

YOUR SIMPLE GUIDE TO SOLAR ENERGY PURCHASE

Solar 101



Disclaimer

This is meant to be a guide to help you to decide whether solar photovoltaic is the right technology for you. The information contained in this ebook is strictly for educational purposes. We have used our best effort in preparing this ebook. We make no representation or warranties with respect to the accuracy, applicability or completeness of the contents of this ebook.

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INTRODUCTION

Is your organization considering going solar? Or maybe your boss asked you to explore ways to reduce cost of electricity bill? You need to meet sustainability goals to remain competitive? If you answer YES to any of these questions, this guide is for you.

This is the second series in TNBX Solar 101 guide ebook. In this book, we will answer these questions::

1. What is Solar Energy Purchase (SEP)?
2. Why SEP is awesome for your business
3. What is Supply Agreement with Renewable Energy contract?
4. How to estimate electricity savings through SEP

These are the commonly asked questions we received from organizations and businesses. Hope this guide helps to answer some of your questions too.





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S O L A R 1 0 1

WHAT IS SOLAR ENERGY PURCHASE?

01

WHAT IS SOLAR ENERGY PURCHASE?

Solar Energy Purchase (SEP), also known as Solar Power Purchase Agreement (PPA), is a financing agreement that enables organizations to purchase solar electricity with ZERO upfront cost.

A third party owns, develops, and finances the project's installation, recovering their costs via the sale of solar electricity generated at contracted rates. Both parties will enter into an agreement named Supply Agreement with Renewable Energy, or short for SARE, that typically runs between 15 to 25 years. More on SARE in Chapter 3 and 4.

Under this arrangement, customers as the owner of the building, provide the space (rooftop/parking lot/unused space in the building compound) for the solar system installation.

The customers only pay for the solar energy generated at a rate that is typically lower than the electricity tariff offered by the utility. In short, customers only buy the solar electricity and not the whole set of solar equipment.

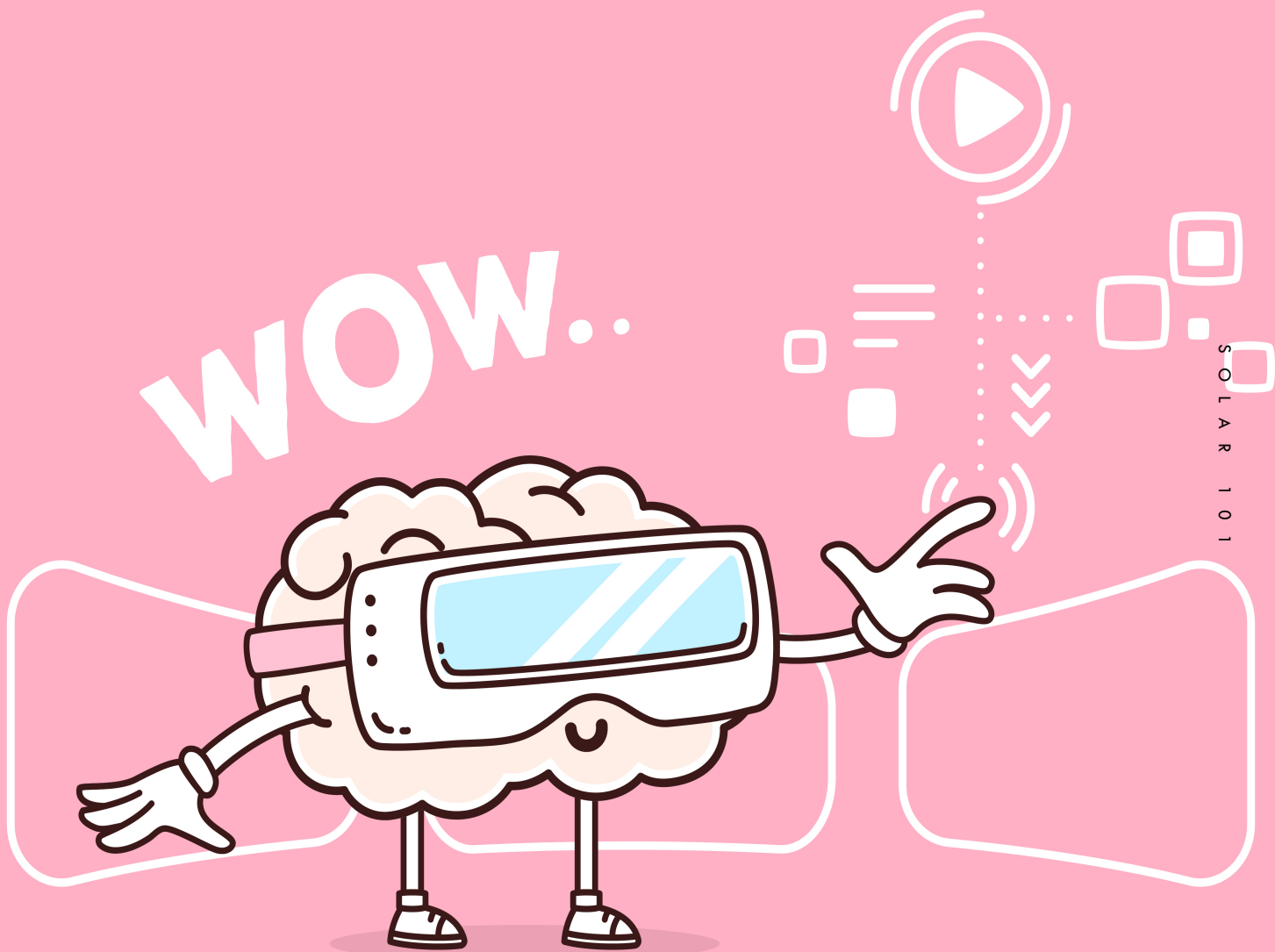
The third party solar provider, also known as Asset owner, or Registered Solar PV Investor (RPVI) in Malaysia, takes responsibility for ownership, operation, repair and maintenance of the solar system throughout contract period.





SEP at a glance

Solar Energy Purchase	
Definition	Means an agreement whereby a third party owns, develops, and finances the project's installation, recovering their costs via the sale of solar energy generated at contracted rates
Applicable for residential?	Not yet in Malaysia
Applicable for businesses?	Yes
Upfront payment	Zero
Payment schedule	Term: Monthly Amount: Fluctuate based on solar energy units generated
System ownership	Owned by solar provider (also known as Asset Owner)
System maintenance & repair cost	Borne by Asset Owner throughout contract period
System warranty	With Asset Owner
Contract term	15 to 25 years



02

**7 AWESOME BENEFITS ABOUT SOLAR ENERGY PURCHASE
YOU NEED TO KNOW**

02

7 AWESOME BENEFITS ABOUT SOLAR ENERGY PURCHASE YOU SHOULD KNOW

1. Zero capital expenditure

Yes, you heard it right. You need to pay MYR Zero to get solar to be installed in your premise. Why buy the whole solar pv system when you can only buy the solar electricity generated. Your capital expenditure budget can be utilized towards growing your core business. On a side note, let's be honest that it is not easy to get capex budget approval from your finance department. Save your headache, go for SEP so you do not have to apply for capex to go solar.

2. Off-balance sheet obligation

Since you are not spending a single dime on the solar pv system, it will not appear in your balance sheet as it is not your asset. Instead, the solar energy that you buy will appear as utility expenditure in your Profit & Loss Statement, just like your electricity or water bill.

3. Instant savings for your electricity cost

This is where it gets more interesting. Typically, the solar rate offered by Asset Owner is lower than your electricity tariff offered by your utility. This creates instant savings as you are buying energy cheaper from your solar system compared to buying energy from the grid. The savings will also come from not paying for the Kumpulan Wang Tenaga Boleh Baharu (KWTBB) and Imbalance Cost Pass Through (ICPT) charges for the solar energy consumed. Depending on the number of solar panels you install, savings can be thousand of Ringgits per year.

4. Protection against future rise of electricity cost

You can lock in your solar electricity rate at a fixed rate throughout contract period. While you do not have control over future rise of electricity tariff, and the tariff usually rises every 3 years, you do have the option to lock in your solar rate.





“If there is no production of solar energy due to many reasons such as faulty system, outage on the grid or severe weather condition, you simply do not have to pay”

5. Zero worry to maintain and repair the solar pv system

Recall that it is the responsibility of the Asset Owner to maintain and repair the solar pv system at their cost. You do not have to worry at all about the operation and maintenance of the solar pv system.

6. Zero production and performance risk

This is related to point 5. As you are only responsible to buy solar electricity that is being generated, if there is no production of solar energy due to faulty system, outage on the electrical network or severe weather, you simply do not have to pay. Asset Owners carry the responsibility to ensure that their solar investment is producing solar energy output and the highest performance.

7. Early buyout option

You have the option to buyout the solar pv system from Asset Owner at a price that is already stipulated in the contract. More on this in Chapter 4.



03

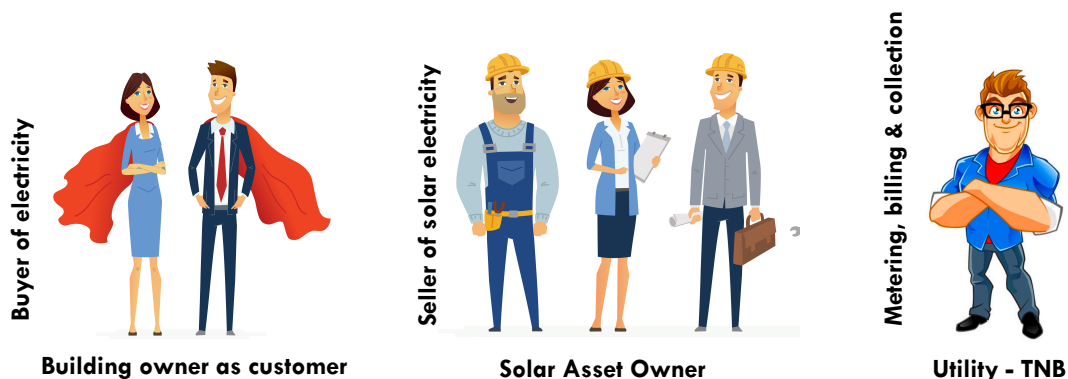
SUPPLY AGREEMENT WITH RENEWABLE ENERGY – A GAME CHANGER

Malaysia has set its goal to increase renewable energy to 20% by 2025. We can argue that the fastest way to achieve this is by rolling out utility scale solar farms. These solar farms, however, use fertile lands that otherwise could be used for growing food or provide green lungs to the nation. That is why we need to tap into thousands of acres of space on building rooftops that are sitting idle.

Solar farms in Malaysia, also known as Large Scale Solar (LSS), are awarded to the lowest offer in bidding exercise under the purview of the government. The winner will sign a 25 year power purchase agreement (PPA) with Tenaga Nasional Berhad (TNB) as the off taker. This makes it exciting for investor to invest in LSS projects as the contract yields attractive returns with low risk on payment. The question is, how do we make growing solar farms on rooftop as exciting as LSS? To make this happen, this is where Supply Agreement with Renewable Energy (SARE) comes in, approved by Energy Commission.

1. What is SARE?

SARE contract adopts the Solar PPA contract, only now it involves three parties. SARE **tripartite** contract is between **Customer** as the host, solar investor also known as Asset Owner and **TNB** as the utility that is responsible for metering, billing and collection to facilitate Solar Energy Purchase (SEP) business model. Click [here](#) to watch video on SARE.



2. How does SARE tripartite contract work?

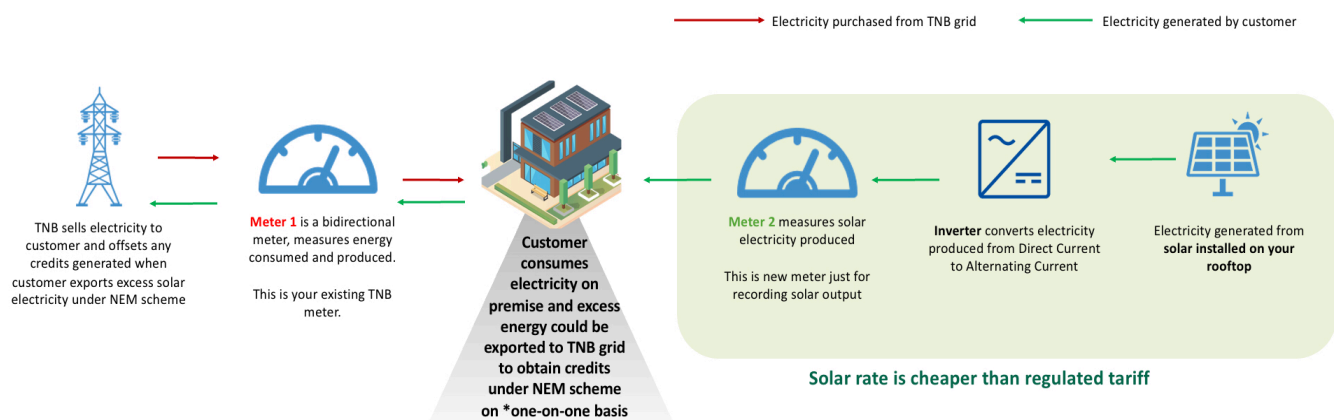
SARE contract makes Solar Energy Purchase model possible. It clearly defines the roles and responsibilities of every party throughout contract period as shown below.

Roles	Building owner as the Customer	Solar Asset Owner	TNB
Primary role	Buyer of solar energy generated	Seller of solar energy generated	Metering, billing & collecting agent
Pre-qualification to determine solar capacity and rooftop suitability	<ul style="list-style-type: none"> Provides access to the rooftop for solar installation Provide historical data of energy consumption 	Conduct rooftop suitability assessment and prepare solar proposal.	Credit check on electricity bill payment
Proposal	Review SARE contract terms and conditions and highlight to Asset Owner terms that require clarification	Submit proposal to customer that specifies: <ul style="list-style-type: none"> ✓ Solar energy rate Sen/kWh ✓ Contract tenure ✓ Minimum Monthly Charge (if any) ✓ Solar energy rate escalation (if any) ✓ Additional cost if rooftop structural repair or reinforcement is required 	Provide copy of SARE contract for review by all parties and provide clarification of the agreement
Contracting	Accept terms & condition	Accept terms & condition	Process contract
Installation	Provide access to the roof during construction	<ul style="list-style-type: none"> Fund the project Install solar Apply for necessary approvals from authorities 	Install Solar Energy Meter upon installation completion
Meter reading and billing			Conduct meter reading and issue bill on monthly basis
Payment	Customer pays to TNB total payable (normal bill + SEP bill)		TNB receives payment and remit payment to Asset Owner
Maintenance, repair & replacement	<ul style="list-style-type: none"> Provide access to the roof Report any anomaly to Asset Owner 	Responsible to ensure the system is in good condition throughout contract period	



3. Electricity flow and metering scheme for Solar Energy Purchase

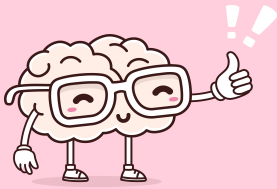
Let's take you through step by step of the electricity flow and how the electricity is being measured for billing. Recall that you now have 2 sources of electricity flowing into your electricity switch board – grid electricity and solar electricity. We always receive question which electricity flows in first to meet your electricity demand. Well, the simplified answer is solar electricity will get consumed first and if the energy is still not enough, the electricity from the grid will automatically flow in to your premise. OK, now let's go through the steps.



New TNB bill with SEP = (Net Energy recorded by M1) x Regulated Tariff + (Solar Energy Generated recorded by M2) x Solar Rate



1. Your solar photovoltaic system generates electricity in direct current (DC)
2. Inverter will transform DC to alternating current (AC) to be used by electrical appliances in the premise
3. The solar electricity will flow through Meter 2, also know as Solar Energy Meter, that will measure solar electricity being produced
4. The solar electricity flows to your main switch board that will then being distributed to your electrical load
5. If there is excess solar electricity not consumed, the electricity will be exported to TNB electrical grid and measured by Meter 1. If you opt for Net Energy Metering Scheme (NEM), it is a bi-directional meter that is able to measure electricity flowing in and out. If you do not opt for this scheme, make sure you size up your solar pv system without energy excess as you cannot export the excess energy to the grid
6. Electricity from TNB grid will be imported to your premise and measured by Meter 1 to meet your electrical loads when the electricity from solar is not enough to cover 100% of your demand, or during night time when there is no solar energy



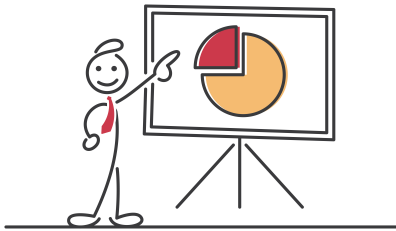
4. Benefits of unified electricity bill to customers and asset owners

Notice how in SARE, TNB's main role has evolved from the main seller of electricity to only metering, billing and collection agency. Utilizing TNB as a common platform to connect solar players and building owners will benefit both customers and solar asset owners in energy and financial transactions.

Benefits of unified electricity bill for both customers and asset owners:



- Customers will receive unified bill from TNB that is reliable and easy to track for audit trail purposes. Unified bill consists of:
 - i. Total energy bought from TNB
 - ii. Total energy sold to TNB (if customer opts for Net Energy Metering to sell excess solar energy)
 - iii. Total energy generated by solar photovoltaic system
- Customers will have the assurance that Solar Energy Meter used to meter solar energy generated is certified and within allowable accuracy limit as set by Energy Commission
- Solar Asset Owners do not have to invest in procuring and maintaining billing capability
- Asset Owner has the assurance that Solar Energy Meter installed is certified and met Energy Commission guideline
- Asset Owners can leverage TNB's customer interface and mature customer payment channels
- Asset Owner can minimize risk of late payment as TNB's billing system will auto generate payment reminder to customers in the event of late or non-payment



5. Let's have a closer look at how unified TNB bill looks like.

First page of monthly energy statement that summarizes amount payable and breakdown of electricity purchased from utility and solar energy



ENERGY STATEMENT

<http://www.mytnb.com.my>



No. Akaun :
Tarikh Penyata :
No. Invois :

Name of company
Address

Ringkasan Akaun Anda

Bayaran Akhir	RM	6,426.15	Terima Kasih.
Tunggakan	RM	0.00	
Caj Semasa	RM	6,988.71	
Penggenapan	RM	0.01-	
Jumlah Bil	RM	6,988.70	Bayar sebelum 08.04.2020

Ringkasan Caj Semasa Perihal Perkhidmatan

		Caj (RM)
 NEM Charges	Import 6,302.00 kWh Eksport 946.00 kWh Net Usage 5,356.00 kWh	RM3,585.51
 Solar Energy	8,508 kWh	RM3,403.20
	Service Tax (6%)	RM0.00
	Jumlah Caj Semasa	RM6,988.71

SAMPLE BILL



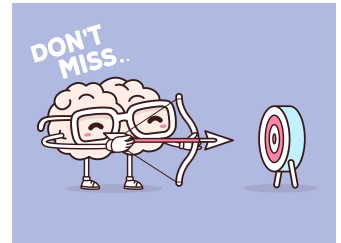
22075208110500010341549100000000698870



Bill Code: 5454
Ref-1: 220752081105

JomPAY online di Perbankan Internet dan Telefon Mudah
Alih dengan akaun semasa, simpanan atau kad kredit

Aras 13, Wisma TNB, No 19, Jalan Timur, 46200 Petaling Jaya, Selangor
Nombor Pendaftaran ST W10-1808-31022372



1. All energy transactions are under the same account number (easy to track & audit)
2. You will see the summary of payable and due date
3. At a glance, you will see the summary of energy imported and exported to TNB
4. Lastly, you will can see the summary of solar energy generated under Solar Energy Purchase contract



Second page is your normal electricity bill that itemizes the electricity that you import from TNB grid and excess solar electricity that you export to TNB under Net Energy Metering Scheme (NEM). Click [here](#) if you need a refresher on NEM.

BIL ELEKTRIK DAN INVOIS CUKAI

No. Kontrak :
 Deposit :
 No. Sijil NEM :
 Jenis Bacaan : **Bacaan Sebenar**

Tempoh Bil : 01.02.2020 - 29.02.2020 (29 Hari)
 Tarif : B:Perdagangan

Blok Tarif (kWh)	Blok Prorata (kWh)	Kadar (RM)	Amaun (RM)
200	200.00	0.4350	87.00
>200	6,102.00	0.5090	3,105.92
Jumlah Import (kWh)	6,302.00	Jumlah Import (RM)	3,192.92

Blok Tarif (kWh)	Blok Prorata (kWh)	Kadar (RM)	Amaun (RM)
200	0.00	0.4350	0.00
>200	946.00	0.5090	481.52
Jumlah Eksport (kWh)	946.00	Jumlah Eksport (RM)	481.52

Keterangan	Tidak Kena ST	Kena ST	Jumlah
Kegunaan (kWh Import)	kWh	6,302.00	0.00
Kegunaan RM	RM	3,192.92	0.00
ICPT (RM0.0200)	RM	126.04	0.00
Surcag Angkadar Kuasa (0.73)	RM	696.98	0.00
Kegunaan Bulan Semasa	RM	4,015.94	0.00
KWTBB (1.6%)	RM		51.09
Caj Semasa (Import)	RM		4,067.03
kWh Eksport: 946.00	RM	481.52	481.52
Caj Semasa (Eksport)	RM		481.52
Jumlah Caj Bersih	RM		3,585.51

Muatan Tertinggi Dicapat 415.00 kW

No. Meter	Faktor Meter	Bacaan Meter		Kegunaan	Unit
		Dahulu	Semasa		
M 219556492	1.00000	3,201.00	4,147.00	946.00	kWh (I)
M 219556492	1.00000	78,441.00	84,743.00	6,302.00	kWh (I)
M 219556492	1.00000	414.00	414.00	0.00	kWh
M 219556492	1.00000	39,813.00	40,759.00	946.00	kWh

TENAGA NASIONAL

TERIMA KASIH
 Kerana
 Membayar Dalam
 Tempoh 30 Hari
 TNB Careline
 1-300-88-5454

Bil: LPC NEM

Untuk maklumat bil dan bayaran terdahulu, sila layari -
<http://www.mytnb.com.my>
 atau hubungi Hotline TNB
 1 300 88 5454
 Untuk gangguan bekalan atau kerosakan lampu jalan TNB sila hubungi melalui telefon/SMS: 15454

Untuk pertanyaan, sila hubungi:
 TNB KUANTAN
 19, JLN GAMBUT
 25000 KUANTAN
 PAHANG
 Tel : 09-5155555
 Fax : 09-5155683

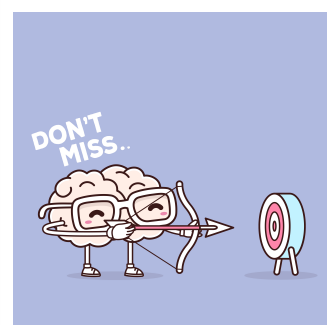
Surcag 1% dikenakan bagi pembayaran selepas 30 hari dan tarikh bil selaras dengan Peraturan-Peraturan Bekalan Pemegang Lesen 1990

Maklumat Tambahan:
 Angkadar Kuasa : 0.73
 Faktor Beban : 0.21

Bayaran melalui cek sah setelah penjelasan cek oleh bank

Baki NEM: 0 kWh
 Baki NEM: RM0.00

Tarikh lupus Baki NEM:
 31/12/2020



Your normal electricity bill will specify total energy imported from TNB and excess solar energy exported to TNB under NEM scheme. On the right column of the bill, you can also find your NEM credit that will be rolled over to the next month, as well as the date that your NEM credit will expire.



Third page is your Solar Energy Purchase bill that itemizes solar energy generated by the system installed on your rooftop.

BIL TENAGA BOLEH BAHARU

No. Kontrak :

BIL TENAGA BOLEH BAHARU SEMASA

Tempoh Bil : 01.02.2020 - 29.02.2020
 Bilangan Hari : 29 Hari
 Jenis Bacaan : Bacaan Sebenar

KETERANGAN JUMLAH TENAGA BOLEH BAHARU SEMASA

Keterangan	Penjanaan(kWh)	Kadar(RM)	Jumlah(RM)
Kadar Penjanaan Tenaga Boleh Baharu	8,508.00	0.4000	3,403.20
Pembayaran Minimum Tenaga Boleh Baharu			0.00
Ansuran (Modal Pendahuluan)			0.00
JUMLAH (RM) :			3,403.20

MAKLUMAT PEMBELIAN TENAGA SOLAR

Nama SP/Pelabur :	Tempoh Baki Kontrak
No. Tel. Pengguna :	Kod Tarif
Emel Pengguna :	Kadar Tarif
Kapasiti :	Tarikh Mulatugas
Penyambungan :	Baki Ansuran (RM) :
Teknologi :	Baki Ansuran (Bulan) :

BACAAN PEMBELIAN TENAGA SOLAR SEMASA

No. Meter	Faktor Meter	Bacaan Meter		Penjanaan	Unit
		Dahulu	Semasa		
M 217415380	1.00000	27,965.00	36,473.00	8,508.00	kWh
Jumlah Pembelian Tenaga Solar				8,508.00	kWh



TERIMA KASIH
 Kerana
 Membayar Dalam
 Tempoh 30 Hari

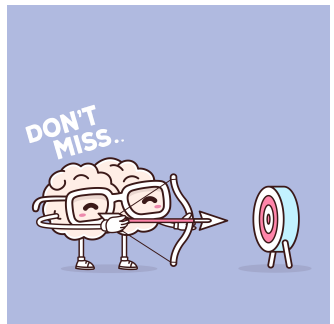
TNB Careline
 1-300-88-5454

BIL: OPC SEP

Untuk maklumat bil dan bayaran terdahulu, sila layari - <http://www.mytnb.com.my> atau hubungi Hotline TNB 1 300 88 5454

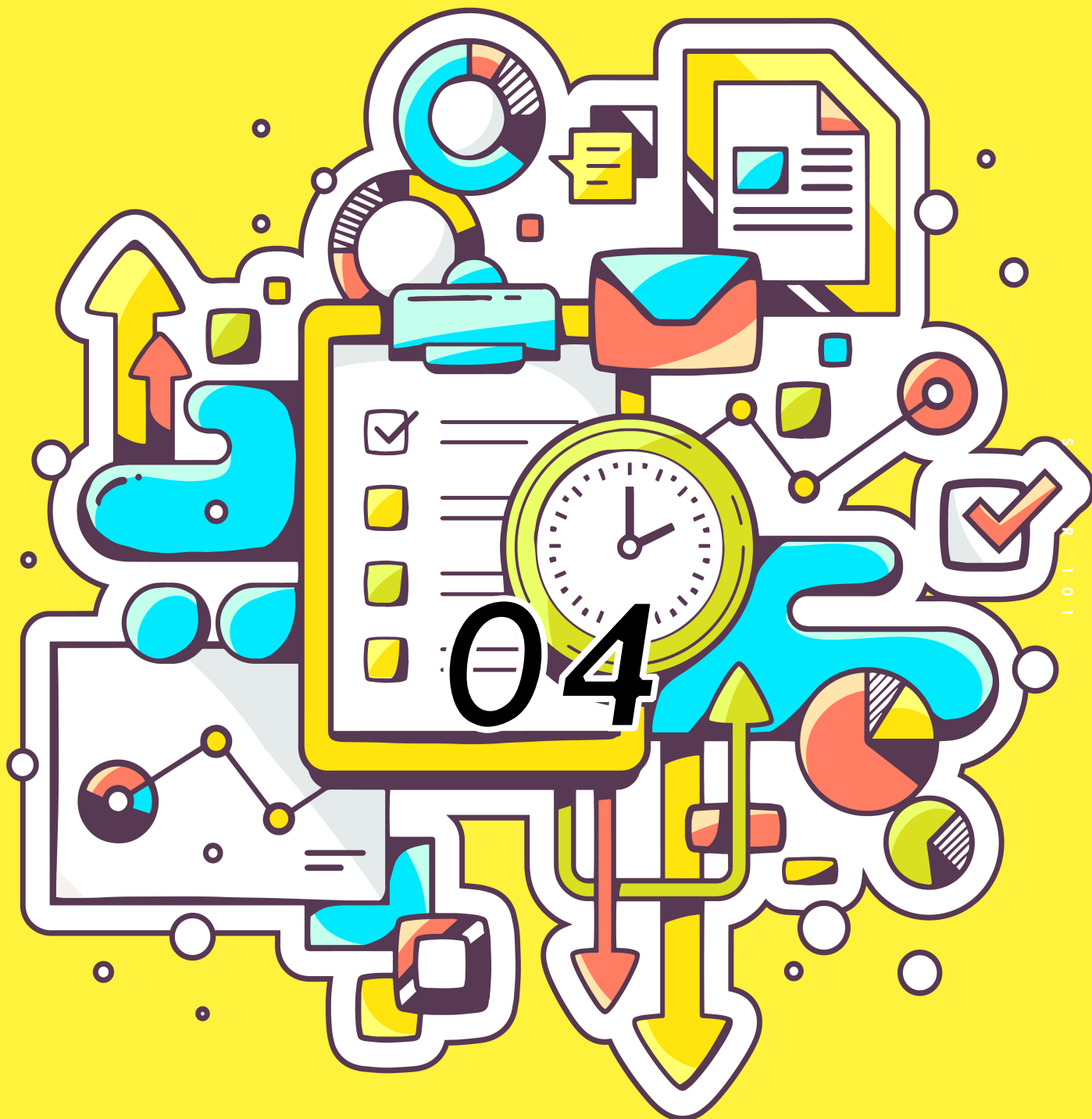
Untuk gangguan bekalan atau kerosakan lampu jalan TNB sila hubungi melalui telefon/SMS: 15454

Sebarang pertanyaan, sila hubungi:
TNB Kuantan
 19, JLN GAMBUT
 25000 Kuantan
 PAHANG
 Tel : 09-5155555
 Fax : 09-5155683



Information on your SEP contract and the solar energy generated for the month

SAMPLE BILL



WHAT YOU SHOULD KNOW IN SARE CONTRACT

04

WHAT YOU SHOULD KNOW IN SARE CONTRACT

1. Applicability of Electricity Supply Contract

When you opened an account with TNB, you signed a contract called Electricity Supply Contract (ESC). The terms and conditions in the ESC shall be applicable concurrently with SARE contract.

2. Contract term

SARE contract will take effect from Execution Date and continue to take effect for a term that is agreed between customer and asset owner. Typical term is between 15-25 years after which the solar pv system belongs to customer.

3. Billing and payment

TNB will issue a billing invoice to customer monthly and the customer has 30 days of the date of the invoice to make payment. In addition, just like your normal electricity bill, should you make late payment, 1% late payment fee will be charged on the outstanding amount. In the event of non-payment, TNB will issue disconnection notice and may disconnect your electricity.

4. Metering

The Solar Energy Meter must be paid by Asset Owner and transfer to TNB. TNB shall thereafter inspect, maintain, calibrate and/or test the Solar Energy Meter. The customer shall not tamper or modify the Solar Energy Meter.

5. Supply disconnection

To protect both customer and Asset Owner, TNB has the right to disconnect supply of solar photovoltaic energy and electricity supply from the grid under emergency condition or for the purpose of maintenance, repair, inspection and/or testing. Disconnection shall also occur if the customer fails to make payment, termination of contract and/or breach of any provisions in the Electricity Supply Act.



6. Solar Energy Rate

Solar Energy Rate (Sen/kWh) is the rate at which the customer has agreed to pay to Asset Owner for every unit of energy the solar pv system generates. Also look out for if there is any Minimum Monthly Charge. Typically, it is set to RM 0.

7. Environmental attributes

The value of any credits or financial benefits for reduction of green house gas emissions, also known as Renewable Energy Certificates (REC), belongs to the agreed party – either customer or Asset Owner, depending on the arrangement between the two. Find out more about REC [here](#).

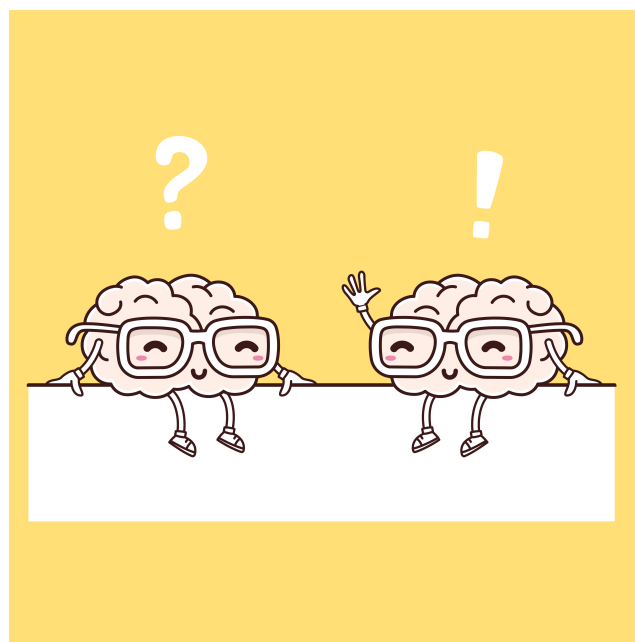
8. Solar pv system buyout

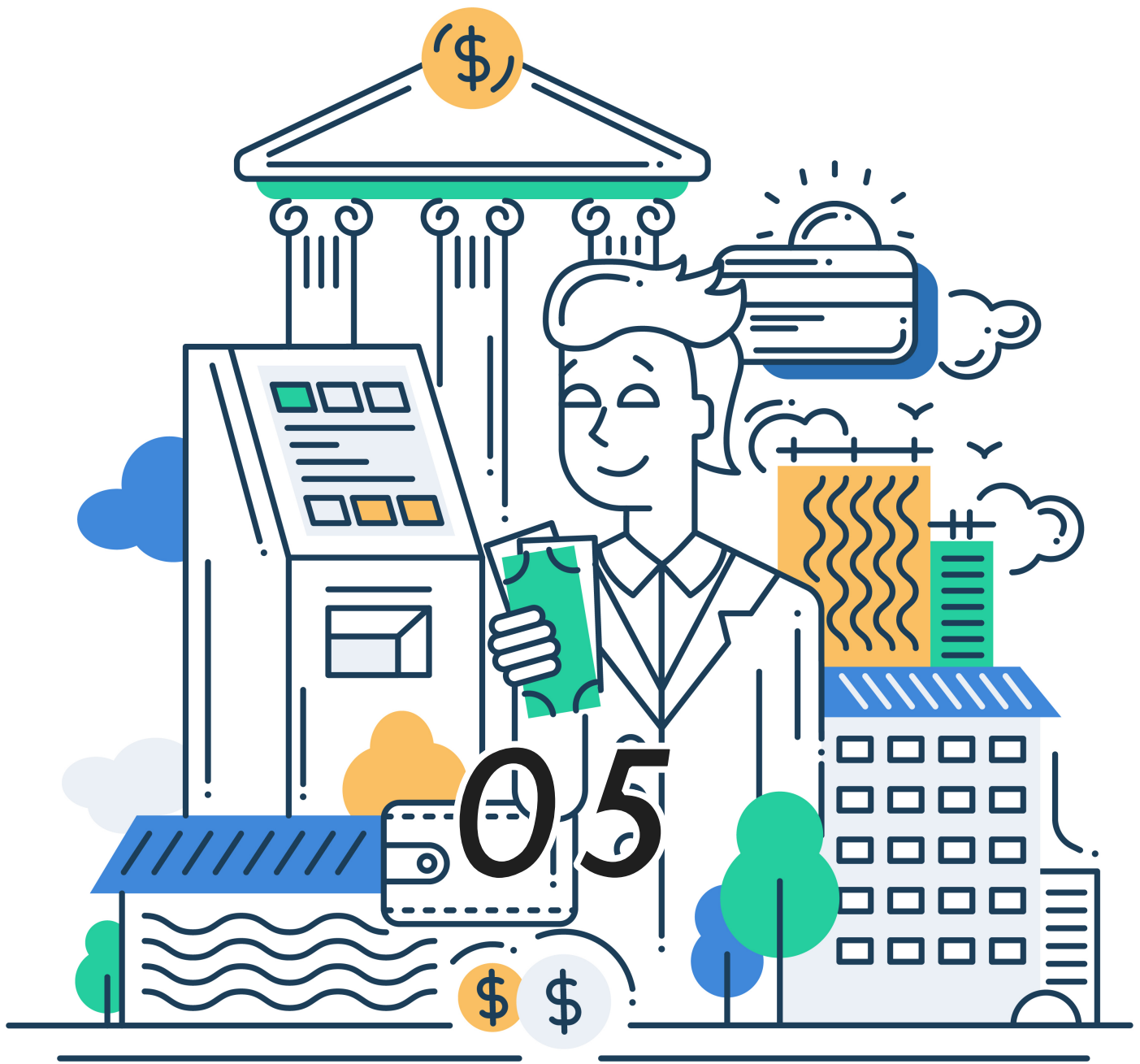
Customer has a choice to buyout the solar pv system anytime during the term of the contract. Your Asset Owner will include a buyout table in the SARE contract that varies according to which year of the contract term you wish to purchase the system.

9. Representation and warranties

Under this clause, it specifies that the customer shall have full control and possession of the premise and maintain sufficient insurance. In the event that the customer wishes to sell the premise, the customer can novate the contract to the new buyer.

This is just the summary of salient terms in SARE contract to help you understand. For full terms of the contract, you can request a copy of the contract from your potential Asset Owner.





ESTIMATE YOUR SAVINGS WHEN YOU CHOOSE SEP

05

ESTIMATE YOUR SAVINGS WHEN YOU CHOOSE SEP

We have made it easy for you. We have prepared a financial model to assist you to estimate your savings when you choose Solar Energy Purchase (also known as Solar PPA). Click [here](https://www.tnbx.com.my/sare) or type www.tnbx.com.my/sare to calculate your savings now.

Solar PPA Savings Calculator for You

1) Let's start by entering these information from your bill & rooftop area:

Step 1: Enter your maximum demand (kW)	=	1,000
Step 2: Enter your estimated rooftop area (sq m)	=	10,000
Step 3: Enter your TNB tariff	=	C1
Step 4: Enter your desired solar price (RM/kWh)	=	0.31

2) Here is the summary of your potential solar installation size:

Your potential solar size (kWp) is	=	750
Your monthly bill (RM) WITHOUT solar is	=	29,142.97
ICPT (RM0.02/kWh)	=	1,596.88
1.6% KWTBB	=	466.29
Your first monthly bill (RM) WITH solar is	=	24,751.56
Your savings (RM) for the month is	21%	6,454.57
Your total savings (RM) for 25 years is	=	4,018,004.91



1. Find out what your maximum demand is from your electricity bill
2. Estimate your rooftop area
3. Refer to TNB bill to find out what your tariff category is. Click [here](https://www.tnbx.com.my/sare) to find out about TNB tariff rate
4. The calculator will then calculate potential solar size and the electricity savings you will receive

Hope you enjoy this ebook and find it helpful. Do reach out to us for any questions.

ALL THE BEST!





USEFUL LINKS

Topic	Link
Solar electricity generation concept	https://youtu.be/OelhlcPVtKE
Tax incentives for green industry	https://www.mida.gov.my/home/tax-incentives-for-green-industry/posts
Estimate solar pv cost and savings	https://www.tnb.com.my/solar/index.html
Solar Energy Purchase savings calculator	https://www.tnbx.com.my/sare
Video on Solar Energy Purchase	https://youtu.be/B_tVN2vx6ml
Video on Net Energy Metering	https://youtu.be/3p5V-btjBtA
NEM guidelines	http://www.seda.gov.my/reportal/nem/guidelines/
Registered Solar PV Investor (RPVI) directory	https://www.seda.gov.my/directory/2020-registered-solar-pv-investor-rpvi-directory/
Renewable Energy Certificates	https://www.tnbx.com.my/rec
TNB Tariff for Commercial and Industrial customers	https://www.tnb.com.my/commercial-industrial/pricing-tariffs1
Kumpulan Wang Tenaga Boleh Baharu (KWTBB) charge on your electricity bill	https://www.tnb.com.my/kumpulan-wang-tenaga-boleh-baharu-kwtbb/
Imbalance Cost Pass Through (ICPT) charge on your electricity bill	https://www.tnb.com.my/faq/tariff/

EMAIL: TNBX@tnbx.com.my

WWW.TNBX.COM.MY

