JOURNAL OF INNOVATION AND TECHNOLOGY
eISSN:2805-5179 Vol.2026, Issue 2, No.12

Performance Improvement of Weak Power Networks with Solar Energy and Facts Devices

R. Rajasree[1*], D. Lakshmi[2], R. Karthick Manoj[3]

[1,2,3]Department of EEE, AMET University, Chennai, Tamilnadu, India

***Email:** raji.sree1988@gmail.com

Abstract

The study presents an effective approach for enhancing the performance of weak electrical grids through the integration of a solar photovoltaic (PV) system with a Distribution Static Synchronous Compensator (DSTATCOM). The increasing penetration of solar energy into weak utility networks often results in voltage instability, reactive power imbalance, harmonic distortion, and degraded power quality. To overcome these issues, the proposed system utilizes solar PV as a clean renewable energy source while employing the DSTATCOM to provide rapid reactive power compensation, voltage support, and harmonic suppression. A comprehensive model of the integrated system is developed in MATLAB/Simulink to evaluate its performance under varying load conditions and network disturbances. The simulation investigates important parameters such as voltage profile, power factor, total harmonic distortion (THD), system stability, and transmission losses. The results indicate that the DSTATCOM effectively maintains voltage within acceptable limits and significantly improves the dynamic response of the weak grid. It also reduces harmonic content, enhances the power factor, and minimizes transmission losses during fluctuating operating conditions. The coordinated operation of the solar PV system and DSTATCOM ensures reliable power delivery and stable grid performance despite variations in renewable energy generation. Furthermore, the proposed configuration supports greater integration of renewable energy resources without compromising grid security. Overall, the study demonstrates that the solar PV–DSTATCOM combination is a practical and efficient solution for improving the stability, reliability, and power quality of weak power systems, thereby contributing to the development of sustainable and resilient smart grid infrastructures.

Keywords

Solar Photovoltaic (PV) Systems, Distributed Static Compensator (DSTATCOM), Voltage profile, Total Harmonic Distortion (THD), Reactive Power Compensation

Introduction

Modern electrical power systems are facing increasing challenges due to the growing demand for electricity and the rapid integration of renewable energy sources into existing power

Submission: 2 June 2026; **Acceptance:** 29 June 2026; **Available online:** July 2026

networks. Weak electrical grids, particularly in remote and rural regions, often experience poor voltage regulation, low power factor, high transmission losses, and reduced system stability. The intermittent nature of solar photovoltaic (PV) generation further intensifies these problems by causing voltage fluctuations, reactive power imbalance, harmonic distortion, and frequency deviations. Consequently, maintaining power quality and ensuring reliable grid operation have become major priorities for modern utilities. Flexible AC Transmission System (FACTS) devices have emerged as effective solutions for improving voltage stability and enhancing power quality. Among these devices, the Distribution Static Compensator (DSTATCOM) has gained considerable attention because of its rapid dynamic response, efficient reactive power compensation, and harmonic mitigation capabilities. By dynamically injecting or absorbing reactive power, DSTATCOM improves voltage profiles, enhances power factor, reduces transmission losses, and increases the reliability of weak distribution networks. The coordinated integration of solar PV generation with DSTATCOM therefore provides an attractive approach for supporting higher renewable energy penetration while maintaining secure and stable grid operation.

Although extensive research has been carried out on solar PV integration and FACTS-based compensation, most existing studies focus either on conventional grid conditions or on evaluating individual power quality parameters independently. Limited attention has been given to the comprehensive assessment of solar PV-integrated weak distribution systems under varying solar irradiance, load disturbances, and weak grid operating conditions. Furthermore, the combined influence of DSTATCOM on voltage regulation, reactive power compensation, harmonic suppression, transmission loss reduction, power factor improvement, and dynamic system stability has not been sufficiently investigated using a unified simulation framework. This limitation represents an important research gap in the existing literature. The novelty of this work lies in developing a comprehensive MATLAB/Simulink model that integrates a solar PV system with a DSTATCOM FACTS device for weak grid applications. Unlike previous studies that emphasize isolated performance indices, the proposed work simultaneously evaluates multiple electrical performance parameters under realistic operating scenarios, providing a more complete understanding of the interaction between renewable energy integration and power quality enhancement.

Based on the identified research gap, this study investigates the enhancement of weak power network performance through the coordinated integration of solar PV generation and a DSTATCOM FACTS device. A detailed MATLAB/Simulink model is developed to analyze system performance under different operating conditions, including variations in solar irradiance, changing load demands, and network disturbances. The DSTATCOM provides fast dynamic reactive power compensation and voltage support to maintain stable system operation. The proposed system is evaluated using key performance indicators such as voltage profile, power factor, total harmonic distortion (THD), transmission losses, transient response, and overall system stability. Simulation results demonstrate significant improvements in voltage regulation, harmonic reduction, power factor correction, and network reliability. The findings confirm that the proposed solar PV–DSTATCOM configuration provides a practical, reliable, and cost-effective solution for enhancing weak distribution networks while facilitating higher renewable energy penetration. This research therefore contributes to the development of efficient, resilient, and sustainable smart grid systems capable of meeting future energy demands.

Literature Survey

Luis Miguel Fernández-Ramírez examines how Battery Energy Storage Systems (BESS) can help improve the frequency stability of weak power grids with high penetration of renewable energy sources that rely on inverter-type conversion methods [1]. He describes how low system inertia within the renewable energy-rich grid results in frequency instability any time there are sudden disruptions or changes in the loading (i.e. when there is an unplanned loss of generation), and shows through simulation that BESS can provide fast frequency support, improve damping ability, improve the reliability of the power networks, and improve the stability of weakly rated power networks.

Shuai Wang, Kai Cui, and Peng Hao present a grid-voltage feedforward based control strategy for use with grid connected inverters connected to weak power grids. Their study introduces the use of a multi-objective optimisation approach as means to improve inverter stability and reduce the effects caused by voltage perturbations and in general, improve inverter's performance due to operating under conditions characterized as a weak power grid [2]. Their results demonstrate that the proposed control methodology will improve power quality, mitigate oscillations, and provide a dependable operational level for renewable energy systems that are connected to weak-power systems.

Shuai Li and co-authors propose a decomposed harmonic current suppression method for Virtual Synchronous Generator (VSG) based Microgrid (MG) systems on distorted power grid. The proposed technique is able to separate out the harmonic components and effectively suppress the harmonic currents hence achieving good power quality and stable operation and performance of the microgrid system during distorted grid condition. Experimental and simulation results demonstrate the effectiveness of the method in terms of improving harmonic compensation capability, current distortion reduction, and microgrid systems with renewable energy sources reliability [3].

S. Maganti and N. P Padhy present an advanced control strategy for distributed generation (DG) system connected to weak power system to enhance the voltage support during the simultaneous voltage sag and voltage swell. A powerful control method is developed that improves voltage stability, maintains voltage quality and allows reliable operation of DG under abnormal grid disturbance [4]. Simulation results reveal good performance of the proposed strategy in terms of voltage fluctuations and dynamic performance of weak grid connected renewable energy system.

The Power Quality Enhancement – Artificial Neural Network-Proportional Integral (ANN-PI) and fuzzy granular controllers for DSTATCOM integrated with Renewable energy and Battery Storage System is the focus of P. V. Ramana and K. M. Rosalina. The controllers suggested in this article optimise voltage regulation, reduce reactive power and harmonics under varying load and renewable energy conditions [5]. Based on the simulation results, it is found that the intelligent control techniques offer superior dynamic response, stability and power quality performance in comparison with the conventional control techniques.

N. Khosravi and co-authors present an optimized proportional-integral multiresonant controller for stand-alone AC microgrids as an improved control method for Multi-functional Unified Power Quality Conditioner (M-UPQC). Optimization techniques are used in the study to improve the controller performance in harmonic reduction, voltage regulation, and microgrid stability in different load conditions. It is shown that simulation and experimental results are better than the conventional control methods in terms of dynamic response, power quality and reliability [6].

G. Grazioli and co-authors explore the technical, economic, environmental and operational concerns of integrating more renewables into modern power systems [7]. The study identifies grid stability, energy storage, transmission capacity, and advanced control and smart grid technologies to support high levels of renewables. They believe there are three key factors in achieving reliable and sustainable integration of renewable energy: effective planning, flexible grid infrastructure, and innovative energy management strategies.

M. Yessef et al. introduces an enhanced direct power control method based on a backstepping technique for wind energy conversion system (WECS) with a Doubly Fed Induction Generator (DFIG). It is proposed that the control method will help to improve active and reactive power regulation, stabilise system and minimise power fluctuations under different wind conditions [8]. The simulation results demonstrate that the backstepping based controller achieves faster dynamic response, better tracking performance and higher efficiency than the traditional control strategies.

A weak-grid-tied, current-controlled converter in unbalanced grid with a harmonic distortion of the current is studied by S. Maganti and N. P. Padhy and they introduce a flexible compensation system based on feedback [9]. To ensure the converter stability, minimize distortion of the current and keep the current injection balanced during the occurrence of grid disturbances, the study proposes a new advanced control method. The results of simulation and experiments show that the converter works reliably on weak and distorted grids, and the power quality is improved. The simulation and experimental results validate improved power quality, improved dynamic response, and reliable converter operation in a weak and distorted grid environment.

A. Ghaffari and co-authors propose an optimized allocation strategy for Energy Storage Systems (ESS), wind turbines and photovoltaic (PV) to distribution networks taking into account flicker mitigation. The research objectives of the study are to enhance the voltage stability, reduce the fluctuations in power system and minimize Flicker effect due to integration of Renewable energy sources in weak DTS. A suitable placement and size of ESS and renewable sources can significantly minimize network losses and improve the overall reliability of the electrical distribution network while improving the power quality [10].

A. A. Abdelsalam and his co-authors suggest an efficient compensation technique based on a modified DSTATCOM to enhance the operation and power quality of microgrid. This study is conducted to improve the voltage regulation, reactive power compensation, and the suppression of harmonic distortion in various load and disturbance conditions [11]. The simulation results show that the proposed DSTATCOM works remarkably to enhance the stability of the microgrid, minimize the total harmonic distortion (THD), and guarantee reliable and efficient functioning of the renewable energy based microgrids.

An improved control method for voltage regulation of a DSTATCOM based Self-Excited Induction Generator (SEIG) system is given by A. S. Özer and co-authors in [12]. The proposed control approach provides better voltage stability, reactive power and dynamic performance in the standalone power system under different load conditions. Simulation and experimental results validate the effectiveness of the proposed enhanced DSTATCOM controller, which ensures stable voltage levels, enhances power quality and enhances generation system reliability using renewable energy sources.

A. A. Nafeh and co-authors suggest intelligent fuzzy-based controllers to improve the voltage stability of AC-DC microgrids with D-STATCOM. The study presents a development of advanced fuzzy control techniques to enhance the reactive power compensation, voltage regulation and system stability under different operation conditions [13]. The results of the simulation show that the proposed fuzzy based controllers offer better dynamic response, less fluctuation in voltage and better power quality than the conventional controllers.

M. Ranjan and R. Shankar provides a comprehensive literature review of the existing literature on load frequency control (LFC) in power systems that integrate renewable energy. The study presents an overview of the recent control strategies, optimization techniques and the challenges in maintaining the frequency stability in renewable rich power networks. The authors point to future research directions such as advanced intelligent controllers, integration of energy storage and smart grid technologies to enhance system reliability and system dynamics [14].

Proposed Methodology

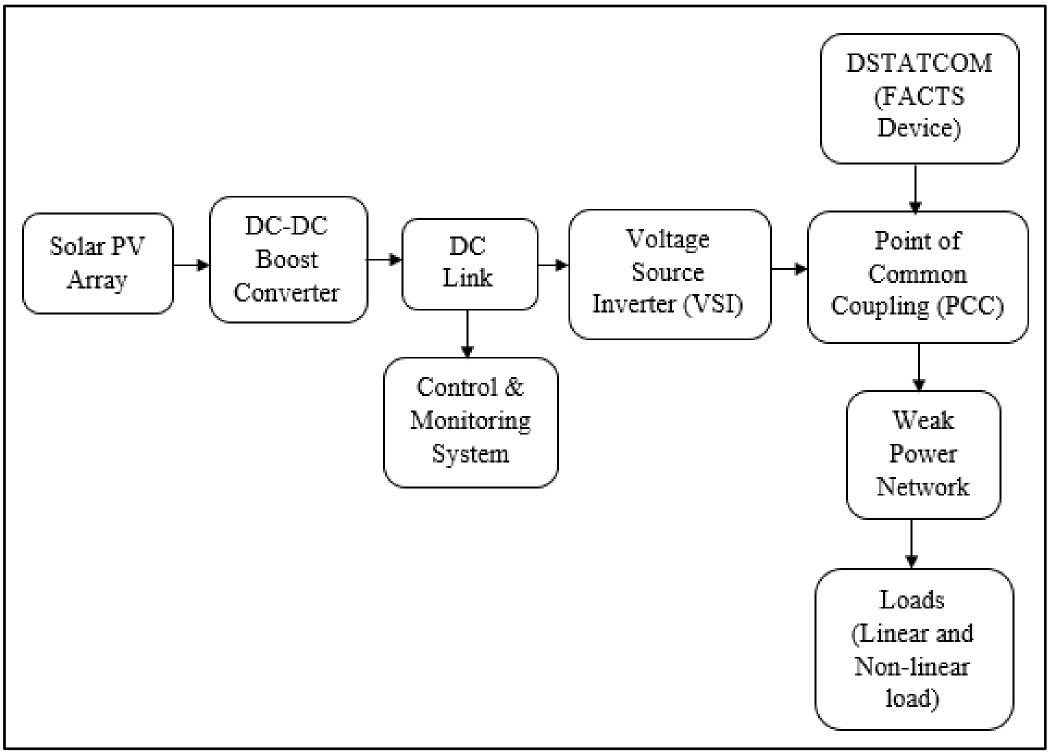

Figure 1. Proposed block diagram for PV system with FACTS device

The block diagram 1 shows the proposed system of integrating Solar Photovoltaic (PV) system with a DSTATCOM FACTS device to enhance the performance of the weak power network. It starts with Solar PV Array which transforms solar energy into electrical energy, which is provided in the form of Direct Current (DC) power [7]. The voltage produced can, however, not be high enough to be grid connected, so the voltage from the DC output is boosted and regulated with a DC-DC Boost Converter. The regulated power is then fed to the DC Link as an intermediate energy storage and voltage stabilizer. A Control and Monitoring System is connected to the DC link to monitor and manage the system parameters, and control the operation of the converters. The Voltage Source Inverter (VSI) changes the DC power into AC power that can be integrated with the grid. The AC output of the inverter is plugged into the Point of Common Coupling (PCC) which is the common connection point of the renewable energy source, compensation device, and the weak power network [8]. It will allow efficient power transfer and stable operation of the overall system across various operating conditions.

The DSTATCOM FACTS device is installed at the PCC to provide reactive power compensation and enhance voltage stability of the weak power network. The main problems of weak grids are voltage fluctuations, harmonics, low power factor, and instability caused by fluctuations in loading and intermittency of renewable energy sources. To overcome these problems, the DSTATCOM is designed to inject or absorb reactive power as per system requirement and keeps voltage profile at PCC stable. The compensated power is then fed to the Weak Power Network (WPN) and the electrical power is distributed to different loads connected to it [9]. Linear and nonlinear loads are incorporated in the system for analysis of the impact of harmonics and power quality disturbance in the system. By incorporating DSTATCOM, total harmonic distortion (THD), power factor, power losses and transient response with disturbance are reduced to a minimum. To evaluate and analyse the system performance and stability, the whole system has been modelled and simulated in MATLAB/Simulink. With the configuration proposed it is guaranteed a reliable operation, a better utilization of renewables and a better power quality in Smart Grid applications [10].

- **Solar PV Array**

Solar PV Array is a component that converts the solar energy to DC electrical power with the help of photovoltaic cells. It is the main renewable energy source of the system. The electricity produced is related to the light intensity of the sun and the environment. Solar PV plays a role in de-carbonising conventional energy supplies. It delivers clean & sustainable electrical power to a weak power network.

- **DC-DC Boost Converter**

The low DC voltage from solar PV array is boosted and regulated by the DC-DC Boost Converter. It can hold the output voltage constant when the solar irradiances change [11]. The converter optimizes the power transfer efficiency between the PV system and inverter. It also helps to extract maximum power from the solar panel. It, therefore, guarantees the reliability of DC power supply to the system.

- **DC Link**

The DC Link is a buffer between the DC Power supply and the DC load. It keeps the constant DC voltage between the converter and inverter. The voltage fluctuation and ripples are minimised by using capacitors in the DC link. The DC link ensures smooth energy transfer in dynamics. It enhances the system's stability and functionality.

- **Control & Monitoring System**

The Control and Monitoring System oversees all the integrated network operation. Measures the parameters of the system like voltage, current and power quality [12]. Based on the measurements, control signals are generated for efficient operation. The system is used for the stable voltage regulation and the compensation of reactive power. Typically these control functions are implemented in MATLAB/Simulink.

- **Voltage Source Inverter (VSI)**

The Voltage Source Inverter is a device that transforms a direct current (DC) into an alternating current (AC) that matches the characteristics of the electrical network. It matches the voltage and frequency of AC power generated with the voltage and frequency of the grid. The inverter controls the flow of active and reactive power in the system. PWM switching method is employed to operate the inverter efficiently. It serves as a link between solar PV and weak grid.

- **DSTATCOM (FACTS Device)**

DSTATCOM is a shunt connected FACTS device, which is employed for reactive power compensation. It enhances voltage stability and keeps the power quality stable in weak power network [13]. The device is able to provide or absorb reactive power as per system requirement. It also reduces the harmonics and increases power factor. Therefore, DSTATCOM provides better reliability and stability of the power system.

- **Point of Common Coupling (PCC)**

The PCC serves as a common point between the inverter, DSTATCOM and the power network. The primary location for monitoring power quality and voltage. The DSTATCOM is installed to compensate the reactive power at PCC, which helps to stabilize voltage. Here, grid synchronization and match of renewable sources are maintained. Thus, PCC is very important for system integration and system stability.

- **Weak Power Network**

Weak Power Network is a low voltage stability and poor power quality grid. These kinds of networks experience significant load variation and influence from renewables. They tend to suffer from voltage drop, voltage harmonics, and reactive power imbalance. This weak grid is proposed to be improved in the proposed system. The DSTATCOM compensation aids in providing stable and reliable operation. The course will also cover linear/non-linear loads.

- **Loads**

There are linear and non-linear electrical loads in the system. Linear loads draw sinusoidal current operating from the power supply, and non-linear loads generate harmonics and distortion of the current waveform [14]. These harmonics lower power quality and power system efficiency. The DSTATCOM is a compensation device for non-linear loads generating harmonic currents. The study of the various load conditions aids in the evaluation of the effectiveness of the proposed system.

Results and Discussion

The diagram 2 shows the harmonic spectrum of the source current before and after DSTATCOM compensation, in a weak power network. The harmonic magnitudes are greater and Total Harmonic Distortion (THD) is approximately 4% and this is a poor power quality. Once the DSTATCOM is integrated the harmonics are effectively reduced and the THD is lowered to 1.8%. This shows the effect of the DSTATCOM in power quality improvement, reduction of distortion and compliance of this system with the IEEE-519 standards.

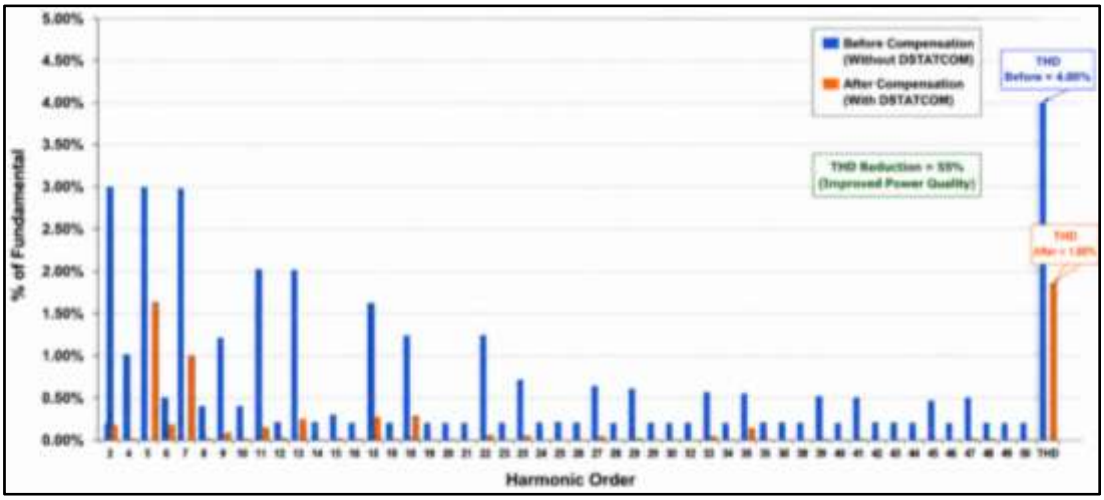

Figure 2. Harmonic Spectrum of the current before and after DSTATCOM compensation

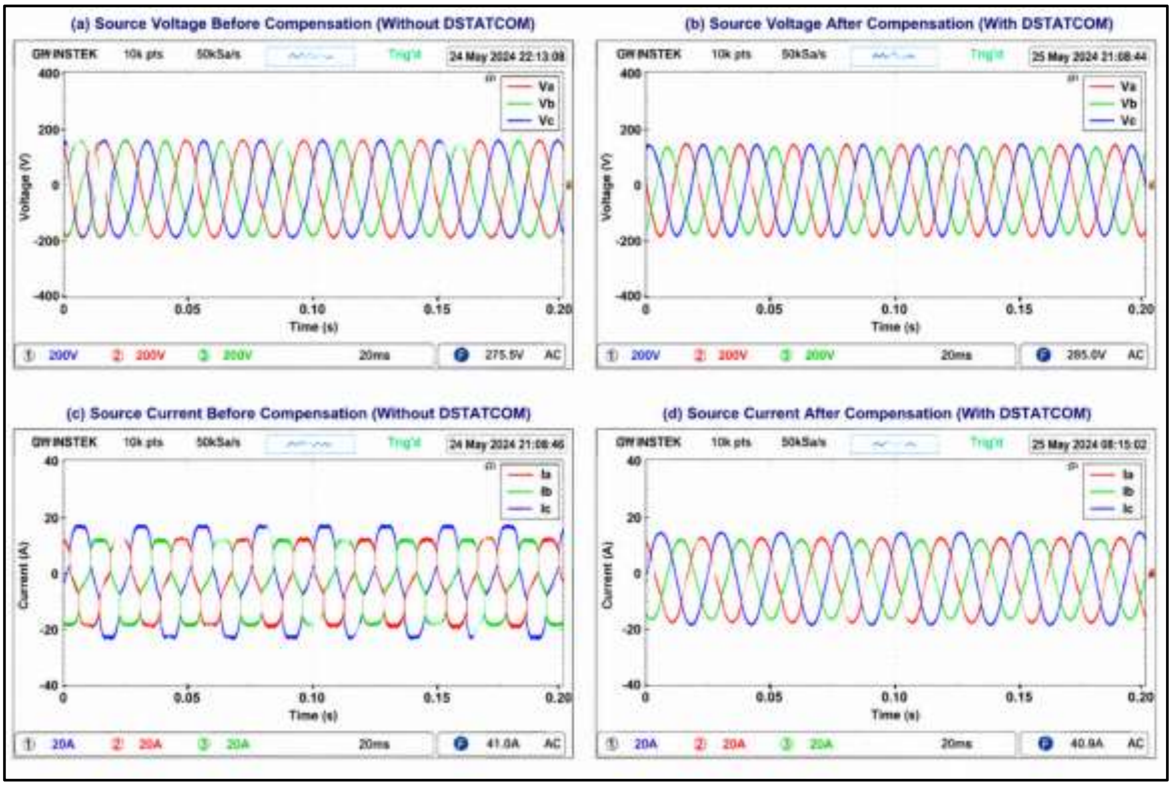

Figure 3. Source Voltage and Source Current waveforms before and after DSTATCOM compensation

The figure 3 illustrates the source voltage and current waveforms of the weak power network before and after DSTATCOM compensation. Prior to compensation, the source current exhibits significant harmonic distortion due to the presence of reactive power fluctuations and nonlinear load effects, while the source voltage experiences noticeable variations and instability. After the integration of the DSTATCOM, both the voltage and current waveforms become smooth, balanced, and nearly sinusoidal. This improvement indicates that the DSTATCOM effectively compensates reactive power, suppresses harmonic distortion, enhances voltage regulation, and significantly improves the overall power quality and operational stability of the weak grid.

The figure 4 presents the RMS voltage and current characteristics of the solar PV-integrated weak power network with DSTATCOM compensation. As shown in figure 4(a), the RMS voltage remains stable throughout the simulation, demonstrating the DSTATCOM's capability to maintain a regulated voltage profile under varying operating conditions. The figure 4(b) shows the RMS current response, where transient fluctuations occur during system disturbances but quickly settle to a stable value due to the fast dynamic response of the DSTATCOM. These results confirm that the proposed solar PV–DSTATCOM system effectively enhances voltage stability, minimizes current fluctuations, improves power quality, and ensures reliable operation of the weak distribution network under dynamic loading conditions.

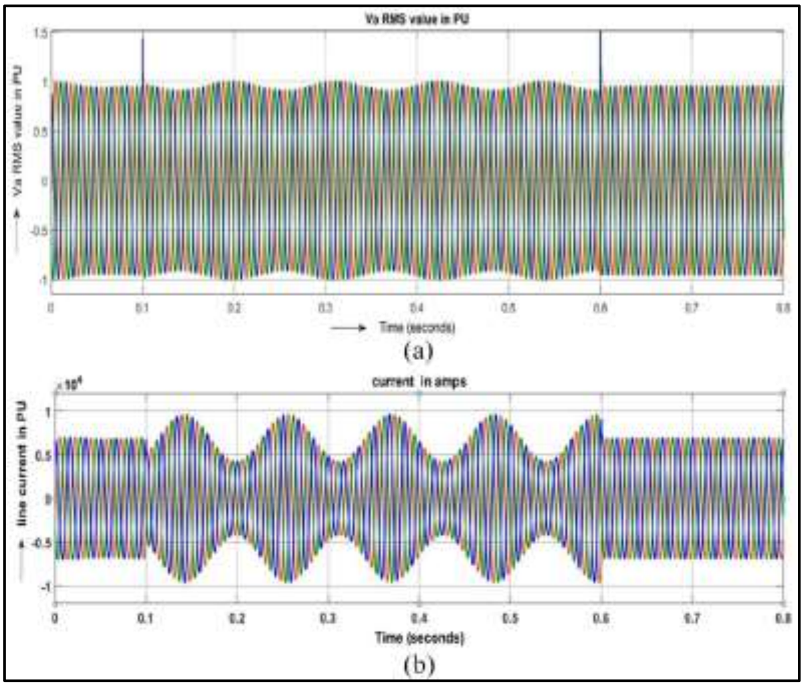

Figure 4. RMS Voltage and Line Current waveforms

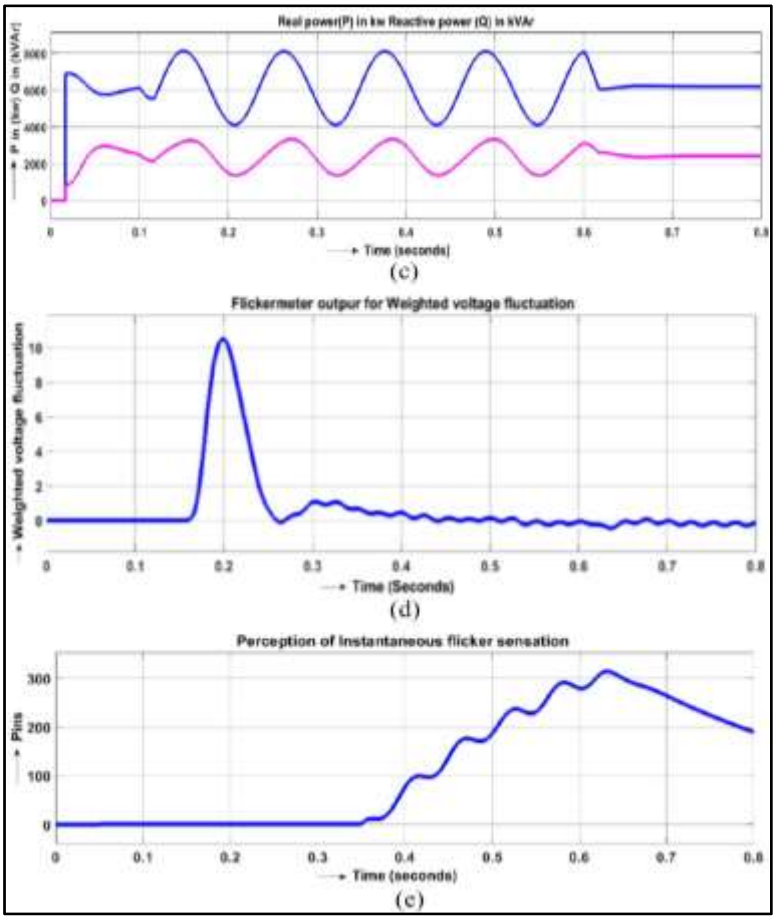

Figure 5. Real Power (P), Reactive Power (Q), Voltage Fluctuation, and Flicker Sensation Characteristics of the Weak Power Network Integrated with Solar Energy and DSTATCOM

The real power (P), reactive power (Q), voltage fluctuation and flicker sensation characteristics of the weak power network integrated with solar energy and DSTATCOM are illustrated in figure 5. Figure (c) shows the variation of real and reactive power during system operation, where the DSTATCOM helps in maintaining stable power flow and reactive power compensation. The voltage fluctuation represented by figure (d) is the weighted voltage fluctuation that begins to increase because of disturbances and then decreases again after the disturbances are compensated. The proposed system thus shows that it is effective in minimizing the flicker effects and enhancing the overall quality of power supply and stability of the network as shown in Fig. (e).

Table 1: Performance Analysis of the Weak Power Network before and after the Integration of the Solar PV system with DSTATCOM

Parameter	Before Compensation	After Compensation
PCC Voltage (PU)	0.82 PU	0.99 PU
Source Current THD	4.00%	1.80%
Reactive Power (Q)	3.4 kVAR	1.5 kVAR
Real Power (P)	5.8 kW	6.3 kW
Power Factor	0.78 lagging	0.98 lagging

The table 1 shows the comparative performance analysis of weak power network before and after integration with Solar PV system with DSTATCOM compensation. The PCC voltage before compensation is 0.82 pu, which is voltage instability in the weak grid condition and after compensation is 0.99 pu, which is the voltage regulation is good. The source current THD is reduced from 4% to 1.8%, which indicates the DSTATCOM successfully reduces the harmonic distortion and enhances the power quality based on IEEE-519 standards. Likewise the reactive power demand is lowered from 3.4kVAR to 1.5kVAR and the real power transfer is raised from 5.8kW to 6.3kW which shows that the power system is utilized more effectively. Additionally, the power factor rises sharply from 0.78 lagging to 0.98 lagging, which shows that the system is compensated efficiently for reactive power and has an enhanced overall system stability.

Conclusion

The proposed system for stability improvement and power quality of weak power network with Solar PV and DSTATCOM FACTS device is successful in improvement the stability and power quality of the electrical network. The integration of solar energy delivers effective active power support and promotes utilization of renewable energy resources in modern power systems. Under different load conditions, DSTATCOM can play an important role in compensating reactive power, reducing voltage fluctuations, and minimizing harmonic distortion. The MATLAB/Simulink simulation result shows that the voltage profile, power factor and Total Harmonic Distortion (THD) have improved considerably. The system is also found to work well from the dynamic response point of view during disturbances and to operate stably in weak grid conditions. The compensated network shows high reliability, low power loss and high energy efficiency. Moreover, the proposed approach is suitable to achieve the Sustainable Growth of a SMART GRID, since it will allow for better utilization of clean energy sources. The results indicate that Solar PV along with DSTATCOM is a successful solution to solve the weak network challenges. Thus, the suggested approach has the potential to enhance the performance, stability, and overall energy quality of modern electrical networks.

Acknowledgement

The authors would like to express their sincere gratitude to all those who contributed to the successful completion of this research. The authors are thankful to their respective institution for providing the necessary facilities, resources, and a supportive research environment.

References

A. A. Abdelsalam, S. S. M. Ghoneim, and A. A. Salem,(2022) "An efficient compensation of modified DSTATCOM for improving microgrid operation," *Alexandria Eng. J.*, vol. 61, no. 7, pp. 5501–5516, https://doi.org/10.1016/j.aej.2021.10.061

A. A. Nafeh, A. Heikal, R. A. El-Sehiemy, and W. A. A. Salem, 2022) "Intelligent fuzzy-based controllers for voltage stability enhancement of AC-DC micro-grid with D-STATCOM," *Alexandria Eng. J.*, vol. 61, no. 3, pp. 2260–2293, https://doi.org/10.1016/j.aej.2021.07.012

A. Ghaffari, A. Askarzadeh, and R. Fadaeinedjad,(2022) "Optimal allocation of energy storage systems, wind turbines and photovoltaic systems in distribution network considering flicker mitigation," *Appl Energy*, vol. 319, https://doi.org/10.1016/j.apenergy.2022.119253

A. S. Özer, F. Sevilmiş, H. Karaca, and H. Arabacı,(2022) "Enhanced control method for voltage regulation of DSTATCOM based SEIG," in 2022 The 4th International Conference on Clean Energy and Electrical Systems (CEES 2022), 2–4 April, 2022, vol. 8, pp. 839–847, https://doi.org/10.1016/j.egyr.2022.05.191

Fernández-Ramírez, L.M.; Abu-Siada, A.; Crebier, J.C.; Moreno-Munoz, A.; Gao, Z.; Fu, K.; Aranda, E.D.; Paiva, P.; Castro, R. (2024) Effects of Battery Energy Storage Systems on the Frequency Stability of Weak Grids with a High-Share of Grid-Connected Converters. *Electronics*, 13, 1083. https://doi.org/10.3390/electronics13061083

G. Grazioli, S. Chlela, S. Selosse, and N. Maïzi, (2022) "The Multi-Facets of Increasing the Renewable Energy Integration in Power Systems," *Energies*, vol. 15, no. 18, p. 6795 https://doi.org/10.3390/en15186795

Khosravi, N. et al. (2023) A new approach to enhance the operation of M-UPQC proportional-integral multiresonant controller based on the optimization methods for a stand-alone AC microgrid. *IEEE Trans. Power Electron*. 38(3), 3765–3774. https://doi.org/10.1109/TPEL.2022.3217964

M. Yessef, B. Bossoufi, M. Taoussi, and A. Lagrioui, (2022) "Enhancement of the direct power control by using backstepping approach for a doubly fed induction generator," *Wind Engineering*, vol. 46, no. 5, https://doi.org/10.1177/0309524X221085670

Ramana, P. V. & Rosalina, K. M. (2024) Power quality enhancement using artificial neural network-Proportional integral controller and fuzzy granular controller for DSTATCOM integrated with renewable energy and battery storage system. J. New Mater. *Electrochem. Syst*. 27(4), 324–339. https://doi.org/10.14447/jnmes.v27i4.a04

Ranjan, M.; Shankar, R. (2022) A literature survey on load frequency control considering renewable energy integration in power system: Recent trends and future prospects. *J. Energy Storage*, 45, 103717. https://doi.org/10.1016/j.est.2021.103717

S. Li, J. Wu, G. D. Agundis-Tinajero, S. K. Chaudhary, J. C. Vasquez, and J. M. Guerrero, (2024) "A Decomposed Harmonic Current Suppression Method for VSG-Based Microgrids Connected to Distorted Grids," *IEEE Transactions on Industrial Electronics*, vol. 71, no. 9, https://doi.org/10.1109/TIE.2023.3333024

S. Maganti and N. P. Padhy, (2022) "A Feedback-Based Flexible Compensation Strategy for a Weak-Grid-Tied Current-Controlled Converter Under Unbalanced and Harmonic Conditions," in *IEEE Transactions on Industry Applications*,. https://doi.org/10.1109/TIA.2022.3195186

S. Maganti and N. P. Padhy, (2024) "An Advanced Control Strategy for a Weak Grid-Connected DG for Enhancing Voltage Support During Co-occurrence of Sag and Swell," *IEEE Trans Power Electron*, vol. 39, no. 1, 2024, https://doi.org/10.1109/TPEL.2023.3325239

Wang, S., Cui, K. & Hao, P. (2024) Grid-connected inverter grid voltage feedforward control strategy based on multi-objective constraint in weak grid. *Energies* 17(13), 3288. https://doi.org/10.3390/en17133288