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Detection, Classification and Location of Fault in DC Micro grid

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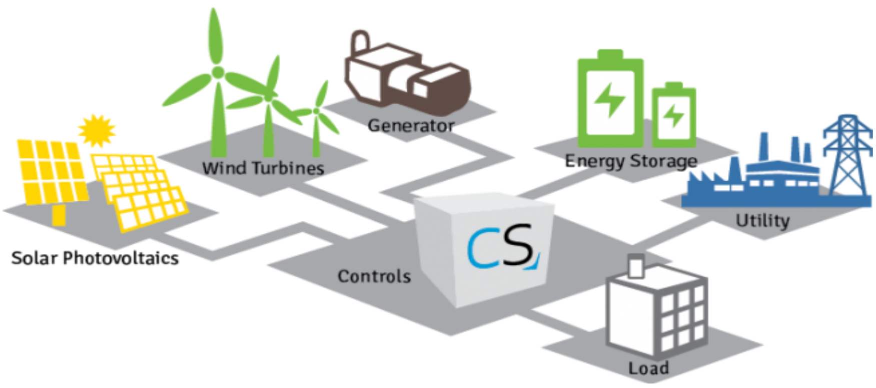
***Abstract**: The majority of the population on this world unable to access basic electricity services, this despite the abundance of renewable energy sources (RESs). The inability to adequately tap into these RESs has led to the continued dependence on non-renewable energy sources such as coal for electricity generation, and kerosene for cooking and lighting, the resulting use of which is poor health conditions. The use of Microgrids (MGs) is being extensively researched as a feasible means of tackling the challenge of electrification, especially in rural and remote areas.A newdifferential current-basedfastfaultdetection andlocationschemeformultiplePhotovoltaic-baseddcmicrogrid isproposedinthispaper.Amultiterminal dc(MTDC)distribu- tionnetwork isaneffective solution forpresentgridscenario, wherelocaldistributionisincorporatedprimarilybypowerelec- tronicsbaseddcloads.PVsystemswithauxiliary powersources andlocalloadsareusedforMTDCconnection,especiallywhen acutilitygridisintegrated withitbyvoltagesourceconverters. Poletopoleandpoletogroundfaultsarebasicallyconsidered as dcdistribution networkhazards.AsPVisconnectedthroughdc cable,highresistive dcarcfaultisalsostudied inpresent litera- ture.*

I. INTRODUCTION

A DC microgrid maintains a DC bus, which feeds DC loads connected to it. Normally, DC loads are low-power rating electronic devices such as laptops, cell phone, wireless phones, DVD players, battery-powered vacuum cleaner, and internet routers. In DC microgrid structure, sources with DC output are connected to DC bus directly, whereas sources with AC output are interfaced to DC bus through AC/DC converter. As the number of DC-generating renewable energy sources is higher as compared to AC-generating sources, lesser converter units are required. This increases the overall efficiency of DC microgrid. In addition, the problem of harmonics due to power electronic converter is not present due to DC nature of output powerMicrogrid consists of microgeneration,energy storage system, load and control system and power electronic interfacing convertor.The emergence of smaller generating systems such as PV,wind,fuel cell,microturbines have opened new opportunities for on site distributed power generation.Economical challenges ,technological advancements and environment impacts are now demanding this distributed generation.To overcome the irregular behavior and increasing penetration of distributed generation microgrid was introduced.



Microgrid Architecture

II. LITERATURE REVIEW

GrowthofenergydemandandenvironmentalconcernurgeforRESsinsmartgridinitiatives. TodayenergypolicyofmanycountriesenvisagesincreasedpenetrationofRESs.Basedontheconnectionofequipmenttypes,networksinthe microgridcanbeAC,DCoracombinationofthetwo. DCnetworkismorefeasibleforademarcated powersystem, forexample,ruralpowersystems,office buildingsandships wherethemajorityofloadsaresensitiveelectronicequipmentandelectricvehicles.Furtheradvantages withDC microgridarehighefficiency,easyconnectionofsources to DC bus , negligibletransmissionloss due to small andlocalizedsystem,enhancedpowertransfercapacityandinterfacingthroughmoreefficientpowerelectronic devices.However,quickdetectionof a fault,DC arc breaking,DCprotective equipment andlackofstandards, guidelinesandexperiencearethemajorissuesinDCnet- workprotection.

Astherearedifferences inpatternsof voltageandcurrentduringfaultinDCsystemscompared to AC,themethodsavailableforprotection ofACnetworkcan- notbecopiedforDCsystemsdirectly.Thus,thereisascope ofdevelopmentforimprovedprotectionforDCmicrogrid. Powerelectronicconvertersarerequiredtoconnectboth ACandDCsourcesandloadstoacommonbus(ACorDC type)inamicrogrid system.Moreover, DCnetworkusesless stagesofconversion. Internalfaultsinconverter includefailureofswitchessuchasinsulated-gatebipolartransistor(IGBT).Suchfaultsaredifficulttobeclearedandfor afaulttolerantconverter systemredundant devicesaresuggested.FaultinDCnetworkwithparallelconvertersisthe moresevereone.TheDClinkcapacitorof converterandsmall cableimpedancecausesevereover current andundervoltage duringafault.

InaDCnetwork,thecommonfaultisofpole-to-ground typeandthisisbecause ofphysical damage,agingorsevere electricalstressincables.Differential currentbased protectionschemesfor cable faultin DCnetworkare proposed inandthatrequiresreliablecommunicationchan- nelforinstantaneous datatransferbetweenprotectivedevices placedatbothendsofthecable.Chances ofcommunication failureandlossofdataresultinperformancelimitationofdifferentialscheme.Thecostofsuchprotectionschemeisalso aconcerninmicrogrid.

Motivation

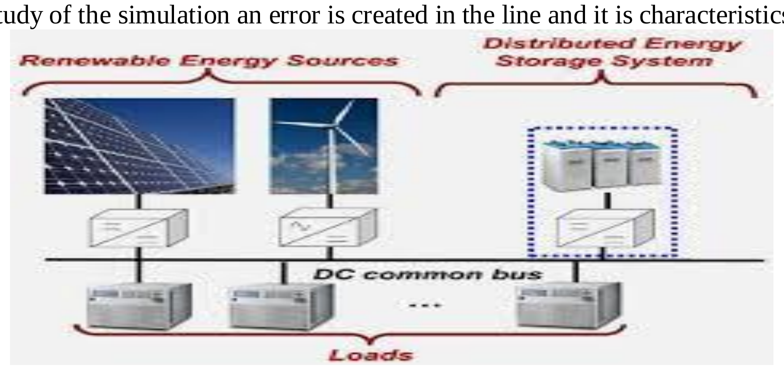
DC network is more feasible for a demarcated power system, for example, rural power systems, office buildings and ships where the majority of loads are sensitive electronic equipment and electric vehicles.DC microgrid are highly efficient, easy connection of sources to DC bus, negligible transmission loss due to small and localized system.

Objective

To Detect the fault in the network very fast and effectively. To locate the fault accurately. Though so many work are done for detection, classification of fault but still very robust and efficient method are not done so there is a scope for more research in this area.

Problem formulation

- One Model of DC Microgrid with 5number of DC Panel are taken into consideration they are connected to a common DC bus bar .
- After the study of the simulation an error is created in the line and it is characteristics is studied.



Solution methodology

- A differential current will pass through the EMD and different IMFS are obtained.
- Out Of All the IMF the sensitive IMF will be pass through the Hilbert Transform to Obtain the amplitude and frequency to calculate the teager energy.
- Empirical Mode Decomposition (EMD) is a signal analysis method with a wide range of applications such as bearing fault detection, biomedical data analysis, power signal analysis, and seismic signals.
- Although EMD has a wide area of applications, there are still issues related to the method that needs to be addressed such as mode mixing, end-effect, and spline problems.

• When the EMD cannot successfully decompose the signal into unique frequency components, then different Intrinsic Mode Functions (IMF) contain the same frequencies as over- lapping components. This is known as the mode mixing issue.

• Another problem related to the EMD is the so-called end- effect, where large deviations occur in the interpolation fitting process of EMD resulting in the propagation and corruption of the data span .

• There are various methods proposed to overcome these problems such as “B-spline EMD”, “mask signal improved EMD” , “adaptively fast ensemble empirical mode decomposition”, “improved CEEMD (Complete Ensem- ble EMD)” , and wavelet packet denoising improved EMD.

• In this paper, a new method is proposed, i.e., the EMD improved with median filtering which provides a filter that eliminates the effects of the impulse noise while decreasing the mode-mixing. Median filter in general allows eliminating the impulse noise in various different signal analysis appli- cations . In the MEMD method, a variable window sized median filter is applied to the IMFs.

• Firstly, EMD is applied to the signal to generate the IMFs. A variable window sized median filter is applied to these IMFs, where a narrow window size is used for high frequency components and a broader window size is used for lowfrequency components. These filtered IMFs are then summed to reconstruct the signal. EMD is once again applied to the reconstructed signal and the improved IMFs are generated. Comparison of the results of the MEMD and the regular EMD shows that the new method, i.e., MEMD, improves the decomposition in terms of mode mixing, allowing a better decomposition of the each frequency component per IMF

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