

# Optimal Placement of Distributed Generation on Distribution Network: A Research Road Map

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**Abstract-** The penetration of DG indicates significant increasing throughout the world. One of the important problems in the integration of DG into distribution networks is optimal placement of DG. This paper presents classification of the optimal placement of DG research with the point of view: objective, method and DG interface. One part of our road map research that has been done is about DG interface. The proposed model is inverter single pulse width modulation. Pre result is shown in this paper.

**Index Terms-** Distributed Generation, Optimal Placement, Distribution Network, Research Road Map.

## I. INTRODUCTION

The penetration of DG indicates significant increasing throughout the world. Distributed Generation (DG) is defined as generating units connected directly to the distribution network or the customer site. Distributed Generation (DG) is related with the use of small generating units installed at strategic points of the electric. DG can be used in isolated way to supply local loads or connected to the grid to supply electric power systems [1],[2].

Technical challenges associated with the utilization of DG in distribution systems are divided into three categories: DG interfaces with distribution systems, operation and control of DG, and DG planning and design.

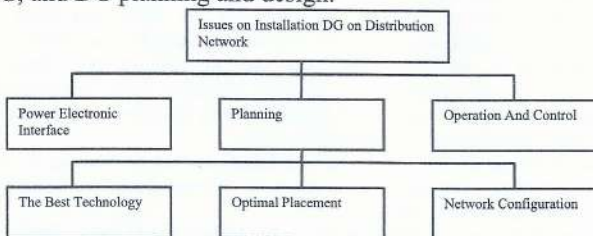


Fig.1. Issues on Installation DG on Distribution Network

Non-optimal DG placement cause negative effects such as increased losses, voltage instability, power quality problems.

## II. CLASSIFICATION OF OPTIMAL DG PLACEMENT RESEARCH

Classification of optimal DG placement research based on three points of view such as: optimal placement objective, optimization method, and power electronic as DG interface described below:

Optimal placement objectives include technical aspect and economical aspect. Technical aspect such as: minimize of power losses at [3]-[18], improve voltage profile at [3], [4], [7],[9],[10],[16], improve reliability [3],[16], improve network

stability [13], [17], [22] and mitigating power quality problem [9], [23]. Economical aspect like : minimize cost of network power losses [24], minimize network cost up grading [24], minimize cost of energy undelivered [24], minimize cost of load supply [25], investment for total losses compensation [6],[21],[26],[19],investment cost [18], economic assessment [10] and outage cost [28].

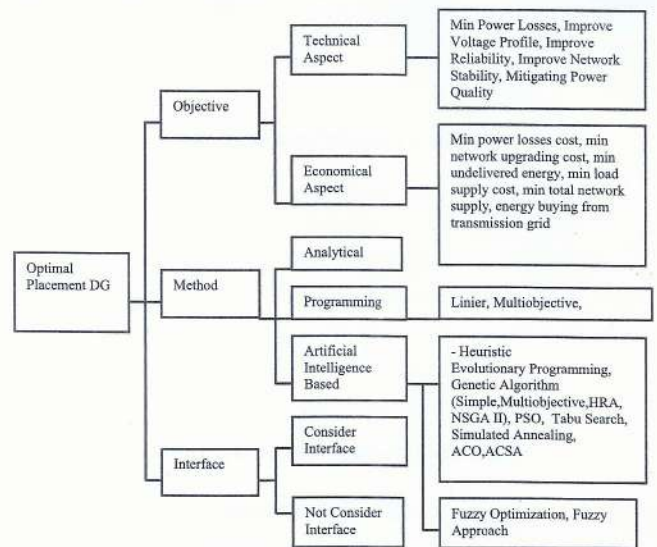


Fig.2. Classification of Optimal DG Placement Research

Optimization method includes analytical [8],[10],[14],[22], programming [7],[15],[20], and artificial intelligence based. Artificial intelligence include heuristic method and fuzzy. Heuristic method such as: evolutionary [25], genetic algorithm [3],[4],[6],[12],[13],[16],[17],[19],[23],[24],[26],particle swarm optimization (PSO)[5], tabu search [18],[28], simulated annealing (SA)[13], ant colony optimization (ACO) [11],[27]. Fuzzy optimization at [9],[21].

Power electronic as DG Interface divided as two part: consider DG interface [26] and not consider DG interface [2]-[25], [27],[28].

## III. RESULT AND DISCUSSION

Our research road map includes the three aspect of DG optimal placement as mentioned above.

1. Modeling of .DG interface. The topic about DG inverter and the work is still in progress.
2. DG placement with objective: minimize power losses, improve voltage profile and enhance voltage stability with:

injection active and reactive power, consider the maximum penetration limit of DG, consider DG output that fluctuate depend on the type of sources, calculate minimum and maximum value of DG units installed on each bus, analyze of reduction of CO2 emissions as effect of DG installing.

3. DG placement use optimization method based artificial intelligence (Breeder Genetic Algorithm).

One part of our road map research that has been done and still in progress is modeling of DG interface. The proposed model is inverter single pulse width modulation. Fig. 3 shows about circuit modeling circuit. Fig. 4 shows about output

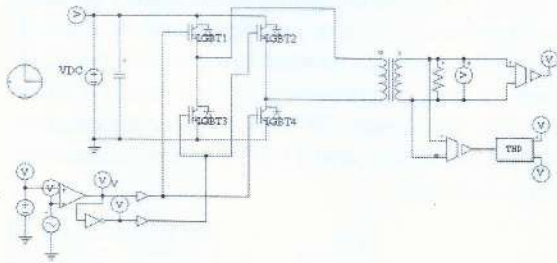


Fig 3. Circuit of proposed model



Fig. 4. Load rms output voltage of proposed model

#### IV. CONCLUSION

This paper describes about classification of optimal DG placement and one part of our DG placement research road map that has been done. It is about modeling DG interface. The pre result is shown in this paper.

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ICAST2009 is a part of the GRASIUS (Graduate School Action Scheme for Internationalization of University Students) Project of Graduate School of Science and Technology, Kumamoto University, supported by the grant-in-aid from MEXT to promote innovative education at graduate schools.

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 Foreword & Keynote Speeches

## Foreword

On behalf of the Organizing Committee of the third International Student Conference on Advanced Science and Technology (ICAST), I would like to welcome all the participants to ICAST2009 in Seoul, Korea. It is my pleasure to host the third Conference at the Ewha Campus Complex, Ewha Womans University with association of the Center for Intelligent Nano-Bio Materials and Department of Bioinspired Science, Ewha Womans University.

I would like to thank the distinguished speakers for keynote presentations, other presenters and participants from Ewha Womans University, Seoul National University, Sunkyunkwan University, University of Seoul, Seoul Women's University, KAIST in Korea, Sichuan University in China, ITS in Indonesia, and Ege University in Tyeky as well as from Kumamoto University. Great interest and participation from our partner universities are much appreciated and of encouragement to promote further cooperation in international joint education.

ICAST 2009 in Seoul is a part of the GRASIUS (Graduate School Action Scheme for Internationalization of University Students) Project of Graduate School of Science and Technology, Kumamoto University, which is supported by the grant-in-aid from the Ministry of Education, Culture, Sports, Science and Technology to promote innovative education at graduate schools. In this program we are trying to make our education and research more open internationally by promoting international exchanges of students and faculty members with overseas universities and also by putting emphasis on English based higher education. One of the missions of our Graduate School is to foster students who can work professionally in the international communities. Therefore, we hope this international student conference offers a platform for students and young researchers to get together to present their work and exchange ideas, so they can broaden their horizons.

I hope ICAST will be succeeded in the following years and become an annual event to promote international joint education and research among our partner universities.

Finally, I would like to express special thanks to all the members of the Organizing Committee and the Program Committee for their effort to realize the third ICAST to Ewha Womans University. In addition, we should not forget the support and hard work by the staff of Ewha Womans University and the Project Support Office of GSST to make this event possible.

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