YAYASAN BRATA BHAKTI DAERAH JAWA TIMUR
UNIVERSITAS BHAYANGKARA SURABAYA
LEMBAGA PENELITIAN DAN PENGABDIAN PADA MASYARAKAT
(LPPM)
Kampus : Jl. A. Yani 114 Surabaya Telp. 031 - 8285602, 8291055, Fax. 031 - 8285601

SURAT KETERANGAN

Nomor: Sket/ 43/I/2023/LPPM/UBHARA

Kepala Lembaga Penelitian dan Pengabdian kepada Masyarakat (LPPM) Universitas Bhayangkara Surabaya menerangkan bahwa:

Nama : Dr. Amirullah, ST, MT.
NIP : 197705202005011001
NIDN : 0020057701
Unit Kerja : Universitas Bhayangkara Surabaya

Benar telah melakukan kegiatan:

1. Mereview makalah jurnal internasional bereputasi berjudul "Power Quality Enhancement In Pv Integrated Single Phase Distribution System Using A 1ph To 3ph Upqc Supporting Single And Three Phase Load" dari Automatika, Publisher: Taylor & Francis United Kingdom Tahun 2022, Terindeks Scopus Q2.
2. Telah melakukan korespondensi email dengan editor/pengelola jurnal dalam rangka mereview substansi materi makalah jurnal dalam selang waktu yang telah ditentukan sebelumnya. Bukti korespondensi email dan bukti pendukung adalah benar sudah dilakukan oleh yang bersangkutan serta sudah dilampirkan bersama surat ini.

Demikian surat keterangan ini dibuat untuk kepentingan kelengkapan pengusulan Guru Besar.

Surabaya, 20 Januari 2023
Kepala LPPM

Drs. Heru Irianto, M.Si.
NIP. 9000028

Lampiran 1

Bukti Korespondensi Email dengan Editor/Pengelola Jurnal

Amirullah Ubhara Surabaya <amirullah@ubhara.ac.id>

You have been registered on the Automatika: Journal for Control, Measurement, Electronics, Computing and Communications website

1 pesan

Automatika <em@editorialmanager.com> 25 Maret 2022 pukul 18.22
Balas Ke: Automatika <taut-peerreview@journals.tandf.co.uk>
Kepada: Amirullah Amirullah <amirullah@ubhara.ac.id>

Mar 25, 2022

Dear Prof Amirullah Amirullah,

You have been registered for the Editorial Manager online submission and peer review tracking system for Automatika: Journal for Control, Measurement, Electronics, Computing and Communications.

Here is your username and confidential password, which you need to access the Editorial Manager at https://www.editorialmanager.com/taut/.

Username: AmirullahAmirullah
your password can be set at this link: https://www.editorialmanager.com/taut/l.asp?i=167117&l=YMTZPQQ6

Please save this information in a safe place.

You can change your password and other personal information by logging into the Automatika: Journal for Control, Measurement, Electronics, Computing and Communications website and clicking on the Update My Information link on the menu.

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Ubhara Surabaya

Amirullah Ubhara Surabaya <amirullah@ubhara.ac.id>

Reviewer Invitation for Power Quality Enhancement In Pv Integrated Single Phase Distribution System Using A 1ph To 3ph Upqc Supporting Single And Three Phase Load

3 pesan

Automatika <em@editorialmanager.com> 25 Maret 2022 pukul 18.32
Balas Ke: Automatika <taut-peerreview@journals.tandf.co.uk>
Kepada: Amirullah Amirullah <amirullah@ubhara.ac.id>

Mar 25, 2022

Dear Prof Amirullah Amirullah,

The paper titled "Power Quality Enhancement In Pv Integrated Single Phase Distribution System Using A 1ph To 3ph Upqc Supporting Single And Three Phase Load" has been submitted for possible publication in Automatika: Journal for Control, Measurement, Electronics, Computing and Communications. I believe that this paper is in your field of interest and I should greatly appreciate your help in evaluating the submission.

Your help would be very much appreciated by me and those that read and publish in Automatika: Journal for Control, Measurement, Electronics, Computing and Communications.

This is the abstract:
To achieve the solution of series-parallel power line compensation, the three-stage UPQC proposal uses a single phase dual control method. This technique is unique in that it uses a Back Propagation Neural Network (BPNN) to adjust the voltage of the Direct Current (DC) connection capacitors. The suggested system is intended for use in remote rural locations where single-phase systems are typically used. As a result, three-phase systems are unable to serve three-phase loads with energy. To do this, the UPQC system draws sinusoidal current from a single-phase utility grid while retaining its high power factor. We're able to reduce harmonics, as well as compensate for voltage fluctuations. The outcome is a balanced, regulated, and sinusoidal output voltage. Synchronous Reference Frame (SRF) controllers regulate the input currents and output voltages of UPQC.In the above strategy, BPNN is replaced with PI to reduce THD further.MATLAB/SIMULINK is used to model the control
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The manuscript reference is TAUT-2021-0507.

If possible, I would appreciate receiving your review in 30 days. You may submit your comments online at the above URL. There you will find spaces for confidential comments to the editor, comments for the author and a report form to be completed.

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With kind regards,
On behalf of
Chitti Babu B, Ph.D

Section Editor

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Amirullah Ubhara Surabaya <amirullah@ubhara.ac.id> 27 Maret 2022 pukul 08.02
Kepada: Automatika <taut-peerreview@journals.tandf.co.uk>
Cc: Amirullah Ubhara Surabaya <amirullah@ubhara.ac.id>
Bcc: Amirullah Ubhara Surabaya <amirullah@ubhara.ac.id>

Dear Chitti Babu B, PhD,

I need your confirmation before reviewing this entitled paper in Automatika: Journal for Control, Measurement, Electronics, Computing and Communications:
1. Is https://www.scopus.com/sourceid/19700174656-link Scopus of this journal?
2. Is https://www.scimagojr.com/journalsearch.php?q=19700174656&tip=sid&clean=0-link Scimago of this journal?
3. Is https://www.tandfonline.com/journals/taut20-your official link? the official link of this journal?

These are my questions and I will be happy if you respond them.

Dr. Amirullah
Univesitas Bhayangkara Surabaya-Indonesia

[Kutipan teks disembunyikan]

Amirullah Ubhara Surabaya <amirullah@ubhara.ac.id> 29 Maret 2022 pukul 05.48
Kepada: Automatika <taut-peerreview@journals.tandf.co.uk>
Cc: prshelp@tandf.co.uk
Bcc: Amirullah Ubhara Surabaya <amirullah@ubhara.ac.id>

Dear Chitti Babu B, PhD,

I need your confirmation before reviewing this entitled paper in Automatika: Journal for Control, Measurement, Electronics, Computing and Communications:
1. Is https://www.scopus.com/sourceid/19700174656 link Scopus of this journal?
2. Is https://www.scimagojr.com/journalsearch.php?q=19700174656&tip=sid&clean=0 link Scimago of this journal?
3. Is https://www.tandfonline.com/journals/taut20 the official link of this journal?

These are my questions and I will be happy if you respond to them.

Dr. Amirullah
Univesitas Bhayangkara Surabaya-Indonesia
[Kutipan teks disembunyikan]

Ubhara Surabaya

Amirullah Ubhara Surabaya <amirullah@ubhara.ac.id>

Invitation to review manuscript for Automatika: Journal for Control, Measurement, Electronics, Computing and Communications - Reminder

2 pesan

Automatika <em@editorialmanager.com> 27 Maret 2022 pukul 12.19
Balas Ke: Automatika <taut-peerreview@journals.tandf.co.uk>
Kepada: Amirullah Amirullah <amirullah@ubhara.ac.id>

Mar 27, 2022

Ref.: Ms. No. TAUT-2021-0507
Power Quality Enhancement In Pv Integrated Single Phase Distribution System Using A 1ph To 3ph Upqc Supporting Single And Three Phase Load
Automatika: Journal for Control, Measurement, Electronics, Computing and Communications

Dear Prof Amirullah,

On Mar 25, 2022 we sent you a request to review a paper title Power Quality Enhancement In Pv Integrated Single Phase Distribution System Using A 1ph To 3ph Upqc Supporting Single And Three Phase Load.

We have not yet received a response from you. We understand that you must be very busy, but we would be grateful if you could let us know if you can carry out this review.

This is the abstract:
To achieve the solution of series-parallel power line compensation, the three-stage UPQC proposal uses a single phase dual control method. This technique is unique in that it uses a Back Propagation Neural Network (BPNN) to adjust the voltage of the Direct Current (DC) connection capacitors. The suggested system is intended for use in remote rural locations where single-phase systems are typically used. As a result, three-phase systems are unable to serve three-phase loads with energy. To do this, the UPQC system draws sinusoidal current from a single-phase utility grid while retaining its high power factor. We're able to reduce harmonics, as well as compensate for voltage fluctuations. The outcome is a balanced, regulated, and sinusoidal output voltage. Synchronous Reference Frame (SRF) controllers regulate the input currents and output voltages of UPQC.In the above strategy, BPNN is replaced with PI to reduce THD further.MATLAB/SIMULINK is used to model the control
techniques. The simulation results assess the UPQC system's performance while considering power flow across series and parallel converters. The experimental findings are provided to validate the concept and assess the suggested topology's static and dynamic performance

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The manuscript reference is TAUT-2021-0507.

If possible, I would appreciate receiving your review in 30 days. You may submit your comments online at the above URL. There you will find spaces for confidential comments to the editor, comments for the author and a report form to be completed.

For assistance with submitting your review please contact the T&F Peer Review Systems Helpdesk

Kind regards,

Ivan Petrovic
Editor-in-Chief
Automatika: Journal for Control, Measurement, Electronics, Computing and Communications

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Amirullah Ubhara Surabaya <amirullah@ubhara.ac.id> 29 Maret 2022 pukul 05.59
Kepada: Automatika <taut-peerreview@journals.tandf.co.uk>
Cc: prshelp@tandf.co.uk
Bcc: Amirullah Ubhara Surabaya <amirullah@ubhara.ac.id>

Dear Dr Ivan Petrovic.

I have received the same email from Chitti Babu B, Ph.D (Section Editor of this journal) about this request.

I need your confirmation before reviewing this entitled paper in Automatika: Journal for Control, Measurement, Electronics, Computing and Communications:
1. Is https://www.scopus.com/sourceid/19700174656 link Scopus of this journal?
2. Is https://www.scimagojr.com/journalsearch.php?q=19700174656&tip=sid&clean=0 link Scimago of this journal?
3. Is https://www.tandfonline.com/journals/taut20 the official link of this journal?

These are my questions and I will be happy if you respond to these questions.

Dr. Amirullah
Univesitas Bhayangkara Surabaya-Indonesia
[Kutipan teks disembunyikan]

Amirullah Ubhara Surabaya <amirullah@ubhara.ac.id>

Re: Re: Reviewer Invitation for Power Quality Enhancement In Pv Integrated Single Phase Distribution System Using A 1ph To 3ph Upqc Supporting Single And Three Phase Load #TrackingId:11429697

2 pesan

TAUT-peerreview@journals.tandf.co.uk <TAUT-peerreview@journals.tandf.co.uk> 29 Maret 2022 pukul 08.41
Kepada: amirullah@ubhara.ac.id, bcbabunitrkl@ieee.org
Cc: amirullah@ubhara.ac.id

Dear Dr. Chitti Babu,

Thank you for your email.

Below is an email from the reviewer for your perusal.

Could you please have a look in to it and kindly assist the reviewer in this regard.

Thank you very much.

Best regards,

Vishali.

Journal Editorial office

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Automatika

From:amirullah@ubhara.ac.id
Sent:27-03-2022 06:32
To:vishali.parameswaran@straive.com
Cc:amirullah@ubhara.ac.id
Subject: Re: Re: Reviewer Invitation for Power Quality Enhancement In Pv Integrated Single Phase Distribution System Using A 1ph To 3ph Upqc Supporting Single And Three Phase Load

Dear Chitti Babu B, PhD,

I need your confirmation before reviewing this entitled paper in Automatika: Journal for Control, Measurement, Electronics, Computing and Communications:
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3. Is https://www.tandfonline.com/journals/taut20-your official link? the official link of this journal?

These are my questions and I will be happy if you respond them.

Dr. Amirullah
Univesitas Bhayangkara Surabaya-Indonesia

Pada tanggal Jum, 25 Mar 2022 pukul 18.33 Automatika <em@editorialmanager.com> menulis:

> Mar 25, 2022
>
> Dear Prof Amirullah Amirullah,
>
> The paper titled "Power Quality Enhancement In Pv Integrated Single Phase Distribution System Using A 1ph To 3ph Upqc Supporting Single And Three Phase Load" has been submitted for possible publication in Automatika: Journal for Control, Measurement, Electronics, Computing and Communications. I believe that this paper is in your field of interest and I should greatly appreciate your help in evaluating the submission.
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> Your help would be very much appreciated by me and those that read and publish in Automatika: Journal for Control, Measurement, Electronics, Computing and Communications.
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> This is the abstract:
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> The manuscript reference is TAUT-2021-0507.
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> If possible, I would appreciate receiving your review in 30 days. You may submit your comments online at the above URL. There you will find spaces for confidential comments to the editor, comments for the author and a report form to be completed.
>
> For assistance with submitting your review please contact the T&F Peer Review Systems Helpdesk
>
> With kind regards,
> On behalf of
> Chitti Babu B, Ph.D
> Section Editor

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Amirullah Ubhara Surabaya <amirullah@ubhara.ac.id> 29 Maret 2022 pukul 13.35
Kepada: Automatika <TAUT-peerreview@journals.tandf.co.uk>
Cc: Amirullah Ubhara Surabaya <amirullah@ubhara.ac.id>
Bcc: bcbabunitrkl@ieee.org

Dear Section Editor,
Automatika

Thanks a lot for your information.

Dr Amirullah
[Kutipan teks disembunyikan]

Ubhara Surabaya

Amirullah Ubhara Surabaya <amirullah@ubhara.ac.id>

Thank you for agreeing to review

1 pesan

Automatika <em@editorialmanager.com> 29 Maret 2022 pukul 13.36
Balas Ke: Automatika <taut-peerreview@journals.tandf.co.uk>
Kepada: Amirullah Amirullah <amirullah@ubhara.ac.id>

Mar 29, 2022

Dear Prof Amirullah Amirullah,

Thank you for agreeing to review manuscript TAUT-2021-0507. Your timely and thoughtful review enables us to maintain our commitment to quality and fast turnaround time. Your help is very much appreciated by us and those that read and publish in Automatika: Journal for Control, Measurement, Electronics, Computing and Communications.

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If possible, I would appreciate receiving your review by Apr 28, 2022.

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For assistance with submitting your review please contact the T&F Peer Review Systems Helpdesk

With kind regards

Chitti Babu B, Ph.D
Section Editor
Automatika: Journal for Control, Measurement, Electronics, Computing and Communications

Review_Due.ics
1K

Amirullah Ubhara Surabaya <amirullah@ubhara.ac.id>

Re: Re: Reviewer Invitation for Power Quality Enhancement In Pv Integrated Single Phase Distribution System Using A 1ph To 3ph Upqc Supporting Single And Three Phase Load #TrackingId:11443194

1 pesan

TAUT-peerreview@journals.tandf.co.uk <TAUT-peerreview@journals.tandf.co.uk> 31 Maret 2022 pukul 09.56
Kepada: bcbabuiiitdm@gmail.com, amirullah@ubhara.ac.id

Dear Dr. Chitti Babu,

Please find the below email from the reviewer for your perusal.

Could you please have a look in to it and kindly assist him further in this regard.

Thank you very much.

Best regards,

Vishali.

Journal Editorial office

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From:amirullah@ubhara.ac.id
Sent:29-03-2022 04:19
To:vishali.parameswaran@straive.com
Cc:prshelp@tandf.co.uk
Subject: Re: Re: Reviewer Invitation for Power Quality Enhancement In Pv Integrated Single Phase Distribution System Using A 1ph To 3ph Upqc Supporting Single And Three Phase Load

Dear Chitti Babu B, PhD,

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3. Is https://www.tandfonline.com/journals/taut20 the official link of this journal?

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Dr. Amirullah
Univesitas Bhayangkara Surabaya-Indonesia

Pada tanggal Min, 27 Mar 2022 pukul 08.02 Amirullah Ubhara Surabaya <amirullah@ubhara.ac.id> menulis:

> Dear Chitti Babu B, PhD,
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> Univesitas Bhayangkara Surabaya-Indonesia
>
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>
> > Mar 25, 2022
> >
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> >
> > The paper titled "Power Quality Enhancement In Pv Integrated Single Phase Distribution System Using A 1ph To 3ph Upqc Supporting Single And Three Phase Load" has been submitted for possible publication in Automatika: Journal for Control, Measurement, Electronics, Computing and Communications. I believe that this paper is in your field of interest and I should greatly appreciate your help in evaluating the submission.
> >
> > Your help would be very much appreciated by me and those that read and publish in Automatika: Journal for Control, Measurement, Electronics, Computing and Communications.
> >
> > This is the abstract:
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> > If you would like to review this paper, please click this link: https://www.editorialmanager.com/taut/l.asp?i=167155&l=JZFTVL6D *
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> > If you do not wish to review this paper, please click this link: https://www.editorialmanager.com/taut/l.asp?i=167156&l=3KDYKD0P *
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> > If the above links do not work, please go to https://www.editorialmanager.com/taut/. Your User Name is AmirullahAmirullah and your password can be set at this link: https://www.editorialmanager.com/taut/l.asp?i=167157&l=2VGEYM8Y.
> >
> > The manuscript reference is TAUT-2021-0507.
> >
> > If possible, I would appreciate receiving your review in 30 days. You may submit your comments online at the above

URL. There you will find spaces for confidential comments to the editor, comments for the author and a report form to be completed.

For assistance with submitting your review please contact the T&F Peer Review Systems Helpdesk

With kind regards,
On behalf of
Chitti Babu B, Ph.D
Section Editor

Ubhara Surabaya

Amirullah Ubhara Surabaya <amirullah@ubhara.ac.id>

Thank you for the review of TAUT-2021-0507

3 pesan

Automatika <em@editorialmanager.com> 15 April 2022 pukul 13.52
Balas Ke: Automatika <taut-peerreview@journals.tandf.co.uk>
Kepada: Amirullah Amirullah <amirullah@ubhara.ac.id>

Apr 15, 2022

Ref.: Ms. No. TAUT-2021-0507
Power Quality Enhancement In Pv Integrated Single Phase Distribution System Using A 1ph To 3ph Upqc Supporting Single And Three Phase Load
Automatika: Journal for Control, Measurement, Electronics, Computing and Communications

Dear Prof Amirullah,

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You can access your review comments and the decision letter (when available) by logging onto the Editorial Manager site at:

https://www.editorialmanager.com/taut/
username: AmirullahAmirullah
your password can be set at this link: https://www.editorialmanager.com/taut/l.asp?i=182857&l=U3FZM330

As a thank you please find a link to a voucher for a 30% discount on Taylor & Francis books:

www.tandf.co.uk/journals/pdf/books_discount_postcard.pdf

Kind regards,

Chitti Babu B, Ph.D
Section Editor
Automatika: Journal for Control, Measurement, Electronics, Computing and Communications

Amirullah Ubhara Surabaya <amirullah@ubhara.ac.id> 15 April 2022 pukul 18.15
Kepada: Automatika <taut-peerreview@journals.tandf.co.uk>
Cc: em@editorialmanager.com
Bcc: Amirullah Ubhara Surabaya <amirullah@ubhara.ac.id>

Dear Chitti Babu B, Ph.D,

Thank you, hopefully, my review will be useful for the development of science in this journal.

Dr. Amirullah
Dept of Electrical Engineering
Universitas Bhayangkara Surabaya
Indonesia

[Kutipan teks disembunyikan]

Amirullah Ubhara Surabaya <amirullah@ubhara.ac.id> 23 April 2022 pukul 07.09
Kepada: reviews@publons.com
Cc: reviews@publons.com
Bcc: Amirullah Ubhara Surabaya <amirullah@ubhara.ac.id>

Pada tanggal Jum, 15 Apr 2022 pukul 13.53 Automatika <em@editorialmanager.com> menulis:
[Kutipan teks disembunyikan]

Ubhara Surabaya

Amirullah Ubhara Surabaya <amirullah@ubhara.ac.id>

A decision has been made on TAUT-2021-0507

2 pesan

Automatika <em@editorialmanager.com> 3 Juli 2022 pukul 19.59
Balas Ke: Automatika <taut-peerreview@journals.tandf.co.uk>
Kepada: Amirullah Amirullah <amirullah@ubhara.ac.id>

Jul 03, 2022

Ref.: Ms. No. TAUT-2021-0507
Power Quality Enhancement In Pv Integrated Single Phase Distribution System Using A 1ph To 3ph Upqc Supporting Single And Three Phase Load
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Power Quality Enhancement In Pv Integrated Single Phase Distribution System Using A 1ph To 3ph Upqc Supporting Single And Three Phase Load

--Manuscript Draft--

Full Title:	Power Quality Enhancement In Pv Integrated Single Phase Distribution System Using A 1ph To 3ph Upqc Supporting Single And Three Phase Load
Manuscript Number:	TAUT-2021-0507
Article Type:	Regular Paper
Keywords:	Distributed Generation; Unified Power Quality Conditioner; Sag; Harmonics; Photo Voltaic
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Power Quality Enhancement In Pv Integrated Single Phase Distribution System Using A 1ph To 3ph Upqc Supporting Single And Three Phase Load

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ABSTRACT

The Unified Power Quality Conditioner (UPQC) system is presented in this work to improve the performance of Distributed Generation (DG) with three phase to single phase single-phase configuration with grid connected photovoltaic (PV) source. To achieve the solution of series-parallel power line compensation, the three-stage UPQC proposal uses a single phase dual control method. This technique is unique in that it uses a Back Propagation Neural Network (BPNN) to adjust the voltage of the Direct Current (DC) connection capacitors. The suggested system is intended for use in remote rural locations where single-phase systems are typically used. As a result, three-phase systems are unable to serve three-phase loads with energy. To do this, the UPQC system draws sinusoidal current from a single-phase utility grid while retaining its high power factor. We're able to reduce harmonics, as well as compensate for voltage fluctuations. The outcome is a balanced, regulated, and sinusoidal output voltage. Synchronous Reference Frame (SRF) controllers regulate the input currents and output voltages of UPQC.In the above strategy, BPNN is replaced with PI to reduce THD further.MATLAB/SIMULINK is used to model the control techniques. The simulation results assess the UPQC system's performance while considering power flow across series and parallel converters. The experimental findings are provided to validate the concept and assess the suggested topology's static and dynamic performance.

Keywords: Distributed Generation, Unified Power Quality Conditioner, Back Propagation Neural Network, Sag, Swell, Harmonics, Photo Voltaic

1. INTRODUCTION

A three-phase load is applied in remote locations, it requires a single-phase-to-three-phase switch. One phase load is connected to a one phase grid by using an ACDCAC UPQC (single-phase to three-phase).A full bridge three-phase inverter, also known as a three-leg

inverter, employs a parallel active filter topology. However, in the series active filter topology, a single leg inverter is used. UPQC's appropriate modelling and control method improves the overall system's power quality.

The power distribution system in India's rural areas (rural areas or distant locales) is typically constructed with a single phase. Because of the three-phase extension cost, switching from a single phase to a three-phase power supply is generally costly [1, 2]. During power shortage periods in many areas, the power is supplied for only a single-phase load. During that time, using a two-phase supply, the agriculture motor loads are used, polluting the distribution system. The proposed 1ph-to-3ph UPQC in distribution system with PV integration safeguards the agriculture load and distribution system.

Due to lower cost, lesser volume, redundancy, and other factors, three-phase induction motors are preferred in rural regions over single-phase induction motors. Power converters are required to manage the speed and torque of a three-phase motor. There is a demand for high-quality power using this power converter [3].A full-bridge diode rectifier-based 1ph-to-3ph power converter is a common solution. This system features a low power factor and minimal harmonic distortion. A regulated rectifier, rather than a diode rectifier, is necessary to remedy this problem. This alternate method can supply the grid with minimal harmonic distortion and a high power factor. The UPQC is made up of four legs and is based on a 1ph-to-3ph converter. The remaining part of this work is organized as follows.

i. Section two discusses the literature survey for existing UPQC control strategies
ii. Section three presents the operation of the proposed 1ph-to-3ph UPQC in a distribution system with PV integration.
iii. Section four discusses the simulation results and performance analysis of the proposed 1ph-to-3ph UPQC system
iv. Section 5 concludes with a discussion of this work's conclusion and future scope

2. LITERATURE SURVEY

In this section, some of the important research proposed in the literature on the power distribution system has been reviewed.

In [4], the author developed a single-phase to three-phase UPQC to supply three-phase power for rural areas, and this topology suppressed harmonics and sag. The static and dynamic performance of this system is validated experimentally. Convertibles in the UPQC were studied to compensate system demands [5-7] due to ideal volt-ampere (VA) values. The

phase angle control (PAC) method is explained and the variable online VA load is shown by changing the adjustable displacement angle.

According to the authors [8-9], in order to enhance energy efficiency and power quality (PQ), they recommended the use of an Open Unified Energy Quality Conditioner (UPQC-O) combined with a Photovoltaic (PV) framework in radial distribution networks. UPQC is a series and parallel inverter system that is used to create customised power devices. It is believed that inverters are distributed to the network via UPQC (see 10 and 11). It was proposed in [12] to use parallel rectifiers and series inverters to address the single-phase to three-phase imbalance.

Instead, the input current of the rectifier circuit will be reduced, and the output voltage of the inverter circuit will be reduced [13].The dual compensation technique also allows simpler algorithms to get the desired result [14-16]. Synchronous Reference Frame (SRF) theory is used by the controllers [17, 18 and 24] to run secure control references for the series and parallel APFs. The coordinates of the unit are sinθ and cosθ, employing SRF-based controllers, of the three-phase phase-locked loop (PLL) system [19-21]. The sine wave voltage and current references, which reduce the stability errors used by conventional proportional-integral (PI) controllers, are acceptable when SRF-based controllers cause continuous control references [22].

Researchers built a local three-phase four-wire (3P4W) single-phase power distribution system EPDS from [23] with UPQC capabilities using the 1Phto-3PH converter. Half-bridge inverters (one inverter leg) are used in series converters, while in parallel converters, three-leg split capacitor inverters (4 inverter legs) are used. In [25], researcher utilized the Adaptive Neuro-Fuzzy Inference System Controller way to deal with further develop power quality with UPQC framework. With grid power supply and an independent PV framework, an exact expense examination and power quality issues were led. It can impressively decrease power transformation misfortunes without transformer and rectifier circuits [26].

The above-discussed methods have some issues with DC-link voltage regulation. Therefore, in this work, the Back Propagation Neural Network method has been proposed to control the function of UPQC. As compared with conventional DC-link voltage control methods, the proposed method obtains low steady error.

3. PROPOSED SYSTEM

The proposed 1Ph-to-3Ph UPQC is configured with a single-phase distribution system and PV to combat quality difficulties and provide power to single-phase and three-phase loads.

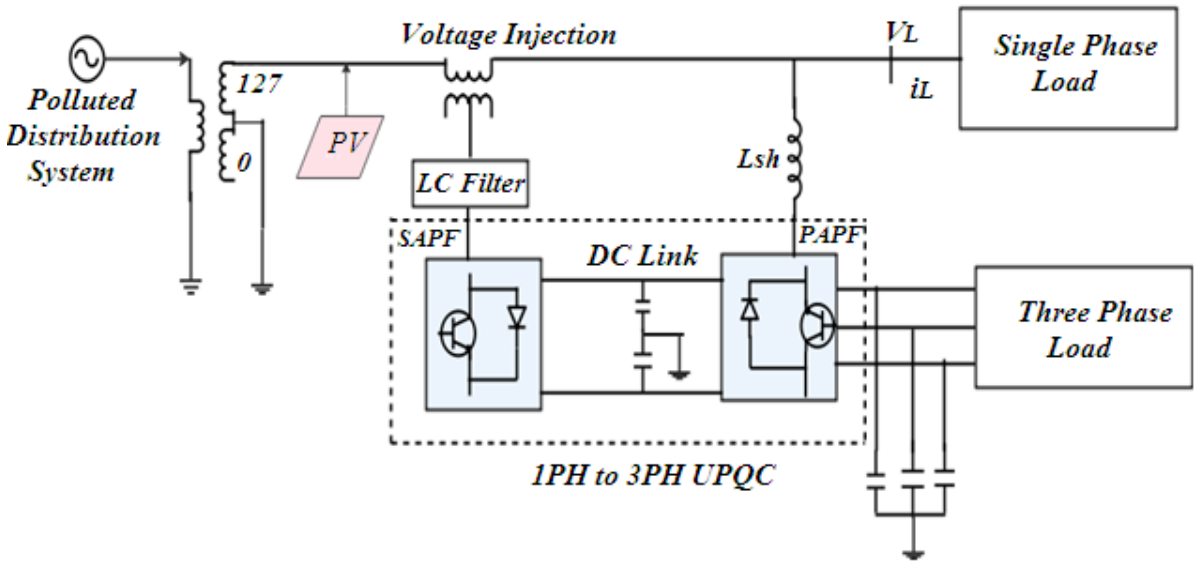

Figure 1. Functional Architecture of Proposed System

According to the suggested 1Ph-to-3Ph-UPQC arrangement shown in Figure 1, the architecture is as follows: Single-phase distribution, PV, a Series Active Power Filter (SAPF), a Parallel Active Power Filter (PAPF), single-phase load, and three-phase load are all part of this design. The series filter remedies voltage aberrations. Defensive power and harmonic current countermeasures are also required by parallel filters. It also adds the required amount of voltage to the DC-link capacitor. The next subsections address SAPF, PAPF, and PV modelling.

3.1 PHOTOVOLTAIC MODELLING AND MPPT CONTROL

Associating a light-triggered current source with the source, a series resistor, and a diode with the resistor creates a solar cell-like circuit. The partition affected by the underlying electric field and the float of photo-generated electron-hole pairs because the photo-induced current.

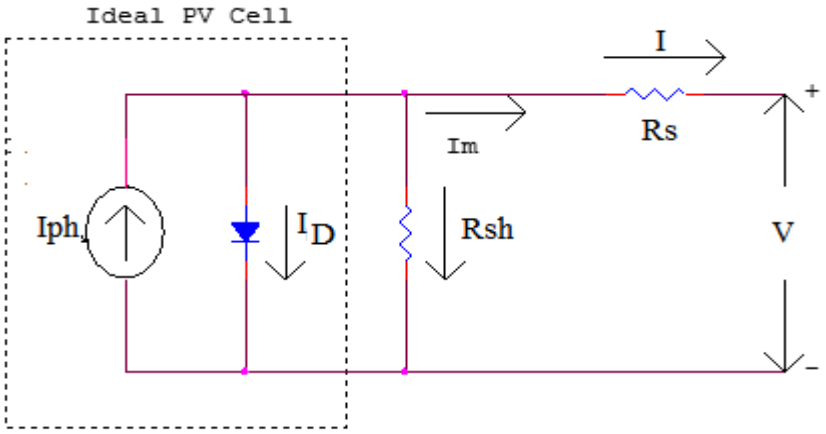

Figure 2. Equivalent model of solar cell

Figure 2 depicts a comparable model of a solar cell. The corresponding voltage vs. current (V-I) equation (1) is

$$I = I_{ph} - I_o \left[exp \left[\frac{q \times (V + IR_s)}{AKT} \right] \right] - 1 \ldots (1)$$

Where

I = Current value of Solar Cell

V = Voltage value of Solar Cell

I_{ph} = Photo Current

I_o = Diode's reverse Saturation Current

A = diode's Ideality factor

T = Temperature in Kelvin

K = Boltzmann Constant (1.380 x 10^{-23}J/K)

q = Elementary Charge (1.602 x 10^{-19}C)

R_s = Resistance in Series

3.1.1 DC-DC BOOST CONVERTER

The DC-DC boost converter boosts the solar panel's voltage. The DC-DC boost converter circuit is shown schematically in Figure 3.

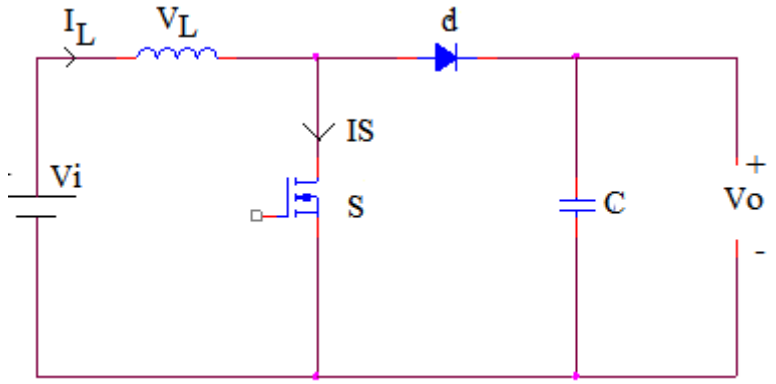

Figure 3. Circuit diagram of Boost Converter

The average voltage across the inductor for a full period is zero in steady-state operation, as shown in equations (2), (3), and (4).

$$V_{in} * T_{on} - (V_o - V_{in})T_{off} = 0 \ldots (2)$$

$$V_{in} * d * T = (V_o - V_{in})(1 - d)T \ldots (3)$$

$$\frac{V_0}{V_{in}} = \frac{1}{(1-d)} \ldots (4)$$

The expressions for the inductor and capacitor are

$$L = \frac{d(1-d)R}{2f} \ldots (5)$$

$$C = \frac{k}{2fR} \ldots (6)$$

Here R is a load resistance. Assuming the lossless circuit, the input resistance of the boost converter is,

$$R_{in} = \frac{V_{in}}{I_{in}} \ldots (7)$$

$$R_{in} = \frac{V_o(1-d)}{I_o/(1-d} \ldots (8)$$

$$R_{in} = R_o(1 - d)^2 \ldots (9)$$

By observing the equation (9) and changing the duty ratio from 0 to 1, the input resistance varies from R_0 to 0. At any given time, the input resistance equals the output resistance. At the point when the source resistance is equivalent to the load resistance, the maximum power is conveyed to the load, as per the maximum power transfer. Source impedance equals load impedance at this moment, the Maximum Power Maximum Power Transfer Theory is utilized to convey to the load.

3.1.2 Fractional current feedback (FCF) MPPT Method

The proposed PV module with a fractional current feedback MPPT method is shown in Figure 4. The FCF algorithm is the simplest control method. To measure the SCC, high impedance is to be provided for a short duration. Now, based on this equation (10), the maximum power can be achieved. This relationship can be expressed as:

$$I_{MP} = Zc.I_{SC} \ldots . (10)$$

Where

Zc = current factor.

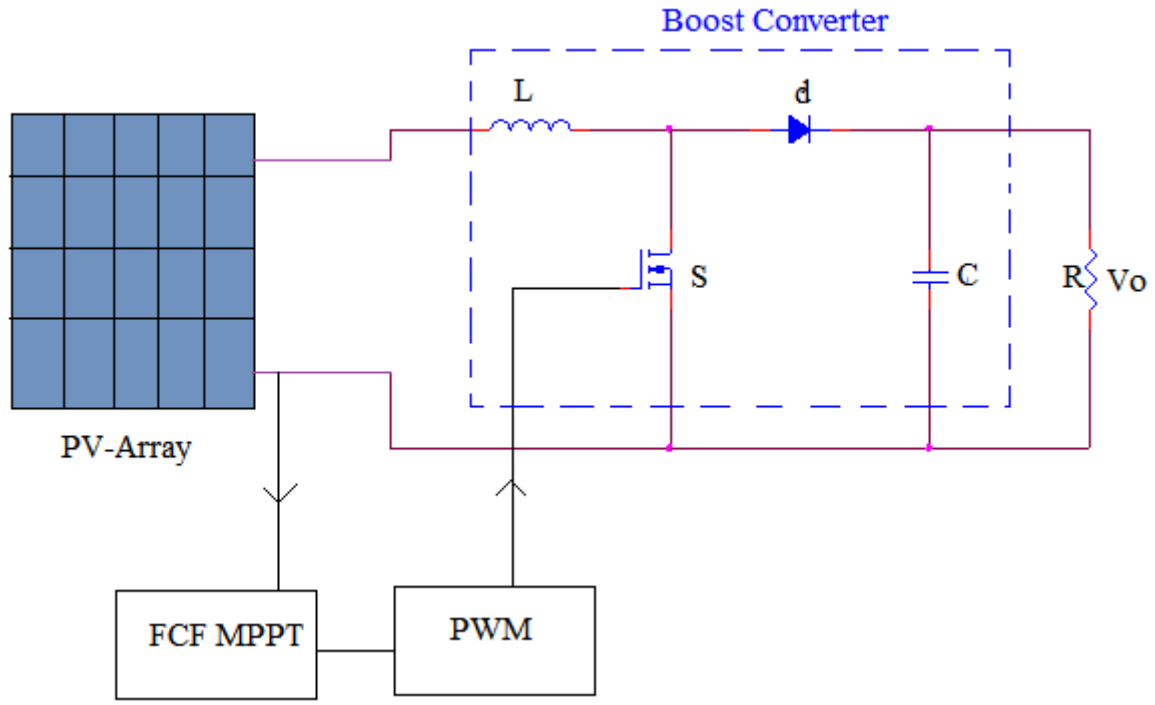

Figure 4. The architecture of fractional current feedback MPPT

The following flowchart (Figure 5) shows the practical implementation based on equation (10).

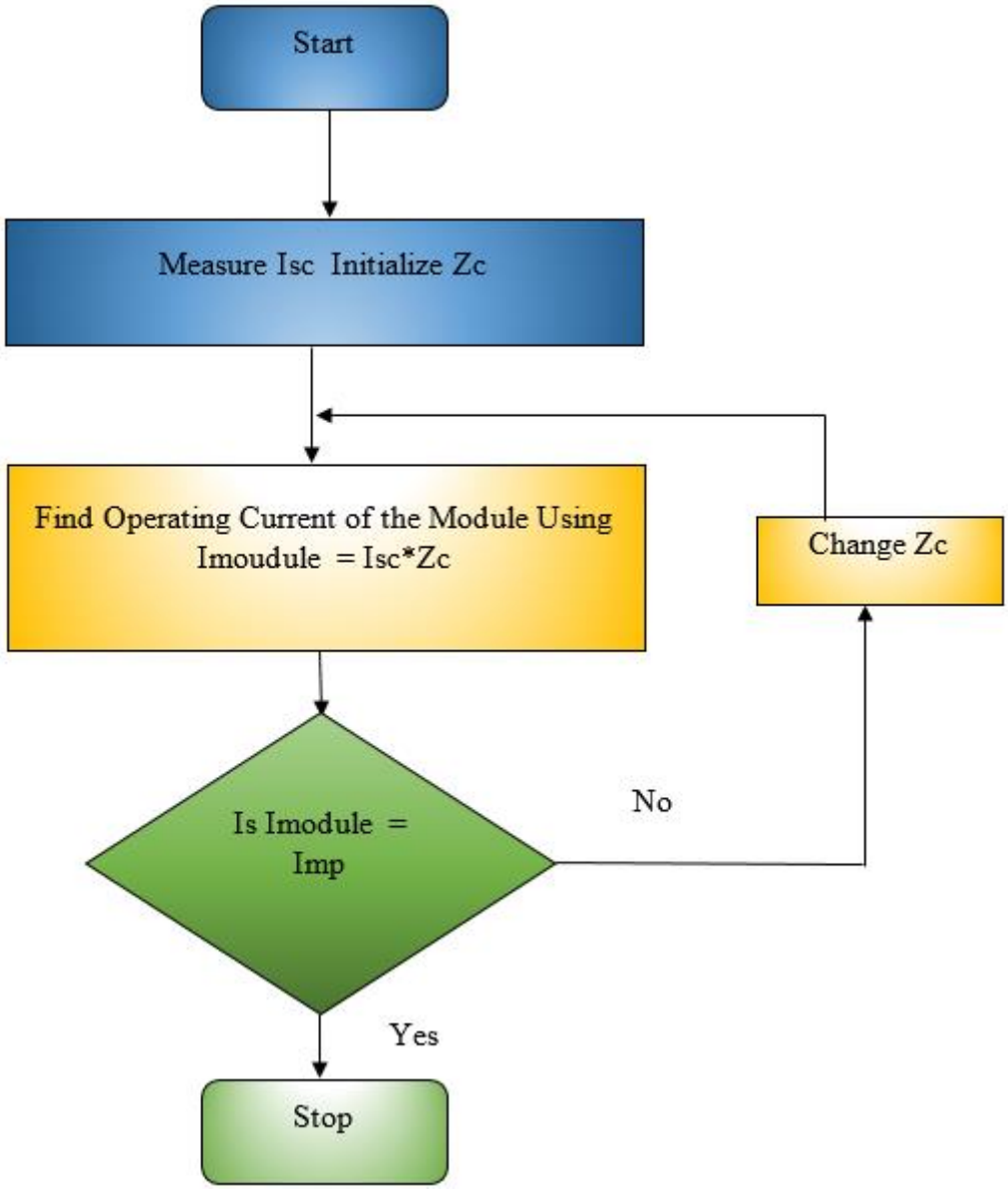

Figure 5. Flowchart of fractional current feedback MPPT

3.2 SAPF CONTROL STRATEGY

The figure 6 shows the control of action series active filter in proposed UPQC. The reference load voltage and real source voltage are injected by the series active filter.

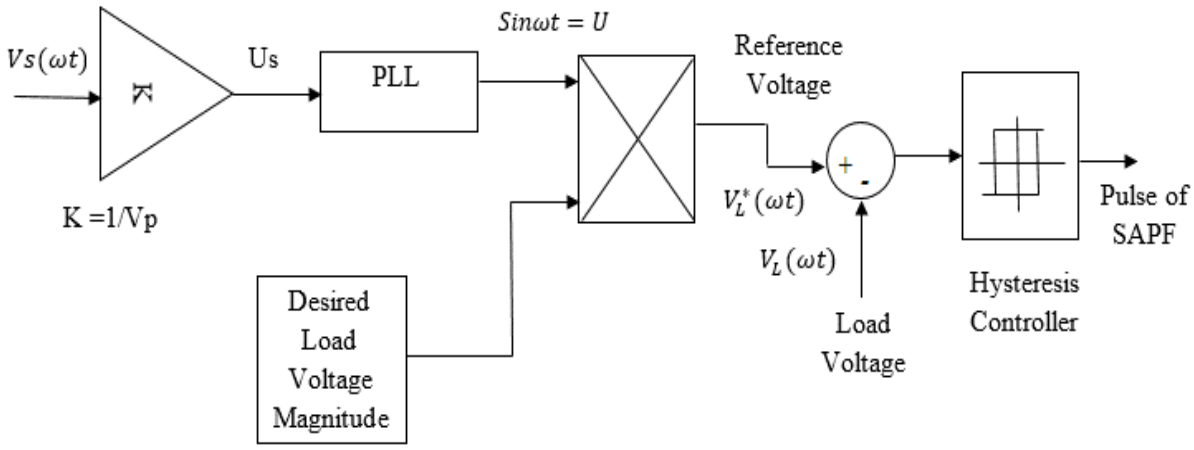

Figure.6 SAPF control strategy of UPQC-1Ph-to-3Ph

Figure 6 depicts the UPQC-1Ph-to-3Ph SAPF control method. By observing this signal, PLL gives sine-based unit vector templates. The measured supply voltage is multiplied by the desired peak magnitude. For the SAPF pulses, the reference signal is multiplied by the intended load voltage compared to the load voltage in PCC.

3.2.1 Reference Signal generation of SAPF

As shown in Figure 7, the dq of the rotating reference frame has been used to obtain a series current reference for operating the SAPF. The three-phase load current (iLa, iLb, and iLc) in the output is measured with a two-phase fixed frame and a Clark transition (ABC-axis) from the three-phase fixed frame.Frames 0 are the standard current level and are then translated into synchronous frames (dq-axes). As shown in Figure 6, the component vectors are plotted in a rotating frame using the sin (θ) and cos (θ) coordinate using PLL. The power equations (11&12) in the dq frame can be represented as follows.

$$vd_{dc} = v_{sp}\sqrt{\frac{3}{2}} \ldots (11)$$

$$I_{sp} = \sqrt{6id_{dc}} \ldots (12)$$

Where

vd_{dc} = dc bus voltage

id_{dc} = dc bus current

v_{sp} = single phase peak voltage

i_{sp} = single phase peak current.

3.3 PARALLEL ACTIVE POWER FILTER (PAPF) CONTROL STRATEGY

The generated reference current must be modified to match the average single-phase input power (P_s) with the average three-phase output power (P_L).PAPF maintains the DC link voltages as well as cancels the voltage imbalance of DC-link capacitors. Along with the usual control strategy, these two parts are also taken into account. This work uses a Back Propagation neural network algorithm to maintain the DC link voltages.

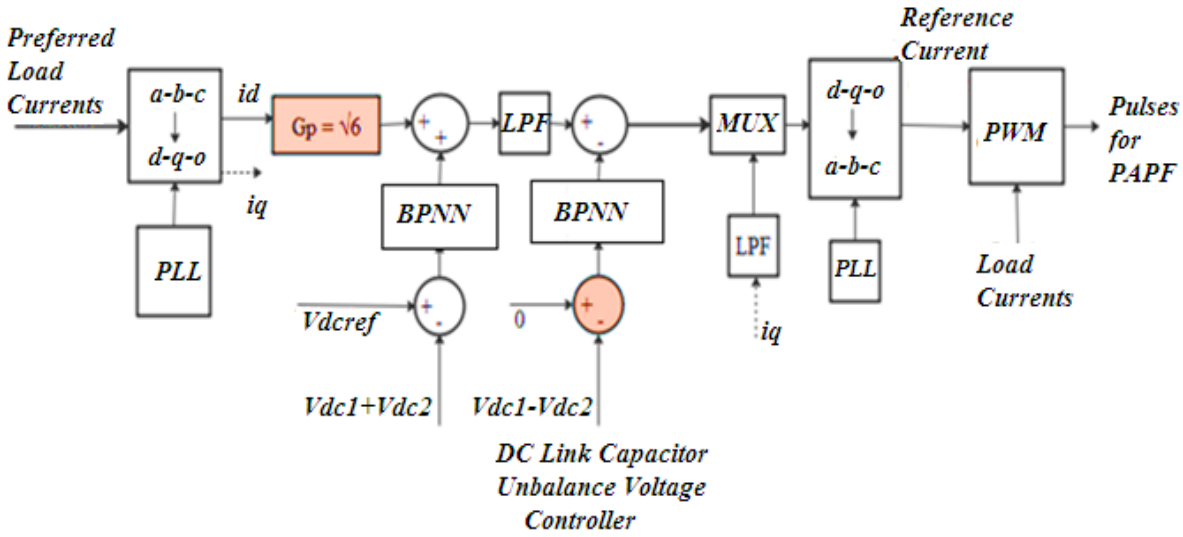

Figure.7 PAPF control strategy of UPQC-1Ph-to-3Ph

Figure 7 shows how Phase-Locked Loop (PLL) generates the two quadrature unit vectors (sinωt, cosωt). Using Synchronous Reference Frame theory, the preferred load current is transformed to the dq0 frame via the park transformation. Furthermore, PLL helps in synchronization with the supply voltage.

3.3.1 Reference Signal generation of PAPF

Phase A's output voltage has been adapted to the grid's output voltage. In order to calculate the yield voltage, the grid voltage phase point and the VLP voltage amplitude are used. The yield voltage is determined utilizing the accompanying condition.

$$V_{La}^{*} = V_{Lp}\sin(\theta) \ldots (13)$$

$$V_{Lb}^{*} = V_{Lp}\sin(\theta - 120) \ldots (14)$$

$$V_{Lc}^{*} = V_{Lp}\sin(\theta - 240) \ldots (15)$$

3.4 DC LINK VOLTAGE CONTROL – BPNN

The function of DC-link Voltage is controlled in this work using a Back Propagation Neural Network. The DC capacitor voltage must be kept at a specific level. The measured DC voltage should be deducted from the reference esteem, the error should be limited to zero utilizing a transfer function, and the control signal should be added to the Id current.

As depicted in Section 3.3, the parallel controller utilizes a comparable technique for network preparing to keep up with steady DC connect capacitor voltage and to give the reference signal. Referencing Vdc vs. the real voltage is done so that the capacitor voltage balance may be maintained. The network gets the estimated output as target data from BPPN, i.e., the current loss component (I*dc) and the associated error as input data. Figure 8 demonstrates how the network size and the number of 100 hidden layers can be adjusted using the re-transmission neural network training network.

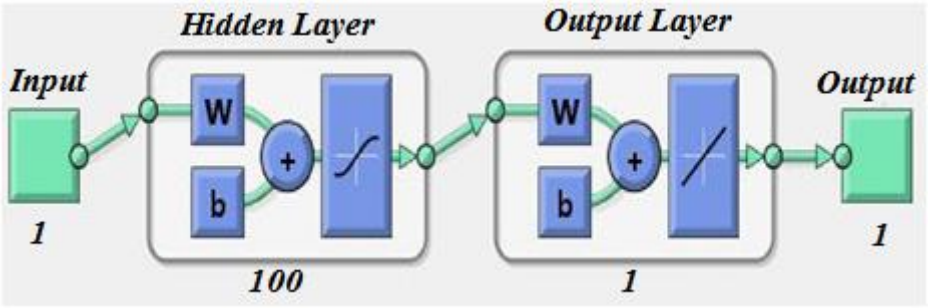

Figure 8.Trained network back propagation Algorithm

The load currents (ILa, ILb, and ILc) and the current loss component (I*dc) are used to create the reference currents. The network considers the anticipated reference currents to be the target data. Figure 9 depicts the trained network in the current reference generation using the backpropagation neural network technique, with the network size reduced to 200 hidden layers.

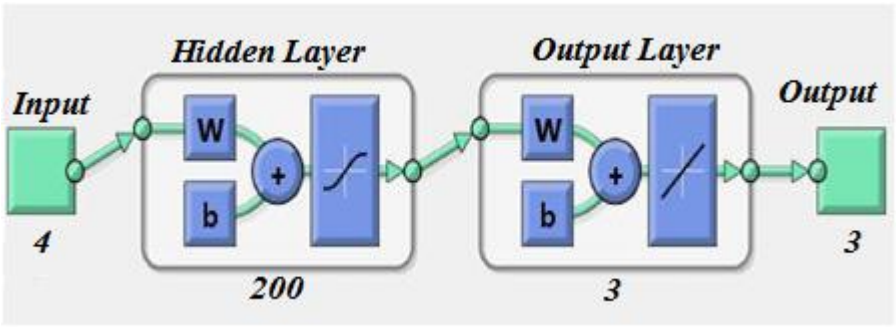

Figure 9. Network for reference current generation

A BPNN Simulink block for capacitor voltage balancing and reference current generation may be shown in picture 10 (right).

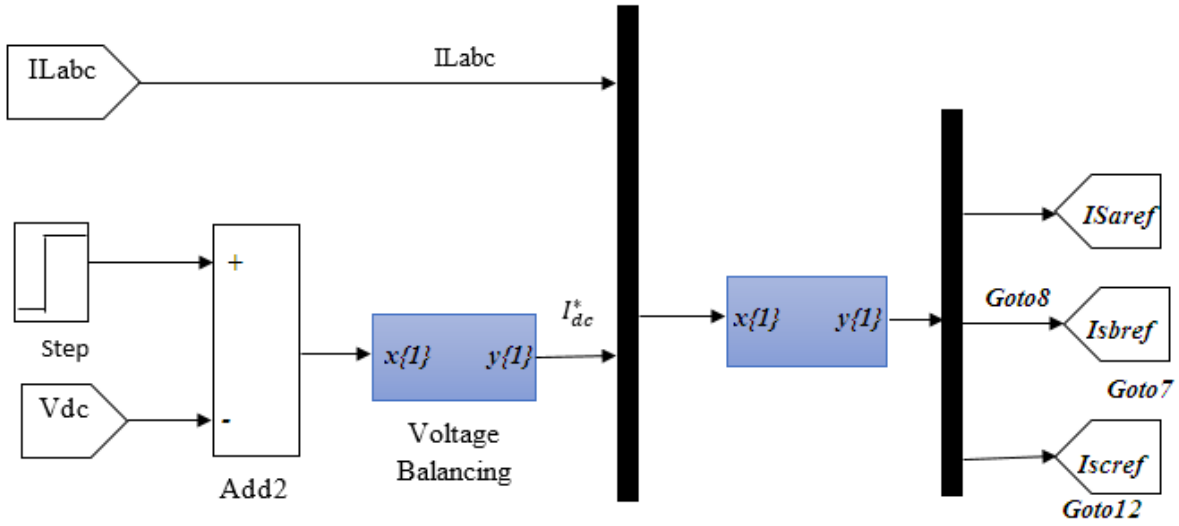

Figure 10. Structure of Capacitor Voltage Balancing

According to Figure.11, reference parallel injecting currents are obtained by comparing the BPNN method's reference flows with real parallel injecting currents in a current hysteresis scope of 2.5 percent and 5 percent.

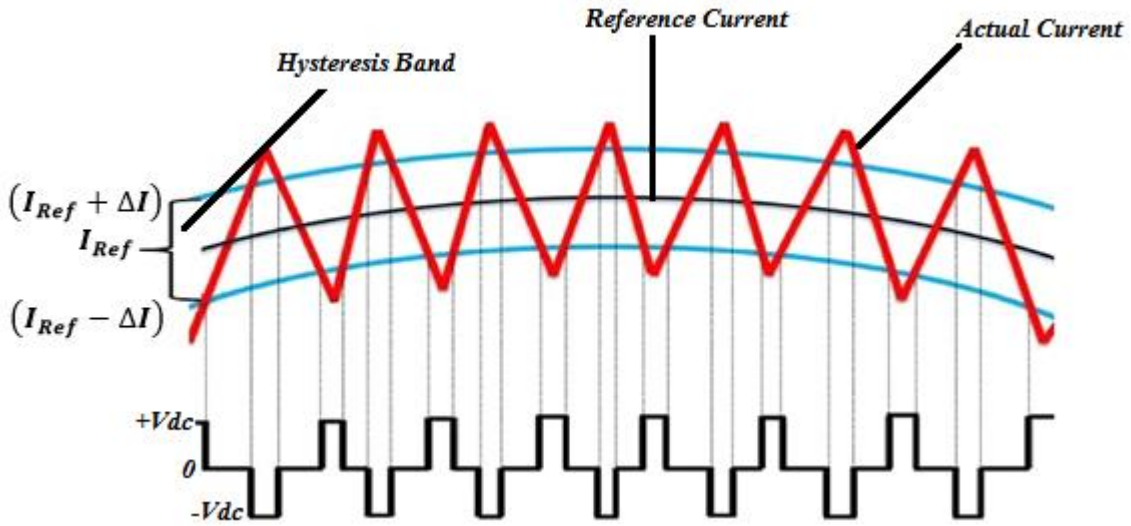

Figure 11. Hysteresis Current Response of parallel converter

The condition of switching pattern in three-level inverter with hysteresis current controller is discussed as follows:

i. *If* $\boldsymbol{I_{act} > (I_{Ref} + \Delta I)}$, *Then turn on all the lower switches to obtain the +Vdc result*

ii. *If* $I_{act} < \boldsymbol{(I_{Ref} - \Delta I)}$, *Then turn on all the higher switches to obtain -Vdc result*

iii. If$(I_{Ref} - \Delta I) \leq I_{act} \leq (I_{Ref} + \Delta I)$,

Finally, one innermost upper switch and one innermost lower switch are turned on, re sulting in zero states.

4. SIMULATION RESULTS AND DISCUSSION

The simulation results and performance analysis of the recommended system are detailed in this section. Table 1 shows the planned single-phase to three-phase UPQC System Parameters. The three items mentioned below were used to model the proposed system.

1. This topology is connected with single-phase and three-phase linear loads.
2. Single-phase supplies power to nonlinear loads, and three-phase is connected with the linear load.
3. The three-phase load is nonlinear, and the single-phase is connected with the linear load.

The proposed system effectively mitigates sag, swell, harmonics and irradiation variation in all three aspects.

Table 1 System Parameters of UPQC-1Ph-to-3Ph

No	Parameters	Values
1	Source Voltage	100V (P-P)
2	1Φ Linear and Nonlinear Load	100+3.14Ω
3	3 Φ Linear and Nonlinear Load	100+3.14Ω per phase
4	Line Parameters	1+3.14j
5	DC link Capacitor	1**F**
6	DC link Voltage	6000V
7	Inductors in converter L1 & L2	1mH & 3mH
8	Capacitors in converter C1	10µF

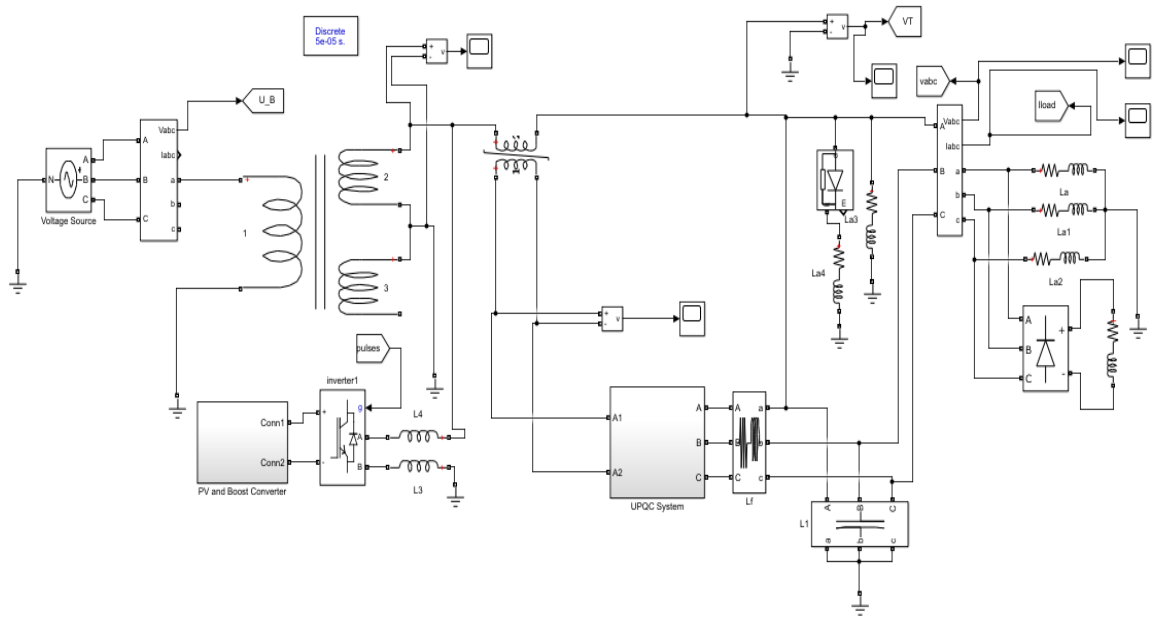

Figure 12. Simulation diagram of UPQC-1Ph-to-3Ph

The simulation diagram of the proposed 1Ph-to-3Ph-UPQC is shown in Figure 12.A. Single-phase distribution system plus PV system is connected with linear and nonlinear loads and three-phase linear and nonlinear load via the proposed UPQC structure. It is simulated for the duration of 1sec.

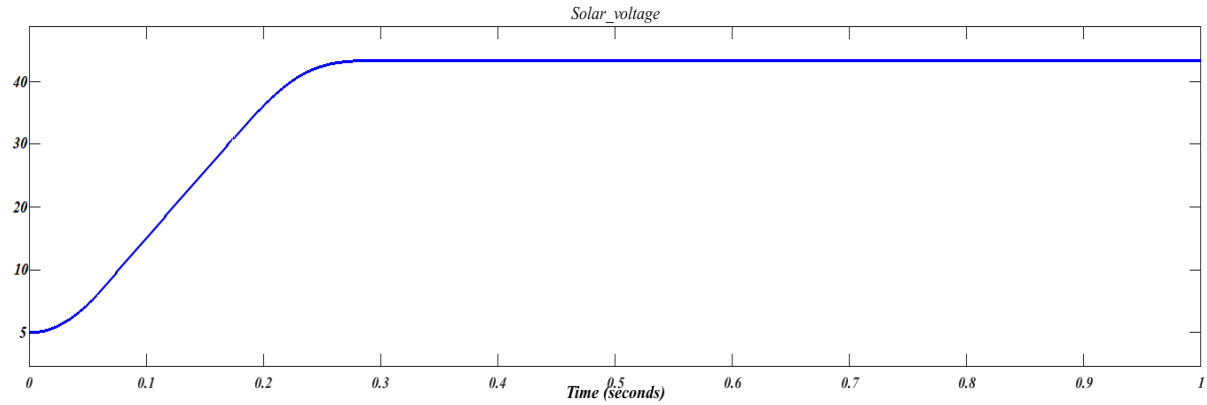

Figure 13. Simulation Response of Solar Voltage

The simulation result of solar response is shown in Figure 9. The converter and inverter control the solar system with irradiation variation. The undistorted electrical signal from solar is paralleled with a single-phase distribution system to enhance the overall system's capacity. The function of the solar system has been explained in the previous chapter. The converter converts 40V (shown in Figure 13) from solar into 100V and it becomes an AC signal at the output of the inverter.

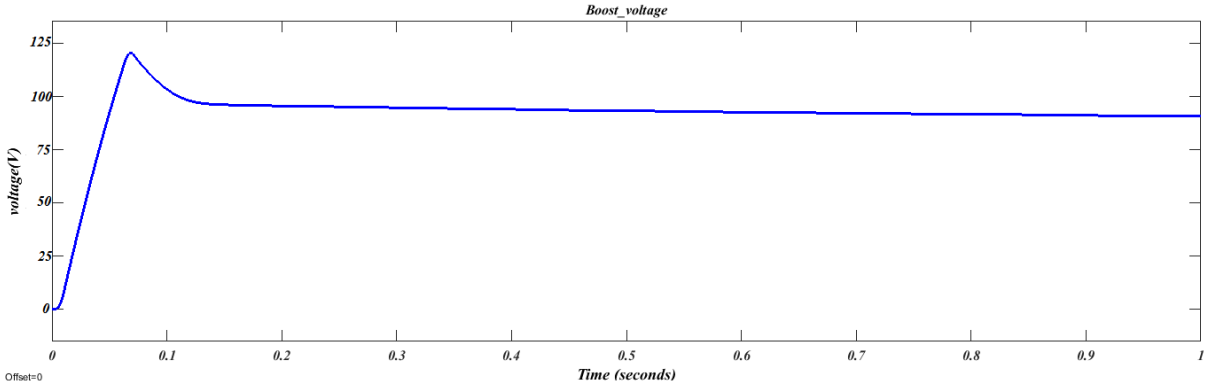

Figure 13.Simulation Result of Boost Converter

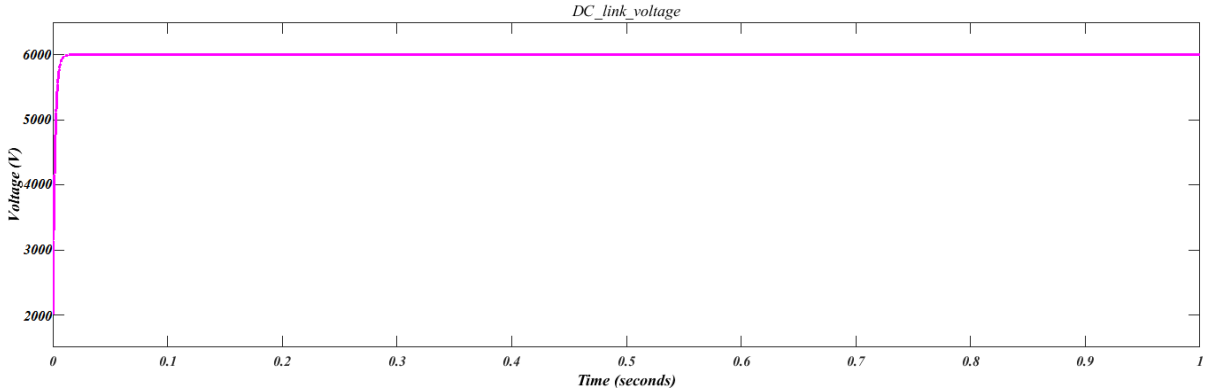

Figure 14. DC link Voltage response

Figure 14 depicts the suggested system's DC-link voltage response. The DC-link has a value of 6000V.

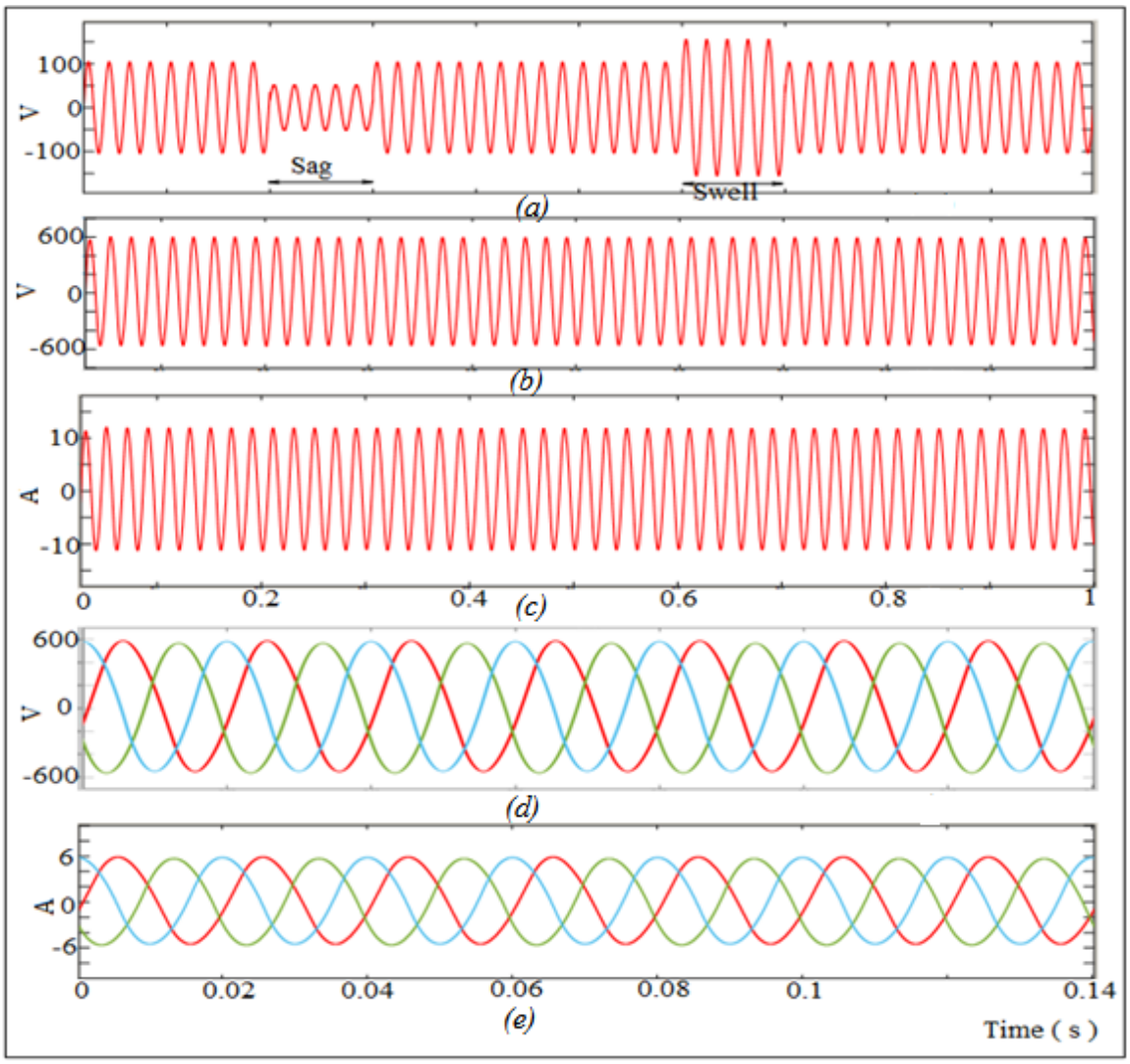

Figure 15. Power Quality issues of Sag and Swell and its mitigation responses under linear loads in 1Φ and 3Φ

Figure 15 shows the simulation response of Power Quality issues of Sag and Swell and its mitigation responses under linear loads in 1Φ and 3Φ. Figure 15a shows the voltage response of PCC, and figure 15b shows the simulation response of 1Φ load voltage, figure 15c shows the simulation response of 1Φ load current. Figures 15d and figure 15e show the simulation response of 3Φ load voltage and 3Φ load current

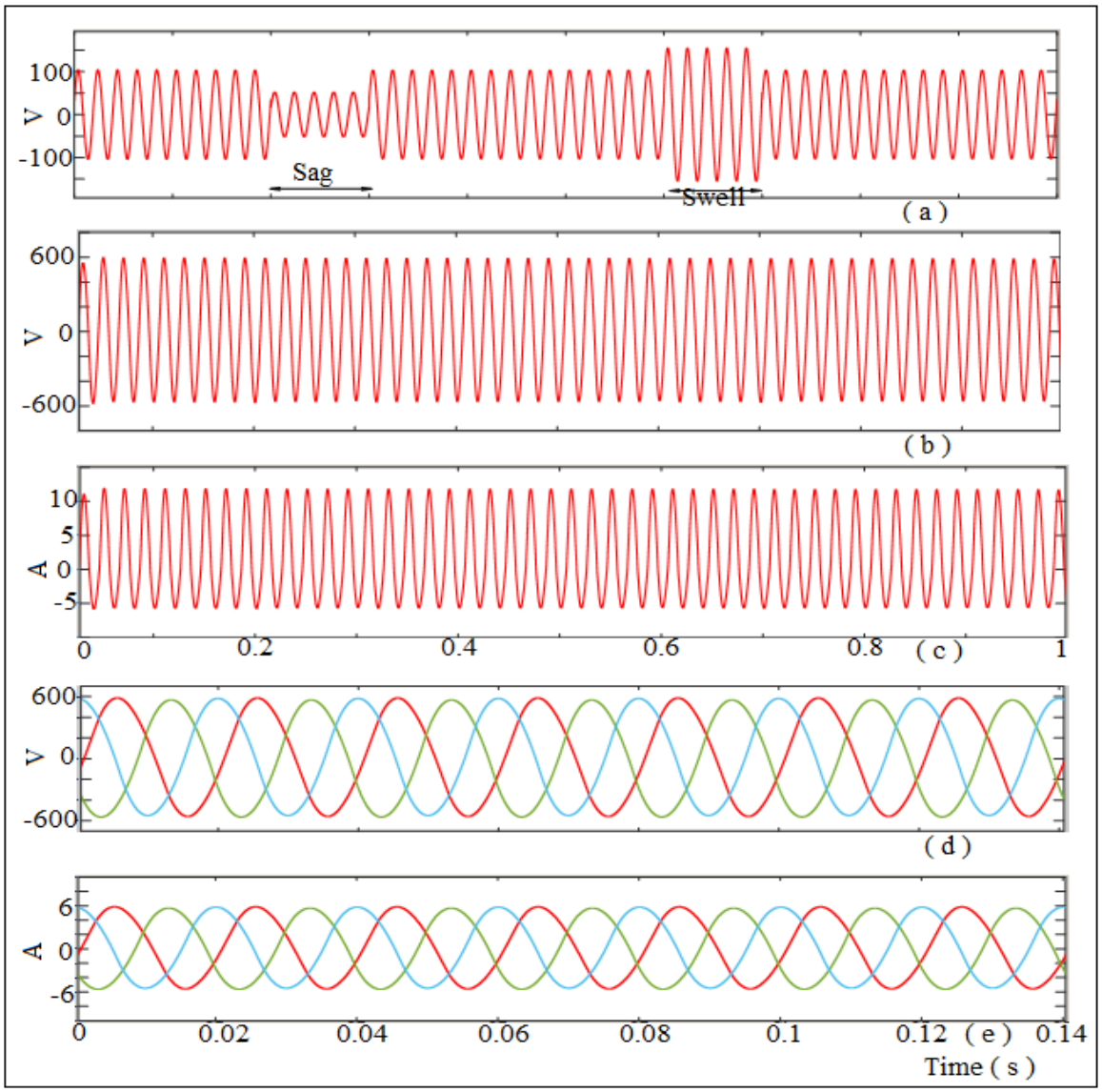

Figure 16. Power Quality issues of Sag and Swell and its mitigation responses under nonlinear load in 1Φ and linear load in 3Φ.

The simulation response of Power Quality issues of Sag and Swell and its mitigation responses under nonlinear load in 1Φ and linear load in 3Φ are shown in Figure 16. The voltage reaction at PCC is shown in Figure 16a, 1Φ Load voltage is shown in Figure 16b, 1Φ Load current response is shown in Figure 16c, 3Φ Load voltage is shown in Figure 16d, and 1Φ Load current response is shown in Figure 16e.

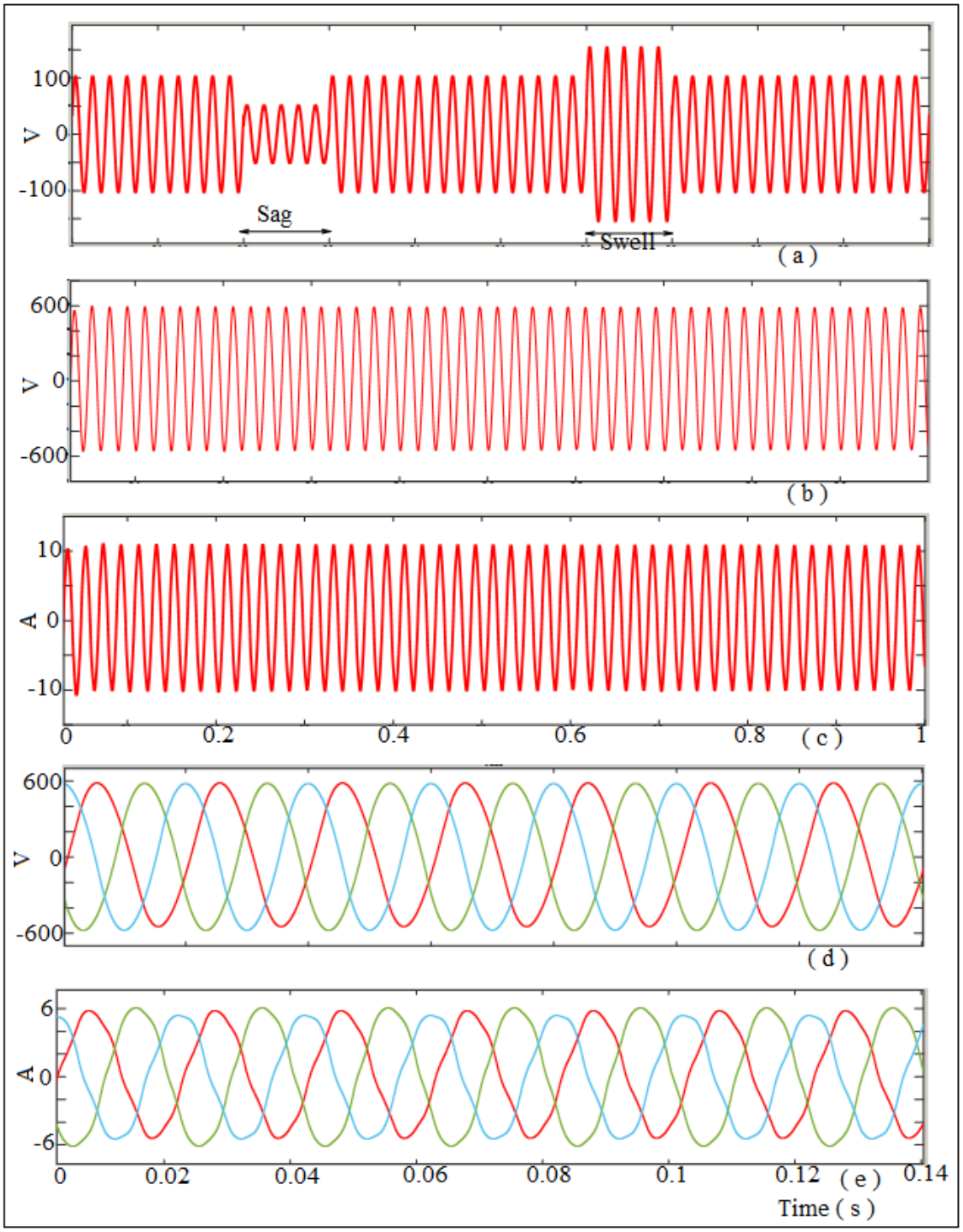

Figure 17. Power Quality issues of Sag and Swell and its mitigation responses under nonlinear load in 3Φ and linear load in 1Φ

Power Quality issues of Sag and Swell and its mitigation responses under nonlinear load in 3Φ and linear load in 1Φ are shown in Figure 17. Figure 17a shows Voltage at PCC, Figure 17b shows 1Φ Load voltage, Figure 17c shows 1Φ Load current, Figure 17d shows 3Φ Load voltage, and Figure 17e shows 3Φ Load current.

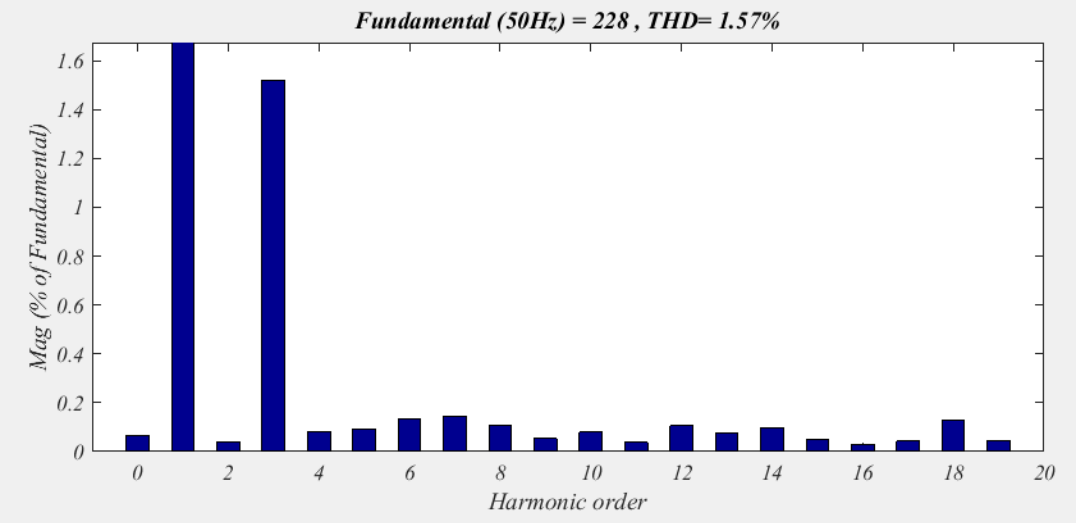

Figure 18. Single Phase Load Current THD for Linear Load

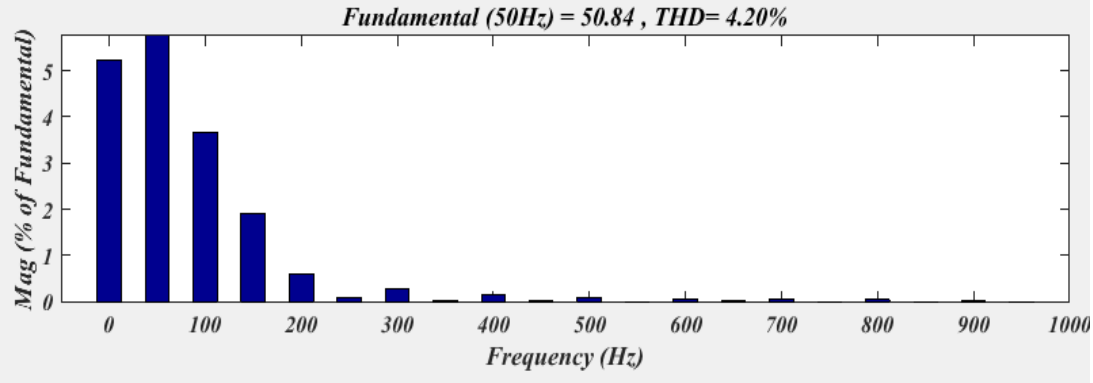

Figure 19. Single Phase Load Current THD for Non Linear Load

The simulation results of THD response in single-phase load current for both linear and nonlinear load circumstances are shown in figures 18 and 19. THD response is 1.57% in a linear load state, and in a nonlinear load scenario, THD response is 4.20%.

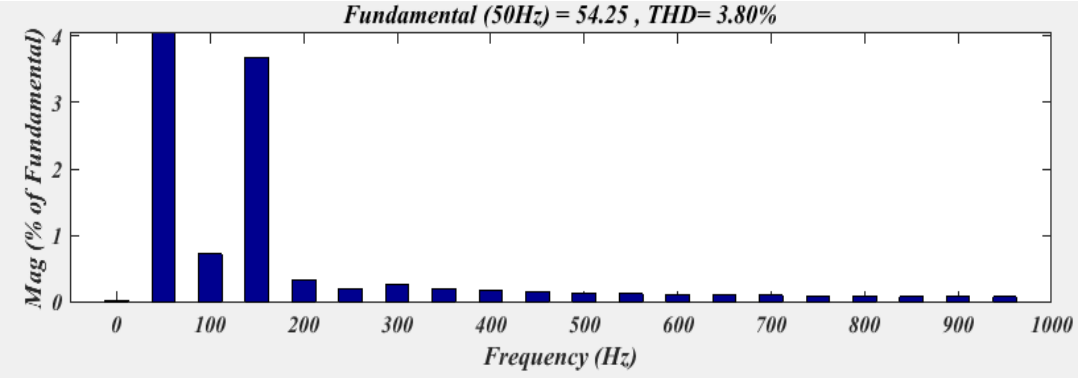

Figure 20. Three Phase Load Current THD for Linear Load

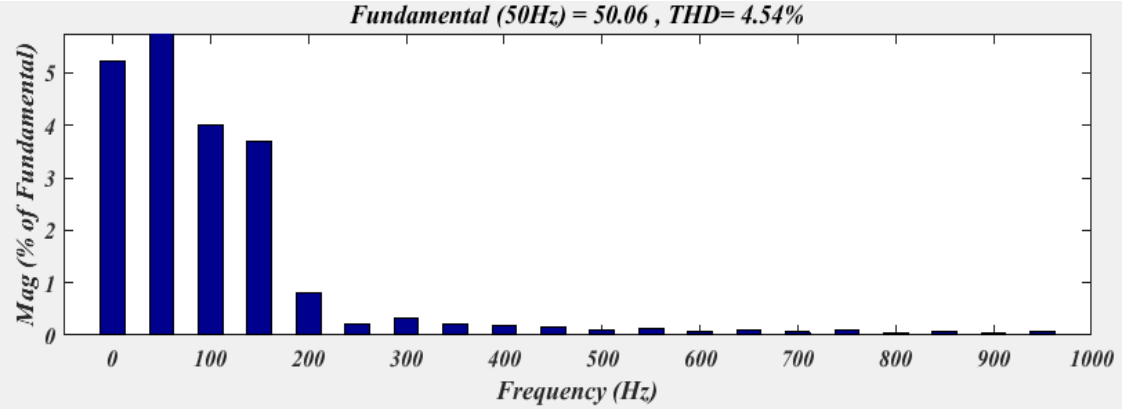

Figure 21. Three Phase Load Current THD for Non Linear Load

Figure 20 and figure 21 show the simulation results of THD response in three-phase load current for linear and nonlinear load conditions. THD response is 3.80% in linear load condition, and in nonlinear load condition, THD response is 4.54%.

Table 2. Performance analysis of Existing method with the proposed system

THD linear Load 1Φ		THD linear Load 3Φ		THD Nonlinear Load 1Φ		THD Nonlinear Load 3Φ	
UPQC with PI	UPQC with BPNN	UPQC with PI	UPQC with BPNN	UPQC with PI	UPQC with BPNN	UPQC with PI	UPQC with BPNN
4.12	1.57	5.45	3.84	5.16	4.20	5.31	4.54

The THD response of the proposed UPQC with BPNN based dc voltage control and PI-based THD response is discussed in table2. This comparison clearly shows that the proposed BPNN based dc regulation control gives a good result in both linear and non-linear conditions compared to the PI-based control system.

5. CONCLUSION

This research, a single phase to three phase Unified power quality conditioner is used in order for it to function better. Through the use of a Synchronous Reference Frame (SRF) management method for series and parallel converters, the proposed 1Ph-to-3Ph-UPQC may safeguard the distribution system from different disturbances including voltage fluctuations,

transients, distortions, and harmonics at the load at DC-link voltage As a result, UPQC solves both voltage and current-related power issues at the same time. As compared to previously offered techniques, the proposed control offers a significant advantage over the others. For both series and parallel active filter control, it has utilised sinusoidal references that do not require complex computations or coordinate conversions. It lowers the overall harmonic content in load voltages in order to ensure power quality and reliability. In the BPNN controller, the THDs are lower than those in strategies without UPQC and with UPQC using the PI controller.

Declaration:

Ethics Approval and Consent to Participate:

No participation of humans takes place in this implementation process

Human and Animal Rights:

No violation of Human and Animal Rights is involved.

Funding:

No funding is involved in this work.

Conflict of Interest:

Conflict of Interest is not applicable in this work.

Authorship contributions:

There is no authorship contribution

Acknowledgement:

There is no acknowledgement involved in this work.

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Dr. S.Srinath received his B.Tech in Electrical Engineering from NIT Hamirpur and M.E. in Power Electronics and drives from college of Engineering, Guindy. He completed his doctorate from NIT Trichy in the area of power quality. He is associated with Velammal Engineering college from 2001. His-area of research includes power Quality, Active power filters, application of power Electronics to Power systems etc. He has contributed more than 30 papers in several reputed Journals and conferences. He is member in ISTE, IE(I) and Chartered Engineer

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Power Quality Enhancement In Pv Integrated Single Phase Distribution System Using A 1ph To 3ph Upqc Supporting Single And Three Phase Load

Reviewer : Amirullah
Affiliation: Electrical Eng Department-Universitas Bhayangkara Surabaya Indonesia

1. Title (Line 1) revise the title into Power Quality Enhancement in PV Integrated Single Phase Distribution System using A Single Phase to Three Phase UPQC Supporting Single and Three Phase Load.
2. Authors (Line 5): Erase Mrs and Dr before the authors name into Poongothai S and Srinath (Only). Reputable journals do not need to mention the academic title or gender before or after the author's name.
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4. Professor, (Line 9) Erase Professor into Department of Electrical and Electronics Engineering, Velammal Engineering College, Chennai, Tamil Nadu 600066 (Only).
5. Figure 2, 3, and 4: Replace the previous figure using Power Simulator (PSim) by using Visio.
6. Equation format (Line 26 and another lines): Revise R_0 and equation in all paragraph equations in italic format.
7. Explain in detail the advantages of the fractional current feed back MPPT method compared to other MPPT methods such as P and O MPPT or Incremental Conductance MPPT in PV modeling. Why did you choose this method in your research (Line 35)?
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12. Figure 15, 16, and 17. Remove all grid frames in the figures, Mention all the quantities and units on the x and y axes (Ex. Voltage (Volt/V), Current (A/Ampere), and Time (Second/Sec/S)), and Add a legend menu for phase A, B, and C waves in the 3 phase system image (Voltage and Current).
13. Figure 20 and 21. Please specify at what phase the THD image is generated because for a 3 phase system only single THD spectra value is displayed (THD spectra in Ph A, Ph B, or Ph C)
14. Table 2. For a 3-phase system, state the THD value in each phase and the nominal average value also. Then draw in a bar graph to explain the advantages of your proposed method over the PI method in improving THD values both in 1 phase and 3 phase system.
15. Conclusion. Explain the weaknesses of this study and how future work will be to improve and refine these weaknesses so that the results are better. Describe in detail in one final paragraph in the conclusion section.

Reviewer Recommendation and Comments for Manuscript Number TAUT-2021-0507

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Original Submission
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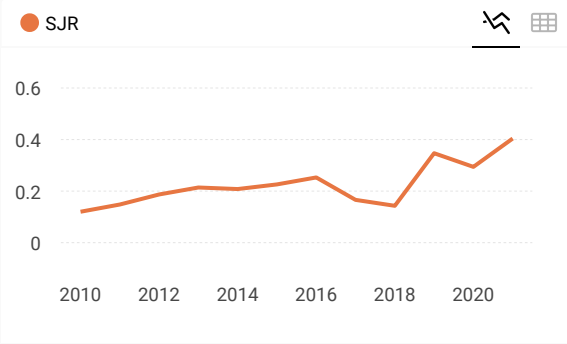

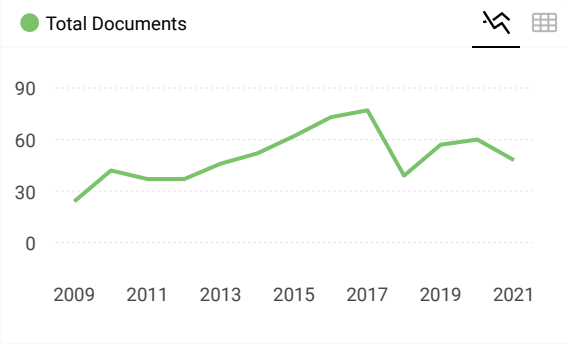

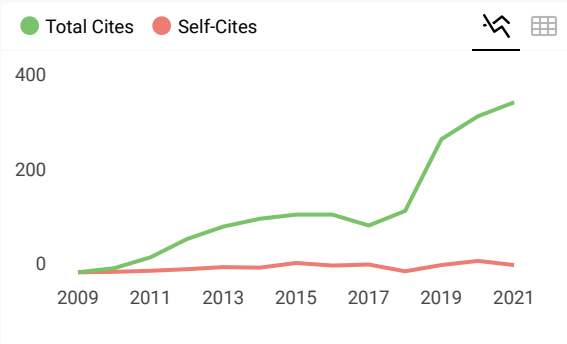

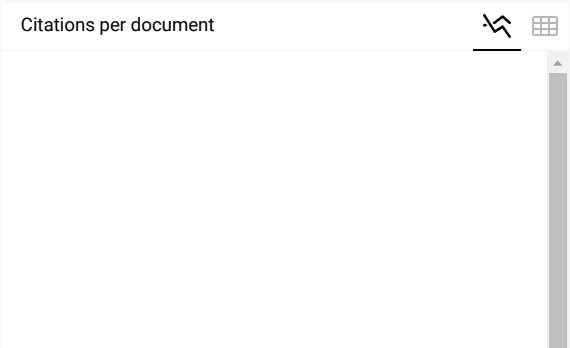

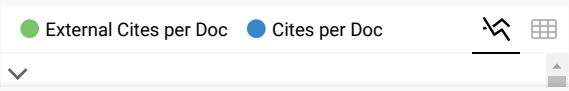

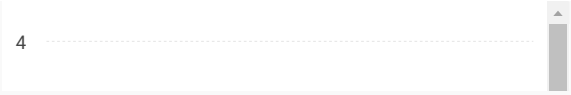

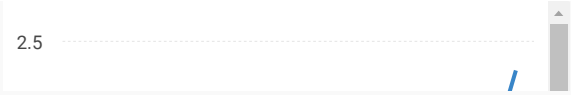

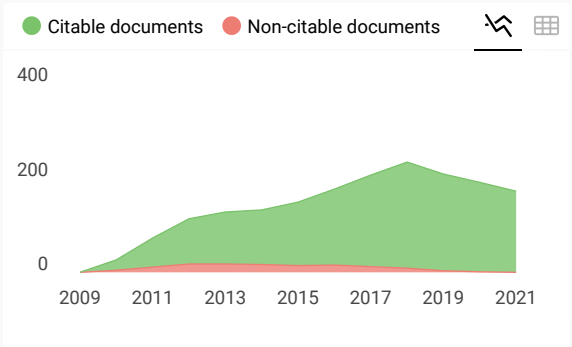

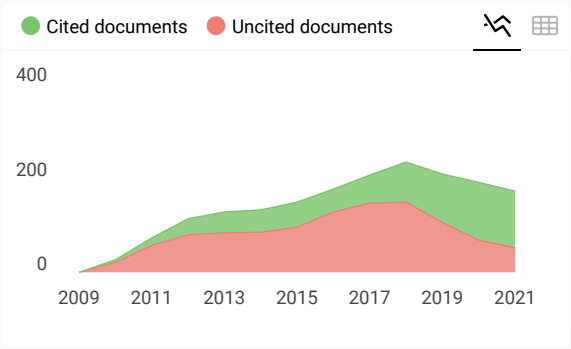

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