EU-Japan Centre for Industrial Cooperation
日欧産業協力センター

Report on
EU-Japan Energy Business Seminar – Towards Flexible Energy Systems
Wednesday 21 June 2017 hosted by the European Committee of the Regions

This event was organised on the fringes of the EU-Japan Energy Dialogue and brought together representatives of EU and Japanese energy companies and the EU and Japanese Authorities for a wide-ranging discussion, focussing on four topics:

1) The evolution towards highly flexible energy systems: needs and opportunities
2) Flexibility at transmission and utility scale
3) Flexibility at distribution scale
4) Reactions from an industry panel

The event, moderated by Sonja van Renssen (a freelance energy journalist) began with opening remarks by senior representatives of the EU and Japanese Authorities: The **European Commission's Director-General for Energy** noted that EU-Japan cooperation makes sense given that the EU and Japan have much in common – both are both big energy importers; attach considerable interest to energy security; share common interests in international fora; are oriented to clean energy and clean technology and so are looking to modernise their energy systems to decarbonise and to digitalise them simultaneously; have nuclear power and an absolute safety requirement for the plants, for reprocessing and for enriching; and wish to incorporate more renewables in their energy mixes. The **Japanese Ambassador to the EU** emphasised the need for a sustainable supply of energy for all. We must invest more in renewable energy and in batteries. The goal of flexible energy systems remains a challenge, but is achievable given insight, imagination and integrity.

Session 1: Round table discussion on an evolution towards highly flexible energy systems – needs & opportunities

*** MHI** outlined the benefits of turbine technology – 2 gas turbines can have the same output as a nuclear power station. Smaller more distributed generation is less efficient*, so (third parties could) use the equipment of large users to be energy aggregators – digitalisation will enable them to play a more active role*[1].

ENTSO-e looked at transmission issues – the large amount of RE in European energy generation allows grid operators to become digital platform players orchestrating interactions between generators and aggregated resources. ENTSO-e is designing new markets for the clean energy package, with RE driving value into the real-time balancing elements of the market. It is also re-thinking the price signal for investments. Europe has major investment plans.

Asahi Kasei Corporation outlined the benefits offered by CO_2-free hydrogen generation – H_2 can be an energy store; combining the power, heat and transport sectors. It can help decarbonisation: methanol can be produced from H_2 and the CO_2 produced during CCS. Demand for hydrogen will increase as electric vehicles become more common.

Wind Europe felt integrating variable renewables into the energy system takes 5 steps: electricity markets must function properly; investments are needed in transmission and distribution; demand response; storage; and the balancing of variable supply with other back-up sources of generation. Wind technology is becoming more flexible and can provide balancing services. *Dynamic line rating should be used to allow more effective monitoring as to how changes in temperature are adding capacity to the transmission network.* Hydrogen is the key for storage.

The discussion addressed how big a role gas can play in terms of flexibility; how realistic it is to use large energy facilities as aggregators and whether PPAs could be concluded with RE providers to get stable electricity suppliers; *we should think how we will price things given transmission system limitations and the need for flexibility*; and the business case and commercial viability of hydrogen and whether green hydrogen will be used in Japanese refineries; *the benefit of including sector coupling in future debates to help increase efficiency in the transport sector*.

Session 2: Flexibility at transmission and utility scale

*** Mitsubishi Hitachi Power Systems** offers a technological 'flexible generation scheme'. Europe's market has shifted from 'electricity-valued' to 'heat-valued'. This led to the development of 'power to heat' modules and is an example of sector coupling. Technological developments include exotic technologies such as SOFC – MHPS has 4 pilot SOFC plants in Japan. Europe's transport policy seeks decarbonisation and an increase in the share of renewable fuels. MHPS produces a synthetic liquid fuel, recycling CO_2. As the market changes, new technologies and services are needed.

*** ABB** explained that a trans-European e-highway, such as the e-Highway2050 project, will carry high capacity (>1GW) over long distances (AC/DC/hybrid) and interconnections will smooth out volatile problems. HVDC has fewer losses and can interconnect more easily. VSC-HVDC facilitates grid planning, public acceptance, grid operation flexibility and grid resilience. HVDC can be used with RE where supply and demand fluctuate and enables long-distance connections to wherever power is being generated at the time. An ABB-Hitachi JV transfers ABB's experience in Europe to Japan.

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* companies marked with a star gave presentations

[1] Suggestions made during the seminar are given in italics.

*** Asahi Kasei Europe GmbH**, one of the largest suppliers of membrane process chlor-alkali electrolysis, sees 'power to gas' (P2G) as an enabling technology that produces green hydrogen to help meet the EU's high RE targets: H_2 can be combined with CO_2 to produce methane (for the heating sector); H_2 can also be used in the transport sector and in the industrial sector. In Japan, high efficiency and unit size is leading to larger and larger P2G units. Unlike other storage systems, P2G is already suitable at a large-scale and increases RE's share in both the heating and transport sectors.

Session 3: Flexibility at distribution scale

*** Solar Power Europe** explained that if southern Europe followed the 28.2% drop in German PV prices (2015-2017), solar energy could be produced at €0.03/kWh. 2 years ago, the price was double today's €7.700/kWh. By 2050, 1:2 Europeans could generate their own electricity. By 2020, there will be 60,000 home energy storage systems. Whereas PV is mainly currently used for self-consumption, the market needs to allow systems to stack benefits so that peak injections and demands will be reduced. *The market should be open for RE in all market time frames. Bid sizes should fall (to <1MW), there should be a clear reporting obligation, local flexible markets and clear rules for TSOs and DSOs*.

*** Hitachi Chemical Co., Ltd.** provides hybrid battery systems. Aggressive German policy increases RE's share whilst nuclear and fossil fuels decline. High RE penetration can make grids unstable, grid operators must have reserve power to balance supply and demand – battery systems are a solution, but need updating. Hitachi Chemical runs two NEDO projects in Germany (a self-consumption system with PV and battery in Speyer and a largescale hybrid battery system in Niedersachsen). 'Curtailment' (switching off) should be considered a service when the energy price is negative.

*** Energy Pool** is a French demand response (DR) provider active in Japan. On 02/06/2016 it supplied 500MW to RTE in <2hrs. TSOs drive DR as they operate the balancing / reserves market, whilst generators and demand response aggregators are suppliers. Japan, unlike France, is trying to liberalise its market and introduce DR simultaneously. Firms looking to enter the Japanese market can either wait for the balancing / reserve market to open to DR or monetise where DR has a value. Consumer discipline can lead to consumption falls without need for a control centre (e.g. right after Fukushima disaster).

Session 4: Industry Panel

* **Hydrogen Europe** outlined that storage is essential to meeting the challenge of transferring energy from the summer (production excess) to winter time. Hydrogen and a mechanised project is a good solution. The Energiepark in Mainz will produce hydrogen milliseconds after the power grid. In addition to being stored, 6% of the H_2 is fed into the gas grid (although this earns just €1/kg whereas transport pays €10/kg). Hydrogen acts as a buffer and is the second energy carrier after electricity and the feedstock for many processes. Sectoral integration / coupling is important.

* **NEDO** explained that Japan's rapid penetration of PV installation means that the certified capacity in Kyushu (17.9GW) exceeds off-peak demand (8.8GW) making storage essential. The most promising energy storage technologies are battery storage and pumped hydro (although this is not widely used in Japan). By 2030, if there is 3GW of battery storage, fuel costs can be cut by 2%. The Government of Japan is funding smart community projects, virtual power plant demonstration projects and battery projects for load frequency and the absorption of surplus power. As the cost of batteries for EV falls, their use will become more feasible. By 2030, a 100kg battery should allow 300km of driving. A 500kg battery is a target.

EWE AG explained that in the same way that the electric candle did not come from the continuous improvement of candles but was instead a ubiquitous movement, the sheer amount of RE in Germany means that system architecture must change – a smart grid and legal and regulatory changes are needed. A €200m demonstration project is underway.

EWE-NETZ predicted that changes at the last mile of the distribution system will require Germany to integrate 220GW by 2030, with connected capacities falling from 80GW to 50GW thereby turning the system upside down. To overcome congestion, local action is needed – a single market price does not make sense as currents and voltages must be addressed. To electrify the transport sector, a lot more RE must be integrated than was predicted. Storage would be better than the current solution to peak supply, namely energy curtailment. *EWE-NETZ suggested Japan should not change its DSO set-up.*

Red Electrica de España noted that Europe, unlike Japan, must address problems developing interconnectors; different views; and reconciling the power, heat and transport sectors. Europe is fighting between distribution and transmission – the whole energy system is becoming one energy system. *Europe needs clear political guidance, but at member-state level – not by the European Commission.* There needs to be a radical transformation of both the energy and transport systems.

The participant from **MHI Vestas Offshore Wind** reacted to the earlier discussions, feeling that Wind Europe's '5 steps' will be solved. This year, for the first time, there is a project in Germany without any strike price subsidy. Offshore wind generation is approaching parity (with market price for energy) and could be a mainstream global technology. The Japanese market is far behind. He felt that *the Government of Japan should allow the provision of offshore wind power in Japan.*

The **EASE / Saft Batteries** participant felt that there was a consensus for a broad portfolio of solutions – flexible generation; flexible transmission and distribution; flexible consumers and energy storage. But different kinds of flexibilities are needed (seasonal vs. short-term or local vs. national). We need both energy storage and flexibility if we are to achieve a decarbonised, sustainable market. All current legislative proposals focus on electricity – this is a problem. *There should be a clear definition of sectoral integration that is not just about buffering but also addresses greening industrial pathways*.

Concluding remarks

DG Energy felt that events such as this seminar are useful and so will propose to METI to organise a similar event in Japan on the fringes of the 2018 EU-Japan Energy Dialogue. Today's energy dialogue discussed energy market reform and design. This seminar showed the need to find the right balance between technologies. One idea would be to establish these exchanges on the basis of an MoU between a market agency and DG Energy. A market-based level playing field is needed. Pricing systems should reflect scarcity and there should be a value for CO_2 savings. In the same way that NEDO is financing projects in Germany, Europe could be inspired to finance projects abroad – possibly in Japan, benefiting European and Japanese companies.

Speakers during the introductory and formal first sessions

Participants at the 2017 seminar

EU-Japan Energy Business Seminar
'Towards Flexible Energy Systems'

European and Japanese Business Perspectives on the Energy Transition

21 June 2017, 14:30 – 18:00
Jacques Delors Building (The European Committee of the Regions),
Rue Belliard 99 – 101, 1040 Bruxelles, Room 70

Programme

Moderator: Ms Sonja van Renssen, freelance energy journalist

14.30 – 14.40	**Opening remarks**

- Mr Dominique Ristori, Director-General, Directorate-General for Energy, European Commission
- Mr Kazuo Kodama, Ambassador Extraordinary and Plenipotentiary, The Mission of Japan to the European Union

14.40 – 15.30	**High-level Round Table:** **The evolution towards highly flexible energy systems: needs and opportunities**

Participants:
- Mr Yasushi Fukuizumi, Vice-President Power Systems, Mitsubishi Heavy Industries
- Mr Laurent Schmitt, Secretary-General, European Network of Transmission System Operators – electricity (ENTSO-e)
- Dr. Masami Takenaka, Managing Executive, Clean Energy Project Corporate R&D, Asahi Kasei Corporation
- Mr Giles Dickson, Chief Executive Officer, Wind Europe

Themes for discussion:
- Investments towards flexible energy systems
- Flexibility of future electricity generation
- Networks accommodating flexibility
- Storage solutions for flexibility
- Flexibility and the electricity consumer market

15.30 – 15.45	Coffee break

15.45 – 16.15	**Flexibility at transmission and utility scale**

1. Rethinking base load: technologies to support flexible energy systems
   Speaker: Prof Emmanouil Kakaras, Vice President and Head of Business Unit New Products & Innovation, Mitsubishi Hitachi Power Systems – Europe
2. Electricity highways: inter-connecting to integrate variable energy production
   Speaker: Mr Athanasios Krontiris, Head of Product Development HVDC light, ABB
3. Beyond electricity: the flexibility potential of Power-to-Gas
   Speaker: Dr. Mutsuhiro Maruyama, Europe Regional Senior Manager, Clean Energy Project R&D Center, Asahi Kasei Europe GmbH

16.15 – 16.45	**Flexibility at distribution scale**

1. Renewable energy producers contributing flexibility services to the energy system
   Speaker: Mr Thomas Döring, Expert policy analysis, Solar Power Europe
2. Commercialisation of battery technology
   Speakers: Mr. Masatoshi Shiiki, General Manager, Energy Storage Business Strategy Sector, Energy Storage Business Headquarters, Hitachi Chemical Co., Ltd. // Mr Naohide Natsume, Project Manager of New Energy Development, Hitachi Chemical Europe GmbH
3. The potential of active demand
   Speaker: Ms Ann-Sophie Chamoy, Director Regulatory Developments, Energy Pool, France

16.45 – 17.45	**Initial reactions from industry panel, followed by discussion & debate**

Participants:
- Mr. Christian Arnold, Senior Vice President enera Innovation, EWE AG, Germany
- Mr Marcus Merkel, Office of the Board of Directors, EWE-NETZ, Germany
- Mr Masato Yamada, Vice President, Chief Strategy Officer, MHI Vestas Offshore Wind
- Mr Michael Lippert, Vice President European Association for the Storage of Energy / Saft Batteries
- Dr Eng Akira Yabe, Director General, Renewable Energy Unit, Energy System & Hydrogen Unit, Technology Strategy Center, NEDO
- Mr Vicente Gonzalez, Head of R&D and Innovation, Red Electrica de España
- Mr Jorgo Chatzimarkakis, Secretary-General, Hydrogen Europe

17.45 – 18.00	Concluding statements & remarks by METI and DG ENER

18.00 – 20.00	Networking Reception

List of Participants

Moderator: Ms Sonja van Renssen, freelance energy journalist

Public bodies and coordinator

- Mr Dominique Ristori, Director-General, DG Energy, European Commission
- Mr Matthieu Craye, International Relations Officer, DG Energy, European Commission
- Ms Emily Robinson, Policy Officer, DG Energy, European Commission
- Mr Kazuo Kodama, Ambassador Extraordinary and Plenipotentiary to the Mission of Japan to the European Union
- Mr Sunao Orii, First Secretary, the Mission of Japan to the European Union
- Mr Yota Ono, Deputy Commissioner for International Affairs, Ministry of Economy, Trade and Industry
- Mr Masashi Hoshino, Deputy Director, International Affairs Division, ANRE
- Mr Hiroyuki Matsui, Assistant Director, International Affairs Division, ANRE
- Ms Sayaka Shishido, Assistant Director, International Affairs Office, Energy Efficiency & Renewable Energy Department, ANRE
- Ms Naoko Kato, Deputy Director, Natural Resources and Fuel Department, ANRE
- Mr Yutaka Fujimoto, Deputy Director, Policy Planning Division, Electricity and Gas Market Surveillance Commission (EGC)
- Dr Eng. Akira Yabe, Director General, Renewable Energy Unit, Energy System & Hydrogen Unit, Technology Strategy Center (TSC), NEDO
- Mr Hidenori Yonekura, Researcher, Renewable Energy Unit, TSC, NEDO
- Ms Yuka Ogasawara, Researcher, Energy System & Hydrogen Unit, TSC, NEDO
- Mr Mitsuhiro Yamazaki, Deputy Director, Representative office in Europe, NEDO
- Ms Aiko Higuchi, Director, EU-Japan Centre for Industrial Cooperation

Industry and industry associations

- Mr Athanasios Krontiris, Head of Product Development HVDC light, ABB
- Ms Ann-Sophie Chamoy, Director Regulatory Developments, Energy Pool
- Mr Michael Lippert, Vice President, European Association for the Storage of Energy
- Mr Laurent Schmitt, Secretary-General, ENTSO-e
- Mr Marcus Merkel, Office of the Board of Directors, EWE-NETZ
- Mr Christian Arnold, Senior Vice President enera Innovation, EWE AG, Germany
- Mr Jorgo Chatzimarkakis, Secretary-General, Hydrogen Europe
- Mr Vicente Gonzalez, Head of R&D and Innovation, Red Electrica de España
- Mr Thomas Döring, Expert policy analysis, Solar Power Europe
- Mr Marco Baresi, Institutional Relations Director, Turboden
- Mr Gunnar S. Jungk, Chief Representative Brussels, thyssenkrupp
- Mr Giles Dickson, Chief Executive Officer, Wind Europe
- Dr Masami Takenaka, Managing Executive, Clean Energy Project Corporate R&D, Asahi Kasei Corporation
- Dr Mutsuhiro Maruyama, Europe Regional Senior Manager, Clean Energy Project R&D Center, Asahi Kasei Europe GmbH
- Mr Hiroshi Kakihara, Europe Regional Manager R&D Center, Clean Energy Project, Asahi Kasei Europe GmbH
- Mr Yasuhiko Nakayama, CEO, FIAMM Energy Technology SpA, (a Hitachi Chemical Group company)
- Mr Mattia Dalle Vedove, Manager, transport and energy policy, Hitachi Corporate Office, Europe
- Mr Masatoshi Shiiki, General Manager, Energy Storage Business Strategy Sector, Energy Storage Business Headquarters, Hitachi Chemical
- Mr Naohide Natsume, Project Manager of New Energy Development, Hitachi Chemical Europe GmbH
- Mr Yasushi Fukuizumi, Fellow, Vice-President Power Systems, Mitsubishi Heavy Industries
- Mr Masazumi Oishi, Programme Execution Manager, Technology & Innovation Department, Mitsubishi Heavy Industries
- Mr Yoshihiro Shiraiwa, Senior Vice President, Chief Regional Officer EMEA; Mitsubishi Heavy Industries, Ltd.
- President, Mitsubishi Heavy Industries France, S.A.S.
- Mr Hiroaki Ichihashi, Commercial & Marketing Director, Mitsubishi Heavy Industries France
- Prof Emmanouil Karakas, Vice President and Head of Business Unit New Products & Innovation, Mitsubishi Hitachi Power Systems Europe
- Ms Maria João Duarte, Representative to the EU Institutions and Head of the Brussels Liaison Office, Mitsubishi Hitachi Power Systems Europe
- Mr Masato Yamada, Vice President, Chief Strategy Officer, MHI Vestas Offshore Wind