The 27th Formation Evaluation Symposium of Japan

Special Session "Geothermal"

PROGRAM

Hybrid Symposium September 14 & 15, 2022

Sponsored	by Japan Formation Evaluation Society – A Chapter of SPWLA
Cosponsored	by Technology & Research Center, Japan Oil, Gas and Metals National Corporation
Supported	by TBD

https://jfes-spwla.org/

Sponsors

Gold

To be announced

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Program

Wednesday, September 14

Opening
Invited Talk 1: Geothermal
Invited Talk 2: Geothermal
Break
Special Session: Geothermal
Nuclear Magnetic Resonance
Borehole Geology and Geomechanics
General Meeting

Thursday, September 15

Keynote
Invited Talk 3: Geothermal
Invited Talk 4: Geothermal
Break
Simulation and Seismic
Machine Learning
Closing

Technical Session: Wednesday, September 14

Opening

Chairperson: *Yuki Maehara (SLB)*

09:00 **Opening**

09:10 **Safety Briefing**

09:15 **Opening Address**
Masatoshi Nishi (President of JFES; INPEX CORPORATION)

Invited Talk 1: Geothermal

Chairperson: *Tatsuya Sato (GERD)*

09:45 **PATHWAYS FOR ADVANCING GEOTHERMAL DEPLOYMENT**
Dr. Carolyn Seto (IHS Boston)

10:15 **GEOTHERMAL ELECTRICITY IN A HIGH RENEWABLE GRID**
Prof. Roland N. Horne (Stanford University)

10:45-11:00 **Break**

Invited Talk 2: Geothermal

Chairperson: *Yoshinori Sanada (JAMSTEC)*

11:00 **IGA ASIA AND WESTERN PACIFIC REGIONAL BRANCH**
Pres. Andrea Blair

11:30 **GEOTHERMAL DEVELOPMENT AND ENVIRONMENT-STUDIES IN JAPAN AND AROUND -**
Dr. Kasumi Yasukawa

12:00-12:15 **Technical Session by Sponsor 1**

12:10-13:15 **Break**

Special Session: Geothermal

Chairperson: *Kentaro Hasebe (INPEX)*

13:15 **-A- ADVANCED NON-ELECTRIC BOREHOLE MEASUREMENTS SUCCESSFULLY PROMOTE THE TRANSFORMATION FROM MISTAKEN GAS RESERVOIR TO GEOTHERMAL RESERVOIR**
Kaixuan Li (Schlumberger), Yuyu Wu (Petrochina Southwest Oil & Gas Company)

13:40 **-B- INTEGRATED FRACTURE ANALYSIS WITH BOREHOLE IMAGE AND SONIC LOG FOR FLOW ZONE IDENTIFICATION: CASE STUDY FROM VOLCANIC GEOTHERMAL WELL IN JAPAN**
Chiaki Morelli, Yuki Maehara, Somenath Kar, Chang Wei Qu (Schlumberger), Masami Ikeya,

Masanori Okamoto (Idemitsu Kosan)

14:05 **-C- A HIGH-ROBUSTNESS TIDAL SIGNAL ANALYSIS FOR ONSHORE RESERVOIRS**
Tianci Zhang, Kozo Sato, Shunsuke Kobayashi, Kazumi Osato, Roland Horne (the University of Tokyo)

14:30-14:45 **Break**

Nuclear Magnetic Resonance

Chairperson: *Chisato Konishi (OYO)*

14:30 **-D- EFFECT OF CRUDE VISCOSITY TO NUCLEAR MAGNETIC RESONANCE (NMR) RESPONSES IN DIFFERENT TYPES OF RESERVOIRS: AN EXPERIMENTAL STUDY**
Wei Zhang, Ping Zhang, Yi Li (COSL), Liang Xiao (China University of Geosciences)

14:55 **-E- A NOVEL METHOD TO IDENTIFY SURFACE WATER INVASION HYDROCARBON-BEARING POTENTIAL RESERVOIRS USING GEOPHYSICAL WELL LOGGING DATA**
Jinyu Zhou, Yanmei Wang, Bowen Sun, Yitong Yao, Gaoren Li, Die Liu (PetroChina), Liang Xiao (China University of Geosciences)

15:20-15:35 **Technical Session by Sponsor 1**

15:35-15:50 **Break**

Borehole Geology and Geomechanics

Chairperson: *Takeaki Otani (JAPEX)*

15:50 **-F- RESERVOIR CHARACTERIZATION AND FLUID TYPING OF TIGHT CARBONATE RESERVOIR ASSISTED BY HIGH-RESOLUTION ELECTRICAL IMAGE LOGS: A CASE STUDY OF CENTRAL SICHUAN BASIN, CHINA**
Kaixuan Li (Schlumberger), Yuyu Wu (PetroCchina)

16:15 **-G- DETERMINING MAGNITUDE AND ORIENTATION OF PRINCIPAL IN-SITU STRESS USING CONVENTIONAL LOGS AND BOREHOLE IMAGE LOGS: A CASE STUDY OF AN IRANIAN CARBONATE RESERVOIR**
Nazir Mafakheri Bashmagh, Weiren Lin (Kyoto University), Abbas Khaksar Manshad (Petroleum University of Technology and Soran University)

16:40-17:10 **General Meeting**

Technical Session: Thursday, September 15

Keynote

Chairperson: *Shinichi Takaoka (MOECO)*

09:00 **Opening**

09:10 **Safety Briefing**

09:15 **Keynote Address**
Tegwyn Perkins (President of SPWLA; Lloyds Register)

Invited Talk 3: Geothermal

Chairperson: *Takayuki Wada (WJEC)*

09:45 **FORMATION EVALUATION OF DEEP RESERVOIRS FOR CLOSED-LOOP GEOTHERMAL DEVELOPMENT**
Mr. Peter Bauman (Eavor)

10:15 **DEVELOPMENT OF HIGH-TEMPERATURE LOGGING TOOLS FOR MULTI-PHASE WELLBORE SAMPLING**
Pres. Paul von Hirtz (Thermochem)

10:45-11:00 **Break**

Invited Talk 4: Geothermal

Chairperson: *Yasuhiro Yamada (Kyushu University)*

11:00 **GEOTHERMAL DEVELOPMENT BETWEEN JAPAN AND INDONESIA**
Ms. Finna Christi Lingkan (INPEX Corporation)

11:30 **OUTLINE OF RESEARCH ON SUPERCRITICAL GEOTHERMAL POWER GENERATION**
Dr. Hiroshi Asanuma (Fukushima Renewable Energy Institute, AIST)

12:00-12:15 **Technical Session by Sponsor 2**

12:15-13:15 **Break**

Simulation and Seismic

Chairperson: *Shota Yamashita (JX Nippon)*

13:15 **-H- DEVELOPMENT OF NUMERICAL SIMULATOR PREDICTING METHANE HYDRATE DISSOCIATION AND PRODUCTION BEHAVIOR IN USING GROUT MATERIAL**
Kyohei Matsuka, Yuchen Liu, Masanori Kurihara (Waseda University)

13:40 **-I- DEVELOPMENT OF MULTI-PERMEABILITY, WHITE OIL TYPE**

NUMERICAL SIMULATOR CAPABLE OF PREDICTING SHALE OIL/GAS PRODUCTION INCREASED BY NANO-EOR
Toshiaki Nakamoto, Yasuhiro Kaneshima, Masanori Kurihara (Waseda University)

14:05 **-I- SEISMIC P WAVE REFLECTIVITY IMAGING OF THE 3D SHALLOW LITHOLOGICAL BOUNDARIES BY ACTIVE MINE BLAST SIGNAL AUTOCORRELATION ANALYSIS BASED ON SEISMIC INTERFEROMETRY**
Tarek Imam, Tatsunori Ikeda (Kyushu University), Takeshi Tsuji (Tokyo University), Jiro Uesugi, Takeshi Nakamura, Yoshinori Okaue (Sumitomo Metal Mining)

14:30-14:45 **Break**

Machine Learning

Chairperson: *Tetsuya Yamamoto (JAPEX)*

14:45 **-J- QUANTIFYING THE SURFACE RUGGEDNESS OF THE ROCK OUTCROPS BY USING 3D DIGITAL OUTCROP MODELS**
Takumu Nakamura, Yasuhiro Yamada, Arata Kioka (Kyushu University)

15:15 **-K- GAS CHANNELS AND CHIMNEYS DETECTION USING 3D SEISMIC DATA AND CONVOLUTIONAL NEURAL NETWORKS (CNNS)**
Ahmad Bahaa Ahmad (Kyushu University), Amir Ismail (Helwan University), Tarek Samir Imam (Kyushu University), Takeshi Tsuji (Tokyo University)

15:40 **-L- TIGHT SANDSTONE RESERVOIR PORE STRUCTURE CHARACTERIZATION FROM CONVENTIONAL WELL LOGGING DATA BASED ON MACHINE LEARNING METHOD**
Fei Li, Wenjing Zhang, Weibing Li, Zhen Chen, Bowen Sun, Ruiqiang Chi (PetroChina), Liang Xiao (China University of Geosciences)

16:05 **Closing**
Tetsuya Yamamoto (First VP of JFES; JAPEX)

Symposium Committee 2022

Chairman	Masatoshi Nishi, INPEX
Vice-Chairman	Tetsuya Yamamoto, JAPEX
Technical	Yuki Maehara, SLB
PR	Tetsuzo Fukunari, JOGMEC
Finance	Akira Fujimoto, JOGMEC
IT	Takuya Ishibashi, AIST
Sponsor	Shinichi Takaoka, MOECO
Poster	Takeaki Otani, JAPEX
Award/Gift	Tatsuya Sato, GERD
Count	Chisato Konishi, OYO
Entertainment	Tsuyoki Fujii, GSC
Review	Kentaro Hasebe, INPEX
Review	Shinichi Sakurai, Independent Scientist
Review	Shota Yamashita, JX Nippon
Review	Tomomi Ninomiya, SLB
Review	Takayuki Wada, WJEC
Review	Yasuhiro Yamada, Kyushu University
Review	Yoshinori Sanada, JAMSTEC

Invited Talk 1-1

Pathways for geothermal development

Carolyn Seto (S&P Global Commodity Insights)

ABSTRACT

With the expanding electrification of the energy sector as well as increasing pressure to decarbonize power industry, geothermal energy is experiencing a renewed interest. While this technology has a long history of deployment, it remains limited in application, with only a fraction of the global geothermal resource being developed. Advancements in new technology are leading to a renewed interest in geothermal energy. What are the barriers to widespread deployment? How can technology and innovation support increased adoption? What new commercial models will arise, and who is best positioned to capture them?

Biography

Carolyn is an Executive Director with S&P Global Commodity Insights's Upstream Transformation Service where she investigates the strategic role of emerging technologies in enabling a firm's broader business goals in the energy transition.

Prior to joining S&P Global Commodity Insights, Carolyn has worked across the energy value chain, in technical and commercial capacities in the upstream oil and gas—working as a reservoir engineer for Shell, BP and Chevron; and utility sectors—managing the quantitative fuels analytics group at Edison Mission Marketing and Trading, where she advised the firm's strategies for environmental policy and natural gas trading.

Carolyn was the Clare Boothe Luce Postdoctoral Fellow at the Massachusetts Institute of Technology, where she researched risk management of large-scale carbon sequestration and was a contributor to the MIT Future of Natural Gas Study. She holds PhD and MSc degrees in Petroleum Engineering from Stanford University and a BSc in Engineering Chemistry from Queen's University.

Invited Talk 1-2

To be announced

Invited Talk 2-1

To be announced

Invited Talk 2-2

GEOTHERMAL DEVELOPMENT AND ENVIRONMENT -STUDIES IN JAPAN AND AROUND

Kasumi Yasukawa (JOGMEC)

ABSTRACT

Any development, including geothermal development, may give impact to the local environment. However, it may be minimized by technology and innovative ideas. Even with a risk of impact, it worth developing the resources if there exists larger merit, such as local welfare and protection of global environment.

Geothermal development has lots of merit, such as electricity and hot water supply, possibility of new business, contribution to energy security, and reduction of CO_2 emission. Studies to minimize environmental impact by geothermal energy development has been done from many different aspects, from toxic gas emission, induced seismicity, and hydraulic impact to adjacent aquifers. Possible impact to surrounding hot spring aquifer by geothermal development, which is a big issue in Japan, is focused and geochemical method to avoid such impact will be introduced in this paper.

Hydraulic relationship between geothermal reservoir and hot spring aquifer is categorized into five types by shielding ability of caprock between geothermal reservoir and hot spring aquifer. Type 1 is an identical reservoir. Type 2 is Water supply, Type 3 is steam supply and Type 4 is heat conduction from a deep reservoir to hot spring aquifer. Type 5 is independent systems. Possible impact by geothermal fluid extraction differs according to such types: flow rate decline for Types 1 and 2, chemical component change for Type 3 and temperature decline for Type 4. Types 1-5 can be roughly identified by geochemical survey of the hot spring fluid. Thus, possible impact should be investigated in advance of development and adequate monitoring should be conducted.

Biography

Currently a senior councilor of Geothermal Unit, Japan Oil, Gas and Metals Corporation (JOGMEC). Having been a research scientist in National Agency of Industrial Science and Technology (AIST) from 1987 to 2019, she has studied geophysics and geothermal reservoir engineering and involved in many international geothermal research projects. As an officer in the Ministry of Economy, Trade and Industry (2009-2011), she was in charge of international environmental policy such as Inter-governmental Panel for Climate Change (IPCC) and London Convention for marine environment. She is a Board of Directors in International Geothermal Association (IGA) from (2020-2023), leading its bylaws committee. In 2022, she was appointed to be the Chair of the International Energy Agency - Geothermal Implementation Agreement (IEA-GIA).

Invited Talk 3-2

Formation Evaluation of Deep Reservoirs for Closed-loop Geothermal Development, examples from North America.

Peter Bauman (Eavor Technologies Inc.)

ABSTRACT

TBD

Biography

Peter Bauman is a Professional Geologist registered with the Association of Professional Engineers and Geoscientists of Alberta (APEGA). For more than 20 years, he has held various technical and managerial roles at major, intermediate and junior energy companies with a successful track record of growth and value addition. His passion and strengths lie in new country entry, exploration, and development. His geographic experience includes North America, South America, Europe, Australia, Western Asia, North Africa, and Middle East. Peter holds a B.Sc and M.Sc from the University of Calgary in Geology and Geophysics.

Peter is a Director of the Canadian Global Energy Forum, the Past-President of the AAPG Canada Region and is an active member of the CSPG. He has authored numerous presentations at domestic and international energy conferences.

Invited Talk 3-2

Development of the first Commercial 400°C TPS Logging Tool and Downhole pH Sensor

Paul von Hirtz (Thermochem, Inc.)

ABSTRACT

Thermochem has developed a memory TPS (Temperature, Pressure, Spinner) logging tool to that can be deployed under extreme well conditions, far exceeding conventional logging tool capabilities. The tool has been tested under simulated wellbore conditions up to 400°C. A complete range of simulated well temperature tests have been performed to enable the maximum safe time-in-well to be calculated based on the temperature profile of the well to be logged. An integrated approach, utilizing a high-performance heat shield, combined with internal heat-sinking, high-temperature electronics and battery has allowed us to meet the aggressive goal of a 400°C logging tool.

In a parallel research effort, Thermochem, in partnership with Sandia National Laboratories, is developing High-temperature high-pressure (HTHP) electrodes selectively sensitive to hydrogen (H^+) ions. This technology has already demonstrated in representative geothermal environments up to 225°C and 100 bar. The goal is to develop the prototype pH and reference electrode sensors into a commercial product incorporated into an existing two-phase downhole sampling tool operable up to 300°C and 350 bar.

Biography

Paul von Hirtz is the President of Thermochem, Inc. Paul has a degree in chemistry and has trained and worked as a chemical engineer with 30 years' experience in the geothermal energy industry. He specializes in chemical process design for steam and binary power plants, chemical modeling and geochemistry. Paul has performed research for the US Department of Energy (DOE) and the California Energy Commission (CEC), with a primary focus on steam purification, advanced wellbore logging tools and pH-modification for silica scale control. Paul is the inventor of the TFT® technology for two-phase flow measurement used worldwide, downhole sampling tools and instrumentation for on-line steam purity and quality measurement. Paul chairs the ASTM committee on Materials and Geothermal Fluid Sampling and Analysis and is an associate editor for the international journal Geothermics. Paul founded PT. Thermochem Indonesia in 1998. Both companies were acquired by Kyuden International Corporation and WestJEC in 2000, and Paul continues to lead Thermochem, Inc.

Invited Talk 4-1

Geothermal Development between Japan and Indonesia

Lingkan Finna Christi (INPEX Corporation)

ABSTRACT

Located within the Pacific Ring of Fire, Japan and Indonesia have one thing in common with regard to the abundance of volcanic coming concurrently with its potencies and hazard risks. This -by the nature- geographic position has brought both countries to the top three of geothermal resource richest country in the world. Moving forward with energy transition trend aiming for carbon neutral in 2050 for Japan followed by Indonesia in 2060, geothermal energy is playing a significant role as an alternative energy to secure the demand of power generation from renewable sector. Carrying out this big vision, as energy developer company, reinforcing strategy to achieve this goal is a must and INPEX is the one that has been reflecting this goal to the company's 2022 vision. Accordingly, other than Japan, Indonesia is the only country where geothermal has become one of the core businesses area along side with its oil and gas sector. Challenges in maturating geothermal business from exploration all the way to production from various project stages are the key points of establishing synergy of geothermal development in both countries. In this presentation, we discuss about how we create synergy of developing geothermal, filling the cultural gap, overcoming the challenges as well as gaining lesson learned to excel in each stage of project development.

BIOGRAPHY

Born in Jakarta, 25 December 1989

Education Background

Bachelor of Geological Engineering, Trisakti University (2012)
Master of Engineering, Earth Resource Engineering, Kyushu University (2015)

Career

Geothermal Engineer, Renewable Energy and Power Business Division, INPEX Corporation (2016 – 2019)
Reservoir Engineer, Sarulla Operation Ltd (2019 – 2020)
Geothermal Resource Engineer, Renewable Energy and New Business Division, INPEX Corporation (2020 – present)

Invited Talk 4-2

Current status of research on supercritical geothermal power generation in Japan

(Invited) Dr. Hiroshi Asanuma (AIST)

ABSTRACT

Nature of geothermal resources that rate of emission of CO2 is one of the lowest among all the energy sources is significantly attractive for the counties with geothermal manifestation such as volcanic activities Japanese scientists have estimated that the Japanese nationwide potential of “Supercritical Geothermal Resources”, which has an origin in the subduction of oceanic plates, reaches hundreds GWs from distribution of old volcanos and calderas. Power generation using supercritical geothermal resources, which temperature range is 400 to 500 deg-C and the depth is expected to be less than several kilometers in Japan, (supercritical geothermal power generation) in Japan can significantly contribute to energy security and reduction of emission of CO2. However, there are a lot of scientific unknowns about nature, especially in rock-mechanical and geochemical behavior under supercritical conditions. We also need technological breakthroughs, because temperature and pressure conditions in the supercritical geothermal systems are far beyond the current technological limitations, and experiences in the foregoing ultra-high temperature geothermal drillings suggest that the presence of acidic geothermal fluid should be expected. The Japanese government has identified supercritical geothermal power generation as one of the key technologies to establish a “Carbon-Free Society in 2050”, and is funding projects for detailed site surveys and well design in the most promising area in northeast Japan and Kyushu as shown in this presentation.

Biography

1992 Dr. Eng. Tohoku University
1992 Research Associate, Tohoku University
1996 Associate Professor, Tohoku University
2013 Senior Principal Researcher, AIST
2013 Team Leader, Geothermal Team, AIST
2019 Principal Research Manager, AIST
2022 Deputy Director, Renewable Energy Research Center, AIST

General Information

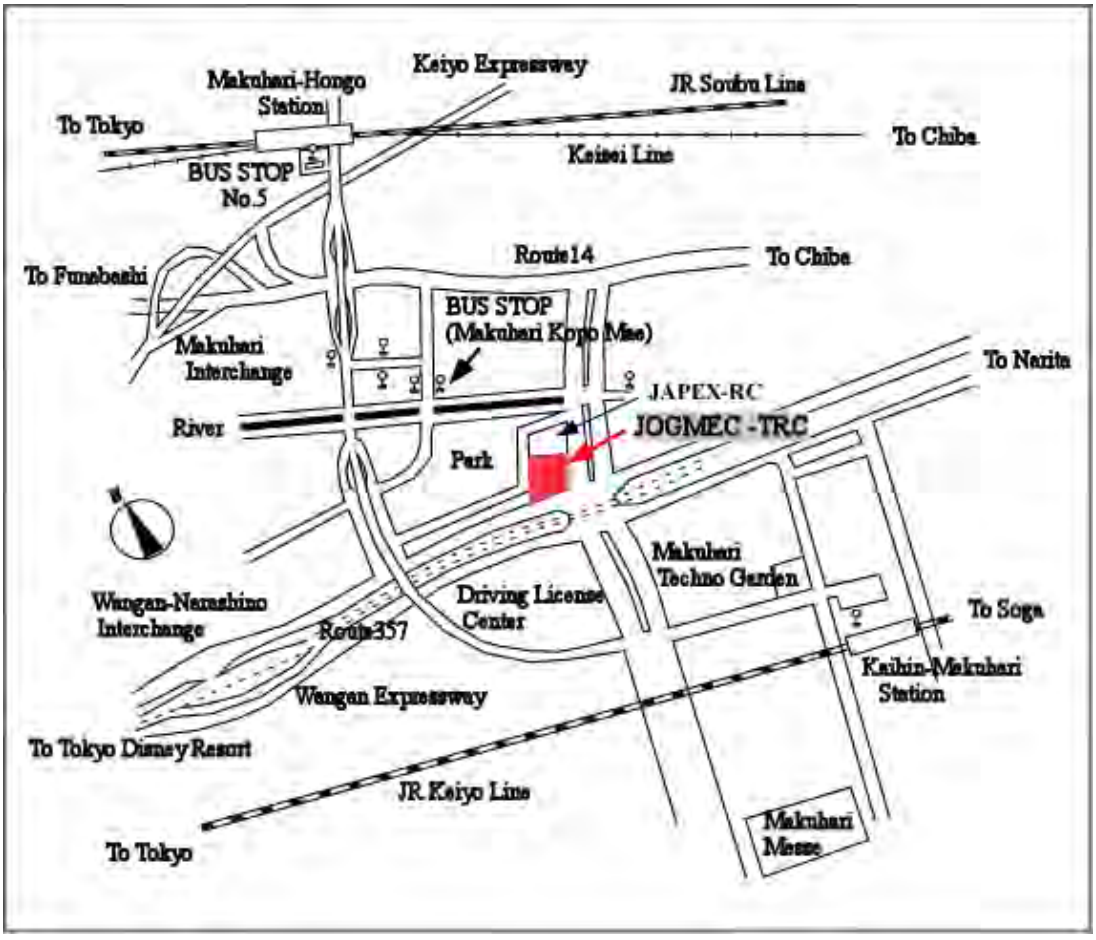
VENUE: Technology & Research Center (TRC)
Japan Oil, Gas and Metals National Corporation (JOGMEC)
1-2-2, Hamada, Mihama-ku, Chiba 261-0025, Japan
Tel: +81 (43) 276 9212

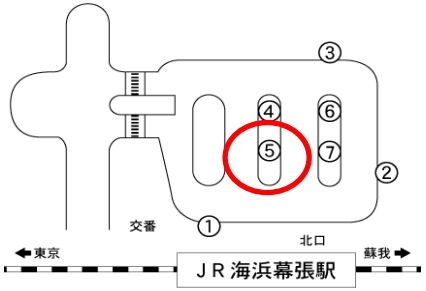
HOW TO GET TO THE JOGMEC-TRC:

From Makuhari-Hongo Station (JR Sobu Line; 40 min from Tokyo station)
- 10 min. by taxi or 30 min. on foot
- 10 min. by City bus (see below map and bus schedule)

From Kaihin-Makuhari Station (JR Keiyo Line; 30 min. from Tokyo station)
- 10 min. by taxi or 20 min. on foot
- 10 min. by City bus (see below map and bus schedule)

City Bus Service
City bus services are available from Makuhari-Hongo Station and Kaihin Makuhari Station. Please refer to the bus schedule in the next page. Take "Columbus City Line" and get off at "Sekiyu Kaihatsu Gijyutsu Center". The fare is 170yen.





Bus Schedule -Columbus City Line-

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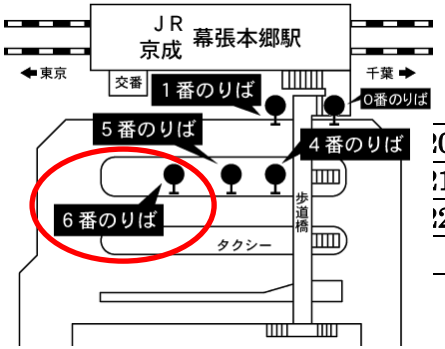

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海浜幕張駅
Kaihinmakuhari-Station

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For Makuharihongo-Station

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石油開発技術センター
Sekiyukaihatsugijyutu-Center
(JOGMEC-TRC)

幕張本郷駅行き(幕 22, ｲｵﾝ 32)							海浜幕張駅行き(幕 22) For Kaihinmakuhari-Station				
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幕張本郷駅
Makuharihongo-Station

海浜幕張駅行き(幕 22)
For Kaihinmakuhari-Station

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Accommodation and other travel

Land Transportation from Narita Airport

For foreign visitors, limousine bus service is the most convenient to the hotel. Ticket is available at the orange colored "Friendly Airport Limousine Bus" booths for the bus heading to your hotel. “Keisei Bus” goes to Makuhari area. The fee is around 2,400 – 3,000 yen depending on the destination.

Taxi to the hotel around Makuhari area is more than 10,000 yen. The taxi to the center of Tokyo is around 30,000 yen.

Accommodation

Some examples of the hotels in Makuhari and Tokyo area are listed below and available at your choice. JFES does not have block booking, so make the reservations by directly contacting with the hotels.

Makuhari Area
20 min. walk to JOGMEC-TRC or 10 min. by taxi

- Hotel the Manhattan
  http://www.the-manhattan.co.jp/english/

- Hotel Springs Makuhari
  http://springs.co.jp/english/index.html

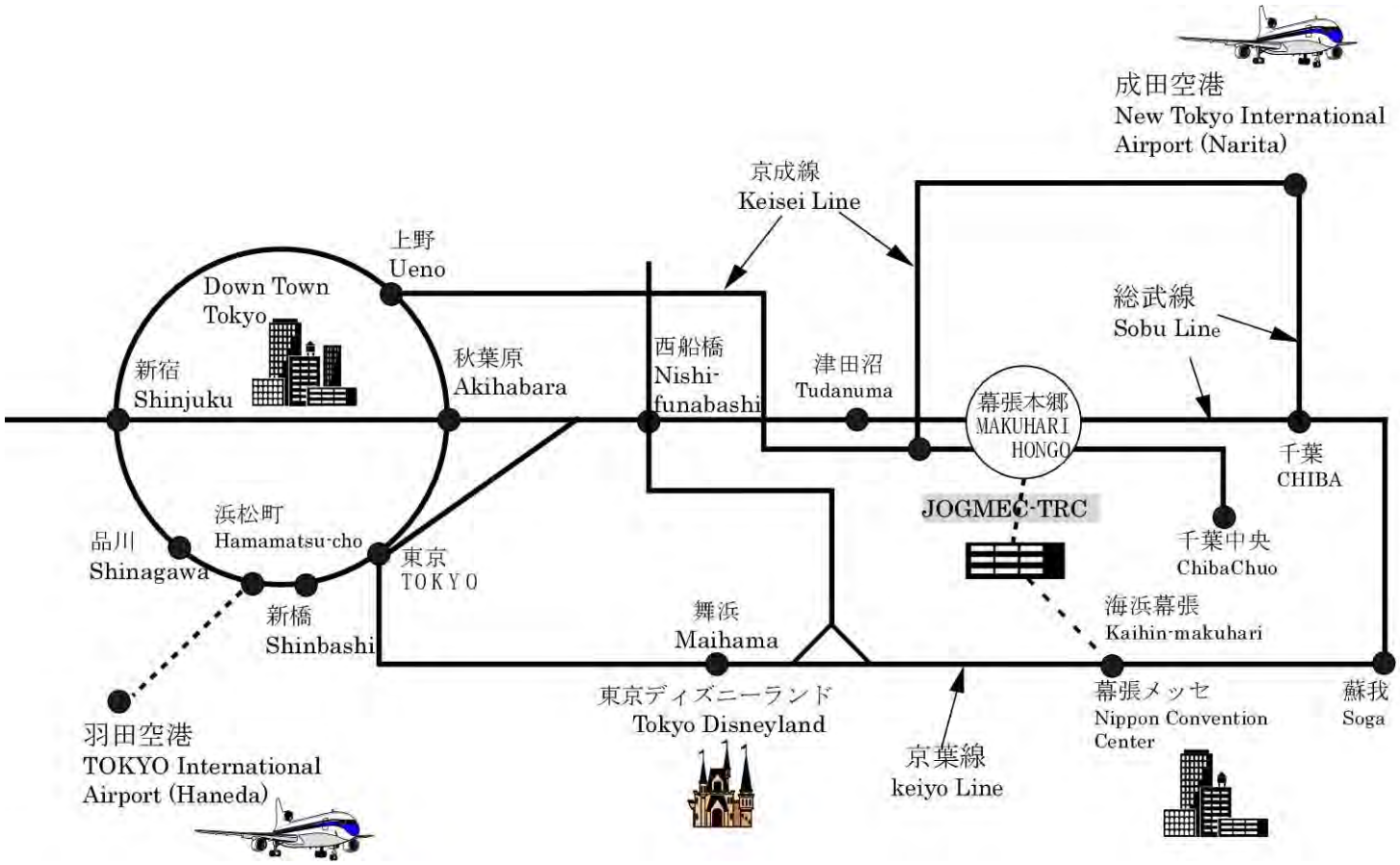
- APA Hotel & Resort Tokyo Bay Makuhari
  https://apahotel.com/ja_en/hotels/detail.php?id=16673

Tokyo area
40 min. to Makuhari Hongo (via JR Sobu Rapid Train) then bus

- Shinagawa Prince Hotel
  http://www.princehotels.com/shinagawa/

- Mércure Hotel Ginza Tokyo
  http://www.accorhotels.com/gb/hotel-5701-mercure-tokyo-ginza/index.shtml

* This program is subject to change due to the preparation of the symposium.


成田空港
New Tokyo International
Airport (Narita)
京成線
Keisei Line
上野
Ueno
Down Town
Tokyo
新宿
Shinjuku
秋葉原
Akihabara
西船橋
Nishi-
funabashi
津田沼
Tudanuma
総武線
Sobu Line
幕張本郷
MAKUHARI
HONGO
千葉
CHIBA
JOGMEC-TRC
千葉中央
ChibaChuo
浜松町
Hamamatsu-cho
品川
Shinagawa
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舞浜
Maihama
海浜幕張
Kaihin-makuhari
東京ディズニーランド
Tokyo Disneyland
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