Assessment two Droop Control Models: Elementary Control and Angle- Frequency Advanced Control Strategies in Islanding Micro-Grid

[1]Foroogh Qashqaie
M.Sc of Electrical engineering -Power,
Department of Electrical Engineering -Power,
Bushehr Branch, Islamic Azad University,
Bushehr, Iran
E-mail: fq.electrical@gmail.com
Tel Number: +9171021969

[2]Mojtaba Hajihosseini
M.Sc of Electrical power engineering,
Department of Electrical Electronics Engineering,
Islamic Azad University, Kazerun Branch,
Kazerun, Iran.
E-mail: mojtaba.hajihosseini@tirazisgroup.com

[3] MohammadAmir Naziri
M.Sc of Electrical power engineering,
Department of Electrical Electronics Engineering,
Islamic Azad University Fars Science and Research Branch,
Shiraz, Iran.
E-mail: Amir.naziri1365@gmail.com

[4] Mohsen ZareMoayedi
M.Sc of Electrical power engineering,
Department of Electrical Electronics Engineering,
Islamic Azad University, Kazerun Branch,
Kazerun, Iran.
E-mail: mohsenmoayedi66@gmail.com

***Abstract*—This paper has been presented a islanding micro grid (IMG) which controlled by two controlling model. The first model is a droop control old method which has been used by phase locked loop (PLL), and operates in connected mode, essentially. But, using a microgrid central protection unit (MCPU) that in which is a centralized droop controller in IMG, presents a controlling modern way. The main advantage of the first model is power control of IMG, even thought with PLL. The second control model is an angle- frequency droop modern method which used for none linear load, generally. This model is a decentralized droop control strategy which is microgrid (MG) insular for controlling power and regulating MG voltage on the basis of the load different characteristics. The main advantage of second model is a law for a fixed frequency range in IMG. The main goal in both controllers is regulation of voltage and frequency in under study IMG, using resaved controlling signal from voltage source converter (VSC). At the end, to confirm proper functioning of the control system MATLAB/SIMULINK application has been used, then the suggested plan is being simulated and then results are compared**.

Keywords— centralized and decenteralized droop control, islanded microgrid, angle- frequency droop control, microgrid central protection unit, unbalanced and non-linear characteristics.

I. Introduction

Micro grids are power generation modern system which using distributed generation (DG), help to environment, energy saving. Therefore is a suitable alternative for traditional power system. MGs that benefits DGs, operate in two modes:1) Connected to main grid. 2) Autonomous mode (disconnected from the main grid for a time certain duration). The main challenge of the operation of DG with local load, in the case of connection to the network and also in insular case is that this DG must be equipped to a VSC with controlling machine, so it could meet the following conditions: 1) maintaining the MG buses voltage and frequency, 2) supplying preset load regardless of system parameters and 3) control thought feedback from local load. The control methods in literatures are mainly divided into two major categories: master/slave control and droop control. Although the master/slave control can achieve good voltage regulation and load sharing, the main drawback is that the entire system operation is highly dependent on the master unit and high bandwidth communication [1].). In the other hand, the droop control method is very flexible, economical and whit a few relations calculations. Therefore, the droop method is more acceptable. Droop control is an output impedance programming method without requirement of communication; the output voltage linearly decreases with the output current/power. In AC micro grids, the real power–frequency (P=f) droop and reactive power–voltage (Q=V) droop laws are deduced under the condition that the transmission lines are mainly inductive [2]. The reference [3] proposes a method for power flow control between utility and microgrid through back-to-back converters, which facilitates desired real and reactive power flow between utility and microgrid. In the proposed control strategy, the system can run in two different modes depending on the power requirement in the microgrid. In mode-1, specified amount of real and reactive power are shared between the utility and the microgrid through the back-to-back converters. Mode-2 is invoked when the power that can be supplied by the DGs in the microgrid reaches its maximum limit. In such a case, the rest of the power demand of the MG has to be supplied by the utility. An arrangement between DGs in the MG is proposed to achieve load sharing in both grid connected and islanded modes. The back-to-back converters also provide total frequency isolation between the utility and the MG. It is shown that the voltage or frequency fluctuation in the utility side has no impact on voltage or power in MG side.

Reference [4] introduces the potential-function based method for secondary (as well as tertiary) control of a MG, in both islanded and grid-connected modes. A potential function is defined for each controllable unit of the MG such that the minimum of the potential function corresponds to the control goal. The dynamic set points are updated, using communication within the microgrid. The proposed potential function method is applied for the secondary voltage control of two MGs with single and multiple feeders. Both islanded and grid-connected modes are investigated.

The control objective of DC micro grids is to obtain system stability, low voltage regulation and equal load sharing in per unit. The droop control is an effectively method adopted to implement the control of MGs with multiple distributed energy units. However, in the application of low-voltage DC micro grids, the nominal reference mismatch and unequal cable resistances require a trade-off to be made between voltage regulation and load sharing. In this paper, a unified compensation framework is proposed using the common load condition in local controller, to compensate the voltage drop and load sharing errors. The voltage deviation is compensated with a P controller while the load sharing is compensated through a PI controller. An additional low bandwidth communication is introduced to share the output current information, and the average output current in per unit is generated to represent the common load condition [1].

The failure of the master unit will cause the outage of the entire system immediately. While in the case of droop control, two or more units participate in the voltage regulation, therefore disconnection or reconnection of one unit has slight impact to the system operation, the power balance is achieved automatically with redistribution of the load among distributed energy units (DEUs). The control of active power and reactive power becomes coupling, when both the resistance and inductance of the transmission line are considered in low-voltage AC applications. An orthogonal linear rotational transformation method [5] is adopted to decouple the power control. The active power P and reactive power Q are transformed to ‘‘modified’’ active power P_0 and reactive power Q_0 to apply droop control laws, another similar method is also referred as virtual frequency– voltage frame [6]. The frequency is a global variable through the entire system, but not the voltage magnitude, the voltage drops in transmission lines will lead to unequal sharing of reactive power.

The virtual resistance [7] or virtual impedance [8,9] methods are proposed to match the line impedances. The compensation method using a modified voltage V is introduced in [10], in which the time rate change of the converter output voltage magnitude V is used to control the Q control with modified voltage V.

The reference [11] addresses real and reactive power management strategies of electronically interfaced distributed generation (EI-DG) units in the context of a multiple-DG microgrid system. The emphasis is primarily on electronically DG units. DG controls and power management strategies are based on locally measured signals without communications. Based on the reactive power controls adopted, three power management strategies are identified and investigated. These strategies are based on 1) voltage-droop characteristic, 2) voltage regulation, and 3) load reactive power compensation. The real power of each DG unit is controlled based on a frequency-droop characteristic and a complimentary frequency restoration strategy. A systematic approach to develop a small-signal dynamic model of a multiple-DG microgrid, including real and reactive power management strategies, is also presented. The microgrid eigen structure, based on the developed model, is used to 1) investigate the microgrid dynamic behavior, 2) select control parameters of DG units, and 3) incorporate power management strategies in the DG controllers. However, this paper has not been attention to control MG in islanding mode, But, we attention to this issue whit same controlling structure and just whit adding a MCPU.

II. The Droop control according to hierarchical control and frequency control in MGs

When two or more voltage scours inverter (VSIs) are in parallel position, rotating current can appear. The main idea of this controlling level is to show the behavior of a controlling generator in which frequency declines when active power rises. These features can be integrated using *P/Q* controlling method in VSIs. The droop method and its classified strategies (centralized and decentralized) are in hierarchical control group. It means which the hierarchical control divided to two method such as:1) Centralized droop control , 2) Decentralized droop control.

A. *Droop Control According to Primary Control*

" Fig. 1" shows the relationship between *P-Q* circle of a DG unit and *Q-E* losses. DG, here, is able to generate active power ($P>0$) and stored energy ($P<0$). At the same time, it is able to supply reactive power ($Q>0$ in capacitive performance) or absorb reactive power ($Q<0$ similar to inductive performance). MGs frequency and voltage are strongly influenced by active and reactive loads.

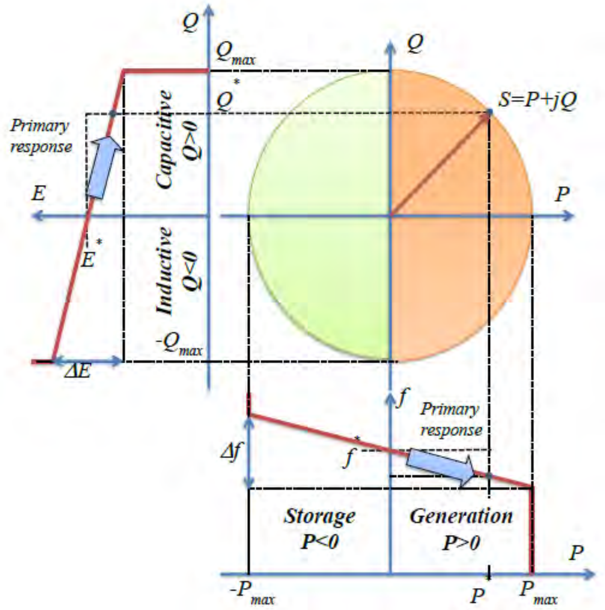

Fig .1.The relationship between primary control of *P-Q* droop, *P-f,* and *Q-E*[12].

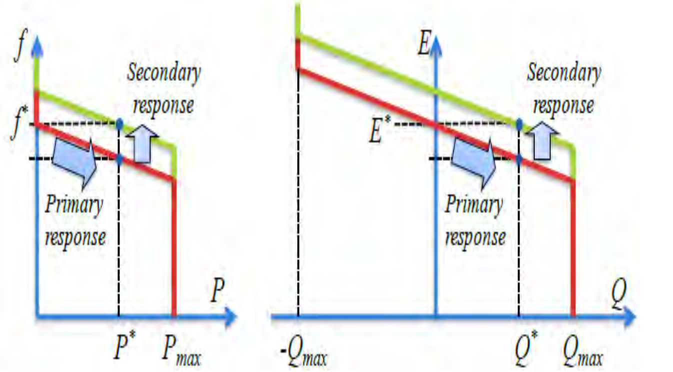

Fig. 2. *P-f* and *Q-E* secondary and primary controlling performance [12].

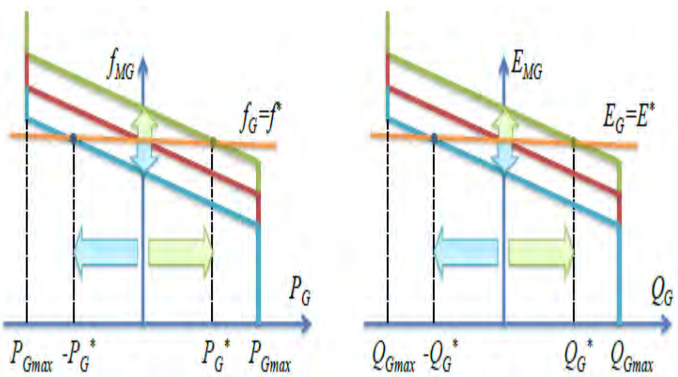

Fig. 3. *P-f* and *E-Q* tertiary control performance[12].

In one MG, there are usually some voltage supply inverters according to DG with local droop feature for each DG. Load change in one MG might lead to imbalance between generation and consumption and change output voltage and frequency VSIs according to the droop feature. If load changes become sufficiently large, DG might not make MG stable.

B. Droop Control According to Secondary Control

"Fig. 2" illustrates primary and secondary control performance during *P-f* and *Q-E.* This frequency and range restoring methods to be controlled by secondary control in MG with droop. This is performed when *P* and *Q* demands rise. But, MG frequency and range depend on load.

C. Droop Control According to Tertiary Control

When MG works at the mode of connection to the network, power distribution can be controlled by setting frequency (phase change at steady state) and MG internal voltage range.

"Fig. 3" shows tertiary control performance which illustrates *P* and *Q* exchange at point of common coupling (PCC), two-way MG power distribution. The network has constant frequency and range ($E_G=E^*$ and $f_G=F^*$) illustrated by horizontal lines. Therefore, *P* and *Q* between MG and network, P_G and Q_G are determined by internal section of MG droop feature and horizontal lines. Similarly, P_G can be controlled by setting f_{MG}^* reference frequency of micro grid, as shown. If $_{MG}$*>f_G where $P_G>0$, micro grid injects *P* to the network, while if $f_{MG}^*<f_G$ where $P_G<0$, micro grid absorbs *P* from the network. MG frequency will be determined by the network so that this is achieved by power angle change. When it exceeds from the expected values, MG is disconnected to maintain its security and third control becomes inefficient .

III. ISLANDING MICROGRID CONTROL BASED ON DROOP METHODE

A. The First Controller

1) Active Power Management by Droop Control

Fig.4" is shows an active power management and frequency control block diagram of a smart grid DGs unit. The input of this block diagram is local frequency *(ω_n)* that is estimated by PLL with bus voltages. The block diagram output is reference current of *x* axis internal current controller that is contradicted with active power reference (P reference). Gain parameters of this block diagram are shown in Table.I. This structure is a reactive power strategy control based on voltage-droop characteristic that consists of a *Q/V* characteristic to determine reactive power reference (Q_{ref}) and PI controller to determine *q* axis reference current ($i_{qn}(ref)$). The block diagram input is rms voltage at PCC of a DG unit. The real power reference is:

$$P_n^{RS} + P_n^D = P_{ref} \quad (1)$$

Where P_n^D corresponds to variations in the local frequency, determined from the frequency-droop characteristic, to supply adequate power to the load or damp power oscillations, and P_n^{RS} is to restore the steady-state frequency of the system. Typical frequency-droop characteristics are shown in fig. 4 in which the *ω-P* characteristics for the *n*th and the *m*th DG units are presented. A *ω-P* characteristic can be mathematically represented as:

$$P_n^D = \frac{1}{K_{wn}}(w_a - w_n) + P_n^a \quad (2)$$

Where $K_{\omega n}$ is the characteristic slope for the *n*th DG unit, ω_0 is the reference frequency of the microgrid, and P_n^D represents the initial power generation assigned to the unit. In the case of multiple-DG units with different capacities serving a MG, slopes of *ω- P* characteristics should satisfy.

$$S_{Gn}k_{wn} = S_{Gm}K_{wn,}\forall_{n,m} \quad (3)$$

Where S_{Gn}, S_{Gn} are the rated power capacities of the *n*th and the th units, respectively. Equation (3) indicates that the load demand is shared among the DG units proportional to the capacities of units. To restore the frequency of the islanded microgrid, a frequency restoration algorithm, as shown in Fig. 4, is needed. The frequency restoration term is extracted from deviations in the local frequency of the system, using a controller with a large time constant. The frequency restoration term is where K_{PRS} and K_{iRS} represent the proportional and the integral gains of the controller. For more information see [11].

$$P_n^{RS} = (K_{PRs} + \frac{K_{iRs}}{S})(w_a - w_n) \quad (4)$$

2) Central Protection Algorithm of MicroGrid

MCPU use an algorithm based on send and receive, when a message is received by MCPU new error current in relay will be updated. To open separate connections relays are used when the current value exceeds the limit, relay sends a signal to adjust the error detection bit. If the error did not clear in another relay in delay time to open the circuit, that specific relay isolates the error. The time delay is set in the system to ensure appropriate selectivity. It is clear that central relays such as *R1* and *R2* have more delay than those on splits *R4* and *R8*. If the MG is connected, the network take over the role of frequency control of MG is determined by the network but, connection or disconnection in complicated system may change the structure of network and relay procedure[13].

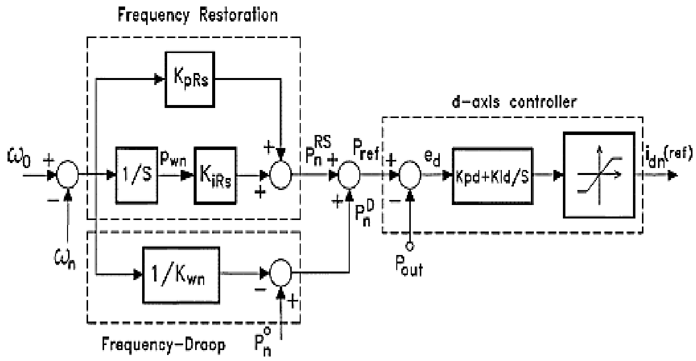

Fig .4. Droop controller algorithm of first model whit n DG.

TABLE. I. PARAMETERS OF THE FIRST CONTROLLER

Parameters	Value
Proportional Gains(K_p-R_S)	5
Integrator Gain(K_i-R_s)	200
Droop Gain-K_{wn}	0
Proportional Gain (K_{pd})	0.05
Integrator Gain(K_{id})	30
Maximum d-axis current(I_{dn}-max)	3

In this case relay rearrangement procedure may be required and time delay setting must be updated in current operational error, if any error occurred and was not resolved by supporting relay. MCPU and the task of identifying the error and sending orders to cut OFF relay. is related to where the error is and automatically detects which should be a priority relay and which one should operate as a supporter.

$$I_{relay} = (I_{faultGRID} \times \text{Operating Mode}) + \sum_{i=1}^{m}(k_i \times I_{faultDGi} \times Status_{DGi}) \quad (5)$$

If the MG is in islanded mode, other network frequency is not MG frequency and one of generators must take over the role of frequency control. It means that we must assume one of generators as busbar slack. In this proposed project we assume DG3 as a busbar slack. Speed sample will be sent to the control system DG3. There is a real power management block and control frequency for DG units. Local frequency is the input block and is speed sample when the MG is connected to the network, DG3 acts as busbar *PQ* and islanded mode should take over busbar slack role. In connected mode network takes over control frequency and MG so that MG remains stable in islanded mode.

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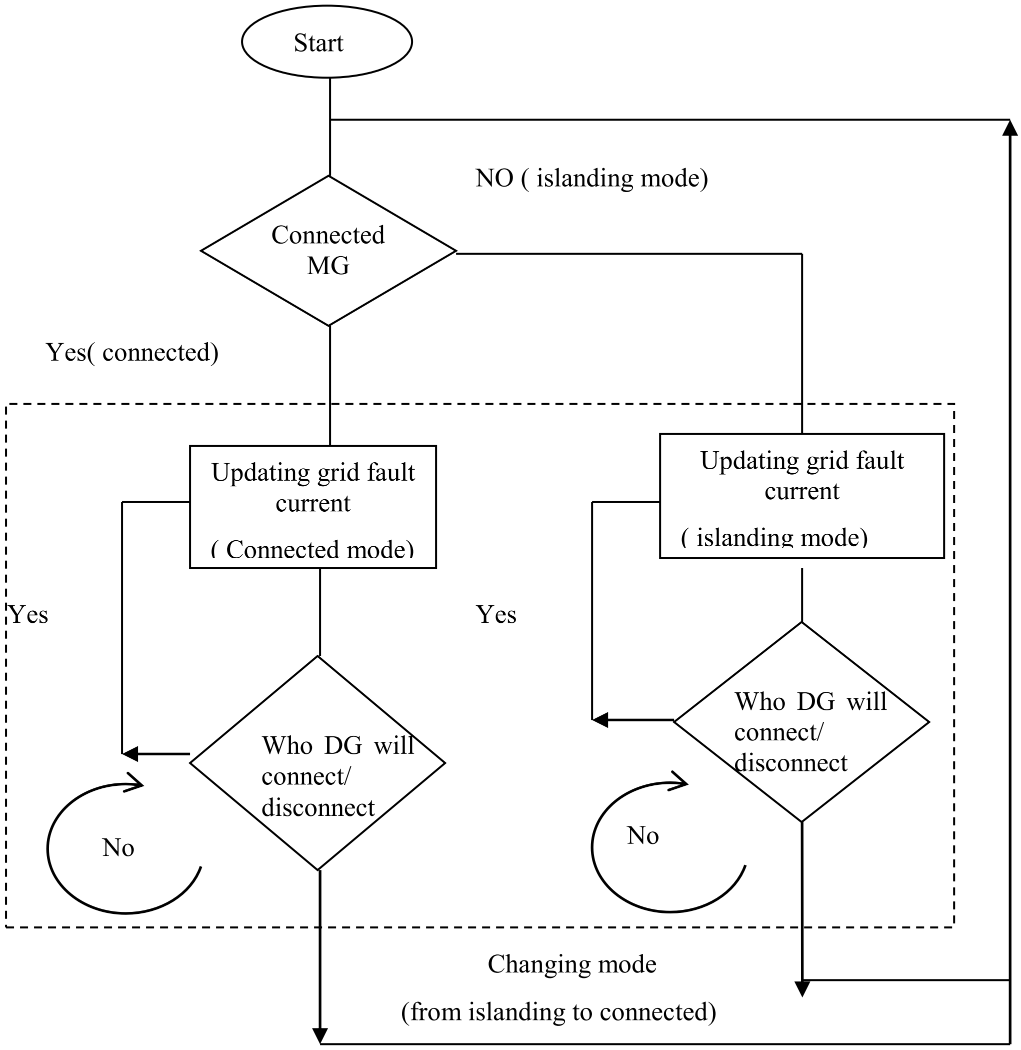

Fig.5. Algorithm of microgrid central protection unit[13].

One of the DG resources must take over control frequency role and microgrid voltage. By using intelligent system and protection unit and central control, microgrid mode is diagnosed and to change control mode a signal is sent to DGs. When the MG turns to islanded mode to change control mode status to DGs, central protection unit sends a signal in which in this case, DG3 takes over voltage frequency control role in MG. Finally, frequency measurement entering the DG3 control system as microgrid frequency in islanded mode controlled [13].

B. Droop Controller Angle-Frequency

3) Active Power Management /Control Ferquency:

In order to divide real power between DGs, frequency or angle droop method can be utilized. Using angle droop is an alternative for power distribution. Despite synchronous generators, output power angle of inverter voltage supply can be changed without changing the frequency; therefore, using angle droop is another method to divide the real power. Since real power is controllable through load angle, changing frequency is not required to regulate the power, therefore frequency is only applied as an interface to regulate angle.

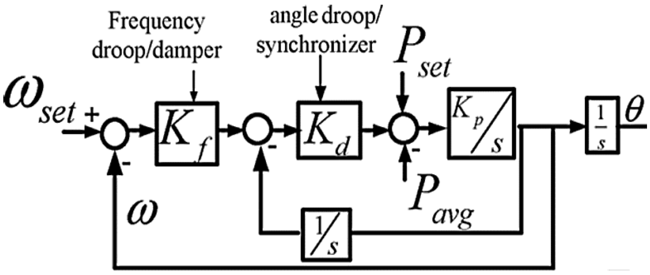

Fig. 6. Phase-angle controlling structure [14].

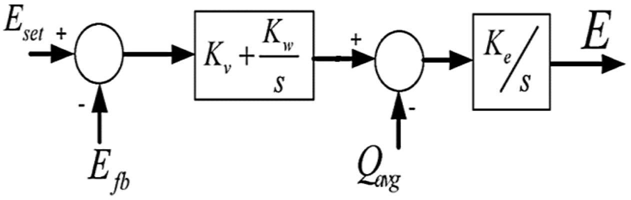

Fig. 7. Voltage controller in phase-angle control[14].

TABLE. II ISLANDING MODE PERFORMANCE WHIT FIRST CONTROLLER[13]

Operating Mode	**Islanded**	**Time delay for Selectivity**
	0	
Grid Fault Contribution	———	
Relays	**Fault Detection (1 – Y, 0 – N)**	
R_1	1	t_1
R_2	1	t_2
R_3	0	t_3
DG_S	$I_{faultDGS}$	Status (1-ON, 0-OFF)
DG1	$I_{faultDG1}$	1
DG2	$I_{faultDG2}$	1
DG3	$I_{faultDG3}$	0

The angle droop provides a constant frequency performance which is the main advantage. Therefore, frequency or angle droop method is used in order to divide the real power among DG units. As stated earlier, angle regulation is the basic tool to divide the power. Another alternative approach is integrating these two methods and using it as a controlling method in order to employ advantages of both frequency and angle droop methods.

TABLE. III ANGLE-FREQUENCY CONTROLLER VALUES

Parameters	**DG1**	**DG2**	**DG3**
Line-line voltage(rms)	4140	4140	4140
VSC Voltage(rms)	4760	4760	4760
Kd	253000	304000	203000
Kf	2	2	2
Kp	0.01	0.01	0.01
Kv	33800	40560	27000
Kw=0 for islanding mode	0	0	0
Ke	500	500	500
ω_c	200	200	200
P(MW)	3.5	4.2	2.8

"Fig. 4" shows hybrid droops with connecting frequency and angle droop. In this structure, there are three cascading droops including angle, frequency, and power. The first loop is frequency which is the reference angle as an angle from frequency error. Real power loop is achieved by using angle droop such as:

$$\delta=\delta_{set}- K_d P \qquad (6)$$

C. Reactive Power Management/ Voltage Control

This model provides constant voltage performance along with appropriate reactive power regulation. Although constant voltage performance can be imposed in both DG modes. Although constant voltage performance can be imposed in both DG modes (connected and independent), it is not an ordinary approach for independent micro grid management. On the contrary, voltage droop is applicable for both performance modes of micro grid, however it is not an optimal solution for micro grid connected to the network and it is appropriate for independent mode. By $Kw=0$, which is more appropriate for independent more, is used. The requirement for independent mode is zero constant in order not to have constant voltage in independent mode. Thus, it will lead voltage droop. This constant is, however, varying in connected mode. The dynamics for voltage control is such as(7) , (8)[14]:

$$\Delta E=-K_e K_v \Delta E_{fb}-K_e \Delta Q_{avg} \qquad (7)$$

$$\Delta Q_{avg}= - \omega c \Delta Q_{avg}+\omega_c \Delta Q \qquad (8)$$

Where K_f is DG connecting filter reactance, K_d is power/current vs. angle slope constant, K_w is gain of integrator which is zero in this case, K_p is P_{avg} whit angle slope constant, $\omega_{set}= 2*\pi*f$, $P_{set}=P_{ref}$, Q_{set} are Nominal active/ reactive power for DG, i_d, i_q are d-q current components of VSC, i_d*, i_q* are Controller commands of *d-q* current components, K_v is Reactive power vs. voltage slope constant , E_{set} is Voltage reference, $P_{elec} = P_{avg}$ is from P/Q measurement, K_e is Voltage regulation loop integrator gain, δ is DG voltage angle, E_{fb} is feedback voltage amplitude and is line impedance angle[14]. Table. III shows the information of this table in which $Eset$ is assumed 3400.

IV. Simulation Results in Loads Different Charactristics

A. Micro-Grid Under Consideration

A micro grid, which consists of three DG units, is used to study the energy management and IMGs control. The system consists of two EI-DG Electronic Interfaced-DG units and one DG unit according to traditional synchronous machines. The system offers all features of a radial micro grid by applying the PMS concept and its impact on MG behavior. Powers of DGs explained in Table II, which connected to the supplies and power system by voltage supply convertor. Here, DG1, 2, 3 are flexible supplies with good capacity to deal with active and reactive power demands in turbulent conditions. Such supplies are controllable supplies consisting of DC-bus related energy storage. These three units independently supply active/reactive power characteristics. The basis system structure and parameters are taken from 1997-399IEEE [15] which are some definitions based on independent modes. The main network is connected to a three-phase 69KV voltage supply with the capacity of 1000 MW and x/r=22.2 in three lines, 69 KV phase and *RL* elements per unit.

"Fig. 8" shows 69 KV to 13.8KV distribution transformer and load transformer in the form of linear three-phase distribution system with appropriate wiring condition. A 13.8 KV system was defined. A three-phase distribution sub system is connected to a main network by a 69 KV radial line. 13.8 KV distribution post is equipped with a fixed 1.5 Mvar parallel capacitor bank. A 13.8KV busbar post is radially connected to a distribution transformer and 69 KV line is connected to the main network. The network at the end of 69 KV line is completed with a 69 KV and 1000 MW short-circuit bus[11]. Each feeder is offered with RL integrated elements in per unit. Simulation samples is performed for each non-linear and imbalance loads.

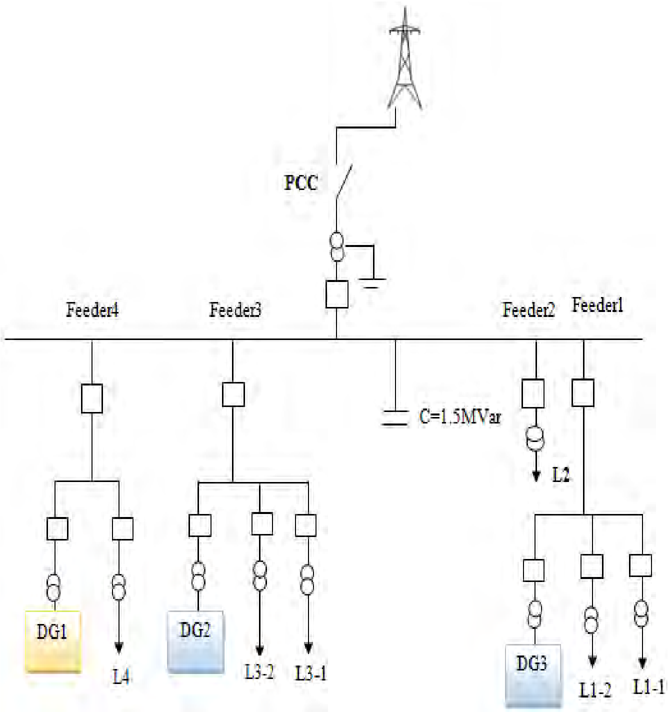

Fig. 8. Linear single diagram of the micro grid under consideration.

This micro-grid is the same case in [11] which controlled using angle- frequency droop controlling new outlook. Therefore, changing in MG is normal. This MG has been tested whit both controller. The Impedance of transformers (L_m, R_m Ω) is 0.165 Ω + 1 j **.** When $kw= 0$, highlighted values of transformers are not correct. Because in this case, voltage is float.

B. Ferequency and Angle Control for non Leanear Load

In this scenario, at t=1 s, a non-linear load (a three-phase six-pulse diode bridge rectifier which supplies DC section of 1MW load) is placed in point of common coupling of DG units. In this scenario, at t=1 s, a non-linear load (a three-phase six-pulse diode bridge rectifier which supplies DC section of 1MW load) is placed in point of common coupling of DG units for both controller. "Fig. 9" shows the Insufficiencies of the elementary droop controller to regulate frequency the under studying IMG. "Fig.10" has been compensated using MCPU while has been supported the elementary droop control while IMG, depended to main grid using MCPU which make centralized droop controller.

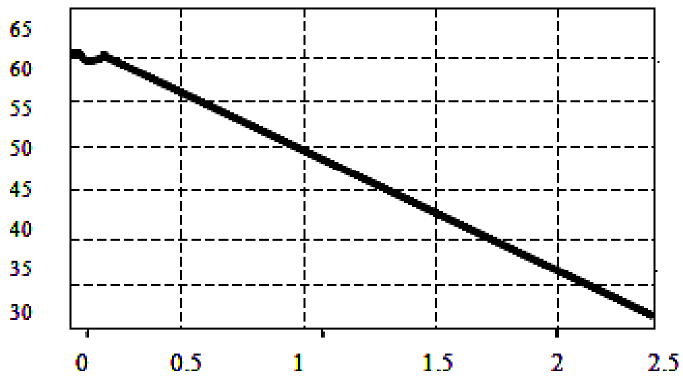

Fig. 9 . Instability of frequency waveform for the elementary droop controller whit PLL.

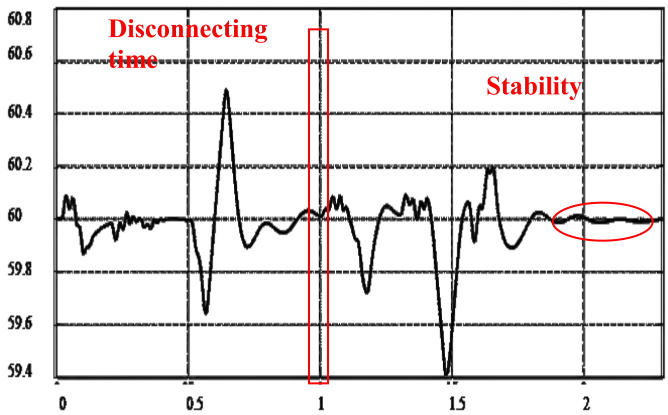

Fig. 10 . Stability of frequency waveform for the first droop controlling model.

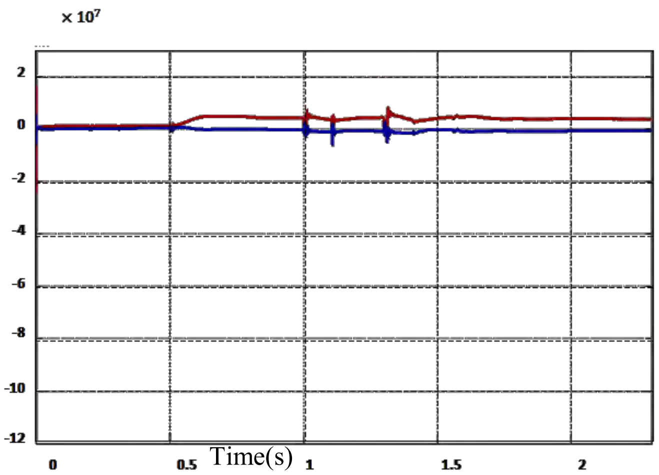

Fig.11 . Active/ reactive power wave form for first model.

TABLE IV. PARAMETERS OF MG FOR ANGLE-FREQUENCY DROOP CONTROLLER

Parameters	Controller
$Load_{(1-1)}$	0.75MW, 0.2MVAr
$Load_{(1-2)}$	___________
$Load_2$	1MW
$Load_{(3-1)}$	2MW, 0.6MVAr
$Load_{(3-2)}$	___________
$Load_4$	1.4MW,1.2MVAr
$Transformer_1$	4.14KV/3.18KV
T_2	___________
T_3	4.14kv/3.18kv
T_4	___________
T_5	___________
T_6	___________
T_7	4.14KV/3.18KV
T_8	___________
T_9	___________
T_{10}	13.8KV/69KV
Z_I	1.14j+0.885Ω
Z_2	0.05j+0.1Ω
Z_3	o.75j+1Ω
Z_4	0.05j+0.1Ω
Z_5	___________
Z_6	___________
Z_7	1.14j+0.885Ω
Z_8	0.05j+0.1Ω
Z_9	___________
Z_{10}	___________

"Fig.11" shows active power (red wave form) and reactive power(blue wave form) ,while the under studying IMG controlled by first model. In this case, capacity of DGs in IMG is limited. Therefore, value power sharing between DGs is low. In which, values of DG1, DG2, DG3 are 1.8MW, 2.5MW ,1.5MW, consequently. For else of parameters and values see[11]. "Fig. 12" shows the P changes of each of units for adding one non-linear load. "Fig. 13" shows f related wave forms. "Fig. 14" shows effective output phase voltage of each of units. "Fig. 15" shows reactive power of units.

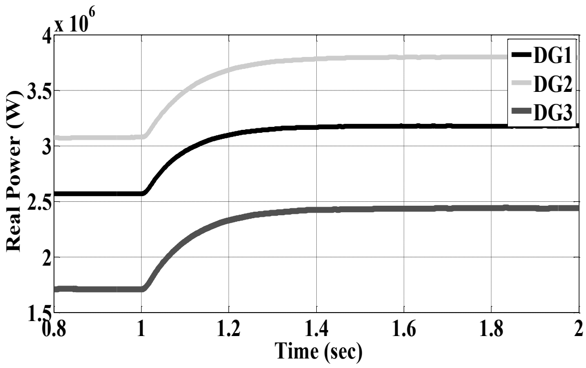

Fig. 12. Real power changes after adding non-linear load.

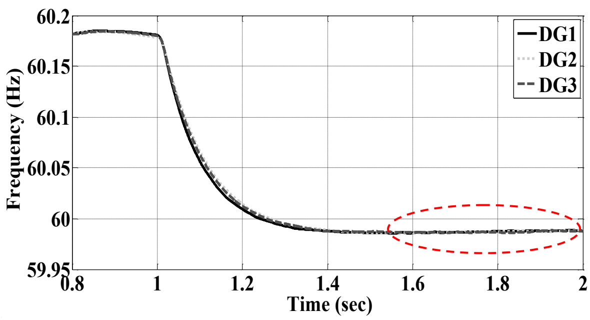

Fig.13. Frequency changes after adding non-linear load.

According to the results, controller performance is appropriate to deal with non-linear loads. In above diagram, an acceptable level of all three DGs is studied for each non-linear load imposing so that DG1 achieved more than 2.5 MW after load connection at t=1 s and becomes stable until minimum t=2 s with 3 MW rise. DG2 reached more than 3 MW. DG3 reached around 2.5 MW to show appropriate active power division and dynamism among DG units. "Fig. 13" shows frequency changes after imposing non-linear load at t=1 s. Nominal frequency is 60 Hz. This controller, which is responsible for optimal phase-angle control with maintaining the maximum frequency, is dealt with frequency deviation of 0.2 Hz after t=1 s and 59.98 Hz after t= 2 s with only 0.01 deviation. This deviation is ignorable. The observed loss is real power-frequency droop which experienced loss for each parallel performance of all three DGs. Since the controller is non-linear for non-linear loads, non-linear diagram with negative slope is declining at t= 1.2 s. In fig. 14, voltage control changes can be well observed in the new controller for reactive power control. As it can be seen, DG1 achieved the desired loss of voltage droop control by 2880(rms) effective voltage after the first second of running with non-linear load. After t= 1.2 s until t=2 s, it reaches stability with negative non-linear slope resulting from non-linear controller.

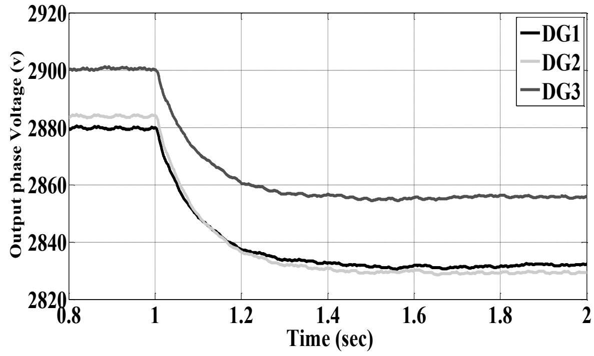

Fig. 14: Output phase voltage changes for adding non-linear load.

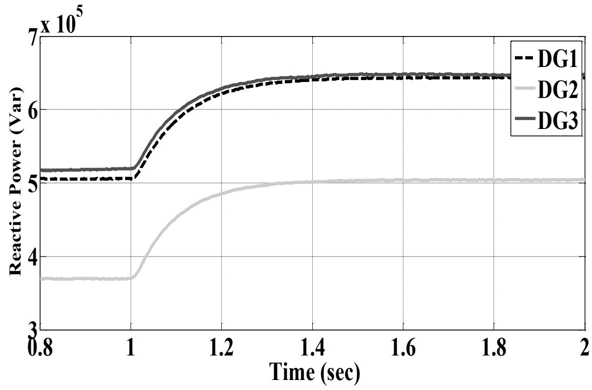

Fig. 15: Reactive power changes for adding non-linear load.

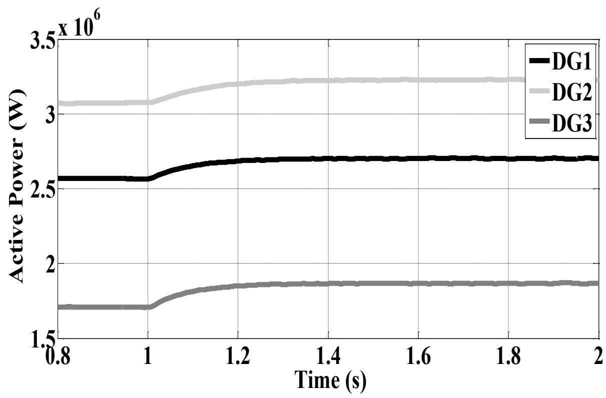

Fig. 16: Real power changes for unbalanced power changes.

Each of DGs exchanges reactive power according to various effective voltages. This can be easily seen for DG 2, 3. As it can be seen, Q is 6.5 MW for DG 1, 3 after t= 1.8 s. DG2 continues until 5MW. This point should be mentioned which the first controller has been installed on the under studying IMG while both non-linear load and unbalanced load has been presented in different buses of IMG.

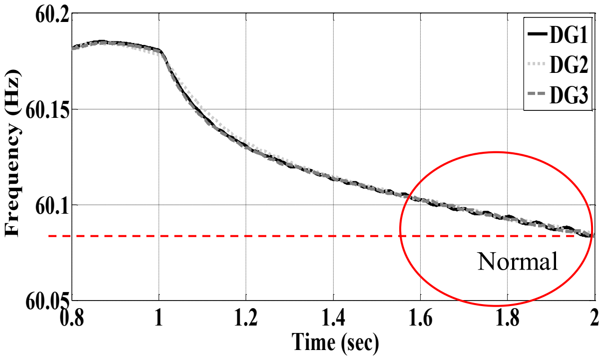

Fig. 17. Frequency changes for unbalanced load.

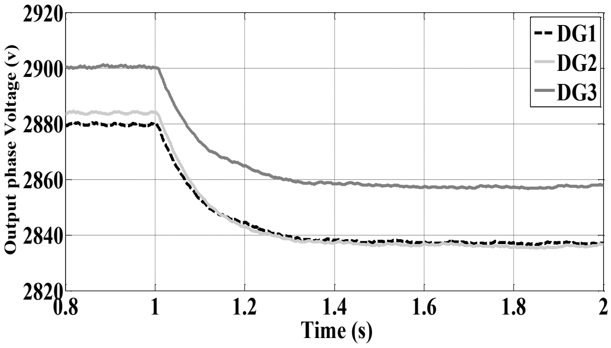

Fig. 18. Output phase voltage changes for unbalanced load.

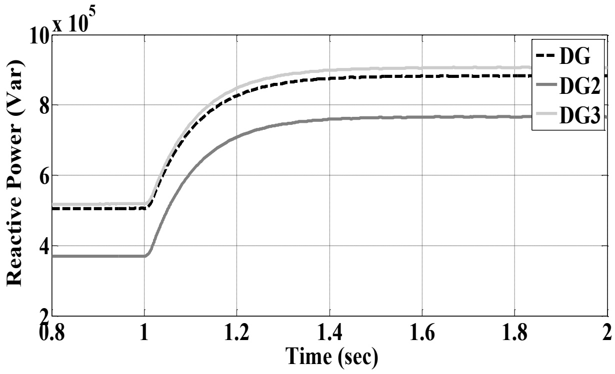

Fig. 19. Reactive power changes for unbalanced load.

C. Unbalanc Load

In the second droop control model the unbalanced load mode is assumed by connecting three single-phase with real and reactive power. In this scenario, at t= 1s, we connect each of imbalanced loads to the system. The figs.(16,17,18,19) also show waveforms related to real power, frequency, effective output phase voltage, and reactive power changes, consequently. As it can be seen, controlling system has transient response and appropriate constant mode. Next diagrams show the dynamic and logical generation of all three DGs for IMG running for unbalanced load and with phase-angle controller. As reliable phase-angle controller was expected, minor frequency deviation rapidly manages micro grid frequency and reaches stability 60 Hz until t= 2s with an acceptable slope from frequency droop. This stability time continues until t= 2s.

V. CONCOLUTION

In this article had been presented two droop controlling models such as: 1) centralized droop control whit MCPU, 2)Decentralized angle- frequency droop control. It not means that we don't agree the first controller but, should be explain which the decentralized angle- frequency droop controller is economical, global and safe to protection because this controlling strategy is local whiteout attention to the main grid. In the proposed controlling models, a well reliable controller can be imagined resistant behavior of micro grid against non-linear and imbalance loads without the utilization of any telecommunications systems can hopefully be achieved by both active and reactive power management while the frequency is constant in micro grid. By controlling decentralized improved angle-frequency droop control, we will observe acceptable control and appropriate transient behavior for each of cascading independent control plan which goes toward stability according to the simulated results. From hierarchical droop control outlook; this type of local controller is performed at primary local level according to the DG units. Taking advantage of secondary level is not possible because we will require centralized telecommunication links for power management. Tertiary management level is also ineffective because the control is independent type. Therefore, the only level which is close to our work in decentralized stage droop control is primary control level. According to what was discussed, both centralized and decentralized droop control are usually able to:

1) Supply an appropriate path to divide p in independent mode in DGs and accordingly, energy DGs

2) Maintain acceptable system frequency and maintain to regulate appropriate voltage in IMG whiteout attention to characteristics of load.

Therefore, micro grid power management can be optimized by MG power planning and energy distribution. Finally, should be attention which this article is a advanced case from [16].

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