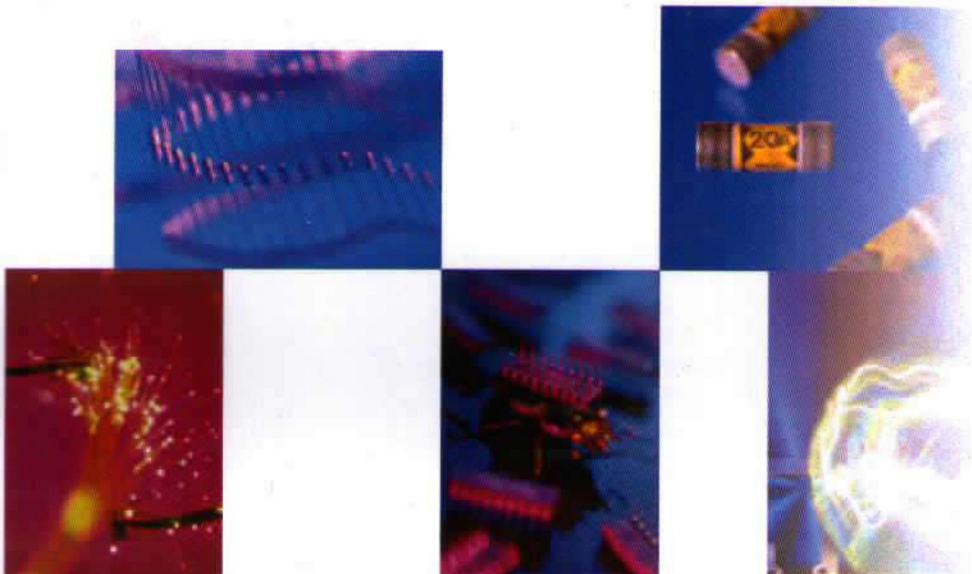
ISSN 0973-4562

Volume 12,
Number 14,
2017

International Journal of APPLIED ENGINEERING RESEARCH

Editor-in-Chief
Prof. Ir Dr Mohd Sapuan Salit



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Print ISSN 0973-4562
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Audience: Mechanical, computer, aeronautical, chemical, civil, electronics, mathematic, geology, electrical.

Submission: Authors are requested to submit their papers electronically to IJAEReditor@gmail.com

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Publication Date and Frequency: Twenty four issues per year.

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Research India Publications
B-2/84, Ground Floor,
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International Journal of Applied Engineering Research

Volume 12, Number 14 (2017)

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International Journal of Applied Engineering Research (IJAER)

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ISSN 0973-4562

Published by

RIP Research India Publications

Head Office: B-2/84, Ground Floor, Rohini Sector-16, Delhi-110089, INDIA
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International Journal of Applied Engineering Research (IJAER)

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Universities and research institutions in India

SUBJECT AREA AND CATEGORY

Engineering
Engineering (miscellaneous)

PUBLISHER

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09734562, 09739769

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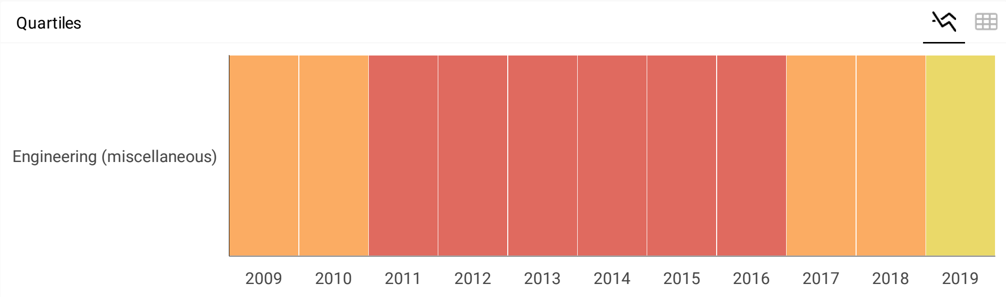

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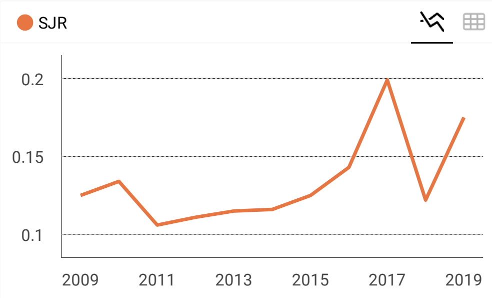

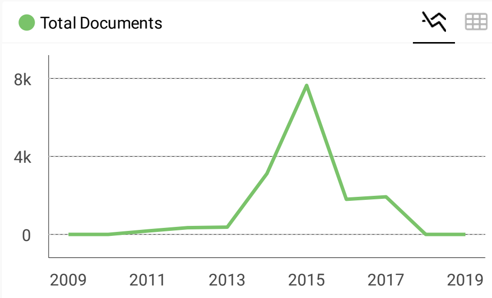

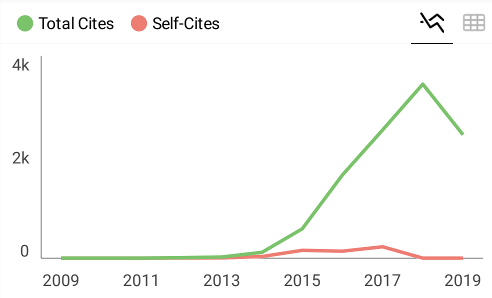

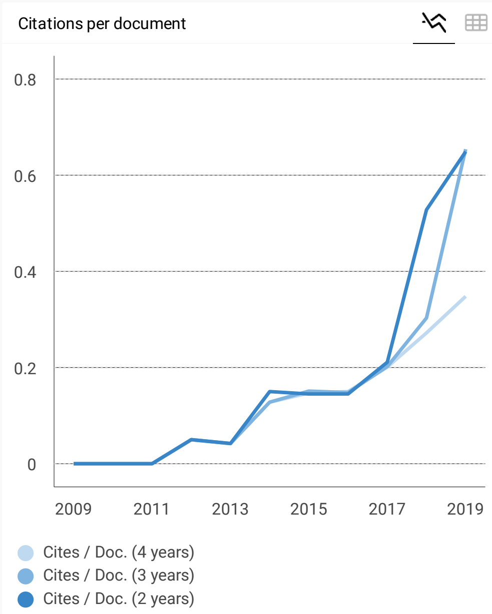

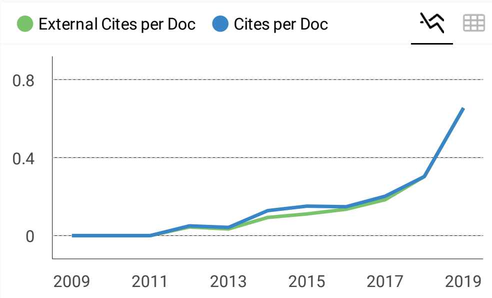

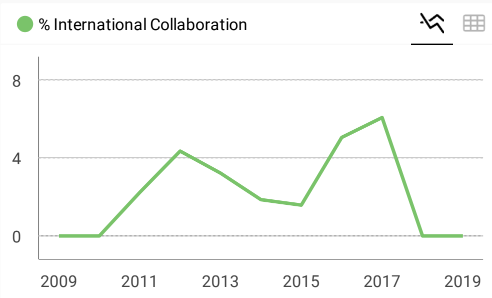

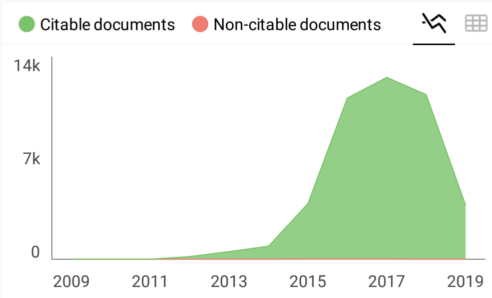

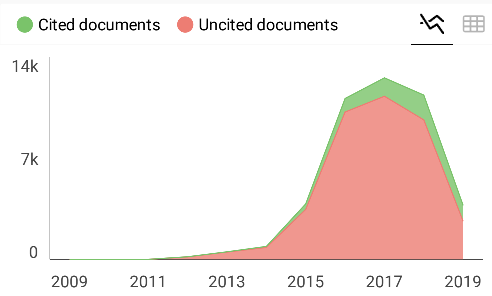

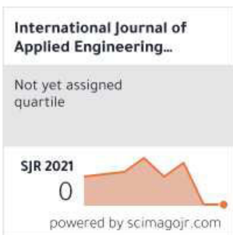

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R

Ravi Bhramaramba 4 weeks ago

My article was published in International Journal of Applied Engineering and Research in 2015. Can you tell me the Quarter this Journal belongs to?

Thanks and regards

Prof. R. Bhramaramba

reply

SCImago Team

Melanie Ortiz 4 weeks ago

Dear Ravi, thank you very much for your request. You can consult that information just above. Best Regards, SCImago Team

D

Dr.D.Abitha kumari 8 months ago

Dear mam, I published two articles in International Journal of Applied Engineering Research at 2015, one article indexed in Scopus, another article is not indexed in Scopus, Why?
“An Enhanced Queuing System for Multiple Mobile Elements in Wireless Sensor Network”, International Journal of Applied Engineering Research, ISSN 0973-4562 Vol. 10 No.20 (2015)pp: 16019- 16023, this article indexed in Scopus.
“An Optimal Time Interval Selection and Authenticating Primary User Signal for Cognitive Radio System” International Journal of Applied Engineering Research, ISSN 0973-4562 Vol. 10 No.1 (2015) pp. 835-839, this article is not indexed in Scopus.

reply

SCImago Team

Melanie Ortiz 8 months ago

Dear Dr.D.Abitha,
thank you very much for your comment, unfortunately we cannot help you with your request. We suggest you contact Scopus support team:
https://service.elsevier.com/app/answers/detail/a_id/14883/kw/scimago/supporthub/scopus/
Best Regards, SCImago Team

M

Maula 2 years ago

I would like to ask:
It mentioned discontinue as 2017. However the Quartil is still running and improving from Q4-Q3 and in 2019 is in Q2.
Does it mean that it's still in Scopus up to now?

reply

SCImago Team

Melanie Ortiz 2 years ago

Dear Maula,

Thank you for contacting us.

The SJR reflects the data that Scopus sends us annually. The SJR is calculated for the last year, although all the information calculated for previous years can be consulted on our website. Despite the fact that a journal no longer appears in Scopus, as long as SCImago continues to receive data from Scopus related to the Citation Window (up to 3 years, necessary to calculate the SJR), the scientometric indicators are still being calculated.

Best Regards,
SCImago Team

F

Firas Mohammed Ali 2 years ago

Dear Authors,
Actually, this Indian publisher is predatory and is included in Beal's black list of faking journals. It targets the money of the authors rather than the quality of their work. Therefore, it was removed from the Scopus indexing. With best regards.

reply

M

Miriam Edith 2 years ago

Today February 2, 2021, I checked the list that comments and the magazine "International Journal of Applied Engineering Research" does not appear.

SCImago Team

Melanie Ortiz 2 years ago

Dear Firas, thanks for your participation! Best Regards, SCImago Team

S

Soheir Ghonaim 2 years ago

Dear Sir,
I have paper , I would like to publish it with you .
How much money do you take ?
How many days it will take for publish?
Do you have Scopus of Thomson Reuters?

reply

SCImago Team

Melanie Ortiz 2 years ago

Dear Soheir,
thank you for contacting us.
We are sorry to tell you that SCImago Journal & Country Rank is not a journal. SJR is a portal with scientometric indicators of journals indexed in Elsevier/Scopus.
Unfortunately, we cannot help you with your request, we suggest you visit the journal's homepage or contact the journal’s editorial staff , so they could inform you more deeply.
Best Regards, SCImago Team

S

S.DINESHKUMAR 3 years ago

I am need to apply to this journal.If it is available in updated list?

reply

SCImago Team

Melanie Ortiz 3 years ago

Dear Dineshkumar,
thank you for contacting us.
We are sorry to tell you that SCImago Journal & Country Rank is not a journal. SJR is a portal with scientometric indicators of journals indexed in Elsevier/Scopus.
Unfortunately, we cannot help you with your request, we suggest you to visit the journal's homepage or contact the journal's editorial staff , so they could inform you more deeply.
Best Regards, SCImago Team

R

rama 3 years ago

is this journal in scopus indexed.it seems there is a cancellation for some period.please clarify

reply

P

pulareddy 3 years ago

concluded that it was not a scopus publisher from 2017 onwards further deatils could find at https://www.ripublication.com/ijaer.htm

Melanie Ortiz 3 years ago SCImago Team

Dear Rama, thank you very much for your comment, unfortunately we cannot help you with your request. We suggest you to consult the Scopus database directly. Remember that the SJR is a static image of a database (Scopus) which is changing every day. Best regards, SCImago Team

D

Dr. Mohd 3 years ago

Does this Journal indixed in Scopus or still indixed as I saw that it's ongoing till 2018!
Please advice.
Thank you and Kind regards

reply

Melanie Ortiz 3 years ago SCImago Team

Dear Mohd, thank you very much for your comment, unfortunately we cannot help you with your request. We suggest you to consult the Scopus database directly. Remember that the SJR is a static image of a database (Scopus) which is changing every day. Best regards, SCImago Team

J

Jobin Jose 3 years ago

I have published a paper in International Journal of Applied Engineering Research. But my designation written in the paper is wrong. Is it possible to correct it?

reply

Melanie Ortiz 3 years ago SCImago Team

Dear Jobin,
thank you for contacting us.
Sorry to tell you that SCImago Journal & Country Rank is not a journal. SJR is a portal with scientometric indicators of journals indexed in Elsevier/Scopus.
Unfortunately, we cannot help you with your request, we suggest you to contact the journal's editorial staff , so they could inform you more deeply.
Best Regards, SCImago Team

M

Manjunath 3 years ago

Dear Professor, as i am looking for journal which does not charge anything for article. Hope this journal does not have any Article Processing Charges or Publication Fee. Clarify this please.

reply

SCImago Team

Melanie Ortiz 3 years ago

Dear user,
thank you for contacting us.
Sorry to tell you that SCImago Journal & Country Rank is not a journal. SJR is a portal with scientometric indicators of journals indexed in Elsevier/Scopus.
Unfortunately, we cannot help you with your request, we suggest you to visit the journal's homepage or contact the journal's editorial staff , so they could inform you more deeply.
You can see the updated journal's information just above .
Best Regards, SCImago Team

N

Nawaraj Sanjel 3 years ago

Dear / editor

What do you mean by
1 Coverage : 2011-2017 (cancelled)
and
2. coverage : 2013 ongoing

Regards,

–
Nawaraj

reply

SCImago Team

Elena Corera 3 years ago

Dear Nawaraj, thank you very much for your participation. Our data comes from Scopus/Elsevier, which offers an annual copy of their database. We understand that since the date indicated by Scopus/Elsevier the journal is no longer indexed in its database. While the citation window is still active, we can show indicators of the journal. Best Regards, SCImago Team

A

alhassan 4 years ago

Dear / editor
I need to ask about the difference between :

1. Coverage : 2011-2017 (cancelled)
and
2. coverage : 2013 ongoing

thanks

reply

P

Pham Viet Hung 4 years ago

I need IJAER manuscript (MS word file)

reply

A

Ann Vasyukova 4 years ago

You can publish a research article in your magazine? What are the requirements for the article?

Thank you.

Ann

reply

SCImago Team

Elena Corera 4 years ago

Dear Ann Vasyukova,

Please, check comments below.

Best regards,
SCImago Team

W

Weal 4 years ago

I'm wondering about the cost of submission and publishing, is it free?

reply

SCImago Team

Elena Corera 4 years ago

Dear Weal,

thank you very much for your comment, unfortunately we cannot help you with your request. We suggest you check author's instructions in journal website. You can find that information in SJR website https://www.scimagojr.com

Best Regards,
SCImago Team

W

What is the Impact Factor of IJAER ? 4 years ago

I am going to publish my research work in this journal. So, I need information on Imafact Factor.

reply

C

chris_rj 4 years ago

in coverage, it says cancelled since 2017.so dont send your manuscript.. moreover it indicates Q3 for this.. go for journals which hav Q1 and Q2..

SCImago Team

Elena Corera 4 years ago

Dear user, SCImago Journal and Country Rank uses Scopus data, our impact indicator is the SJR. Check our page to locate the journal. We suggest you consult the Journal Citation Report for other indicators (like Impact Factor) with a Web of Science data source. Best Regards, SCImago Team

P

Pham Cao Thang 4 years ago

is IJAER in year 2018 indexed by Scopus?

reply

SCImago Team

Elena Corera 4 years ago

Dear Pham CAo, the publication of articles of 2018 is not over yet (we are in September), and much less it has been possible to cite unpublished articles. The 2018 indicators will not be available until June 2019. We can not see what will happen in the future with this journal. SCImago receives the data from Scopus / Elsevier annually and does not have the authority to include, exclude or modify the data provided by Scopus. Best Regards, SCImago Team

N

Nader Farouk 4 years ago

I'd like to ask why journal coverage canceled.is something wrong with it

reply

SCImago Team

Elena Corera 4 years ago

Dear user,

thank you very much for your comment. Unfortunately, we cannot help you with your request, we suggest you to contact the journal directly.

Best Regards,
SCImago Team

S

Sulaiman Alfadul 4 years ago

International Journal of Applied Engineering Research is still in your web until now>

reply

C

chris_rj 4 years ago

see the coverage.. it says 2011 to 2017.. which means its no longer part of this database.. also it indicates Q3.. go for journals with Q1 and Q2

H

Hasan Saad 4 years ago

Dear Sir,
I have paper , I would like to publish it with you .
How can I submit ?
How much money do you take ?
How many days it will take for publish?

Yours Sincerely ,

reply

G

Giap 4 years ago

How many magazines International Journal of Applied Engineering Research a year?

reply

Elena Corera 4 years ago SCImago Team

Dear Giap, we suggest you contact the journal directly. Best Regards, SCImago Team

A **adnan** 4 years ago

good afternoon
it is very important for me knowing the impact factor of this journal

reply

H **Hasan Saad** 4 years ago

Dear Sir,
I have paper , I would like to publish it with you .
How much money do you take ?
How many days it will take for publish?
Do you have Scopus of Thomson Reuters?

Yours Sincerely ,

Elena Corera 4 years ago SCImago Team

Dear Adnan, SJR uses Scopus data, our impact indicator is the SJR. Check our page to locate the journal. We suggest you consult the Journal Citation Report for other indicators with a Web of Science data source. Best Regards, SCImago Team

S **slamet isworo** 4 years ago

please information, whether the International Journal of Applied Engineering Research including journal predatory. because I looked at BEALL'S LIST OF PREDATORY JOURNALS AND PUBLISHERS
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• International Journal of Advanced Engineering Research and Applications (IJA-ERA)
• International Journal of Advanced Engineering Research and Science (IJAERS)
• International Journal of Agriculture and Environmental Research (IJAER)
Please input and corrections

thank you
Best regards

reply

Fahruddin 4 years ago

thats true is International Journal of Applied Engineering Research at BEALL'S LIST OF PREDATORY JOURNALS AND PUBLISHERS

Elena Corera 4 years ago SCImago Team

Thanks for the info!

D **dwi cahyani ratna sari** 4 years ago

is IJAER in year 2018 indexed by Scopus?
Is IJAER in year 2018 Q3 ?

I really need the confirmation from the journal
thank you
best regards

reply

SCImago Team

Elena Corera 4 years ago

Dear Dwi, 2018 has not ended, therefore, not all articles in the journal have been published, nor many cited. It is impossible to know which quartile will be placed in 2018. Best Regards, SCImago Team

S

susan 4 years ago

Can any one comment about the (cancelled) coverage of this journal?

reply

SCImago Team

Elena Corera 4 years ago

Dear Susan, our data come from Elsevier, which offers an annual copy of your database. We understand that since the date indicated by Scopus the journal is no longer indexed in its database. Best Regards, SCImago Team

Y

Yemi 4 years ago

Today being 23rd July, 2018, what is the scopus-indexed status of this controversial journal?

reply

SCImago Team

Elena Corera 4 years ago

Dear Yemi, we suggest that you consult the Scopus database directly. Remember that the SJR is a static image of a database (Scopus) that changes daily. Best regards,

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SJR 2019
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Calculated on 01 May, 2017

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International Journal of Applied Engineering Research ISSN 0973-4562 Volume 12, Number 14 (2017) pp. 4264-4281
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Calculation Analysis of Power Losses on the Medium Voltage Feeders and Distribution Transformers

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[2]*Department of Energy Conversion, Politeknik Negeri Bandung (POLBAN), Jl. Gegerkalong Hilir, Ciwaruga, Bandung Barat, 40559, Indonesia.*

[2]*Orcid: 55604930700*

Abstract

With the increasing electric power demand, the power losses will also rise. Thus, its losses are need to be calculated accurately and become one of most important things that need to be considered in the expansion of electrical line.

This research served the method to calculate the power losses in medium voltage power distribution 20 kV includes with the result according to the load curve in every distribution transformer. The losses on the medium voltage line were calculated according to the current in the line, and the losses in transformer were calculated according to the loads those change every time. The calculated sample of feeder was taken from the power substation focused on UZB line. The loss calculations were also used by using the simulation, so that the calculations could be compared each other.

The loss result in the transformers had the biggest one, that was 5% of transformer capacity, and the biggest power loss in transformers was occurred in ALTA distribution transformer, as 5.8005% and the lowest was occurred in GKSI distribution transformer, as 0.3158%. Thus, the result could be considered to plan the electrical power distribution because they had some impact in investment.

Keywords: power loss, energy loss, medium voltage feeder, distribution transformer, distribution transformer

INTRODUCTION

To meet the electricity demand of society in a region, it is need a distribution system of plant to the consumers. The electric power distribution system that relates directly to consumers is contained in the distribution system. Therefore, the distribution system has an important role in the distribution of electrical energy to consumers.

In the distribution of electrical energy, the continuity of proper service is necessary to consumers. This will affect the reliability of system and lead to blackouts when the system reliability is not proper, so that the consumers will feel be aggrieved. To overcome this case, the system must expand the distribution network, and one of the criteria that must be met, such as high efficiency, without ignoring the economic aspect. The high efficiency will be achieved if the energy loss can be minimized. Currently, the company is expanding the distribution network system to improve the service needs due to increasing load, the losses that occur in the network distribution system must be taken into consideration, both in planning and in operation. It will affect the cost of investment. By knowing the power loss, an enabling research was carried out on the possibility of additional investments to reduce the losses.

On the basis for the ideas, it was intended to conduct the research on power losses in the distribution network system. Therefore, it was captured the calculation analysis of power losses in the feeder on the medium voltage side, including the distribution transformers.

LITERATURE REVIEW

The losses in distribution lines are caused by line conductor losses and transformer (copper and core) losses. The losses could be reduced as possible and could be estimated. They affect voltage profiles [1-34].

Generally it was used capacitor banks for improving power factors and reducing losses [35, 36]. However, they generated harmonics, although not so high for additional losses [37]. The unbalanced and location loads would affect the feeder losses and voltage drop [38]. The regulatory authorities' penalty system would ensure better service standards for customers [39]. Power losses were also occurred in renewable energy generation, such as wind farms [40-42]. Power losses were significantly occurred in power and distribution transformers and they should be reduced as well as harmonics and unbalances [43-77].

The objectives of research in this study were to investigate the power losses in the feeder at the substation taking into account the loading curve and to provide a recommendation to minimize the losses on the network. It was limited the scope of discussion, namely the research was only used one feeder that was originated from the substation and the power loss calculations of in the distribution transformers were core and copper losses.

The states of the art of research were to calculate the power losses in the medium distribution lines and in the medium voltage sides of distribution transformer copper as well as core losses. These computations were not only in rating condition, as usual where relatively simple, but as far as in real condition in sites according to the measurement results. The computation results were compared to the simulation results. Finally, they could be analyzed by those comparisons.

METHOD OF DISTRIBUTION SYSTEM POWER LOSS CALCULATION

There were some steps to undertake the problem analysis. The process of analysis in this study was divided into several stages described schematically and systematically as shown in Figure 1.

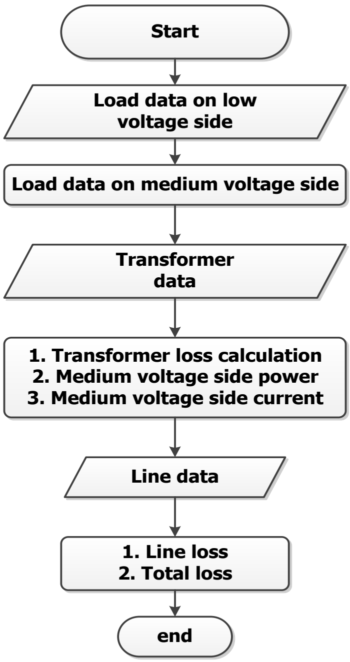

Figure 1. Flowchart of research

The next stage after the obtained data was necessary to perform data processing to determine the power losses on each phase for each distribution transformer. The steps of calculations can be described in Figure 2, which shows the power loss calculation steps along with the used formulae.

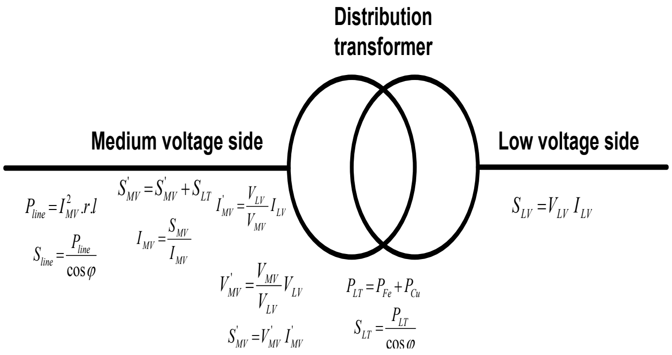

Figure 2. Steps of power loss calculations

The load data on the medium voltage side were obtained by the transformations of load parameter values on the low voltage sides and in the transformer rated voltage ratios.

$$I'_{MV} = \frac{V_{LV}}{V_{MV}} I_{LV} \tag{1}$$

$$V'_{MV} = \frac{V_{HV}}{V_{LV}} V_{LV} \tag{2}$$

$$S'_{MV} = V'_{MV}\, I'_{MV} \tag{3}$$

Where I_{MV} ', V_{MV} ', S_{MV} ', I_{MV}, V_{MV}, S_{MV}, V_{LV} were current load on the medium voltage side (A), voltage on the load side of medium voltage (V), power load on the medium voltage (kVA), current in the medium voltage side (A), voltage at 20 kV medium voltage (V), power at the side of medium voltage (kVA) and secondary 400 V voltage transformer (V) respectively.

The transformer capacity data and brands were acquired from the company, while the data regarding the amount of iron loss and copper loss of transformers were obtained by using the datasheets of transformers and the standard, where these losses were for the three-phase transformers.

If S_T, P_{Fe3ph}, P_{CU3ph} were capacity transformer (kVA), iron loss (watt) and copper loss (watt) respectively, the iron loss per phase (P_{Fe1ph}) was

$$P_{Fe1ph} = \frac{P_{Fe3ph}}{3} \tag{4}$$

the copper loss per phase (P_{Cu1ph}) was

$$P_{Cu1ph} = \frac{P_{Cu3ph}}{3} \tag{5}$$

the transformer nominal current (I_n)

$$I_n = \frac{S_T}{\sqrt{3}\, V_{MV}} \tag{6}$$

the resistance of copper per phase (R_{Cu})

$$R_{Cu} = \frac{P_{Cu1ph}}{I_n^2} \quad (7)$$

The transformer loss was calculated per phase at each distribution transformers and on any encumbrances. The iron losses were assumed to be constant, while the copper losses depended on the load or current. The iron loss was as P_{Fe1ph}, so that the loss of copper was

$$P_{Cu} = I_{MV}^{'2} R_{Cu} \quad (8)$$

The total transformer losses (P_{TL}) was

$$P_{TL} = P_{Fe1ph} + P_{cu1ph} \quad (9)$$

The apparent transformers total loss (kVA) was

$$S_{LT} = \frac{P_{LT}}{\cos\varphi} \quad (10)$$

The transformer efficiency was

$$\eta = \frac{P}{P + P_{TL}} x100\% \quad (11)$$

The apparent power on the medium voltage side (kVA) was

$$S_{MV} = S_{MV}^{'} + S_T \quad (12)$$

The current in medium voltage side was

$$I_{MV} = \frac{S_{MV}}{V_{MV}} \quad (13)$$

The cable or conductor data were obtained from the company, including the type, length, resistance and reactance. The active power loss of conductors was

$$P_{LL} = I_{MV}^2 \, r \, l \quad (14)$$

The apparent power loss of conductors was

$$S_{LL} = \frac{P_{LL}}{\cos\varphi} \quad (15)$$

The efficiency line was

$$\eta_{LL} = \frac{P_{MV} - P_{LL}}{P_{MV}} x100\% \quad (16)$$

The total losses were the transformer losses and distribution line loss between X and Y as

$$P_{LTot} = P_{LT} + P_{LL} \quad (17)$$

The power transformer losses could be written by the following equation as

$$P_{LT} = P_{Fe} + P_{Cu} \quad (18)$$

DATA, RESULTS AND DISCUSSION

The used networks in the calculation of power losses were the medium voltage of UZB feeder, using the medium voltage **cable**, as shown in Figure 3.

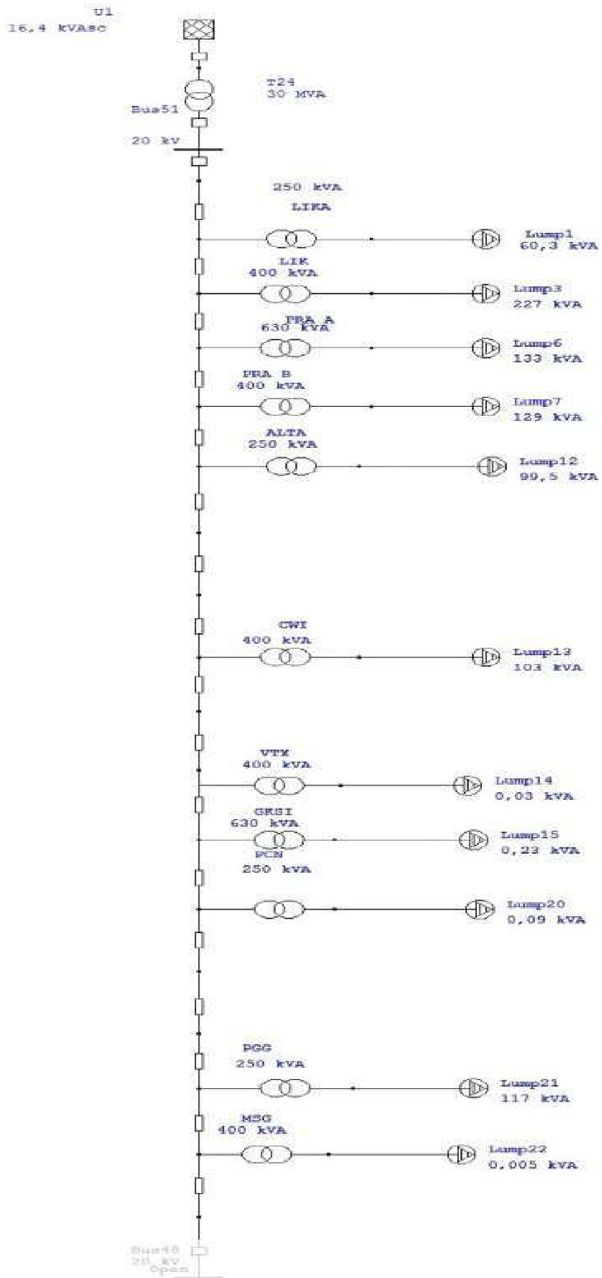

Figure 3. Network system feeder of UZB

Table 1 list the data of conductor feeder UZB that be investigated. The longest line was between PGG and OGA, as 2,402 m and the shortest one was between PRA B and ALTA as 32 m, where the resistances were 0.124 Ω/km for all feeder conductors.

Table 1: Data of conductor feeder UZB

No	Distribution transformer		Length (m)
	Beginning	End	
1	H	LIKA	411
2	LIKA	LIK	347
3	LIK	PRA A	1070
4	PRA A	PRA B	60
5	PRA B	ALTA	32
6	ALTA	CWI	254
7	CWI	VTX	483
8	VTX	GKSI	86
9	GKSI	PCN	409
10	PCN	MSG	273
11	MSG	PGG	275
12	PGG	OGA	2402

The distribution transformer data were necessary to calculate power losses in the distribution transformers for each load condition. The distribution transformer data can be shown in Table 2. The table lists that the highest transformer capacity was 1 300 kVA, as PRA A, GKSI, MSG and OGA distribution transformers. The copper resistances and the power factors were assumed 0.02 Ω and 0.8 lagging respectively.

Table 2: Distribution transformer data for feeder UZB

No	Distribution transformer	Transformer capacity (kVA)	Core loss (Watt)
1	LIKA	250	600
2	LIK	400	930
3	PRA A	630	1300
4	PRA B	400	930
5	ALTA	250	600
6	CWI	400	930
7	VTX	400	930
8	GKSI	630	1300
9	PCN	250	600
10	MSG	630	1300
11	PGG	250	600
12	OGA	630	1300

The load data were the amount of use of electrical load (current), which were obtained by the measurements every distribution transformer. The load data can be seen in Table 3 for LIKA distribution transformer. The highest currents were occurred in 18:00 and 19:00 o'clocks, as 103 A and 104 A for phase-S, 91 A and 92 A for load data phase-R and phase-T, respectively.

Table 3: Measurement of distribution transformer of LIKA

Hours	Phase Current (A)			Phase Voltage (V)		
	R	S	T	R	S	T
0:00	87	95	83	223	223	224
1:00	84	96	84	222	222	221
2:00	81	93	81	224	224	223
3:00	80	92	80	225	225	224
4:00	82	94	82	226	226	225
5:00	79	91	79	224	224	223
6:00	83	95	83	226	226	225
7:00	81	93	81	228	228	227
8:00	79	91	79	227	227	226
9:00	82	94	82	226	225	224
10:00	85	97	85	225	224	223
11:00	87	99	87	227	226	225
12:00	87	99	87	227	226	225
13:00	87	99	87	227	226	225
14:00	89	101	89	228	227	225
15:00	85	97	85	224	222	225
16:00	88	100	88	225	223	222
17:00	86	98	86	227	225	224
18:00	91	103	91	231	231	231
19:00	92	104	92	231	231	231
20:00	91	99	87	228	228	227
21:00	86	94	82	229	229	228
22:00	92	100	88	230	230	229
23:00	90	98	86	225	225	224

Table 4 lists the load data for LIK distribution transformer. The highest currents were occurred in 18:00 and 19:00 o'clocks, as 315 A and 316 A for phase-S, 350 A and 351 A for phase-R and 389 A and 390 A for phase-T, respectively.

Table 4: Load data of distribution transformer LIK

Hours	Phase Current (A)			Phase Voltage (V)		
	R	S	T	R	S	T
0:00	346	307	381	223	222	221
1:00	343	308	382	220	219	218
2:00	340	305	379	221	220	219
3:00	339	304	378	222	221	220
4:00	341	306	380	223	222	221
5:00	338	303	377	219	218	217
6:00	342	307	381	220	219	218
7:00	340	305	379	221	220	219
8:00	338	303	377	218	217	216
9:00	341	306	380	216	215	214
10:00	344	309	383	214	213	212
11:00	346	311	385	217	216	215
12:00	346	311	385	217	216	215
13:00	346	311	385	217	216	215
14:00	348	313	387	217	216	215
15:00	344	309	383	217	217	211
16:00	347	312	386	225	226	226
17:00	345	310	384	226	227	227
18:00	350	315	389	212	215	215
19:00	351	316	390	228	228	228
20:00	350	311	385	222	221	220
21:00	345	306	380	223	222	221
22:00	351	312	386	224	223	222
23:00	349	310	384	222	221	220

Table 5 lists the load data for PRA A distribution transformer. The highest currents were occurred in 18:00 and 19:00 o'clocks, as 214 A and 219 A for phase-S, 207 A and 208 A for phase-R and 195 A and 196 A for phase-T, respectively.

Table 5: Load data of distribution transformer PRA A

Hours	Phase Current (A)			Phase Voltage (V)		
	R	S	T	R	S	T
0:00	203	211	187	217	221	222
1:00	200	212	188	215	219	220
2:00	197	209	185	216	220	221
3:00	196	208	184	217	221	222
4:00	198	210	186	218	222	223
5:00	195	207	183	214	218	219
6:00	199	211	187	216	220	221
7:00	197	209	185	217	221	222
8:00	195	207	183	215	219	220
9:00	198	210	186	214	218	219
10:00	201	213	189	213	217	218
11:00	203	215	191	216	220	221
12:00	203	215	191	216	220	221
13:00	203	215	191	216	220	221
14:00	205	217	193	218	222	223
15:00	201	213	189	225	222	223
16:00	204	216	192	229	229	229
17:00	202	214	190	229	229	229
18:00	207	219	195	229	229	229
19:00	208	220	196	222	221	227
20:00	207	215	191	215	217	214
21:00	202	210	186	219	223	224
22:00	208	216	192	220	224	225
23:00	206	214	190	216	220	221

International Journal of Applied Engineering Research ISSN 0973-4562 Volume 12, Number 14 (2017) pp. 4264-4281

Table 6 lists the load data for PRA B distribution transformer. The highest currents were occurred in 18:00 and 19:00 o'clocks, as 193 A and 194 A for phase-S, 184 A and 185 A for phase-R and 216 A and 217 A for phase-T, respectively. In this distribution transformer, the current in phase-T was higher than that in phase-S.

Table 6: Load data of distribution transformer PRA B

Hours	Phase Current (A)			Phase Voltage (V)		
	R	S	T	R	S	T
0:00	180	185	208	226	227	225
1:00	177	186	209	222	223	221
2:00	174	183	206	223	224	222
3:00	173	182	205	224	225	223
4:00	175	184	207	225	226	224
5:00	172	181	204	220	221	219
6:00	176	185	208	222	223	221
7:00	174	183	206	223	224	222
8:00	172	181	204	222	223	221
9:00	175	184	207	221	222	220
10:00	178	187	210	220	221	219
11:00	180	189	212	224	225	223
12:00	180	189	212	224	225	223
13:00	180	189	212	224	225	223
14:00	182	191	214	226	227	225
15:00	178	187	210	217	219	216
16:00	181	190	213	223	221	222
17:00	179	188	211	225	223	224
18:00	184	193	216	231	231	231
19:00	185	194	217	231	231	231
20:00	184	189	212	231	231	231
21:00	179	184	207	223	224	222
22:00	185	190	213	225	226	224
23:00	183	188	211	224	225	223

Table 7 lists the load data for ALTA distribution transformer. The highest currents were occurred in 18:00 and 19:00 o'clocks, as 133 A and 134 A for phase-S, 126 A and 127 A for phase-R and 193 A and 194 A for phase-T, respectively. In this distribution transformer, the current in phase-T was higher than that in phase-S.

Table 7: Load data of distribution transformer ALTA

Hours	Phase Current (A)			Phase Voltage (V)		
	R	S	T	R	S	T
0:00	122	129	182	231	231	231
1:00	119	126	186	229	229	229
2:00	116	123	183	230	230	230
3:00	115	122	182	231	231	231
4:00	117	124	184	232	232	232
5:00	114	121	181	230	230	230
6:00	118	125	185	231	231	231
7:00	116	123	183	231	231	231
8:00	114	121	181	229	229	229
9:00	117	124	184	227	227	227
10:00	120	127	187	225	225	225
11:00	122	129	189	228	228	228
12:00	122	129	189	229	229	229
13:00	122	129	189	230	230	230
14:00	124	131	191	231	231	231
15:00	120	127	187	215	214	206
16:00	123	130	190	225	220	215
17:00	121	128	188	229	228	220
18:00	126	133	193	231	231	231
19:00	127	134	194	231	231	231
20:00	125	132	192	231	231	231
21:00	120	127	187	232	232	232
22:00	126	133	193	233	233	233
23:00	124	131	191	230	230	230

Table 8 lists the load data for CWI distribution transformer. The highest currents were occurred at 18:00 o'clock as 205 A, 180 A and 200 A for phase R, S and T respectively, and at 19:00 o'clocks, as 192 A, 169 A and 187 A for phase-S, 126 A and 127 A for phase-R and 193 A and 194 A for phase-T, respectively. In this distribution transformer, the current in phase-R was higher than that in phase-S.

Table 8 Load data of distribution transformer CWI

Hours	Phase Current (A)			Phase Voltage (V)		
	R	S	T	R	S	T
0:00	125	108	120	214	213	212
1:00	125	108	120	215	215	215
2:00	128	113	123	216	216	216
3:00	129	114	124	216	216	216
4:00	127	112	122	216	216	216
5:00	130	115	125	215	215	215
6:00	180	165	175	215	215	215
7:00	180	165	175	215	215	215
8:00	184	169	179	209	209	209
9:00	190	170	185	214	214	214
10:00	196	177	191	218	218	218
11:00	173	150	168	215	215	215
12:00	170	147	165	218	218	218
13:00	167	142	162	218	218	218
14:00	160	138	155	218	218	218
15:00	158	126	153	207	209	207
16:00	168	143	163	228	228	228
17:00	187	173	182	220	220	220
18:00	205	180	200	228	228	228
19:00	192	169	187	228	228	228
20:00	198	179	193	228	228	228
21:00	196	177	191	228	228	228
22:00	176	153	171	225	225	225
23:00	144	128	139	225	225	225

Table 9 lists the load data for VTX distribution transformer. The high currents, for all R, S and T phases, were distributed in some hours, not only on one or two hour(s). The currents those had higher values than 150 ampere were occurred at 00:00, 01:00, 02:00, 03:00, 05:00, 09:00, 11:00, 18:00 and 22:00, as well as for nearly 150 ampere it was at 23:00 on each phase. Thus, the time range where the current values were high was from 22:00 until 03:00. This case was reasonable because the feeder supplied almost the industry.

Table 9 Load data of distribution transformer VTX

Hours	Phase Current (A)			Phase Voltage (V)		
	R	S	T	R	S	T
0:00	**171**	**173**	**221**	223.66	225.72	225.32
1:00	**155**	**161**	**203**	221.71	223.65	223.34
2:00	**163**	**167**	**212**	221.90	223.82	223.38
3:00	**153**	**159**	**203**	223.58	225.48	224.93
4:00	134	140	181	223.57	225.47	224.92
5:00	**151**	**156**	**197**	221.14	223.12	222.82
6:00	111	118	157	223.52	225.44	224.98
7:00	126	127	172	224.10	225.96	225.46
8:00	136	133	179	221.87	223.87	223.36
9:00	**150**	**151**	**193**	220.59	222.57	222.10
10:00	118	122	162	219.52	221.50	221.04
11:00	**154**	**152**	**196**	219.94	221.99	221.54
12:00	121	124	166	220.42	222.43	221.94
13:00	121	124	166	219.95	221.95	221.54
14:00	132	131	174	220.25	222.32	221.89
15:00	137	135	179	219.97	222.11	221.64
16:00	123	122	167	221.78	223.79	223.33
17:00	129	130	171	222.12	224.20	223.85
18:00	**154**	**156**	**197**	220.07	222.37	222.22
19:00	127	132	172	220.01	222.35	222.13
20:00	128	132	173	220.48	222.71	222.50
21:00	126	131	172	221.93	224.11	223.95
22:00	**160**	**160**	**204**	223.11	225.15	224.81
23:00	**147**	**149**	**193**	222.71	224.69	224.28

Table 10 lists the load data for GKSI distribution transformer. The highest currents were occurred at 14:00 o'clock as 288.2, 308.6 and 288.4 amperes for phase R, S and T respectively, and at 16:00 o'clocks, as 289, 308.4 and 288.4 amperes for phase-S, phase-R and phase-T, respectively. Thus, in this distribution transformer, the high currents were ocurred in 14:00 and 16:00 o'clocks in ranges. This case was not usual than other ones.

Table 10: Load data of distribution transformer GKSI

Hours	Phase Current (A)			Phase Voltage (V)		
	R	S	T	R	S	T
0:00	265.4	297.4	277.4	223.55	225.57	225.13
1:00	277.2	298.8	280.0	221.62	223.52	223.12
2:00	262.2	282.6	263.8	221.94	223.79	223.28
3:00	253.6	273.6	254.0	223.30	225.24	224.69
4:00	254.4	274.8	254.8	223.41	225.33	224.79
5:00	193.8	210.4	193.8	221.35	223.30	222.87
6:00	204.4	220.6	202.2	223.25	225.13	224.70
7:00	199.0	214.4	195.8	224.31	226.17	225.63
8:00	193.2	208.2	189.8	222.05	223.97	223.41
9:00	232.6	253.0	232.8	220.96	222.87	222.29
10:00	255.4	273.4	253.6	219.53	221.50	220.94
11:00	274.2	294.2	274.4	219.67	221.68	221.20
12:00	282.6	302.4	283.0	220.53	222.48	221.94
13:00	280.8	302.4	281.0	220.00	221.98	221.48
14:00	288.2	308.6	288.4	220.17	222.19	221.65
15:00	285.2	305.8	285.6	220.18	222.20	221.67
16:00	289.0	308.4	288.4	220.81	222.78	222.23
17:00	278.8	299.8	279.2	222.32	224.33	223.88
18:00	274.6	299.8	279.2	220.02	222.27	222.11
19:00	280.0	305	284.2	219.87	222.12	221.96
20:00	277.8	303	281.4	220.19	222.41	222.19
21:00	274.0	297.8	276.6	221.83	224.00	223.68
22:00	282.6	306.4	285.2	223.76	225.78	225.41
23:00	277.6	298.2	279.2	222.99	224.89	224.45

Table 11 lists the load data for PCN distribution transformer. The highest currents were occurred at 00:00 o'clock as 306.8, 319.2 and 358.4 amperes for phase R, S and T respectively, and at 01:00 o'clocks, as 297.2, 310.8 and 350.0 ampere for phase-S, phase-R and phase-T, respectively. Thus, in this distribution transformer, the high currents were ocurred in 00:00 and 01:00 o'clocks in ranges. This case was not usual than other ones.

Table 11: Load data of distribution transformer PCN

Hours	Phase Current (A)			Phase Voltage (V)		
	R	S	T	R	S	T
0:00	**306.8**	**319.2**	**358.4**	223.94	222.25	224.26
1:00	**297.2**	**310.8**	**350.0**	225.22	223.60	225.43
2:00	278.4	292.8	326.0	222.57	221.08	222.89
3:00	294.4	308.8	343.6	223.65	222.24	223.99
4:00	256.4	272.4	307.6	224.29	222.87	224.59
5:00	237.2	245.2	284.8	222.67	221.14	223.04
6:00	141.2	132.8	185.6	223.20	221.62	223.46
7:00	175.6	170.4	226.4	225.06	223.72	225.46
8:00	169.6	164.0	218.4	223.94	222.43	224.20
9:00	132.0	127.6	173.2	222.45	221.00	222.83
10:00	146.8	153.6	193.2	221.01	219.60	221.34
11:00	139.2	144.8	184	220.46	218.93	220.74
12:00	139.6	148.4	187.6	221.25	219.77	221.59
13:00	150.0	160.4	198.8	221.28	219.81	221.67
14:00	143.2	151.6	190.4	221.07	219.52	221.40
15:00	124.4	126.8	166.4	221.31	219.75	221.66
16:00	143.2	151.2	191.6	221.19	219.60	221.50
17:00	149.6	150.8	197.6	223.53	221.96	223.80
18:00	134.4	122.8	171.2	221.75	219.73	221.82
19:00	132.4	120.8	168.8	221.29	219.20	221.31
20:00	135.2	123.6	172.4	221.72	219.70	221.82
21:00	142.8	130.4	183.6	222.48	220.50	222.60
22:00	150.8	138.8	191.6	223.97	222.13	224.12
23:00	155.2	144.4	197.6	224.45	222.86	224.65

Table 12 lists the load data for PGG distribution transformer. The highest currents were occurred at 18:00 o'clock as 146, 172 and 233 amperes for phase R, S and T respectively, and at 19:00 o'clocks, as 147 A, 173 A and 234 A for phase-S, phase-R and phase-T, respectively.

Table 12: Load data of distribution transformer PGG

Time	Phase Current (A)			Phase Voltage (V)		
	R	S	T	R	S	T
0:00	142	164	225	221	218	215
1:00	139	165	226	219	216	213
2:00	136	162	223	220	217	214
3:00	135	161	222	221	218	215
4:00	137	163	224	222	219	216
5:00	134	160	221	218	215	212
6:00	138	164	225	219	216	213
7:00	136	162	223	220	217	214
8:00	134	160	221	219	216	213
9:00	137	163	224	218	215	212
10:00	140	166	227	217	214	211
11:00	142	168	229	220	217	214
12:00	142	168	229	220	217	214
13:00	142	168	229	220	217	214
14:00	144	170	231	225	222	214
15:00	140	166	227	230	231	231
16:00	143	169	230	229	229	227
17:00	141	167	228	230	230	228
18:00	**146**	**172**	**233**	231	231	231
19:00	**147**	**173**	**234**	231	231	231
20:00	146	168	229	220	217	214
21:00	141	163	224	222	219	216
22:00	147	169	230	223	220	217
23:00	145	167	228	220	217	214

Table 13 lists the load data for MSG distribution transformer. The high currents were occurred at the range of 8:00 until 15:00 o'clocks, where the current values between 45 and 71 amperes.

Table 13: Load data of distribution transformer MSG

Hours	Phase Current (A)			Phase Voltage (V)		
	R	S	T	R	S	T
0:00	29	25	23	222.32	224.34	222.84
1:00	28	27	23	221.07	222.89	221.45
2:00	26	25	22	222.40	224.36	222.78
3:00	27	25	22	222.74	224.72	222.96
4:00	27	25	22	220.87	222.75	221.18
5:00	27	26	21	221.93	223.86	222.27
6:00	27	25	21	223.80	225.75	223.86
7:00	26	24	21	221.89	223.92	222.18
8:00	**52**	**62**	**53**	220.71	222.69	221.02
9:00	**46**	**58**	**48**	219.23	221.30	219.45
10:00	**59**	**71**	**62**	218.72	220.86	219.06
11:00	**47**	**53**	**48**	219.82	221.89	220.16
12:00	**49**	**54**	**49**	219.56	221.67	219.91
13:00	**50**	**56**	**52**	219.46	221.63	219.86
14:00	**45**	**56**	**50**	219.68	221.87	220.19
15:00	**45**	**55**	**48**	219.70	221.88	220.20
16:00	25	22	22	221.77	223.95	222.23
17:00	25	24	22	219.38	221.77	220.47
18:00	27	24	21	219.05	221.42	220.16
19:00	28	26	19	219.46	221.83	220.53
20:00	28	25	20	220.80	223.08	221.74
21:00	28	24	21	222.57	224.68	223.44
22:00	29	25	22	222.99	225.02	223.63
23:00	28	25	22	222.32	224.34	222.84

Table 14 lists the load data for OGA distribution transformer. The highest currents were occurred at 19:00 o'clock as 463 A, 530 A and 568 A for phase R, S and T respectively, for phase-S, phase-R and phase-T, respectively.

Table 14: Load data of distribution transformer OGA

Time	Phase Current (A)			Phase Voltage (V)		
	R	S	T	R	S	T
0:00	458	521	559	218	218	218
1:00	455	522	560	215	215	215
2:00	452	519	557	216	218	216
3:00	451	518	556	217	219	217
4:00	453	520	558	218	220	218
5:00	450	517	555	215	217	215
6:00	454	521	559	217	215	217
7:00	452	519	557	218	216	218
8:00	450	517	555	216	214	216
9:00	453	520	558	215	213	215
10:00	456	523	561	214	212	214
11:00	458	525	563	217	215	217
12:00	458	525	563	217	215	217
13:00	458	525	563	217	215	217
14:00	460	527	565	219	217	219
15:00	456	523	561	200	204	211
16:00	459	526	564	215	218	215
17:00	457	524	562	216	219	216
18:00	**462**	**529**	**567**	213	210	206
19:00	**463**	**530**	**568**	220	210	213
20:00	**462**	**525**	**563**	222	222	218
21:00	457	520	558	224	224	224
22:00	463	526	564	225	225	225
23:00	461	524	562	220	220	220

Power Loss Calculation on feeder of UZB

On the distribution transformer of ALTA, on 0:00 o'clock, the load data of low voltage side were I_{TR} and V_{TR} as 122 A and 231 V respectively. Thus, the load data of medium voltage side are shown in Table 15.

Table 15: The medium quantity parameters

Parameter	Quantities
I_{TM}'	2.44
V_{TM}'	11 550
S_{TM}'	28.182 kVA
P_{TM}'	22.5465 kW

The distribution transformator data of ALTA were K_{transf}, $P_{Fe3phase}$ and R_{Cu} as 250 kVA, 600 watt and 0.02 Ω respectively. Therefore, the iron loss per phase was 200 watt and the core resistance was 666,667 Ω.

The transformer copper loss at the loading $P_{Cu1phase}$ was 0.119072 watt. The transformer iron loss per phase was 200.014 watt. Therefore, the distribution transformer loss was 200.223 watt. Finally, the apparent power loss was 250.028 VA and the efficiency, based on the apparent loss, was 0.88808%.

The apparent power on the medium voltage side S_{TM} was 28.43215 kVA. While, the current on the medium voltage side I_{TM} was 2.4616 A.

The line data between PRA and ALTA were medium voltage power cable, 0.032 km and 0.14 Ω/km. Therefore, the line loss between PRA and ALTA was 0.02715 watt, or 0.0339 VA or 0.00012% of apparent power. The total loss between PRA and ALTA was 200.14615 watt or 250.18 VA.

Table 16 shows the values of power losses in the distribution transformers for feeder UZB. There were not all power losses of transformers could be calculated, because there are some distribution transformers owned by the customer or commonly called the medium voltage customers on UZB feeder.

If a transformer has medium voltage status, then the company only provide power only to the customer and can not see how much power is used on the transformer.

Table 16: Distribution transformer losses on feeder UZB in one day

Distribution transformer	Transformer loss (kW)	Transformer capacity (kVA)	Transformer loss (%)
LIKA	15.0048	250	5.7378
LIK	23.3221	400	5.2830
PRA A	32.52431	630	4.7162
PRA B	23.27215	400	5.4818
ALTA	15.0132	250	5.8005
CWI	23.2651	400	5.2162
VTX	23.25	400	0.3812
GKSI	32.5	630	0.3158
PCN	15	250	0.3827
PGG	15.0197	250	5.4478
MSG	23.25	400	0.3812
OGA	32.6592	630	4.5184

To know the values of power losses based on the calculations in the feeder of UZB on any loading for one day, it can be seen in Table 17. The table shows that the total loss as 11.96 kwatt and above were occurred at the range of 16:00 until

22:00 o'clocks. This case was reasonable due to, in this time, usually it was in peak load conditions. Otherwise, the highest percentage was occurred at 5:00 o'clocks, due to in this time, it was the lowest loss.

Table 17: Calculation of losses on feeder UZB in one day

Hours	Calculating loads (kWatt)	Calculating transformer loss (kWatt)	Calculating line loss (kWatt)	Total loss (kWatt)	Loss (%)
0:00	941.4	10.96	0.95	11.92	1.27
1:00	929.7	10.96	0.94	11.90	1.28
2:00	925.7	10.96	0.94	11.90	1.29
3:00	926.4	10.96	0.94	11.90	1.28
4:00	936.8	10.96	0.95	11.91	1.27
5:00	913.0	10.96	0.92	11.89	1.30
6:00	958.2	10.96	0.97	11.93	1.24
7:00	954.6	10.96	0.97	11.93	1.25
8:00	939.1	10.96	0.95	11.91	1.27
9:00	949.3	10.96	0.96	11.92	1.26
10:00	960.3	10.96	0.97	11.94	1.24
11:00	966.0	10.96	0.98	11.94	1.24
12:00	966.0	10.96	0.98	11.94	1.24
13:00	964.4	10.96	0.98	11.94	1.24
14:00	974.9	10.96	0.99	11.95	1.23
15:00	930.9	10.96	0.94	11.91	1.28
16:00	984.8	10.96	0.996	11.96	1.21
17:00	992.1	10.96	1.00	11.97	1.21
18:00	1009.8	10.96	1.02	11.99	1.19
19:00	1021.6	10.96	1.03	11.997	1.17
20:00	1003.8	10.96	1.02	11.98	1.19
21:00	989.9	10.96	1.00	11.965	1.21
22:00	1004.2	10.96	1.02	11.98	1.19
23:00	966.9	10.96	0.98	11.94	1.24

Table 18 lists the results of loss simulation in the feeder of UZB. The total losses those higher than 12 kwatt were occurred in the ranges from 11:00 until 14:00 and from 16:00 until 23:00. Nevertheless, the latter was significantly higher than the former. This case was reasonable due to, in the latter time, it was usually peak load occurred.

Table 18: Simulation of losses on feeder UZB in one day

Time	Simulating loads (kWatt)	Simulating transformer loss (kWatt)	Simulating line loss (kWatt)	Total loss (kWatt)	Loss (%)
0:00	987.4	11	1	12	1.22
1:00	975.4	10.7	0.9	11.6	1.19
2:00	970.4	10.7	0.9	11.6	1.20
3:00	972.4	10.7	0.9	11.6	1.19
4:00	981.3	10.9	1	11.9	1.21
5:00	957.3	10.3	0.9	11.2	1.17
6:00	1005.2	10.8	1	11.8	1.17
7:00	1000.3	10.8	1	11.8	1.18
8:00	984.3	10.5	1	11.5	1.17
9:00	994.3	10.5	1	11.5	1.16
10:00	1005.4	10.6	1	11.6	1.15
11:00	1011.3	11.1	1	12.1	1.20
12:00	1011.3	11.1	1	12.1	1.20
13:00	1009.3	11.1	1	12.1	1.20
14:00	1021.3	11.5	1	12.5	1.22
15:00	977.3	10.5	0.9	11.4	1.17
16:00	952.3	11.6	1	12.6	1.32
17:00	1040.3	11.5	1.1	12.6	1.21
18:00	1055.3	11.5	1.1	12.6	1.20
19:00	1069.3	12.1	1.1	13.2	1.23
20:00	1051.3	11.7	1.1	12.8	1.22
21:00	1037.3	11.2	1.1	12.3	1.19
22:00	1050.3	11.9	1.1	13	1.24
23:00	1013.3	11.4	1	12.4	1.22

Figure 4 shows the chart of load comparison between the calculation and the simulation results. Although experienced little difference between them, both charts had similar behavior, where the peak load range was from 16:00 until 20:00.

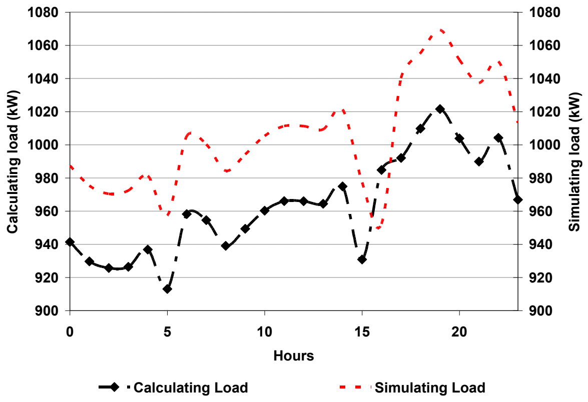

Figure 4: Load comparison charts between the calculation and simulation

Based on the chart in Figure 4, the full load was occurred at 19:00 as 1021.592 watt. Nevertheless, it is shown in the simulation, it was occurred at 19.00 as 1069.29 watt.

Figure 5 shows the chart of transformer loss comparison between the calculation and the simulation results. Although experienced very small difference between them, both charts had similar behavior, where the peak load range was from 16:00 until 20:00.

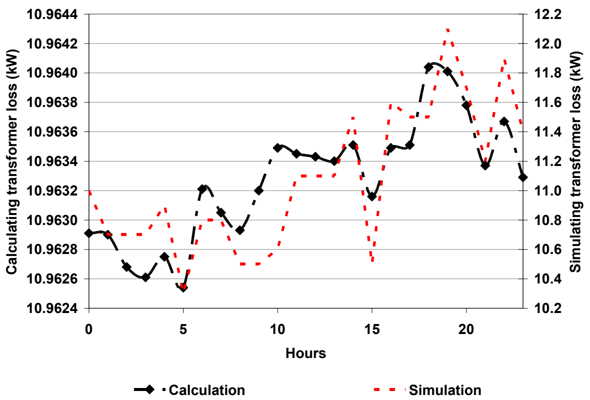

Figure 5: Transformer loss comparison charts between the calculation and simulation

From the calculation results, it was obtained by the average distribution transformer losses during the first day amounted to 10.96 kW. While the results of simulation was 11.06 kW for the same load condition. Thus, the difference between the calculation and the simulation was 0.1 kW.

Figure 6 shows the chart of line loss comparison between the calculation and the simulation results. Although experienced very small difference between them, both charts had similar behavior, where the peak load range was from 16:00 until 21:00.

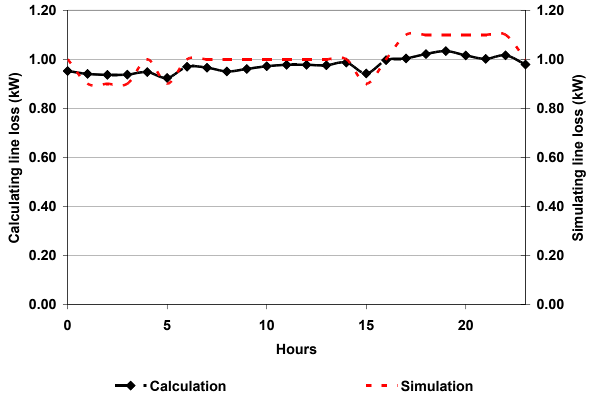

Figure 6: Line loss comparison charts between the calculation and simulation

Figure 7 shows the chart of total line loss comparison between the calculation and the simulation results. This loss consisted of both transformer loss and line loss. Although experienced very small difference between them, both charts had similar behavior, where the peak load range was from 16:00 until 21:00.

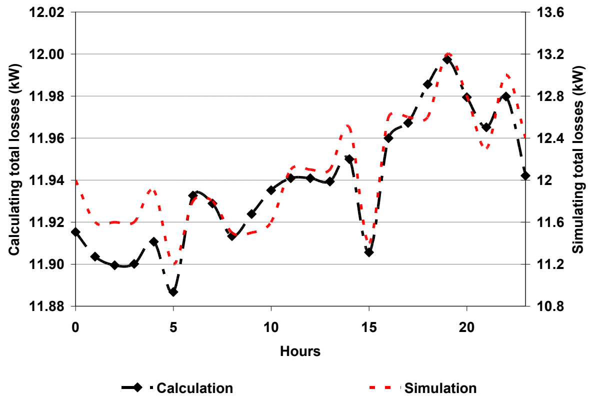

Figure 7: Total line loss comparison charts between the calculation and simulation

The line average power loss during one was 0.97 kW. While, the results of simulation for the same feeder and same load was obtained as 1 kW. Thus, the difference between the calculation and simulation results was equal to 0.03 kW.

From the tables, it is shown that the power losses in the transformers and the lines followed the shape of curve load. Thus, the greater the load, the power losses would be greater.

From the calculation results, it was obtained the average power losses, during one day, amounted to 11.93 kW. While, the results of simulation, for the case of feeders with the same load condition was obtained the yield of 12.07 kW. Thus, the difference between the calculation and the simulation was 0.13 kW.

For the energy loss in the feeder UZB during one day was obtained by the calculation amounted to 298.42 kWh, and for one month was 8.96 MWh.

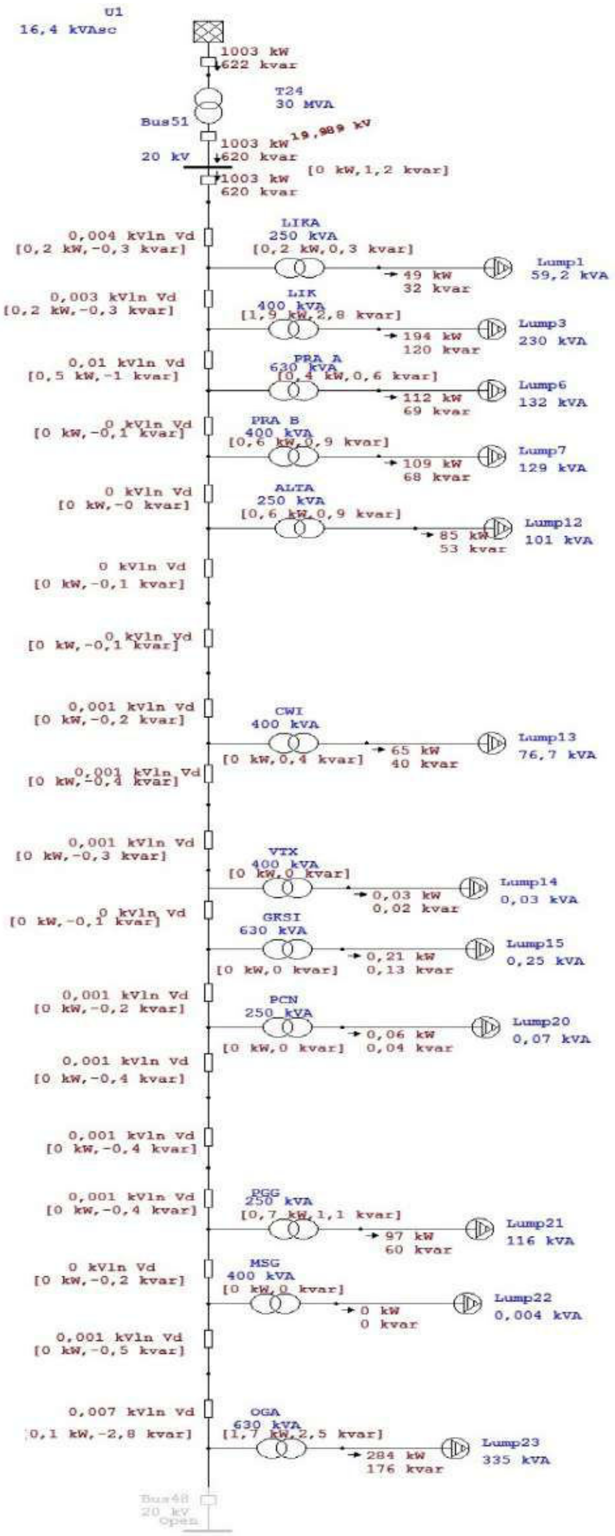

Figure 8: The load simulation results

CONCLUSION

From the calculation results, it was obtained that power losses in the conductor had little value, to the line feeder UZB, which was 0.48 kW. This was caused by the used conductor of UZB feeder had the small resistance of 0.124 Ω/km, and the distance between distribution transformers was short, under 1 km.

While, the transformer power losses had considerable value, above 5% of transformer capacity. The greatest power loss was in the transformer of ALTA distribution transformer, as 5.8005% and the lowest was occurred in GKSI distribution transformer, as 0.3158%.

The maximum limit of losses to be achieved by the company was 10% for the no-load loss and + 5% for the total loss. According to the total calculation, the loss in the transformer had met the standard as 5%.

By the calculation result, it was obtained the feeder power loss for 1 day amounted to 11.93 kW. While, for same feeder and same load condition, the result of simulation was obtained as 12.07 kW. Thus, the difference between the calculation and the simulation power was 0.13 kW.

By the calculation results, it was obtained the transformer loss for 1 day amounted to 10.96 kW. While, for same feeder and same load condition, the simulation result was obtained the yield of 11.06 kW. Thus, the difference between the calculation and the simulation powers was 0.1 kW.

The line power loss during the one day was 0.97 kW. While, for same feeder and same load condition, the result of simulation was obtained as 1 kW. Thus, the difference between the calculation and the simulation was equal to 0.03 kW.

The feeder UZB energy loss during the one day was obtained by the calculation amounted to 298.42 kWh, and for one month was 8.96 MWh.

The losses contained in the line feeder of UZB were line loss and distribution loss. Furthermore, they also were identical to energy losses.

On the simulation, it could be known that the power equilibrium on the medium voltage network system, has been met. It can be seen that the source of power supply was 1003 kW and 620 kVAR, and the power on the load was 995.3 kW and 618.19 kVAR, the loss power in the transformer was 11.06 kW and 9.5 kVAR, and the loss power in the line was 1kW and - 7.8 kVAR.

A recommendation for improvement, it should be advised to do an addition of new substation with larger capacity. Furthermore, it could be changed the type of cable to be larger on the cross-sectional area of conductor. Finally, it should be advised to re-line or re-setting the distance between distribution transformers.

To obtain the power loss at medium voltage distribution network more rigorous, it should be considered other loss factors, such as inductance, leakage current due to medium voltage on the line, and so forth.

ACKNOWLEDGMENTS

We would like to express the deepest appreciation to The State Electric Company APJ UB which has supported to provide the data.

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