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DC Based Open Energy System Using Interconnected DC Nanogrids

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Abstract: **This paper proposes on dc based open energy system using the alternative way of exchange the intermittent energy between houses in local community. In parallel process to the software, we made a physical model of four node open energy system (OES) on which different power strategies can be simulated and compared. Each houses is equipped with a dc nanogrid, including photovoltaic panels and batteries. Energy storage can enhance the system response by providing short-term energy sources. The outputs of those distributed generations are connected to a dc distribution line, and the power from generations can be shared among residences. We constructed a small scale experimental system in our laboratory, and examined the fundamental characteristics of dc micro grid. The innovative idea is to move beyond the current concept of smart grids proposing a new architecture whose main advantages are explained. In this way of, demand response fluctuations are absorbed not only by the local battery, but can be spread over all batteries in the system. The concepts feasibility has been demonstrated on the first three houses of a full scale OES.**

Keywords: **microgrid, smartgrid, system control, interconnected power distribution, DC-DC converter.**

I. INTRODUCTION

A high penetration of renewables requires profound changes to the current grid system [1]. The variability and intermittency in power output are posing a serious issue for managing the demand–response requirements for electricity networks. This is especially true as plug in hybrid electric vehicle (EV) add the large stochastic load onto the system. Large and fast energy storage units are needed to handle the transient mismatch of generation and consumption. Fuel or nuclear power plants that distribute network over long transmission lines, and substations. The conventional grid is increasingly becoming a bottleneck for expanding the share of renewables. Instead of the conventional top-down approach requiring a grid infrastructure and large scale power transmission on the top, OES is based on independent subsystems that are interconnected to share power from unstable distributed sources. It is called open because the connections can vary freely and energy can be exchanged both among subsystems as well as with the environment, for solar energy.

To propose the solution for these challenges, a wide range of new energy grid system, as smart grids. The three main approaches:1. Microgrid,2.Nanogrid,3. vpp

Microgrids are promising solutions for integrating large amounts of micro-generation by reducing the negative impact to the utility network. Concluded that even though ac microgrids are now predominant, the number of dc microgrids is expected to increase in the coming years as they will soon be the right candidates for furture energy system. In general terms, microgrids can be defined as structures that combine the DG units, energy storage systems (ESS), and loads.

Nanogrids are they face less technical and regulatory barriers than their micro grid counterparts, substantial deployment is already undergoing. This is why compared to micro grids; nanogrids are often seen as a bottom-up approach, well suited also for off-grid areas and with a clear preference for dc solutions. Interconnections and energy storage facilities are required to reduce the stress that intermittent renewable cause on primary generation such as nuclear and thermal. Thus,

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the future energy grid in those areas is predicted to be based on the various DG units, storage devices, and controllable loads that are connected with advanced information and communication devices such as automated meter infrastructure. In Europe, where the utility grid is advanced and DER are widespread, feed-in-tariffs have been more attractive compared to purchasing a storage unit, but they are decreasing yearly because the higher the intermittency of power sources, the higher is the costs for upgrading the conventional grid and including energy storage. Each houses equipped with the subsystem, a dc nanogrid including batteries that is connected to a dedicated shared dc power bus well as a communication line allowing power exchanges within a community.

Virtual power plant (VPP) describe the OESs concept and architecture that is the components of a standalone nanogrid as well as the interconnection of subsystem to make an OES. First simulations result of our system are shown. Finally overview of our experimental platform that is currenty under development in Okinawa is given.

Electric power transmission is the bulk transfer of electrical energy, from generating power plants to electrical substations located near demand centers. This is distinct from the local wiring between high-voltage substations and customers, which is typically referred to as electric power distribution. Transmission lines, when interconnected with each other, become transmission networks. The combined transmission and distribution network is known as the "power grid" in North America, or just "the grid". In the United Kingdom, the network is known as the "National Grid". A wide area synchronous grid, also known as an "interconnection" in North America, directly connects a large number of generators delivering AC power with the same to a large number of consumers. For example, there are four major interconnections in North America (the Western Interconnection, the Eastern Interconnection, the Quebec Interconnection and the Electric Reliability Council of Texas(ERCOT) grid), and one large grid for most of continental Europe.

II. OES AS DC GRID SYSTEM

They classification field the level of integration among the subsystem and showed promising results in their preliminary analysis [21]. Indirectly subsystems may be internally connected to the utility grid that would serve as auxiliary power source as it is the case for commercially available residential system. In this last scheme each unit responds to variation in local state variables, typically voltage magnitude and frequency. A show central controller may send signals to vary steady state set-points, but not redundancy, local control determines transient and default behavior. The speed of response of the distributed elements must be sufficient to ensure stable microgrid operation with careful microgrid design.

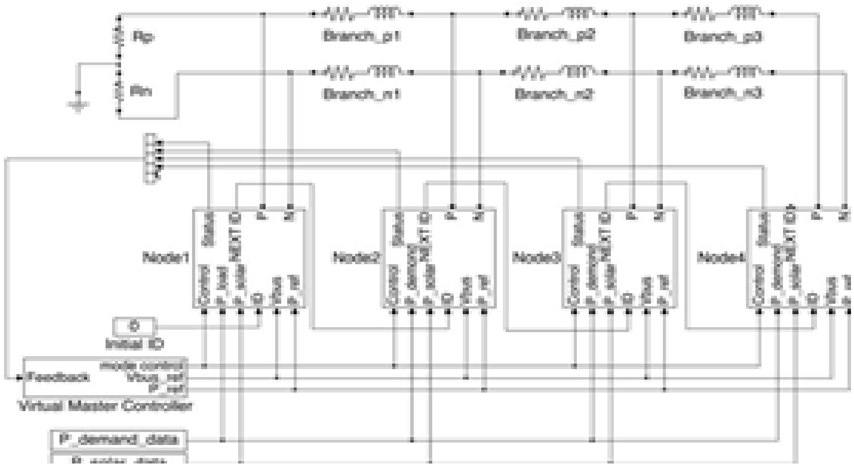

Fig1: OES consisting four subsystem

An intelligent connection interface is also needed to reconnect the microgrid to the utility network when their voltages pass close background. The microgrid implementation described below have been categorized further by geographically and the research consortia which were involved in their implementation. Progress of dc conversion technologies has led to efficiencies above 90% making it practical to convert voltage sources to current sources (over 94% efficiency for 48-380v conversion at 2 KW using a resonant type bidirectional dc-dc converter.

III. OPERATIONAL BENEFITS OF DGS

Various operational benefits of DG employment are as follows: DGs deliver safe, clean, reliable, and efficient electrical energy at low price with no or low emissions, DGs directly provide power in the vicinity of the loads and help in reducing the loadings on feeders, Introduction of DGs in the distribution system reduces the number of electric elements (substations, transformers, feeders, capacitors, regulators, protective devices, and control circuits) in the network, which in turn, leads to minimization of number of possibilities as well as randomness of faults and outage occurrences. DGs with their modern power electronic interface devices can be interconnected to the grid to achieve special power quality, reliability, and voltage profile requirements. DG units can be operated for: Simultaneous compound heat and power, Peak load shaving to minimizing the required centralized reserve power, Stand-by generation in case of electric utility failure.Customer- owned DGs can help customer by providing some portion of their demands during peak load periods and by feeding the excess power to the grid during the light load periods. This way, they can get some revenue back from the electric utility.

IV. INTERCONNECTED POWER SYSTEM

An electrical grid is an interconnected network for delivering electricity from suppliers to consumers. It consists of generating stations that produce electrical power, high-voltage transmission lines that carry power from distant sources to demand centers, and distribution lines that connect individual customers. Power stations may be located near a fuel source, at a dam site, or to take advantage of renewable energy sources, and are often located away from heavily populated areas. They are usually quite large to take advantage of the economies of scale. The electric power which is generated is stepped up to a higher voltage at which it connects to the electric power transmission network. The bulk power transmission network will move the power long distances, sometimes across international boundaries, until it reaches its wholesale customer (usually the company that owns the local electric power distribution network). On arrival at a substation, the power will be stepped down from a transmission level voltage to a distribution level voltage. As it exits the substation, it enters the distribution wiring. Finally, upon arrival at the service location, the power is stepped down again from the distribution voltage to the required service voltage.

V. MATHEMATICAL BACKGROUND

These are multiple way to merge dc power in order to achieve a controller n-to-n peer exchange. The other is to assign a single dc voltage sources and line resistance which is widely used for the dc electric raiway system.

$$\sum_{i=1}^{n} aij \qquad (1)$$

The price of algorithamic variables that is formed by the bids of all persons and so express the global desire.

$$aij_i - pj_i \geq \max_{j \in A(i)} \{aij - pj\} - \varepsilon \qquad (2)$$

If all persons are assigned to objects the algorithm terminates the right part refers to the object that given maximum value to person I minus the actual value of aij-pij positive scaler.

$$wi = \max_{j \in a(i)} \{aij - pj\} \qquad (3)$$

The next phase is the assignment phase where each object j selected as best object by the nonempty subset P(j) of persons in I determine the highest bidder.

$$ij = \max_{i \notin p(j)} \{\gamma i\} \qquad (4)$$

In the first iteration all persons desire object I so ther are bids for this object. It should be mentioned that in case the bids are equal some selections are random or based on rules. The initial selection could be the second object or two persons.

$$\gamma i = (ui - wi) + \in + \in = 2 \in \qquad (5)$$

In this example the need of illustrated because otherwise no price increase.

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Photovoltaic energy is approximately equal to demand

$$Ppv = \{Ppeak(-\cos(\frac{2\pi t}{Tday})).\cos(\frac{2\pi t}{Tday}) < 0$$

$$0$$

$$ksolar = \frac{Edemand - Eac - Esoc}{Edemand} \quad (6)$$

To compare the different systems we define the solar energy replacement indicator Ksolar since this indicator takes into account the losses from dc-dc converter as well as the ones of the battery cycle.

This paper focuses on providing a general configuration less flexible interface for higher layers. Future research should aim at analysing efficiency, optimizing power transformer and identifying bottlenecks as to increase overall energy self sufficiency of the community.

VI. SIMULATION RESULTS

System	DC bus intermittency ratio	DC-DC Converter loss	Wasted Solar Energy	Renewable Replacement ratio K_{solar}
A	-	-	14%	84%
B	83%	8.3kWh	5%	91%
C	79%	10.3kWh	0%	95%

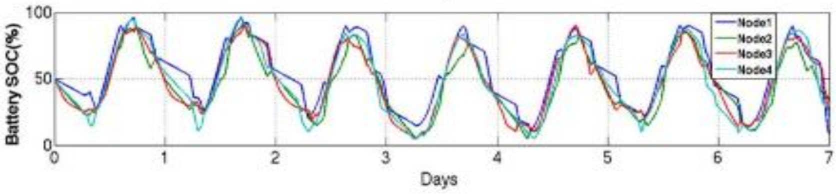

Fig2: Soc for system

VII. CONCLUSION

The paper analyses a new type of dc based, distributed interconnection of dc nanogrids.In this paper, we purpose a new concept, both in terms of hardware and software architecture and show the benefits on four node simulation using physical model. The output come simulation result was developed in increase the efficiency and hardware and software architecture and show the benefits on four-node simulations using physical model. Further investigated for control and management of large scale distribution networks in future, which will lead toward actual smart grid development.

REFERENCES

[1] A. Dimeas and N. Hatziargyriou, “A multiagent system for microgrids,” in proc IEEE power eng soc gen meeting, vol. 2. Denver, CO, USA, 2004, pp. 55–58.

[2] M. Pipattanasomporn, H. Feroze, and S. Rahman, “Multi-agent systems in a distributed smart grid: Design and implementation,” in proc IEEE power syst conf expo Seattle, WA, USA, 2009, pp. 1–8.

[3] 3.T. Logenthiran, D. Srinivasan, A. M. Khambadkone, and H. N. Aung, “Multiagent system for real-time operation of a micro grid in real-time digital simulator,”IEEE trans smart grid , vol. 3, no. 2, pp. 925–933, Jun. 2012.

[4] A.Donoho [Online]. Available: http://www.upnp.org/specs/arch/UPnP-arch-DeviceArchitecture-v1.1.pdf

[5] 5.N. Kitamura, A. Werth, and K. Tanaka, “The autonomous DC micro gird system based on electric vehicle technologies,” in 2014, pp. 1–6.