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DISTRIBUTED GENERATION AND ITS FUNDAMENTALS

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Introduction

Owing to the scientific research from year to year new devices that allow getting the electricity from renewable energy sources are being increasingly designed. These smart grids have got the wide utilization in different industrial sectors. Also these technologies are being used by individual entrepreneurs to reduce energy costs. The connection presence to electric network allows compensating the lack of energy. Furthermore, entrepreneurs can activate the power installation to bring under the power plant emergency by operator command. The capacity of alternative energy units is determined by consumer. Renewable energy power plants have impact on energy system: the unbalances between the electricity generation and energy consumption result regularly, so their common contribution into the energy network cannot be disregarded. That is why the definition of distributed energy is coming up.

Distributed generation (DG)

DG – electricity and heat energy generation on the capacities are located near the consumer [2]. The sources of distributed generation allows owners to send generated energy into the network by way of getting the income or in case of power plant emergency when the additional sources of capacity are required to reduce the network load. All the communications are realized by way of complicate network which is based on the Smart Grid technologies such as smart meters etc. A rural radial distribution system incurs above-average costs when energy has to be transmitted long distances from the remote generating plant. The need to supply isolated locations increases the costs of the distribution network and, in addition, electrical losses are incurred in feeding the energy to the extremities of the system. In such instances, renewable electricity generating technologies offer benefits to deliver energy closer to consumer demand than centralized generation [5].

Distributed generation availability

The issue of DG availability and its impact on the utility can be settled in contractual agreements. Such an arrangement is appropriate for relatively large DG units. However, in the case of very small PV DG systems, diagnostic and monitoring systems coupled with communication support, will be essential, if an aggregate of such units is to be effectively managed. Each unit will have to be monitored not only for delivered active power, but also for behavior indicative of reduced performance. A PV may deliver a low level of power either because of atmospheric conditions, or because of internal conditions such as aging or poor maintenance. Diagnostic system will run either in each DG, or in a computer system that monitors many DGs in geographical proximity, thus mitigating atmospheric effects. The Smart Grid's ability to collect or share data from many DGs allows the usage of failure detections algorithms that automatically build empirical models of systems that function at correct levels, and have no need for theoretical models that would likely be manufacturer and model dependent. Such an approach will exploit the high level of behavior correlation of DGs in the same geographical area, and be able to not only detect which DGs do not perform at the expected level, but also estimate the level of performance degradation [5].

DPGS structure

A general structure for distributed systems is illustrated in Fig. 1. The input power is transformed into electricity by means of a power conversion unit whose configuration is closely related to the input power nature. The electricity produced can be delivered to the local loads or to the utility network, depending where the generation system is connected. One important part of the distributed system is its control. The control tasks can be divided into two major parts [4].

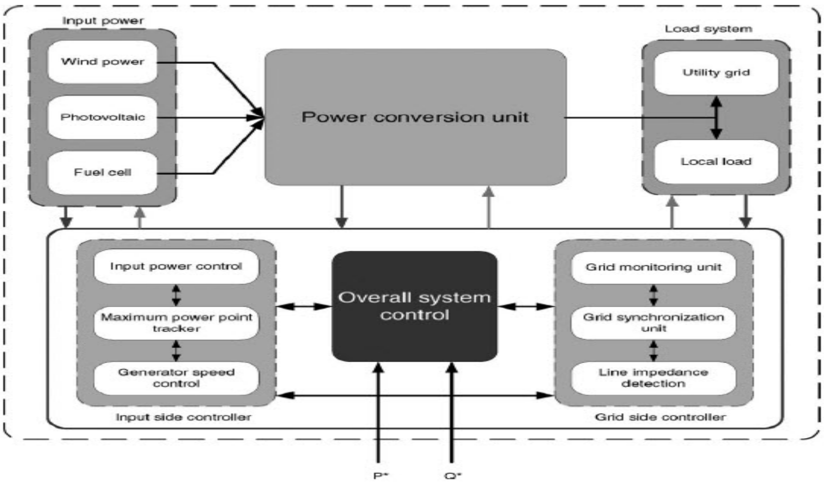

Fig. 1. General structure for distributed power system having different input power sources

1) Input-side controller, with the main property to extract the maximum power from the input source. Naturally, protection of the input-side converter is also considered in this controller.

2) Grid-side controller, which can have the following tasks:

- control of active power generated to the grid;
- control of reactive power transfer between the DPGS and the grid;
- control of dc-link voltage;
- ensure high quality of the injected power;
- grid synchronization.

The items listed above for the grid-side converter are the basic features this converter should have. Additionally, ancillary services like local voltage and frequency regulation, voltage harmonic compensation, or active filtering might be requested by the grid operator [4].

Also it is necessary to resynchronize energy network because of the commissioning of new power generating plants. Resynchronization is defines as a repeated synchronization. Whereas, synchronization is the aggregation of operations are carried out while connection a generator to the mains. There are several methods of synchronization:

1. Self-synchronization. The principle of this method is that unenergized generator with short-circuited bias coil on the resistor is adjusted to subsynchronous velocity by primary motor. Then generator is cut into mains and energized. Generator is being involved into synchronism in response to mechanical shock action.

2. Ideal synchronizing. Generator reaches the subsynchronous frequency and then is energized. Hereafter the frequency and voltage of synchronized generator and electric network are set equal by through the instrumentality of automatics or in a manual way. Next the switching on the generator instruction is being given. For the frequency and voltage of synchronized generator and electric network it is necessary to be balanced stiffly accurate in order to the equalizing current bump in the switch-on moment does not exceed the feasible value and generator rotor swinging will die out fast.

Grid synchronizing technique

Phase Locked Loop (PLL). A phase-locked loop is a control system that generates an output signal whose phase is related to the phase of an input "reference" signal [3].This circuit compares the phase of the input signal with the phase of the signal derived from its output oscillator and adjusts the frequency of its oscillator to keep the phases matched. The output signal from the phase detector is used to control the oscillator in a feedback loop. Frequency is the time derivative of phase. Keeping both the input and output phase in lock step implies keeping the input and output frequencies in lock step. Consequently it can track an input frequency or it can generate a frequency that is a multiple of the input frequency.

Conclusion

This paper has discussed the basics of a distributed power generation system. Availability of DG, distributed power generation system structure, the synchronization methods (such as self-synchronization and ideal synchronization) and grid synchronizing technique were primarily addressed.

Finally, it may safely be said that distributed generation has a lot of advantages and ways to develop. The energy systems and energy market are evolving, so we do hope that in near future distributed generation will play a leading role in forming power engineering development strategy.

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TEXAS GERMAN

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The history of Texas German language originated 150 years ago. Native speakers turn out well with passing through the generations of their language. Texas German is German dialect. Such dialect exists only in Texas. Its name is Texasdeutsch. This dialect is spoken by German immigrants who settled in Texas in the mid-19th century. After moving overseas majority of Germans still speak their native language. Over time, they used more and more English words which influence on formation of Texas German. So lots of English verbs and lots of English nouns were borrowed into Texas German. In Texas, Germany, for example, there are such expressions as "der hamburger" or "der Cowboy." Now Texas German is spoken by 8000 people. And they are almost all older than 60. Virtually no young people speak the language, and it will be dead in 30 years.

Texas German faced its first major challenge as anti-German sentiment arose around World Wars I and II. As English-only laws in schools and churches were passed, Texas German – which once had as many as 110,000 speakers – began to dissipate.