grid operator to balance the system and the effectiveness of the balancing and adjustment mechanism must be increased.

Source:EMO*

1. The limits which are/can be imposed by the grid operator

TEIAS, as a grid operator, is responsible for taking the necessary measures to avoid compromising the continuity of supply in the grid. In this context, the sudden load changes (sudden arrival of a cloud) and capacities that are not available at all times (nighttime or overcast weather) in SPPs, one of the renewable energy power plants, push the grid operator to be extremely cautious in the capacities provided to these power plants in the substations. However, with the evolving technology and decreasing costs, while the capacity utilization ratios of SPPs increase with more DC loading it is becoming more feasible for these power plants to operate like baseload power plants with the battery storage integration.

The applicable business models are: the Green PPA, 'Tender-Free, Incentive-Free , Licensed SPP', 'Tendered, Licensed SPP'

2. Financing difficulties

Banks financing this business model based on a long-term contract may be limited due to the financial position of companies. In the Green PPA-based models applied globally, it is likely that the long-term contracts signed by the major institutions with A/A+ credit rating and the Green PPA investors will be a barrier against the funding due to the a few number of institutions that can offer this in Turkey. If a government guarantee or a government-guaranteed low cost suretyship insurance etc. can be provided for the Green PPA's that have gone through certain criteria checks and brought the financing supply contracts to the signature maturity to overcome this risk, the investments in the Green PPA business model will not only be limited to investors from within Turkey. As for the RERA, it is believed that the unwillingness of the international financial institutions to provide funding due to the requirement to use local product will cause difficulties.

The applicable business models: the Green PPA, RERA

3. Failure to obtain a license application by EMRA

As is known, EMRA receives license application in certain periods in line with both the incentives given to SPPs and the decisions taken by the policymaker to use domestic resources and domestic equipment. However, there is usually a long delay in opening the license applications due to the legislator's concern in making a decision and the lengthy communication process between EMRA and these institutions. However, under the Tender-Free, Incentive-Free, Licensed model that we particularly recommend where EMRA does not require a specific deadline to receive SPP license application, the applications will always be open under this system once the application system is announced.

The applicable business models: 'Tender-Free, Incentive-Free , Licensed SPP', 'Tendered, Licensed SPP'

4. The Green PPA regulatory infrastructure not being ready

The legislation in our country does not yet allow a license to be granted by means of the consumer choosing his/her own producer and making a commitment to buy the electricity from the said producer through a long-term bilateral agreement under an agreed-price before a renewable power plant is built. Producers can make the bilateral agreements only after registration in the EPİAŞ system which takes place simultaneously with the commissioning of the production facility Whereas, with the Green PPA contract infrastructure to be created, legislation may allow large-scale consumers to select their producers prior to the construction of the plant, i.e., to grant a license to that pre-selected producer under the contract signed with the consumer.

The applicable business models: the Green PPA

5. Failure to evaluate the unlicensed projects within the scope of the Green PPA

Evaluation of unlicensed projects with the Green PPA is not possible as the electricity produced within this scope cannot be commercialized. This would limit the desired financial benefit.

The applicable business models: the Green PPA

6. The commercial and cultural barriers to signing a long-term contract

The volatility of the exchange rate, and in general its upward course poses a barrier to making a long-term contract of over 2-3 years. On the other hand, due to changing macroeconomic indicators and policies, there is not a mechanism in place to protect this agreement within a certain framework.

The applicable business models: the Green PPA

2-COMMERCIAL BUSINESS MODELS

MARKET SIZE

• Turkey is an emerging market. Especially in the last 5 years, growing both above the targeted and expected rate, it has shown how easily it can use its potential when appropriate conditions are created,

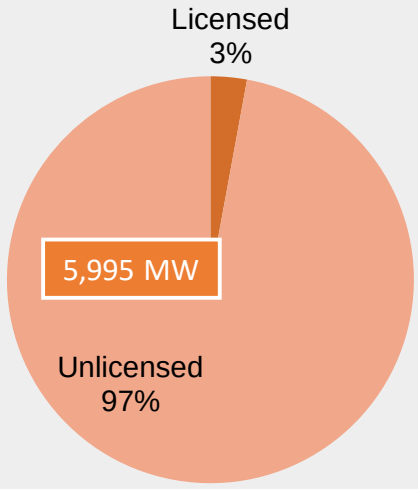
• The market has made significant progress on industrial roofs and land installations, especially in the commercial segment.

• As of the end of 2019, roof installations accounted for 4.6% and field installations accounted for 95.4% of the market size of 5,995 MW.

• In particular, the growing end-user segment is commercial. Addressing the energy producers in the market that include these and larger installations the segment is expected to be the basis for an annual growth of at least 3 GW in the coming years in accordance with the business models examined in this section. Therefore, the potential of the market is conducive to high growth, as long as appropriate policy conditions, transformer capacities and regulatory infrastructure allow.

• Of these models, the Green PPA, 'Tender-Free, Incentive-Free, Licensed SPP' and 'Tendered, Licensed SPP' are models that can provide an annual growth of 3 GW. Other than these, the RERA model will serve an additional market size of 1,000 MW in total, with 74 renewable resource areas to be tendered separately as 10, 15 and 20 MW.

Solar Energy Licensed and Unlicensed Systems, 2019, Turkey



Source: TEIAS

Investments in solar energy in Turkey were revived and realized with extraordinary momentum every year since 2014 as the regulation of the unlicensed electricity generation made it possible to sell to the grid first through YEKDEM. However, investments have shown a slowdown since 2018, when the regulation was revised again in 2017 to be focused on self-consumption. Although the regulation is aimed at self-consumption, the fact that it made it possible to sell electricity to the grid played a very important role in bringing the solar energy market to its current level of development.

Solar3GW Recommendation

The Green PPA through Additionality Model Flow

Process
Project Developer / Investor

- The project developer configures the project according to the needs of the renewable energy buyer (off-taker)
- The correct location is determined taking into account the constraints of the grid and the development plan.
- When optimization is achieved, the investor applies to EMRA.

Application
Financial Institution

- The project developer and the renewable energy buyer involve the financial institution /bank in the Green PPA process at an early stage and establish the necessary resources in the optimum structure for the project to be implemented.
- The parties should also develop a roadmap of how the power plant will become a market access and energy management model if the investment is implemented.

Application
Grid Operator

- The grid operator submits the detailed connection opinion to the applicant, which contains the technical requirements necessary for the connection to be possible.
- If necessary, this connection opinion also includes the requirements for the operation of the power plant like a base load power plant, and also determines the criteria for a sudden drop and rise in voltage.

Application
Investor

- When the applicant thinks that s/he can meet all the criteria, s/he informs the grid operator and EMRA that s/he accepts the connection option.

Licensing

- The licensing process continues in accordance with the legislation, obtaining the necessary guarantees and within the periods specified in the legislation.
- The project developer submits the facility projects to the grid operator and the EIGM* for approval.

*Directorate General of Energy Affairs

Licensing

- During this approval process, the compliance of the facility with the requirements specified in the connection opinion is also checked by both the EIGM and the grid operator.
- When all the requirements of the legislation are met, the license is issued for the project developer.

Commissioning of Facility

- The applicant who has obtained the license makes the facility ready for commissioning within the construction period granted to him.
- In line with the projects, the system is put into operation by making commissioning of the facility.
- As of commissioning, the predetermined market access provider manages the market operations by assuming the financial responsibility and risks of the power plant against the grid operator.
- The imbalances of the power plant are the responsibility of the plant owner. Imbalance costs are managed and billed like a regular licensed renewable power plant

In the connection agreement, compliance with the conditions in the connection opinion given at the very beginning is guaranteed. When the facility is in operation, it is constantly checked under the legislation to see if it is already complying with the agreement, and if it is not, the sanctions provided for in the law are applied. The important thing here is that the market access services of the power plant should be designed in such a way as to make it possible to effectively integrate renewable energy into the grid and reduce the burden on the system operator. Thus, the grid operator is affected by a power plant being connected to the grid, only as much as when connected to a base load thermal power plant. The investor shall sell the electrical energy s/he feeds to the system by producing it at the facility to the company with which s/he has entered into the green PPA within the framework of this agreement . S/he takes the risk of finding financing and ensuring the profitability of the investment with the electrical energy s/he sells in this context, like a prudent merchant. S/he does not submit any incentive requests to the government.

2-commercial BUSINESS MODELS

RECOMMENDED BUSINESS MODELS FLOWCHARTS:
The Green PPA

Solar3GW Recommendation

The Green PPA Model Flow

Why is this business model necessary, what benefit does it have for the sector?

- It allows the demand for electricity that continues to grow to be met with sustainable and clean energy sources, and in doing so, public resources do not need to be used. Thus, the social benefit is optimized.

- With the predictable debt service mechanism offered by this model, it will be possible to finance renewable power plants that are essential to enter the system.

- Since the model does not include incentive mechanisms, it does not represent an element that would negatively affect the free market pricing.

- When the clean energy produced reaches industrial consumers with fixed price guarantees:

    - In particular, the electricity costs of large industrial consumers who receive electricity with contracts indexed to the last resource tariff and have volatile costs indexed to spot prices will be fixed /budgeted. This is an element that will increase the competitiveness of the industry.

    - It will be ensured that consumers will be able to achieve their climate change and environmental goals which they have committed to or which are proposed or mandated so that they can export.

2-commercial BUSINESS MODELS

Solar3GW Recommendation

Tender-Free, Incentive-Free , Licensed Business Model

Application Investor	• The investor works out the requirements of the grid. • Licensing application is made with a SPP in a capacity appropriate to the transformer centers in regions in need of production.
Application EMRA	•EMRA will forward the application to the grid operator
Application Grid Operator	•The grid operator submits the detailed connection opinion to the applicant, which contains the technical requirements necessary for the connection to be possible. •If necessary, this connection opinion also includes the requirements for the operation of the power plant like a base load power plant, and also determines the criteria for a sudden drop and rise in voltage.
Application Investor	•When the applicant thinks that s/he can meet all the criteria, s/he informs the grid operator and EMRA that s/he accepts the connection option.
Licensing	•The licensing process continues in accordance with the legislation, obtaining the necessary guarantees and within the periods specified in the legislation. •The investor project submits the facility projects to the grid operator and the EIGM for approval.
Licensing	•During this approval process, the compliance of the facility with the requirements specified in the connection opinion is also checked by both the EIGM and the grid operator. •When all the requirements of the legislation are met, the license is issued for the investor.
Commissioning of Facility	•The applicant who has obtained the license makes the facility ready for commissioning within the construction period granted to him. •In line with the projects, the system is put into operation by making commissioning of the facility.

In the connection agreement, compliance with the conditions in the connection opinion given at the very beginning is guaranteed. When the facility is in operation, it is constantly checked under the legislation to see if it is already complying with the agreement, and if it is not, the sanctions provided for in the law are applied. Thus, the grid operator is affected by the fact that a renewable energy plant is connected to the grid, but only as much as a base load thermal power plant is connected. The investor sells the electrical energy fed to the system by producing it at the facility at the price formed in the free market without any price guarantee or within the framework of this agreement with a company with which he has a bilateral agreement. S/he takes the risk of finding financing and ensuring the profitability of his investment with the electrical energy s/he sells in this context, like a prudent merchant and does not submit any incentive request to the government. Actually, the recommended **model is almost identical to the licensing and commissioning flow carried out for natural gas power plants.**

2-COMMERCIAL BUSINESS MODELS

Solar3GW Recommendation

Tender-Free, Incentive-Free , Licensed Business Model

Why is this business model necessary, what benefit does it have for the sector?

- With this business model, the lengthy bureaucratic processes that require the coordination of many different government agencies, such as the organization of tenders for the establishment of a new SPP, the allocation of capacity in special regions, will disappear.

- Installations will be carried out in each region according to the grid adequacy and needs of the region. In addition, these needs will be analyzed and determined accurately and quickly by the private sector, so that the private sector dynamism will be maximized.

- With this model, on the one hand, the country will gain clean and domestic electricity generation facilities, on the other hand, sustainable and stable capacity that the sector needs will be created. Since there is no incentive and support mechanism such as the YEKDEM mechanism in operation, the SPP to be established with this model will not be a burden on the sector. Since the investors will calculate their own commercial risks like a prudent merchant, the entire model will be shaped within the framework of free market dynamics.

2-COMMERCIAL BUSINESS MODELS

RETURN ON INVESTMENT

Business Model based on the Green PPAs

The Green PPA can be configured as the sale of on-site SPP electricity to the customer over the grid or installation on the customer's roof and 'behind-the-meter' sales. This model gives different results according to the type and scale of the installations made in terms of IRR expectations. With the economies of scale that can be achieved in installations on the land, the cost calculations of installations on roof will be different and therefore the sale and IRR expectations will also be different. In any case, it can be seen from more advanced Green PPA markets such as Europe and the United States, the income expectation of the Green PPA investors may be priced below free market prices. Despite this, there will still be profitable investments. While it is possible to make good profits even on TRY-based Green PPA through Additionality Models, it will also be possible to provide an electricity contract priced below inflation expectations for the Green PPA customer. In addition, it will be possible to reach larger green PPAS and thus more affordable electricity sales prices with permission to sell electricity to multiple customers in the land PPAs based on economies of scale.

Tender-Free, Incentive-Free , Licensed SPP Model

Although electricity prices in Turkey fluctuate from time to time, they have remained below 4.5 cents/kWh for the past decade. Since electricity in the model will be sold without incentives, it makes sense to take this minimum price as the selling price. Especially in recent years, SPP installation costs with the rapid decline, the return time has shortened for licensed SPPs. Accordingly, with the current costs, the IRR of a non-storage power plant is about 10.5%. If the grid operator requests a balanced power supply, the IRR of a SPP with 4-hour storage is 5.7% and the IRR of a SPP with 16-hour storage (which can also provide power at night) is 4.8%.*

*IRRs are calculated in USD.

A Tendered, Licensed SPP Model

In the model, the EMRA will receive a license application with the specified capacities in the regions it has previously determined; if there is an application for the specified capacity in the same region or transformer, a tender will be held by reducing the unit price of the electricity to be sold. A look at the past 600 MW licensed SPP tenders shows that although the tenders were conducted by increasing the fixed contribution price per MW capacity, investors offered prices that allowed IRRs in the 7-8% range at the time. It is very likely that the electricity bids to be submitted in the newly opened tenders in this direction will offer an IRR of about 8%. IRRs are calculated in USD.

The RERA model (RERA SPP-3)

In the model, the EMRA will receive a license application with the specified capacities in the regions it has previously determined; if there is an application for the specified capacity in the same region or transformer, a tender will be held by reducing the unit price of the electricity to be sold. Considering the licensed SPP tenders of 600 MW in the past; although the tenders were conducted through the increase of a fixed contribution price per MW of capacity; it was seen that investors offer prices that would provide IRRs in the range of 7-8% at that time. It is very likely that the electricity price bids to be submitted in the newly opened tenders in this direction will offer an IRR of about 8%. These IRRs are denominated in USD. With the tender specification published in July 2020, it was announced that the competitions would be held in TRY. In addition, an escalation has also been put on the price. Accordingly, it is believed that loans will also be used in TRY. It is normal for investors to expect a high IRR from the loan interest rate.

Return on Investment on a Model Basis

The Green PPA

In this model, the timeline will differ according to the profiles of the parties to the agreement

Tender-Free, Incentive-Free , Licensed SPP Model

- 7 tears return without storage, economic life 30 years
- 13 years return with 4 hours storage, economic life 25 years
- 16 years return with 16 hours storage, economic life 25 years

Tendered, Licensed SPP Model

The return is 9 years (in USD), the economic life is 30 years

RERA model (RERA SPP-3)

The return is 9 years (in USD), the economic life is 30 years

All business models can be financed with project financing loans from Turkish banks and with loans from the EBRD.

1 Investors

Independent Electricity Producers

2 Supply Chain

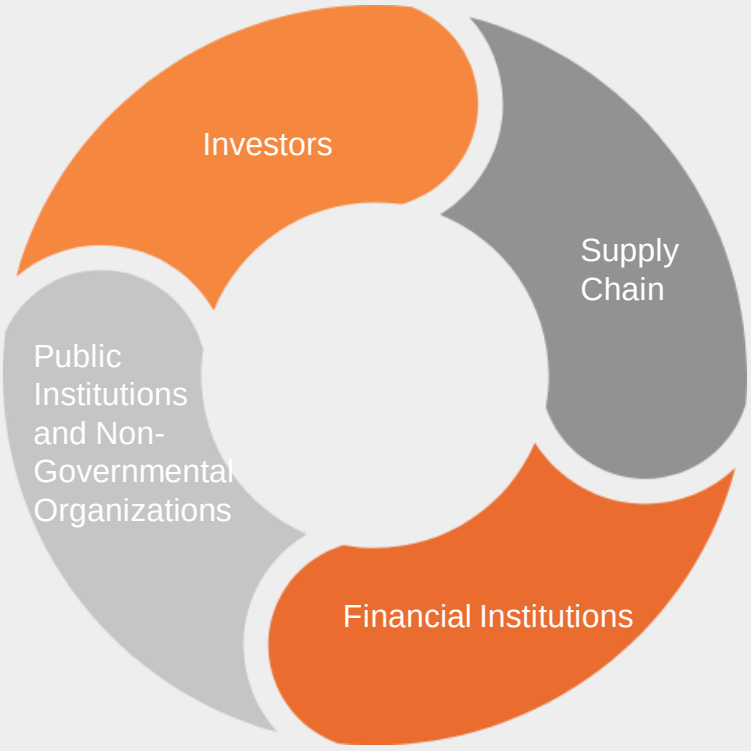
a. Panel Manufacturers
b. Inverter Manufacturers
c. Manufacturers of Metal Parts (Steel, Aluminum)
d. Cable Manufacturers
e. Electrical Panel Manufacturers
f. Connector Manufacturers
g. Transformer producers
h. High Voltage Switchgear Manufacturers
i. Remote Monitoring System Companies
j. Engineering Companies
k. Application Companies
l. Wholesale Companies
m. Retail Sales Companies
n. Audit Firms
o. Testing Companies
p. EPC Companies
q. Logistics Companies
r. Customs Clearance Companies
s. Insurance Companies
t. Excavation Companies
u. Private Security Companies
v. Crane Companies
w. Battery Manufacturers

3 Financial Institutions

a. National Banks
b. International Funds
c. EBRD

4 Public Institutions and Non-Governmental Organizations

a. EMRA
b. Ministry of Energy
c. TEIAŞ
d. EDAŞ
e. Associations



As solar energy shows rapid growth in Turkey, both the categories of players involved are diversifying, and the number of players in these categories is increasing and the sector is gradually gaining depth. With this continued growth in the sector, solar energy will continue to be also an important source of employment and it will be able to transfer the knowledge and experience it has gained even more outside of the country in this way.

The Green PPA

Solar3GW Recommendation

• Sector stakeholders, especially financial institutions, should be encouraged, collateral packages should be used, especially collaterals such as credit insurance should be evaluated in accordance with the business model, financial green PPAs contained in the business model should be released in terms of capital market legislation.

•Rooftop PPA's must be encouraged, the company installing system with the green PPA should be able to sell electricity to its customer behind-the-meter and in periods of electricity surplus, it should be able to sell electricity to the grid at a certain price or at least with free market pricing mechanism.

• It is an important legislation regulation that is expected to be able to establish rights on the rooftop PPAs to the system builder (to separate the ownership of the roof) within the scope of the Green PPA .

Tender-Free, Incentive-Free , Licensed SPP Model

Solar3GW Recommendation

It is a business model recommended by Solar3GW, and its political infrastructure is still in the proposal stage. However, both in line with Turkey's policy of turning to renewable resources in order to reduce its current account deficit, and in line with its strategy of minimizing costs and therefore incentives in doing so, the legislative infrastructure of the model is expected to be created in the near future.

A Tendered, Licensed SPP Model

Article 26 of the 'Law on Amendments to Certain Laws' No. 7226 published in the Official Gazette of March 26, 2020 converted the unit prices of electricity generated from renewable resources to TL by amending the corresponding articles of the Law on the Use of Renewable Energy Resources for the Purpose of Generating Electric Energy" no. 5346. Thus, the legislator decided to continue to maintain prices in TL instead of terminating YEKDEM completely after 2020. This shows that the business model will be tendered and implemented again with new capacities soon.

RERA model (RERA SPP-3)

The Regulation on Renewable Resource Area states that RERA can be designated by private companies through a tender and that SPP can be installed there in capacities tendered. Since March 2019, it has been mentioned several times by high-level officials of the T.R. Ministry of Energy and Natural Resources that there will be tenders for RERA SPP in relatively small capacities, in June 2020, and a competition announcement was published. In accordance with the announcement, it was declared that competitions will be held by dividing the total connection capacity of 1,000 MW into a total of 74 renewable energy resource areas of 10 MW, 15 MW and 20 MW. For each competition, the starting ceiling price is set at 0.35/kWh in TL, and the electricity purchase period is also set at 15 years.

2-COMMERCIAL BUSINESS MODELS

LEGISLATION

The Green PPA*

- Code of Obligations
- Electricity Market Law
- Renewable Energy Resources Law
- Regulation on the Production of Unlicensed Electricity in the Electricity Market
- Electrical Grid Regulation
- Capital Market Law and related legislation

*Although the infrastructure is available, additional legislative changes and additions are needed to implement this business model.

Tender-Free, Incentive-Free , Licensed SPP Model

- Electricity Market Law
- Renewable Energy Resources Law
- Electricity Market Licensing Regulation
- Regulation on Balancing and Settlement of the Electricity Market

A Tendered, Licensed SPP Model

- Electricity Market Law
- Renewable Energy Resources Law
- Electricity Market Licensing Regulation
- Regulation on Balancing and Settlement of the Electricity Market
- Regulation on Certification and Support of Renewable Energy Sources
- Regulation on the Competition for Pre-License Applications for the Establishment of a Production Facility Based on Wind or Solar Energy

RERA model (RERA SPP-3)

- Electricity Market Law
- Renewable Energy Resources Law
- Electricity Market Licensing Regulation
- Regulation on Balancing and Settlement of the Electricity Market
- Regulation on Certification and Support of Renewable Energy Sources
- Renewable Energy Resource Areas Regulation
- Regulation on the Competition for Pre-License Applications for the Establishment of a Production Facility Based on Wind or Solar Energy

4 SOLAR3GW RECOMMENDATIONS

Solar3GW Recommendations

Business models suggested by Solar3GW

Prosumer Model	The Green PPA	Tender-Free, Incentive-Free, Licensed SPP Model

Solar3GW is confident that the development of solar energy in Turkey will take place much more robustly and efficiently, especially within the framework of these three models, and hence recommends these models.

Solar3GW Solution Suggestions

Prosumer Model

✓ In order for investors not to block their own collateral limits in the prosumer model, the state can create a collateral or cost-effective surety insurance fund for self-consumption projects over a certain size. In this way, the financing of projects can be completed in the form of 100% external financing.

✓ All application processes and procedures of the Prosumer Model can be made with remote access via online systems, and the bureaucratic process can be shortened and facilitated. Running the process in a digital environment as much as possible by integrating it in the e-government application, healthy follow-up of the model, analysis of data will allow the issues that emerge to be addressed transparently and resolved in a rapid and solid manner.

✓ With the commitment that the energy that will be generated for 100% self-consumption will not be fed to the grid, project investors who are the subject of self-consumption should be exempt from TEIAS assessment for transformer center compliance status.

✓ TEIAS can determine the necessary conditions for the healthy functioning of the grid in the installation for the SPPs that will feed the excess self-consumption to the grid and check the suitability of all of them during commissioning. In this way, it is possible to overcome problems such as capacitive load or sudden load fluctuations that may affect the grid, and it will be possible to proceed more healthily in the approval of SPP capacities.

✓ Unlicensed legislation should be revised based on need in a roof constraint, roof, facade, land, etc. and the area limit that can be used within the Prosumer Model should be expanded.

✓ The process carried out by the grid company on its own should be made more transparent to all stakeholders, and the capacities of the transformers should be shared regularly in a clear and up-to-date manner. In this way, investors will be able to take action faster by seeing the areas where they can take responsibility more clearly for the problems that arise in the process, and thus the bureaucratic process will speed up.

Solar3GW Recommendation

Solar3GW Solution Suggestions

Prosumer Model (ctd)

✓ For those who want to install SPP within their self-consumption, removal of the 18% VAT in case of the use of local panels and low-interest loan financing will increase the prevalence of this business model. It will be an incentive for local panel manufacturers.

✓ Increasing the capacity of TEIAS substations is an important step for realizing the potential of the grid within self-consumption, as well as in the direction of efficiency.

✓ It should be made mandatory that all structures that will be reconstructed by urban transformation provide their energy from the sun.

Commercial Business Models

✓ In order for the Green PPA to be implemented effectively, collaterals such as state guarantee or state-guaranteed cost-effective surety insurance, credit insurance must be provided.

✓ Financial PPAs should be released from the point of view of capital market legislation.

✓ The relevant regulation should be revised so that unlicensed projects can also be evaluated within the scope of the Green PPA and the electricity produced can be traded within the framework of the Green PPA.

✓ The necessary legislative regulation should be made in order to establish the rights of the founder of the Green PPA over the ownership of the roof in rooftop PPAs.

✓ Considering that SPP that will be connected to the grid will pose a risk to the system, TEIAS should set out certain technical criteria for system investors, and give capacity approval to systems that meet these criteria.

✓ The legislative infrastructure required for the Tender-Free, Incentive-Free, Licensed SPP model should be created so that the investor potential should not be kept waiting for a long time for the new license capacity.

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