Suruhanjaya Tenaga
Energy Commission

Electricity Tariff Review in Peninsular Malaysia for Regulatory Period 2 (RP2: 2018-2020) under Incentive-Based Regulation (IBR) Mechanism

30th March 2018

Electricity Tariff Review under the IBR Mechanism for the 2nd Regulatory Period (RP2: 2018-2020)

Summary of key Government decisions on 13 Dec 2017:

i. IBR implementation for regulatory period 2 (RP2) in the Peninsular effective on 1st January 2018 to 31st December 2020.

ii. Maintain current tariff structure and schedule.

iii. Consumers continue to receive reliable electricity supply along with more advanced infrastructure development initiatives and support programmes by TNB

Tariff structure and schedule remain unchanged as RP1

ELECTRICITY TARIFF SCHEDULE

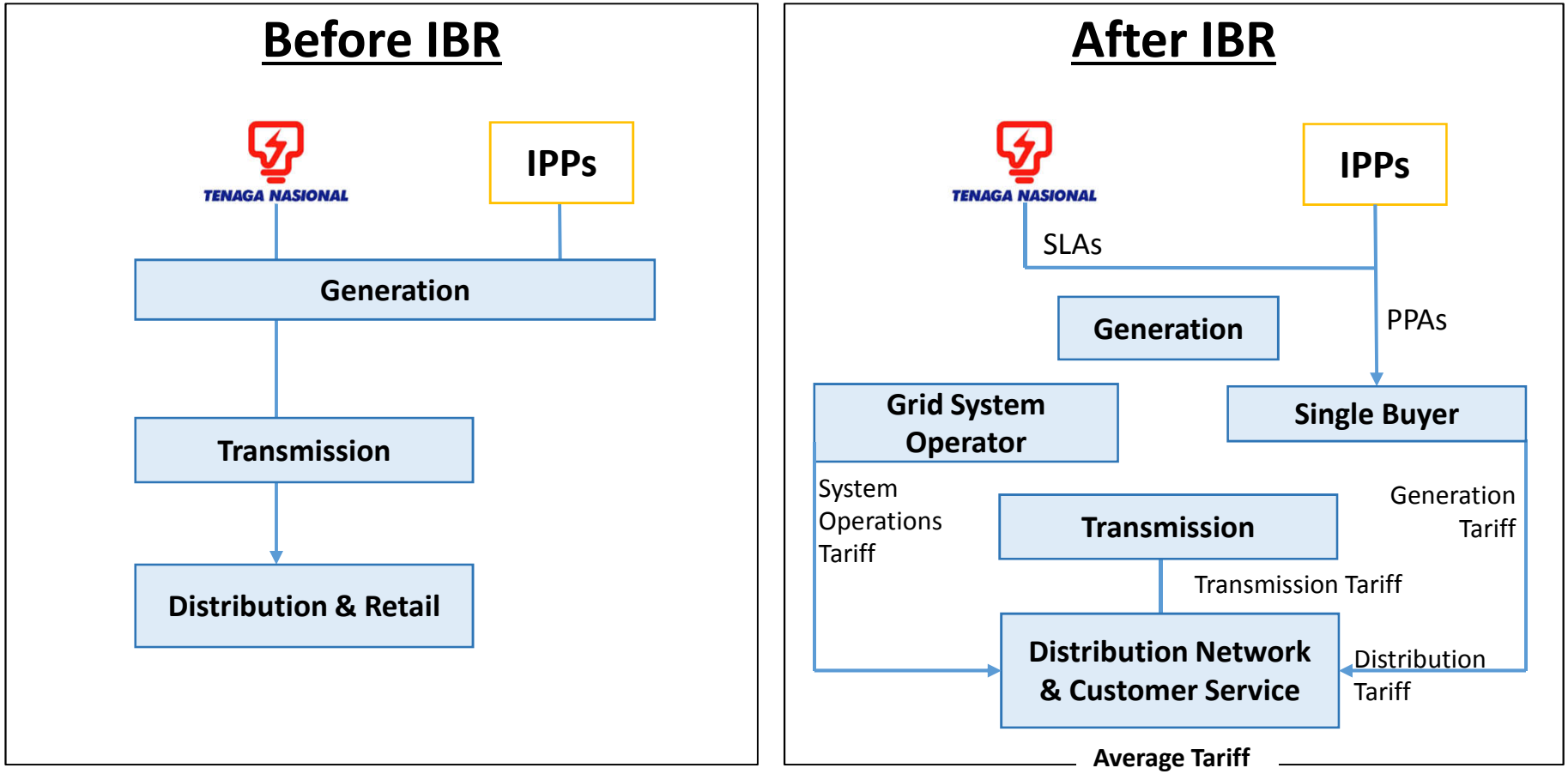
(This tariff is effective from 1st January 2014 and supersedes the previous tariff schedule which was effective from 1st June 2011)

Schedule 1
TNB tariff rates are set out as follows:-

Tariff Category	Unit	New Rates (1 January 2014)
1. Tariff A – Domestic Tariff		
For the first 200 kWh (1 - 200 kWh) per month	sen/kWh	21.80
For the next 100 kWh (201 – 300 kWh) per month	sen/kWh	33.40
For the next 300 kWh (301 – 600 kWh) per month	sen/kWh	51.60
For the next 300 kWh (601 – 900 kWh) per month	sen/kWh	54.60
For the next kWh (901 kWh onwards) per month	sen/kWh	57.10
The Minimum Monthly Charge is	*RM*	*3.00*
2. Tariff B - Low Voltage Commercial Tariff		
For the first 200 kWh (1 -200 kWh) per month	sen/kWh	43.50
For the next kWh (201 kWh onwards) per month	sen/kWh	50.90
The Minimum Monthly Charge is	*RM*	*7.20*
3. Tariff C1 - Medium Voltage General Commercial Tariff For each kilowatt of maximum demand per month	RM/kW	30.30
For all kWh	sen/kWh	36.50
The Minimum Monthly Charge is	*RM*	*600.00*
4. Tariff C2 - Medium Voltage Peak/Off-Peak Commercial Tariff For each kilowatt of maximum demand per month during the peak period	RM/kW	45.10
For all kWh during the peak period	sen/kWh	36.50
For all kWh during the off-peak period	sen/kWh	22.40
The Minimum Monthly Charge is	*RM*	*600.00*

Overview on the Incentive-based Regulation Mechanism

IBR is a mechanism for electricity tariff setting with incentives to improve efficiency of TNB and give greater transparency for customers



From non-transparency cost mechanism

To IBR that achieves transparency

Electricity tariff is made up of two components under IBR Framework - Base Tariff and Imbalance Cost Pass-Through (ICPT)

Imbalance Cost Pass-Through (ICPT) :

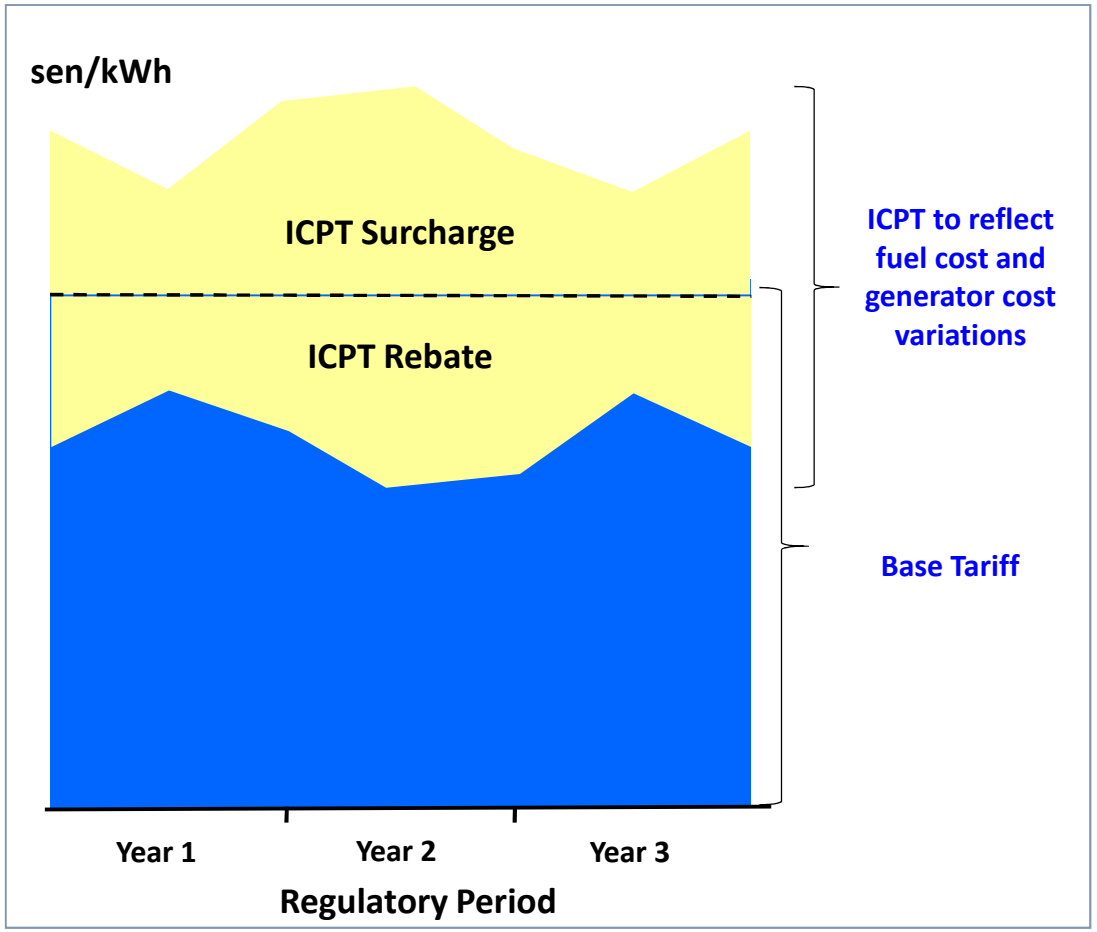
6-monthly tariff adjustment to reflect variations in fuel costs, costs associated with PPAs & SLAs and RE displaced costs

Base Tariff reflects:

a) CAPEX and OPEX of Transmission, Distribution, System Operation (SO) and Single Buyer (SB) Operation

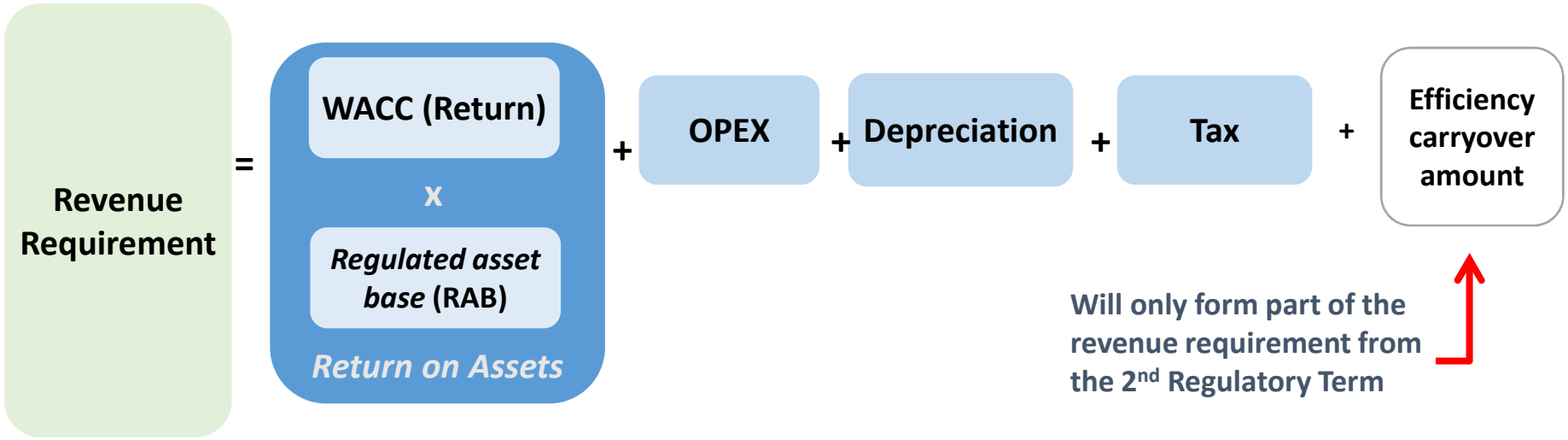
b) Return on regulated asset base of Transmission, Distribution, SO and SB

c) Power purchase cost charged by Generators (including base price for fuel) to the Single Buyer (SB)



Note 1 : CAPEX = Capital expenditure
2 : OPEX = Operational expenditure

Revenue Requirement Building Block Model Under the IBR Framework



Efficiency

- testing for efficiencies through benchmarking and trend analysis
- review of historical cost performance
- efficiency and prudency of asset management policies
- consistency with capex and sales forecast

IBR Mechanism has been Successfully Implemented in the 1st Regulatory Period (2015-2017)

Trial-run period 2014

Regulatory Period 1 (RP1: 2015 – 2017)

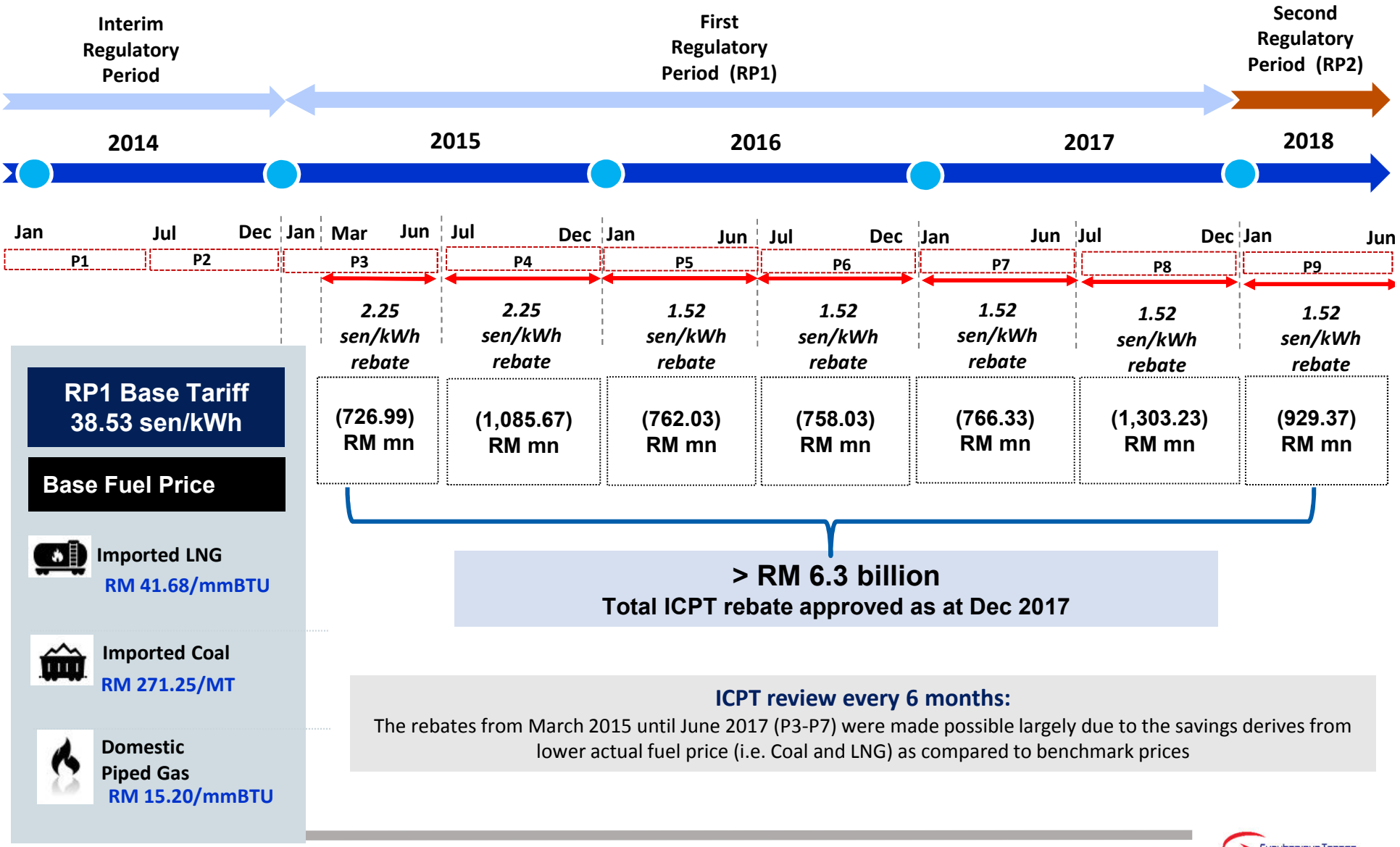
Key Features:

- Projected CAPEX and OPEX for setting of average base tariff at **38.53 sen/kWh**
- Structured tariff regulatory process for overall efficiency enhancement
- Regulated return to TNB : WACC at 7.5%
- Imbalance Cost Pass-Through Mechanism (ICPT) for uncontrollable costs
- Performance targets with incentive/penalty mechanism by regulator

Enhancement Prior to Regulatory Period 2 (RP2: 2018-2020):

1. Benchmarking of transmission and distribution costs
2. Regulatory Account Audit from 2014-2017
3. Review of TNB's tariff proposal submission
4. Setting of new KPIs targets
5. Enhanced Regulatory Implementation Guidelines

RP1: Total RM 6.3 bil of rebates and subsidies were passed-through to end-customers

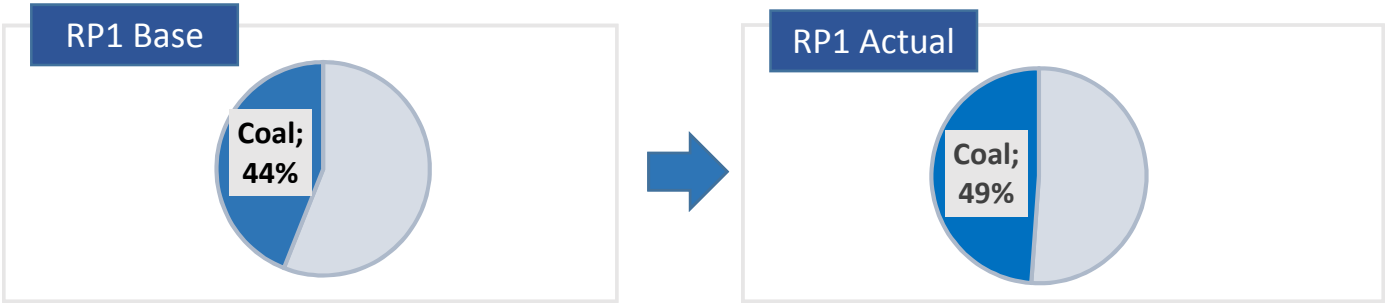


ICPT review every 6 months:

The rebates from March 2015 until June 2017 (P3-P7) were made possible largely due to the savings derives from lower actual fuel price (i.e. Coal and LNG) as compared to benchmark prices

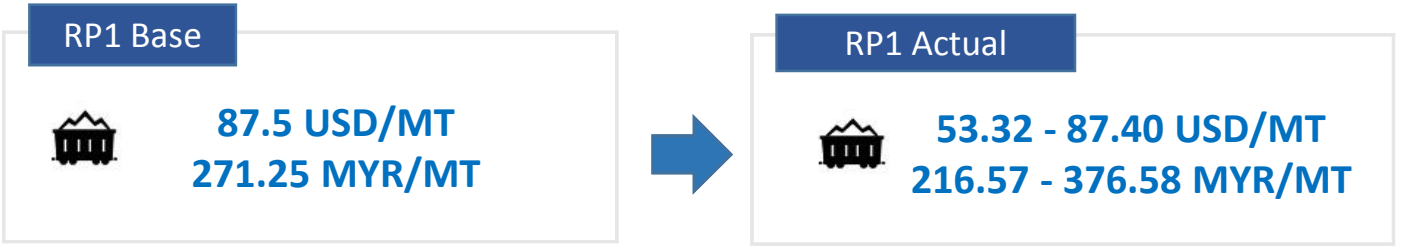
Main factors allowing for rebates and subsidies of RM 6.3 bil

1 **Generation mix** : Higher actual generation from coal in RP1, compared to gas



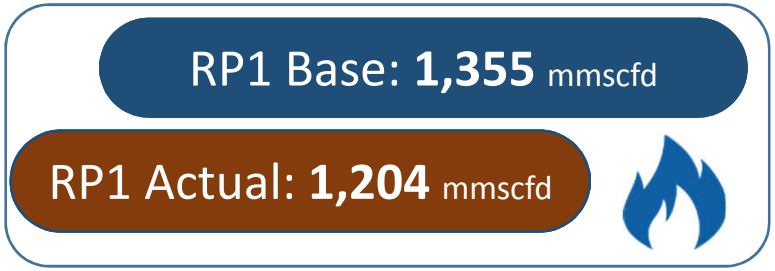
Made possible by improved coal plants performance

2 **Cheaper coal price :**



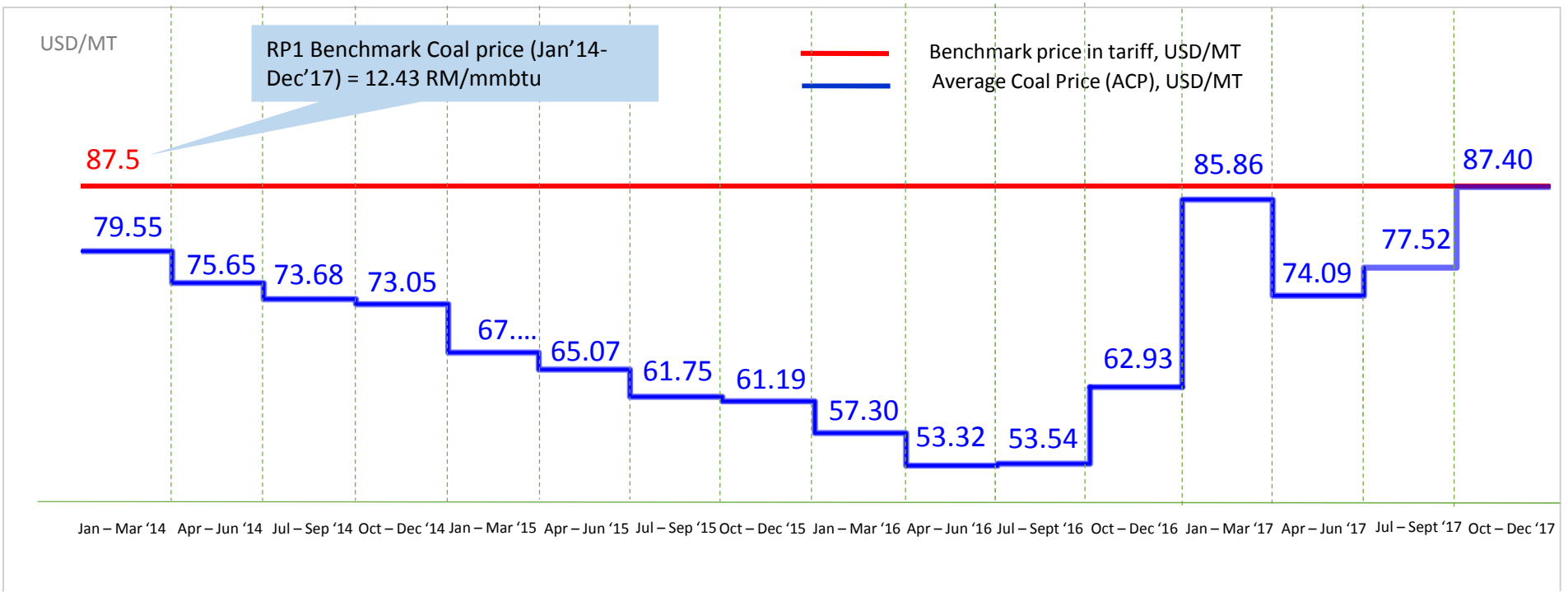
3 **Reduction in gas volume :**

Reduction in actual gas volume in RP1 means less utilization of higher priced LNG



Regulatory Period 1 (RP1: 2014-2017)
Fuel Prices Trend under IBR Framework

Power Sector Coal Prices (USD/MT)

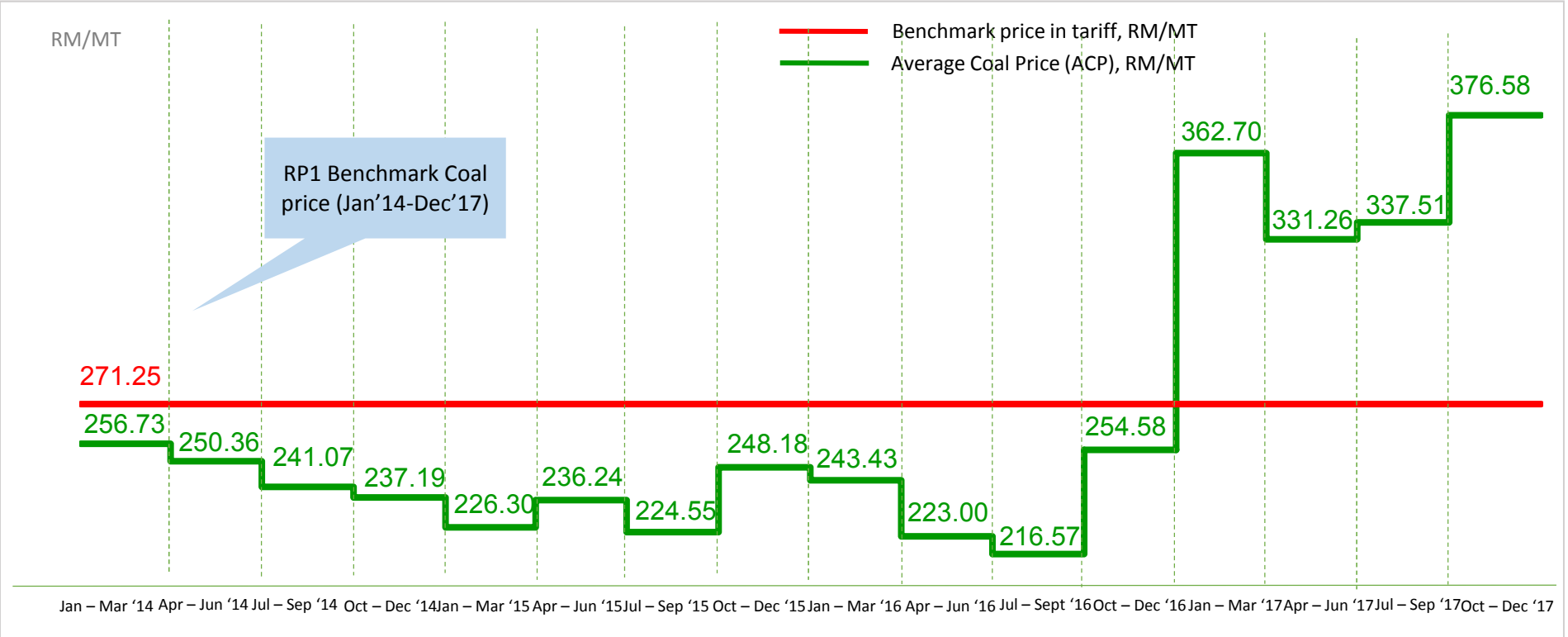


Base Forex	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Actual Forex	3.2273	3.3096	3.2717	3.2468	3.3702	3.6304	3.6362	4.0560	4.2487	4.1822	4.0447	4.0453	4.2242	4.4710	4.3541	4.3089
RM/ mmBTU	11.76	11.47	11.04	10.87	10.37	10.82	10.29	11.37	11.16	10.22	9.93	11.67	16.62	15.18	15.46	17.26
RM/GJ	11.15	10.87	10.47	10.30	9.83	10.26	9.75	10.78	10.57	9.68	9.40	11.05	15.76	14.39	14.66	16.35

Note:
1 - Forex or Exchange rate is: 1 USD to RM
2 - Benchmark coal price is 12.43 RM/mmBTU (11.78 RM/GJ)

Source: Fuel Management, Single Buyer, TNB

Power Sector Coal Prices (RM/MT)



Base Forex	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Actual Forex	3.2273	3.3096	3.2717	3.2468	3.3702	3.6304	3.6362	4.0560	4.2487	4.1822	4.0447	4.0453	4.2242	4.4710	4.3541	4.3089
RM/ mmBTU	11.76	11.47	11.04	10.87	10.37	10.82	10.29	11.37	11.16	10.22	9.93	11.67	16.62	15.18	15.46	17.26
RM/GJ	11.15	10.87	10.47	10.30	9.83	10.26	9.75	10.78	10.57	9.68	9.40	11.05	15.76	14.39	14.66	16.35

Note:
1 - Forex or Exchange rate is: 1 USD to RM
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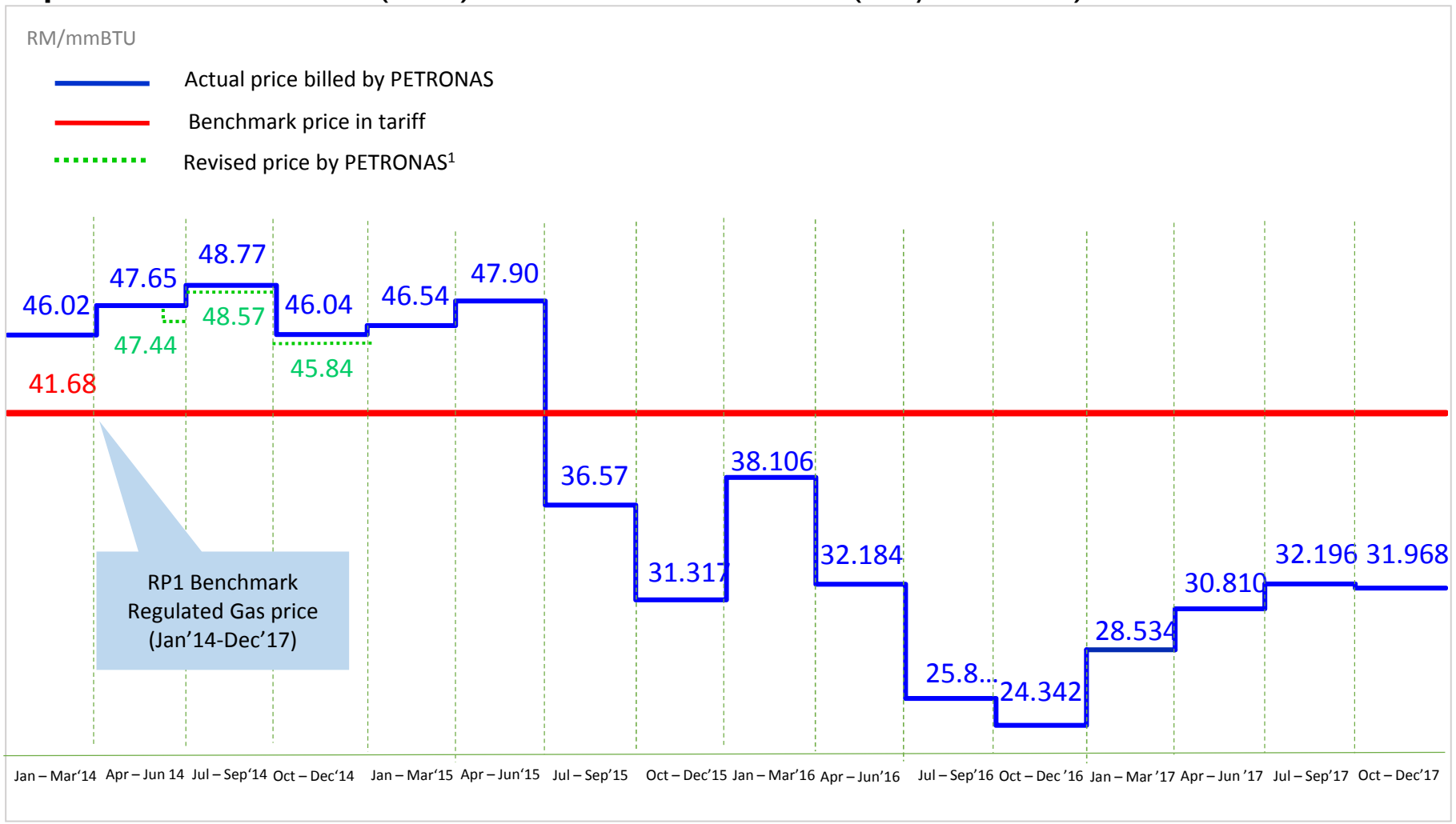
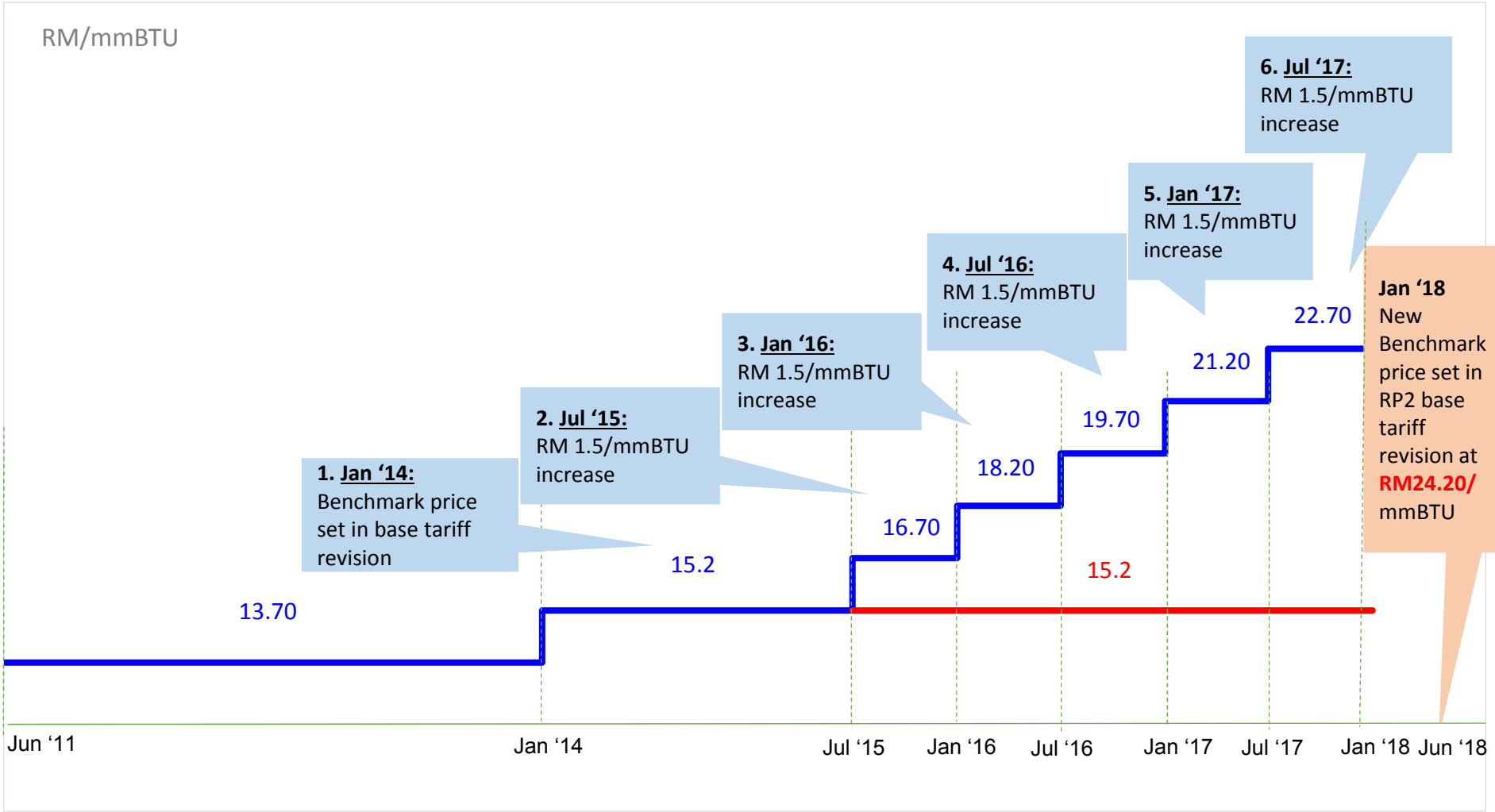
Liquefied Natural Gas (LNG) Price to Power Sector (RM/mmBTU)



Source: PETRONAS

Regulated Piped Gas Price to Power Sector (RM/mmBTU)



Note:
1 - Prior to May '97, the Gas Price Formula for Power Sector = 1.04 x MFO Price
2 - From Jan 2014, the regulated gas price is only applicable for gas consumption ≤ 1,000 mmscfd. Consumption beyond this will be priced at LNG

RP1 (2015-2017) Performance under IBR Framework

RP1 ELECTRICITY TARIFF COST OF COMPONENTS UNDER IBR FRAMEWORK

Regulatory Period 1 (2015-2017)

Component	sen/kWh
Single Buyer (Generation) 69.5%	26.76
Transmission 9.5%	3.66
Distribution Network & Customer Services 20.4%	7.87
Single Buyer (Operation) 0.5%	0.19
Grid System Operations 0.1%	0.05

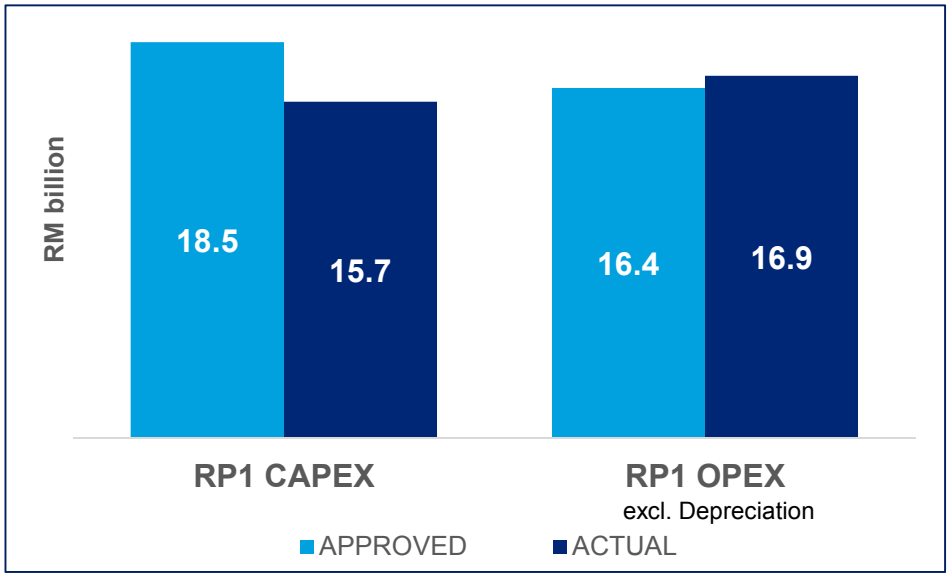
38.53 sen/kWh

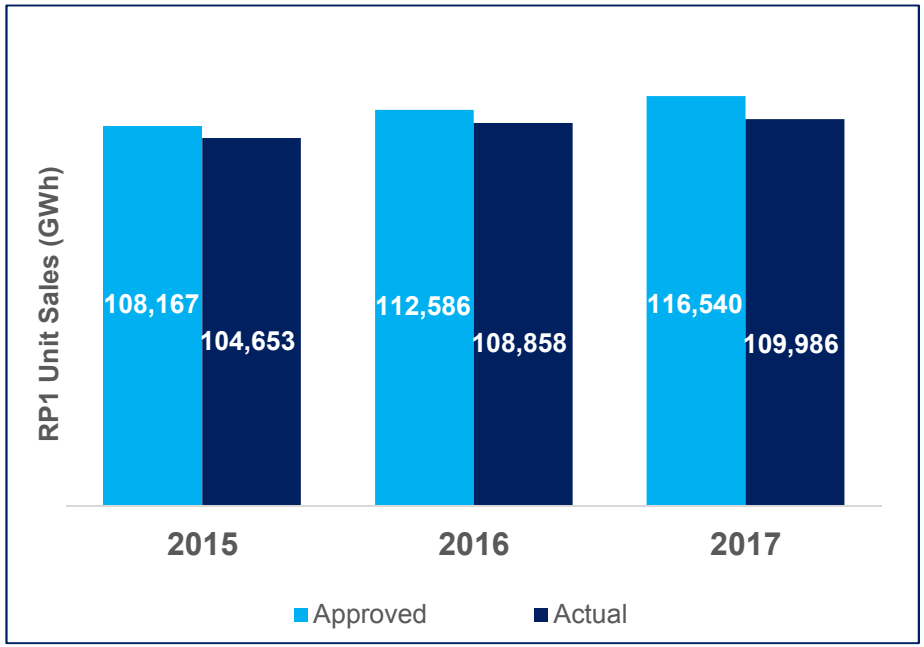
+

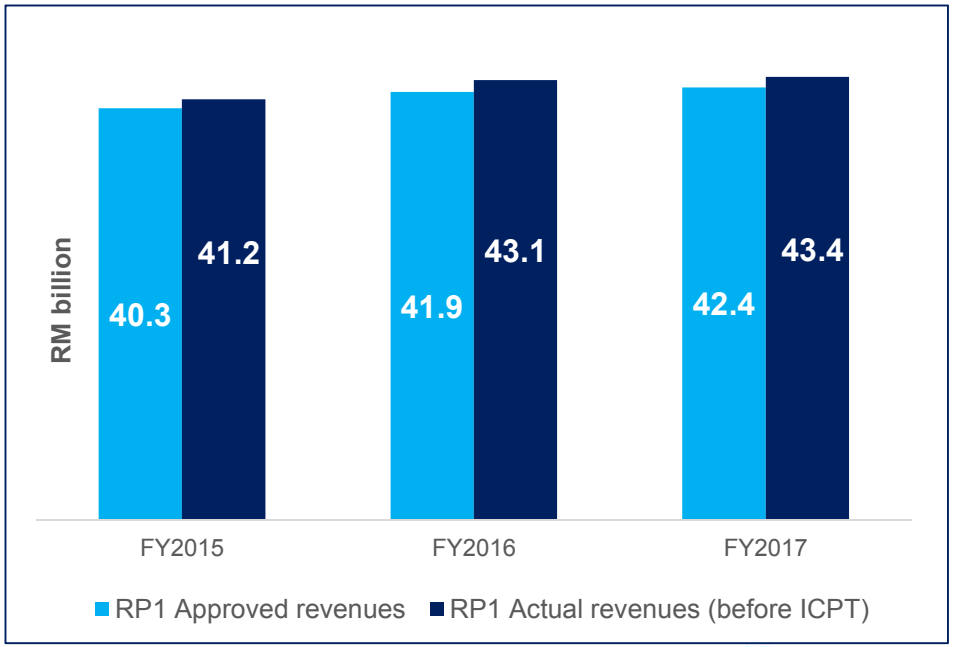
Imbalance Cost Pass-Through (ICPT) every 6 months

TNB RP1 (2015-2017) Performance of IBR Framework

- ✓ Actual unit sales are below approved forecast levels
- ✓ Average profit for RP1 for regulated business entities ~RM4.1 bil
- ✓ Actual CAPEX spent RM15.7 bil vs. approved at RM18.5 bil
- ✓ Actual OPEX spent RM16.9 bil vs. approved at RM16.4 bil
- ✓ System reliability with System Average Interruption Duration Index (SAIDI) at 50.24 minutes /customer in FY2017

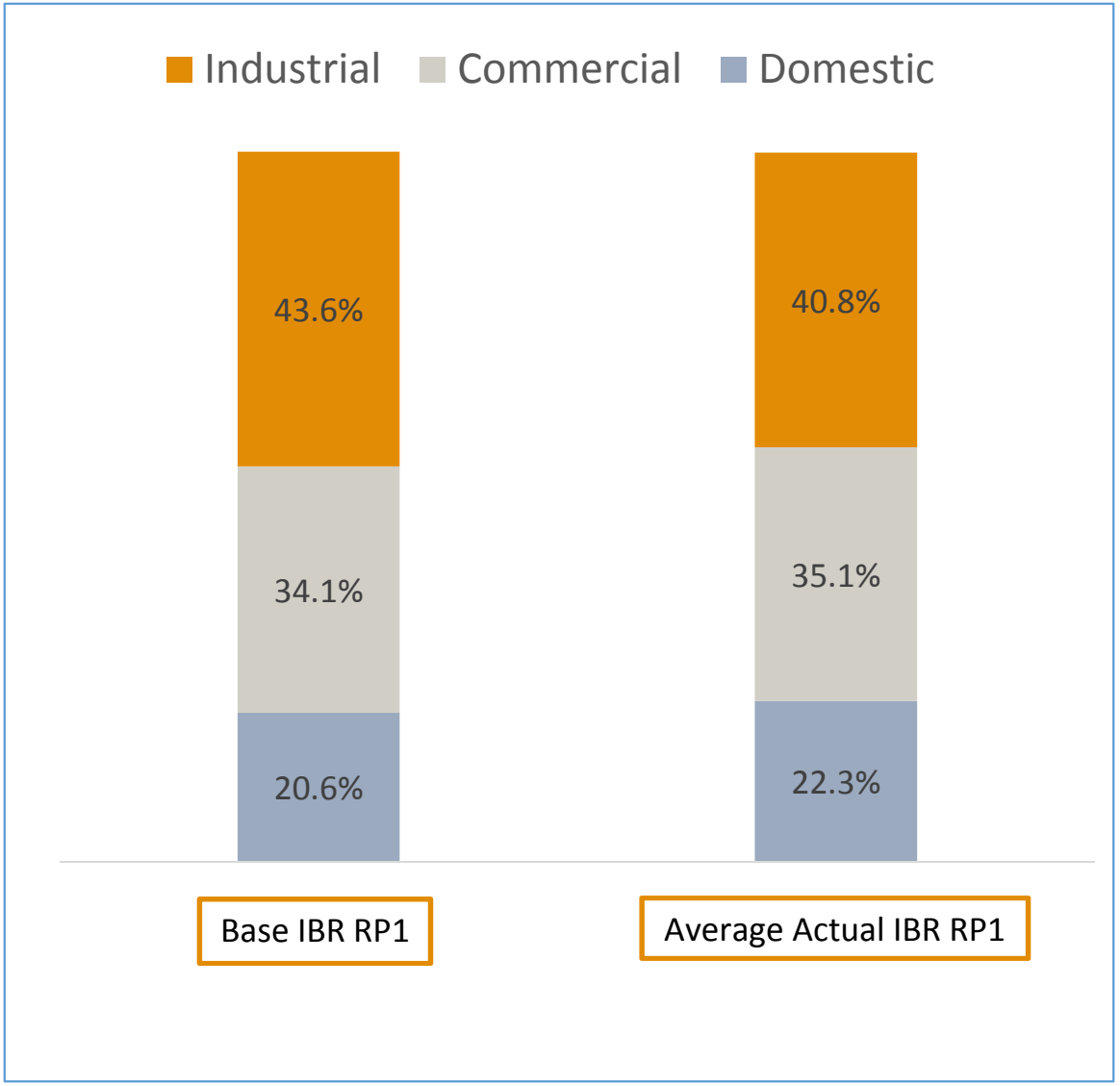






Changes in Customer Mix (%) in RP1 (2015-2017)

- ✓ Customer growth from 7.9 mil (2012) to 8.5 mil (2017)
- ✓ Changes in consumer mix with revenue from commercial/ services sector
- ✓ Actual average selling price in RP1 was 39.45 sen/kWh vs. approved average base tariff at 38.53 sen/kWh



RP1 (2015-2017) Performance Indicators

Summary of TNB RP1 (2015-2017) Performance Indicators

Business Entities	Code	Key Performance Indicator	Measurement Dead Band (Neutral)	Performance FY2015	Performance FY2016	Performance FY2017
Customer Services	CSPI 1	SAIDI	55 mis - 70 mins	49.66 mins (I)	45.95 mins (I)	50.24 mins (I)
	CSPI 2	Average of MSL Compliance Performance	84.11% - 94.11%	93.95% (N)	95.74% (I)	83.30% (P)
	CSPI 3	Weighted Average GSL (3,4,and 5)	86.32% - 95.5%	99.71% (I)	99.38% (I)	92.30% (N)
Transmission	TXPI1	System Minutes	1.5 mins - 5.1 mins	0.77 mins (I)	1.30 mins (I)	0.23 mins (I)
	TXPI2	System Availability	99.04% - 99.48%	99.73% (I)	99.76% (I)	99.79% (I)
	TXPI3	Project Delivery Index	0 month - 5.47 month	-1.38 months (N)	-2.35 months (N)	1.68 months (N)
Single Buyer (Operations)	SBPI1	System Average Cost	0% - 5%	-2.50% (I)	-1.60% (I)	-0.20% (I)
	SBPI2	Compliance to Timely Settlement of Generators' Invoices	99.55% - 99.85%	100% (I)	100% (I)	100% (I)
	SBPI3	Non- Compliance to Malaysian Grid Code (MGC)	2 - 7 occurrence	0 occurrence (I)	0 occurrence (I)	0 occurrence (I)
	SBPI4	Non- Compliance to Single Buyer Rules (SBR)	2 - 7 occurrence	4.5 occurrence (N)	5 occurrence (N)	5 occurrence (N)
System Operator	SOPI1	Wide Area Loss of Supply Event	Less than 0 occurrence	0 occurrence	0 occurrence	0 occurrence
	SOPI2.1	Security Limit Compliance: Voltage Limit Compliance (VLC)	90% - 96			
	SOPI3	Security Limit Compliance: Frequency Limit Compliance (FLC)	90% - 96			
	SOPI2.3	Dispatch Adjustment	0.2% - 0.4			

Summary for FY 2017:

1. 10 over 14 KPIs are in incentive band
2. 3 KPIs in neutral band
3. One KPI in the penalty scheme (Average of MSL Compliance Performance)

Indicator: I = Incentive P = Penalty N = Neutral

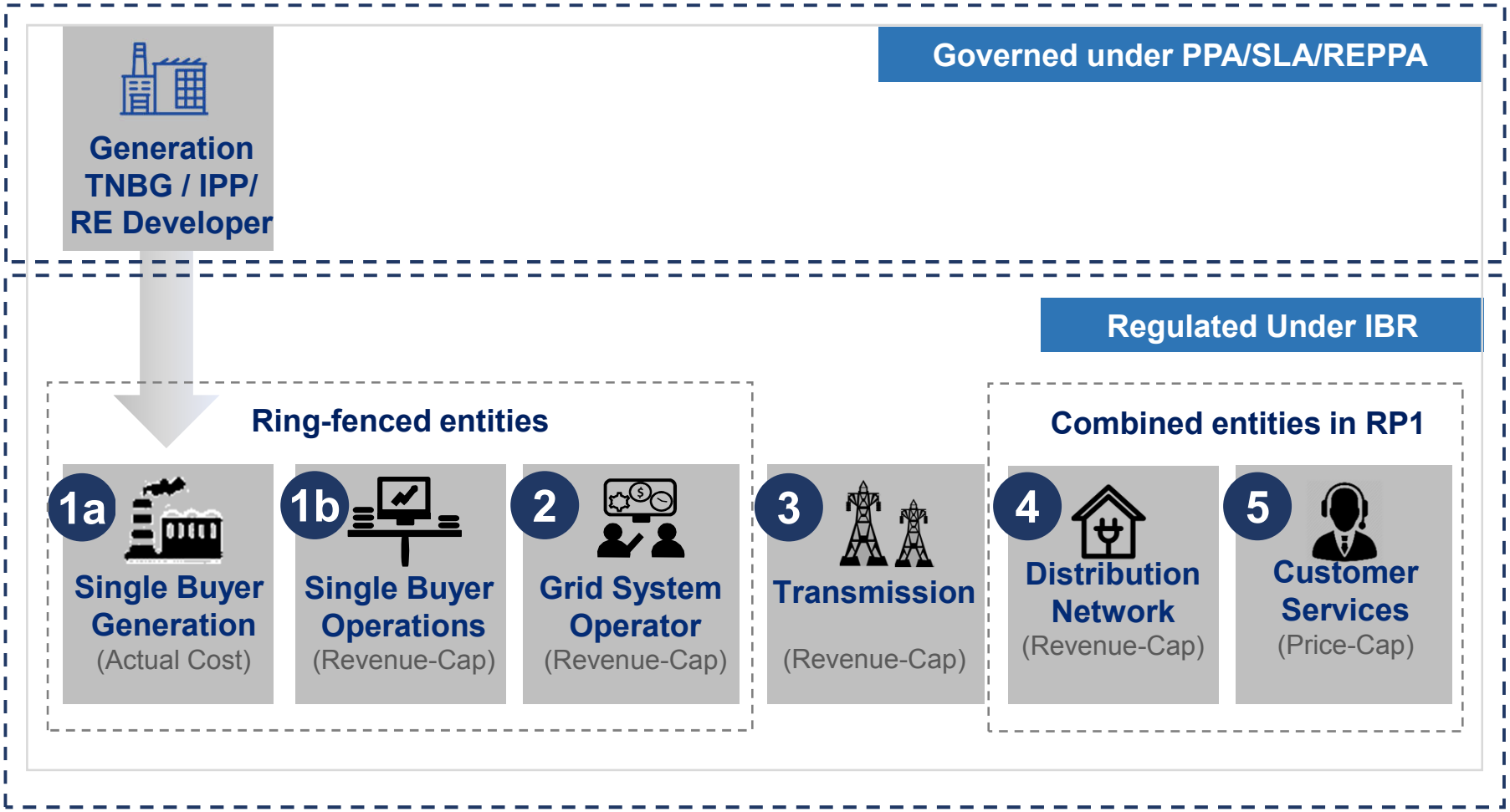
(For RP1, the incentive and penalty scheme was implemented for monitoring purpose only without any monetary impact)

Determination of Electricity Tariff for IBR Regulatory Period 2 (RP2: 2018-2020)

New Features in Electricity Tariff Review for RP2 (2018-2020)

More efficient and reliable electricity supply	Support Government's initiatives and aspirations	New addition in Key Performance Indicators	Separation of Distribution Networks and Customer Services
• Efficient and reliable electricity supply at the lowest efficient cost; • Enhancement in safety and reliability with smart grid capabilities.	• Supporting Government's initiatives in green energy and sustainability for example AMI, Distribution Automation, Group Relamping of streetlight, etc. • Continue the gas price subsidy rationalization by gradual removal of gas price subsidy;	• New performance indicators on each business entity that are in line with Government's policies; • Enhancement on KPI mechanisms and principles (symmetric and asymmetric).	• Separation of these business entities will enhance the system reliability and consumer experience; • This will increase the productivity and consumer satisfaction.

RP2 (2018-2020) of Regulated Business Entities under the IBR Framework



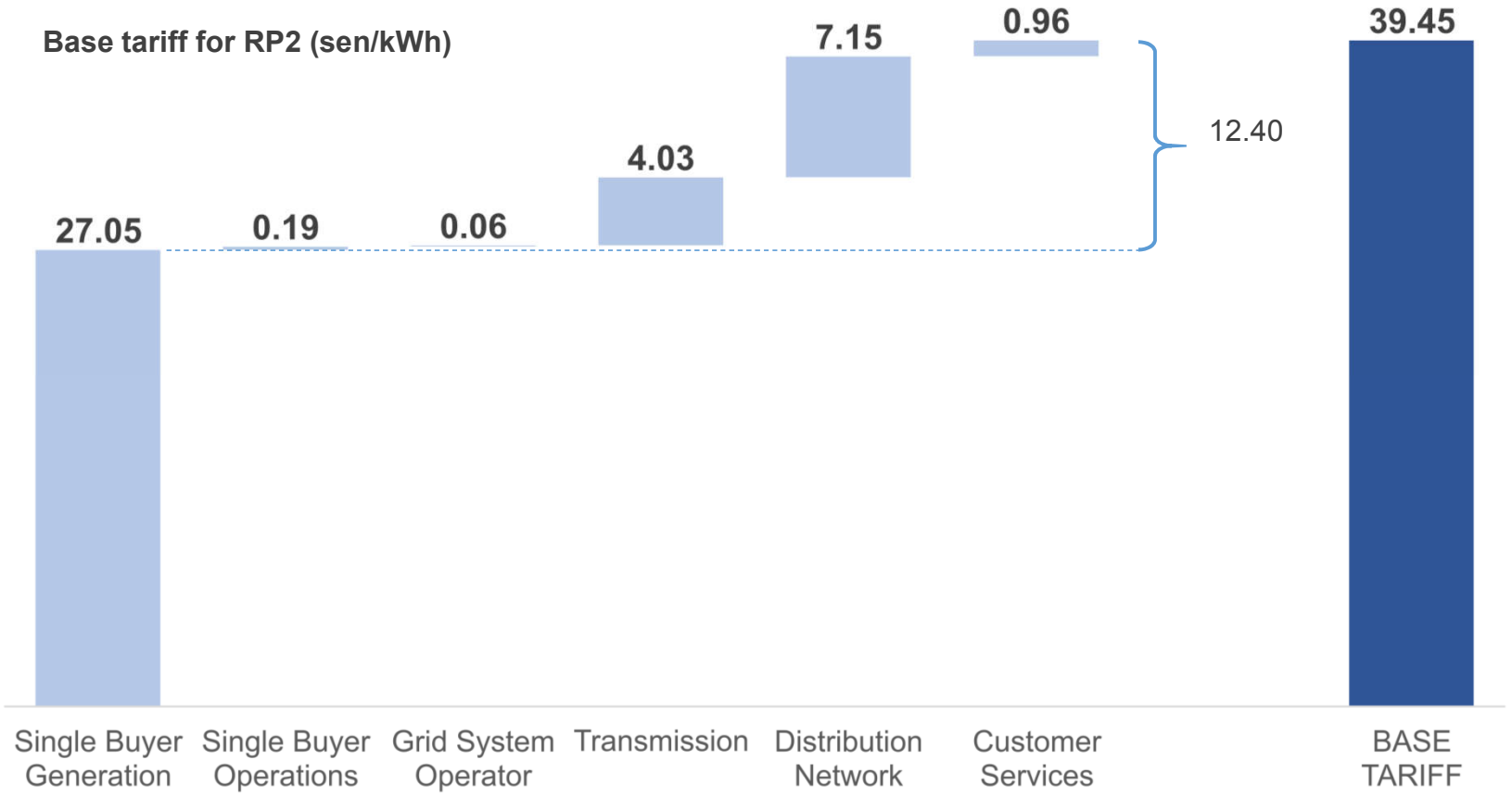
For RP2, five regulated business entities will be operating under IBR framework with the separation of Distribution Network and Customer Services

Determination of Regulatory Weighted Average Cost of Capital (WACC) for RP2 (2018-2020)

	TNB Proposal			Final
	Low	Medium	High	Decision
After-tax cost of debt	**4.1%**	**4.2%**	**4.3%**	**4.3%**
Cost of equity	**11.4%**	**12.9%**	**14.4%**	**10.9%**
Gearing	55%	55%	55%	55%
WACC (after-tax)	**7.4%**	**8.1%**	**8.8%**	**7.30%**

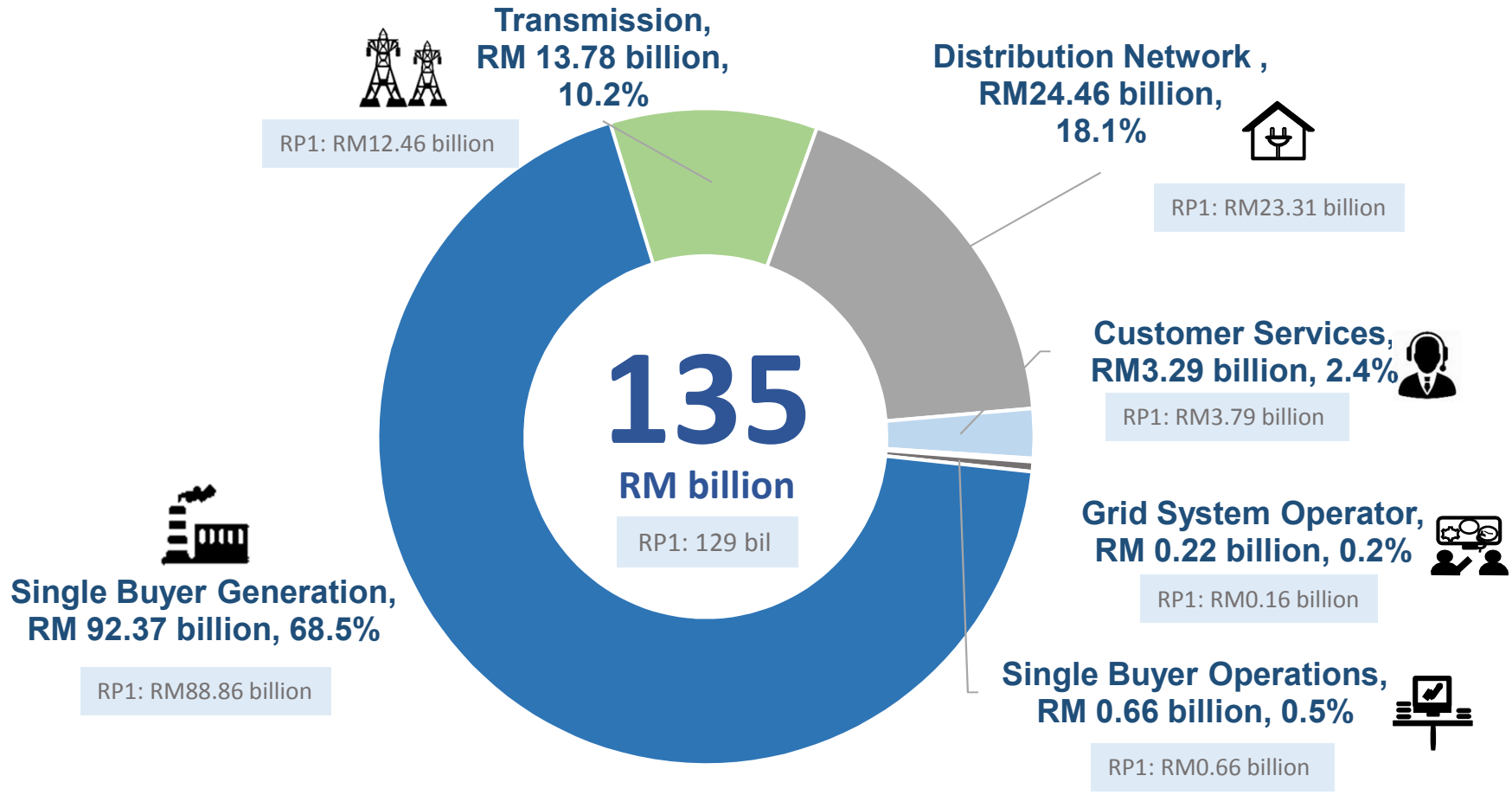
RP1: WACC is 7.5%

New Base Tariff under IBR mechanism RP2 (2018-2020) is 39.45 sen/kWh



RP1 (sen/kWh)	**26.76**	**0.19**	**0.05**	**3.66**	**6.77**	**1.10**	**11.77**	**38.53**
% change	1.1%						5.3%	2.4%

RP2 (2018-2020) Allowed Revenue Requirement is RM135 billion

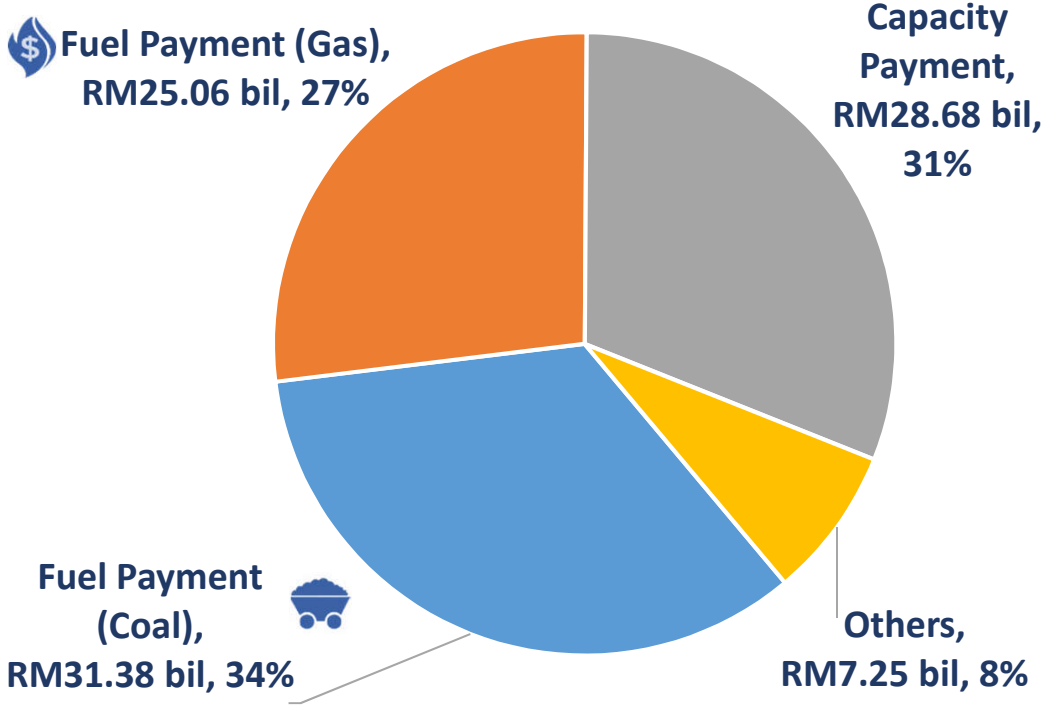


1- RP1 represents the allowed revenue for 2015 – 2017
2- The numbers for RP2 allowed revenues are levelised based on allowed return of 7.3%

69% of the total allowed revenue for RP2 is to account for Single Buyer Generation Cost

The levelised Single Buyer generation cost for RP2 is 27.05 sen/kWh. an increase of 1.08% (RP1: 26.76 sen/kWh)

Total Single Buyer Generation Costs for RP2



RM92.4 bil

(RP1: RM88.9 bil)

RP2 Base Fuel Prices

Coal:
USD75/MT
(RM14.47/mmbtu @ 4.212/USD)

LNG:
RM35/mmbtu

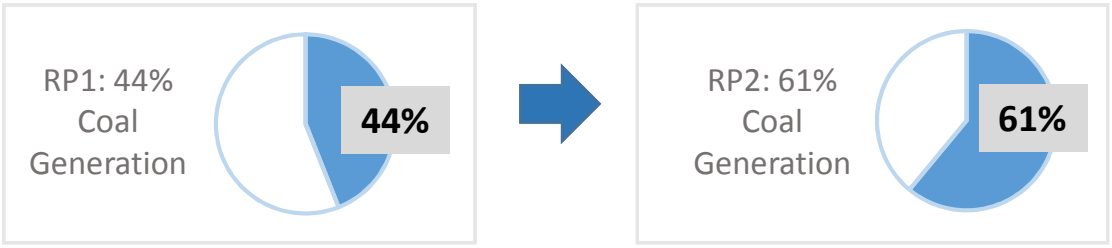
Regulated Gas:
RM24.20/mmbtu (Jan'18 – Jun'18)
RM25.70/mmbtu (Jul'18 – Dec'18)
RM27.20/mmbtu (Jan'19 – Dec'20)

Others include: VOR Payment, Hydro Energy Payment, Renewable Energy Displaced Cost under the FiT regime and Laos-Thailand-Malaysia Interconnection

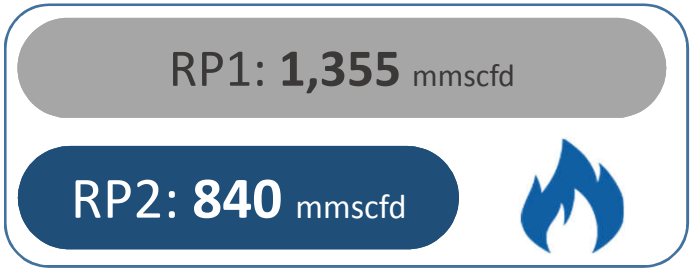
In summary, 3 major shifts in RP2 (2018-2020) contributes in a lower increase in the Single Buyer Generation Costs

1. **Lower load growth (1.8 – 2.0%)** and lower sales volume
   - less generation required to meet demand

2. **Coal will be the dominant fuel** in the energy mix for RP2

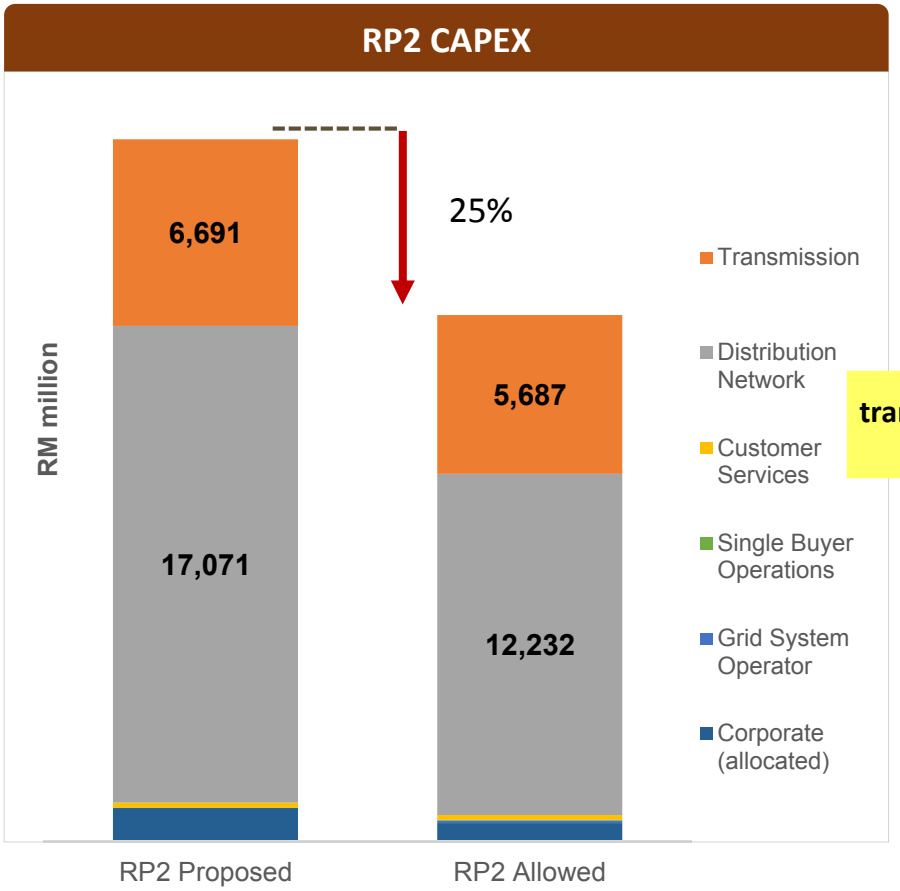


3. Significant **reduction in gas volume** means less utilization of LNG



RP2 (2018-2020) Total Allowed CAPEX is RM 18.8 bil
(RP2 Proposed: RM 25.1 bil)

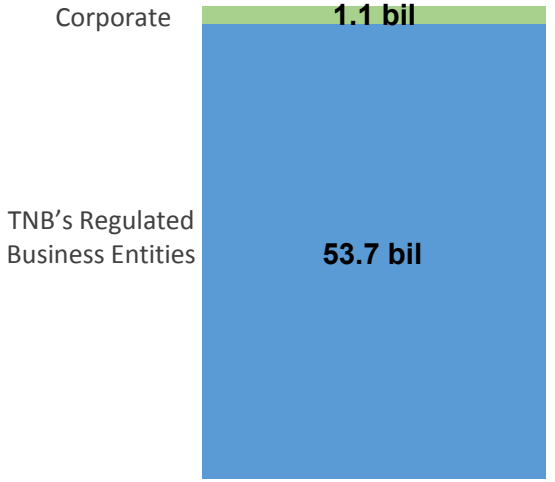
RP2 CAPEX



translated into

Regulated Asset Base (RAB)

Forecasted Average RAB in 2020 is **RM 54.8 bil**



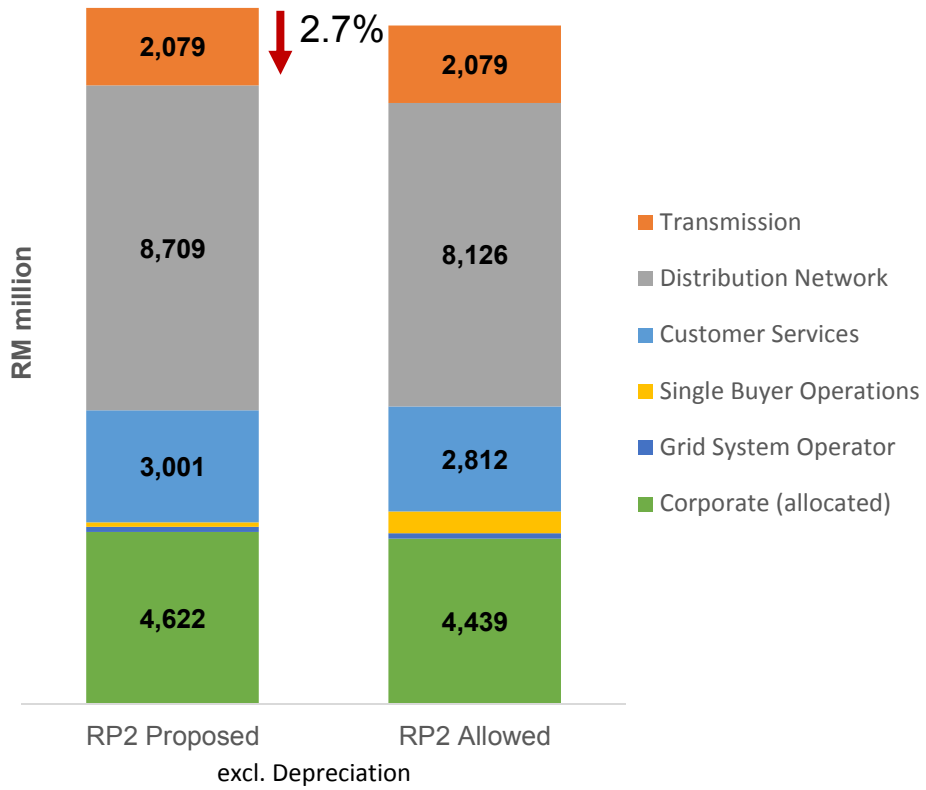
Total Average Return on RAB in RP2:
RM 3.8 bil/year

- 85% deliverability adjustment is applied on all regulated business entities' overall CAPEX. The deliverability adjustment reflects historical under-delivery by TNB against approved RP1 CAPEX.
- Major Infrastructure development initiatives in RP2:

i. Advanced Metering Infrastructure (AMI) with the installation of 1.5 million smart meters starting with major urban areas of the Peninsular;
ii. Fiber optic networks to ensure the reliability and safety of electrical supplies are assured; and
iii. Installation of 367,000 LED street lights in major cities throughout the country to promote energy efficient practices.

RP2(2018-2020) Total Allowed OPEX is RM 18.2 bil (RP2 Proposed: RM 18.7 bil)

RP2 OPEX

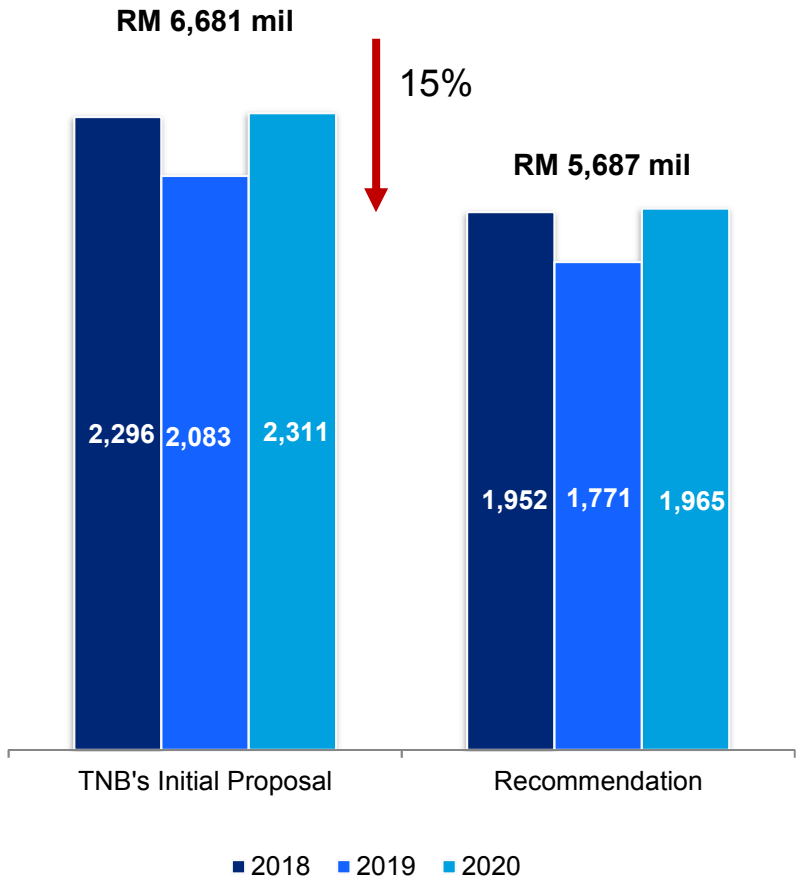


excl. Depreciation

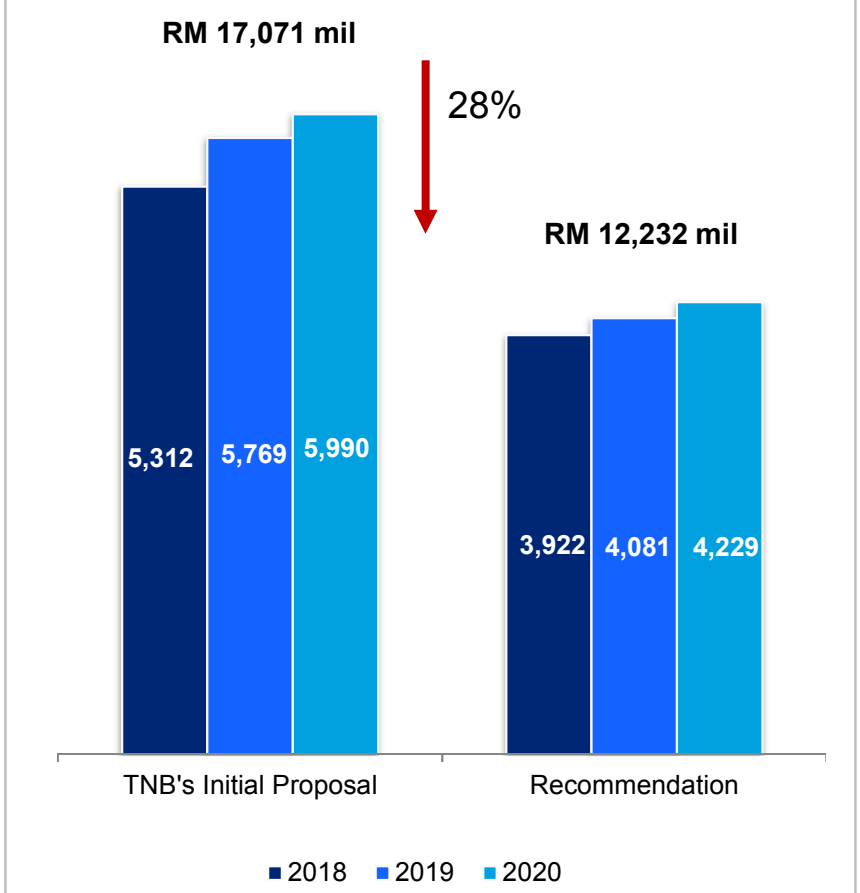
- OPEX target productivity level for RP2 is 3.4%
- OPEX included in the RP2 base tariff is allocated for staff costs, repair and maintenance, other general expenses, working capital and interest on customer deposits.

Review of Two Major RP2 (2018-2020) CAPEX

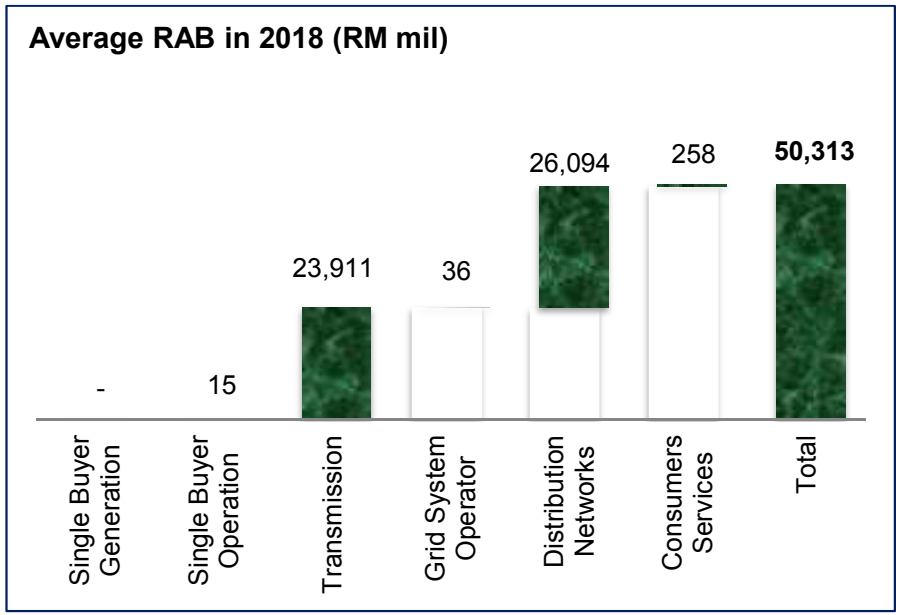
TRANSMISSION

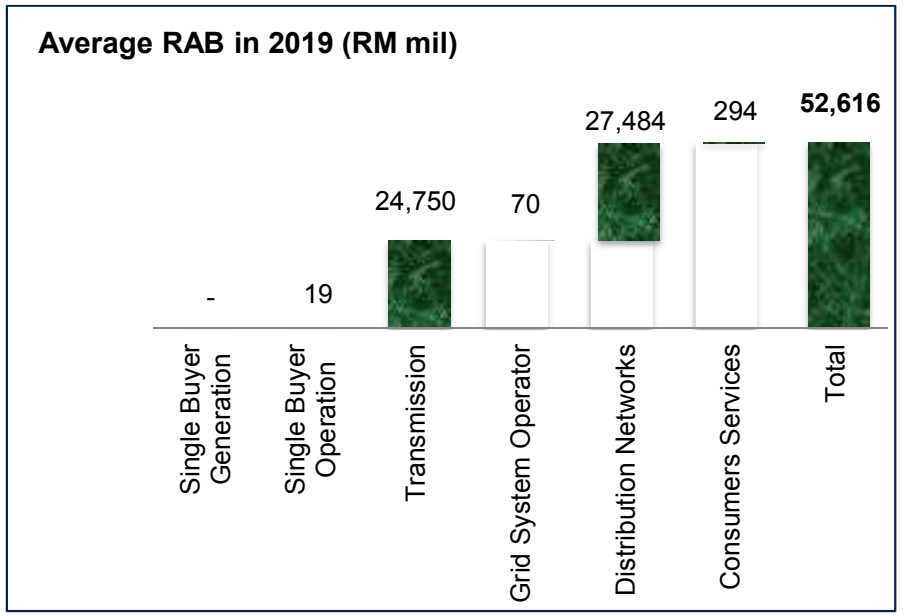


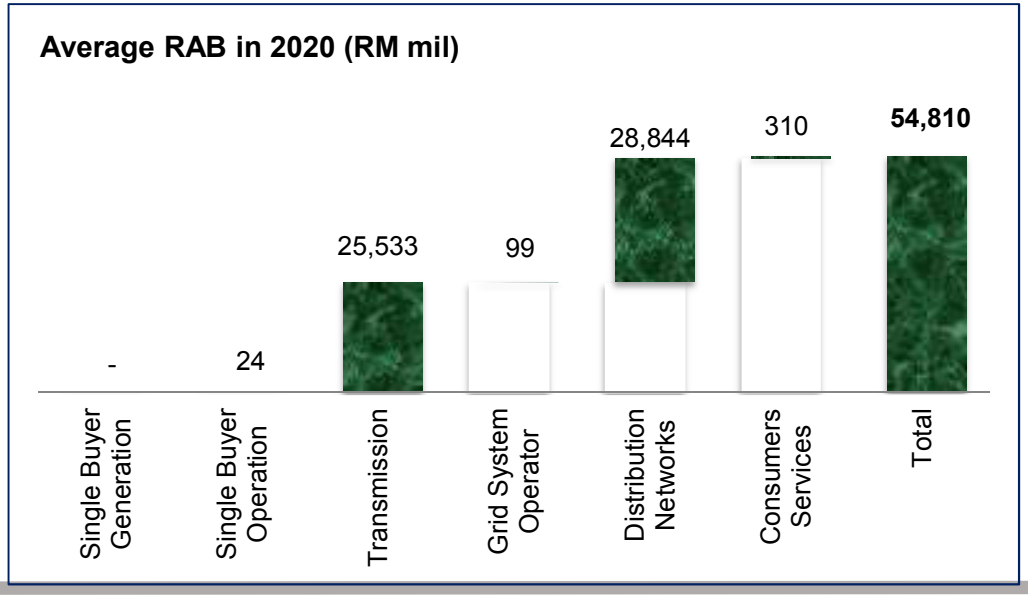
DISTRIBUTION NETWORK



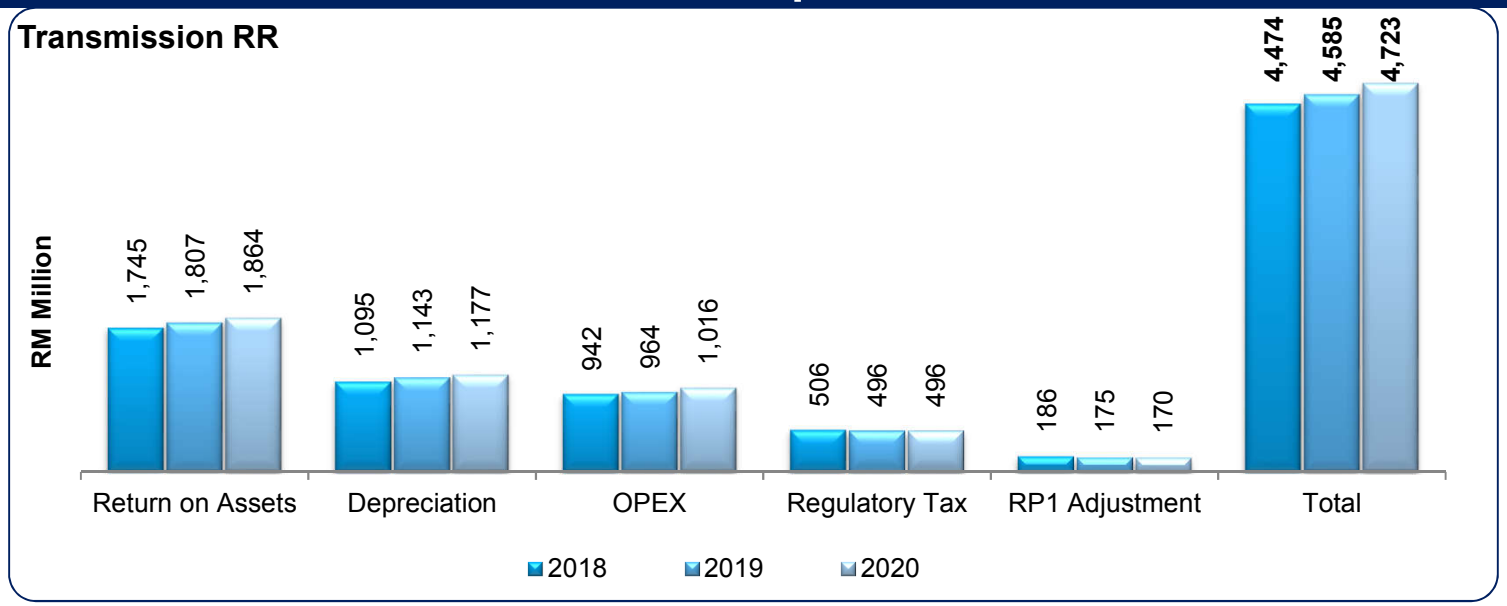
RP2 Average Regulated Asset Base (RAB) (2018-2020)

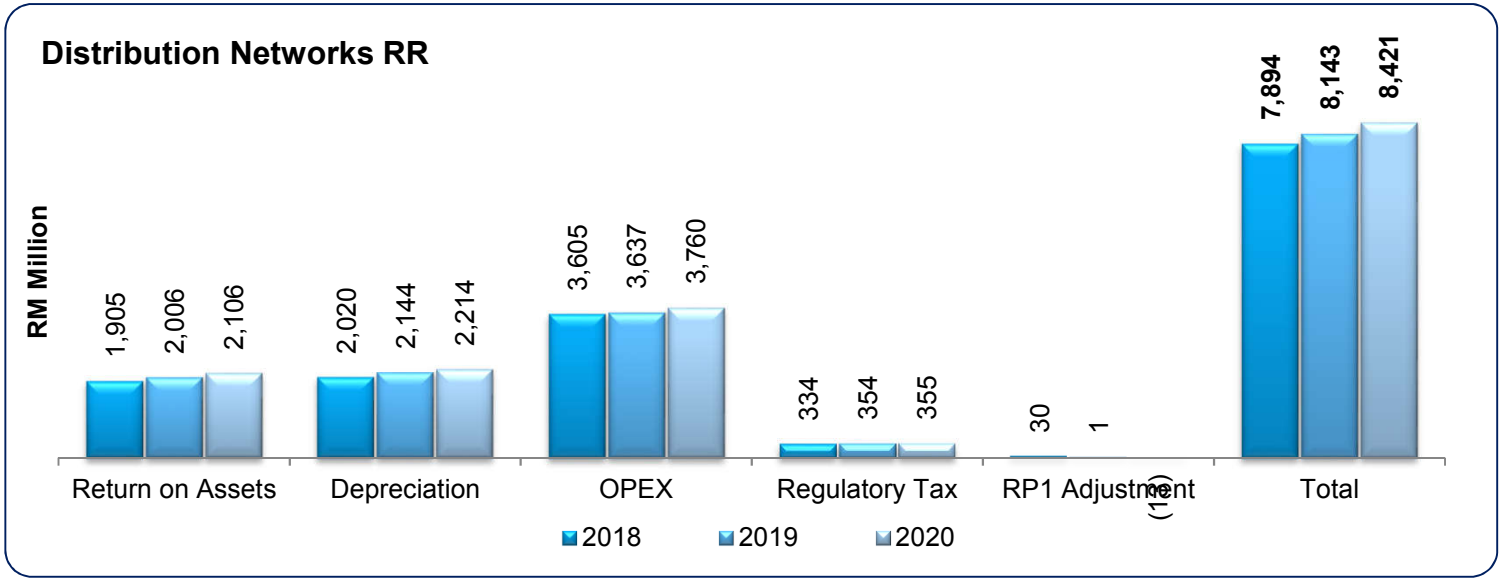






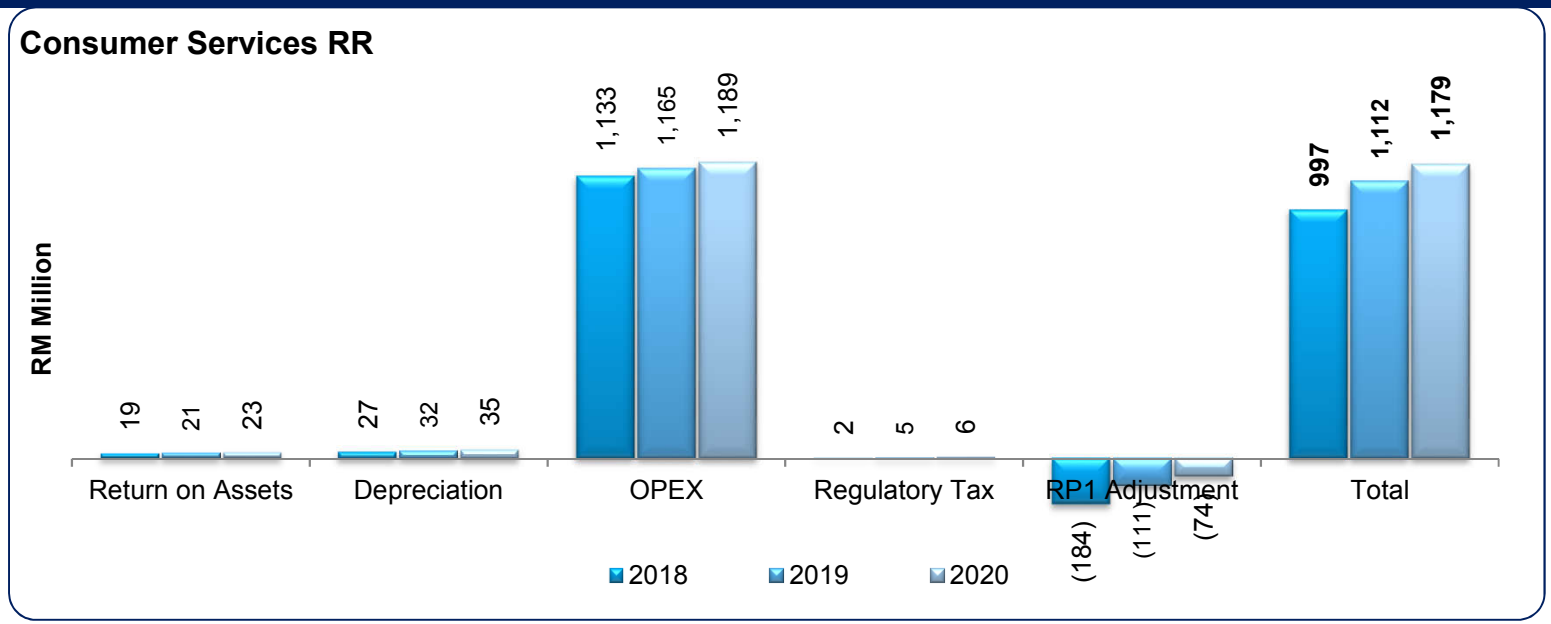
RP2 (2018-2020) TNB's Regulated Business Entities
Revenue Requirement

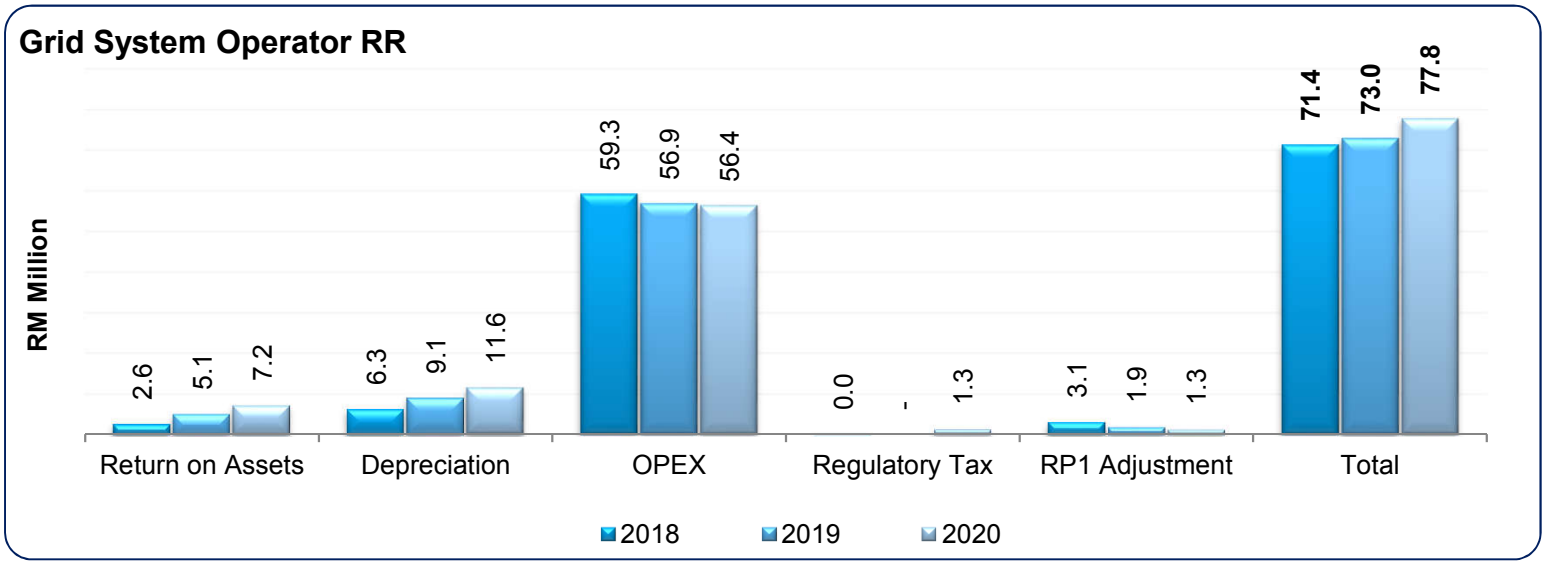




RP1 Adjustments inclusive: OPEX and CAPEX Efficiency Carryover Scheme & Revenue Cap Adjustments

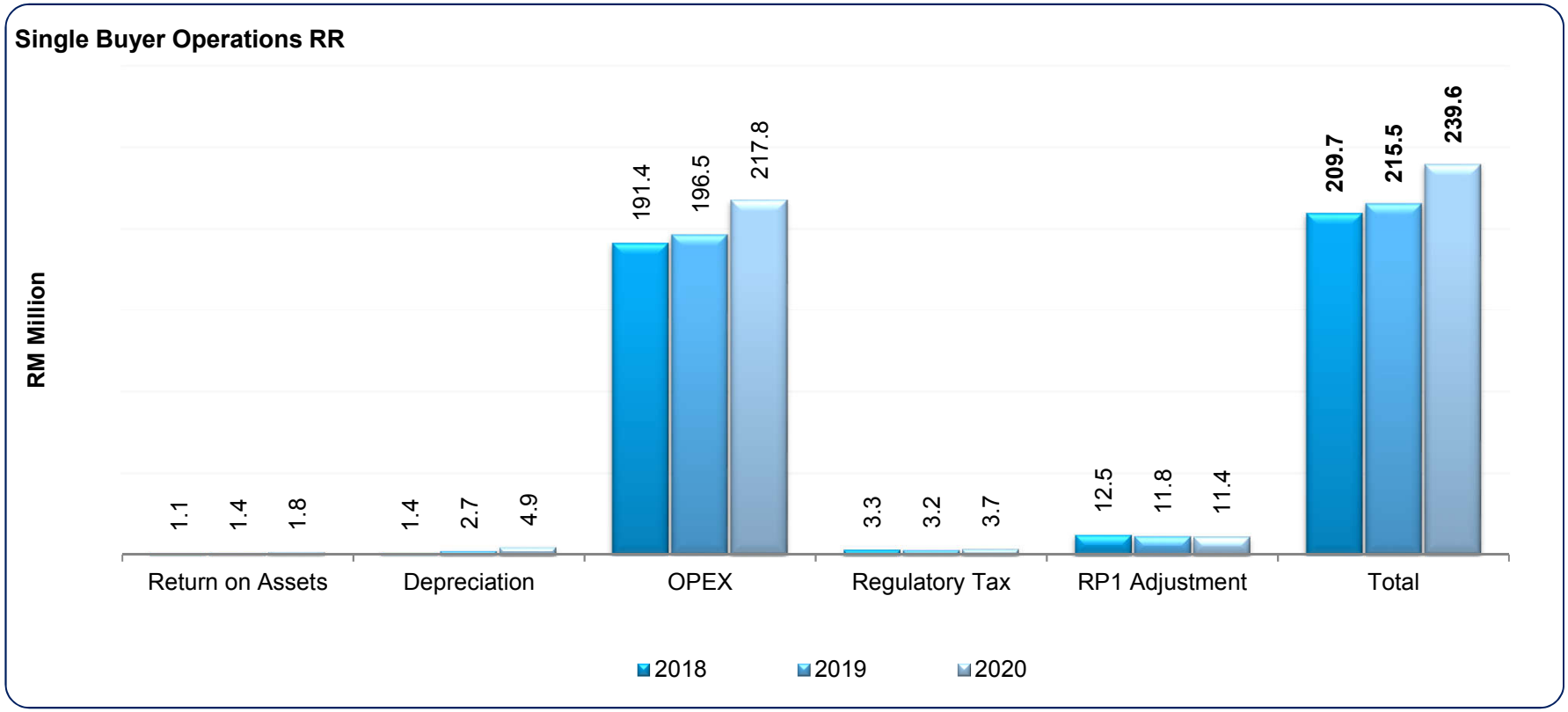
RP2 (2018-2020) TNB's Regulated Business Entities Revenue Requirement (RR)





RP1 Adjustments inclusive: OPEX and CAPEX Efficiency Carryover Scheme & Revenue Cap Adjustments

RP2 (2018-2020) TNB's Regulated Business Entities
Revenue Requirement



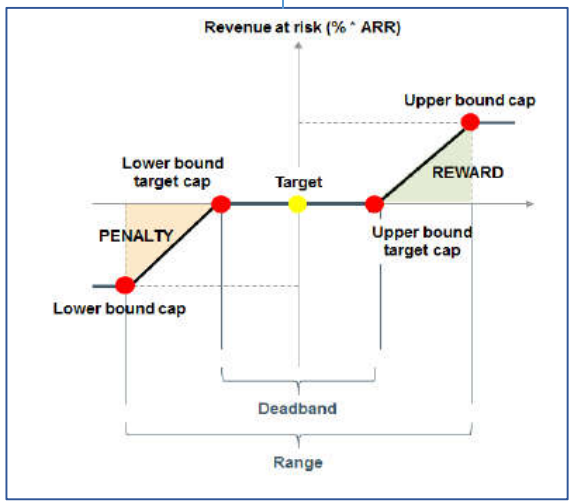
RP1 Adjustments inclusive: OPEX and CAPEX Efficiency Carryover Scheme & Revenue Cap Adjustments

RP2 (2018-2020) Proposed Performance Indicators

RP2 (2018-2020) KPI Mechanism and Principles

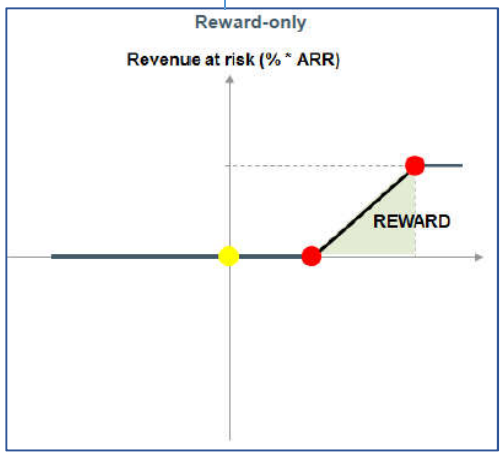
RP2 KPI Mechanism

Symmetrical performance incentive mechanism

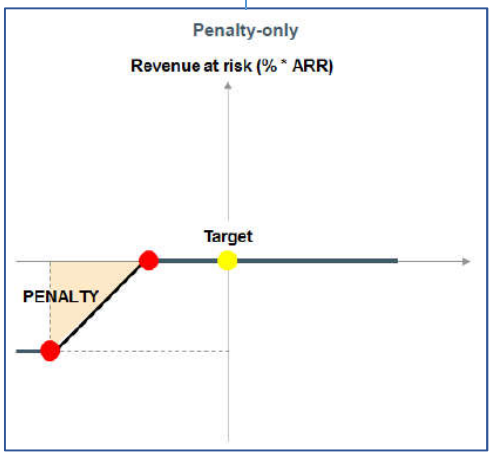


Asymmetrical performance incentive mechanisms

Reward-only



Penalty-only



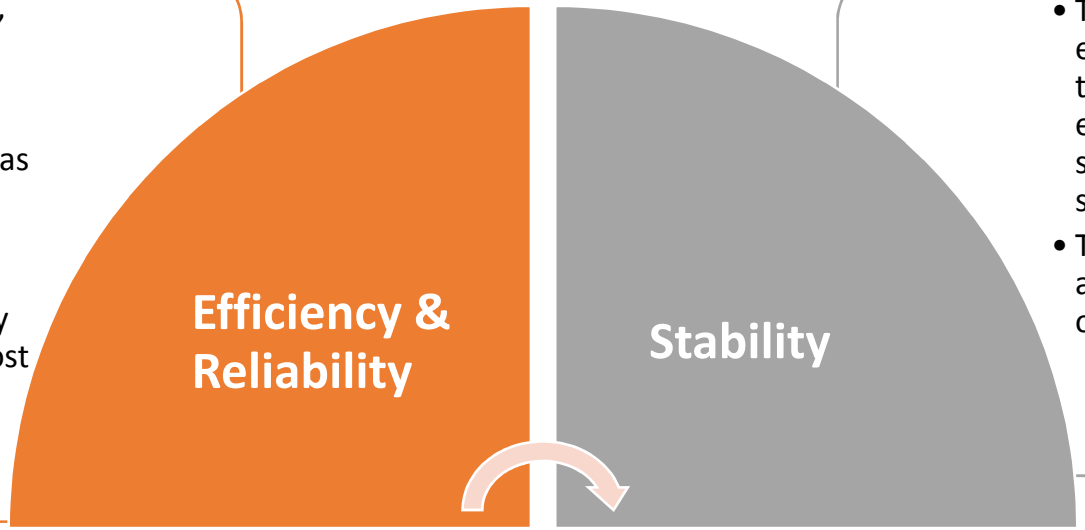
Summary of RP2 (2018-2020) Performance Indicators

Code	KPI	Weight	Type
CS	**Customer Services**		
CSPI1	Customer Satisfaction Index	33%	*Symmetric*
CSPI2	Average Renewable Energy Connection Time	33%	*Symmetric*
CSPI3	Customer Satisfaction Index on EE Programme	33%	*Reward-only*
CSPI4	Delivery of EE Programme	n/a	*Monitor-only*
DN	**Distribution Network**		
DNPI1	SAIDI Urban		
	a. Kuala Lumpur	10%	*Penalty-only*
	b. Shah Alam	10%	*Penalty-only*
	c. Johor Bharu	10%	*Penalty-only*
	d. Pulau Pinang	10%	*Penalty-only*
	e. Petaling Jaya	10%	*Penalty-only*
DNPI2	MSL 3B Compliance	50%	*Symmetric*
DNPI3	Lost Time Injury Frequency	n/a	*Monitor-only*
DNPI4	Special Projects Delivery Index	n/a	*Monitor-only*
TX	**Transmission**		
TXPI1	System Minutes Lost	33%	*Penalty-only*
TXPI2	System Availability	33%	*Penalty-only*
TXPI3	Project Delivery Index	33%	*Symmetric*
TXPI4	Lost Time Injury Frequency	n/a	*Monitor-only*
GSO	**Grid System Operator**		
SOPI1	Wide Area Loss of Supply Event	20%	*Symmetric*
SOPI2	Voltage Limit Compliance	20%	*Symmetric*
SOPI3	Frequency Limit Compliance	20%	*Symmetric*
SOPI4	Least Cost Operation	20%	*Symmetric*
SOPI5	System Minutes Lost	20%	*Penalty-only*
SB	**Single Buyer (Operations)**		
SBPI1	System Average Cost Deviation	n/a	*Monitor-only*
SBPI2	Load Forecast Accuracy	33%	*Symmetric*
SBPI3	NEDA Cost Savings	33%	*Reward-only*
SBPI4	NEDA Participation	33%	*Reward-only*

Note: Has yet to be approved and finalizing in progress by ST

Conclusion

Expectations for IBR Mechanism of RP2 (2018-2020) onwards



- To improve the accuracy, efficiency and transparency of IBR process based on the policies and procedures as per stipulated in the guidelines (RIGs)
- To deliver efficient and reliable electricity supply at the lowest efficient cost

- To deliver a stable and efficient regulatory system that encourages the electricity industry to be stable and reliable to its stakeholders
- To safeguarding a stable and continuous availability of electricity supply

- To ensure TNB comply with all regulatory and license conditions
- To have a comprehensive checks and balances to ensure that ST will uphold the highest standards of governance for the IBR RP2
- To enhance standard of reporting

- To be transparent in determine the electricity price
- To ensure that electricity price is fair and affordable to its stakeholders
- To establish a cost-reflective tariff for an efficient and fair tariff design
- To enhance the communication with the Rakyat and stakeholders

Approved Average Base Tariff In Adherence to Regulatory Governance And Enhanced IBR Mechanism

RP 1: 2015-2017

Reference Price:
38.53 sen/kWh

Average Selling Price:
39.45 sen/kWh

RP 2: 2018-2020

New Reference Price:
39.45 sen/kWh

Key Features of IBR RP2:

1. **No change** in the end user tariffs rates beginning on 1st January 2018 until Dec 2020
2. Regulated return to TNB : WACC reduced from **7.5% (RP1)** to **7.3% (RP2)**
3. New projected CAPEX and OPEX for setting of average base tariff
4. Continuity of the Imbalance Cost Pass-Through Mechanism (ICPT) for uncontrollable costs every 6 months
   - Closely monitoring of fuel prices and forex
5. Introduction of the revenue adjustment annually for the revenue cap price setting business entities
6. Enhanced target for efficiency improvements under new KPIs setting

TERIMA KASIH

Suruhanjaya Tenaga