

# **2020 International Conference and Utility Exhibition on Energy, Environment and Climate Change (ICUE 2020)**

**Pattaya City, Thailand  
20-22 October 2020**



**IEEE Catalog Number: CFP2096K-POD  
ISBN: 978-1-7281-8335-0**

**Copyright © 2020 by the Institute of Electrical and Electronics Engineers, Inc.  
All Rights Reserved**

*Copyright and Reprint Permissions:* Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

***\*\*\* This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP2096K-POD
ISBN (Print-On-Demand):	978-1-7281-8335-0
ISBN (Online):	978-1-7281-8334-3

**Additional Copies of This Publication Are Available From:**

Curran Associates, Inc  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: (845) 758-0400  
Fax: (845) 758-2633  
E-mail: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com



## TABLE OF CONTENTS

### Day 1: 20 October 2020 (Tuesday)

Session A: Energy Resources and Technology			
Ref. No.	Title, Authors, Affiliation	Country of Origin	Page No.
S. A.1	<b>A Year Around System Simulation for An Experimental Set-Up of A Thermosyphon Solar Water Heater in Thailand</b> <i>Uthpala Ekanayake<sup>1</sup> and Bundit Limmeechokchai<sup>2</sup></i> <sup>1</sup> University of Peradeniya, Sri Lanka <sup>2</sup> Sirindhorn International Institute of Technology, Thammasat University, Pathum Thani, Thailand	Sri Lanka	1
S. A.2	<b>Simultaneous upgrading utilizing Iron Sponge and Zeolite 13X fixed bed columns for Gaseous Fuel Production</b> <i>Antonio-Abdu Sami M. Magomnang and Dianne Mae M. Asiñero</i> University of Science and Technology of Southern Philippines – Cagayan de Oro Campus, Philippines	Philippines	7
S. A.3	<b>Econo– Environmental Dispatch Solutions for Power Systems Integrated with Renewable Energy Resources</b> <i>Femin Varghese<sup>1</sup>, Petra I.<sup>1</sup>, and Mathew S.<sup>2</sup></i> <sup>1</sup> Universiti Brunei Darussalam, Brunei Darussalam <sup>2</sup> University of Agder, Grimstad, Norway	Brunei	11
S. A.4	<b>Effect of Process Parameters on Slow Pyrolysis of Rice Straw: Product Yield and Energy Analysis</b> <i>Anil Kumar Sakhiya, Paramjeet Baghel, Shivangi Pathak, Virendra Kumar Vijay, and Priyanka Kaushal</i> Centre for Rural Development and Technology, Indian Institute of Technology, New Delhi, India	India	18
S. A.5	<b>Study on Application of SOFC on Biogas in Standalone Agriculture Enterprise Power Supply Systems</b> <i>Elena N. Sosnina, Andrey V. Shalukho, and Leonid E. Veselov</i> Nizhny Novgorod State Technical University n.a. R.E. Alekseev, Russia	Russia	27
S. A.6	<b>Investigation of the Thermal Hazard of Faulty Li-ion Battery under External Heating</b> <i>Pius Victor Chombo and Yossapong Laoonual</i> King Mongkut's University of Technology Thonburi	Thailand	35
S. A.7	<b>Electrochemical Study on Activated Carbon Electrode from Kenaf Biowaste for Supercapacitor Application</b> <i>S. Thilageshwaran<sup>1</sup>, M.N.M. Ansari<sup>1,2</sup>, Noor Afeefah Nordin<sup>2</sup>, Alaseel Bassam<sup>1</sup>, Zainudin Yahya<sup>1</sup>, P. Elumalai<sup>3</sup>, and A. Prasath<sup>3</sup></i> <sup>1</sup> Mechanical Engineering Department, Universiti Tenaga Nasional (UNITEN), Kajang, Malaysia <sup>2</sup> Institute of Power Engineering, Universiti Tenaga Nasional (UNITEN), Kajang, Malaysia <sup>3</sup> Madanjeet School of Green Energy Technologies, Pondicherry University, Puducherry, India	Malaysia	43

Session B: MESIA's Special Session on Energy Access			
Ref. No.	Title, Authors, Affiliation	Country of Origin	Page No.
S. B.1	<b>Challenges in Using Renewable Energy for Islands in Indonesia: A Case Study of Karimunjawa</b> <i>Dwi Novitasari, Rachmawan Budiarto, Fiki Rahmatika Salis, and Sarjiya</i> Universitas Gadjah Mada (UGM), Yogyakarta, Indonesia	Indonesia	48
S. B.2	<b>Potential of Renewable Energy in selected Greater Mekong Subregion (GMS) Countries to achieve NDCs in 2030</b> <i>Degeorge Dul and Bundit Limmeechokchai</i> Sirindhorn International Institute of Technology, Thammasat University, Pathum Thani,	Thailand	56

	Thailand		
S. B.3	<b>Training Needs regarding Gensets for Isolated Areas</b> <i>Antonis Tsikalakis, K. Fiorentzis, Y. Syllignakis, N. Mavrikakis, D. Giaourakis, and I. Katsigiannis</i> Hellenic Mediterranean University, Crete, Greece	Greece	66
S. B.4	<b>Sustainable Fuelwood Production In Kenya: Potential Role of Community Forest Associations</b> <i>Kasaon Stephanie Jepng'etich</i> Graduate School of Global Environmental Studies, Sophia University, Tokyo, Japan	Japan	73
S. B.5	<b>Pongamia as a Potential Biofuel Crop: Oil Content of Pongamia pinnata from the Best Provenance in Java, Indonesia</b> <i>Trimaria Hasnah<sup>1</sup>, Budi Leksono<sup>1</sup>, Nur Sumedi<sup>1</sup>, Eritrina Windyarini<sup>1</sup>, Hamdan Adma Adinugraha<sup>1</sup>, Himlal Bara<sup>2</sup>, and Yustina Artati<sup>2</sup></i> <sup>1</sup> Center for Forest Biotechnology and Tree Improvement Research and Development, Yogyakarta, Indonesia <sup>2</sup> Center for International Forestry Research, Bogor, Indonesia	Indonesia	79
S. B.6	<b>Isolated Energy Management Learning Platform through Smart and Green Building Design: A Case Study of USIS Building, Naresuan University</b> <i>Phisut Apichayakul, Piyadanai Pachanapan, Akaraphunt Vongkunghae, and Sarintip Tantanee</i> Naresuan University, Phitsanulok, Thailand	Thailand	85

### Session C: Climate Change I

Ref. No.	Title, Authors, Affiliation	Country of Origin	Page No.
S. C.1	<b>An Improved Statistical Method for Rainfall Forecasting in Sri Lanka using the WRF Model</b> <i>V.A.P.C. Perera and K.G.H.S. Peiris</i> University of Sri Jayewardenepura, Nugegoda, Sri Lanka	Sri Lanka	90
S. C.2	<b>Assessing the "Value" of Nature-based Solutions at the Belgian Coast for Sustainable Tourism, using a Ecosystem-based Management Approach</b> <i>Patrick D. De Klerck and Brendan P. De Baets</i> Territorial Development Program for the Flemish Coastal Region, Flemish Government / Department of Environment and Spatial Development, Bruges, Belgium	Belgium	97
S. C.3	<b>Addressing Climate Change in Brazil: Is Rio De Janeiro City Acting on Adaptation Strategies?</b> <i>Andrea Souza Santos, Suzana Kahn Ribeiro, and Victor Hugo Souza de Abreu</i> Graduate School and Research in Engineering, Federal University of Rio de Janeiro, Rio de Janeiro, Brazil	Brazil	104
S. C.4	<b>Carbon Footprint and Carbon Stock Volume for Para Rubber Production in Southern Part of Thailand</b> <i>Tanate Chaichana, Saowalak Thongdee, and Worawan Pechurai</i> Maejo University, Chiangmai, Thailand	Thailand	115
S. C.5	<b>Are Renewable Energy Technologies Competitive?</b> <i>Govinda Timilsina<sup>1</sup> and Kalim Shah<sup>2</sup></i> <sup>1</sup> World Bank <sup>2</sup> University of Delaware, Delaware, USA	USA	121
S. C.6	<b>A Systematic Analysis of Vietnam's Province Level Household Energy Security Status and its Implication for Sustainable Development Goals</b> <i>Malay Pramanik, Sylvia Szabo, Indrajit Pal, Parmeshwar Udmale, Md. Juel Rana</i> Asian Institute of Technology, Pathum Thani, Thailand	Thailand	136

### Day 2: 21 October 2020 (Wednesday)

### Session D: Energy and Environment

Ref. No.	Title, Authors, Affiliation	Country of Origin	Page No.
S. D.1	<b>Optimization of Microwave Hydrothermal Carbonization Conditions of Hydrochar for Ammonium Adsorption Capacity</b> <i>Anh Kim Phan<sup>1</sup> and Duangkamol Phipu Sutra<sup>2</sup></i> <sup>1</sup> Center of Excellence for Environmental and Hazardous Waste Management, Chulalongkorn University, Bangkok, Thailand <sup>2</sup> Environmental Research Institute, Chulalongkorn University, Bangkok, Thailand	Thailand	144
S. D.2	<b>Enhanced Enzymatic Conversion of Durian Peel by Sulfuric Pretreatment for Biofuel Production</b> <i>Jakaphan Ratanapoompinyo<sup>1</sup>, Patchanee Yasurin<sup>1</sup>, Prapakorn Tantayota<sup>2</sup>, Theerawut</i>	Thailand	149

	<i>Phusantisampan<sup>3</sup>, Elizabeth Jayex Panakka<sup>4</sup>, and Malinee Sririyanun<sup>4</sup></i> <sup>1</sup> Assumption University, Bangkok, Thailand <sup>2</sup> Srinakharinwirot University, Bangkok, Thailand <sup>3</sup> Faculty of Applied Science KMUTNB, Bangkok, Thailand <sup>4</sup> Chemical and Process Engineering, TGGS, KMUTNB, Bangkok, Thailand		
S. D.3	<b>Assessment of Biochar from Chicken Litter and Sawdust for Soil Amendment</b> <i>Shooha Tabil, Atique Ahmed Khan, Kawnish Kirtania, Shaumik Sharif, and Md. Saiful Islam</i> Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh	Bangladesh	157
S. D.4	<b>Inhibitory Effect of Inorganic Salts Residuals on Cellulase Kinetics in Biofuel Production from Lignocellulose Biomass</b> <i>Parita Mutrakulcharoen<sup>1</sup>, Peerapong Pornwongthong<sup>1</sup>, Prapakorn Tantayota<sup>2</sup>, Kraipat Cheenkachorn<sup>1</sup>, Supacheree Roddecha<sup>3</sup>, and Malinee Sririyanun<sup>1</sup></i> <sup>1</sup> King Mongkut's University of Technology North Bangkok, Thailand <sup>2</sup> Srinakharinwirot University, Bangkok, Thailand <sup>3</sup> Kasetsart University, Bangkok, Thailand	Thailand	165
S. D.5	<b>Determination of Appropriate Conditions for Volatile Fatty Acids from Rubber Industrial Wastewater by GC-FID: Headspace Technique</b> <i>Chatchawan Khotsena<sup>1</sup> and Siraporn Potivichayanon<sup>2</sup></i> <sup>1</sup> Environmental pollution and Safety Program, Suranaree University of Technology, Nakhon Ratchasima, Thailand <sup>1,2</sup> School of Environmental Health, Institute of Public Health, Suranaree University of Technology, Nakhon Ratchasima, Thailand	Thailand	173
S. D.6	<b>Health Risk Assessment of Passive Air Sampler-derived Polychlorinated biphenyl and Polycyclic Aromatic Hydrocarbons in Bangkok and Chiang Mai, Thailand</b> <i>Nareerat Punvitayakul and Wanida Jinsart</i> Chulalongkorn University, Bangkok, Thailand	Thailand	180
S. D.7	<b>Farmers' Knowledge, Attitude and Practice on Integrated Pest Management in Kalaw Region, Myanmar</b> <i>Zin Mie Mie Aung<sup>1</sup>, Noppol Arunrat<sup>1</sup>, Sukanya Sereenonchai<sup>1</sup>, Monthira Yuttiham<sup>1</sup>, Thomas Neal Stewart<sup>1</sup>, and Winai Chaowiwat<sup>2</sup></i> <sup>1</sup> Mahidol University, Nakhon Pathom, Thailand <sup>2</sup> Hydro Informatics Institute, Bangkok, Thailand	Thailand	186
S. D.8	<b>Comparison of Rural Livelihoods between Government-led and Local-led Initiatives under Community-based Forest Management: A Case Study in Chin State, Myanmar</b> <i>Ngun Kam</i> Mahidol University, Bangkok, Thailand	Thailand	193
S. D.9	<b>Analyzing Discharge Characteristics of Redox Flow Battery using Hydrochloric Acid as a Reactant</b> <i>Adisorn Thomya and Yottana Khunatorn</i> Chiang Mai University, Chiang Mai, Thailand	Thailand	201
S. D.10	<b>Meteorological Drought Hazard Assessment under Future Climate Change Projection for Agriculture Area in Songkhram River Basin, Thailand</b> <i>Thanasit Promping<sup>1</sup> and Tawatchai Tingsanchal<sup>2</sup></i> <sup>1</sup> Kasetsart University Sriracha Campus, Chonburi, Thailand <sup>2</sup> Asian Institute of Technology, Pathum Thani, Thailand	Thailand	208

#### Session F: Energy Price and Policy

Ref. No.	Title, Authors, Affiliation	Country of Origin	Page No.
S. F.1	<b>An Enabling Dissemination Framework Mechanism to Accelerate the Uptake of Energy-efficient Household Appliances and Lighting Products in the Off-grid Energy Product Market of Bangladesh</b> <i>Utpal Bhattacharjee</i> University of Colorado, Denver, USA	Bangladesh	215
S. F.2	<b>The Co-benefits of Renewable Energy Policies in Japan: Barriers and Ways Forward</b> <i>Etsujiro Takai</i> Sustainable Governance Center, Institute for Global Environmental Strategies, Hayama, Japan	Japan	225
S. F.3	<b>Comparison of Various Machine Learning Algorithms for Predicting Energy Price in Open Electricity Market</b> <i>Puja Chaudhury, Abhishek Tyagi, and Prabhakar Karthikeyan Shanmugam</i> Vellore Institute of Technology, Vellore, India	India	231
S. F.4	<b>The Potential Role of Carbon Tax in Achieving the Paris Agreement Targets for a Developing Country: A Case Study of Sri Lanka</b> <i>Gayashika L. Fernando and Migara H. Liyanage</i> Sri Lanka Institute of Information Technology, Malabe, Sri Lanka	Sri Lanka	238
S. F.5	<b>A Prospective Feed-in Tariff of Rice Husk Power Plants in Thailand under the Power Development Plan 2018</b>	Thailand	246

	<i>Prachuab Peerapong and Bundit Limmeechokchai</i> Sirindhorn International Institute of Technology, Thammasat University, Pathum Thani, Thailand		
S. F.6	<b>Simulation of Blockchain based Power Trading with Solar Power Prediction in Prosumer Consortium Model</b> <i>Kaung Si Thu, Weerakorn Ongsakul</i> Asian Institute of Technology, Bangkok, Thailand	Thailand	255

### Day 3: 22 October 2020 (Thursday)

Session G: Smart Grid and Smart Cities			
Ref. No.	Title, Authors, Affiliation	Country of Origin	Page No.
S. G.1	<b>Chiangmai Smart City Initiative: A Scenario-based Assessment</b> <i>Achiraya Chaichaloempreecha, Puttipong Chunark, and Bundit Limmeechokchai</i> Sirindhorn International Institute of Technology (SIIT), Thammasat University, Pathum Thani, Thailand	Thailand	265
S. G.2	<b>Energy Conservation – Residential Building</b> <i>Atharav Joshi, Niyati Khandelwal, Yash Suryavanshi, and Maya Kurulekar</i> Vishwakarma University, Pune, India	India	276
S. G.3	<b>Scenario-based Analysis of Electric Vehicle Penetration in Road Transportation in Laos</b> <i>BounEua Khamphilavan<sup>1</sup> and Toshihiko Masu<sup>2</sup></i> <sup>1</sup> Tokyo Institute of Technology, Tokyo, Japan <sup>2</sup> National Institute for Environmental Studies, Ibaraki, Japan	Japan	281
S. G.4	<b>Driving Factors of Smart City Development in Thailand</b> <i>Jirawan Klaylee, Phethai Kesorn, and Pawinee lamtrakul</i> Center for Excellence in Urban Mobility Research and Innovation, Thammasat University, Pathum Thani, Thailand	Thailand	289
S. G.5	<b>Potential for Integrating Solar Rooftop Photovoltaic System with Rain Water Harvesting Facility and Electric Vehicle Charging Facility: Designing a Multicriteria Framework</b> <i>Debalina Saha<sup>1</sup> and Rabindra N. Bhattacharya<sup>2</sup></i> <sup>1</sup> Centre for Excellence in Public Management, Administrative Training Institute, India <sup>2</sup> Jadavpur University, Kolkata, India	India	298
S. G.6	<b>Measuring Elevated Indoor Carbon Dioxide Concentration from Unsuitable Condition of Indoor Plant</b> <i>Kanittha Pamonpol<sup>1</sup>, Natsima Tokhun<sup>1</sup>, and Atcharaporn Somparn<sup>2</sup></i> <sup>1</sup> Valaya Alongkorn Rajabhat University under the Royal Patronage, Pathum Thani, Thailand <sup>2</sup> Udon Thani Rajabhat University, Udon Thani, Thailand	Thailand	306
S. G.7	<b>The Study on Association between Urban Green Space and Temperature Changes in Mega City</b> <i>Apinya Padon, Pawinee lamtrakul, Benjamin Punson, and Jirawan Klaylee</i> Thammasat University, Pathum Thani, Thailand	Thailand	312
S. G.8	<b>Energy Management in Data Centers from Design to Operations and Maintenance</b> <i>Montri Wiboonrat</i> King Mongkut's Institute of Technology Ladkrabang, Bangkok, Thailand	Thailand	319

Session H: Climate Change II (Emissions)			
Ref. No.	Title, Authors, Affiliation	Country of Origin	Page No.
S. H.1	<b>Reducing Carbon Dioxide Emission Generated by Thermal Power Plants with Solar Power on the Uganda's Electricity Grid</b> <i>Chrish Kavuma<sup>1</sup>, Diego Sandoval, and Hakizimana Khan Jean de Dieu<sup>1</sup></i> <sup>1</sup> African Centre of Excellence in Energy for Sustainable Development (ACEESD) University of Rwanda	Uganda	326
S. H.2	<b>A Study on Green House Gas Mitigation from Solar Parks in India</b> <i>Hirwe Rahul Rajaram<sup>1</sup> and Guru Balamurugan<sup>2</sup></i> <sup>1</sup> Tata Institute of Social Sciences, Mumbai, India <sup>2</sup> Central University of Tamil Nadu Thiruvarur, India	India	332
S. H.3	<b>The Assessment of Energy Consumption and Carbon Emission from Maize Production Process in Northern Thailand</b> <i>Tanate Chaichana<sup>1</sup>, Natthawud Dussadee<sup>1</sup>, Nigran Homdoug<sup>1</sup>, Yinnittra Khamnuengphon<sup>1</sup>, Kunyaporn Chaiwong<sup>2</sup>, Salidpron Withayaphadoug<sup>3</sup>, and Ukrit Samaksaman<sup>4</sup></i>	Thailand	340

	<sup>1</sup> Maejo University, Chiang Mai, Thailand <sup>2</sup> Rajamangala University of Technology Lanna Nan, Nan, Thailand <sup>3</sup> Chiang Rai Rajabhat University, Chiang Rai, Thailand <sup>4</sup> Naresuan University, Phitsanulok, Thailand		
S. H.4	<b>Performance of the Outdoor Evaporative Cooling: A Case Study of Thammasat University Rangsit Campus</b> <i>Moaz Altaf, Wisuwat Klabwisas, Kaung Si Thu, and Weerakorn Ongsakul</i> Asian Institute of Technology, Bangkok, Thailand	Thailand	347
S. H.5	<b>Design and Simulation of an Islanded Hybrid Microgrid for Remote Off-Grid Communities</b> <i>Shubham Tiwari, Weerakorn Ongsakul, and Jai Govind Singh</i> Asian Institute of Technology, Pathum Thani, Thailand	Thailand	354
S. H.6	<b>Very Short Term Wind Speed Forecasting Using Convolutional Long Short Term Memory Recurrent Neural Network</b> <i>Firuz Ahamed Nahid, Weerakorn Ongsakul, Nimal Madhu Manjiparambil</i> Asian Institute of Technology, Thailand	Thailand	363

<b>Session I: Energy</b>			
Ref. No.	Title, Authors, Affiliation	Country of Origin	Page No.
S. I.1	<b>Comprehensive Analysis of Convolutional Neural Network Models for Non-Instructive Load Monitoring</b> <i>G.M. Herath<sup>1</sup>, T.D. Thilakanayake<sup>1</sup>, M.H. Liyanage<sup>1</sup>, and C.J. Angammana<sup>2</sup></i> <sup>1</sup> Sri Lanka Institute of Information Technology, Malabe, Sri Lanka <sup>2</sup> University of Waterloo, Ontario, Canada	Sri Lanka	371
S. I.2	<b>Economic Viability of Solar PV for Domestic Applications in a Middle-Income Country: A Case Study of Sri Lanka</b> <i>Janith K. Wijesinghe, Mohamed Y. M. Najim, Gayashika L. Fernando, and Migara H. Liyanage</i> Sri Lanka Institute of Information Technology (SLIIT), Malabe, Sri Lanka	Sri Lanka	382
S. I.3	<b>Low Electricity Access Rate as a Barrier to Achieving the Global Goal of Providing Affordable and Cleaner Energy for All in Burundi</b> <i>Gatoto Placide<sup>1</sup>, Michel Roddy Lollchund<sup>2</sup>, and Gace Athanase Dalsou<sup>3</sup></i> <sup>1</sup> African Center of Excellence in Energy for Sustainable Development, University of Rwanda, Kigali, Rwanda <sup>2</sup> University of Mauritius, Réduit, Mauritius <sup>3</sup> Department of Physics, University of Rwanda, Kigali, Rwanda	Rwanda	392
S. I.4	<b>Dielectric Strength of Kenaf/Glass Fiber Reinforced Unsaturated Polyester Hybrid Composites Used as Insulator</b> <i>Alaseel Bassam, M.N.M. Ansari, Fairuz Abdullah, A.R.M. Nazim, K.S. Vinoth, Noor Afeefah Nordin, and S. Thilageshwaran</i> Universiti Tenaga Nasional, Kajang, Malaysia	Malaysia	398