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A Review on Hybrid Renewable Energy System Using Dynamic Voltage Restorer

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Abstract- This paper presents a new system for integration of a grid-connected photovoltaic (PV) system together with a self-supported dynamic voltage restorer (DVR).Power quality (PQ) is gaining a great deal of importance as more sensitive loads are introduced into the utility grid. The degradation of product quality, damage of equipment and temporary shutdowns are the general issues associated with PQ problems in industries. Any mal-operation or damage of the industrial sensitive loads results in monetary losses disproportionately higher than the severity of the PQ issues. The evolution of power electronics technology replaced the traditional power quality mitigation methods with the introduction of Custom Power System devices (CUPS). The major power electronic controller based CUPS are DSTATCOM, DVR and UPQC. DVR is a pertinent solution for the economic losses caused by the PQ issues in the industries. Among the CUPS, DVR is the most cost-effective one. In the published literature, only a few papers correspond to the review of DVR technology. In this paper, a systematic review of published literature is conducted and a description is given on the design, standards and challenges in the DVR technology. In addition to the energy variability of renewable energy sources, random voltage sags, swells and disruptions are already a major issue in power systems. Recent advances in power electronic devices have provided a platform for new solutions to the voltage support problem in power systems.

Keywords- Wind, Solar, MPPT, DVR, SVM, DC to DC converter.

I. INTRODUCTION

Human development is related to amplification in power consumption per capita. If the required power generation Facilities can be built to meet increasing demand, the entire power division or transmission system or also be improved to cope with the extra load. Therefore, building additional command resources or upgrading the transmission arrangement will cost a lot of cost or time, both of which cannot be achieved. [1]

Although the island has some advantages, it also has some disadvantages. Some of them are as follows: After opening or marking the primary source, the DG source will power the system, thereby threatening line workers' safety. The power or incidence may not be kept within an ordinary allowable level. The island arrangement may be due to insufficient grounding of DG interconnection. Immediate re-closure may lead to an out-of-phase re-closure of GD.

As a result, great emotionless torque or current are produced, injuring the generator or the drive motor. Also, transients can also generate, which can cause damage to utilities and other user equipment. If this occurs at a power peak, off-phase reconnection will produce very severe capacitive switching transients. In a slightly attenuated organization, peak overvoltage can be close to three times the rated power. [11] The resulting risks include degradation of electronic machinery due to voltage and frequency operation. For these reasons, it is very significant to discover islands swiftly or truthfully.

1. Solar Potential in India: Scope and Challenges:
Installed power capacity in India is 187549.6 MW out of which renewable energy share is 20162.2 MW (nearly 11%). India receives solar energy equivalent to more than 5,000 trillion units per year. Further, the daily average solar energy incident per unit area (m^2) varies between 4–7 units, much in accordance with the location. Also, most parts of the country have about 300 clear sunny days. All these augur well for solar energy development through well devised policy-cum-programme initiatives.

In this context, the Jawaharlal Nehru National Solar Mission (JNNSM) was launched in 2010 and there has been a dramatic change in the way solar technology is perceived. The mission was launched at a time when the price of solar modules was declining by almost 50%. This has made Solar Photovoltaic (SPV) systems more affordable and accessible than ever before.
The Concentrated Solar Power (CSP) technologies, particularly parabolic trough based systems are mature

enough for commercial power generation. It is now widely believed that the solar mission targets are achievable. Among the broad targets of the mission, capacities of 20,000 MW, 100,000 MW and 200,000 MW are targeted for 2022, 2030 and 2050 respectively. The period 2022–2050 is expected to generate an investment opportunity of INR 850,000 -1,050,000 million. Realization of the targets will make India a global leader in solar energy.

2. Region-specific solar energy variability:

Availability of solar energy is influenced by geographic and climatic factors apart from daily, monthly and annual variations. Region-specific considerations play pivotal role in the techno-economic viability of solar power generation. Since massive investments are involved, it is very important for the government and the private players to perform solar technology performance analyses. The project developers need to study local conditions with a clockwork precision.

A study was undertaken to quantify the regional variability of solar energy and identify hotspots of solar potential that are viable for large scale solar power generation in India. The study strategically informs investment-specific decisions for potential solar power developers as well as policy decisions for energy planners.

A techno-economic analysis of solar technologies like SPV and CSP was also undertaken. Investigation of regional variability of solar energy in our vast country with sparse radiation data from merely 45 stations is futile. Hence, the study was carried out with high spatial resolution NASA meteorological dataset that is available for a period of 22 years. Radiation data was available for over 350 locations in India and monthly maps depicting solar energy availability were created to analyze the regional variability Above 5.25 kWh/m^2/day of global horizontal solar radiation is considered excellent while that from 4–5.25 kWh/m^2/day is considered good.

The analyses of monthly solar energy availability (Figure 1) concluded that global insolation throughout India increases from January to May (gradually from south to north India) and decreases after May with the onset of monsoon. The average variation of solar radiation with area within the dotted lines indicates places with radiation over 5 kWh/m^2/day; these are considered to be the hotspot of solar potential in India (Figure 2).

It was found that the gangetic plains, the plateau region, the western dry region, Gujarat plains and hill region, west coast plains, and ghat regions receive annual global insolation above 5 kWh/m^2/day. These zones include states such as Karnataka, Gujarat, Andhra Pradesh, Maharashtra, Madhya Pradesh, Rajasthan, Tamil Nadu, Haryana, Punjab, Kerala, Bihar, Uttar Pradesh, and Chhattisgarh. The eastern part of Ladakh and some parts of Himachal Pradesh, Uttarakhand, and Sikkim which are located in the Himalayan belt are also solar hotspots. These cover nearly 1.89 million km^2 (~58%) area of the country and present favorable prospects for solar energy utilization. (Ramachandra et al., 2011).

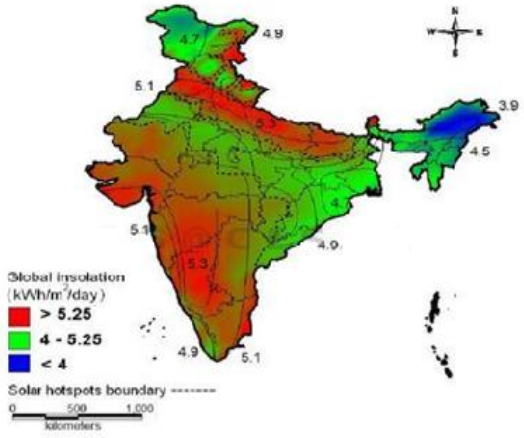

Fig 1. Solar hotspots demarcated over the annual solar energy map of India.

3. Solar energy: The hope for today and tomorrow:

Solar hotspots in India uphold the prospects as major hubs of clean power generation to meet the ever increasing electricity demands coupled with the diminishing stock of fossil fuels. This necessitates the region specific availability and variability analysis. Thereafter, a clear understanding of relevant solar technologies is required from a variety of end-use considerations. The Indian landscape is well suited to be dotted with SPV and CSP plants and the country is poised to be the leader with the energy secure future (Ramachandra and Krishnadas, 2011).

4. SPV:

The SPV is a semiconductor based technology, which converts sunlight directly into electricity. ASPV-based system, without battery backup on-site, may actually be able to provide just about 67.5% of the maximum power output, on a clear sunny day.

This is attributed to factors, such as time of the day, internal heating, dust, module mismatch, wiring, and DC-AC conversion losses affecting the overall system performance. If, a battery is added to the system, the net power output may further reduce by 6%–10%.

The European Photovoltaic Industry Association (EPIA) and Greenpeace predict that by 2050, solar power will meet about 21% of global electricity needs. As per the current estimates, more than 3 million people, globally, benefit from small SPV systems. Also, the per peak watt price of solar modules in India is less than INR 100 and is

further on a decline. India currently has few major grid interactive SPV plants and a lot more are being commissioned through private participation in the best sun-soaked regions of Karnataka, West Bengal, Maharashtra, Punjab, and Rajasthan among others. The grid interactive SPV capacity in the country has grown nearly 10 times from pre-JNNSM to 481.8 MW as of today.

5. CSP:
While SPV modules are capable of using global solar radiation, direct solar radiation above 5 kWh/m^2/day is congenial for CSP applications. Sun rays are concentrated to focus on a point or a line where the boiler unit is placed. Depending on the design of the plants the temperature may vary from 300–1500 °C. Heat collected in a CSP plant can be stored in various forms for later use and this makes it distinct benefit from SPV technology. Also, it is relatively simpler and cost effective as compared to conventional battery storage that is used with SPV. The CSP plants require about 2 ha (20,000 m^2) in semi-arid and arid regions with clear skies.

It is very important to have knowledge of yearly direct solar insolation data prior to their installation. Nearly 50% of the investments in CSP-based power plants is used to purchase locally available materials like steel, mirrors, concrete, besides the labour cost. It thus provides socio-economic stability and local employment opportunities. Undeniably, CSP adapts well to the Indian socio-economic conditions, but needs vigorous research and development for up-scaling. In the present context, serious efforts are underway to design and develop CSP plants suitable for Indian conditions. Research centers at premier institutes like Indian Institute of Technology (Rajasthan) are forging ahead in this direction.

II. RELATED WORK

Dipayan Guha et.al (2020) this article discusses the frequent instability of hybrid power systems (HEPSs) that are associated with thermal energy production. Initially, a stochastic improvement technique called the sine cosine algorithm (SCA) was used to improve the gain from the derivative control derivative control (FOPI-D) to balance power production or load curvature. To increase speed the flexibility of alternatives or avoid solutions from local high-level, quasi-opposition-based learning (Q-OBL) is combined with SCA to create QOSCA.

In this function, PID controller statement is placed in feedback path to avoid problem being set up suddenly. Shows the comparative evaluation of energy storage devices by analyzing effectiveness of energy storage devices in HEPS. The qualitative or qualitative appraisal of results shows that planned QOSCA: FOPI-D Controller has best performance compared to the FOPI-D organizer developed by SCA-, Gray Wolf Optimizer (GWO) or hyper spherical Search (HSS).

It can also be seen in the results provided by QOSCA: FOPI-D Controller has anti-interference capabilities and demonstrates strong effectiveness in resisting parameter uncertainty and load stress. By examining the constraints on power generation, the governor's dead zone, and the influence of boiler power, it is possible to determine the inspectors' effectiveness [2].

Mohammad Javad Morshed et.al (2020) this article presents an expensive and simple design for a wind / photovoltaic system. Their main goal is to have a capable system that meets the requirements of the new plate rules and eliminates the need for inverters for photovoltaic installation. The planned topologies attach PV system to DFIG DC link via a DC-DC converter, thereby reducing cost or eradicate need for an inverter committed to PV power generation. Under normal circumstances, the DC-DC converter control working power of the hybrid wind / photovoltaic system.

In the event of a plate failure, GSC is used as STATCOM to insert immediate energy into the grid, and the DC-DC converter control DC-link currency of the DFIG. To make certain the best presentation, fuzzy PI method is used to automatically adjust the gain of the RSC, GSC or DC-DC converter monitors. In the event of a one-step, three-step, three-step error and parameter change, evaluate the effectiveness of the proposed strategy. It also compares its performance to traditional electric riding techniques.

The proposed strategy shows that it can reduce rotor speed, improve converter efficiency, reduce power consumption, power consumption and change and protect hybrid wind / photovoltaic systems during power outages. In addition, it can also support the plate by inserting a moving motor during the electric shock [3].

Anwesha Manisha Nayak (2020) et.al Islanding Detection in the distributed generation (DG) system is a major function that needs to be addressed. Traditional Islanding Detection methods such as the passive ones have drawbacks in the form of existence of large no detection zones whereas Active Detection Methods have devastating effects on power quality. To overcome these drawbacks an inventive islanding detection approach has been proposed that is built on the basis of Islanding Detection Signal (IDS) and Voltage Unbalance Factor (VUF).

Detection of VUF at the Point of Common Coupling (PCC) helps in accurate determination of an islanding condition. False islanding under faulty operation can be prevented by setting the threshold voltage unbalance factor and the minimum judgment time of three cycles for which IDS may be absent. The simulation results suggest

that the method that has been proposed is able enough to perform effective and rapid detection of islanding in all the circumstances for the chosen system model [4].

Ch. Rami Reddy (2020) et.al The use of alternative energy sources is increasing in daily life to meet the world energy demand. The Distribution Generation (DG) sources place an import role in the smart grid. They are mainly suffering with islanding detection problem. This paper presents the review of various islanding detection methods and parameters for efficient islanding detection in smart grids. The islanding detection methods are majorly classified as passive, active and hybrid islanding detection methods. The advantages, disadvantages and applications of available methods are presented. The best islanding detection parameters are suggested for future islanding detection in smart grids. [5]

Gongke Wang (2020) et.al this paper proposes a hybrid islanding detection method for inverter-based distributed generation units. Firstly, this paper carries out a comprehensive characteristic analysis and obtains design principles for the hybrid method in inverter-based DGs. Then, based on these principles, the proposed method combines the passive method of voltage unbalance and total harmonic distortion (VU/THD) detection and the active method of bilateral reactive power variation (BRPV). In specific, the BRPV method is only triggered when the islanding condition is suspected by VU/THD method. Doing so, the islanding detection performance can be improved significantly without reducing the power quality. In addition, this paper modifies the conventional VU/THD method to realize fast and accurate detection, and the threshold setting principle is analyzed for the first time based on equivalent circuit approach. Comparison analysis reveals that the proposed method has a more satisfactory islanding detection performance for inverter-based distributed generation units. Simulation and experimental results under various conditions based on IEEE Std. 929 and IEEE Std. 1547 were carried out to verify the islanding detection performance of the proposed method [6].

AlperYılmaz (2020) et.al Unintentional grid disconnection of wind turbines (WTs) from the existing power grid can cause serious failures for the power system. WTs operating in island mode must be disconnected from the network within a maximum of 2 seconds because the grid is suddenly disconnected. In this study, a medium-power WT model with a double-fed asynchronous generator (DFIG) was proposed and a discrete wavelet transforms (DWT)-based island mode detection method was presented. The coefficients of the approximation for island mode detection from a single voltage signal received from the point of common coupling in WT have been obtained in the proposed method by taking advantage of the ability of DWT to analyze both frequency and time domain. The obtained DWT approach coefficients were determined in island mode study using experimentally determined threshold values under different grid condition. The non-detection zone (NDZ) problem was eliminated and island mode detection was performed in less than 0.2 seconds with the proposed method. Detection of island mode using a single signal is also advantageous in terms of applicability compared to existing islanding detection methods [7].

Zeng Xiang et.al (2019) this paper offers a new HPQC for quality compensation and power supply. According to traditional methods, the UPQC is often used in the current related energy and power quality (PQ) compensation. By integrating renewable energy, UPQC is able to operate in island mode. However, UPQC suffers from high DC link costs, which increases system costs and losses. To reduce the cost of DC links, the UPQC has been upgraded to compensate for quality of the power supply and the power injection.

However, when the application is not effective, the modified UPQC cannot work on the island mode. So, a suggestion for a new HPQC topology can work in the event of a technological failure in traditional way. In this article, we will first give an overview of the proposed HPQC topology process. Then, the HPQC basic control idea is given. Finally, to validate HPQC proposal, compared to UPQC and modified UPQC, PSCAD chemical analysis is given for HPQC [8].

Zheng Zeming et al. (2019): electronics transformers (PETs) can efficiently manage quality of power, while allowing AC and DC devices to communicate well with the grid, the voltage rating of the PET scheme under interference important is in civilizing performance of organization the stability and design of the security devices in the system are of great importance. Based on the typical topology of the three levels of PET and its control strategy, the characteristics of the electricity in the port under two major disturbances.

The results show that the 1900V state voltage output in the regulator field may be a major indicator of the nature of the PET / DC hybrid system. Finally, technique is used to overestimate severity of PET / AC-based hybrid system failures. The results of the research can provide references to the design of PET safety equipment and the analysis of PET systems [9].

Arshiya Aggarwal et.al (2019) Due to the increasing use of electronic devices, electrical quality disruptions are included in the indicator. To ensure the reliability, safety, and quality of adequate power expenditure, it is necessary to identify and classify power quality interference accurately. This paper presents an effective algorithm that uses the Convolutional Neural Network (CNN) to exploit assorted features of input power supply, thereby identifying and classifying various power quality

disturbances , or then provide them to multiple categories sponsors The classifier (MCSVC) performs detection and reconnaissance Classify electrical quality disruptions. Validated from simulation results and verified by industrial data, the performance of the proposed model is better than that of conventional convolution neural networks. This work helps to improve the quality of power provided for business function, making process of the energy system economical, efficient and safe [10].

Tripurari Nath Gupta et al. (2018) introduced an autonomous energy-based filtering algorithm (AANF) using sustainable energy-based generators to improve the integration of solar photovoltaic (PV), WEGS for public cable. The AANF controller is designed to transmit the basic components of the current radio. The advanced technology provides high sensitivity and resistance to electrical interference. The main purpose of classification is to provide dynamic power to load, or single network connected to the PCC also mitigates power quality issues such as switching- equality now and the compensation of the force of motion.

To achieve maximum power, the MPPT (Maximum Power Point Tracking) algorithm is used based on P&O (disruption and analysis). The word feed forward about solar energy and energy contribution was introduced to improve dynamic comeback to modify in sunlight and wind speed. The sense of manage offered is simple, and the response of the system is fast. In a laboratory-developed prototype, the efficiency of the system was tested by heavy conditions, variable light rays, and wind speeds. The performance of planned organization is in line with the objectives of planned plan and the IEEE-519 standard [12].

Jinsong Tao (2018) et.al Islanding detection is a hot technology developed in tandem with the emergence of large scale Distribution Grids. In this paper, a new parameter V is defined as a criterion to detect islanding, or small non-detection zones (NDZs). An advanced strategy coordinating the V detection and the rate of change of frequency (ROCOF) detection is proposed to improve overall effectiveness.

A simulation of the V detection and the advanced islanding detection strategy was performed using the IEEE nine node system on the PSCAD/EMTDC platform. The performance of this advanced strategy was compared with that of the ROCOF detection. We can conclude that the advanced strategy exploits all the advantages of the ROCOF detection and the V detection; as they reciprocally complement each other. [13]

VaibhavNougain (2018) et.al on the occurrence of an unintentional islanding in an inverter-based DG system, an effective islanding detection method is mandatory to ensure safe operation of loads in the system. This work proposes a hybrid islanding detection method (IDM) which combines a passive and an active IDM for a rapid, secure and dependable islanding detection. ROCOF over reactive power is employed as the passive IDM which enables the active IDM, where injection of d-axis disturbance current to analyze d-axis voltage component at the point of common coupling (PCC) takes place on a standard UL1741 test configuration.

MATLAB/ SIMULINK is the simulation platform employed to validate the proposed hybrid method. An FPGA based NI Lab View PXI with SbRio 9606 interface hardware setup is employed for the hardware validation of the proposed work. [14]

Reza Zamani (2018) et.al Penetration of distributed generators (DGs) has continued to grow rapidly into power grids and is one of the indispensable aspects of the future smart grid. If a part of the system becomes islanded, DGs should effectively continue to control the islanded power system without degradation of power quality, and otherwise the DGs should be disconnected as soon as they have no adverse impact on the islanded grid. Therefore, the islanding should be detected timely in order to disconnect the DG or change control strategy of the DG.

This paper proposes a passive islanding detection method for synchronous DGs based on pattern recognition of signal trajectory. The proposed algorithm provides an accurate islanding detection for future smart grid using intelligent relays. The islanding situation can be discriminated from grid-connected disturbances even when the generation and load are closely matched in the island. The performance of the proposed method has been investigated using PSCAD/EMTDC time-domain simulations in different scenarios. [15]

Kuang-Hsiung Tan (2018) et.al An intelligent controlled distributed generator (DG) system is proposed for the tracking control and islanding detection in this study. First, a DC power supply with a DC/AC power inverter is adopted to emulate a DG system for the tracking control of active power and reactive power outputs. Moreover, a novel active islanding detection method is proposed for the DG system to meet stringent standard requirements for interconnection with the power grid.

The proposed active islanding detection method is based on injecting a disturbance signal into the DG system through the d-axis current which leads to a frequency deviation at the terminal of the RLC load when the power grid is disconnected. The feasibility of the proposed active islanding detection method is evaluated under the UL1741 anti-islanding test configuration. Furthermore, in order to improve the tracking control of the active power and reactive power outputs of the inverter-based DG system, and to further improve the performance of the

active islanding detection method, two probabilistic fuzzy neural network (PFNN) controllers are adopted to replace the conventional proportional-integral (PI) controllers. In addition, the network structure and the online learning algorithm of the adopted PFNN are introduced in detail. Finally, the effectiveness and feasibility of the tracking control and the proposed active islanding detection method using PFNN controllers are verified with experimental results. [16]

Zicheng Li (2018) et.al Islanding detection is one important concern for the safety of grid connected photovoltaic systems. Conventional active frequency drift (AFD) method and the AFD with positive feedback of the voltage frequency are popular for islanding detection. However, these methods have some drawbacks such as much time consumption and much total harmonic distortion (THD) of the current.

This paper presents an active frequency drift islanding detection method with a positive feedback by absolute value of voltage frequency for grid connected micro-photovoltaic systems. This proposed method can generate 4% less THD and less 0.02s of islanding detection time compared to conventional AFD method. The simulation results show that the proposed algorithm can improve the detection speed, power quality and reduce the non-detection zone (NDZ) compared to AFD method. Due to the proposed method fixing the direction of disturbance, the possibility of detection failure can be also avoided. [17]

Vikas Shrivastava 2017 -This paper establishes the flywheel energy storage organization (FESS) in a long lifetime uninterruptible power supply. The Flywheel Energy Storage (FES) system has emerged as one of the best options. This paper presents a conceptual study and illustrations of FES units. After brief introduction to the FES system and its theory of operation, the paper focuses on the important role of the FES system in enhancing the operation of the distribution network.

Supported by illustrated circuits, the FES system in the improvement of the power quality of the network. A flywheel energy storage technology was ended, with a special focus on the progress in automotive applications. In order to improve the efficiency and lifetime, then it discusses a newly proposed design of the FES system that emerged recently, which includes the use of Super conducting Magnetic Bearings (SMB) and Permanent Magnetic Bearings (PMB). In conclusion, the paper analyzes the FES systems great potentials that could be exploited in improving the reliability of the electrical system. [18]

Dong Xie (2017) et.al Multi grid-connected inverters islanding detection methods include two categories: passive islanding detection and active islanding detection. Firstly, an active islanding detection method based on negative sequence current disturbance is analyzed. Aiming at the shortcomings of this method, a novel passive islanding detection method is proposed in this paper.

The proposed islanding detection method uses wavelet transform to extract signal features, and then according to the extracted signal features adopts the neural network to judge whether or not the islanding occurs. The simulation results show that the passive multi grid-connected inverters islanding detection method has good islanding detection performance, and does not affect the stability and power quality of the system. [21]

Dhruba Kumar (2017) et.al Islanding is a special type of open circuit fault where the distributed resource continues to feed local loads during loss of mains situation. This paper develops a technique to detect islanding in a six-bus power system. The input to the technique is dependent on synchrophasor measurement. The decision made in the technique is based on IEC62116 standards and predefined threshold and of current phases.

Islanding detection can be considered as communication-based islanding detection where measurements from both islanded region and grid connected region are utilized for islanding detection. PMU based islanding detection is highly recommended to predetermine cascading line outage and to check voltage profile of islanded region. [22]

Ruchika (2017) et.al Islanding detection is an important protection issue of distributed generation. Since the overcurrent (OC) protection and OC relay grading is different for island mode and grid connected mode of operation, the conventional protection does not suits to active distribution network. It is essential to know the mode of operation first so that the relay setting may be shifted to island mode as soon as the islanding is detected.

The conventional islanding detection methods face problems during the balanced matched load condition of DG as there is no significant change in voltage and frequency. This paper proposes a technique to detect islanding by perturbing the dc link voltage. The detection is done by measuring the harmonics level. The test system is simulated in MATLAB/Simulink and the total harmonic distortion (THD) analysis is done using Sam power system Block set. [23]

III. METHODOLOGY

The current quality is "the expansion of the interval, current, or frequency and the appropriate behavior, which may cause the user's system to collapse or collapse". The development of electronics technology and the use of long-term equipment have attracted the attention of

people to the quality of electricity. It is understandable that an electrical system transmits system parameters according to standard amplitude, frequency and shape standards. The power system consists of large departments such as power generation, transmission or distribution companies. Power generation is part of the production of connected power plants.

The transmission system is accountable for transmitting generated electricity to the distribution site. The power allotment system is accountable for deal out input feeder from the feedbox gearbox to the output center. Goods are often divided into commercial loads, household loads, manufacturing loads, city loads and agricultural loads. Profitable or manufacturing loads are the largest consumers with electricity from power plants. Loads can be divided into unloaded goods and goods.

Industrial loads use a feasible control controller (PLC) and a motor driver system with a malfunctioning device. The type of non-linear load provided by a pure wave source absorbs the non-linear element of the current source or influences the harmonics of the source element. The presence of neutral elements reduces the quality of electricity.

Due to the increase in cargo size, power generation must meet the requirements to establish the system. The load is suspended and the load change cannot be accurately predicted. Sudden changes in load may cause a setback in the system. The increase in the type of moving load has a straight impact on power and working force of the system. Decreased Capacitive and inductive reactance will affect the strength of structure.

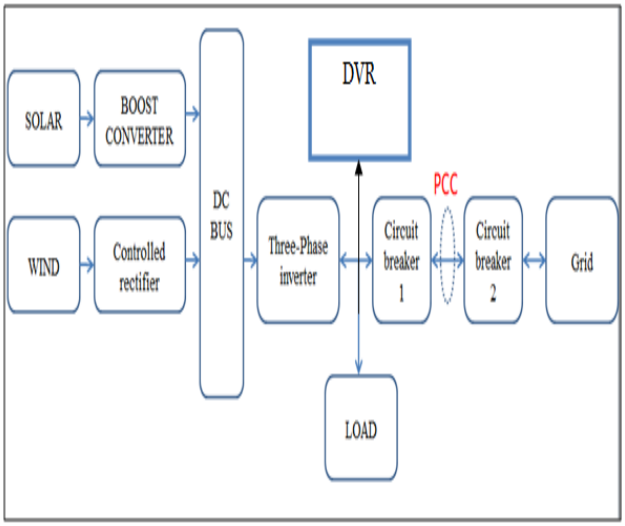

Fig 2. Proposed block diagram.

A sudden change in capacitive deceleration will increase the power at the end of the reception, and a sudden change in the inductive response will reduce the power at end of the reception. The voltage change in the system can be due to countless causes in the electrical system, but the nominal value of the voltage continuation is very significant. An increase in power can damage related equipment, but a voltage drop below nominal value will reduce the efficiency of the connected load and thereby shorten the life of the equipment.

1. Power Value:

The quality of generated and distributed power has become a significant issue for electricity companies or consumers. Since the late 1980s, the term "power quality" has become a fruitful buzzword in e-commerce. Power quality is the concept of interference in many discrete electrical systems. The problems covered by the power quality concept are not new in nature, but the cracking factors that solve the power quality problem are now being developed.

The common denominator that runs through all of these reasons that has caused people's increasing attention to power quality is continuous improvement in efficiency for all supply customers. Current quality is "the deviation between voltages, current, or frequency from ideal properties, which can cause the user's system to go down or go down". "Power quality is the degree of similarity between the actual system and the ideal system".

Power quality keeps the system power, frequency and power factor within the nominal value. The power or current waveforms are almost close to or equal to the sine curve, giving uninterrupted power. The construction of the electrical system and the characteristics of the connected equipment can affect the current quality, which is called the current quality problem. The power quality depends mainly on the continuity of power supply or quality of the parameters of the power system. [19]

2. Islanding Condition:

Islanding is the condition in which a distributed generator (DG) continues to power a location even though external electrical grid power is no longer present. Islanding can be dangerous to utility workers, who may not realize that a circuit is still powered, and it may prevent automatic re-connection of devices.

Additionally, without strict frequency control, the balance between load and generation in the islanded circuit can be violated, thereby leading to abnormal frequencies and voltages. For those reasons, distributed generators must detect islanding and immediately disconnect from the circuit; this is referred to as anti-islanding.

A common example of islanding is a distribution feeder that has solar panels attached to it. In the case of a power outage, the solar panels will continue to deliver power as long as irradiance is sufficient. In this case, the circuit detached by the outage becomes an "island". For this reason, solar inverters that are designed to supply power

to the grid are generally required to have some sort of automatic anti-islanding circuitry.

Some designs, commonly known as a microgrid, allow for intentional islanding. In case of an outage, a microgrid controller disconnects the local circuit from the grid on a dedicated switch and forces the distributed generator(s) to power the entire local load.

Electrical inverters are devices that convert direct current (DC) to alternating current (AC). Grid-interactive inverters have the additional requirement that they produce AC power that matches the existing power presented on the grid. In particular, a grid-interactive inverter must match the voltage, frequency and phase of the power line it connects to. There are numerous technical requirements to the accuracy of this tracking.

Consider the case of a house with an array of solar panels on the roof. Inverters attached to the panels convert the varying DC current provided by the panels into AC power that matches the grid supply. If the grid is disconnected, the voltage on the grid line might be expected to drop to zero, a clear indication of a service interruption. However, consider the case when the house's load exactly matches the output of the panels at the instant of the grid interruption. In this case the panels can continue supplying power, which is used up by the house's load. In this case there is no obvious indication that an interruption has occurred.

Normally, even when the load and production are exactly matched, the so-called "balanced condition", the failure of the grid will result in several additional transient signals being generated. For instance, there will almost always be a brief decrease in line voltage, which will signal a potential fault condition. However, such events can also be caused by normal operation, like the starting of a large electric motor.

Methods that detect islanding without a large number of false positives constitute the subject of considerable research. Each method has some threshold that needs to be crossed before a condition is considered to be a signal of grid interruption, which leads to a "non-detection zone" (NDZ), the range of conditions where a real grid failure will be filtered out. For this reason, before field deployment, grid-interactive inverters are typically tested by reproducing at their output terminals specific grid conditions and evaluating the effectiveness of the islanding methods in detecting islanding conditions.

3. Power Quality Issues:
Major industrial users insist on using equipment connected to the system to improve power quality, advancing in the industrial control process. The unpredictable nature of the electrical system and the characteristics of the connected equipment can affect the current quality, which is called a current quality problem. DVR for Series Compensation-DVR (Dynamic Voltage Restorer) is a sequence printer integrated with a large power system.

This contains a VSC with a DC source. The major reason of a DVR is to recompense for voltage drop/swelling in the cable passing during the converter. The DVR compensates for the power by finding or enthralling power in power area. The DVR is proscribed by a manage strategy, such as SRF theory. [20]

IV. CONCLUSION

The proposed configuration is the integration of a conventional grid-connected PV system and a self-supported DVR. The proposed work exhibits all the functionalities of existing PV and DVR system as well as enhances the DVR operating range. It lets DVR to utilize active power of PV plant and thus improves the system robustness against severe grid faults.

The proposed integration can operate in different modes based on the grid condition and PV power generation. The modes discussed here are the healthy mode, sag mode, and PV inactive mode.

The simulation study demonstrates the effectiveness of the proposed configuration and its practical feasibility to perform under different operating conditions. The proposed configuration can be very useful for modern load centers where on-site PV generation and strict voltage regulation are required.

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