An Efficient Renewable Distributed Energy Management System For Low Power Loss : A Review

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Abstract: The transformation of the power grid / electric grid from centralized control systems to decentralized control structures has drastically changed. This is also due to increasing use of distributed renewable resources in the utility grid. As a consequence, this form of evolution requires new and advanced ideas / methodologies for smart grid procedural code. Multi-agent structures (MASs) are the result of this necessity, which is capable of handling disturbances due to renewable energy sources, insular efficiency and the large scalable existence of the grid. Currently, multi-agent systems are the development of artificial intelligence. Agents make it easier to cross the difference between humans and machines by interaction and intelligence. In this paper , a brief overview of the multi-agent program with its functionality and technologies used for grid energy management.

Keywords:Microgrid, Electricity, MAS, Power system

I.INTRODUCTION

Minimizing transmission loss in electrical delivery systems is a key issue for optimizing power systems engineering. This question relates to the reliability of the network for supplying electricity to consumers[1]. In addition to investment related problems, when the platform is built and functioned to perform accurate, the life cycle of wires and other equipment rises.

A separate interpretation of the power loss function can be discovered when the optimal solution is needed to manage dynamic load variations. Customer needs are not quite the same ,different groups of users have different requirements, as well as several considerations modify the consumer needs, such as the hour of the day, the weekday or the weekend, the weather, the same kind of machinery plugged in the grid, and others [2]. Modern electrical devices are intended to allow advanced technologies for production, generation & distribution through the use of new components and systems integrated over a computer system for data sharing, embedded with artificial neural networks for decision-making.

Designing and programming activities have become more complicated as the scale keeps increasing. As a consequence, the use of centralized processes is tedious and hard to prevent. While the reasons for applying multi-agent structures (MASs) to workers from different fields are common, as suggested in[3], the key benefits of using multi-agent technologies involve:(1) Individual people consider the application-specific resources and the environment; (2) local relationships among entities can be represented and reviewed; and (3) problems in simulation and processing are structured as different layers and/or modules. Therefore, MASs include a workable approach for dynamic systems as a computational paradigm. In turn, the methods of artificial intelligence (AI) can be used.

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In [4], the MAS is defined as a system comprising two or more representatives who coordinate with each other while pursuing local objectives.

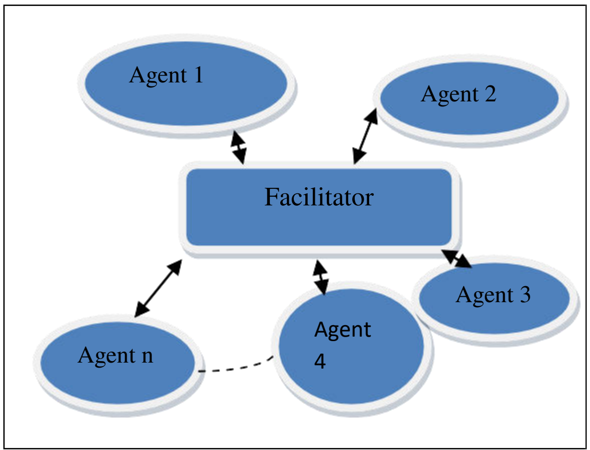

Figure 1:Basic Structure of Multi-agent System

Every intelligent system should have the appropriate characteristics:[5-6]

(a) Autonomy / versatility: an agent should have the capacity to perform individually without any interference, but with clear control over its decisions and actions.

(b) Reactivity: the agent will be able to obtain and respond to environmental requirements in a timely manner.

(c) Pro-activeness: the assistant should have a formation for goal-oriented implementation without being reliant on interface reactions.

(d) Social capability: an agent will interact with human and other agents on the framework of an agent's communication language.

(e) Compilation of data: the agent should have ample data via understanding of the subject. It could allow them to make a judgment on their goals.

(f) Continuous learning capacity: An agent must have a constant learning capability, i.e. by upgrading its data selection according to the output of its commuting part, the variance in the area and the location of a college agent.

A few MAS[7] applications in the Renewable Energy Hybrid Power System are System Power Control, optimization methods, Agent Communication and Agent Platforms.

Table 1.1 Different MAS architectures for microgrid control[8-10]

MAS Architecture	Types of agent	Role	Features
Centralized	1.Cognitive agent 2.Reactive Agent	Higher level of intelligence, Fast Response	collects information at a single point , capable of making global decision , flexibility and openness in the operation of smart grid.
Two-level hierarchical	High and Low Level Agent	Infrastructure management, low level scheduling	distinct levels of decision making
Three-level hierarchical	High and middle level agent	Critical decisions, data and policy management, Fault location, switching of grid connected/islanded mode	good scalability through delineation of roles to agents
Distributed	Low and local level agent	Sensor management ,communication	robust system with agents being capable of reorganizing and coping up with the loss of other agents

The rest of the paper is organized as follows: Section II addresses methodological research to MASs in the Literature Review. The conclusion of the paper is explained in Section III.

II. LITERATURE SURVEY

Nunna et al.,[11] Within this document, an agent-based trading network for the incorporation of energy storage systems (ESSs) into the energy management framework of microgrids is suggested. The suggested methodology also provides for costs suffered by energy transfers across ESSs and microgrids using a dynamic current-based loss allocation process. The overall effectiveness of the suggested energy market management program is illustrated by a modified IEEE 123-bus delivery network with several microgrids and ESSs. Obtained from the simulation results , it is noted that the suggested design can effectively improve the equilibrium around supply and demand in microgrids using a combination of local and global ESSs.

Saraiva et al.,[12] This paper introduces a multi-agent system (MAS) approach that handles adjustments in topology by transient events to boost system efficiency in a dynamic scenario where the electricity production varies during the day. Experiments were conducted to allocate three specific load consumer profiles (residential, commercial and industrial) to two 12-bus and 16-bus systems integration, generating various scenarios. Agents were installed in a series of small single-board computers with low computing power to imitate CPS. The experiments have shown the effectiveness of the decision-making management approach between the various agents in order to allow a collective effort to handle the transmission losses on the network.

Lin et al.,[13] In this paper, an optimum short-term deployment approach that relies on multi-agent systems is suggested for an autonomous community microgrid comprising wind power, photovoltaic power generation, electric motors, energy storage devices and load. In order to track the results of day-to-day shipments and reduce the use of diesel generators, different dispatch strategy is built based on the results of day-to-day shipments and the present state of energy storage equipment. Recompense should be listed in the sense of load-side management. An efficient load-shedding distribution model is developed to reduce users' power outage losses. Ultimately, an illustration of an independent group microgrid is provided to verify the validity of the optimal short-term dispatch described in this work.

Sen et al.,[14] In this paper , a multi-agent, decentralized current controller for the power management of the smart grid linked microgrid (MG) is suggested to decrease the distribution failure and enhance the voltage regulation introduced via the Multi Agent System (MAS) framework. MG is made up of a two-layer network. In fact, the control legislation for the suggested protocol is being evaluated on a customized version of the IEEE 13 bus test system modeled in MATLAB-Simulink TM. The numerical simulations of the updated test program are provided to show the efficiency of the proposed control scheme.

Fruhwirth et al.,[15] This paper describes a distributed multi-agent switching optimization method for low-voltage power grids. In comparison to centralized methods, the ultimate optimization process is not applied in a single node but is based on the actions and interaction of the participating members. Thereby, contact follows strict a predetermined procedure for interaction. Losses are minimized by managing the loads of all usable transformers. Results obtained are needed to accurately describe the possible energy savings potential in more complicated real-world scenarios. In addition, the efficiency of the suggested distributed network will be contrasted with centralized and hierarchical solutions and achieved higher than others.

S. Wen et al. [16] Suggested Particle Swarm Optimization (PSO) method to mitigate power loss and boost system voltage curves by efficiently handling the various kinds of distributed generations, taking into account the worst conditions of renewable energy generation. The developed IEEE 34-bus framework is utilized to carry out case studies. The comprehensive numerical simulations for each case clearly illustrate the need for optimum device operation management and the effectiveness of the suggested technique.

III. CONCLUSION

Currently, MAS is emerging as a new model for monitoring and handling electricity in urban grids, including such microgrids and smart grids. MAS would most likely play a significant role in the years to come if energy efficient storage is to be a necessary condition for realizing the smart grid. The writers also explore the dimensions of MAS in the hybrid system of benefits in the area of applications. This paper discusses current work into the application of multi-agent structures to microgrid systems. The paper focuses primarily on recent advances in multi-agent growth in various aspects of microgrids.

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