ICEF 2020 and Japan’s Path toward Carbon Neutrality

2021-2-2 CGEP Columbia University
Nobuo TANAKA
Chairman of the Steering Committee
The Innovation for Cool Earth Forum (ICEF)
Tokyo “Beyond-Zero” Week

Tokyo “Beyond-Zero” Week features six leading international conferences organized and hosted by Japan. Each conference offers a forum for high-level discussions about the key innovations required to build a global roadmap to carbon neutrality and find pathways to go “beyond zero”—namely reducing the levels of CO2 emissions already in the atmosphere.

Led by Kajiyama Hiroshi, Japan’s Minister of Economy Trade & Industry (METI), participants are set to include ministerial-level government representatives from the United States, Europe, Saudi Arabia and Qatar, Dr. Fatih Birol, Executive Director of the International Energy Agency (IEA), leaders from national research institutes, as well as leading innovators from academia and industry.

Between October 7th and 14th 2020, Japan will host a series of wide-ranging discussions with these distinguished participants aimed at making an impactful contribution to addressing the global challenge of climate change.
Innovation for Cool Earth Forum (ICEF)

◆ To raise awareness and promote discussion on innovations in energy and environmental technologies, ICEF started its activity in 2014.
◆ Gathering experts, the annual event in every October shares latest topics and trends with 1000 audiences from areas of business, policy making and academia.

ICEF Steering Committee Members: 2020-2021

Nobuo Tanaka(Chair)
Special Advisor, The Sasakawa Peace Foundation
Former Executive Director, International Energy Agency (IEA), Japan

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Chief Executive Officer of Bloomberg New Energy Finance, United Kingdom

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Richard K. Lester
Associate Provost, Massachusetts Institute of Technology, United States

Laurence Tubiana
CEO, European Climate Foundation; Chair of the Board of Governors, French Development Agency; Professor, Sciences Po Paris, France

Kenji Yamaji
Senior Vice President/director-General, Research Institute of Innovative Technology for the Earth (RITE); Professor Emeritus, The University of Tokyo, Japan

Ajay Mathur
Director General, The Energy and Resources Institute (TERI), Member of the Prime Minister’s Council on Climate Change, India

Sally M. Benson
Professor, Department of Energy Resources Engineering, School of Earth Energy & Environmental Sciences, Stanford University, United States

Itaru Yasui
Honorary Adviser, Institute of Promotion for Sustainable Society, Honorary Adviser, National Institute of Technology and Evaluation (NITE), Japan

Eija-Riitta Korhola
Delegate of the Consultative Commission on Industrial Change, Adviser in the EU affairs, Finland

Nebojsa Nakicenovic
Executive Director, The World in 2050(TWI2050)
## Activities

- Choose topics for panel discussions that are relevant to technological and societal innovation on energy and environment.
- As one of output, ICEF publishes Road Map on specific technology which are deemed to have impact on technological development.

<table>
<thead>
<tr>
<th>Year</th>
<th>Main theme</th>
<th>Road map topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>The Role of Innovation for Addressing Climate Change</td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>Principal Issues in the Future GHG Reduction</td>
<td>Distributed Solar and Storage</td>
</tr>
<tr>
<td>2016</td>
<td>Importance of Net Zero Emission of CO2 and Innovation for Realizing the Net Zero Anthropogenic Emission of CO2</td>
<td>CO2 Utilization and ZEB/ZEH</td>
</tr>
<tr>
<td>2018</td>
<td>Driving Green Innovation</td>
<td>Direct Air Capture of Carbon Dioxide</td>
</tr>
<tr>
<td>2019</td>
<td>Bending down the emissions trajectory by Innovation and Green Finance</td>
<td>Industrial Heat Decarbonization</td>
</tr>
<tr>
<td>2020</td>
<td>Action toward “Beyond Zero” emission society in light of COVID-19; with a focus on gender equality</td>
<td>BiCRS : Biomass Carbon Removal and Storage</td>
</tr>
</tbody>
</table>

Choose topics for panel discussions that are relevant to technological and societal innovation on energy and environment. As one of output, ICEF publishes Road Map on specific technology which are deemed to have impact on technological development.
BiCRS feedstocks are available for 2.5 to 5 GT CO2 removal/ year by 2050
"Top 10 innovations" is an event to elect the most notable among recent innovative developments to raise public awareness regarding innovations to counter global warming.

Top 10 Innovations were selected from among 20 nominees through a vote by ICEF participants.

The voting results are as follows:

<table>
<thead>
<tr>
<th>Category A: Research &amp; Development</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No.A2</td>
<td>A new development of viable sodium-ion battery</td>
</tr>
<tr>
<td>No.A4</td>
<td>A new method which converts CO2 to methane at low temperature</td>
</tr>
<tr>
<td>No.A6</td>
<td>Direct solar-to-hydrogen production process with high efficiency by perovskite-silicon tandem absorbers</td>
</tr>
<tr>
<td>No.A7</td>
<td>Dramatic increase in solar cell output (2 electrons with 1 photon)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Category B: Adoption &amp; Implementation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No.B1</td>
<td>The world's highest efficiency fuel cell for residential use</td>
</tr>
<tr>
<td>No.B3</td>
<td>The world's first liquefied hydrogen carrier building an International hydrogen energy supply chain</td>
</tr>
<tr>
<td>No.B5</td>
<td>New concrete manufacturing technologies with saving fresh water and reducing carbon footprint</td>
</tr>
<tr>
<td>No.B6</td>
<td>A new development of Medium Voltage Switchgear without SF6</td>
</tr>
<tr>
<td>No.B9</td>
<td>Future fuel capabilities for shipping and energy sector with first ammonia tests</td>
</tr>
<tr>
<td>No.B11</td>
<td>A new technology changing CO2 to a mineral in concrete manufacturing</td>
</tr>
</tbody>
</table>
Dr. Fatih Birol, Executive Director of the International Energy Agency (IEA), said that COVID19 made for a historic “Black April” for the oil markets. **Renewable Energy is a sole WINNER!**

But he recently said, “Today, I’m more optimistic than ever about the world’s ability to reach the goals of the Paris agreement,. Even the, 1.5 degrees seems less remote than it did a year ago.” (2021-1-13)
Solar PV is becoming the ‘new king’ of electricity.

Solar PV is now the cheapest source of electricity in most countries in part due to low cost financing and is set to triple before 2030 under current and proposed policies, with the potential to grow much faster.
Our existing energy infrastructure is too big to ignore

Reaching net-zero emissions requires tackling emissions from long-lived assets in power generation and heavy-industries. In emerging Asia, 80% of existing coal power capacity was built in the past 20 years.
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Of the 10 Gt of CO2 captured globally in 2070 in the Sustainable Development Scenario, more than 90% are stored. Nearly 3 Gt of the stored CO2 comes from BECCS or direct air capture.

The emissions that remain in 2070 in the Sustainable Development Scenario are concentrated in sectors where emissions are hard to abate – essentially heavy industry and long-distance transport.
Japan’s Green Growth Strategy

◆ In Oct 2020, Prime Minister Suga declared Japan’s intention to aim for carbon neutrality in 2050. This challenge has become the core of Japan's growth strategy.
◆ The Green Growth Strategy, released Dec 2020, is an industrial policy which aims to create a positive cycle of economic growth and environmental protection, together with the business community.
◆ The aim is to set ambitious goals and fully support the private sector’s efforts toward carbon neutrality.
◆ The strategy includes 5 cross sectoral policy tools (support measures) and action plans for 14 sectors, and will be updated continuously.

14 sectors covers supply and demand sides, and early deployment to future technologies.

<table>
<thead>
<tr>
<th>Offshore wind power</th>
<th>Nuclear power</th>
<th>Maritime</th>
<th>Aviation</th>
<th>Resource circulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel ammonia</td>
<td>Mobility and battery</td>
<td>Logistics, people flow and infrastructure</td>
<td>Carbon Recycling</td>
<td>Lifestyle-related industry</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>Semiconductor and ICT</td>
<td>Foods, agriculture, forestry and fisheries</td>
<td>Housing and building, Next generation PV</td>
<td></td>
</tr>
</tbody>
</table>
Energy Outlook of Carbon Neutrality in 2050
(reference for a discussion purpose)

- **2018**: 1.06 billion ton
  - Consumer 0.11 bil ton
  - Industry 0.3 bil ton
  - Transport 0.2 bil ton

- **2030 mix**: 0.93 billion ton (▲25%)
  - Consumer 0.09 bil ton
  - Industry 0.33 bil ton
  - Transport 0.15 bil ton

- **2050**: Emission reduction + Removals = net zero (▲100%)
  (Future discussion will not be limited to this reference)

- **Maximum usage of CCUS**
- **30-50% increase of electricity demand**
- **Decarbonized electric sources**
  - Renewables (50~60%)
  - Nuclear
  - Thermal + CCUS/ Carbon Recycling (30~40%)
  - Hydrogen/ammonia (10%)
  - Plantation, DACCS

- **BiCRS**

※values are the amounts of CO2 derived from energy

*Based on a material released by Ministry of Economy, Trade and Industry of Japan, presenter added information.
Green Growth Strategy is a Manifest of Japan Returning as a Hydrogen Leader

- Ramp up consumption across all industries to around 3 million tons by 2030 and 20 million tons by 2050
- Fuel Ammonia: 20% co-firing in thermal power generation, controlling NOX, deploying in ASEAN countries, NEXI & JBIC finance, building global supply chain by Japanese suppliers (100Mton in 2050)
- Hydrogen Gas Turbine as Carbon free power; Development of non-fossil value trading market
- FC Trucks: Support deployment, H2 stations, deregulation
- Direct Reduction Ironmaking (DRI); RD Support, Top Runner approach, Border adjustment measures
- H2 Transportation: Liquid Hydrogen, MCH, Ammonia; Support Scaling up and commercialization
- Electrolyzer: RD support, use of cheap energy
- High Temperature Gas Reactor for H2: RD support
- Synfuel from H2 for Mobility
- Carbon Free Vessels; H2FC, H2 / Ammonia fuel engine,
- Carbon Neutral Port/ H2FC for construction equipments
- H2 Airplane: RD support for Carbon fiber tank/ H2 fuel engine/ international standardization
- Photocatalyst / H2 for plastic
- ZEH/ZEB with FCV/EV, Enhance RE flexibility by H2
Potential Supplies of Blue and Green Ammonia. Organic Hydrate and Liquid Hydrogen are alternative modes of transportation.
A huge amount of evidence is emerging that the Coronavirus will have an outsized economic impact on women. So does Climate Change.
Climate Change is NOT Gender Neutral!

Key Findings

- Critical mass of >30% women on Board (WOB) makes difference.
- >30% WOB threshold is growing 2% => 16% in 10 years.
  - More women in management reasonably correlates to % women in workforce
- International initiatives such as TCFD is key driver for better climate governance, and early adopters show better gender diversity.
- Legislation and reporting requirements accelerate disclosure.

Gender diversity positively correlates to better climate governance and innovation.

Study by the Sasakawa Peace Foundation and BNEF