

ICOPE-2021

International Conference on Power Engineering (ICOPE-2021)

October 17-21, 2021, Virtual Conference, Online

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The Power and Energy System Division of The Japan Society of Mechanical Engineers

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ICOPE-2021

**International Conference on
Power Engineering – 2021**

Conference Program

October 17-21, 2021, Virtual Conference, Online

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Preface

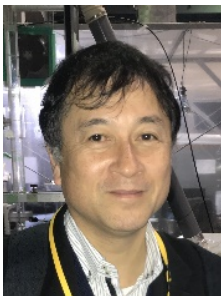
Welcome to ICOPE-2021

On behalf of the Steering Committee I would express the warmest welcome to all participants in the International Conference on Power Engineering, ICOPE-2021. ICOPE is an international conference targeting a vast area of research and developments on power and energy systems with the exception of nuclear power generation.

ICOPE is co-organized by The Japan Society of Mechanical Engineers (JSME), Chinese Society of Power Engineering (CSPE), and American Society of Mechanical Engineers (ASME). The first ICOPE was held in Tokyo in 1993, From then onwards, it has been successfully held in Shanghai (1995), Tokyo (1997), San Francisco (1999), Xian (2001), Kobe (2003), Chicago (2005), Hangzhou (2007), Kobe (2009), Denver (2011), Wuhan (2013), Yokohama (2015), Charlotte (2017), and Kunming (2019). As a continuation, this is the 15th ICOPE.

The conference is drawing interest as an ideal place to present on a variety of studies such as developments of industrial technologies, researches on measuring methods and evaluation tools, and feasibility studies. Initially, thermal power generation was the main topic of discussion at the conference, and energy saving by improving the efficiency of equipment and systems was an important issue. Then, the topic expanded to distributed energy and smart energy networks due to the development of high efficiency gas engine, the widespread use of fuel cells, the introduction of natural energy. The sharing not only of power but also of heat became an important issue. Since the beginning of the 21st century, environmental protection issues, such as the prevention of global warming, have become a major concern. Therefore, a large amount of natural energy is being introduced, and thermal power generation is required to adjust the power supply to meet the demand fluctuations. As the environment surrounding power engineering is changing drastically, we must continue the research and development on power engineering to realize a sustainable society.

International conferences are not only a place to present the results of one's own research, but also a place to exchange information through fruitful discussions. Originally, ICOPE-2021 was planned to be held face-to-face in Kobe, Japan. However, unfortunately, we had to decide that ICOPE-2021 would be held as a remote conference. We apologize for any inconvenience this may cause in communication and information exchange. We hope all the participants in ICOPE-2021 enjoy fruitful discussions and find a motivation to the next stage of your research and development.



Hitoshi Asano, Dr. Eng.
Chair, Steering Committee of ICOPE-2021
Professor, Kobe University

Committees

Steering Committee

Chair

Hitoshi Asano (Kobe University)

Co-Chairs

Frank L. Michell (Chair of the ASME Energy Generation and Storage Technology Group)

Jianhua Yan (Zhejiang University)

Chair of General Affairs Committee

Masahide Kazari (Kawasaki Heavy Industries, Ltd.)

Chair of Scientific Committee

Ryosuke Matsumoto (Kansai University)

Chair of Planning Committee

Tsubasa Ohshima (Hitachi Zosen Corporation)

Secretary General

Hideki Murakawa (Kobe University)

Program overview

ICOPE-2021 Program Overview

October 18 (Mon.)								
9:00 – 9:10 Opening Remarks								
9:10 – 10:00	P01	Plenary Lecture 1 CCS - From an R&D toward a Policy Agenda as a Vital Tool to Realize Carbon Neutral Society Prof. Makoto Akai (Kyushu University, Japan)						
10:00 – 10:10 Break								
10:10 – 11:00	P02	Plenary Lecture 2 Developments and Opportunities of Co-combustion Technology of Coal and Biomass/Waste in China Prof. Fei Wang (Zhejiang University, China)						
11:00 – 11:10 Break								
11:10 – 12:00	P03	Plenary Lecture 3 Evolving US Power Market Transition to Clean Energy Mr. Frank L. Michell (Chair of the ASME Energy Generation and Storage Technology Group, USA)						
12:00 – 12:10 Announcement								
12:10 – 13:30 Lunch Break								
<i>Room A</i>		<i>Room B</i>		<i>Room C</i>		<i>Room D</i>		
13:30 – 15:10	A11	Renewable Energy (1)	B11	Turbines and Generators (1)	C11	Advanced Combustion Technologies (1)	D11	Materials Engineering for Energy Systems (1)
15:10 – 15:30 Short Break								
<i>Room A</i>		<i>Room B</i>		<i>Room C</i>		<i>Room D</i>		
15:30 – 17:10	A12	Renewable Energy (2)	B12	Turbines and Generators (2)	C12	Advanced Combustion Technologies (2)	D12	Materials Engineering for Energy Systems (2)

October 19 (Tue.)								
<i>Room A</i>		<i>Room B</i>		<i>Room C</i>		<i>Room D</i>		
9:00 – 10:20	A21	Renewable Energy (3)	B21	Turbines and Generators (3)	C21	Other Topics (1)	D21	Materials Engineering for Energy Systems (3)
10:20 – 10:40 Short Break								
<i>Room A</i>		<i>Room B</i>		<i>Room C</i>		<i>Room D</i>		
10:40 – 12:20	A22	Renewable Energy (4)	B22	Turbines and Generators (4)	C22	Hydrogen Energy Technologies (1)	D22	Distributed Energy Systems (1)
12:20 – 13:30 Lunch Break								
<i>Room A</i>		<i>Room B</i>		<i>Room C</i>		<i>Room D</i>		
13:30 – 15:10	A23	Renewable Energy (5)	B23	Other Topics (2)	C23	Hydrogen Energy Technologies (2)	D23	Distributed Energy Systems (2)
15:10 – 15:30 Short Break								
<i>Room A</i>		<i>Room B</i>		<i>Room C</i>		<i>Room D</i>		
15:30 – 17:10	A24	Environmental Protection (1)	B24	Operation, Maintenance and Diagnosis Technologies (1)	C24	Hydrogen Energy Technologies (3)	D24	Power Grid Stabilization Technologies
17:10 – 17:30 Short Break								
17:30 – 19:00	W01	Hydrogen Energy Workshop Panelists: Drs. Ing. Patrick Cnubben (New Energy Coalition), Dr. Patrick Hartley (CSIRO Energy) Prof. Zhihua Wang (Zhejiang University), Dr. Motohiko Nishimura (Kawasaki Heavy Industries, Ltd.)						

October 20 (Wed.)								
<i>Room A</i>		<i>Room B</i>		<i>Room C</i>		<i>Room D</i>		
9:00 – 10:40	A31	Environmental Protection (2)	B31	Operation, Maintenance and Diagnosis Technologies (2)	C31	Thermal Hydraulics, Boiling and Condensation (1)	D31	Techno-Socio-Economic Aspect of Energy System
10:40 – 11:00 Short Break								
<i>Room A</i>		<i>Room B</i>		<i>Room C</i>		<i>Room D</i>		
11:00 – 12:20	A32	Environmental Protection (3)	B32	Operation, Maintenance and Diagnosis Technologies (3)	C32	Thermal Hydraulics, Boiling and Condensation (2)	D32	Centralized Power Generation Systems (1)
12:20 – 13:30 Lunch Break								
<i>Room A</i>		<i>Room B</i>		<i>Room C</i>		<i>Room D</i>		
13:30 – 14:50	A33	Other Topics (3)	B33	Operation, Maintenance and Diagnosis Technologies (4)	C33	Thermal Hydraulics, Boiling and Condensation (3)	D33	Centralized Power Generation Systems (2)
15:00 – 15:20 Closing Remarks								

Technical session program

ICOPE-2021 Technical Program

October 18 (Mon.)		International Conference on Power Engineering-2021 (ICOPE-2021)
9:00 – 9:10		Opening Remarks
9:10 – 10:00	P01	<p>Plenary Lecture 1</p> <p>CCS - From an R&D toward a Policy Agenda as a Vital Tool to Realize Carbon Neutral Society</p> <p>Prof. Makoto Akai (Kyushu University, Japan) Chair: Takao Nakagaki (Waseda University)</p>
10:00 – 10:10		Break
10:10 – 11:00	P02	<p>Plenary Lecture 2</p> <p>Developments and Opportunities of Co-combustion Technology of Coal and Biomass/Waste in China</p> <p>Prof. Fei Wang (Zhejiang University, China) Chair: Takao Nakagaki (Waseda University)</p>
11:00 – 11:10		Break
11:10 – 12:00	P03	<p>Plenary Lecture 3</p> <p>Evolving US Power Market Transition to Clean Energy</p> <p>Mr. Frank L. Michell (Chair of the ASME Energy Generation and Storage Technology Group, USA) Chair: Takao Nakagaki (Waseda University)</p>
12:00 – 12:10		Announcement
12:10 – 13:30		Lunch Break

October 18 (Mon.)					International Conference on Power Engineering-2021 (ICOPE-2021)				
Room A		Room B		Room C		Room D			
13:30 – 15:10	A11	Renewable Energy (1) Chair: Daotong Chong (Xi'an Jiaotong University)	B11	Turbines and Generators (1) Chair: Yutaka Oda (Kansai University)	C11	Advanced Combustion Technologies (1) Chair: Manabu Fuchihata (Kindai University)	D11	Materials Engineering for Energy Systems (1) Chair: Ming Liu (Xi'an Jiaotong University)	
13:30 – 13:50	A111	ICOPE-2021-0181 Performance of a direct expansion ground-source heat pump for air conditioning ○ Dai Moriya (Univ. of Yamanashi), Tetsuaki Takeda	B111	ICOPE-2021-0240 Verification of 1650°C class JAC gas turbine ○ Kazuki Morimoto (Mitsubishi Power, Ltd.), Susumu Wakazono, Masanori Yuri, Masahiro Kataoka	C111	ICOPE-2021-0222 100% hydrogen dry low NOx combustor developments for 2MW class gas turbine ○ Atsushi Horikawa (Kawasaki Heavy Industries, Ltd.), Kunio Okada, Manfred Wirsum (RWTH Aachen Univ.), Harald H.-W. Funke (Aachen Univ. of Applied Science), Karsten Kusterer (B&B-AGEMA GmbH)	D111	ICOPE-2021-0242 Effect of grain boundary precipitations on fatigue cracking path of Alloy 617 in a superheated steam environment at 750 °C ○ Yoichi Takeda (Tohoku Univ.), Masumi Yoshida, Kosuke Araki, Susumu Nakano	
13:50 – 14:10	A112	ICOPE-2021-0201 Hot water supply performance of a ground source heat pump that use open-type direct expansion method. ○ Yuki Kanai (Univ. of Yamanashi), Tetsuaki Takeda, Shingen Yamada	B112	ICOPE-2021-0209 Unsteady flow simulation of industrial gas turbine compressor under start-up operation ○ Hironori Miyazawa (Tohoku Univ.), Koki Araki, Takashi Furusawa, Satoru Yamamoto, Shuichi Umezawa (Tokyo Electric Power Company Holdings, Inc.), Koichi Yonezawa (Central Research Institute of Electric Power Industry), Shuichi Ohmori (Tokyo Electric Power Company Holdings, Inc.), Takeshi Suzuki	C112	ICOPE-2021-0176 Development of burner for hydrogen firing boiler ○ Yohei Takashima (Mitsubishi Power Industries Co., Ltd.), Toshikazu Tsumura, Kazuhiro Ishii (Yokohama National Univ.), Yutaka Kabuki (Mitsubishi Power Industries Co., Ltd.), Tomiaki Kozuma, Yuzo Taguchi	D112	ICOPE-2021-0144 High-temperature corrosion behaviors of Ni-based alloys in carbon dioxide ○ Zhiyuan Liang (Xi'an Jiaotong Univ.), Yufeng Li, Qinxin Zhao	
14:10 – 14:30	A113	ICOPE-2021-0256 Heating performance evaluation of recirculation type air conditioning system using underground aquifer for greenhouse in winter. ○ Kyosuke Wakishima (Univ. of Yamanashi), Koji Toriyama	B113	ICOPE-2021-0298 Research on structural optimization of compressor blade-disk ○ Yukun Zhang (Shanghai Electric Power Generation Group), Haoyang Zhou, Luyi Tan, Jie Wang	C113	ICOPE-2021-0193 Experimental investigation on MILD combustion of co-firing biomass and pulverized coal fuel blend in a pilot-scale furnace ○ Fan Hu (Huazhong Univ. of Science and Technology), Pengfei Li, Pengfei Cheng, Yaowei Liu, Guodong Shi, Zhaohui Liu	D113	ICOPE-2021-0216 Experimental study of the corrosion behavior of 09CrCu5b under external stress in concentrated sulfuric acid ○ Zhiyuan Ning (Xi'an JiaoTong Univ.), Qulan Zhou, Zhiheng Li, Na Li	
14:30 – 14:50	A114	ICOPE-2021-0156 Study on the effect of tube gap on nucleate boiling heat transfer coefficient in horizontal tube bundle ○ Kohei Fukukita (Kobe Univ.), Katsumi Sugimoto, Hideki Murakawa, Hitoshi Asano, Shizuka Makimoto (Fuji Electric Co., Ltd.), Ichiro Myougan	B114	ICOPE-2021-0245 Study on change of turbine blade performance due to difference in incoming wake characteristics ○ Kenji Kumagai (Iwate Univ.), Ken-ichi Funazaki, Kota Yamamoto, Shuichi Umezawa (Tokyo Electric Power Company Holdings inc.), Koichi Yonezawa (Central Research Institute of Electric Power Industry), Shuichi Omori (Tokyo Electric Power Company Holdings inc.)	C114	ICOPE-2021-0274 Moderate or intense low-oxygen dilution oxy-combustion characteristics of biomass-pulverized coal fuel blends in a pilot-scale furnace ○ Hongyu Zheng (Huazhong Univ. of Science and Technology), Pengfei Li, Pengfei Cheng, Fan Hu, Zhaoliu Liu	D114	ICOPE-2021-0235 Development of analysis support program for evaluation of fatigue strength under non-proportional multiaxial loading ○ Takumi Asada (Ritsumeikan Univ.), Keiwa Makino, Fumio Ogawa (Tohoku Univ.), Takamoto Itoh (Ritsumeikan Univ.)	
14:50 – 15:10	A115	ICOPE-2021-0281 Heat exchange performance of ground source heat pump that use direct expansion method ○ Nanami Kobayashi (Univ. of Yamanashi), Tetsuaki Takeda	B115	ICOPE-2021-0179 Physical fields prediction for supercritical carbon dioxide turbine using deep learning techniques ○ Jiarui You (Xi'an Jiaotong Univ.), Tianyuan Liu, Yuqi Wang, Bo Tang, Yonghui Xie, Di Zhang	C115	ICOPE-2021-0282 Influences of operating pressure on moderate or intense low-oxygen dilution combustion of pulverized coal under both O₂/N₂ and O₂/CO₂ atmospheres ○ Pengfei Cheng (Huazhong Univ. of Science and Technology), Pengfei Li, Hongyu Zheng, Fan Hun, Zhaohui Liu			
15:10 – 15:30	Short Break								

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15:30 – 17:10	A12	Renewable Energy (2) Chair: Ryosuke Matsumoto (Kansai University)	B12	Turbines and Generators (2) Chair: Ken-ichi Funazaki (Iwate University)	C12	Advanced Combustion Technologies (2) Chair: Atsushi Horikawa (Kawasaki Heavy Industries, Ltd)	D12	Materials Engineering for Energy Systems (2) Chair: Xuan Wang (Shanghai Nuclear Engineering Research & Design Institute CO., LTD)	
15:30 – 15:50	A121	ICOPE-2021-0210 Energy potential matching analysis on solar methanol reforming system in dynamic processes ○ Peiye Zhang (Xi'an Jiaotong University), Ming Liu, Junjie Yan	B121	ICOPE-2021-0180 Measurement of gas turbine cooling air flow rate at an advanced combined cycle power plant using the heater method for plant operation and maintenance ○ Shuichi Umezawa (Tokyo Electric Power Company Holdings, Inc.), Shuichi Ohmori	C121	ICOPE-2021-0217 Effect of improving gasification performance by injecting steam into a gasifier -Influences of oxygen ratio on steam injection- ○ Kazuhiro Kidoguchi (Central Research Institute of Electric Power Industry), Hiroyuki Hamada, Shiro Kajitani, Yuso Oki	D121	ICOPE-2021-0249 Evaluation of oxidation behaviors during fatigue crack growth in aged CrMo cast steels in a steam environment at 600 °C ○ Hiroki Kobayashi (Tohoku University), Yoichi Takeda, Susumu Nakano	
15:50 – 16:10	A122	ICOPE-2021-0254 Development of a low-cost remote sensor for ground-based solar radiation and related data measurement ○ Pepe Haoulomou (Kyushu University), Frantisek Miksik, Kyaw Thu, Takahiko Miyazaki	B122	ICOPE-2021-0208 Conjugated heat transfer simulation of a gas turbine with various flow rate of cooling air ○ Koichi Yonezawa (Central research institute of electric power industry), keita Kado (Kyoto University), Kazuyasu Sugiyama (Osaka University), Shuichi Ohmori (Tokyo Electric Power Company Holdings), Shuichi Umezawa	C122	ICOPE-2021-0283 Evaluation, development, and validation of a new reduced mechanism for syngas oxidation and NO-reburning under air and oxy-fuel combustion ○ Cong Fan (Huazhong University of Science and Technology), Pengfei Li, Cuijiao Ding, Fan Hu, Zhaohui Liu	D122	ICOPE-2021-0268 Characterization of oxidation behavior of Ni-based alloy contains precipitates in supercritical water at 750oC ○ Seitaro Fujiwara (Tohoku University), Yoichi Takeda, Susumu Nakano	
16:10 – 16:30	A123	ICOPE-2021-0203 Topology optimization of the fluid flow layout in a thermal cavity receiver under inhomogeneous heat flux ○ Jun Liu (Huazhong University of Science and Technology), Renfu Li, Jianguo Zheng, Yanping Zhang, Yuxuan Chen, Kun Wang	B123	ICOPE-2021-0166 Development of surrogate models for estimating transient temperature of hot gas path part ○ Eiji Sakai (Central Research Institute of Electric Power Industry), Toshihiko Takahashi, Yuji Ozawa	C123	ICOPE-2021-0260 Comparative study between flameless and swirl flame combustion using low preheating temperature air for NO-reburning ○ Yaowei Liu (Huazhong University of Science and Technology), Pengfei Li, Cuijiao Ding, Fan Hu, Zhaohui Liu	D123	ICOPE-2021-0297 Microstructure and tensile properties of HX alloy fabricated by selective laser melting ○ Hongqi Zhang (Shanghai Electric Power Generation Group), Min Pan, Luyi Tan	
16:30 – 16:50	A124	ICOPE-2021-0293 Thermal analysis of a solar conical receiver under different flow directions ○ Yuxuan Chen (Huazhong University of Science and Technology), Ding Wang, Yanping Zhang, Jun Liu	B124	ICOPE-2021-0255 Unsteady measurements of film cooling effectiveness with fast-response PSP in a linear turbine vane cascade ○ Noriyoshi Fukuoka (Kansai University), Yutaka Oda, Naoto Nakabayashi, Kenichiro Takeishi (Tokushima Bunri University)	C124	ICOPE-2021-0284 Evaluation, reduction, and validation of a new simplified mechanism for propane combustion in both air and oxy-fuel conditions ○ Xinyue Tan (Huazhong University of Science and Technology), Pengfei Li, Cong Fan, Zhaohui Liu	D124	ICOPE-2021-0122 Analysis of novel leakage of water wall tube in a super-critical boiler ○ Zhidong Fan (Xi'an Thermal Power Research Institute Co., Ltd.), Yichao Ma, Bingyin Yao, Zhibo Zhang, Kun Niu, Chengxin Liu, Fangping Zheng, Nuofei Jia, Anwen Zhang	
16:50 – 17:10	A125	ICOPE-2021-0265 Dynamic performance analysis of different schemes of solar tower power plant ○ Yaqian Wang (Xi'an Jiaotong university), Weixiong Chen, Junjie Yan	B125	ICOPE-2021-0172 Assessment of prediction accuracy of droplet-film-interaction - numerical simulation and experimental test rig validation of water film suction slots for low pressure steam turbine guide vanes Dieter Bohn (RWTH Aachen University), ○ Christian Betcher (B&B-AGEMA GmbH), Kristof Weidtmann, Tatsuya Uno (Kawasaki Heavy Industries Ltd.), Takeshi Yoshida	C125	ICOPE-2021-0186 Effect of water droplet diameter and water content in emulsified fuel on the operation characteristics of diesel engine ○ Ghazian Amin Mukhtar (Kindai University), Manabu Fuchihata			

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Room A		Room B		Room C		Room D							
9:00 – 10:20	A21	Renewable Energy (3) Chair: Katsuya Hirata (Doshisha University)		B21	Turbines and Generators (3) Chair: Koichi Yonezawa (CRIEPI)		C21	Other Topics (1) Chair: Ryosuke Matsumoto (Kansai University)		D21	Materials Engineering for Energy Systems (3) Chair: Yoichi Takeda (Tohoku University)		
9:00 – 9:20	A211	ICOPE-2021-0183 Savonius wind turbine performance in high turbulence and its improvement by jet supply ○ Yuichi Murai (Hokkaido University), Takahiro Umemura, Ryosuke Sayama, Yasufumi Horimoto, Hyun Jin Park, Yuji Tasaka, Shuji Otomo (University of Edinburgh)		B211	ICOPE-2021-0136 Evaluation of water-spray characteristics and cooling performance under heated supply-water conditions ○ Naoki Kobayashi (Gunma University), Takuma Komaru, Katsuhiko Sugita (Tokyo Electric Power Company Holdings, Inc.), Shuichi Ohmori, Shuichi Umezawa, Hisanobu Kawashima (Gunma University), Tsuneaki Ishima		C211	ICOPE-2021-0187 Experimental study on preparation of amorphous SiO₂ by fluidized bed combustion of rice husk ○ Jingkai Tan (Xi'an Jiaotong University), Qulan Zhou, Yashu Yao, Na Li		D211	ICOPE-2021-0164 Numerical study on flow irreversibility and wear of elbow-reducer pipe connection with gas-solid two phase flow ○ Chang Wang (Xi'an Jiaotong University), Ming Liu, Yu Wang, JunJie Yan		
9:20 – 9:40	A212	ICOPE-2021-0175 Wind turbine wake evaluation using a vertical profiling Lidar and new CFD porous disk model ○ Tadasuke Yoshida (Hitachi Zosen Corporation), Takanori Uchida (Kyushu University), Masaki Inui (Hitachi Zosen Corporation), Yoshihiro Taniyama (TOSHIBA ENERGY SYSTEMS & SOLUTIONS CORPORATION), Yuki Fukatani		B212	ICOPE-2021-0106 Strategic renovation for existing steam turbine in the electricity market changing ○ Kazuki Ikushima (Mitsubishi Power, Ltd.), Yuichiro Waki, Masaomi Makino, Shinya Isoda, Hidetoshi Fujii, Yuji Akaishi		C212	ICOPE-2021-0262 Study on low-nitrogen combustion technology of double U-shaped slag-tap boilers ○ Xiang Ma (Xi'an Thermal Power Research Institute Co., Ltd.), Yang Wang, Hao Zhou (Tianjin Huaneng Yangliuqing Thermo Power Co., Ltd.), Fan Fang (Xi'an Thermal Power Research Institute Co., Ltd.), Qiang Liu (Tianjin Huaneng Yangliuqing Thermo Power Co., Ltd.), Huiliang Sun		D212	ICOPE-2021-0221 Simulation and experiment on elbow wear in pneumatic conveying system ○ Le Xiao Chen (Xi'an Jiaotong University, China), Lan Qu Zhou, Du Wen, Tian Qing Liu, Na Li		
9:40 – 10:00	A213	ICOPE-2021-0233 Wind turbine wake evaluation considering atmospheric stability using vertical profiling LiDARS ○ Yuki Fukatani (TOSHIBA ENERGY SYSTEMS & SOLUTIONS CORPORATION), Takanori Uchida (Kyushu University), Yoshihiro Taniyama (TOSHIBA ENERGY SYSTEMS & SOLUTIONS CORPORATION), Zhiren Bai, Tadasuke Yoshida (Hitachi Zosen Corporation), Masaki Inui		B213	ICOPE-2021-0270 Validation of a state-of-the-art low-pressure steam turbine at T-point 2 demonstration plant ○ Hiromichi Kitahara (Mitsubishi Power, Ltd.), Soichiro Tabata, Jin Aoyagi, Kazuyuki Matsumoto (MITSUBISHI HEAVY INDUSTRIES, LTD.), Eiji Konishi		C213	ICOPE-2021-0113 On trade-off relation between power and efficiency of piston-cylinder system ○ Hiro Yoshida (former Kanagawa Institute of Technology), Naoto Hagino (Kindai University Technical College)		D213	ICOPE-2021-0155 Prediction of von Mises stress on the membrane wall in a lab-scale arch-fired boiler based on artificial neural work ○ Du Wen (Xi'an Jiaotong University), Qulan Zhou, Yuqing Pan, Xiaole Chen, Na Li		
10:00 – 10:20	A214	ICOPE-2021-0304 Wind wake superposition and interaction with the boundary layer in stable and unstable stratifications ○ Maulidi Barasa (Huazhong University of Science and Technology), Xuemin Li, Yi Zhang, Weiming Xu								D214	ICOPE-2021-0204 Experimental study on the influence of the temperature and thermal stress of water wall in different arrangements of burners ○ Lin Wei (Xi'an Jiaotong University), Qulan Zhou, Zhuhan Liu, Na Li		
10:20 – 10:40	Short Break												

October 19 (Tue.)					International Conference on Power Engineering-2021 (ICOPE-2021)				
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10:40 – 12:20	A22	Renewable Energy (4) Chair: Yuichi Murai (Hokkaido University)	B22	Turbines and Generators (4) Chair: Shuichi Umezawa (Tokyo Electric Power Company Holdings, Inc.)	C22	Hydrogen Energy Technologies (1) Chair: Yutaka Tabe (Hokkaido University)	D22	Distributed Energy Systems (1) Chair: Yukihiro Matsumura (Hiroshima University)	
10:40 – 11:00	A221	ICOPE-2021-0130 Simplified numerical modeling of rotational speed response for a small wind turbine ○ Hiroki Suzuki (Okayama University), Yutaka Hasegawa (Nagoya Institute of Technology), Shinsuke Mochizuki (Yamaguchi University)	B221	ICOPE-2021-0263 Measuring uncertainty of generator efficiency by calorimetric method ○ Dengfeng Cao (China Institute of Water Resources and Hydropower Research), Lian Duan (Powerchina Chengdu Engineering Corporation Limited), Ye Zhou (China Institute of Water Resources and Hydropower Research), Chenglong Li (Beijing IWHR Technology Co., Ltd.)	C221	ICOPE-2021-0154 Superaerophobic hierarchical NiCo-P@Ni electrode for highly efficient hydrogen evolution reaction ○ Run Liu (Chongqing University), Jun Li, Yang Yang, Qian Fu, Liang Zhang, Qiang Liao, Xun Zhu	D221	ICOPE-2021-0127 Kawasaki L30A gas turbine upgrade for improved CHP and CCGP efficiency ○ Yoshihiko Muto (Kawasaki Heavy Industries, Ltd.), Tomoki Taniguchi, Ryoji Tamai, Satoshi Takami, Ryozeo Tanaka, Masanori Ryu	
11:00 – 11:20	A222	ICOPE-2021-0252 Reduction in platform motion and dynamic loads of a floating offshore wind turbine-generator system by feedforward control using previewed wind speed ○ Tetsuya Wakui (Osaka Prefecture University), ○ Kouki Tanaka, Ryohei Yokoyama	B222	ICOPE-2021-0131 Fault detection and application of Repetitive Surge Oscilloscope for large turbo-generator rotor winding inter-turn short circuit ○ Zhongfeng Hou (Xi'an Thermal Power Research Institute), Zhan Liu, Jiayu Wang, Haojun Cao, Shanglin Lv, Min Ren	C222	ICOPE-2021-0266 Visualization of oxygen bubble behavior depending on porous material in PEM water electrolysis cell ○ Konosuke Watanabe (Yokohama National University), Kohei Wakuda, Kodai Wani, Takuto Araki	D222	ICOPE-2021-0184 Thermodynamic optimization of closed air Brayton cycle and air-ORC combined cycle ○ Yiran Qian (Xi'an Jiaotong university), Zhuohua Zhang (Nuclear Power Institute of China), Jingwei Yi, Weixiong Chen (Xi'an Jiaotong university), Ming Liu, Junjie Yan	
11:20 – 11:40	A223	ICOPE-2021-0198 Economic analysis of a waste-to-energy power plant in Shanghai ○ Haonan Fang (Shanghai Jiao Tong University), Yue Pang, Xiaojing Lv, Yiwu Weng	B223	ICOPE-2021-0128 Research of the diagnostic method of insulation failure between excitation windings of large turbine generators ○ Zhan Liu (Xi'an Thermal Power Research Institute), Zhongfeng Hou, Haojun Cao, Shanglin LV, Jiayu Wang	C223	ICOPE-2021-0289 Application of machine learning methods in performance prediction and multi-objective optimization of fuel cell ○ Boshi Xu (Northeast Electric Power University), Hongwei Li	D223	ICOPE-2021-0225 Evaluation of a CO2 network system for district heating and cooling using energy storage tanks ○ Junjo Kajita (Waseda University), Akira Yoshida, Yoshiharu Amano	
11:40 – 12:00	A224	ICOPE-2021-0223 Thermodynamic analysis of Maisotsenko cycle based humidification dehumidification desalination system ○ Mansoor Abdul Aziz (Kyushu University), Kyaw Thu, Takahiko Miyazaki	B224	ICOPE-2021-0271 Research on the turbine efficiency test based on Winter-Kennedy method ○ Ye Zhou (China Institute of Water Resources and Hydropower Research), Lunzhong Xu (Power China Sinohydro Bureau 16 Co., Ltd.), Dengfeng Cao (China Institute of Water Resources and Hydropower Research)	C224	ICOPE-2021-0219 Effects of water accumulation in the proton exchange membrane and the gas diffusion layer on the power generation performance of PEFC. ○ Kazushi Mine (Kobe University), Hideki Murakawa, Katsumi Sugimoto, Hitoshi Asano, Daisuke Ito (Kyoto University), Yasushi Saito	D224	ICOPE-2021-0123 Simulation and optimization of distributed poly-generation system in large community ○ Chang Li (Shandong University), Fupeng Dai (The Personnel Testing Authority of Shandong Province, China), Meng Yue (Shandong University), Yuetao Shi	
12:00 – 12:20					C225	ICOPE-2021-0251 Temperature-controlled microextrusion printing to obtain greater electrode-electrolyte interfacial area in solid oxide fuel cells ○ Cheng Ding (Kyoto University), Haewon Seo, Masashi Kishimoto, Hiroshi Iwai			
12:20 – 13:30	Lunch Break								

October 19 (Tue.)					International Conference on Power Engineering-2021 (ICOPE-2021)								
Room A		Room B		Room C		Room D							
13:30 – 15:10	A23	Renewable Energy (5) Chair: Tetsuaki Takeda (University of Yamanashi)		B23	Other Topics (2) Chair: Hiroki Suzuki (Okayama University)		C23	Hydrogen Energy Technologies (2) Chair: Yuso Oki (CRIEPI)		D23	Distributed Energy Systems (2) Chair: Takuto Araki (Yokohama National University)		
13:30 – 13:50	A231	ICOPE-2021-0158 Role of biomass toward carbon neutral society in 2050 ○ Yukihiko Matsumura (Hiroshima University)		B231	ICOPE-2021-0215 Experimental study on dam outlet works using a link-sleeve valve with air aspiration ○ Takafumi Shimoda (Doshisha University), Keisuke Matsubara (Kurimoto, Ltd), Atsushi Nagase, Koichi Yonezawa (Central Research Institute of Electric Power Industry), Takahiro Sato, Takashi Noguchi (Doshisha University), Katsuya Hirata		C231	ICOPE-2021-0101 Assessment on operation conditions of CH4 dry reforming membrane reactor to produce H2 ○ Akira Nishimura (Mie University), Satoshi Ohata, Tomohiro Takada		D231	ICOPE-2021-0234 Disaster prevention and energy in the city ○ Masataka Kawana (Tokyo University of Marine Science and Technology), Masahiro Osakabe		
13:50 – 14:10	A232	ICOPE-2021-0243 Prediction of biodiesel iodine value from its fatty acids composition using a novel approach ○ Yundi Huang (Kunming University of Science and Technology), Fashe Li, Guirong Bao, Qingtai Xiao		B232	ICOPE-2021-0161 Temperature dependence of temperature sensitive luminophores at cryogenic temperatures ○ Yanrong Li (Ibaraki University), Satoshi Someya (National Institute of Advanced Industrial Science and Technology (AIST)), Sou Yasuzawa (Ibaraki University), Terumi Inagaki, Shimpei Saito (National Institute of Advanced Industrial Science and Technology (AIST)), Soumei Baba, Naoki Takada		C232	ICOPE-2021-0278 Experimental investigation of ammonia-hydrogen interaction in a jet-stirred reactor ○ Guodong Shi (Huazhong University of Science and Technology), Pengfei Li, Cuijiao Ding, Kesheng Li, Fan Hu, Zhaohui Liu		D232	ICOPE-2021-0228 Capacity configuration optimization of an integrated energy system coupled with hydrogen storage for a park Yanjun Guo (Xi'an Jiaotong University), ○ Shuo Zhang, Jinshi Wang, Xiaoqu Han, Ming Liu, Junjie Yan		
14:10 – 14:30	A233	ICOPE-2021-0107 Kinetics analysis and estimation of energy properties of torrefied biomass ○ Toru Sawai (Kindai University), Satoru Mizuno, Fumiya Moriyama		B233	ICOPE-2021-0134 Study on mixing phenomena around a stirring blade in a mixing device ○ Akane Kuwakubo (Meiji University), Tsuyoshi Kawanami		C233	ICOPE-2021-0236 Low NOx hydrogen burner developments for industrial application and small boiler demonstration ○ Yuta Uchiyama (Kawasaki Heavy Industries, Ltd.), Takahiro Uto, Daniel Kroniger, Atsushi Horikawa, Masayoshi Hashimoto (Kawasaki Thermal Engineering Co., Ltd.), Yoshihiko Kanamura, Kazuyuki Makita		D233	ICOPE-2021-0168 Power density of silica nano-holed microcapsule composites based on calcium chloride for chemical heat pump ○ Linbin Zeng (Kobe University), Hiroshi Suzuki, Ruri Hidema, Keiko Fujioka (Functional Fluids Ltd.)		
14:30 – 14:50	A234	ICOPE-2021-0230 The air velocity of starting deposition of biomass particle conveyed by air in the fuel pipes of boilers ○ Shohei Matsunari (IHI Corporation), Toshihiko Yamada, Emi Ohno		B234	ICOPE-2021-0232 Experiment at low Reynolds number on the fluid force acting on an oscillating sphere in viscous fluid ○ Masashi Yamamoto (Doshisha University), Kyohei Matsumoto, Takashi Noguchi, Katsuya Hirata		C234	ICOPE-2021-0277 Development of ammonia co-firing burner with coal for coal firing boiler ○ Ryo Hanaoka (IHI Corporation), Genichiro Nagatani, Hiroki Ishii		D234	ICOPE-2021-0279 Optimization of operating condition of vapor-compression type air-conditioning systems based on genetic algorithm and cycle simulation ○ Tetsuya Wakui (Osaka Prefecture University), Hiroaki Okamura, Ryohei Yokoyama		
14:50 – 15:10	A235	ICOPE-2021-0194 The evaluation of carbonized biomass on hue value as a utilization of renewable energy ○ Akira Suami (Gifu University), Nobusuke Kobayashi, Yoshinori Itaya, Tsuguhiko Nakagawa					C235	ICOPE-2021-0196 A Study on solid oxide fuel cell hybrid system combined with an existing heavy-duty gas turbine to promote the use of hydrogen ○ Ryotaro Yajima (Tohoku University), Susumu Nakano, Yoichi Takeda		D235	ICOPE-2021-0108 Model to adapt fluctuating wind-power heat sources in urban district heating system with DVSP configuration ○ Guang Yang (Tongji University), Hai Wang		
15:10 – 15:30	Short Break												

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15:30 – 17:10	A24	Environmental Protection (1) Chair: Takao Nakagaki (Waseda University)		B24	Operation, Maintenance and Diagnosis Technologies (1) Chair: Weixiong Chen (Xi'an Jiaotong University)		C24	Hydrogen Energy Technologies (3) Chair: Pengfei Li (Huazhong University of Science and Technology)		D24	Power Grid Stabilization Technologies Chair: Hisashi Umekawa (Kansai University)	
15:30 – 15:50	A241	ICOPE-2021-0159 Visible light driven CO2 photocatalytic reduction by Co-porphyrin coupled MgAl layered double hydroxide composite ○ Jie Xu (Huazhong University of Science and Technology), Xiaowei Liu, Zijian Zhou, Lidan Deng, Lei Liu, Minghou Xu		B241	ICOPE-2021-0104 Technique for shortening the term of periodic inspection of a steam turbine utilizing 3D shape measurement and FEA ○ Satoshi Kumagai (Mitsubishi Heavy Industries, Ltd.), Shunsuke Mizumi, Koji Ishibashi, Juichi Kodera		C241	ICOPE-2021-0248 Development of 1MW class hydrogen gas turbine co-generation system and demonstration of supplying heat and power in city area ○ Mitsugu Ashikaga (Kawasaki Heavy Industries, Ltd.), Masato Yamaguchi, Tomoyuki Ogin, Atsushi Horikawa, Shigeki Aoki		D241	ICOPE-2021-0132 The role of heat energy storage in the decentralized electrical grid stabilization: A system analysis ○ Frantisek Miksik (Kyushu University), Takahiko Miyazaki, Josef Kotlik (Brno University of Technology)	
15:50 – 16:10	A242	ICOPE-2021-0189 Experimental study on electrocatalytic reduction of CO2 to methanol over Cu2O and Cu2O/ZnO films ○ Wenfei Zhang (Xi'an Jiaotong University), Qulan Zhou, Ji Qi (China Mobile System Integration Co., Ltd), Na Li (Xi'an Jiaotong University)		B242	ICOPE-2021-0142 Simulation and experimental study of blade vibration monitoring method based on tip timing ○ Chun Guan (Harbin Turbine Company Limited / Harbin Institute of Technology), Feng Yu Li (Harbin Turbine Company Limited), Yu Zhen Weng, Liang Yi Ma, Qing Deng Cao (Harbin Institute of Technology), Liang Hai Xue (Harbin Turbine Company Limited)		C242	ICOPE-2021-0237 Numerical investigation of micromix hydrogen flames at different combustor pressure levels ○ Daniel Kroniger (Kawasaki Heavy Industries, Ltd.), Atsushi Horikawa, Harald H.-W. Funke (Aachen University of Applied Sciences), Franziska Pfaeffle		D242	ICOPE-2021-0218 A recommendation system of an operational strategy for heat pumps with thermal energy storage ○ Akira Yoshida (Waseda University), Yoshiharu Amano	
16:10 – 16:30	A243	ICOPE-2021-0276 Effects of methane addition on the oxidation of ammonia under N2 and CO2 atmosphere in a jet stirred reactor ○ Kesheng Li (Huazhong University of Science and Technology), Pengfei Li, Cuijiao Ding, Guodong Shi, Fan Hu, Zhaohui Liu		B243	ICOPE-2021-0170 Fault diagnosis of blade crack based on blade tip timing and convolution neural network ○ Guangya Zhu (Xi'an Jiaotong University), Di Zhang, Zhufeng Liu, Yonghui Xie		C243	ICOPE-2021-0231 Impact of non-condensable gas on oxygen-hydrogen combustion power generation system ○ Kotaro Takehana (Tokyo Institute of Technology), Muhammad Husein Rahman, Ken Okazaki, Tomohiro Nozaki		D243	ICOPE-2021-0195 Improving load changing rate of heavy duty gas turbine applied with overground compressed air energy storage (CAES) system ○ Kenta Goto (Tohoku University), Susumu Nakano, Hiroki Nonomura, Yoichi Takeda	
16:30 – 16:50	A244	ICOPE-2021-0111 System simulation and analysis of using waste heat of flue gas and steam to dry municipal solid waste ○ Ruxue Bai (Shandong University), Yidan Zhang, Yuetao Shi		B244	ICOPE-2021-0171 Investigation on reduced-order modeling of bladed-disk with contact friction damping ○ Zhufeng Liu (Xi'an Jiaotong University), Yonghui Xie, Guangya Zhu (Xi'an Jiaotong University)		C244	ICOPE-2021-0250 Demonstration of direct spray combustion of liquid ammonia in 2MW-class gas turbine Masahiro Uchida (IHI corporation), ○ Shintaro Ito, Toshiyuki Suda		D244	ICOPE-2021-0191 Long-term operational planning of energy storage and supply systems based on time-domain decomposition Tetsuya Wakui (Osaka Prefecture University), ○ Boyun Zhang, Ryohei Yokoyama	
16:50 – 17:10	A245	ICOPE-2021-0124 Thermal and economic analysis of magnesium sulfate waste liquid concentration and crystallization system using waste heat of flue gas ○ Zhenxue Wang (Shandong University), Mingwei Yan, Yuetao Shi, Fupeng Dai (The Personnel Testing Authority of Shandong Province)		B245	ICOPE-2021-0273 Uncertainty analysis of gas-lubricated microbearings considering surface wear ○ Liangliang Li (Xi'an Jiaotong University), Yupeng Liu, Di Zhang, Yonghui Xie		C245	ICOPE-2021-0257 NOx reduction of city gas/hydrogen mixed combustion by two-stage combustion ○ Daisuke Kobayashi (Kansai University), Koki Arai, Takuma Kanaoka, Ryosuke Matsumoto, Yutaka Oda		D245	ICOPE-2021-0261 Flexible performance and efficiency of coal-fired power plant as share of renewable energies increases ○ Fumihiko Yoshida (Central Research Institute of Electric Power Industry), Yuji Hanai, Isamu Watanabe, Hiromi Shirai	
17:10 – 17:30	Short Break											
17:30 – 19:00	W01	Hydrogen Energy Workshop Panelists: Drs. Ing. Patrick Cnubben (New Energy Coalition, The Netherlands), Dr. Patrick Hartley (CSIRO Energy, Australia) Prof. Zhihua Wang (Zhejiang University, China), Dr. Motohiko Nishimura (Kawasaki Heavy Industries, Ltd., Japan) Moderators: Hitoshi Asano (Kobe University), Masahide Kazari (Kawasaki Heavy Industries, Ltd.)										

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9:00 – 10:40	A31	Environmental Protection (2) Chair: Yoshinori Itaya (Gifu University)	B31	Operation, Maintenance and Diagnosis Technologies (2) Chair: Jinshi Wang (Xi'an Jiaotong University)	C31	Thermal Hydraulics, Boiling and Condensation (1) Chair: Ichiro Ueno (Tokyo University of Science)	D31	Techno-Socio-Economic Aspect of Energy System Chair: Tetsuya Wakui (Osaka Prefecture University)	
9:00 – 9:20	A311	ICOPE-2021-0200 Update of project to develop high-efficiency oxy-fuel IGCC system - Consideration of further efficiency improvement - ○ Yuso Oki (CRIEPI), Yoshinobu Nakao, Hiroki Umetsu, Shiro Kajitani	B311	ICOPE-2021-0143 Detective method for Type IV creep voids inside of high chromium steel weld ○ Iichiro Aizawa (Tohoku Electric Power Engineering & Construction Co., Inc.), Tsuyoshi Mihara (Tohoku University), Kazushige Konno (Tohoku Electric Power Engineering & Construction Co., Inc.), Yuki Ohori, Tadashi Tatsuki (Tohoku Electric Power Co., Inc.), Atsushi Suzuki	C311	ICOPE-2021-0285 Effect of bubble motion on local heat transfer around a tube across horizontal in-line and staggered tube bundles in bubbly and intermittent flows Kyoya Araki (Kobe University), Yuki Jinzenji, Hideki Murakawa, Katsumi Sugimoto, ○ Hitoshi Asano, Sizuka Makimoto (Fuji Electric Co., Ltd.), Ichiro Myougan	D311	ICOPE-2021-0160 Cost comparisons of hydrogen produced from fossil fuels and renewable energy in 2030 ○ Mina Nishi (Central Research Institute of Electric Power Industry), Hiromi Yamamoto, Katsuhito Takei	
9:20 – 9:40	A312	ICOPE-2021-0157 Demonstration of Kawasaki CO2 Capture (KCC) moving-bed system with solid sorbent at coal-fired power plant ○ Shohei Nishibe (Kawasaki Heavy Industries, Ltd.), Katsuhiro Yoshizawa, Takeshi Okumura, Ryohei Numaguchi, Hidetaka Yamada (Research Institute of Innovative Technology for the Earth), Tomohiro Kinoshita, Takayasu Kiyokawa, Quyen T. Vu, Firoz A. Chowdhury, Katsunori Yogo, Kazuo Tanaka (Kawasaki Heavy Industries, Ltd.)	B312	ICOPE-2021-0162 Study on ultrasonic testing of austenitic stainless steel pipe weld in thermal power plant ○ Yichao Ma (Xi'an Thermal Power Research Institute Co., Ltd.), Zhidong Fan, Chengxin Liu, Zhibo Zhang, Shaohu Song, Kun Niu, Wenjuan Liu, Ruofei Jia	C312	ICOPE-2021-0229 Study on direct contact heat transfer during MEB in subcooled pool boiling ○ Yuki Ohkura (Kyushu Institute of Technology), Shosuke Sakamoto, Hirohumi Tanigawa, Takaharu Tsuruta	D312	ICOPE-2021-0112 Thermal system simulation and economic analysis of MSW drying system by steam ○ Xueqing Lu (Shandong University), Yidan Zhang, Yuetao Shi	
9:40 – 10:00	A313	ICOPE-2021-0121 Evaluation CO2 solubility in biphasic solvent with AMP/Ether/Water for CO2 capture ○ Takehiro Esaki (Fukuoka University / Kyusyu University), Yosuke Ueno (Fukuoka University), Hiroki Uchiyama, Yosuke Matsukuma, Hiroshi Machida (Nagoya University)	B313	ICOPE-2021-0153 Research on condition monitoring, failure risk and three dimensional fault location technology of utility boiler ○ Kaixuan Yang (Shanghai Power Equipment Research Institute Co.,LTD), Yong Wang, ZhiCheng Deng, Meng Sun, Gang Ding, LeTian Li, JiaYing Chen	C313	ICOPE-2021-0296 Influence of U-bend on two-phase heat transfer characteristics ○ Yue Pan (Kunming University of Science and Technology), Zhouhang Li, Hua Wang	D313	ICOPE-2021-0238 An energy mix to reach carbon neutral in the electric power generation toward 2050 - Based on the recent four years records of VRE power generation and electricity demand data in Japan- ○ Shoji Kotake (NPO Nuclear Salon), Koji Sato	
10:00 – 10:20	A314	ICOPE-2021-0120 Transfer hydrogenation of CO2 into formaldehyde from aqueous glycerol heterogeneously catalyzed by Ru bound to LDH ○ Lidan Deng (Huazhong University of Science and Technology), Xiaowei Liu, Jie Xu, Zijian Zhou, Shixiang Feng (Tianjin University), Zheng Wang (Chinese Academy of Sciences), Minghou Xu (Huazhong University of Science and Technology)	B314	ICOPE-2021-0299 Study on accurate evaluation method of explosion characteristics of Shenhua bituminous coal and its blended coal ○ Jianwen Xie (Guoneng Guohua (Beijing) Electric Power Research Institute CO.,LTD), Wei Yao (Xi'an Thermal Power Research Institute Co., Ltd.), Jiali Liu, Xilai Zhang	C314	ICOPE-2021-0305 Enhancement on two phase flow boiling via expanding micro channel heat sinks ○ Shaobo Yang (The University of Tokyo), Sihui Hong (The Sun Yat-sen University), Chaobin Dang (Fukui University), Yu Chen (The University of Tokyo)	D314	ICOPE-2021-0118 Cost estimation of CCS integration into thermal power plants in Japan ○ Hirota Isogai (Waseda University), Corey Adam Myers, Takao Nakagaki	
10:20 – 10:40	A315	ICOPE-2021-0264 Non-Catalytic synthesis of hydrocarbons from CO2 with CH4 by activation in microwave plasma promoted by char particles ○ Xiuqiang Zhang (Gifu University), Akira Suami, Nobusuke Kobayashi, Yoshinori Itaya			C315	ICOPE-2021-0226 Prediction model study of critical heat flux in flow boiling heat transfer based on the bubble crowding model ○ Fuchang Chang (Xi'an Jiaotong University), Lele Wang, Xi Li, Yongpeng Hu, Long Liu, Huixiong Li	D315	ICOPE-2021-0169 Analysis of conditions for the power transmission and distribution company to select high shares of variable renewable energy and minimize the total social cost of power supply ○ Binesh Lukwesa (Hokkaido University), Suguru Uemura, Yutaka Tabe	
10:40 – 11:00	Short Break								

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Room A		Room B		Room C	Room D				
11:00 – 12:20	A32	Environmental Protection (3) Chair: Yoshimitsu Tsumita (IHI Corporation)		B32	Operation, Maintenance and Diagnosis Technologies (3) Chair: Atsuki Komiya (Tohoku University)	C32	Thermal Hydraulics, Boiling and Condensation (2) Chair: Chaobin Dang (Fukui University)	D32	Centralized Power Generation Systems (1) Chair: Mina Nishi (CRIEPI)
11:00 – 11:20	A321	ICOPE-2021-0173 Experimental study on the CO-SCR performance of honeycomb-based Fe-Cu/RHA catalyst ○ Yuqing Pan (Xi'an Jiaotong University), Na Li, Du Wen, Shiyuan Ran, Chenyang Wu, Qulan Zhou		B321	ICOPE-2021-0207 Development of a tomography clamp-on ultrasonic flowmeter for measuring biased flows ○ Hideki Murakawa (Kobe University), Asahi Matsuo, Katsumi Sugimoto, Shuichi Umezawa (Tokyo Electric Power Company Holdings, Inc.), Takeshi Suzuki, Shuichi Ohmori	C321	ICOPE-2021-0192 Experimental study on flow boiling heat transfer of R1234yf inside a 3.5 mm OD horizontal microfin tube ○ Afdhal Kurniawan Mainil (Saga University), Naoki Sakamoto, Hakimatul Ubudiyah, Keishi Kariya, Akio Miyara	D321	ICOPE-2021-0148 Dynamic simulation of the rapid load-change performance of a large-scale gas turbine combined cycle power plant ○ Yutaka Watanabe (Central Research Institute of Electric Power Industry), Toru Takahashi, Kojun Suzuki
11:20 – 11:40	A322	ICOPE-2021-0126 Absorption refrigeration cycle for automotive air conditioning ○ Kai Togashi (Graduate school of Kanto-gakuin university), Atsushi Tsujimori (Kanto-gakuin university), Reiwa Suzuki		B322	ICOPE-2021-0239 Void fraction estimation in vertical gas-liquid flow by multi-layer long short-term memory implemented in current-voltage system (mLSTM-SM-CV) ○ Daisuke Saito (Chiba University), Koji Tanaka, Prima Asmara Sejati (Chiba University / Universitas Gadjah Mada), Yosephus Ardean Kurnianto Prayitno, Masahiro Takei (Chiba University)	C322	ICOPE-2021-0178 Effect of gravity on flow condensation heat transfer of R134a in mini-channel Ruitao Song (Tianjin University), ○ Xuetao Liu, Minxia Li, Qifan Wang, Haomiao Zhan, Ning Zhang, Pengwei Qin	D322	ICOPE-2021-0280 Performance enhancement comparison of a gas turbine combined cycle system by introducing a refrigeration cycle using environment-friendly refrigerants to recover waste heat ○ Yang Du (Xi'an Jiaotong University / Technical University of Denmark), Yicen Zhang (Xi'an Jiaotong University), Nan Jiang, Xiaochen Lu, Yiping Dai
11:40 – 12:00	A323	ICOPE-2021-0197 Improvement of LiBr-H₂O pairs absorption heat pump performance using LiBr fine crystal slurry ○ Dio Afinanda Makarim (Gifu University), Pranowo Pranowo (Gifu University / Universitas Atma Jaya Yogyakarta), Agung Tri Wijayanta (Sebelas Maret University), Akira Suami (Gifu University), Nobusuke Kobayashi, Yoshinori Itaya		B323	ICOPE-2021-0288 Simulation and experimental research on gas temperature deviation on retrofitting to bituminous coals in tangentially lean coal boiler Jun Zhao (China Huadian in Hubei power generation company LTD.), Jin Wang (Huazhong University of Science and Technology), Xiaopei Li (China Huadian in Hubei power generation company LTD.), Qiang Cheng (Huazhong University of Science and Technology), ○ Zixue Luo	C323	ICOPE-2021-0119 Experimental study on vapor bubble oscillation and boiling sound in microbubble emission boiling (MEB) ○ Hotaka Kobayashi (Tokyo University of Science), Kizuku Kurose, Ichiro Ueno	D323	ICOPE-2021-0275 A comparative analysis of solid oxide fuel cell combined power generation systems ○ Kalimuthu Selvam (The University of Tokyo), Yosuke Komatsu, Anna Sciazko, Shozo Kaneko, Naoki Shikazono
12:00 – 12:20	A324	ICOPE-2021-0269 Analysis and feasibility study of typical F-class gas turbine SCR denitrification low-load operation and "yellow smoke" control ○ Lele Wang (Xian Thermal Power Research Institute Co. Ltd.), Yunlong Ma, Qiang Bao, Kaizhu Wang (Huaneng Jinling Gas Turbine Power Plant), Menglei Qing (Xian Thermal Power Research Institute Co. Ltd.), Daoshun Jiao (Huaneng Jinling Gas Turbine Power Plant), Cheng Dong (Xian Thermal Power Research Institute Co. Ltd.), Siyuan Lei, Jun Xiang (Huazhong Univ. of Sci. and Tech.), Sheng Su		B324	ICOPE-2021-0109 Validation of modified genetic algorithm in source term inversion of nuclear accident ○ Xuan Wang (Shanghai Nuclear Engineering Research & Design Institute CO., LTD), Bo Wang (Nuclear and Radiation Safety Center, Ministry of Ecology and Environment), Feng ze Han (Shanghai Nuclear Engineering Research & Design Institute CO., LTD), Li Guo (National Nuclear Emergency Response Technical Support Center, National Defense Science and Industry Administration), Xiu Jing Lin	C324	ICOPE-2021-0259 Measurement of evaporation heat transfer by falling film on horizontal tube having porous bodies ○ Sho Fukuda (Kyushu Sangyo University), Kazuhi Miyata (Fukuoka University), Shuichi Umezawa (Tokyo Electric Power Company Holdings, Inc.)	D324	ICOPE-2021-0227 Multiple load short-term forecasting model of integrated energy system based on multiple LSTM networks ○ Yanchun Cai (Xi'an Jiaotong University), Kaiwen Xu, Daotong Chong, Jinshi Wang, Junjie Yan, Ming Liu
12:20 – 13:30	Lunch Break								

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Room A		Room B		Room C		Room D							
13:30 – 14:50	A33	Other Topics (3) Chair: Yutaka Oda (Kansai University)		B33	Operation, Maintenance and Diagnosis Technologies (4) Chair: Toru Sawai (Kindai University)		C33	Thermal Hydraulics, Boiling and Condensation (3) Chair: Takaharu Tsuruta (Kyushu Institute of Technology)		D33	Centralized Power Generation Systems (2) Chair: Yoshiharu Amano (Waseda University)		
13:30 – 13:50	A331	ICOPE-2021-0167 Theoretical research on mercury-laden halogenated activated carbon adsorbent product stability ○ Ruize Sun (Huazhong University of Science and Technology), Guangqian Luo, Xian Li, Hong Tian (Changsha University of Science and Technology), Hong Yao (Huazhong University of Science and Technology)		B331	ICOPE-2021-0129 Prediction of ash-deposition characteristics in co-combustion conditions with CCSEM ○ Takehito Mori (Tohoku Electric Power Engineering & Construction Co., Inc. / Chubu University. / Tohoku Ryokka Kankyo Hozen Co., Ltd.), Hiroshi Naganuma (Tohoku Electric Power Engineering & Construction Co., Inc.), Yoshihiro Abe (Tohoku Ryokka Kankyo Hozen Co., Ltd.), Yasunori Hishinuma, Yoshihiko Ninomiya (Chubu University.)		C331	ICOPE-2021-0220 Applicability of clamp-on ultrasonic flow meter to wet steam in carbon steel pipes of different diameters ○ Yuta Uchiyama (Central Research Institute of Electric Power Industry), Ryo Morita, Shuichi Umezawa (Tokyo Electric Power Company Holdings, Inc.), Masayuki Ibi, Hirotoshi Taira, Hajime Akahane (TEPCO Energy Partner, Inc.)		D331	ICOPE-2021-0110 The rotor design solution of supercritical CO2 turbine unit Zhenya Li (Shanghai Power Equipment Research Institute Company Limited), ○ Wenjie Bian, Feng Zhao, Xuefei Fan		
13:50 – 14:10	A332	ICOPE-2021-0146 Experimental investigation of the effect of preheating on the performance of a novel thermally driven pumping system ○ Yemanebirhan Tadesse Abirham (Kyushu University), Nobuo Takata, Kyaw Thu, Takahiko Miyazaki		B332	ICOPE-2021-0125 Ash deposition mechanisms in Waste-to-Energy plants ○ Hiroshi Naganuma (Tohoku Electric Power Engineering & Construction, Co., Inc.), Takehito Mori, Sho Watanabe, Akihiro Sawada, Taeko Goto, Yasuaki Ueki (Nagoya University), Ryo Yoshiie, Ichiro Naruse		C332	ICOPE-2021-0152 Numerical simulation on metal temperature and heat flux of the superheater in a coal-fired thermal power plant boiler ○ Kizuku Kurose (Tokyo University of Science), Kazushi Miyata (Fukuoka University), Shuichi Umezawa (Tokyo Electric Power Company Holdings), Shuichi Ohmori		D332	ICOPE-2021-0174 Energy potential matching analysis of coal utilization processes of gasification ○ Ruiqi Mu (Xi'an Jiaotong University), Ming Liu, Junjie Yan		
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SAITO Yasushi	C224: Hydrogen Energy Technologies 1
SAKAI Eiji	B123: Turbines and Generators 2
SAKAMOTO Naoki	C321: Thermal Hydraulics, Boiling and Condensation 2
SAKAMOTO Shosuke	C312: Thermal Hydraulics, Boiling and Condensation 1
SATO Koji	D313: Techno-Socio-Economic Aspect of Energy System 1
SATO Takahiro	B231: Other Topics 2
SAWADA Akihiro	B332: Operation, Maintenance and Diagnosis Technologies 4
SAWAI Toru	A233: Renewable Energy 5
SAYAMA Ryosuke	A211: Renewable Energy 3
SCIAZKO Anna	D323: Centralized Power Generation Systems 1
SEJATI ASMARA Prima	B322: Operation, Maintenance and Diagnosis Technologies 3
SELVAM Kalimuthu	D323: Centralized Power Generation Systems 1
SEO Haewon	C225: Hydrogen Energy Technologies 1
SHI Guodong	A243: Environmental Protection 1

	C113: Advanced Combustion Technology 1
	C232: Hydrogen Energy Technologies 2
SHI Yuetao	A244: Environmental Protection 1
	A245: Environmental Protection 1
	D224: Distributed Energy Systems 1
	D312: Techno-Socio-Economic Aspect of Energy System 1
SHIKAZONO Naoki	D323: Centralized Power Generation Systems 1
SHIMODA Takafumi	B231: Other Topics 2
SHIRAI Hiromi	D245: Power Grid Stabilization Technology 1
SOMEYA Satoshi	B232: Other Topics 2
SONG Ruitao	C322: Thermal Hydraulics, Boiling and Condensation 2
SONG Shaohe	B312: Operation, Maintenance and Diagnosis Technologies 2
SU Sheng	A324: Environmental Protection 3
SUAMI Akira	A235: Renewable Energy 5
	A315: Environmental Protection 2
	A323: Environmental Protection 3
SUDA Toshiyuki	C244: Hydrogen Energy Technologies 3
SUGIMOTO Katsumi	A114: Renewable Energy 1
	B321: Operation, Maintenance and Diagnosis Technologies 3
	C224: Hydrogen Energy Technologies 1
	C311: Thermal Hydraulics, Boiling and Condensation 1
SUGITA Katsuhiko	B211: Turbines and Generators 3
SUGIYAMA Kazuyasu	B122: Turbines and Generators 2
SUN Huiliang	C212: Other Topics 1
SUN Meng	B313: Operation, Maintenance and Diagnosis Technologies 2
SUN Ruize	A331: Other Topics 3
SUN Xuenan	A333: Other Topics 3
SUZUKI Atsushi	B311: Operation, Maintenance and Diagnosis Technologies 2
SUZUKI Hiroki	A221: Renewable Energy 4
SUZUKI Hiroshi	D233: Distributed Energy Systems 2
SUZUKI Kojun	D321: Centralized Power Generation Systems 1
SUZUKI Reiwa	A322: Environmental Protection 3
SUZUKI Takeshi	B112: Turbines and Generators 1
	B321: Operation, Maintenance and Diagnosis Technologies 3
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TABATA Soichiro	B213: Turbines and Generators 3

TABE Yutaka	D315: Techno-Socio-Economic Aspect of Energy System 1
TAGUCHI Yuzo	C112: Advanced Combustion Technology 1
TAIRA Hiroto	C331: Thermal Hydraulics, Boiling and Condensation 3
TAKADA Naoki	B232: Other Topics 2
TAKADA Tomohiro	C231: Hydrogen Energy Technologies 2
TAKAHASHI Toru	D321: Centralized Power Generation Systems 1
TAKAHASHI Toshihiko	B123: Turbines and Generators 2
TAKAMI Satoshi	D221: Distributed Energy Systems 1
TAKANO Satoru	C333: Thermal Hydraulics, Boiling and Condensation 3
TAKASHIMA Yohei	C112: Advanced Combustion Technology 1
TAKATA Nobuo	A332: Other Topics 3
TAKEDA Tetsuaki	A111: Renewable Energy 1
	A112: Renewable Energy 1
	A115: Renewable Energy 1
TAKEDA Yoichi	C235: Hydrogen Energy Technologies 2
	D111: Materials Engineering for Energy Systems 1
	D121: Materials Engineering for Energy Systems 2
	D122: Materials Engineering for Energy Systems 2
	D243: Power Grid Stabilization Technology 1
TAKEHANA Kotaro	C243: Hydrogen Energy Technologies 3
TAKEI Katsuhito	D311: Techno-Socio-Economic Aspect of Energy System 1
TAKEI Masahiro	B322: Operation, Maintenance and Diagnosis Technologies 3
TAKEISHI Kenichiro	B124: Turbines and Generators 2
TAMAI Ryoji	D221: Distributed Energy Systems 1
TAN Jingkao	C211: Other Topics 1
TAN Luyi	B113: Turbines and Generators 1
	D123: Materials Engineering for Energy Systems 2
TAN Xinyue	C124: Advanced Combustion Technology 2
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TANAKA Koji	B322: Operation, Maintenance and Diagnosis Technologies 3
TANAKA Kouki	A222: Renewable Energy 4
TANAKA Ryozeu	D221: Distributed Energy Systems 1
TANG Bo	B115: Turbines and Generators 1
TANIGAWA Hirohumi	C312: Thermal Hydraulics, Boiling and Condensation 1
TANIGUCHI Tomoki	D221: Distributed Energy Systems 1
TANIYAMA Yoshihiro	A212: Renewable Energy 3

TASAKA Yuji	A213: Renewable Energy 3
TATSUKI Tadashi	A211: Renewable Energy 3
THU Kyaw	B311: Operation, Maintenance and Diagnosis Technologies 2
	A122: Renewable Energy 2
	A224: Renewable Energy 4
	A332: Other Topics 3
TIAN Hong	A331: Other Topics 3
TOGASHI Kai	A322: Environmental Protection 3
TORIYAMA Koji	A113: Renewable Energy 1
TSUJIMORI Atsushi	A322: Environmental Protection 3
TSUMURA Toshikazu	C112: Advanced Combustion Technology 1
TSURUTA Takaharu	C312: Thermal Hydraulics, Boiling and Condensation 1
U	
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UCHIDA Masahiro	C244: Hydrogen Energy Technologies 3
UCHIDA Takanori	A212: Renewable Energy 3
	A213: Renewable Energy 3
UCHIYAMA Hiroki	A313: Environmental Protection 2
UCHIYAMA Yuta	C233: Hydrogen Energy Technologies 2
	C331: Thermal Hydraulics, Boiling and Condensation 3
UEKI Yasuaki	B332: Operation, Maintenance and Diagnosis Technologies 4
UEMURA Suguru	D315: Techno-Socio-Economic Aspect of Energy System 1
UENO Ichiro	C323: Thermal Hydraulics, Boiling and Condensation 2
UENO Yosuke	A313: Environmental Protection 2
UMEMURA Takahiro	A211: Renewable Energy 3
UMETSU Hiroki	A311: Environmental Protection 2
UMEZAWA Shuichi	B112: Turbines and Generators 1
	B114: Turbines and Generators 1
	B121: Turbines and Generators 2
	B122: Turbines and Generators 2
	B211: Turbines and Generators 3
	B321: Operation, Maintenance and Diagnosis Technologies 3
	C324: Thermal Hydraulics, Boiling and Condensation 2
	C331: Thermal Hydraulics, Boiling and Condensation 3
	C332: Thermal Hydraulics, Boiling and Condensation 3
UNO Tatsuya	B125: Turbines and Generators 2

UTO Takahiro

C233: Hydrogen Energy Technologies 2

V

VELUT Stephane

D334: Centralized Power Generation Systems 2

VU T. Quyen

A312: Environmental Protection 2

W

WAKAZONO Susumu

B111: Turbines and Generators 1

WAKI Yuichiro

B212: Turbines and Generators 3

WAKISHIMA Kyosuke

A113: Renewable Energy 1

WAKUDA Kohei

C222: Hydrogen Energy Technologies 1

WAKUI Tetsuya

A222: Renewable Energy 4

D234: Distributed Energy Systems 2

D244: Power Grid Stabilization Technology 1

WANG Bo

B324: Operation, Maintenance and Diagnosis Technologies 3

WANG Chang

D211: Materials Engineering for Energy Systems 3

WANG Ding

A124: Renewable Energy 2

WANG Fei

P02: Plenary Lecture 2

WANG HANG Yu

A334: Other Topics 3

WANG Hai

D235: Distributed Energy Systems 2

WANG Hongyu

A333: Other Topics 3

WANG Hua

C313: Thermal Hydraulics, Boiling and Condensation 1

WANG Jiaju

B222: Turbines and Generators 4

B223: Turbines and Generators 4

WANG Jie

B113: Turbines and Generators 1

WANG Jin

B323: Operation, Maintenance and Diagnosis Technologies 3

WANG Jinshi

D232: Distributed Energy Systems 2

D324: Centralized Power Generation Systems 1

WANG Kaizhu

A324: Environmental Protection 3

WANG Kun

A123: Renewable Energy 2

WANG Lele

A324: Environmental Protection 3

C315: Thermal Hydraulics, Boiling and Condensation 1

WANG Qifan

C322: Thermal Hydraulics, Boiling and Condensation 2

WANG Xuan

B324: Operation, Maintenance and Diagnosis Technologies 3

WANG Yang

C212: Other Topics 1

WANG Yaqian

A125: Renewable Energy 2

WANG Yong

B313: Operation, Maintenance and Diagnosis Technologies 2

WANG Yu	B333: Operation, Maintenance and Diagnosis Technologies 4
WANG Yuqi	D211: Materials Engineering for Energy Systems 3
WANG Zheng	B115: Turbines and Generators 1
WANG Zhenxue	A314: Environmental Protection 2
WANI Kodai	A245: Environmental Protection 1
WATANABE Isamu	C222: Hydrogen Energy Technologies 1
WATANABE Konosuke	D245: Power Grid Stabilization Technology 1
WATANABE Sho	C222: Hydrogen Energy Technologies 1
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WEI Lin	D321: Centralized Power Generation Systems 1
WEI Wang	D214: Materials Engineering for Energy Systems 3
WEIDTMANN Kristof	D334: Centralized Power Generation Systems 2
WEN Du	B125: Turbines and Generators 2
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	D213: Materials Engineering for Energy Systems 3
WENG Yiwu	A223: Renewable Energy 4
WENG ZHEN Yu	B242: Operation, Maintenance and Diagnosis Technologies 1
WIJAYANTA TRI Agung	A323: Environmental Protection 3
WIRSUM Manfred	C111: Advanced Combustion Technology 1
WU Chenyang	A321: Environmental Protection 3
X	
XIANG Jun	A324: Environmental Protection 3
XIAO Qingtai	A232: Renewable Energy 5
XIE Jianwen	B314: Operation, Maintenance and Diagnosis Technologies 2
XIE Yonghui	B115: Turbines and Generators 1
	B243: Operation, Maintenance and Diagnosis Technologies 1
	B244: Operation, Maintenance and Diagnosis Technologies 1
	B245: Operation, Maintenance and Diagnosis Technologies 1
XU Boshi	C223: Hydrogen Energy Technologies 1
XU Jie	A241: Environmental Protection 1
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XU Kaiwen	D324: Centralized Power Generation Systems 1
XU Lunzhong	B224: Turbines and Generators 4
XU Minghou	A241: Environmental Protection 1
	A314: Environmental Protection 2

XU Weiming	A214: Renewable Energy 3
XUE Binghan	B334: Operation, Maintenance and Diagnosis Technologies 4
XUE HAI Liang	B242: Operation, Maintenance and Diagnosis Technologies 1
Y	
YAJIMA Ryotaro	C235: Hydrogen Energy Technologies 2
YAMADA Hidetaka	A312: Environmental Protection 2
YAMADA Shingen	A112: Renewable Energy 1
YAMADA Toshihiko	A234: Renewable Energy 5
YAMAGUCHI Masato	C241: Hydrogen Energy Technologies 3
YAMAMOTO Hiromi	D311: Techno-Socio-Economic Aspect of Energy System 1
YAMAMOTO Joji	C333: Thermal Hydraulics, Boiling and Condensation 3
YAMAMOTO Kota	B114: Turbines and Generators 1
YAMAMOTO Marcio	C333: Thermal Hydraulics, Boiling and Condensation 3
YAMAMOTO Masashi	B234: Other Topics 2
YAMAMOTO Satoru	B112: Turbines and Generators 1
YAN JunJie	D211: Materials Engineering for Energy Systems 3
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	D324: Centralized Power Generation Systems 1
	D332: Centralized Power Generation Systems 2
	D333: Centralized Power Generation Systems 2
YAN Mingwei	A245: Environmental Protection 1
YANG Guang	D235: Distributed Energy Systems 2
YANG Kaixuan	B313: Operation, Maintenance and Diagnosis Technologies 2
	D333: Centralized Power Generation Systems 2
YANG Shaobo	C314: Thermal Hydraulics, Boiling and Condensation 1
YANG Yang	C221: Hydrogen Energy Technologies 1
YAO Bingyin	D124: Materials Engineering for Energy Systems 2
YAO Hong	A331: Other Topics 3
YAO Wei	B314: Operation, Maintenance and Diagnosis Technologies 2
YAO Yashu	C211: Other Topics 1
YASUZAWA Sou	B232: Other Topics 2
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YOGO Katsunori	A312: Environmental Protection 2

YOKOYAMA Ryohei	A222: Renewable Energy 4 D234: Distributed Energy Systems 2 D244: Power Grid Stabilization Technology 1
YONEZAWA Koichi	B112: Turbines and Generators 1 B114: Turbines and Generators 1 B122: Turbines and Generators 2 B231: Other Topics 2
YOSHIBA Fumihiko	D245: Power Grid Stabilization Technology 1
YOSHIDA Akira	D223: Distributed Energy Systems 1 D242: Power Grid Stabilization Technology 1
YOSHIDA Hiro	C213: Other Topics 1
YOSHIDA Masumi	D111: Materials Engineering for Energy Systems 1
YOSHIDA Tadasuke	A212: Renewable Energy 3 A213: Renewable Energy 3
YOSHIDA Takeshi	B125: Turbines and Generators 2
YOSHIIE Ryo	B332: Operation, Maintenance and Diagnosis Technologies 4
YOSHIZAWA Katsuhiko	A312: Environmental Protection 2
YOU Jiarui	B115: Turbines and Generators 1
YUE Meng	D224: Distributed Energy Systems 1
YURI Masanori	B111: Turbines and Generators 1
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ZENG Linbin	D233: Distributed Energy Systems 2
ZHAN Haomiao	C322: Thermal Hydraulics, Boiling and Condensation 2
ZHANG Anwen	D124: Materials Engineering for Energy Systems 2
ZHANG Boyun	D244: Power Grid Stabilization Technology 1
ZHANG Di	B115: Turbines and Generators 1 B243: Operation, Maintenance and Diagnosis Technologies 1 B245: Operation, Maintenance and Diagnosis Technologies 1
ZHANG Hongqi	D123: Materials Engineering for Energy Systems 2
ZHANG Liang	C221: Hydrogen Energy Technologies 1
ZHANG Ning	C322: Thermal Hydraulics, Boiling and Condensation 2
ZHANG Peiye	A121: Renewable Energy 2
ZHANG Qiang	B333: Operation, Maintenance and Diagnosis Technologies 4
ZHANG Shuo	D232: Distributed Energy Systems 2
ZHANG Wenfei	A242: Environmental Protection 1
ZHANG Xilai	B314: Operation, Maintenance and Diagnosis Technologies 2

ZHANG Xiuqiang	A315: Environmental Protection 2
ZHANG Yanping	A123: Renewable Energy 2 A124: Renewable Energy 2
ZHANG Yi	A214: Renewable Energy 3
ZHANG Yicen	D322: Centralized Power Generation Systems 1
ZHANG Yidan	A244: Environmental Protection 1 D312: Techno-Socio-Economic Aspect of Energy System 1
ZHANG Yukun	B113: Turbines and Generators 1
ZHANG Zhibo	B312: Operation, Maintenance and Diagnosis Technologies 2 D124: Materials Engineering for Energy Systems 2
ZHANG Zhuohua	D222: Distributed Energy Systems 1
ZHAO Feng	D331: Centralized Power Generation Systems 2
ZHAO Jun	B323: Operation, Maintenance and Diagnosis Technologies 3
ZHAO Qinxin	D112: Materials Engineering for Energy Systems 1
ZHENG Fangping	D124: Materials Engineering for Energy Systems 2
ZHENG Hongyu	C114: Advanced Combustion Technology 1 C115: Advanced Combustion Technology 1
ZHENG Jianguo	A123: Renewable Energy 2
ZHONG Cengsi	B333: Operation, Maintenance and Diagnosis Technologies 4
ZHOU Hao	C212: Other Topics 1
ZHOU Haoyang	B113: Turbines and Generators 1
ZHOU QU Lan	D212: Materials Engineering for Energy Systems 3
ZHOU Qulan	A242: Environmental Protection 1 A321: Environmental Protection 3 C211: Other Topics 1 D113: Materials Engineering for Energy Systems 1 D213: Materials Engineering for Energy Systems 3 D214: Materials Engineering for Energy Systems 3
ZHOU Ye	B221: Turbines and Generators 4 B224: Turbines and Generators 4
ZHOU Zijian	A241: Environmental Protection 1 A314: Environmental Protection 2
ZHU Guangya	B243: Operation, Maintenance and Diagnosis Technologies 1 B244: Operation, Maintenance and Diagnosis Technologies 1
ZHU Xun	C221: Hydrogen Energy Technologies 1

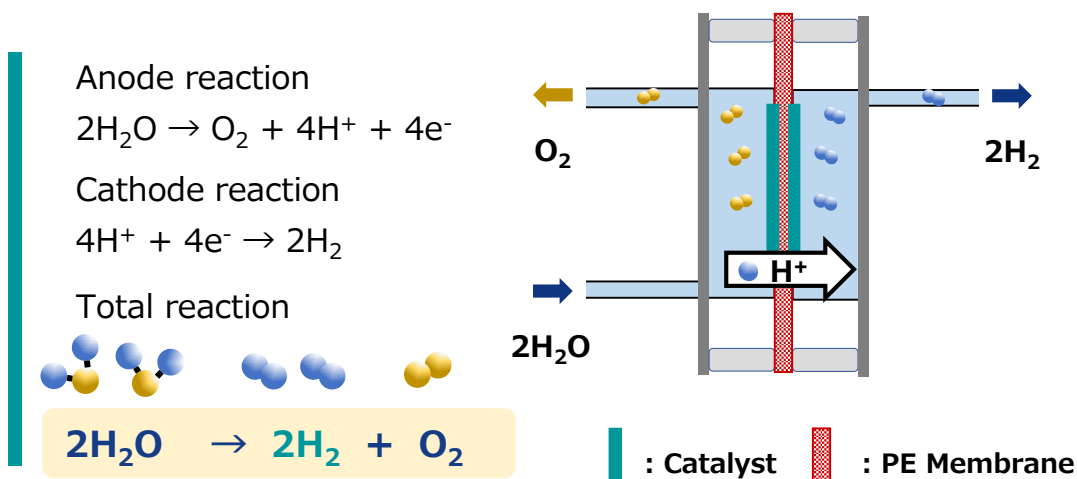
Sponsors

概要 Outline

当社は、電気と水を原料として二酸化炭素の発生が無いクリーンなオンサイト型水素発生装置“HYDROSPRING®”を開発しました。
本装置により、再生可能エネルギー導入拡大に加え、CO₂フリーな水素社会構築に貢献していきます。

Hitachi Zosen has developed “HYDROSPRING” which is an on-site hydrogen generator providing hydrogen only from electricity and water, without emitting CO₂.
We contribute to expand renewable energy and realize the sustainable hydrogen society.

■ オンサイト型水素発生装置 On-site Hydrogen Generation System



当社は2000年に固体高分子型水素発生装置“HYDROSPRING”の販売を開始し、多数の納入実績を重ねており、国内初となる40フィートコンテナに収納された大型固体高分子型水素発生装置を開発しました。

本装置は日立造船の持つ電解技術とフィルタープレス技術の融合により大型化を実現し、200Nm³/hの水素製造能力を有しているため、再生可能エネルギーなどのMW級電力を水素に変換・貯蔵することが可能です。

また、コンテナに内蔵した屋外仕様であるため、新たに建屋を建造する必要がなく、従来よりも設置コストを低減することができます。

“HYDROSPRING”, Proton Exchange Membrane-type (PEM-type), is commercialized in 2000 and has developed larger system enclosed in a 40-foot container.

HYDROSPRING has a capacity of 200Nm³/h for enabling the storage of surplus power at megawatt-scale power generation facilities and have been developed by uniting Hitachi Zosen’s own technologies, electrolysis and filter press. This system is all-in-package in container so that it can be installed easily and there is no need of constructing the building.

HydroSpring ^{H₂}





**Realizing a
Decarbonized Society**



-253°C

Japan's first hydrogen liquefier, capable of producing liquefied hydrogen at the cryogenic temperature of -253°C.

Production

1

800

Liquefaction shrinks the volume of hydrogen to 1/800, making mass transportation possible.



Transportation

Paving the way for a hydrogen-based society

We will contribute to the creation of a prosperous future through our technologies and products for achieving decarbonization.



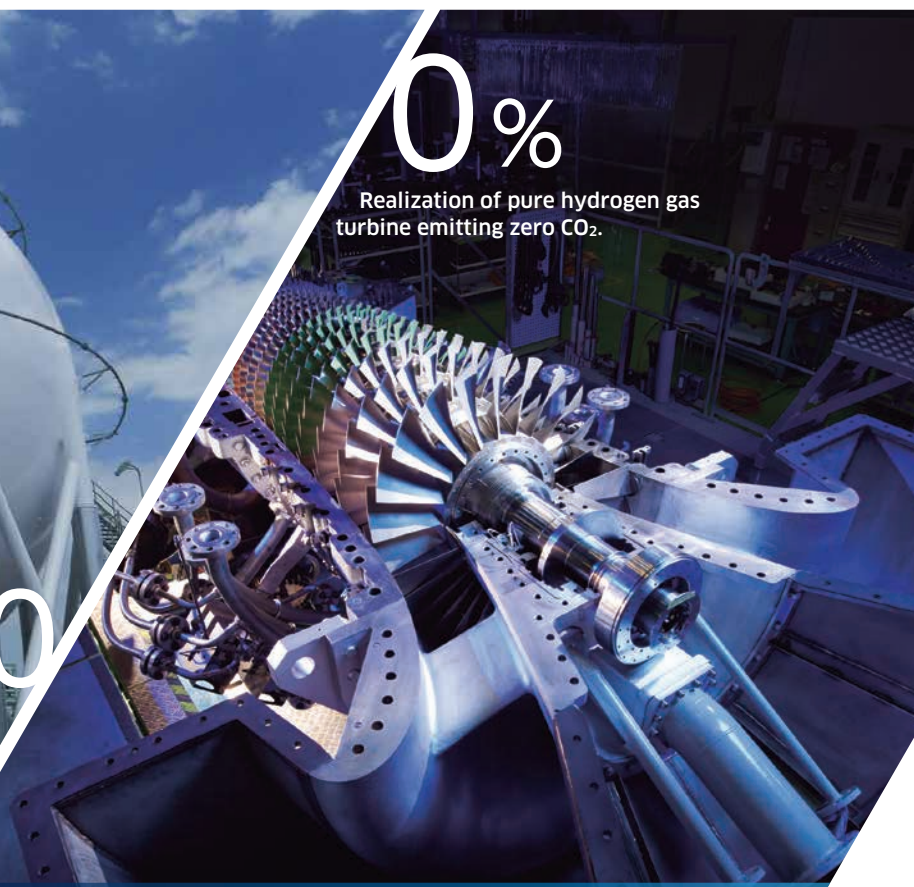
30,000 vehicles

Development of a huge hydrogen storage tank equivalent to the total volume of 30,000 fuel cell vehicles' fuel.

Storage

0%

Realization of pure hydrogen gas turbine emitting zero CO₂.



Utilization

Transition to a carbon-free society powered by hydrogen energy.

CO₂-free electricity produced by hydrogen gas turbines.

The world is daring to dream.

Transition to a carbon-free society with leading
power generation technology and solutions.

Mitsubishi Power energy transition.

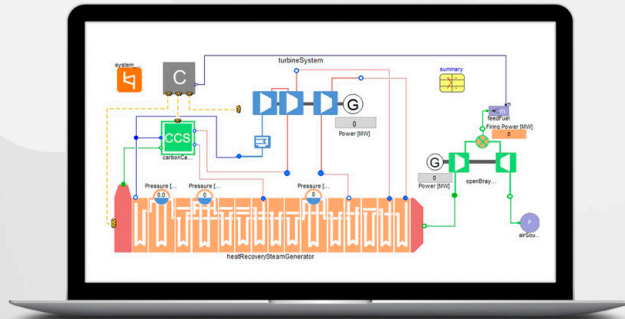


MOVE THE WORLD FORWARD  **MITSUBISHI
HEAVY
INDUSTRIES
GROUP**

 **MITSUBISHI
POWER**

Mitsubishi Power is a power solutions brand
of Mitsubishi Heavy Industries.

Power and Heat Generation in Modelon Impact!



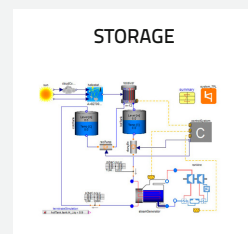
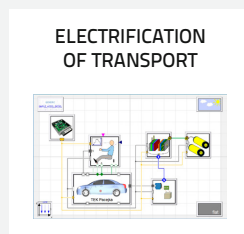
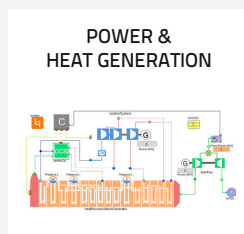
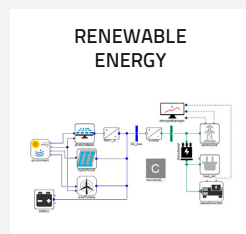
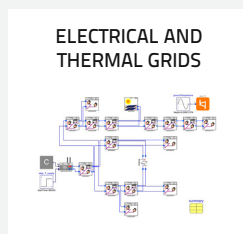
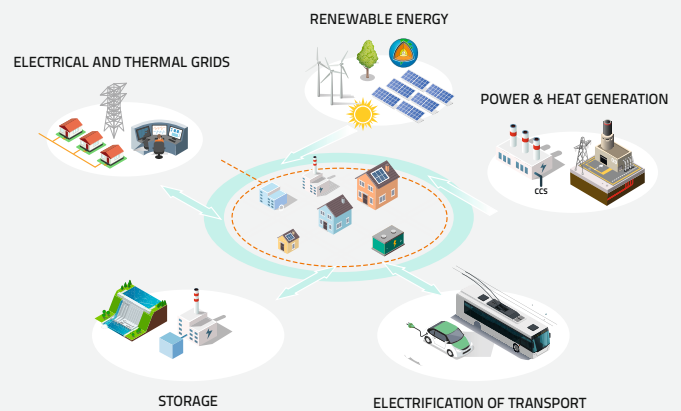
- Thermal Power Plants
- Steam, CO₂, & Organic Rankine Cycles
- Control & Plant Design
- Flexibility Analysis
- Carbon Capture
- Hydrogen Gas-Turbine Retrofit



Modelon Impact

Cloud-native and accessible through your browser, **Modelon Impact** supports systems simulation, optimization, and analysis to enable engineering insight and decision making. Modelon Impact can be used for analysis and design of power plants, renewable energy generation and integration systems, storage systems, carbon capture plants or hydrogen-based solutions.

For more information, visit [here](#).



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www.modelon.com





ひとつひとつ、ミライへ向けて あなたと一緒に進み続ける。

持続可能な社会のために、
Daigasグループの私たちは挑み続ける。

例えば、カーボンニュートラル社会の実現。
例えば、新しい時代の暮らしとビジネスの実現。
例えば、より安心して安全な社会の実現。

ひとつひとつ、ミライへ向けて
あなたと一緒に進み続ける。

ぐっとそばで、ぐぐっとミライ。

Daigas
Group

大阪ガスグループは、
Daigasグループへ。

水素がつなぐ未来

地球環境への負荷の少ない「再生可能エネルギー」。

しかし自然の力を利用しているため、

社会に必要なエネルギーを安定して供給することが難しいという課題があります。

水素はその課題を解決するキーテクノロジーとなります。

東芝は水素をつくるときもつかうときも CO₂ を排出しない

ゼロ・エミッションの技術を提供します。

A future connected by Hydrogen.

“Renewable energy” with less impact on the global environment.

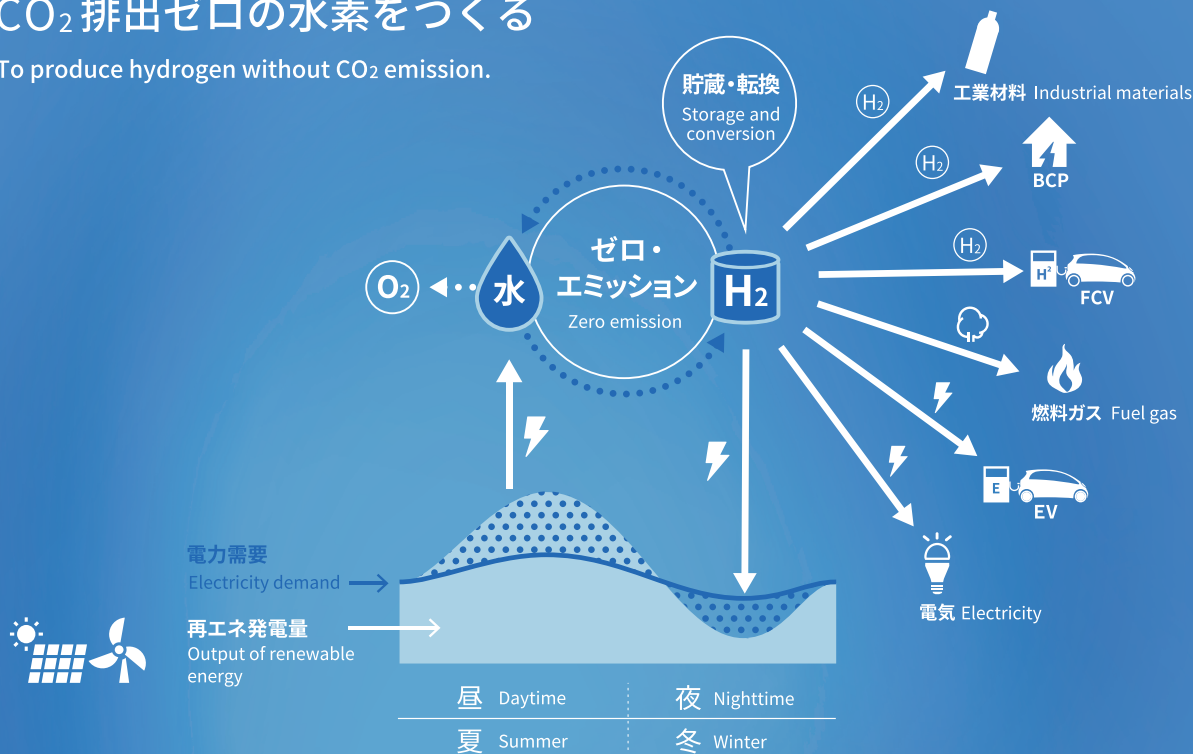
However, it is difficult to supply the energy stably for the demand because it uses the power of nature.

Hydrogen is a key technology that can solve the problem.

Toshiba provides “zero-emission technology” that does not emit CO₂ when producing and using hydrogen.

CO₂ 排出ゼロの水素をつくる

To produce hydrogen without CO₂ emission.



再生エネは需要量に対して不足だったり、余剰が生じたりします。水素は貯蔵・運搬が可能のため、余剰分を水素に換えれば、エネルギーの不足時に補ったり、不足している場所へ運んで使ったりすることが可能となります。これを Power to Gas (P2G) と言います。さらに、水素に換えることで電力以外の様々な利用も可能になります。

Renewable energy may be insufficient or surplus relative to the demand. Hydrogen could be stored and transported. So hydrogen converted from such insufficiency could complement the lack of energy anywhere and anytime. This is called Power to Gas (P2G). Besides that, hydrogen could also be used for many other purposes.

