

Understanding your TNB Bill

Updated 08 March 2013

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Purpose

- * Suitable for Commercial Tariff (Tariff C) and Industrial Tariff (Tariff E)
- * An illustration of how electricity is billed by TNB
 - * Peak and off-peak use
 - * Energy
 - * Demand, Maximum Demand

Big Mac



- * Each Big Mac has 538kcal (calories) as **ENERGY**
- * Lets assume this is equivalent to 1kWh of **ENERGY**
- * In reality, 538kcal is equivalent to 0.625kWh

kWh



NO. JANGKA	MF	DAHULU	SEMASA	KTRG
98120396-M	1.0000	2439368.00	2454834.00	KWh

CAJ	UNIT	KADAR	AMAUN
KEGUNAAN ELEKTRIK	5466.00	0.430	RM 6650.38

Pay for the amount of energy used

Reading on Meter:
 $2454834 - 2439368 = 15466$



Pay for the your BIG MAC

Think: RM 7.95 for 538kcal of energy

Peak and Off Peak



PEAK



OFF-PEAK



Peak and Off Peak



Peak hours:
0800hrs till 2200hrs

Off-Peak hours:
0000 hrs till 0800 hrs
2200 hrs till 0000 hrs

POWER

	DESCRIPTION	CALCULATION	UNITS
	Rate of Energy Consumption	$= \frac{\text{Energy}}{\text{Time}}$	kW Kilo-watt
	Rate of Big Mac Consumption or How FAST can you eat the Big Macs.	$= \frac{\text{Number of Big Mac eaten}}{\text{Time taken to Eat}}$	Big Macs per Hour



Power



If you eat ONE
Big Mac in 15
minutes



$$= \frac{1}{0.25 \text{ hours}}$$



= 4 Big
Macs per
hour

Power: More examples



If you eat 10
Big Macs in 60
minutes

$$= \frac{10}{1 \text{ hour}}$$

= 10 Big
Macs per
hour

If you eat 5
Big Macs in 30
minutes

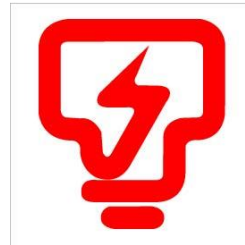
$$= \frac{1}{0.5 \text{ hours}}$$

= 10 Big
Macs per
hour

Demand



- * Number of Big Macs you eat calculated based on a **fixed 30-minute intervals**
- * **Unit: Big Mac per hour**



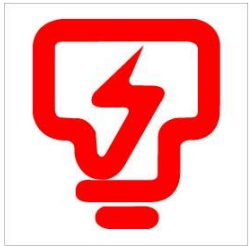
Demand is ONLY calculated during Peak Hours

- Power
- Amount of Energy consumed in **fixed 30-minute intervals**
- **Units: kW** (which is kWh per hour)

Demand



Time (fixed 30 mins period)	Number of Big Macs consumed	Demand, Big Macs per hour
0800 till 0830 hrs	20	40
...
2130 till 2200 hrs	15	30



Time (fixed 30 mins period)	Number of kWh (energy) consumed	Demand, kW (kWh per hour)
0800 till 0830 hrs	20	40
...
2130 till 2200 hrs	15	30

TNB Maximum Demand

Day	Time	Demand
01 Jan 2013	0800 – 0830 hrs	50kW
	0830 – 0900 hrs	60kW

	2130 – 2200hrs	45 kW
...		
31 Jan 2013	0800 – 0830 hrs	51kW
	0830 – 0900 hrs	80kW

	2130 – 2200hrs	30 kW

The highest demand recorded by TNB for the month.

Why Maximum Demand



Imagine:

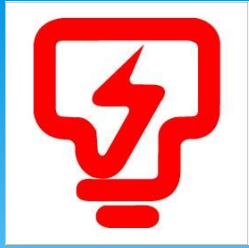
Once a month, you order 1000 Big Macs per hour.
At other times, you order 500 Big Macs per hour.

Result:

Typically, there will be
over & wasted capacity.
(Staff, kitchen size,
stock)



Why Maximum Demand



Imagine:

Once a month, you use 6,400kW

At other times, you use 5,300kW

Result:

Typically, there will be over & wasted capacity.

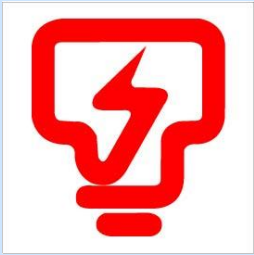
(Cables, transformers, generators)



Time of Use



DESCRIPTION



Charge more when you use energy during peak hours



Charge more if you order Big Mac during Peak hours.
Charge less when you order Big Mac when restaurant is quiet.

Tariff C

Tariff	DESCRIPTION	CALCULATION
C1	Same charge for peak and off-peak energy usage Cheaper MD Charge	Energy for Peak-hours : RM 0.312 per kWh Energy for Off-Peak : RM 0.312 per kWh Maximum Demand : RM 25.90 per kW
C2	Cheaper off-peak energy charge VERY expensive MD Charge	Energy for Peak-hours : RM 0.312 per kWh Energy for Off-Peak : RM 0.192 per kWh Maximum Demand : RM 38.60 per kW

Tariff C

Tariff	DESCRIPTION
C1	<p>Good for those: Use a lot of energy during peak Use very little during off-peak</p> <p>Can apply for special discount: OPTR - 20% discount for off-peak use</p>
C2	<p>Good for those: Using constant or almost constant amount of energy during peak and off-peak period</p> <p>No discount.</p> <p>Way to save is to use more energy during off-peak.</p>

TNB C1 Bill



B A C A A N

<u>NO. JANGKA</u>	<u>FJ</u>	<u>BACAAN DAHULU</u>	<u>BACAAN SEMASA</u>	<u>PENGGUNAAN</u>	<u>KTRG</u>	
M AC06001057	1.0000	0.00	5,630.00	5,630.00	KW	P
M AC06001057	1.0000	0.00	1,024,964.00	1,024,964.00	kwh	P
M AC06001057	1.0000	0.00	425,186.00	425,186.00	kwh	O
M AC06001057	1.0000	0.00	2,137,369.00	2,137,369.00	kwh	P

C A J



<u>PRKR</u>	<u>UNIT</u>	<u>HARGA</u>	<u>AMAIIN</u>
Cons Peak C1 OPTR	2,137,369.00	0.288	615,562.27
Cons OPk C1 OPTR	425,186.00	0.230	97,962.86
Consump MD C1 OPTR	5,630.00	23.930	134,725.90

Energy (kWh) split to Peak and Off-Peak.

Since this customer has OPTR, they get a discount for Energy used in Off-Peak hours

Power Factor

- * Also called “PF” for short.
- * Does not have unit, as it is a ‘ratio’.
- * This is a penalty. (If pf drops below 0.85)
- * Big Mac Example: You order food, but return some of it.



	DESCRIPTION
	<ul style="list-style-type: none">• You order (for example) 100 burgers, but you return 20 burgers.
	<ul style="list-style-type: none">• You take energy, but don't use it. Instead, you return it to TNB.• This is called “Reactive Energy”.• Units in kVARh

Energy: Active and Reactive

	Energy	Reactive Energy
Description	<p>You take the energy, you use it.</p> <p>Also known as “real energy” or “active energy”.</p>	<p>You take the energy, but you return it.</p> <p>You take and return 50 times per second.</p>
Units	kWh	kVAh
Equipment	Oven, heaters	Motors, fluorescent lamps (part of it used, part of it returned)

Power Factor

$$\text{Power Factor} = \frac{\text{Real Energy}}{\sqrt{(\text{Real Energy})^2 + (\text{Reactive Energy})^2}}$$
$$= \frac{kWh}{\sqrt{(kWh)^2 + (kVArh)^2}}$$

	DESCRIPTION
	<ul style="list-style-type: none">• You can only “return 52%” of your Big Mac before you get a penalty.• 52% is based on weight
	<ul style="list-style-type: none">• Penalty only if PF is below 0.85• Use Capacitor Banks to keep PF high.

Real Power, Reactive Power, Apparent Power

	Unit	Analogy
Real Power	kW	The number of Big Macs you eat, per hour.
Reactive Power	kVAr	The number of Big Macs you return, per hour
Apparent Power	kVA	The number of Big Macs you order from the counter, per hour. This includes Big Macs that you will eat and return.

Thank you



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