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REVIEW ON: ENERGY STORAGE MANAGEMENT IN MICROGRID BY USING VEHICLE TO GRID TECHNOLOGY

Payal jangilwar, Prof. Balram Yadav

M-tech scholar, Department of Electrical and Electronics Engineering, Scope College of Engineering, Bhopal-
HOD, Department of Electrical and Electronics Engineering, Scope College of Engineering, Bhopal

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Abstract- Electric vehicles are gaining demand day by day. Energy storage system is important for microgrid energy management. Electric vehicles can help in energy storage system of microgrid. It can store energy by using grid to vehicle technology and can supply back to grid by using vehicle to grid technology. A proper architecture is needed to apply this technique of energy storing. To realized this concept architecture of DC fast charging for electric vehicles is developed. The level 1 and level 2 AC charging for electric vehicles can harms the distribution system, resulting in overloading of transformer, voltage fluctuations and power losses. To reduce these losses Dc fast charging is used because it reduces charging time to 20-30 minutes. In this paper we will see a brief review on electric vehicles and their charging system for energy storage in microgrid.

Keywords : Vehicle to grid technology, electric vehicle, DC fast charging , microgrid, tie- grid inverter.

INTRODUCTION

Electric vehicles are automobile machines designed by one or more electric motors. This can draw power from an onboard source of electricity. Electric vehicles are proven to be workable solution for minimizing green house gases and most importantly global anthropogenic emissions that emerge from transportation and energy sectors. Vehicle to grid technology (V2G) technology can be explained as a system which can bear a control over bidirectional energy flow between electric vehicles and electrical grid. For microgrid energy storage system are very important and electric vehicles plays major role in it. V2G technology in general power grid faces many challenges such as difficulty in control system, requiring large numbers of electric vehicles and difficulty in implementation.
In previous studies we found that, V2G technology in general power grid employs with level 1 and level 2 AC charging which is limited to on board charger's power rating. Therefore DC fast charging architecture is introduced to charge electric vehicles which are also called as level 3 charging. It is previously proven that "level 1 charging technique uses plug to connect with electric vehicles for charging and it uses 120V input voltage." It is very slowest process and takes long time to charge the vehicles. When it comes to level 2 charging "it uses dedicated electric vehicles supply equipment at home or at public station to provide power to electric vehicles it uses 220V – 240V input voltage and 30 A". DC charging(level 3 charging) takes min 20-30 minutes to charge the vehicle. This paper is organized as follows: General overview of Electric Vehicles, vehicle to grid concept, microgrid and DC fast charging scheme.

1. LITERATURE REVIEW

The main objective of this work is to provide precise analysis on energy storage sytsem in microgrid by V2G and G2V technology by using DC fast charging. In prious studies we got to know that" electric automobiles were being produced as early as the 1800". It was studied that " the technology requiring for electric car was being developed before the automobile was conceived.

- The primary cell invented by volta in 1800". It generate electricity by chemical action.
- In 1833 working electric motor was invented, Thomas Davenport come up with it after observing demonstration of an electromagnet. In 1837 he patented his motor.

- " Professor Charles In 1847 built a locomotive which using 100 cells and 16- horsepower".
- It was noted that " The first successful electric automobile was the carriage built by William Morrison of Des Moines, Iowa in 1890".
- This car used high, spoked wagon wheels to travel on the roads of America. This car is capable to run for 13 hours at 14 mph.
- In recent years, VGI investigations have moved from initial "paper studies" to real world types of demonstration and pilot projects. These have now included both individual site studies as well as larger utlity programs involving dozens or even hundreds of vehicles. 0
- Electric cars are better in performances than gasoline powered cars as it reduces pollution and improves air quality. It has electronic controls that can be used to make engines run only hen needed and to do so more efficiently. The average speed of electrical vehicles is 40-60kmph and a range of 50-80 kms.
- "The first Electric car in India was launched by Banglore based company REVA.
- REVA is the 150th model of electric vehicle. It is fully advanced car with all advanced techniques inbuilt in it. It has all benefits of electric car and can easily run in city remote area.

3. MIICROGRID

Microgrid is a portion of the electrical system which views generation and associated loads. Mocrogrid shares three components mainly generation, demand. And control system. It has ability to operate as both grid connected and also as a islanded from grid. The structure of microgrid consist of the five major: a) microsources or distributed generators, b) flexible loads, c) distributed energy storage devices, d)control systems, e) point of common coupling components, which are connected to a low voltage distribution network, which is capable of operating in a controlled, coordinated manner, in both the connected to the utility grid or landed states. Ehen microgrid is connected to main grid it can both receive or inject power to it. Microgrid control objectives are a] independent active and reactive power control b] correction of voltage sag and system imbalance c] fulfilling the grid's load dynamics.

DC FAST CHARGING

DC fast charging technique provides Dc power straight to electric vehicle battery. At charging station AC-DC conversion takes place before electron enter the vehicle. Therefore DC fast charging provides faster charging rate than level 1 and level 2 AC charging. DC Fast Charging bypasses all of the limitations of the on-board charger and required conversion, instead providing DC power directly to the battery. DC fast chargers uses input voltage 200-600 vlts for charging. The only one thing we have to keep in mind we should not over do it because " DC fast chargers can harm battery faster that AC charger."

" Currently in North America there are mainly three types of DC fast charging: CHAdeMO, combined charging system and tesla supercharger."

1. GRID TIE INVERTER

Grid-tie inverters converts direct current power(DC) into alternating current power(AC) before injecting into grid. The grid connected system allows us to power our home and small business with renewable energy in all seasons as well as daily and excessive energy is fed back to grid. There are two main types of grid connection first one is ' high voltage bay connection' and second one is ' low voltage connection through tertiary'. These grid-tie inverters can be used "between local electrical power generators, solar panel, hydro-electric and the grid. The main difference between grid-tie inverters and regular inverters is that" grid-tie inverter draws power from battery and then converts it into alternating current as a output whereas regular inverters have to supply the converted AC power to the appliances instantly". We can also use these inverters as off-grid inverters, the only thing we needed is reference power source. The main drawback of on-grid system is that it cannot provide power during grid outage, whereas off-grid system can allows the storing and saving of power during grid outage.

Operation

The inverter has an on-board computer which can sense the AC current grid waveform, and outputs a voltage to correspond with the grid. But, it is very important to supply 'reactive power' to grid to limit the voltage inside grid. Otherwise, voltage levels might rise to very large extent to reach to high production.

Manufacturers datasheets for their inverters usually include the following data:

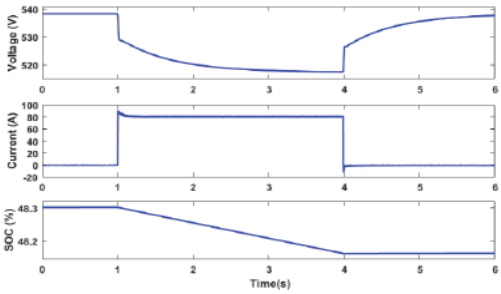
Rated output power: This value is provided in watts or kilowatts. For some inverters, they may provide an output rating for different output voltages.

Output voltage(s): This value shows the utility voltages the inverter can connect to." For smaller inverters for residential use, the output voltage is usually 240 VAC. Inverters that target commercial applications are available for 208, 240, 277, 400, 480 or 600 VAC and may also produce three phase power".

Peak efficiency: the peak efficiency represents highest working rate of inverters r the highest efficiency it can achieve. 'Most of the inverters can have efficiency up to 94% - 96%. During inversion the energy lost is converted into heat.

CEC weighted efficiency: This efficiency is published by the California Energy Commission on its Go Solar website. It is opposite to peak efficiency , it is n average efficiency of inverter or the average working rate of an inverter.

Maximum input current: This is maximum input direct current that inverter can bear



Peak power tracking voltage: this voltage represents a DC voltage ranfe in which inverter can reach at its peak. It is said that "The system designer must configure the strings optimally so that during the majority of the year, the voltage of the strings are within this range. This can be a difficult task since voltage fluctuates with temperature changes".

Start voltage: This voltage is the minimum value of voltage required to start the inverter to operate. This value is not listed on datasheets. This value is provided by the manufacturer, if this is not done then system designers may use lowest band of 'peak power tracking voltage range'.

IPxx rating: it is said that " The Ingress Protection rating or IP Code classifies and rates the level of protection provided against the ingress of solid foreign objects (first digit) or water (second digit), a higher digit means greater protection".

7. CONCLUSIONS

In this paper a general review on energy storage system of microgrid and charging system of electric vehicles is presented. As previously said Electric vehicles can help to store energy n microgrid by Dc fast charging system. In our recent studies we found that DC fast charging system is better in working than level 1 and level 2 AC charging system as it decreases the distribution losses and also reduces the charging time. Vehicle to grid technology and grid to vehicle technology is very workable solution of energy storage in microgrid.

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