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# FUTURE POWER SYSTEM INHERENTING NANOGRIDS

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**ABSTRACT:**

*In this paper we are studying the advantages and disadvantages of nanogrids. Microgrid is a new technology in power generation and this system is used to provide power and heat to its local area, such as cogeneration systems and renewable energy (wind turbines, photovoltaic cells, etc.). They are preferred for medium or high power applications. Nanogrid most likely to be used in small local loads for rural area as they will be more economic then the normal grid power system. Nano grids can operate independently or be connected to the mains and most likely the internal voltage can be utilized as ac or dc. In this research paper a study on small scale microgrid system is proposed for smart homes called "Nanogrid". Each houses have small electrical power system from them can be shared among houses. If it uses a DC system instead of a general AC system, it can reduce energy loss of inverter because each generator doesn't need an inverter. Furthermore, it can continue to provide a power supply when blackout occurs in the bulk power system.*

**KEY WORDS***: Nanogrid, microgrid, cogeneration, energy storage, nanotechnology, centralized power system*

## 1. INTRODUCTION

A HIGH infiltration of renewables requires significant changes to the present framework [1]. Without a doubt, the traditional air conditioning lattice framework is an inflexible design worked around brought together non-renewable energy source or atomic power plants that circulate vitality over long transmission lines, substations, and conveyance arrange before landing toward the end clients. The ordinary matrix is progressively turning into a container neck for growing the portion of renewables. Most encouraging inexhaustible sources like sun powered and wind are topographically disseminated (circulated vitality assets—DERs) and frequently rely upon climate or ecological condition. In any case, circulated ages (DGs) cause issues, for example, voltage rise and security issue in the utility lattice [2]. The inconstancy and discontinuity in power yield are representing a significant issue for dealing with the interest reaction necessities for power systems. This is particularly valid as module half and half electric vehicles (EV) include an enormous stochastic burden onto the framework [3]. Enormous and quick vitality stockpiling units (most promisingly Lithium-particle batteries [4]) are expected to deal with the transient confound of age and utilization.

To propose answers for these difficulties, a wide scope of new vitality lattice frameworks, regularly gathered as savvy matrices [5], are presently rising. Though there is no standard categorization [6], we define three main approaches: 1) microgrid 2) nanogrid and 3) virtual power plant (VPP).

Microgrids are promising answers for incorporating a lot of smaller scale age by decreasing the negative effect to the utility system [7]. All in all terms, microgrids can be characterized as structures that consolidate DG units, vitality stockpiling frameworks (ESSs), and burdens [8]. Microgrids including batteries permit to move pinnacle request and level the utilization design. While their engineering may change extraordinarily relying upon the sort or number of structure hinders just as the application setting [8]–[10], an unmistakable differentiation can be drawn among air conditioning and dc-based microgrids. Justo et al. [8] presumed that despite the fact that air conditioner microgrids are currently dominating, the quantity of dc microgrids is relied upon to increment in the coming a very long time as they will before long be the correct possibility for future vitality framework.

Nanogrids can be seen as smaller and technologically simpler microgrids, typically serving a single building or a single load. As they face less technical and regulatory barriers than their microgrid counterparts, substantial deployment is already undergoing [11]. This is why compared to microgrids, nanogrids are often seen as a bottom-up approach, well suited also for off-grid areas and with a clear preference for dc solutions [11].

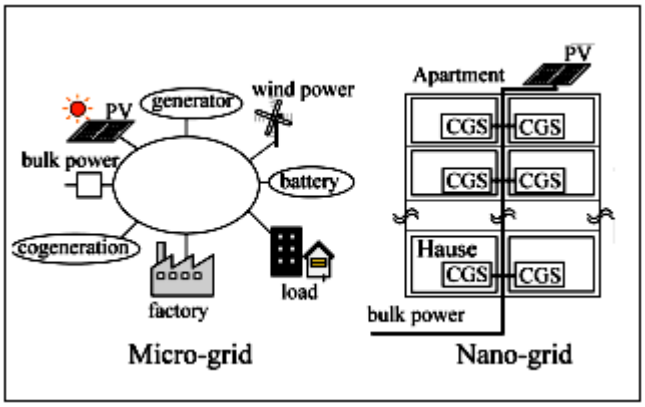


**Fig 1 :** Microgrid and Nanogrid System

The primary framework comprises of wide zone and microgrid spread medium zone and uses the elective vitality assets. The Nanogrids comprises of gadgets and utilized its very own capacity framework, for example, PV sun oriented cell and warming framework. The microgrid frameworks are the focal point of research everywhere throughout the world the sharing of electronic power and warmth (CHP) framework. The microgrid framework comprises of dispersed generators, for example, cogeneration frameworks and sustainable power source frameworks (wind turbines, photovoltaic cells, energy unit and so on.). The idea of Nano-network is that at little scale we select houses around 50-150 houses and the each house has its very own PV cells or an energy component cogeneration framework as appeared in figure 2. The yields of all circulated arrangement of ages are associated with the appropriation line, and the electrical power can be obtained and loaned among houses through the conveyance line.

However, to prevent both power outages and wasting gen- erated electricity, most microgrids/nanogrids include a utility grid connection.

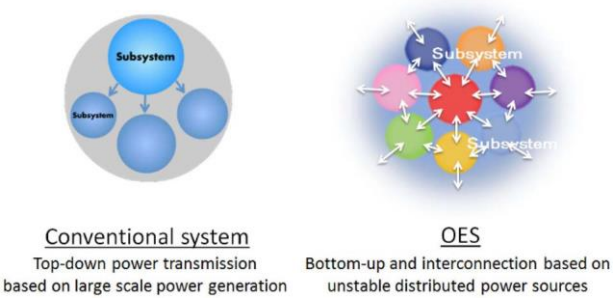


**Fig 2 :** OES concept compared to conventional approach.

The regular network and including vitality stockpiling [12]. Interconnections and vitality storerooms are required to lessen the pressure that irregular renewables cause on essential age, for example, atomic and warm [13], [14]. Along these lines, the future vitality network in those zones is anticipated to be founded on the different DG units, stockpiling gadgets, and controllable burdens that are associated with cutting edge data and specialized gadgets, for example, robotized meter foundation. In those frameworks, DG units, ESS, loads, and furthermore microgrids are totaled in bunches and can be viewed as VPPs [15] that would then be able to be treated as single substance. VPP can be considered as top-down methodology that takes advantage of the current framework through savvy meters and programming to add the knowledge important to oversee request reaction [8]. The point is to remotely and naturally dispatch and advance DG by means of an accumulation stage connecting retail to discount markets [16]. For supporting both a wide range and adaptable number of DERs, VPPs must be both inexactly coupled and by and large received by all players requiring institutionalization of correspondence [17].

All together, nanogrids and microgrids are will undoubtedly fixed structure squares, and VPPs are basically programming arrangements bound to the current utility matrix framework. In this paper, we propose Open Energy Systems (OESs) as another kind of adaptable and base up circulation system that offers a few qualities of each of the three approaches: building squares are an adaptable number of dc nanogrids, interconnected by means of a nearby dc control framework and controlled in an appropriated manner see the Appendix for similar table. The general idea might be viewed as a staggered dc lattice framework whose two-level usage we explore. It gives both equipment and programming to trading vitality in the middle of dc nanogrids of a neighborhood network so we can spread variances over the network without expecting to nourish in vitality to the utility matrix. Each house is furnished with one subsystem, a dc nanogrid including batteries, that is associated with a devoted, shared dc power transport just as a correspondence line permitting force trades inside a network.

## 2. ENERGY STORAGE DC NANO-GRID

In present day control framework, job of vitality stockpiling has turned out to be significantly progressively significant. Vitality stockpiling is vital in smaller scale framework applications to guarantee strength of the framework in nearness of bi-directional power stream of the microgrid, reduce the discontinuity issue of little scale sustainable power sources improve control quality, and bolster nearby generators for extra usefulness, for example, top shaving Load-moving, recurrence guideline and so on. For medium-scale and enormous scale sustainable power source plants, vitality

stockpiling is important to improve controllability and dependability of the plants to such an extent that they can be coordinated into power framework without causing execution corruption of the framework or requiring extra adaptability and working stores from the power framework. DC innovation In the "War of Currents" in the late 1880s, AC current prevailed upon DC current because of its simplicity of venture up/down and simplicity of assurance. Be that as it may, there has been as of late an arrival of DC innovation [4] because of the nearness of intensity hardware.

## ADVANTAGES OF NANOGRIDS

Followings are advantages of the Nanogrids

- Controllers discover other grids and generation system
- sharing power (price, quantity)
- Power can be exchanged mutually beneficial
- Controllers can track cumulative energy.
- Only data exchanged based on price and quantity
- Visibility of the systems adjacent grids
- Bring individual devices into grid context
- Pave way for Microgrids
- Increase microgrid utility; enable local microgrid prices
- Reduce microgrid cost and complexity
- Can scale/deploy much faster than Microgrids
- Enable “Direct DC” (~10% savings)
- Better integrate with mobile devices, mobile buildings
- Help bring good electricity services to developing countries
- It is more secure
- Coordinate only with immediately adjacent (directly attached) grids / devices
- No multi-hop “routing” of power

## 1. ISSUES RELATED TO THE POWER GENERATION AND CONTROL

The followings are the issues related to the power generation and control.

a. The vitality stockpiling will assume significant job in electrical power framework. Physical size in the vitality stockpiling framework assume significant job since more vitality can be put away. In the event that the size of a generator is more prominent than more yield power is accessible in pinnacle time. In shrewd framework vitality stockpiling will assume significant job in vitality age side since matrix will consistently utilize most extreme put away vitality to satisfy the interest of vitality in the pinnacle hours. By utilizing the nanotechnology the vitality stockpiling framework will store more vitality to fulfill the need.

b. The smart grid must control power generation system that can be varying instantaneously as load varies according to the requirement of the consumer. In future wind and solar energy system will be more and since these systems are depend on the weather conditions so the grid operator will need to take sudden actions as changes occurred in Power output [1].

c. The reliability of the grid depends on the synchronization between voltage and current. Since power equal to voltage multiply by current and since current fluctuations in an AC system and voltage has to fluctuate in the same way. Real or complex Power depends on the “Power factor,” and it should be near to one. But typically it runs between 85-95%. If power factor reduce within the certain limits, it causes to lower the system fuel efficiency. It is happening because the generators will produce same

amount of power by using the same amount of fuel but it will deliver less power to load and losses will be increased.

d. Complex power produce by capacitance and inductance and it generated from electrical equipments for example capacitors, tube lights and motors etc. These devices causes current to be out of phase with voltage and it should compensate, so power factor may vary in grid time to time and since this phenomena must happen due to presence of inductive type of load so operator needs to take necessary actions to improve the power factor up to the desired value.

e. Location is always play important role while calculating losses. The resistance of a wire depends on the length of the wire, as length increases the resistance of wire increases. Voltage is directly proportional to the resistance and current. Losses increase with distance and more wire is needed to provide electrical power to long distances. When more wire is needed to connect the generator with load, it reduces current and hence greater energy losses for any given voltage. The line losses should be minimized by impedance matching. These are between 3-5% on average. But these losses increase sharply during peak hours and often exceed up to 25% when wire are congested. Keeping in view above issues it can be concluded more fuel is required to generate the same amount of electrical energy and more money investment is required in the power generation system of any system with generators using in the remote site. These line losses will be reduce in future because researcher are improving transmission line wire by mixing Nanomaterials with copper wire.

f. Electricity generation is very low and cost of electricity is very high as compared to the other developing countries. It totally depends on the centralized system. There is still no proper planning for future due to the influence of the arm forces around 35 years. This is big issue for country to fulfill the demand of electric supply and hence reduce the cost.

In future the decentralized system will be preferred because uses can use its own system in case of blackout. The cost of the energy can be controlled if different options are available.

## 3. CONCLUSION

As the demand for sustainable energies continues to increase, it is important to find ways not only to generate but also to distribute the power coming from inherently distributed and unstable power supplies such as renewable resources. This paper analyzes a new type of dc based, distributed interconnection of dc nanogrids. In this paper, we propose a new concept, in terms of software architecture and show the benefits. Note that the research is still ongoing and some parts of the concepts still need to be studied further. In the future, this paper will constitute the basis of higher-level intelligent exchange strategies using weather forecasts, predictions for peak cutting or even further implementing mechanisms such as monetary control.

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