

## 第2章 研究活動

### 1. 平成 27 年度活動スケジュール

#### 1.1 国内会議

- 平成 27 年度電気学会 電力・エネルギー部門大会 …………… 2015 年 8 月
- 平成 27 年度電気・電子・情報関係学会東海支部連合大会 …………… 2015 年 9 月
- 2015 年（第 33 回）電気設備学会全国大会 …………… 2015 年 9 月
- 電力技術・電力系統技術合同研究会 …………… 2015 年 9 月
- 第 37 回風力エネルギー利用シンポジウム …………… 2015 年 9 月
- 電子情報通信学会 2015 年ソサイエティ大会 …………… 2015 年 10 月
- 平成 27 年度日本太陽エネルギー学会・日本風力エネルギー学会合同研究会  
…………… 2015 年 11 月
- 平成 27 年度 電気・情報関係学会北海道支部連合大会 …………… 2015 年 11 月
- 平成 28 年電気学会全国大会 …………… 2016 年 3 月

#### 1.2 国際会議

- ICEE2015 (International conference on Environment and Energy) …… 2015 年 6 月
- INTELEC2015  
(37Th International Telecommunications Energy Conference) …… 2015 年 10 月
- ISETS'15 (International Symposium on EcoTopia Science 2015) …… 2015 年 11 月

## 2. 学会・公表研究論文等

ここには参加した各学会等の名称等を記載し、公表論文タイトル等は後の一覧で示す。

### ○ 平成 27 年度電気学会 電力・エネルギー部門大会

会 期 2015 年 8 月 25 日～27 日

会 場 愛知県 名城大学 天白キャンパス

主 催 電気学会 電力・エネルギー部門



### ○ 平成 27 年度電気・電子・情報関係学会東海支部連合大会

会 期 2015 年 9 月 28 日～29 日

会 場 愛知県 名古屋工業大学

主 催 電気学会東海支部・電子情報通信学会東海支部・情報処理学会東海支部・照明学会東海支部・映像情報メディア学会東海支部・日本音響学会東海支部・IEEE 名古屋支部





○ 第37回風力エネルギー利用シンポジウム

会期 2015年11月26日～27日

会場 東京都 科学技術会館

主催 日本風力エネルギー学会

○ 電子情報通信学会 2015年ソサイエティ大会

会期 2015年9月8日～11日

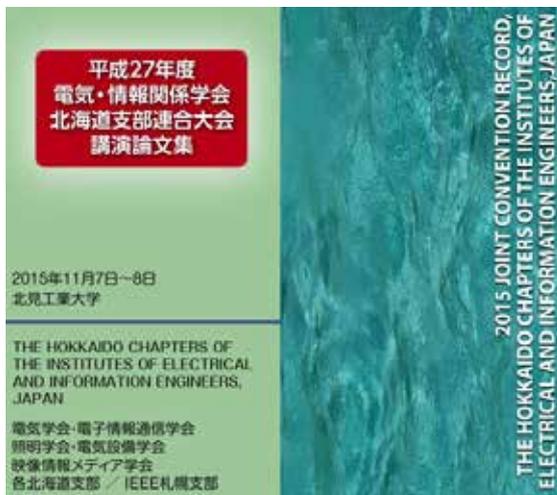
会場 東北大学 川内北キャンパス

主催 電子情報通信学会

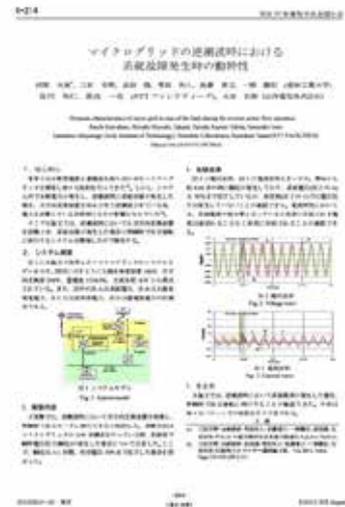
- 平成 27 年度日本太陽エネルギー学会・日本風力エネルギー学会合同研究会  
 会 期 2015 年 11 月 26 日～27 日  
 会 場 宮崎県 ニューウェルシティ宮崎  
 主 催 日本太陽エネルギー学会・日本風力エネルギー学会



- 平成 27 年度 電気・情報関係学会北海道支部連合大会  
 会 期 2015 年 11 月 7 日～8 日  
 会 場 北海道 北見工業大学  
 主 催 電気学会・電子情報通信学会・情報処理学会・照明学会・電気設備学会・映像情報メディア学会 各東海支部/IEEE 札幌支部



- 平成 28 年電気学会全国大会
  - 会 期 2015 年 3 月 24 日～26 日
  - 会 場 東京都市大学 世田谷キャンパス
  - 主 催 電気学会



- ICEE2015 (International conference on Environment and Energy)
  - 会 期 2015 年 7 月 5 日～9 日
  - 会 場 香港 The University of Hong Kong
  - 主 催 HKIE・CSEE・IEEJ・KIEE



**Examination of the Back-Feed MPPF Control Introduced in a Distributed MPPF Control**

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**Abstract**  
In this paper, a distributed maximum power point tracking (MPPF) system for photovoltaic power generation is presented. To cope with the proposed distributed MPPF, an improvement on the control of a power generation unit is required. In this paper, a distributed MPPF system is presented. The proposed MPPF system is composed of a power generation unit and a power generation unit control unit. The proposed MPPF system is composed of a power generation unit and a power generation unit control unit. The proposed MPPF system is composed of a power generation unit and a power generation unit control unit.

**1. INTRODUCTION**  
Controlled maximum power point tracking (MPPF) is generally used to control solar power generation. In MPPF, there are two types. In a simple MPPF, only one MPPF is used. However, distributed MPPF control is required to be performed by the distributed MPPF system. In distributed MPPF control, the MPPF system is composed of a power generation unit and a power generation unit control unit. The proposed MPPF system is composed of a power generation unit and a power generation unit control unit.

**2. BACK-FEED MPPF**  
Figure 1 and 2 show a connection diagram for distributed MPPF. In distributed MPPF, PV modules are connected in series in parallel to each other and connected to the MPPF system. Therefore, a controlled MPPF system is affected by the number of PV modules connected to the MPPF system. It is necessary to change the control logic. The MPPF system is composed of a power generation unit and a power generation unit control unit. The proposed MPPF system is composed of a power generation unit and a power generation unit control unit.

**3. PROPOSED BACK-FEED MPPF**  
In this paper, the output of some of the modules in a power generation system is used to control the MPPF system. The MPPF system is composed of a power generation unit and a power generation unit control unit. The proposed MPPF system is composed of a power generation unit and a power generation unit control unit.

**4. CONCLUSION**  
We compared controlled MPPF control and distributed MPPF control in this study. The MPPF system was controlled by connecting part of a PV module. However, distributed MPPF control was used with the appropriate voltage range. In the process of power generation, it was confirmed that it is possible to control the MPPF system by connecting part of a PV module. The MPPF system was controlled by connecting part of a PV module. However, distributed MPPF control was used with the appropriate voltage range. In the process of power generation, it was confirmed that it is possible to control the MPPF system by connecting part of a PV module.

**Fig. 1** Distributed-type MPPF (three modules)

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**Fig. 100** Distributed-type MPPF (three modules)

○ INTELEC2015 (37th International Telecommunications Energy Conference)

会期 2015年10月18日～22日

会場 大阪府 The Swissôtel Nankai Osaka

主催 IEEE Power Electronics Society

37th International Telecommunications Energy Conference  
18-22 October 2015  
Namba, Osaka, Japan

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Diamond Patrons: HITACHI Inspire the Next

In memory of Christopher O. Riddleberger 1933-2015  
A tireless and consummate ambassador of INTELEC whose gentleness and integrity was beyond special. A mentor to us all. *Peace your sister planet remember. (She is gone, full of years, and full of love)*

### Verification of cost saving for office building using renewable energy and battery system

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Kazuo Yabuki, Kazuo Yabuki, Yutaka Usui, NTT Data Studio, Inc., Tokyo, Japan

**Abstract:** In the present study, the concept of introduction of renewable energy and battery system to office building is verified. The power system is composed of a diesel generator, a photovoltaic (PV) system, a battery system, and a power conditioner. The power system is simulated by using a power system simulation software. The simulation results show that the introduction of renewable energy and battery system can reduce the power consumption of the office building. The simulation results also show that the introduction of renewable energy and battery system can reduce the power consumption of the office building. The simulation results also show that the introduction of renewable energy and battery system can reduce the power consumption of the office building.

**1. Introduction**  
The introduction of renewable energy and battery system to office building is a promising technology. The introduction of renewable energy and battery system can reduce the power consumption of the office building. The introduction of renewable energy and battery system can reduce the power consumption of the office building. The introduction of renewable energy and battery system can reduce the power consumption of the office building.

**2. System Model**  
The system model is composed of a diesel generator, a PV system, a battery system, and a power conditioner. The system model is simulated by using a power system simulation software. The simulation results show that the introduction of renewable energy and battery system can reduce the power consumption of the office building.

**3. Simulation Results**  
The simulation results show that the introduction of renewable energy and battery system can reduce the power consumption of the office building. The simulation results also show that the introduction of renewable energy and battery system can reduce the power consumption of the office building. The simulation results also show that the introduction of renewable energy and battery system can reduce the power consumption of the office building.

**4. Conclusion**  
The introduction of renewable energy and battery system to office building is a promising technology. The introduction of renewable energy and battery system can reduce the power consumption of the office building. The introduction of renewable energy and battery system can reduce the power consumption of the office building. The introduction of renewable energy and battery system can reduce the power consumption of the office building.

○ ISETS'15 (International Symposium on EcoTopia Science 2015)

会期 2015年11月27日～29日

会場 愛知県 名古屋大学

主催 ISETS'15 組織委員会・名古屋大学エコトピア科学研究所

ISETS'15  
International Symposium on EcoTopia Science  
November 27-29, 2015 Nagoya University, Nagoya, Japan

ISETS'15  
International Symposium on EcoTopia Science  
'15

### Load frequency control using flywheel considering reactive power in small power system

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**Introduction**  
Power variation is large because solar power generation and wind power generation using renewable energy depend on weather conditions. Therefore, research is carried out that introduces and develops equipment which suppresses the power fluctuation, technology and operational method and control method of power system in power system including solar power generation and wind power generation. Authors also have done experiment of load frequency control using small generator about power system including distributed generation [1]. In this paper, we focus on the frequency control in system and examined frequency control using flywheel in small power system that distributed generation. Moreover, in this time, we consider line loss in small power system and carry out PQ control using reactive power at flywheel device.

**Experimental model**  
Experimental model that is assumed in this paper is shown in Figure 1. As shown in the same figure, small synchronous generator is a diesel generator, flywheel device is converter (inverter) and flywheel, PV is DC power source and power conditioner (PC) and load fluctuation is RL load fluctuation.

**Experiment method and experiment result**  
Inductive load 0.5 kW are loaded on the small scale power system 1 s after the start of the experiment. A steady-state load of 0.5 kW is given as an initial condition for the small-scale power system. In addition, the frequency is 60 Hz. The experiment first, we carried out the control of small synchronous generator. Then, we carried out experiment about PQ control of flywheel. Figure 2 shows the experiment result, when we carry out control of small synchronous generator. When load fluctuation occurs, frequency and voltage are considerably reduced. Then frequency is able to recover to specified value. However, voltage isn't able to recover to specified value. Figure 3 shows the experiment result, when we carry out PQ control of flywheel device in addition control of small synchronous generator. When load fluctuation occurs, frequency and voltage are considerably reduced. Then voltage and frequency are able to recover to specified value. We compare control result using only generator and control result using generator and flywheel device, confirm that maximum deviation of frequency and voltage is minimized.

**Conclusion**  
In this paper, we proposed the use of flywheel device for frequency control in small-scale power system. Moreover we carry out PQ control using reactive power at flywheel device. In the first part of this paper, we measured frequency and voltage, when inductive load of 0.5 kW. Next, we carried out comparison of control characteristics. As a result, we could confirm validity of PQ control using the flywheel. Moreover, in this time, we assumed only load fluctuation in small power system. Therefore, we will consider small power system that includes electric vehicles and various dispersed power sources.

Figure 1 Experimental model  
Figure 2 Control result using generator  
Figure 3 Control result using generator + flywheel

[1] Tamaki, Yuu, Tomoyasu Ishida, Kazuo Yabuki, Kazuhiko Ichikawa, and Yutaka Usui, "Study of Load Frequency Control using Flywheel in Small Power System," The Papers of Technical Meeting on Power Systems Engineering '2015 Japan.