

*e-ASIA Joint Research Program
Progress Report*

1. Project Title: “Research of Expandable Cluster-based Energy Infrastructure in e-Asia Countries”

2. Joint Research Period: Dec.,1, 2017 – March,31,2021

3. Principal Investigators:

- Japan: Yosuke Nakanishi, Professor, Waseda University
WP1 Exchanging the knowledge and technologies for Expandable Cluster-based Energy Infrastructure (leading and managing the project)
 - Planned Funding Period: Dec.,2017 – March,31,2021
- Thailand: Udom Lewlomphaisarl, Unit Director, National Electronics and Computer Technology Center (NECTEC)
WP2-1 Hybrid Energy Storage System (HESS) for utility grid applications project
WP2-2 Building Energy Management System (BEMS) with Demand Response
 - Planned Funding Period: Feb.,26, 2018 – Feb.,25, 2021
- Philippines: Noel Estoperez, Professor, Mindanao State University-Iligan of Technology
WP3 Techno-Economic Feasibility Study of Microgrid in a Remote Community
 - Planned Funding Period: March,15, 2018 – Dec., 15, 2019WP3N Development and Installation of Microgrid in Barangay Rogongon
 - Expected next Period: 2020 –
- Indonesia: Abraham Lomi, Professor, National Institute of Technology Malang
WP4rev A Design and Implementation of Smart Grid Technology Based on SCADA System in Controlling the Energy Flow on PV System
 - Planned Funding Period: April,1, 2019 – March,31, 2021

4. Summary of the Progress of the Joint Research:

(1) Project Total Management、Workshop Organization (refer to Excel file)

- Regular Meeting was hosted by each country in turns: 11/2017 [Japan], 3/2018 [Thailand], 8/2018 [Philippines], 6/2019 [Japan],10/2019 [Indonesia]
- In the above regular meeting, the optional technical tours and the presentations & discussions on the following visiting sites,
 - Japanese manufacturing companies (Fuji, Toshiba) /
 - National Institute Lab. in FREA (established by AIST)
 - Power Generation Plant (J-Power) / Electric Power Historical Museum (TEPCO)
 - National Institute Lab. (NECTEC), Meralco (Philippines Distribution power)
 - PLN Bali Distribution System office / PV Plant di Bangli Regency
- 7 Collaborated papers by e-Asia JRP members were issued.
- 3 research exchanges were conducted between Japan/Thailand, Thailand/Japan, Philippines/Japan
- Collaboration Research Agreement among members' countries was contracted.

(2) WP1 Guideline Clarification for Smart-Grids Development and their Operations:

Estimation on facility Introduction and operation cluster type micro-grid using HOMER simulator

WP1 Clarification of Technical and Economical Specification GGO Designer

- The architecture of Optimization platform called “Grid of Grids Optimal Designer” (GGOD) has been clarified.
- Optimization component estimation
- Optimal wind power generation selection based on geospatial portfolio selection

- Geospatial transmission expansion planning
- Economic analysis of transmission expansion planning

(3) WP2-1 HESS for utility grid applications

- Hybrid Energy Storage System with Super-capacitor and Lithium battery has been developed.
- The HESS has been packaged in the container, while the designed and tested equipment were equipped to the cabinet. Then field test in EGAT has been ready.

(5) WP2-2 BEMS with Demand Response

-BEMS was installed in the office building to control the power reduction that compares with the demand response signal (DR signal)

- New protocol for collecting information from smart meter to IOT devices was introduced.
- Power Reduction Forecasting (PRF) and Aggregated Modeling (AM) techniques were proposed and have been verified for controlling the air conditioning systems by sending a signal of temperature setting.

(6) WP3 Techno-Economic Feasibility Study of Microgrid in a Remote Community

The following items were conducted.

- Investigation of no-electrification area in Iligan city
- Site Investigation of hydropower potential using GIS and Field survey
- Meeting with Indigenous Peoples and hearing the pros and cons for electrification
- Extracting the barrier such as Ancestral domain area

(7) WP4rev A Design and Implementation of Smart Grid Technology Based on SCADA System in Controlling the Energy Flow on PV System (revised)

- After reviewing and acceptance by RISTEKDIKTI, the project started in 2020 spring to help the local government in maintaining the energy production by the renewable energy sources for 3-year (2009-2021) project.
- In 2019, holding the international conference ICESTI2019 Bali and inviting all our members of e-Asia JRP to ICESTI2019. A paper in ICESTI2019 was submitted to an International Journal of Engineering Research (under review process).

5. Scientific Achievements and Implemented Activities (Research Exchange, Workshop, Publication, etc. if any): See also the attached Excel file.

6. Future Goals and Plan of Activities within and after the project period:

(1) Japan

- The final year goal: the midterm report will issue and the final meeting will be held. The result of JRP will be reported in the form of workshop with the specialists and program officer.
- Improvement and evaluation of testbed GGOD (Grid of Grids optimization Design tool): Discussion for usage of GGOD as information sharing system and continuation of improvement and evaluation for GGOD
- Presentation of the e-Asia JRP's activities in the international conference

(2) Thailand

- Install HESS in the real site: Finding a place to put the container which is heavy and big, so it needs large area for moving to. Moreover, EGAT is still waiting for an authorization to use an area for the container.
- BEMS Phase II: NECTEC's team will research & develop the Load Aggregator Management System (LAMS) for the office buildings. Mainly, LAMS will not only aggregate the power reduction capacity of each load group in the office buildings

but also control each load group in the demand response event as well.

(3) Philippines

The locale people of the five sitios selected in Barangay Rogongon are very optimistic and hopeful that someday their dream of having electricity in their community will realize soon. With this motivation, the team Philippines come up with the following future goals and Plan of Activities:

- To come up with a memorandum of agreement (MOA) with local government unit and MSU-Iligan Institute of Technology: Signing of MOA with Barangay Chairman of Rogongon and Chancellor of MSU-Iligan Institute of Technology.
- To incapacitate locale people in the Field Measurement: Teach identified locale people on how to use the equipment for hydropower potential measurement
- To validate further GIS and LIDAR result of potential hydropower for different month in the selected area: Field measurement of hydropower parameters for different months in coordination with locale people.
- To make proposal for the second phase which is entitled “Development and Installation of Microgrid in Barangay Rogongon”: Write up proposal to be submitted to Department of Science and Technology (DOST) for funding.

(4) Indonesia

As the lack of electricity in the remote area in Indonesia, the project designed is to provide opportunity to local government staffs to participate in workshop in order to maintain the existing renewable energy source constructed by the local government. A design of supporting software for energy management system is developed and will be completed in the end of this fiscal year, 2020.

- Fully designed and Construction: Detailed design and test system (section)
- Energy Management System: Software system design
- System Test: Testing system.

7. Recommendations and Comments to the Program (if any):

(ex. Any support to request from the Program in order to achieve item 6.)

The Expandable Cluster-based Energy Infrastructure will be expected to become installation phase in actual fields. One of demonstration sites are proposed from Philippines.

It is recommended that The proposal for the second phase which is the development and installation of Microgrid in Barangay Rogongon be lobbied also to other funding agency aside from DOST so that there will be a greater chance that the dream of light from the people in the selected sitios of Barangay Rogongon be realize. The e-ASIA JRP may be able to help and support for the success of this project.

Lists of Achievements and Implemented Activities

1. Original Publication of Articles etc.

1. 1 Original Publications (Articles co-authored among Research Teams)

All Authors' Names, Title, Journal Name, Volume, Edition, Page, Year of Publication	DOI Code	Publication Status	Remarks (e.g. publication in top level journals etc.)
Meita Rumbayana, Yosuke Nakanishi, "Prospect of PV-Wind-Diesel Hybrid System as an Alternative Power Supply for Miangas Island in Indonesia", 2018 INTERNATIONAL CONFERENCE ON RENEWABLE AND CLEAN ENERGY(ICRE2018), Tokyo, 2018/03/30		published	
Kazuaki Iwamura, Yosuke Nakanishi, Hiroshi Takamori, Udom Lewlomphaisarl, Noel Estoperez, Abraham Lomi, "DEVELOPMENT AND OPERATION OF EXPANDABLE MICRO-GRID CLUSTERS BASED ON THE DESIGN FRAMEWORK, GRID OF GRIDS OPTIMAL DESIGNER", Grand Renewable Energy 2018 International Conference and Exhibition (GRE2018), Yokohama, Japan, 2018/6/17-22	issn: 2434-0871 0 294	published	
Kazuaki Iwamura, Yosuke Nakanishi, Hiroshi Takamori, Udom Lewlomphaisarl, Noel Estoperez, Abraham Lomi, "Optimization Design Suite for Expandable Micro-Grid Clusters", 7TH INTERNATIONAL CONFERENCE ON RENEWABLE ENERGY RESEARCH AND APPLICATIONS (ICRERA2018), Paris, France, 2018/10/16	isbn: 9781538659823 8566707	published	
Meita Rumbayan, Sherwin Sompie, Yosuke Nakanishi, "Empowering Remote Island Communities with Renewable Energy : A Preliminary Study of Talaud Island", 9th International Conference on Future Environment and Energy (ICFEE 2019), Osaka Japan, 2019/1/9-11	issn: 17551307 e-issn: 17551315	published	
Shyuehi MIYAKE, Kazuaki IWAMURA, Jasada KUDTONGNGAM, Yosuke NAKANISHI, "Optimizing the Facility Planning in BEMS Using HOMER for Expandable Micro-Grids Clusters", IEEE PES Innovative Smart Grid Technologies Conference (ISGT2019 North American), Washington DC, USA, 2019/2/18	e-issn: 2472-8152 e-isbn: 9781538682326 e-isbn: 153868232x 8791665	published	
Kazuaki Iwamura, Yosuke Nakanishi, Udom Lewlomphaisarl, Noel Estoperez, Abraham Lomi, "Planning optimization platform for cluster-type micro-grid installations and operations", 4th International Conference on Electrical Systems, Technology and Information (ICESTI2019), Bali Indonesia, 2019/10/24-27		published	
Kazuaki Iwamura, Yosuke Nakanishi, Udom Lewlomphaisarl, Noel Estoperez, Abraham Lomi, "Planning Optimization Platform for Cluster Type Micro-grid Installations and Operations", IEEE Sustainable Power & Energy Conference Grid Modernization for Energy Revolution (iSPEC2019), Beijing, China, 2019/11/21-23	e-isbn: 9781728149301 e-isbn: 1728149304 8975142	published	

7 Total

1. 2 Original Publications (Articles by Single Team only)

All Authors' Names, Title, Journal Name, Volume, Edition, Page, Year of Publication	DOI Code	Publication Status	Remarks (e.g. publication in top level journals etc.)	Country name of the team
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Shuhei Miyake, "Multi-area State Estimation based on Detection of Bad Data and Analysis using M-estimator" IEE&IEEE.Thailand Joint symposium, Thailand, 2018-3		published		Japan
Kohei Nishiyama, "Optimal Allocation Method for Introduction of a Large Amount of Wind Farms and Substations in Wind Farms" IEE&IEEE.Thailand Joint symposium, Thailand, 2018-3		published		Japan
Yusuke Morimoto, "Study on Transmission Pricing Method for Congested Transmission Line due to Large Penetration of Renewable Energy" IEE&IEEE.Thailand Joint symposium, Thailand, 2018-3		published		Japan
Hong Nhung Nguyen, "Unit Commitment considering Frequency Dynamic Constraint and Wind Power Forecast Uncertainties" IEE&IEEE.Thailand Joint symposium, Thailand, 2018-3		published		Japan
Duc Huy Nguyen, "Development of Small Signal Stability Model for Power Systems considering the Network Transients", IEE&IEEE.Thailand Joint symposium, Thailand, 2018-3		published		Japan
Nhung Nguyen-Hong, Yosuke Nakanishi, "Frequency-Constrained Unit Commitment Considering Battery Storage System and Forecast Error", IEEE PES Innovative Smart Grid Technologies Conference Asia (ISGT Asia 2018), Singapore, Singapore, 2018/5/	e-isbn: 9781538642917 e-isbn: 1538642913 8467848	published		Japan
Kohei Nishiyama, Ryo Kobayashi, Kazuaki Iwamura, Yosuke Nakanishi, "Location Optimization Method of Newly Installable Wind Farms", ICEE2018 24th International Conference on Electrical Engineering, G1-1704, Seoul, Korea, 2018/6/26		published		Japan
Fumiya Motegi, Kenji Iba, Yosuke Nakanishi, "A Study of Correlation of Wind Power Generation and Battery Allocation for Mitigation of Wind Farm's Fluctuation in Northern Part of Japan", ICEE2018 24th International Conference on Electrical Engineering, G3-154, Seoul, Korea, 2018/6/26		published		Japan
Hong Nhung Nguyen, Huy Nguyen Duc, Yosuke Nakanishi, "Joint Optimization of Energy Storage and Wind Power Generation for an Islanded system", 7TH INTERNATIONAL CONFERENCE ON RENEWABLE ENERGY RESEARCH AND APPLICATIONS (ICRERA2018), Paris, France, 2018/10/17	isbn: 9781538659823 8566969	published		Japan
Hong Nhung Nguyen, Yosuke Nakanishi, "Optimal Scheduling of an Isolated Wind-Diesel-Battery System considering Forecast Error and Primary Frequency Response", 7TH INTERNATIONAL CONFERENCE ON RENEWABLE ENERGY RESEARCH AND APPLICATIONS (ICRERA2018), Paris, France, 2018/10/16	isbn: 9781538659823 8566847	published		Japan
Kazuaki Iwamura, Ryo Kobayashi, Kohei Nishiyama, Yosuke Nakanishi, Global Geospatial Optimization of the Location of Wind Farms and the Configuration of Transmission Networks Wind Integration Workshop 2018 (WIW-18), 2018/10/18		published		Japan
Kazuaki Iwamura, Ryo Kobayashi, Kohei Nishiyama, Yosuke Nakanishi, "A Combined Geospatial Approach to Extension Planning of Wind Farms and Transmission Networks", 8th IEEE PES Innovative Smart Grid Technologies Conference Europe (ISGT Europe 2018), Sarajevo, Bosnia-Herzegovina, 2018/10/24	e-isbn: 9781538645055 e-isbn: 153864505x 8571437	published		Japan
Kohei NISHIYAMA, Kazuaki IWAMURA, Yosuke NAKANISHI, "Optimized Site Selection for New Wind Farm Installations Based on Portfolio Theory and Geographical Information", IEEE PES Innovative Smart Grid Technologies Conference (ISGT2019 North American), Washington DC, USA, 2019/2/18	e-issn: 2472-8152 e-isbn: 9781538682326 e-isbn: 153868232x 8791636	published		Japan
Nhung Nguyen Hong, Yosuke Nakanishi, "Optimal Scheduling of an Isolated Wind-Diesel-Energy Storage System Considering Fast Frequency Response and Forecast Error", Energies, 12(5), 843, 2019	doi: 10.3390/en12050843	published		Japan
Yusuke MORIMOTO, Kazuaki IWAMURA, Hiroshi TAKAMORI, Yosuke NAKANISHI, "A Transmission Expansion Plan for Introducing Large-scale Renewable Energies", IEEE PES GTD2019, 2019-3-25	e-isbn: 9781538674345 e-isbn: 1538674343 8715974	published		Japan

Weijia Liang, Kohei Nishiyama, Kazuaki Iwamura, Yosuke Nakanishi, "Effect of the Installation of intermediated Sub-Station Facilities for Wind Power Transmission", ICEE2019 25th International Conference on Electrical Engineering, G3-154, HongKong, 2019/7/2-6		published		Japan
Yuki Katagiri, Kazuaki Iwamura, Yosuke Nakanishi, Sachio Takano, Ryohei Suzuki, "Arbitrary Polynomial Chaos Expansion and its Application to Power Flow Analysis", 2020 International Conference on Control and Decision (ICoCD 2020) , Sydney, Australia, 2020/2/17-19		published		Japan
Xiaomin Wu, Yumeng Zhang, Yosuke Nakanishi, Min Ding, Yicheng Zhou, Koji Kudo, "Improved Light Robust based operation strategy for imbalance adjustment with VPP consideration uncertainty demand", 2020 International Conference on Control and Decision (ICoCD 2020) , Sydney, Australia, 2020/2/17-19		published		Japan
Dick Arnie Badang, Cherrence Sarip and Anacita Tahud," Geographic Information System (GIS) and Multicriteria Decision Making (MCDM) for Optimal Selection of Hydropower Location in Rogongon, Iligan City," 2018 IEEE 10th International Conference on Humanoid, Nanotechnology, Information Technology, Communication and Control, Environment and Management (HNICEM), Baguio City, Philippines, 2018/12/2	Electronic ISBN: 978-1-5386-7767-4	published		Philippines
19		Total		

Lists of Achievements and Implemented Activities

2. presentations at Academic Conferences etc. (Seminars, Workshops, Symposia)

2. 1 Conference Presentations (Joint Presentations among Research Teams)

Date	Type of Presentation	Speaker, "Title", Conference Name, Location, etc.
2 Feb, 2019	Guest/Invited Speaker	Yosuke Nakanishi, "Optimal design platform for smart integration of renewable energy in rural area", JASTip-net, Bangkok
22 Nov., 2019	Guest/Invited Speaker	Panel Session Chair :Yosuke Nakanishi, Yicheng Zhou, " Planning Technology for Integrating Renewable Energies" ISPEC2019 Beijing, China
22 Nov., 2019	Guest/Invited Speaker	Noel Estoperez, "Installation of a Microgrid in a Remote Community", ISPEC2019 Beijing, China
22 Nov., 2019	Guest/Invited Speaker	Huy Nguyen-Duc, "Integration of renewable energy in Vietnam power system, challenges and opportunities", ISPEC2019 Beijing, China
22 Nov., 2019	Guest/Invited Speaker	Yicheng Zhou, "Assessment of Renewable Energy Introduction and Its Technologies", ISPEC2019 Beijing, China

5 Total

2. 2 Conference Presentations (by Single Team)

Date	Type of Presentation	Speaker, "Title", Conference Name, Location etc.	Country name of the team
23 Sept. 2019	Guest/Invited Speaker	Yosuke Nakanishi, "Transmission planning for renewable energies using GIS", IConSEP2019, Manado, Indonesia	JAPAN
25 Oct. 2019	Guest/Invited Speaker	Yosuke Nakanishi, "Power system planning for Energy transition", ICEST2019, Bali, Indonesia	JAPAN
26 Oct. 2019	Guest/Invited Speaker	Anacita Tahud, "Optimal Design of Barangay Rogongon Microgrid System," ICESTI 2019, Bali, Indonesia	PHILIPPINES

3 Total

Lists of Achievements and Implemented Activities

3. Workshops, Seminars, Symposia and Other Events (Organized by the Project)

Event duration	Name of Organizer	Title of the Event	Location (Country, City, Venue)	Number of Participants (Including Team Members)	Overview
Nov. 11–13, 2017	Yosuke Nakanishi	Startup Meeting	Japan, Tokyo, Waseda Univ.	11	Invitation: JST
Nov. 12, 2017	Yosuke Nakanishi	Technical Tour	Japan, Tokyo, Hino & Futyu	10	Fuji Electric, Toshiba
Nov. 13, 2017	Yosuke Nakanishi	Technical Tour	Japan, Fukushima, Koriyama	11	AIST(FREA)
March, 7, 2018	Udom Lewlomphaisarl	Second Meeting	Thailand, Krabi, Maritime Spa&Resort	12	In simultaneous of IEE&IEEE.Thailand Joint symposium
March, 9, 2018	Udom Lewlomphaisarl	Related meeting	Thailand, Bangkok, NECTEC	8	Meeting between Thailand & Japan
Jun, 20, 2018	Yosuke Nakanishi	Related Workshop	Japan, Yokohama,	12	In simultaneous of GRE2018 Invitation: AIST(FREA), TEPCO
Aug., 28, 2018	Noel Esperez	Third Meeting	Phiippines, Manila, Univ. of Philippines	25	Invitation: University of Philippines. DOST
	Noel Esperez	Technical Tour	Phillipines, Manila	12	MERALCO
Feb, 25,26,27	Noel Esperez	Related meeting	Phillipines, Manila	14	CEPALCO, MERALCO, DOE, Isla Verde(Field survey)
Jun, 5, 2019	Yosuke Nakanishi	Fourth Meeting	Japan, Tokyo, JST	12	Invitation: AIST(FREA), TEPCO, JST
Jun, 6, 2019	Yosuke Nakanishi	Technical Tour	Japan Yokohama, Isogo	10	J–Power,Electric Power Historical Museum, Toshiba
Aug., 6–10, 2019	Kanokvate Tungpimolut	Related meeting	Thailand, Chaing Mai, Ubom Ratchathani	12	Chaing Mai Univ., Ubom Ratchathani Univ. Dongna Village/Nongkan Village/Sulisagdam High School(Field Survey)
Oct. 25., 2019	Abraham Lomi	Fifth Meeting	Indonesia, Bali	10	In simultaneous of ISEPTI2019
Oct. 24., 2019	Abraham Lomi	Technical Tour	Indonesia, Bali	15	PLN Bali
Feb. 9–16., 2012	Yosuke Nakanishi	Related meeting	Indonesia, Jakarta, Manado	10	UNESCO, JICA, ERIA, Sam Ratulangi Univ. Bunaken(Field Survey)

15 Total

Lists of Achievements and Implemented Activities

4. Record of Research Exchanges

Date of Departure	Date of Return	Last Name & First Name	Country of Affiliation	Affiliation	Position	Exchange Destination (Country, City, Research Organization etc)	Description of Exchange Content/Purpose	Duration of Exchange (autocompleted)
July 9, 2018	July 31, 2018	Shuhei Miyake	Japan	Waseda Univ.	Master course student	NANOTEC,NECTEC, Bangkok	BEMS research	23
June 10, 2019	June 28, 2019	Unpong Supakchukul	Thailand	NECTEC	Researcher	Waseda Univ.	Planning design using GGOD	19
Sept. 2019	(September 2022)	Rovick Tariffe	Phillipines	Mindanao State Univ, Illigan Institute of Technology	Doctor Course Student	Waseda Univ.	Hydropower research using GIS	
Total (Person)					3	Total (Person-day)		42

Lists of Achievements and Implemented Activities

5. Patent Applications

5. 1 Independent Applications by Single Team

Application Number	Name of Patent/Patent Name	Application Date	Patent Applicants (Fill in All Members)	Publication Number (leave blank if unpublished)	Inventor	Country of Application	Registration Number (leave blank if unregistered)	Country Name of the Team

Total (Number of Application)

Total (Number of Registration)

5. 2 Joint Applications

Application Number	Name of Patent/Patent Name	Application Date	Patent Applicants (Fill in All Members)	Publication Number (leave blank if unpublished)	Inventor	Country of Application	Registration Number (leave blank if unregistered)

Total (Number of Application)

Total (Number of Registration)

Lists of Achievements and Implemented Activities

6. Awards

Date of Award	Name of Award	Recipient	Remarks	Country Name of the Team
October 25 2019	Best Presenter Award	Kazuaki Iwamura	ICESTI2019	Japan
December 2, 2019	Excellent Paper Award	Kazuaki Iwamura	ISPEC2019	Japan, Thailand, Philippines, Indonesia
Febuary 18, 2020	Best Student Paper Award	Yuki Katagiri	iCoCD2020	Japan

3	Total
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