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ENCHANCEMENT OF POWER QUALITY USING ACTIVE POWER CONTROL

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Abstract: The concepts of line frequency transformer and voltage regulation are closely connected to the operation of a bidirectional microgrid. One of the primary challenges associated with hybrid microgrids is the issue of spatial occupation, which poses a significant concern. Additionally, another noteworthy challenge is the problem of increased resource consumption. The present study aims to address the challenges identified in the research by proposing a novel approach known as the Bidirectional Recursive Decision Tree (BRDT). The design of the Bidirectional Resonant Dual Transformer (BRDT) follows a straightforward loop configuration, which exhibits a duty ratio of 50%. This duty ratio is considered superior to the phase shift method. The BRDT (Bridge Resonant Dual Topology) incorporates many topologies, including CLLC (Capacitor-Inductor-Inductor-Capacitor), CLL (Capacitor-Inductor-Inductor) and LLC (High Frequency Transformer) configurations. When a high frequency transformer is utilized, there are certain consequences that arise due to leakage inductance and magnetizing inductance. The experimental verification of the BRDT prototype and hybrid AC/DC microgrid is conducted using MATLAB simulation. It is essential to examine the outcomes of both transient and steady state phenomena.

Keywords: BIC; LLC, CLLC; AC/DC hybrid micro grid

1. INTRODUCTION

In generally renewable energy sources is supplied to such as wind, solar energy. It is few areas for distributing energy source such as coal, fossil fuel and petroleum. In order to generate distributed energy sources like rechargeable batteries and ultra capacitor it is supply of renewable energy, but it is not ready to give power[1]. Dc sources are connected to AC sources which is being an DC/AC conversion. when more energy is conversion at that time energy losses and more degradation. When compared to DC micro grid is better work on DC sources it is another solution. In better solution of hybrid micro grid is proposed to LF transformer[2]. The LF is distributing systematically in between bidirectional interlinking converter as AC bus to realize the DC grid[3]. The LF transformer is occupy more place

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and more weight[4]. These cause to overcome the BRDT is placed in place of LF transformer. It is installed in between DC bus and inverter control BRDT is installed[5]. It is not providing galvanic isolation and includes voltage is critical energy efficiency and power density. Galvanic isolation means two or more electrical circuits but they different from ground [6]. When compared to conventional configuration and BRDT. BRDT is simple, occupy less space and less weight. BRDT is enhancement and some functions like over voltage and current protection is provided [7].

In this paper we are used in DC transformer. While using dc transformer there are some control strategies are implemented [8]. Phase shift control are used in DC transformer due to some advantages of that is small inertia, high dynamic, ease of soft switching. When voltage is above the range that means we can't control at that time shift control will not operate and zvs will not operate. If increase current in high switching and conduction losses [9]. In hybrid ac/dc micro grid is operate at BIC when it is transition state it will be operated. Now a days, people are interested on soft switching with resonant topologies because soft switching losses is reducing the loss of conduction [10]. In there are most power devices as sic and gan with extra resonant. When operating LLC resonant network bidirectional power flow is ensure ZCS and ZVS. When inductor is put on auxiliary side it is automatic forward and reverse mode. When doing the CLLC resonant has being proposed [11]. It is two capacitors and two inductors. While CLLC is operate ZCS is used for rectifier switch and ZVS is used for inverter switches. Power will not supply on both sides because when using inverters at that side power and battery will collide to each other the system will damage [12].it is high power conversion and these topologies are used to control for closed loop. CLLC and LLC network will integrate in general model to get optimum solution of hybrid ac/dc microgrid. In this paper BRDT is proposed to replace the hybrid ac/dc micro grid for BIC voltages. When using hybrid ac/dc microgrid there are different topologies are used [13]. BRDT is operate only for ideal transformer with open loop control system. When compared to open loop control and phase shift control it will get maximize the energy conversion and it is 50% duty ratio. When different loads are produced for conversion gain. It is experimentally verified on sic based prototype.

2. OPERATION ON HBRID AC/DC MICRO GRID WITH BRDT

Bin these hybrid ac/dc micro grid configuration. It is power will distributed through ac to dc bus. when wind turbine is connected to Ac bus it is ac/ac conversion. similarly solar cells are connected to dc bus it is dc/dc conversion. The power will transmit through ac and dc with help of BIC. The LF transformer are general used in normal configuration, but it occupies more space in replace by BRDT it is less weight and space.in hybrid ac/dc microgrid is operating it is classified as two types. They are 1. grid tied.

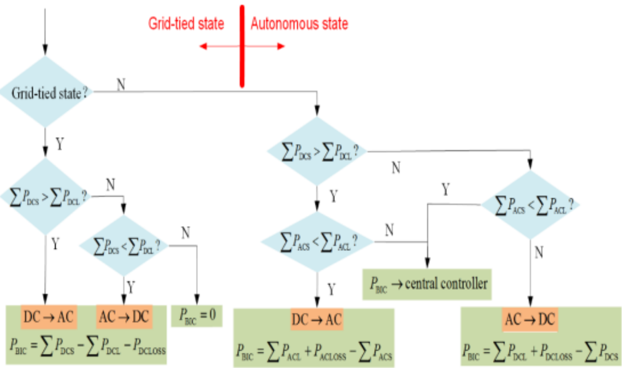

Fig: 1 Flow chart of BRDT

2.1 BRDT DESIGN:

The design of BRDT can operate only on ideal transformer but its systematic control is same. It can effectively work on transmission and voltage. It can follow some conditions.

2.2 High conversion efficiency:

(2) Rated conversion gain within limited voltage variations in different loading conditions.

(3) Bidirectional power flow and seamless transitions.

The existing DT techniques hardly satisfy these criteria with open-loop control scheme High conversion efficiency.

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2.3 Equivalent mode of BRDT

BRDT has consists of two full bridge converters through HFT. It is consisting of series resonant capacitor and transformer. It gives supply to power which as voltage in HV side and low voltage in LV side. when power will transmit from LV to HV side. In HFT topologies classified as CLLC, CLL and LLC. It is leakage and magnetizing inductance. CLLC resonant network in which detect the leakage inductance in which both primary and secondary side. CLLC is special case of topology. while doing these topologies there are CLL, LLC, can be designed for symmetrical or as symmetrical for our convenience. It is same resonant on HV and LV side.

2.4 Maximum transmission power:

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It has introduced the two open loop control with 50% of duty ratio and phase shift. When DR is designing the input voltage is square waveform. It amplitude is –vm to vm.

Vm=4vm/π Σ1/msin(wt)

where w=angular frequency. when dealing ps .It is input

voltage as 3 levels –vm,0,vm.

Vm(ps)=4vm/π Σ 1/m cos m/2 sin(wt).

The input voltage of HFT is i=Isin(wt-pie)

I=input of peak current and pie is phase shift.

2.5 Resonant state analysis

BRDT can operate only ZCS and ZVS conversion effectively. when extra capacitor is affected at that time of leakage inductance and magnetizing inductance

Depends on the transformer. The power flows from LV side to HV side.

M(wm)=VCD/Vm=1/√(q/k)2[f wn-f2/wn+f3/wn]2+(1+1/k-1/kwn2)2

Where q is quality factor k is inductance ratio between leakage and magnetizing inductance. The relation between conversion gain. It we observe max power it varies from g. all types of topologies can satisfy the gain design of transformer.

2.6 Conversion gain with various k at resonant transformer:

High frequency transformer can operate on resonant state. M(wr)=1/1+1/k(1-2f1/f2+√f2-4f1f3) it classified as 3 cases.

Case 1: g<1 M(wr) is increase with k when k≤20

Case 2: g=1

M(wr) is always 1 either high or low value of k.

Case 3: g>1

M(wr) is decreases with k when k< 20. will remain 1 k>20

2.7 Conversion gain with full power:

BRDT design can full power range in frequency when design transformer is Lr1=11.791µH Lr2=45.8µH Lm1=1.4mH Lm2= 5.59mH. It is two cases g=1exponent (5) and g=1.so BRDT is

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proposed of hybrid ac/dc micro grid it operate only on ideal transformer. The condition of reason is max conversion and switching loss. BRDT can operate on open loop, and it has different topologies of DT.

3. CIRCUIT DAIGRAM

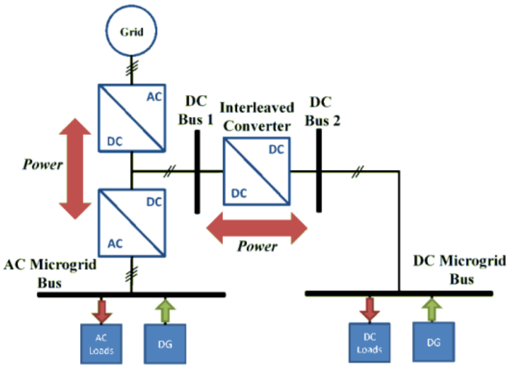

Fig: 2 Block diagram of the proposed system

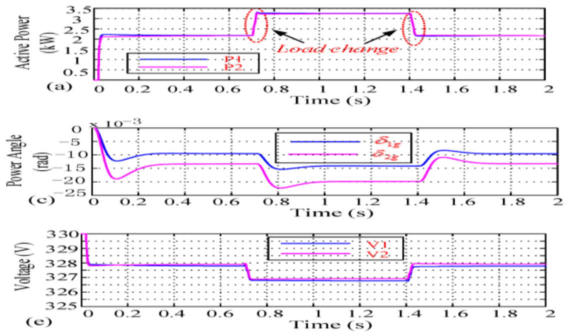

Fig 3 Variation of phase angle due to variation in load (a) variation of Load change, (b) variation of phase angle, (c) variation of voltage profile.

In the proposed system the variation of the load is taken from 2kW at 0.8 sec to 3.25kW up to 1.4 sec and again load comes to normal position.

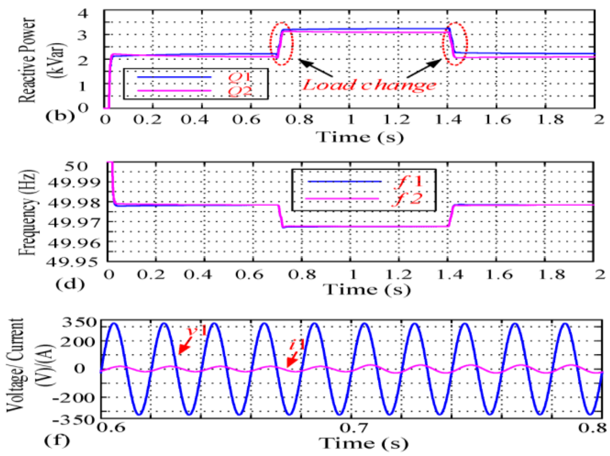

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Fig 4 Variation of frequency to variation in load (a) variation of Load change, (b) variation of frequency, (c)grid voltage and current.

4. CONCLUSION

In these papers, BRDT suggests an ac/dc hybrid micro grid as an alternative to large transformers. Despite having a distinct manner of operation, it is appropriate for open loop control using the best transformer. BRDT features several topologies, including CLL, LLC, and CLLC. HFT can transmit electricity at a maximum of 50% duty ratio. Additionally, the planned transformer's conversion gain is confirmed across its whole power range. To demonstrate and confirm the effectiveness of BRDT with various topologies and hybrid AC/DC microgrid in various operational conditions, several experimental cases have been done.

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