

## Oral presentations for Session 5.2.2 | Thursday, 27 October | Room 3911

### Session Chair:

Jose BILBAO (UNSW, Australia)

Ballang MUENPINIJ (King Mongkut's University of Technology Thonburi, Thailand)



### 5.2.2a (11:00 – 11:15)

Dr Masaki Shioya  
Kajima Corporation, Japan

Estimation of Loss Factors of Mega Solar Systems using SV Analysis

M. SHIOYA<sup>1</sup>, T. ISUMI<sup>2</sup>, M. FUJISAWA<sup>2</sup>

<sup>1</sup> Kajima Corporation, Japan

<sup>2</sup> Field Logic Corporation, Japan

### Abstract

Large scale PV system (Mega-solar) were introduced into a Japanese market sharply in this three years after establishment of a FIT law. From the viewpoint of securing power generation, the O&M (Operation and Maintenance) market is considered to expand firmly in the near future. SV analysis was developed as a method of separating loss factor of PV system. The SV method can separate specific loss factors cause to shading, dirt, temperature rise, voltage etc. using a time series data of around 30 days. So the SV method can grasp the cause of PV system malfunction and analyse aged deterioration. On daily O&M services in real operation it is needed to detect PV system faults timely and online.. This paper describes the outline of SV method aiming at an application for PV system fault detection and diagnosis. results of a Mega-solar in Japan.



### 5.2.2b (11:15 – 11:30)

Mr Yuhei Horio  
Ritsumeikan University, Japan

Impact Estimation of Average Photon Energy of Solar Spectrum on Short Circuit Current of Si Based Photovoltaic Modules

Y. HORIO<sup>1</sup>, H. MANO<sup>1</sup>, M. M. RAHMAN<sup>1</sup> et al.

<sup>1</sup> Ritsumeikan University, Japan

### Abstract

At present, the performance of photovoltaic (PV) modules is estimated at Standard Test Conditions (STC). It is difficult to estimate the performance of PV modules installed outdoor because the outdoor performance of PV modules is influenced by various environmental factors. Environmental factors such as spectral irradiance distribution and module temperature significantly influence on output energy. Thus, when we estimate the performance of PV modules installed outdoor, we measure output energy of PV modules and environmental factors precisely and simultaneously. Also, we correct output energy to that of at STC by considering the environmental factors. In this study, the relationship of the short-circuit current (ISC) of Si based solar cells and solar spectrum which can be represented by the index of average photon energy (APE) were analyzed. It has been demonstrated that the APE is a useful index for ISC correction.

### Biography

Yuhei Horio was born in 1993 at Osaka, Japan. He graduated Faculty of Science and Engineering of Ritsumeikan University on 2016 and he entered graduate school of Ritsumeikan University. His main research topic is outdoor testing of photovoltaic modules.

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### 5.2.2c (11:30 – 11:45)

Dr Takuya Doi

National Institute of Advanced Industrial Science and Technology (AIST), Japan

PV Module Irradiance Sensor for Outdoor Precise Irradiance Measurement - Structure and Response Property to the Module under Test

T. DOI<sup>1</sup>, Y. HISHIKAWA<sup>1</sup>, H. OHSHIMA<sup>1</sup> et al.

<sup>1</sup> National Institute of Advanced Industrial Science and Technology (AIST), Japan

#### Abstract

For the precise characterization of PV modules in outdoor, the evaluation technique using the PV module irradiance sensor (PVMS) as an irradiance sensor had been proposed. In the previous works, to simulate an actual PV modules structure, dummy cells has been arranged around the sensor cell in the PVMS. In this study, in order to attempt the optimization of PVMS structure, we intended to evaluate the effect of aperture size of PVMS on the reduced irradiance. From this preliminary experiments, the reduced irradiances were almost the same within 1 % when those were selected 0.4 sun or more even if the irradiance was fluctuating. We also have been evaluating the effect of dummy cell area, using three PVMSs with different dummy cell areas. The detailed results will be presented in the conference.

#### Biography

1963.4 Born in Yamaguchi pref. Japan. 1989.3 MS from Univ. of Tsukuba 1989.4 Resercher of ETL(former AIST) 1996.10 Senior Resercher of ETL 2001.4 Senior Resercher of AIST 2003.3 Ph.D from Univ. of Tsukuba



### 5.2.2d (11:45 – 12:00)

Mr Ayato Lida

Tokyo University of Science, Japan

Detection Method of the Number of Failure Module in the String by using Module Voltage and String Current in PV Array

A. LIDA<sup>1</sup>, Y. UEDA<sup>1</sup>

<sup>1</sup> Tokyo University of Science, Japan

#### Abstract

String current or module voltage are monitored in Photovoltaic (PV) power generation systems whether any failures are causing power loss or not. A method which detects failure of PV module is necessary. In this research, string current and module voltage at maximum power point (MPP) of the PV array were simulated in order to develop the failure detection method. The failure state that current flows into bypass diode is considered in the PV array with around 100kW power output. Each string of the array has one current sensor and one voltage sensor. As a result, the value of string current and module voltage of a string with failure modules have correlation with the number of failure modules within the string. In other words, string monitoring can find existence of failure.

#### Biography

Mr. Ayato Lida was received the B.E degrees in Department of Electrical Engineering of Tokyo University of Science, Tokyo Japan, in 2015. He is now on master course of Tokyo University of Science.

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### 5.2.2e (12:00 – 12:15)

Mr Pei-Chin Lin

UKC Electronics (H.K.) Co., Ltd. Hsinchu Branch, Taiwan

Photovoltaic Outdoor Performance Benchmark of Thin-Film CIS and Crystal-Silicon Technology

P. LIN<sup>1</sup>, C. LEE<sup>1</sup>, J. CHIANG<sup>1</sup> et al.

<sup>1</sup> UKC Electronics (H.K.) Co., Ltd. Hsinchu Branch, Taiwan

### Abstract

PV indoor performance has been always measured with less argument if following measurement IEC 60904 and using a traceable class-AAA sun simulator. However, PV outdoor performance relatively lacks of standard and simple measurement tool to verify because of PV system cost, construction effort, system uncertainty disturbance, such as inverter loss, cable loss, soiling loss. UKC has developed “DDS-Analyser” to simplify PV performance benchmark and to reduce comparison difficulty. Two major PV technology streams, thin-film (CIS) and crystal-silicon (c-Si) modules, are evaluated to characterize their outdoor behaviour. Also, it is also correlated with entire array power output of mega-watt solar park. DDS-Analyser has been established as a capable platform for PV outdoor performance benchmark. This work demonstrates both performance results of DDS-Analyser and solar park arrays which shows thin-film CIS technology has out-perform than crystal-silicon at least 16% more despite array modules has been installed more than 2 years.

### Biography

My Name is Pei-Chin Lin who was born on 24th of March in 1974 and my nationality is Taiwan R.O.C. I have finished master degree from National Cheng Kong University in 1998 and major in Mechanical Engineering, especially Material and Manufacturing field. After retirement from army service obligation in 2001, I entered Tokyo Electron Limited (TEL) and spent 8 years to work with semiconductor business including 2 years equipment development in Japan headquarter during 2003 to 2005. Since 2008 reward of TEL word-wide outstanding employee, I have been involving with solar business for another 4years and dedicated in both indoor and outdoor test evaluation. By leaving TEL in 2013, tsmc has hired me as technical manager to handle product manufacturing and operation. In 2015, I joined UKC Electronics to start-up solar operation and Maintenance business.