WECC2015

World Engineering Conference and Convention

Report

Engineering: Innovation and Society

Science Council of Japan

The Japan Federation of Engineering Societies

World Federation of Engineering Organizations

United Nations Educational, Scientific and Cultural Organization

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1. Opening Remarks

Hiroyuki Yoshikawa (Honorary Chairman, WECC2015 Organizing Committee)

Your Imperial Highness the Crown Prince, President Marwan Abdelhamid, Secretary General Irina Bokova, Distinguished Guests and Ladies and Gentlemen,

My mission here is to open the Conference, but I feel that I should say about the tragedy in Paris before opening the conference.

I would express deep regret for those lost by the attacks in Paris. I extend my condolence to them. These attacks were extremely wicked and unacceptable, and I wish it will be stopped and never happen in future.

When I am informed such tragedy, always I cannot help but think why we could not find a way to avoid the incident. I understand the difficulty. It is the result of complex issues; of politics, economics, religion, and of regional history. But when I recognise the history of humans which acquired the safe space by conquering the natural attacks by creating and using the scientific and technological knowledge to cope with them, I would believe that we can create knowledge useful for avoiding the tragic incident.

We have plenty of knowledge, especially scientific and technological, which surely has contributed and will contribute toward the establishment of peaceful and secure society for all.

Recently, the United Nations agreed the Sustainable Development Goals, including 17 practical gaols which should solve problems in the world by 2030: they are elimination of the poverty, hunger, violence and threats of disease; and ensuring the health, equality, equity and sustainability. We should be aware that the agreement frequently mentions that scientific and technological knowledge is very important to address these problems.

The United Nations Agreement and armed conflicts have no direct relation between them. However, I think we cannot understand the true root of the evils now hanging over the world, without identifying the relationship between the subjects taken up by the Sustainable Development Goals and the cause of raging armed conflicts in the world.

Now, I open the fifth World Engineering Conference and Convention in Kyoto. Presentations in the Conference cover all engineering domains aiming at contributing to nature and society. I believe that we shall gain useful knowledge of respective domains and at the same time we shall show the power of engineering when integrating domain knowledge toward particular targets in society. I believe the World Federation of Engineering Organisations will play the lead in innovating engineering knowledge necessary for addressing the global problems and reach the goals, establishing the sustainable world without conflict.

2. Welcome Remarks

Jun'ichi Sato (President, The Japan Federation of Engineering Societies (JFES) / Chair, WECC2015 Organizing Committee)

I wish to express my deepest gratitude for the attendance today by His Imperial Highness the Crown Prince, and by the many guests from Japan and abroad, at this, the 5th World Engineering Conference and Convention. I would like to offer welcome remarks on behalf of the Organizing Committee.

How does engineering compare to the science and technology? Engineering is the act of using science and technology to meet the needs of society and humanity through ingenuity, with consideration for the requirements and boundaries presented by society.

The world is faced with numerous problems today. These include problems of population, poverty, energy, and the environment. Global warming is closely related to these problems and steadily having more effect on the planet. The emission of greenhouse gasses such as carbon dioxide is accelerating global warming.

Climate change causes effects such as drought, heavy rains, as well as extreme temperatures throughout the world. This affects the survival of plants and animals and has a major impact on food production.

We must make proactive efforts to address these issues through innovations in engineering. The primary theme of WECC2015 in Kyoto is "Engineering: Innovation and Society." This includes discussions on "Innovation for Sustainable Growth and Socioeconomic Development," "Engineering Research and Development for Innovation," and "Engineering for Society and Engineering in Society." The conference featured seven Conference Plenary Lectures, technical programs covering every engineering domain and summary lectures for each of the technical programs.

On the afternoon of December 2nd, the final day of WECC2015, a concluding lecture and discussion will be given regarding the technical programs. The results of the discussions will be compiled to produce the Kyoto Declaration, a final outcome document that will set forth a vision for the ideal future for engineering.

It is my sincere hope that all of the participants will, through the WECC2015 conference, gain a fresh and more profound appreciation of the relationship between engineering, innovation and society.

Thank you.

3. His Imperial Highness Crown Prince of Japan Naruhito

I am truly delighted that the 5th World Engineering Conference and Convention (WECC2015) will be held with so many people participating from Japan and overseas.

The origin of the WECC can be traced back to 1929, when the Japan Federation of Engineering Societies hosted the World Engineering Congress (WEC) in Tokyo through the collective efforts of industry, academia, and the government at the time. The WEC was a major success, sending out a message to the world that Japan had recovered from the Great Kanto Earthquake. Later, in 1968, the World Federation of Engineering Organizations (WFEO) was founded with the objective of fostering peace and socioeconomic progress around the world by encouraging advances in engineering and international exchange. I understand that currently, a World Engineers' Convention is held at roughly four-year intervals under the leadership of the WFEO. It is deeply meaningful that WECC2015 will be convened in Kyoto, a city that has successfully fused tradition and leading-edge technologies, preserving Japan's culture and heritage all the while developing state-of-the-art technologies.

From the perspective of "Engineering for Society and Engineering in Society," WECC2015 will strike a balance between the innovation that engineering aims to achieve and the presentations by engineers and researchers who will provide the basis for such innovation. It is very important that WECC2015 brings together the business community, academia, the educational community, the government, and the public for discussions on achieving a sustainable society.

The convening of WECC2015 in Japan comes at an excellent time, with the world holding ever higher expectations for Japan's efforts to recover from the national crisis of the Great East Japan Earthquake, as well as for Japan's initiatives to promote sustainable development based on the lessons learned from the disaster. For Japan, WECC2015 offers a valuable opportunity to live up to the expectations of the international community and to share Japan's efforts with leading players from various sectors around the world.

In closing, I would like to express my sincere respect to all those who have dedicated themselves to the advancement of "Engineering for Society and Engineering in Society." I hope that WECC2015 will fulfill its role in presenting a direction for solving the key challenges facing mankind in the 21st century and proposing concrete measures to this end, as well as in promoting global awareness of the key roles played by engineers and researchers. Thank you for your kind attention.

4-1. Greeting from Co-organizer

Takashi Onishi (President, Science Council of Japan (SCJ))

Your Imperial Highness The Crown Prince, Your Excellencies The Ministers, and Distinguished Guests, Ladies and Gentlemen.

It is my great honor to deliver an address as a co-organizer at the opening ceremony of the 5th World Engineering Conference and Convention in the presence of His Imperial Highness, The Crown Prince.

Science Council of Japan is a representative institution of Japan's scientific communities in all kinds, from Humanities to Engineering, including Social, Life and Physical Sciences. Our primary purpose is to develop and advance scientific outcomes to ensure that the science is reflected in and infiltrates policy making, industry, and people's lives.

Since its establishment in 1949, with a view of promoting international exchange in science, we have deepened our ties with research institutions worldwide by hosting international conferences in Japan and dispatching researchers to conferences held overseas.

We are very pleased to host this international conference and welcome the participants from various countries and regions.

I am especially looking forward to hearing the many splendid scientific results under the conference theme of "Engineering: Innovation and Society".

As we all know, social innovation through scientific discoveries and engineering practices become the most important subjects in many countries. Researchers and Experts in engineering, of course, are expected to play indispensable roles for it. I am also working as President of a National University, which is named Toyohashi University of Technology. The aim of our university is seeking technological science, that is, applying and developing engineering through understanding sciences supporting technology. Therefore, I am deeply concerned about the success of this conference.

I hope that there will be intense discussions among researchers and engineers crossing national and regional boundaries on significant research topics, future perspective, and international collaborations towards social innovation, simply for constructing better society securing well-being to all the people.

I am also delighted as a co-organizer that this conference will be an occasion to share the meaning and importance of engineering with the society through the general public forum.

Before closing my welcome address, I would like to express my wish for the great success of this conference. In addition, I hope that you have an enjoyable and memorable stay in Kyoto, the cultural capital of this country, deepening a better understanding of Japanese culture.

Thank you for your attention.

4-2. Greeting from Co-organizer

Marwan Abdelhamid (President, World Federation of Engineering Organizations (WFEO))

As President of the World Federation of Engineering Organizations (WFEO), I would like to join the Federation's members and officials in this Room to express our pleasure to be among you.

I have always found that some of the most exciting ideas and opportunities emerge when you bring people together. I congratulate the Science Council of Japan and the Japan Federation of Engineering Societies for organizing the WECC2015 during which so many aspects of engineering will be addressed. It goes without saying that the prominent speakers, the large number of participants and the importance of the issues to be discussed will guarantee the success of the event and ensure an exceptional outcome. The ideas being discussed at this year's convention are of huge importance to the future character, quality and prosperity of all countries in the world.

The World Federation of Engineering Organizations (WFEO) is the global organization for the engineering profession. It was founded in 1968, under the auspices of UNESCO, and brings together national engineering institutions from over 90 nations and represents some 20 million engineers.

WFEO is an official partner of UNESCO and has its headquarters at UNESCO in Paris. WFEO's work is done through ten committees on the environment, education, disaster risk management, energy, capacity building, information and communication, anti-corruption, young engineers, women in engineering and innovation.

WFEO acts as the voice of the engineering profession in many UN bodies including the UNFCCC which is organizing COP-21 conference at this moment in Paris. In fact, the WFEO Committee on Engineering and the Environment in partnership with UNESCO is organizing a COP-21 Parallel event also in Paris on the 8th of December under the title of WFEO COP-21 Engineers Climate Change Summit "Turning Words into Action".

Many of the topics that you are exploring at this convention under the theme of "Engineering: Innovation for Society" are global in nature and the World Federation of Engineering Organizations engages in these issues too, including: Resilient Infrastructure, climate change adaptation, Energy, Engineering Education, Mobility and Communication Technology. New ideas will emerge from this gathering and I am sure we shall also learn a lot from the Japanese experience.

A convention like this and the exhibition are also great networking opportunities. They bring together national and international organizations, academia and prominent speakers and engineers to share innovative engineering solutions.

The challenges facing humanity are huge and are changing all the time. This is where efforts towards society and the wellbeing of people become more and more important.

Conscious of this fact, the Japanese organizers focused on what engineers and engineering can bring to society. It is a fact that engineers are key players in the search for solutions to achieve sustainable development as indicated in the UN Sustainable Development Goals that include among other: End of Poverty in all its Forms Everywhere; Achieve Food Security; Ensure Inclusive and Equitable Quality Education; Achieve Gender Equality; Sustainable Management of Water and Sanitation for All; Affordable, Reliable Sustainable and Modern Energy for All; Build Resilient Infrastructure; Take Urgent Action to Combat Climate Change and its Impacts.

WFEO through its ten Standing Technical Committees works towards the achievement of these goals by making the voice of engineers heard in national and international organizations and among decision makers.

I want to express my gratitude to the Japanese authorities for their commitment to supporting the global engineering profession in this way.

I also thank again the Science Council of Japan and the Japan Federation of Engineering Societies and all of their support staff for their excellent work.

Finally, I and the World Federation of Engineering Organizations wish you all every success in turning the ideas and opportunities that emerge at this convention into reality.

4-3. Greeting from Co-organizer

Irina Bokova (Director-General, United Nations Educational, Scientific and Cultural Organization (UNESCO))

Welcome message by the Director-General of UNESCO was delivered through video.

5-1. Guest Speech

Aiko Shimajiri (Minister of State for Science and Technology Policy)

Your Imperial Highness The Crown Prince, Your Excellencies The Ministers, Chair of the Organizing Committee, Distinguished Researchers, Honored Guests, and Congress Participants,

Today, in the presence of His Imperial Highness the Crown Prince, on the occasion of the opening ceremony of the 5th World Engineering Conference and Convention, I am greatly honored to offer a few words of congratulations as the minister responsible for science and technology policy of Japan.

I am truly delighted that this congress, which was first held in 2000 and is one of the most authoritative international meetings in the field of engineering, is held in Kyoto.

I learn that this is the first occasion for Japan to host the congress. I would like to express my gratitude to all the people who have exerted themselves to organize this congress as well as the participants who come to Japan from a distance abroad.

The Government of Japan decided "The Comprehensive Strategy on Science, Technology and Innovation 2015" this June. Furthermore, we are now formulating "The 5th Science and Technology Basic Plan," which will start next April.

At this congress, under the global theme of "Engineering: Innovation and Society," some important issues, such as, human resource development and the role of engineering in innovation for sustainable development, will be discussed. The issues are highly relevant to the government's policymaking.

As the Minister of State for Science and Technology Policy, I am promoting the development of science, technology, and innovation, in order to improve people's quality of life and safety. I believe that it is important for the governments and private sector strongly join forces to further develop science, technology, and innovation in such a situation that the sense of uncertainty is growing. Therefore, I am really encouraged by this congress that starts today in Japan.

Finally, I sincerely hope that this congress will achieve its objectives and be truly fruitful, and I also wish the continued success to all the participants.

Thank you very much for your kind attention.

5-2. Guest Speech

Hiroshi Hase (Minister of Education, Culture, Sports, Science and Technology)

Good morning. I would like to extend my sincerest congratulations to you all on this occasion of the World Engineering Conference and Convention 2015, which is being held today with the attendance of His Imperial Highness the Crown Prince.

I am truly delighted that this international conference is being held on such a magnificent scale for the first time in Japan to discuss technological advancements and contributions to society across the various fields of engineering.

In recent years, engineers have been tackling issues that are increasingly diverse and complex in the face of the rapidly globalized world economy and remarkable advances in information technologies. To overcome these challenges and achieve sustainable development, it is critical for new innovations to be created through partnerships that cut across the barriers between the respective academic societies and the Government.

I firmly believe that holding this international meeting has extraordinary significance for solving these issues, as it brings together distinguished researchers from around the world to share their knowledge and experience and expand their circle of friendship.

For example, Germany is taking the lead in developing what they call "Industry 4.0" – the fourth industrial revolution. Here in Japan, we are making comparable efforts by aggressively pursuing the development of robotics making full use of IOT. Our aim is to overcome the shortage of people resulting from the rapid aging of Japanese society. I am very hopeful that the knowledge and unstinting efforts that engineers such as you can bring to such problems will help us further advance this technology.

Lastly, I am sure this international meeting will produce fruitful outcomes, and I have great expectations for the further advancement of engineering. I wish you all continued success in your future endeavors. Thank you very much.

5-3. Guest Speech

Keiji Yamada (Governor, Kyoto Prefecture)

Please allow me to offer my congratulations on the magnificent opening of this World Engineering Conference and Convention (WECC2015) today, the 5th WECC, with His Imperial Highness the Crown Prince of Japan in attendance, and to welcome all of you who have gathered here both from Japan and around the world, to Kyoto. On behalf of the residents of Kyoto Prefecture, I sincerely welcome you.

Please also allow me to express my sincere appreciation to all the successive officials and individuals concerned, including Japan Federation of Engineering Societies (JFES) President Dr. Jun'ichi Sato and WECC2015 Executive Committee Chair Yumio Ishii, who made an enormous effort over many years, beginning with winning the right to host this conference through to the opening here today.

Since being held in Hanover, Germany in 2000, the WEC has been held in the famous cities of Shanghai, Brasilia and Geneva. This is the first time it has been held in Japan, and I feel very happy and extremely honoured that this memorable conference is being held here in Kyoto, a representative Japanese academic city that has cultivated an enduring history and culture.

Furthermore, if we count back to the World Engineering Congress held in Tokyo in 1929, which can be viewed as the origin of today's conference, this event is in fact being held in Japan for the first time in 86 years.

I understand that at that time also, thanks to the concerted efforts of industry, government and academia, including JFES, huge successes were achieved, including letting the world know that Japan had recovered from the Great Kanto earthquake. It is highly significant that this conference too is being held in Japan, which is achieving a steady recovery from the Great East Japan Earthquake, and that it is being held here in Kyoto, where the ties between industry, government and academia are extremely strong. It is my ardent hope that Japan's engineering and technological strengths, human resources prowess and other capabilities are conveyed to the entire world from this location.

Kyoto, the 'thousand-year capital,' attaches importance to tradition but at the same time is home to many globally-renowned and advanced companies that possess superior manufacturing techniques. And alongside that, it has long been a place with an established support framework for venture companies and small- and medium-sized enterprises that bring together industry, universities and government.

I hope that you all use this opportunity to have a good look around Kyoto, which skilfully balances the old and the new in this way.

Furthermore, at the moment Kyoto is approaching the beautiful fall foliage season, so you are very fortunate to be visiting Kyoto at this time.

In particular, the area around this International Conference Center is away from the hustle and bustle of the city, and is blessed with a quiet environment surrounded by nature, so during the conference intervals by all means take leisurely strolls around.

That said, I kindly ask that you do not spend so long enjoying the fall foliage that you end up being late back to the conference.

In closing, I sincerely pray for the success of the 5th WECC and the good health and happiness of all of you taking part today. I offer you my best wishes.

5-4. Guest Speech

Daisaku Kadokawa (Mayor, City of Kyoto)

Ladies and gentlemen from all around the world, welcome to Kyoto. Together with the 1.47 million citizens of Kyoto, I would like to extend all of you our warmest welcome.

Also, it is a great pleasure today for me to address the first World Engineering Conference and Convention to be held in Japan.

For more than 1200 years, Kyoto has carefully nurtured and protected its traditions and culture, yet Kyoto still continues to develop, turning out one innovation after another.

Therefore, the Kyoto spirit is rooted firmly in the ideal of taking advantage of the old to create something new. Traditional pottery techniques have led to innovations in ceramics, sake to biotechnology, and the craft of Buddhist religious objects to new developments in precision equipment.

Given our history, it would be no exaggeration to say that it is our longstanding wisdom of engineering that has supported Kyoto's development as a city of manufacturing.

A great number of universities and research facilities are located in Kyoto. In this respect I believe it is extremely significant and of great value that engineers and scientists come together from all over the world today to debate on issues concerning engineering and to deepen your international exchange. I hope that the 2015 World Engineering Conference and Convention will lead to further developments in engineering, help resolve social issues, and eventually to happiness of all mankind.

For the second consecutive year in a row, Kyoto has been chosen as the best destination city in the world by the highly influential US travel magazine, Travel + Leisure. Now the beautiful colors of the autumn leaves are here and Kyoto has now entered into its most beautiful season. I hope you will be able to experience to feel the charm of Kyoto that has enchanted so many people.

In closing, I would like to express my most sincere wishes that the 2015 World Engineering Conference and Convention 2015 will be fruitful for all who attend and participate.

Thank you very much!

5-5. Message from Prime Minister

Shinzo Abe (Prime Minister of Japan)

Your Imperial Highnesses the Crown Price, your excellencies, distinguished guests.

I am pleased to extend a very warm welcome to all participants from around the world on this occasion of the opening ceremony of World Engineering Conference and Convention in Kyoto.

I am honored that the conference is being held under the joint sponsorship of Science Council of Japan, the Japan Federation of Engineering Societies, the World Federation of Engineering Organizations, and the United Nations Educational, Scientific and Cultural Organization, graced by the presence of His Imperial Highnesses the Crown Prince.

I hope that this international conference for advancement in the field of Engineering will be a great success.

6. General Overview of WECC2015

(1) Outline

1) Conference name: World Engineering Conference and Convention (WECC2015)
2) Organizers: The Japan Federation of Engineering Societies
The Science Council of Japan
World Federation of Engineering Organizations (WFEO)
United Nations Educational, Scientific and Cultural Organization (UNESCO)
3) Dates: Sunday, November 29 to Wednesday, December 2, 2015
4) Venue: Kyoto International Conference Center (Kyoto City, Kyoto Prefecture)
5) Attendance: 1,990 people from 68 countries and two territories
(521 people from overseas, 1,469 people from within Japan)
(1,198 people participated in associated events such as the general public program)

(2) General overview of the conference

1) The background to the event, and how it came to be held in Japan

The World Federation of Engineering Organizations (WFEO), which is an organizer of the WECC2015, has its origins in the World Engineering Congress, which the Japan Federation of Engineering Societies held in Tokyo in 1929 with the support of the Government of Japan. Subsequently, after overcoming numerous difficulties, with UNESCO's backing it was officially established as the World Federation of Engineering Organizations (WFEO) in 1968. Currently the representatives of 15 million or more engineers in 93 countries, and the international organizations of 11 regional federation of engineering organizations in regions worldwide, including the Asia-Pacific, all of America, and Europe, among them UNESCO, participate in the WFEO. From Japan, the Science Council of Japan and the Japan Federation of Engineering Societies carry out WFEO activities as a full member and an associate member, respectively. World Engineers' Convention (WEC) is an international conference that is generally held every four years. The 1st WEC took place in Germany in 2000, the 2nd in China in 2004, the 3rd in Brazil in 2008, and the 4th in Switzerland in 2011. The Science Council of Japan and the Japan Federation of Engineering Societies undertook activities to win the right to host the WECC2015 on the topic of 'Engineering: Innovation and Society,' and the WFEO board granted its approval for the event to be held in Kyoto Prefecture, Japan in 2015. Kyoto City, the venue for the convention, preserves Japan's culture and traditions while simultaneously promoting the development of advanced technologies, and it is a city that successfully combines traditions and the latest technologies, and which boasts a track record of hosting a large number of international conferences up to now. One noteworthy point is that the conference was held at the Kyoto International Conference Center in Kyoto City.

2) The benefits of holding the convention

2015, the year the WECC2015 was held, also coincides with the final fiscal year of the 4th Science and Technology Basic Plan that Japan is in the process of pursuing as a science and technology nation, and along with showcasing Japan as a nation built on scientific and technological innovation to achieve sustainable development in the 21st Century, the WEC was also an extremely valuable opportunity to show the world the engineering and technological capabilities – as well as the human resources strengths – that are underpinning that. At the same time, amid the growing expectations the world is pinning on Japan's efforts to recover from the national crises of the Great East Japan Earthquake and the nuclear accident and to achieve sustainable development that capitalizes on those lessons, there were considerable benefits to being able to use the WECC2015 as a platform for conveying those results to the world.

3) The overall theme at the conference

From the perspective of "Engineering for Society and Engineering in Society," the 5th WECC – as the World Engineering Conference and Convention (WECC2015) – sought to strike a balance between the innovation that engineering aims to achieve and presentations by engineers and researchers who provide the basis for such innovation. Reflecting this approach, the overall conference theme was "Engineering: Innovation and Society," which was broadly divided into the three main themes of: I: Innovation for Sustainable Growth and Socioeconomic Development; II:

Engineering Research and Development for Innovation; and III: Engineering for Society and Engineering in Society.

4) The conference program

The opening ceremony for the WECC2015 began from 9:00 a.m. on Monday, November 30, 2015 with His Imperial Highness Crown Prince Naruhito of Japan in attendance. Following the opening ceremony, six conference plenary lectures from individuals in leadership positions in their respective fields were held, consisting of three lectures in the morning and afternoon, respectively (another conference plenary lecture that was attended by the general public was held from 9:00 a.m. on December 1). Following the plenary lectures, technical sessions (oral sessions) were held in 10 conference rooms and poster sessions were held in one conference room for two days (December 1 and December 2), on the basis of the overall conference theme of "Engineering: Innovation and Society." With 251 invited lectures and 422 poster sessions, it was an environment that allowed participants to take in a full array of lecture presentations. Including those who attended the technical sessions, the conference attracted 1,990 registrants. A technical exhibition was held at the same time at a separate venue, and 97 companies exhibited their technologies at a total of 145 booths over a three-day period (November 30 to December 2). There, domestic and foreign companies exhibited their latest technologies, products, practical examples of business solutions, recommendations and other material. After the oral sessions and poster sessions ended on Wednesday, December 2, closing remarks were given and a closing ceremony was held, and accompanying the adoption of the Kyoto Declaration, the WECC2015 ended.

On the other hand, as World Federation of Engineering Organizations (WFEO)-related events, meetings of the WFEO's Executive Council, General Assembly, Standing Technical Committees and other groups were held at the Kyoto International Conference Center over a four-day period from November 28 to December 4, and included the International Symposium on "River Technology for Innovation and Social System" on Saturday, November 28.

For associated events such as the general public program, please refer to the next section (7. Overview of the conference)

5) Key outcomes of the conference

Practical examples of "engineering that supports society" and "engineering that produces social innovation" were conveyed to the world as a result of a concerted effort by Japan's industry, the scientific and academic communities, government, and the general public, along with the engineering associations and the industrial community that make up the Japan Federation of Engineering Societies. In particular, the industrial community made a concerted contribution with regard to high-value-added manufacturing, including hard and soft systems and services.

Furthermore, we believe the benefits of getting participants to experience Japanese technologies and culture via the Kyoto Program, Engineering Café and Technical Visits and Tours were significant. At the same time, as a result of organizations, companies, ministries and agencies, universities and other entities implementing a wide range of projects at the technical exhibition, it was possible to enhance the depth of the international conference.

(Text composed by Teruhiko Yoda and Kiyoshi Ono)

7. Outline of WECC2015

(1) Opening Ceremony

Date/Time: 9:00 – 10:00 November 30 (Mon.), 2015

Venue: Main Hall of the Kyoto International Conference Center

The Opening Ceremony was graced by the presence of His Imperial Highness the Crown Prince of Japan and other distinguished invited guests who are active in positions of leadership in their respective fields, as noted below, befitting the grand ceremony to mark the start of WECC2015.

Guest of Honor:

- His Imperial Highness the Crown Prince of Japan

Guests:

- Ms. Aiko Shimajiri, the Minister of State for Science and Technology Policy
- Mr. Keiichi Ishii, the Minister of Land, Infrastructure, Transport and Tourism
- Mr. Tsutomu Tomioka, the State Minister of Education, Culture, Sports, Science and Technology
- Mr. Keiji Yamada, the Governor of Kyoto Prefecture
- Mr. Daisaku Kadokawa, the Mayor of City of Kyoto
- Dr. Han Seung-soo, UN Secretary-General's Special Envoy on Disaster Risk Reduction and Water
- Prof. Juichi Yamagiwa, the President of Kyoto University
- Mr. Yoshio Tateishi, the Chairman of the Kyoto Chamber of Commerce and Industry

Executives representing the organizers:

- Mr. Marwan Abdelhamid, the President of the World Federation of Engineering Organizations
- Prof. Dr. Shahbaz Khan, the Director and Representative of the Regional Science Bureau for Asia and the Pacific, UNESCO Office in Jakarta
- Prof. Takashi Onishi, the President of the Science Council of Japan
- Prof. Hiroyuki Yoshikawa, the Honorary Chairman of the WECC2015 Organizing Committee
- Dr. Jun'ichi Sato, the President of the Japan Federation of Engineering Societies
- Dr. Yumio Ishii, the Chair of the WECC2015 Executive Committee
- Prof. Shin-ichi Nakao, the Vice-chair of the WECC2015 Executive Committee

Opening Ceremony:

Entry of His Imperial Highness Crown Prince of Japan

Opening Remarks: Prof. Hiroyuki Yoshikawa, the Honorary Chairman of the WECC2015 Organizing Committee

Welcome Address: Dr. Jun'ichi Sato, the President of the Japan Federation of Engineering Societies, and Chair of the WECC2015 Organizing Committee

Greetings from Co-organizer: Prof. Takashi Onishi, the President of the Science Council of Japan

Greetings from Co-organizer: Mr. Marwan Abdelhamid, the President of the World Federation of Engineering Organizations

Video Message from Co-organizer: Ms. Irina Bokova, the Director-General of the United Nations Educational, Scientific and Cultural Organization

Words from His Imperial Highness Crown Prince of Japan Naruhito

Guest Speeches from distinguished guests:

Ms. Aiko Shimajiri, the Minister of State for Science and Technology Policy

Mr. Tsutomu Tomioka, the State Minister of Education, Culture, Sports, Science and Technology

Mr. Keiji Yamada, the Governor of Kyoto Prefecture

Mr. Daisaku Kadokawa, the Mayor of City of Kyoto

A message from Prime Minister Shinzo Abe

* Prof. Shin-ichi Nakao, the Vice-chair of the WECC2015 Executive Committee, read out the message on behalf of Prime Minister Abe

Closing Remarks:

Dr. Yumio Ishii, the Chair of the WECC2015 Executive Committee

(2) Reception

Date/Time: 18:00 – 20:00 November 29 (Sun.), 2015

Venue: Swan and Sakura, the Kyoto International Conference Center

In order to create a casual atmosphere where delegates could relax and enjoy the food and beverages, we had originally prepared two venues in a get-together style. However, as there were many attendees, about 500 people in total, in the end the entire first floor of ICC Kyoto was utilized for the reception, including the foyer between the 2 venues.

(3) Conference Plenary Lectures (Lectures' outlines can be found starting on page 13)

Date and Time: Part 1 – 6, 10:30 - 16:00, November 30 (Mon.), 2015
Part 7, 9:00 - 9:50, December 1 (Tue.), 2015

Venue: Main Hall, Kyoto International Conference Center

Part 1: Science and Technology for Water in a Carbon-Constrained World
Dr. Han Seung-soo
UN Secretary-General's Special Envoy on Disaster Risk Reduction and Water
Former Prime Minister of the Republic of Korea

Part 2: Engineering-Society Interface for Delivering New Agenda 2030
Prof. Dr. Shahbaz Khan
Director and Representative, Regional Science Bureau for Asia and the Pacific, UNESCO Office, Jakarta

Part 3: Stormy Energy Future and Role of Sustainable Nuclear Power
Mr. Nobuo Tanaka
Former Executive Director, International Energy Agency
Visiting Professor, The University of Tokyo
Director, CHIYODA CORPORATION

Part 4: Engineering Based Experiences and Challenges towards Economic and Social Development
Mr. Keiichi Ishii
Minister of Land, Infrastructure, Transport and Tourism

Part 5: Japan where Innovations Spring up One after Another
Mr. Tsuneo Kitamura
Parliamentary Vice-Minister of Economy, Trade and Industry

Part 6: Embracing a Hydrogen Society: Toyota's Strategy for Environmental Technology
Mr. Takeshi Uchiyamada
Chairman of the Board, Toyota Motor Corporation
Vice Chair, Japan Business Federation

Part 7: Wide-bandgap Semiconductors as Tools for Realizing a Sustainable Society
Prof. Hiroshi Amano
Director, Professor, Center for Integrated Research of Future Electronics, Institute of Materials and Systems for Sustainability, Nagoya University
2014 Nobel Prize Laureate

(4) Oral Sessions (Detailed report can be found on page 17)

Date: November 30 (Sun) – December 2 (Wed.), 2015

Considering the central focus of the meeting on the interaction between engineering and society, the program was divided into 10 main theme Tracks (noted below), comprised of 6 sessions each in order to study the current status and future prospects of technological developments from multiple perspectives. In addition, to examine the way developments are taking place that have a relationship to the fields contiguous with the technologies in each session as well, we formulated the program being conscious of the inter-disciplinary relationship with other sessions.

Track 1: Resilient Infrastructure for Society
Track 2: Energy for a Sustainable Society
Track 3: Natural Resources for a Sustainable Society
Track 4: Urban Development and Infrastructure
Track 5: Mobility and Communication Technology
Track 6: Industry for Society
Track 7: Life Innovation
Track 8: Engineering for Society and Engineering in Society
Track 9: Engineering Education and Women in Engineering

Track 10: Groundwork for the Future and Others

【Speakers for Oral Sessions】

To execute the above objectives and address the themes in detail, we invited researchers and engineering experts who are leaders in their respective fields to give some 251 lectures.

【Poster Sessions】

In addition to the above invited lectures, we solicited individual research poster presentations related to each theme. 422 presentations were accepted. The poster presentations took place in separate venues at ICC Kyoto over 2 days, December 1st (Tue.) and 2nd (Wed.).

【Summary and Concluding Remarks】

On the final day of the conference (December 2nd) from 2 p.m. to 3:30 p.m., Mr. Ken Okazaki, Chair of the Technical Program Committee, along with 6 Track Moderators presented a summary of all the Track lectures.

(5) Closing Ceremony

Date and Time: 15:30 – 17:00, December 2 (Wed.), 2015

Venue: Room A, Kyoto International Conference Center

Closing Ceremony started with the opening remarks, and adoption of the Kyoto Declaration and Signing Ceremony, the Awards Ceremony, and the Ceremony to transfer the emblem to the next host country were taken place. In the end, the closing remarks were given and the WECC2015 closed.

(6) Technical Exhibition

Date: Monday, November 30 – Wednesday, December 2

Venue: Event Hall and Annex Hall, Kyoto International Conference Center (ICC Kyoto)

Exhibitors: 97 Companies/Organizations

(9 sqm (3,000 W x 3,000 D): 145 booths, 2m^2 (2,000 W x 1,000 D) 25booths)

Exhibit Fees: 9 sqm (3,000 W x 3,000 D) 500,000 yen

2sqm (2,000 W x 1,000 D) 250,000 yen

Attendees to the Exhibition were expected to be primarily WECC attendees (in particular government officials of each country and representatives of corporations involved in infrastructure construction). However, we publicized the conference widely by dispatching DM to approximately 800 corporations/universities/research institutions in the Kansai Area, which led to increased attendance.

(7) Technical Visits and Pre & Post-Conference Tours & Accompanying Person Tours

The following tours were held before and during WECC2015.

PT1: Pre-Conference Tour

Course: Kyoto International Conference Center - Textile Museum (KAWASHIMA SELKON TEXTILES CO, LTD.) - Lunch – Kiyomizu-yaki Pottery Complex - Kyoto International Conference Center

Date/Time: 09:00-16:30, November 27 (Fri.), 2015

Participants: 7

Accompanying Person Tour 1

Date/Time: 13:00-17:30, November 30 (Mon.), 2015

Course: Kyoto International Conference Center - Nijo Castle - Kinkakuji Temple – Ryoanji Temple - Kyoto International Conference Center

Participants: 31

Accompanying Person Tour 2

Date/Time: 13:00-17:30, December 1 (Tue.), 2015

Course: Kyoto International Conference Center - Fushimi Inari Taisha Shrine - Kiyomizu-dera Temple - Kyoto International Conference Center

Participants: 33

TV3: Technical Visit Course C - Building and Civil Engineering

Date/Time: 08:00-18:00, December 3 (Thu.), 2015

Course: Kyoto International Conference Center - K computer - Kobe Port (by boat) - Lunch - Honshu-Shikoku Bridge Expressway Company Limited (HSBE) - Kyoto International Conference Center

Participants: 17

(8) Kyoto Program

Date/Time: 13:30 – 16:30, November 29 (Sun), 2015
Venue: Kyoto Chamber of Commerce and Industry
Speakers:
"'Washoku' Sustainability and Inheritance"
Mr. Yoshihiro Murata (Owner & Chef of Kikunoi)
"Kyoto Today: Urban Planning and Safeguarding the Railway Network"
Mr. Mitsuji Okamoto (President, Keifuku Electric Railroad Co., Ltd.)
"Kyoto's Education Revolution: Creating a city starts with fostering citizens"
Mr. Daisaku Kadokawa (Mayor, City of Kyoto)

Mayor Kadokawa's lecture presented Kyoto as an actual example of how traditional culture and flourishing industry can co-exist, centered on "Education" as a key word, interspersed with supporting comments from Mr. Murata and Mr. Okamoto. The audience included attendees from both Japan and overseas. (Simultaneous interpretation provided.)

(9) Engineering Café

Date/Time: 14:00 – 16:00, November 30 (Mon), 2015
Venue: Imadegawa Campus, Doshisha University
Theme: Engineering and Culture
Speakers:
"Engineering is the study of Cultural Creativity"
Prof. Hiroshi Harashima, Professor Emeritus, The University of Tokyo/Visiting Professor, Meiji University
"Japan's Contemporary Art History and Kyoto."
Prof. Hiroyuki Kano, Professor, Doshisha University
"Fusion of Engineering and Art"
Prof. Ryu Murakami, Professor, Kyoto Arts & Crafts University

Lectures and debate among attendees took place focused on "culture," which supports human's psychological side and is an element closely connected with engineering that cannot be overlooked.

(10) Banquet

Date/Time: 19:00-21:00, December 2 (Wed.), 2015
Venue: Mizuho no Ma, 4th floor, The Westin Miyako Kyoto

Some 360 guests, including invitees, attended the Banquet. All of the guests appreciated the special Kyoto "Geigi" dance performance by Kyoto geisha and enjoyed the Banquet, signifying the end of the conference. This "Geigi" dance performance was conducted by grant funding by Kyoto City.

(11) Kyoto traditional products/foods exhibition

Date:November 30 (Mon.) – December 2 (Wed.), 2015
Venue: Main Lounge, Kyoto International Conference Center

Thanks to the cooperation of Kyoto Convention Bureau, exhibition/sales of Kyoto's traditional products (Japanese sake, Uji tea, vegetables native to Kyoto, etc.) took place on the dates noted above, including demonstrations/sales by the producers. An area was set up where attendees could experience tea ceremony and taste Uji tea.

(12) The International Symposium on "River Technology for Innovation and Social System"

Date: November 28 (Sat.), 2015
Venue: Room D, Kyoto International Conference Center
Speakers: 10

This symposium featured lectures by 9 experts, 3 from Japan, 4 from Asia, 1 from the Middle East and 1 from Europe, on disaster mitigation and environmental conservation of rivers. An active exchange of views was held between WECC attendees from various countries and Japanese participants, and the outcome was a proposal; "Outline for environmental disaster risk management that aims to both conserve river environments and simultaneously mitigate the risk of catastrophic landslides/water disasters associated with climate change."

A summary of the symposium contents has been produced as a record of the lectures, along with the abstracts, and is available on the symposium website: http://river-innovation.net/

Finally, this symposium was conducted by grant funding by the River Foundation and financial support by WECC2015.

(Text composed by Tsutomu Nakajima)

8. Outline of Conference Plenary Lectures

(1) Dr. Han Seung-soo (CPL1)

Special Envoy of the UN Secretary General on Disaster Risk Reduction and Water, founding Chair, High-Level Experts and Leaders Panel on Water and Disaster / Former Prime Minister, Republic of Korea

"Science and Technology for Water in a Carbon-Constrained World"

1) At the opening ceremony, Dr. Han Seung-soo, Special Envoy of the UN Secretary General on Disaster Risk Reduction and Water, founding Chair, High-Level Experts and Leaders Panel on Water and Disaster, and former Prime Minister, Republic of Korea, gave a plenary lecture on 'Engineering, Innovation and Society' (hereafter referred to as the lecture). This is an overview of that lecture.
2) At the start of the lecture, Dr. Han expressed gratitude to the conference organizers, along with expressing his gratitude to His Imperial Highness the Crown Prince of Japan, who was present at the conference, and thanking His Imperial Highness for a keynote speech he delivered at the Second United Nations Special Thematic Session on Water and Disasters held two weeks prior to the conference.
3) The lecture was delivered from the perspectives of climate change and disaster management, and centered on the importance of science and technology in resolving these issues. To begin with, Dr. Han explained that the importance of evidence-based policy decisions through science and technology had been being emphasized in major conferences in 2015, such as the Third UN World Conference on Disaster Risk Reduction in Sendai, the 7th World Water Forum in Daegu, Republic of Korea, and the UN Sustainable Development Summit in New York, and noted that that importance will be the same at the COP21, which was set to commence in Paris with an opening ceremony on the same day.
4) Based on the 5th Assessment Report of the IPCC, Dr. Han emphasized the importance of mitigation measures through specific and detailed data. He also sounded a warning that where the expansion of disaster damage from climate change is concerned, the issue of water and disasters is no longer a local issue, it is a global one, and emphasized the importance of strategies. Additionally, when it comes to moving ahead with mitigation measures and strategies, he explained the important role that engineering plays in making evidence-based policy decisions through science and technology, and in their efficient implementation. Furthermore, in promoting mitigation measures and strategies Dr. Han also emphasized that it is important for world leaders to continue to actually take action, it is important that partnerships between governments, business, civil society and other entities function, and it is important that momentum in finance – both public and private – be maintained in order for measures and strategies to be implemented. He stated that the Tokyo Conference on International Study for Disaster Risk Reduction and Resilience and the Third UN World Conference on Disaster Risk Reduction held in 2015 were significant as breakthroughs for reducing disaster risk and resolving water problems.
5) Dr. Han wound up his lecture by explaining that 2015 is a transformative year for sustainable development, that science and technology innovation is indispensable to implementing tangible solutions, and that he hopes innovative engineering will contribute to achieving more disaster-resilient societies. The plenary lecture was based on deep insight and broad experience in the international community, and it ended with strong applause from the venue. (Text composed by Kenichi Tsukahara)

(2) Prof. Dr. Shahbaz Khan (CPL2)

Director of the UNESCO Regional Science Bureau for Asia and the Pacific, UNESCO Office, Jakarta

"Engineering-Society Interface for Delivering UN Agenda 2030"

Shahbaz Khan, Director of the UNESCO Regional Science Bureau for Asia and the Pacific, gave an address on the role and importance of engineering, including engineering education, against the backdrop of the role of engineering cited in the United Nations' sustainable 2030 action plan (the UN Agenda 2030) and a report on engineering for development published by UNESCO (the UNESCO Report, "Engineering: Issues, Challenges and Opportunities for Development" – 2010).

1) The role of engineering cited in UN's sustainable 2030 action plan (the UN Agenda 2030)

The UN's 2030 Agenda for sustainable development set out sustainable development goals (SDGs) that included reducing inequality in order to eradicate poverty and responding to climate change, and it demonstrated the importance of the role of engineering, including technological innovation, in achieving that. Within that, the Agenda also demonstrated that in addition to the need to secure engineers, including training young engineers and increasing the number of women engineers, engineering education is also the foundation of human development, along with social development and economic development, and it noted that expectations are being pinned on further advances in engineering to solve a variety of challenges.

2) The role and importance of engineering as advocated by UNESCO

UNESCO formulated the UEI (UNESCO's Engineering Initiative) on the basis that "Engineering is crucial for technological innovation and economic development, but it is also a key factor in advancing social and human development, especially in addressing global challenges such as poverty alleviation, energy, climate change, and water scarcity. At the same time, engineering is an evolving part of society." Additionally, as was also demonstrated in UNESCO's Engineering Report in 2010, the shortage of young engineers and women engineers, and the shortage of engineers in emerging countries, is now becoming a serious challenge worldwide. As a result, in order to pursue sustainable regional development and realize the UN Agenda 2030, UNESCO is focusing on building an education system for training engineers and partnering with the world's engineering education institutions on applied research and training, and is fostering university-industry partnerships to that end.

Looking ahead, engineering represents a key factor for eradicating poverty and conserving the Earth's environment, and activities are being advanced that regard engineering education, international partnerships and mutual understanding between engineers, partnerships between universities and industry and other initiatives as sustainable regional development. (Text composed by Kazumasa Ito)

(3) Mr. Nobuo Tanaka (CPL3)

Former Executive Director, International Energy Agency / Visiting Professor, The University of Tokyo / Director, CHIYODA CORPORATION

"Stormy Energy Future and Role of Sustainable Nuclear Power"

Mr. Tanaka gave a lecture titled 'Stormy Energy Future and Role of Sustainable Nuclear Power'. The lecture consisted of analysis of the energy situation, which has undergone major changes in the almost five years that have passed since the Great East Japan Earthquake, and the outlook for the energy situation. It is outlined below. Along with establishing a scenario for low-priced crude oil, North American shale oil has come to have a function in terms of promptly adjusting supply according to the market price. To Japan, where operations at most nuclear power plants halted due to the Great East Japan Earthquake, this slump in crude oil prices was fortunate in the short term. However, if low cost crude oil continues, to begin with there is a danger that dependence on OPEC countries by non-OPEC countries will increase further. Above all, amid the ongoing tension in the Middle East situation, economic partnership policies in that region will become important for Japan. The second problem the slump in crude oil prices will generate is a delay in engaging with the global warming issue. Even if a mechanism that all countries participate in can be achieved at COP21, there is a danger low-priced crude oil will hamper the shift toward renewable energies. Even if electricity generation through cheap coal is adopted, technologies such as high-efficiency IGCC and carbon dioxide capture and storage will be essential. In the future, if carbon prices climb hydrogen technology will be advantageous to Japan, but in making investment decisions it will also be necessary to factor the risks into the costs. The third challenge the crude oil price slump poses is how to envisage a future for nuclear power. Unlike America, which has been blessed with energy resources thanks partly to the shale revolution, and Europe, where electricity interchange with neighboring countries is possible, in Japan nuclear power is important as a quasi-nationally-produced source of electricity. The following strict sustainability criteria will be demanded, however. The first is passive safety systems, so that even if by some chance an accident does occur, radioactivity does not spread. Second is the safe disposal of spent nuclear fuel and high-level waste. And third is that it be non-proliferating in nature, so that even if Japan exports its technologies to developing countries, the technologies are not converted for use in nuclear weapons. The revision of the nuclear power agreement between Japan and the United States is approaching in 2018, but in order to extend the agreement in a way that is acceptable to Japanese and American citizens amid strict safety standards, there needs to be a vision for a nuclear power system that is based on these criteria. If Japan and the U.S. were to jointly pursue verification-testing of reactor core debris disposal technologies at Fukushima, this would also be a shortcut to restoring trust in Japanese technologies.

(Text composed by Hideo Yoshida)

(4) Mr. Keiichi Ishii (CPL4) Minister of Land, Infrastructure, Transport and Tourism

"Engineering Based Experiences and Challenges towards Economic and Social Development"

Japan is striving to build a resilient country and society and achieve security and peace of mind for its citizens by recovering from the Great East Japan Earthquake (2011), through disaster risk reduction and disaster mitigation for coming major disasters, and furthermore, by rebuilding business conditions and the economy.

1) Disaster measures

In light of the Sendai Framework for Disaster Risk Reduction 2015-2030 adopted at the 3rd UN World Conference on Disaster Risk Reduction (2015), disaster measures are being implemented that take into account Japan's characteristic features as a disaster-prone country. Along with structural measures on the hard (equipment and facilities) front, Japan is also promoting non-structural measures on the soft (abstract) front, such as hazard maps and the preparation of evacuation routes and evacuation shelters.

2) Infrastructure systems' latest technologies

Japan's road traffic safety technologies are the best in the world, and over the past 44 years the number of road accident casualties has contracted to one-quarter. The Shinkansen system has supported Japan's development, and the construction of the cutting-edge superconducting linear rail system is also underway. On the roads, Vehicle-to-Infrastructure Cooperative Systems have been achieved as a result of ICT, and the world's first drive assist service is progressing as a result of high-speed, high-capacity bidirectional communication. It will also be possible to reduce traffic congestion, prevent accidents and mitigate road degradation, and efficient and long-term "clever use" of even limited road networks will become possible.

3) Utilization of new technologies and ICT

Japan has developed new technologies for protecting its water and river environments. It is currently moving ahead with fuel cell vehicles, environmentally-friendly distribution systems, rainfall forecasting and other initiatives. It is also moving ahead with realizing new technologies to build a safe and secure country, including the development of i-Construction that utilizes ICT, the commercialization of automated driving for vehicles, and automated control of construction machinery.

4) Resolving challenges with technological innovation

Japan has used engineering as a basis for overcoming many challenges. From here on also, it will engage in disaster risk reduction and disaster mitigation, develop infrastructure contributing to economic development, overcome environmental problems through technology, and furthermore will continue to challenge and apply engineering into the future.

(Text composed by Yumio Ishii)

(5) Mr. Tsuneo Kitamura (CPL5) Parliamentary Vice-Minister of Economy, Trade and Industry

"Japan, Where Innovations Spring up One after Another"

Vice-Minister Kitamura gave an address titled "Japan, Where Innovations Spring up One after Another" He began with a greeting centering on the idea that "In the world of learning there are many areas of scholarship and the role assigned to each differs, but I believe engineering is the area of scholarship that is assigned the role of overcoming the world's challenges. Engineering has overcome challenges in a broad range of social fields. Japan is the country that led the world in establishing an engineering college in 1886, and it is an honor to be able to host the World Engineering Conference and Convention." Following that, he explained that Japan is a country of science and technology innovation, and discussed the role the Ministry of Land, Infrastructure, Transport and Tourism has been fulfilling in the field of engineering, while introducing specific examples.

To begin with Vice-Minister Kitamura pointed out that in terms of measures for promoting innovation the government supports medium- to long-term research, and while citing specific successful examples he noted the importance of strengthening the bridge-building functions of the venture companies and public research organizations that link the seeds of technology to business. Following that, he discussed automated driving technology, AI technology, IoT technology, renewable energy technology, energy-saving technology and other technologies as examples of research and development projects that the relevant ministries and agencies as a whole are promoting in a public-private effort, explained the background and expected economic outcomes of those projects, and introduced abundant examples of support and promotion policies and framework development that are being implemented in order to advance technologies. He wound up his address by stating that "I by all means hope all of you gathered here today will visit Japan again for the Olympic and Paralympic Games in 2020 and discover for yourself that the things I talked about are being realized."

Incidentally, ahead of his address Vice-Minister Kitamura visited the exhibition venue for the Monodzukuri Nippon Grand Awards and enthusiastically inspected the exhibition. These awards are a collaborative project involving four ministries – the Ministry of Economy, Trade and Industry, the Ministry of Education, Culture, Sports, Science and Technology, the Ministry of Land, Infrastructure, Transport and Tourism, and the Ministry of Health, Labor and Welfare. The project provides a framework for honoring personnel who play central roles at manufacturing and production front lines, expert personnel who have been supporting "skills," and young personnel responsible for the future, in order to pass on and advance "monodzukuri" The awards were launched in 2005, and are presented every second year. They were presented for the sixth time in 2015. The technologies that won awards in the 6th Monodzukuri Nippon Grand Awards were exhibited at the WECC2015, and also attracted a lot of attention from those attending the event from overseas. (Text composed by Kikuo Kishimoto)

(6) Mr. Takeshi Uchiyamada (CPL6) Chairman of the Board, Toyota Motor Corporation / Vice Chair, Japan Business Federation

"Embracing a Hydrogen Society: Toyota's Strategy for Environmental Technology"

1) History of the automobile

Horse-drawn carriages supported people's lifestyles for a period of around 5,000 years. Why were they displaced by gasoline-powered vehicles in less than 10 years? It is due to the elements that gasoline-powered vehicles possessed; namely, they 1) benefited both the world and its people; 2) did not impair convenience, so customers would choose them; and 3) altered the social framework for the better. These three elements are the very elements that are essential to a product or service that brings about a paradigm shift. Furthermore, the spread of gasoline-powered vehicles made it possible to transport people and goods quickly and over long distances, gave people the freedom to go anywhere at any time, and empowered people with many new values, such as allowing them to enjoy mobile personal spaces that public transportation does not have.

2) Mobility at present: challenges and solutions

Due to the development of non-conventional resources, in 2050 the overall world's capacity to supply fossil fuels is predicted to increase, and the world's population is also predicted to grow, with global GDP picked to increase more than threefold. Accompanying this, the problems of energy, global warming and air pollution will become more serious. Gasoline will be the mainstream automotive fuel for some time yet, and it is inevitable that the development of powertrains for conventional and hybrid vehicles fueled by gasoline will be positioned as a global base technology, and high thermal efficiency and low-fuel consumption engines will be developed. Additionally, powertrains that respond to fuel diversification, including gaseous fuels, biofuels, electricity and hydrogen, will be regarded as the next-generation technology and will be developed in parallel to that. It is unlikely that fuels will be narrowed down to one fuel in the future, and Toyota is likewise engaging in its development omni-directionally.

3) The advent of fuel cell vehicles

Unless next-generation vehicles' technological innovations and the development of the fuel supply infrastructure for the vehicles are disseminated as one package, it will not be possible to popularize them. Toyota is positioning hydrogen as a powerful energy of the future, and led the world in launching sales of a fuel cell vehicle, the MIRAI.

Achieving a hydrogen society is inevitable given that using hydrogen generates zero CO_2, hydrogen can be produced from a variety of primary energy sources and so is suited to energy diversification, and hydrogen is superior on the energy security front since there is no fear of it running out as there is with fossil fuels. (Text composed by Takao Kubozuka)

(7) Prof. Hiroshi Amano (CPL7)

Director, Professor, Center for Integrated Research of Future Electronics, Institute of Materials and Systems for Sustainability, Nagoya University / 2014 Nobel Prize Laureate

"Wide-bandgap semiconductors as tools for realizing a sustainable society"

The development of wide-bandgap semiconductors, as typified by gallium nitride and similar substances, is extremely important to achieving a sustainable society. I would like to explain how materials research can contribute to creating a sustainable society, using research on blue LEDs as an example.

Let us look back on the history of the development of LED light sources. Red LEDs were commercialized in 1962, and were followed by green LEDs, which were commercialized in 1974. Based on these developments, it was presumed that gallium nitride was a plausible candidate for developing blue LEDs next. Gallium nitride blue LEDs were verified as possible in 1959, and blue LEDs were developed using gallium nitride in 1971. However, these were not the current PN-junction semiconductors – they were extremely low-efficiency LEDs. Many companies began developing blue LEDs using gallium nitride, but in all cases the developments ended in failure. Professor Akasaki undertook a fundamental review of the process for manufacturing gallium nitride crystals that had been the mainstream approach up to then, and carried out research. Using equipment he made himself, in 1985 he was able to make gallium nitride with high-efficiency properties for the first time in the world. Furthermore, in 1989 he was able to produce the world's first PN-junction-type gallium nitride LED. In 1993 Dr. Nakamura of Nichia Corporation successfully manufactured commercial blue LEDs. Furthermore, Nichia discovered that by covering blue LEDs with a yellow fluorescent film it was possible to create white LEDs. This was groundbreaking, and indicated that white LED illumination could be made commercially and at low cost. By replacing around three-quarters of illumination with LED illumination it would be possible to achieve electricity savings of around 7%. In other words, it would be possible to reduce power generating facilities' emissions of carbon dioxide, a global warming gas, by around 7%.

Next I would like to talk about future developments for gallium nitride wide-bandgap semiconductors. Securing safe drinking water is an important challenge for humankind. Light sources that emit deep ultraviolet light using gallium nitride semiconductors can be used to sterilize drinking water. Additionally, by utilizing the high-speed switching qualities of gallium nitride wide-bandgap semiconductors, it is possible to make power-supply devices and optical communication devices highly efficient, miniaturize them, and make them high performance. Research on this is currently being pursued.

Finally, and this is directed at younger generations in particular, I want to talk about how innovation is achieved. Based on my experience, first you find the seeds and then press forward with research, and if the research goes well, the next step is to build partnerships between industry, government and academia. This is important. (Text composed by Jun'ichi Sato)

9. Technical Program (Oral and Poster) Overview

(1) Program

Track		Track 1	Track 2	Track 3	Track 4	Track 5
Room		Room A	Room B-1	Room B-2	Room C-1	Room C-2
Theme		Resilient Infrastructure for Society	Energy for a Sustainable Society	Natural Resources for a Sustainable Society	Urban Development and Infrastructure	Mobility and Communication Technology
Nov 30 (Mon)	9:00-10:00	Opening Ceremony				
	10:00-10:30	Break				
	10:30-12:30	Conference Plenary Lectures				
	12:30-14:00	Lunch (Sakura,				
	14:00-16:00	Conference Plenary Lectures				
	16:00-16:20	Break				
	16:20-18:00	1-1 Reconstruction innovation	2-1 Wider applications for fossil resources: Conventional and non-conventional resources	3-1 Satellite-based technology, land and marine survey, resource investigation, disaster monitoring	4-1 Environmental friendly and sustainable cities & housing	5-1 Railway technology, high-speed train, urban transportation, maintenance technology
Dec 1 (Tue)	9:00-9:50	Conference Plenary Lecture				
	9:50-10:10	Break				
	10:10-12:30	1-2 Land/city conservation and disaster mitigation	2-2 Power generation technology	3-2 Supply chain of mineral resources and life cycle of human beings	4-2 Net zero energy building technology, new air-conditioning and sanitary technology, green building technology, water utilization technology	5-2 Automotive technology, society and mobility in 2030
	12:30-14:00	Lunch, Poster Session				
	14:00-16:00	1-3 Robot technology used at disaster sites and its operating system	2-3 Renewable energy sources and energy storage technologies	3-3 Water resource and environmental management	4-3 Measuring, control, security technology, robot technology	5-3 Marine technology, ships, ocean energy utilization, marine resource developments
	16:00-16:20	Break (20 minutes)				
	16:20-18:10	1-4 Strengthening national interests and creating new industries using big data	2-4 Energy saving and efficient energy use	3-4 Advanced recycling technology	4-4 Next generation broadcasting systems	5-4 Aeronautical technology
Dec 2 (Wed)	9:00-10:40	1-5 Creating a resilient economy	2-5 Energy management	3-5 Process technology for sustainability	4-5 Construction technology and management	5-5 Innovative telecommunications technologies
	10:40-11:00	Break				
	11:00-12:40	1-6 Resilience in manufacturing and energy sectors	2-6 Smart grid, smart community	3-6 Agricultural machinery and food engineering, agricultural mechanization, agricultural structures	4-6 Innovation for maintenance and renovation of sustainable civil infrastructure	5-6 Information security and privacy
	12:40-14:00	Lunch, Poster Session				
	14:00-15:30	Summary and Concluding				
	15:30-15:50	Break				
	15:50-17:00	Closing Ceremony				
	19:00-21:00	Banquet (The Westin				

Track 6	Track 7	Track 8	Track 9	Track 10	
Room D	Room E	Room F	Room G	Room H	
Industry for Society	Life Innovation	Engineering for Society and Engineering in Society	Engineering Education and Women in Engineering	Groundwork for the Future	
(Main Hall)					9:00-10:00
(30 minutes)					10:00-10:30
【Part 1, 2, 3】(Main Hall)					10:30-12:30
Annex Hall)					12:30-14:00
【Part 4, 5, 6】(Main Hall)					14:00-16:00
(20 minutes)					16:00-16:20
6-1 Creating value and solving social issues through the big data revolution	7-1 Design of safe and secure communities, reflections on human and robot	【Session Keynote Lecture】 Engineering for the society 【Session Keynote Lecture】 Risk communication as the essential sociotechnical system	【Session Keynote Lecture】 Liberal arts education in engineering 【Session Keynote Lecture】 Promoting female leaders in engineering	10-1 International Round Table on Engineering	16:20-18:00
【Part 7】(Main Hall)					9:00-9:50
(20 minutes)					9:50-10:10
6-2 Trends in utilizing intellectual property for promoting innovation	7-2 Molecular imaging in early diagnosis/treatment	8-1 Social missions of engineering and ethics for engineers	9-1 Promoting female leaders in engineering	10-2 Environment and Water	10:10-12:30
(Sakura, Annex Hall)					12:30-14:00
6-3 Role of finance in industrial innovation	7-3 Recovery from disease: Part 1 (Nanomedicine)	8-2 Science & technology based on the societal trust & communication Part 1: Fukushima Daiichi-the lessons learned	【Panel Discussion】 Promoting young women in engineering: Part 1 Information and communication technology 9-2 Break (10 minutes) 【Panel Discussion】 Promoting young women in engineering: Part 2 Social infrastructure technology		14:00-16:00
6-4 Value-added manufacturing for competitiveness	7-4 Recovery from disease: Part 2 (Minimally invasive therapy and personalized treatment)	Science & technology based on the societal trust & communication Part 1: Fukushima Daiichi-the lessons learned	Break (20 minutes) 【Session Keynote Lecture】 (1) Features of engineering education in Japan (2) World Trend of ICT in Education	Break (20 minutes)	16:00-16:20 16:20-18:10
6-5 Innovation of cutting-edge technology and next generation devices	7-5 Recovery from disease: Part 3 (Regenerative medicine, Tissue engineering)	8-3 Science & technology based on the societal trust & communication Part 2: For the society of robust and secure infrastructure	9-3 World human resource development and engineering education	10-3 Others	9:00-10:40
(20 minutes)					10:40-11:00
6-6 Advanced functional materials	7-6 Sustaining good health (Medical and healthcare devices)	8-4 Engineering qualification systems and ethics	9-4 Development and contribution of the Japanese engineering education to the world		11:00-12:40
(Sakura, Annex Hall)					12:40-14:00
Remarks of the Sessions (Room A)					14:00-15:30
(20 minutes)					15:30-15:50
(Room A)					15:50-17:00
Miyako Kyoto)					19:00-21:00

(2) Overview of all Sessions

Summary and Concluding Remarks

Primary Theme

<Engineering: Innovation and Society>

- ***Innovation for Sustainable Growth and Socioeconomic development***
- ***Engineering Research and Development for Innovation***
- ***Engineering for Society and Engineering in Society***

Ken OKAZAKI

Chair, WECC2015 Technical Program Committee
Professor, Tokyo Institute of Technology

World Engineering Conference and Convention (WECC 2015)
"Engineering: Innovation and Society"
Kyoto International Conference Center, Kyoto, Japan
December 2, 2015

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- **Overview of all sessions** **Ken OKAZAKI** **(10 min)**
- **Tracks 1 and 6** **Botaro HIROSAKI** **(20 min)**
- **Tracks 2 and 5** **Ken OKAZAKI** **(15 min)**
- **Tracks 3 and 4** **Teruhiko YODA** **(15 min)**
- **Track 7** **Kazuo TANISHITA** **(10 min)**
- **Tracks 8 and 9** **Shin-ichi NAKAO** **(10 min)**
- **Summary** **Ken OKAZAKI** **(5 min)**

Noticeable Concern and Interest emerged from Presentations

Number of Papers		Oral (invited)	Poster	Total	Special Highlights
Track 1	Resilient Infrastructure for Society	29	33	62	1-2 (24) Land/city conservation and disaster mitigation
Track 2	Energy for a Sustainable Society	24	75	99	2-3 (17) Renewable energy and energy storage 2-4 (33) Energy saving and efficient energy use
Track 3	Natural Resources for a Sustainable Society	27	51	78	3-3 (27) Water resources and environmental management
Track 4	Urban Development and Infrastructure	27	88	115	4-1 (21) Sustainable cities & housing 4-5 (25) Construction technology and management 4-6 (14) Innovation for maintenance and renovation of sustainable civil infrastructure
Track 5	Mobility and Communication Technology	22	20	42	5-1 (7) Railway technology
Track 6	Industry for Society	28	19	47	6-6 (7) Advanced functional materials
Track 7	Life Innovation	27	24	51	7-6 (8) Sustaining good health
Track 8	Engineering for Society and Engineering in Society	22	17	39	8-4 (5) Engineering qualification systems and ethics
Track 9	Engineering Education and Women in Engineering	29	27	56	9-3 (12) World human resource development and engineering education
Track 10	Groundwork for the Future	16	68	84	(including miscellaneous poster presentations)
Total		251	422	673	(**) : No. of general (poster) presentations

Important Keywords derived from Presentations

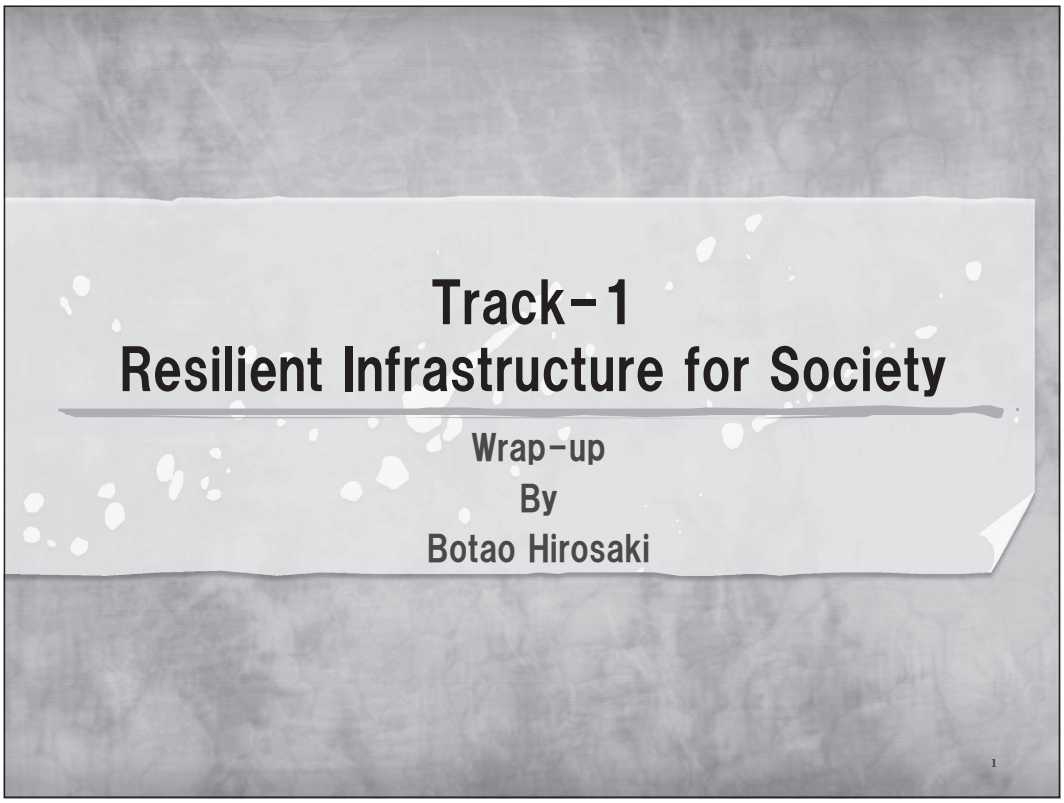
Resilient Infrastructure, Disaster Mitigation, Big Data
Renewable Energy, Energy Saving and High Efficiency
Water Resources and Waste Management, ICT
Sustainable Cities and Housing, Civil Infrastructure
Risk Management and Safety, Sustaining Good Health
Engineering and Ethics, Women in Engineering
Human Resources and Engineering Education

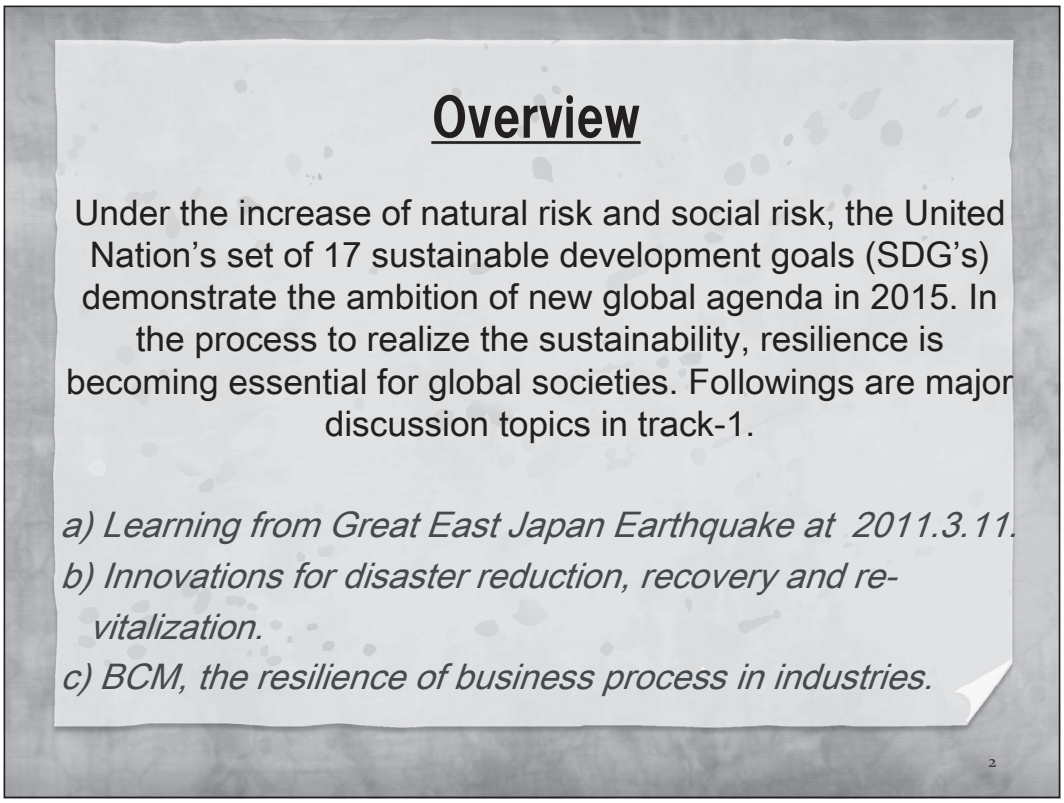
Engineering Innovation for Sustainable Society

- **to mitigate the Global Warming**
- **to improve the Quality of Life**

Kyoto Declaration

(3) Track 1 & 6


Track-1
Resilient Infrastructure for Society
Wrap-up
By
Botao Hirosaki
1


Overview
Under the increase of natural risk and social risk, the United Nation's set of 17 sustainable development goals (SDG's) demonstrate the ambition of new global agenda in 2015. In the process to realize the sustainability, resilience is becoming essential for global societies. Followings are major discussion topics in track-1.
a) Learning from Great East Japan Earthquake at 2011.3.11.
b) Innovations for disaster reduction, recovery and re-vitalization.
c) BCM, the resilience of business process in industries.
2

Learning from Great East Japan Earthquake

The magnitude of the earthquake with the epicenter offshore of Sanriku was 9.0, the largest in recorded history in Japan. Among experiences, following agenda are pointed out to be further studied.

- Importance of digital archive development
  Tohoku University's archive called "Michinoku Shinrokuden" developed under the collaboration with oversea universities is regarded as the valuable asset to the future.
- Role of social science and social innovation.
  Science communication or risk communication is verified to be effective. Under the catastrophic situation, so-called "Kamaishi Miracle" is reported.
- Innovation to mitigate disaster in post-3.11 Japan.
  Good example of challenge is "The Great Forest Wall Project", completely different approach from the conventional super levee.

3

Innovations for disaster reduction, disaster recovery and revitalization

The challenge to engineering is to mitigate disasters by modifying land, cities and buildings resilient to infrequent hazards and to support disaster recovery and revitalization safely. Innovations in this direction are summarized as follows.

- Provisioning feasible disaster information in real time.
- Development of full structural safety assurance systems.
- Big data analytic systems combined with the sensor network. A key point for such sensor network is the development of autonomous time synchronization system using a chip scale atomic clock.
- Disaster response robots, including surveillance by tele-operated ground. Rapid progress of unmanned aircraft surveillance systems has been reported.

4

BCM, the resilience of business process in industries

Since the great earthquake on 3.11 in 2011, a number of experiences relevant to the resilient economy have been reported.

- Evolution of BCP concept to BCM reflecting the role of resilient policy making process. BCMS is now on the process of standardization in ISO22301.
- In financial sectors, BCM rating solutions launched to confirm a market foundation for resilience.
- Best practices of resilient supply chain management (SCM) system have been reported especially in automobile industries in Japan.
- For energy supply systems to be resilient, coherent and over-arching policies through disaster forecast, disaster recovery and revitalization phases are innevitable

5

Remarks

Resilience generally refers to the persistence of relations within a system and ability to adjust and transform the system as a whole through its self-organizational behavior against unanticipated disturbances. In order to enhance the level of resilience for the future, we have to develop not only technical innovations such as robotics engineering and information communication technology (ICT), but also innovative social infrastructures such as policy-making platforms or business continuity management systems.

6

Track-6
Industry for Society

Wrap-up
By
Botao Hirosaki

7

Overview

Increasingly, in today's global societies, industrial innovations are the drivers that enable us both to lay the groundwork for sustainable growth and to provide the basis for addressing national, regional, and global priorities. Track-6 has tried to focus discussions on the key drivers or vehicles that could bring up disruptive industrial innovations in the future.

a) Emerging basic technologies both in data science and material science.
b) Next generation manufacturing methodologies and platforms.
c) Intangible asset management platforms especially for IPR and finance.

8

Emerging basic technologies in data science and material science

- Data science: data driven engineering
  Data science coupled with new methods of data exploration or new approaches of data analytics for massive existing data is emerging as a foundation for problem solving in nearly all industries ranging from healthcare, medicine and agriculture to a variety of engineering such as transportation systems.

- Material science: nanotechnologies
  Cutting edge material science in semiconductor or in functional polymer is going to provide disruptively high-quality and low-price devices. Especially the development of pervasive sensor devices will be key to realize IOT together with the Big Data. Development of business model is required to justify huge investment to the evolving material sciences.

9

Next generation manufacturing methodologies and platforms

The evolutional wave of sustainable manufacturing is spreading over the world. Direction of the new wave can be classified in two streams, i.e., product-service systems (PSS) and smart manufacturing.

- PSS: Product-Service Systems

Redefine the added value in products and services from the viewpoint of SDL. Through the redefinition manufacturing industry will eventually be reorganized to life-cycle industry.

- Smart manufacturing

As in Industrie4.0 in Germany or in Industrial Internet Consortium (IIC) in the USA, we see extensive move to the smart manufacturing. Digitization according to Big Data, cloud computing and IOT is key driver for the smart manufacturing.

10

Intangible asset management innovation especially for IPR and finance

- Intellectual property for promoting innovation

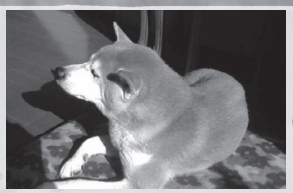
Instead of IPR itself, IP driven innovation or IP driven business model is more important framework in promoting entrepreneurial opportunities that create economic value. In order to activate the IPR management infrastructure for innovation, public-private collaboration and international harmonization are important.

- Next generation financial frameworks for innovation

Finance means more than just extending capital to customers, rather, it should add value and new vitality to community as catalyst for innovation. New challenge in this direction in project finance or in PPP/ PFI are discussed. Furthermore in order to consider long-term value creation, accounting systems with focus on social responsibility are extensively developed over the world. In financial sectors, BCM rating solutions launched to confirm a market foundation for resilience.

11

Remarks



Sustainability in general consists of social sustainability, economic sustainability and environmental sustainability. Throughout the discussions in track-6, we deepen our insight in technology innovation, manufacturing process innovation and knowledge-based asset management innovation as industrial fundamentals to support future sustainability. It has been recognized that these big issues are mutually dependent, and could provide us with the healthy growth of “social capital”. A key is innovation of business model to promote the overarching collaboration.

12

(4) Track 2 & 5

Summary

➔ *Track 2 : Energy for Sustainable Society*
➔ *Track 5 : Mobility and Communication Technology*

Ken OKAZAKI

Professor
Tokyo Institute of Technology

Track 2: Energy for a Sustainable Society			Oral	Poster	Total
2-1	Wider applications for fossil resources: Conventional and non-conventional resources	Advanced production technologies for environmentally friendly fuels and petrochemicals from conventional resources, Global potential of non-conventional supplies of shale gas, methane hydrate, extra heavy oil etc. , Future prospects of technological developments to access and process such resources.	3	6	9
2-2	Power generation technology	Power generation technology sustaining the modern society and industry. Thermal power generation, nuclear power generation, advanced power generation technology such as an integrated coal gasification combined cycle, distributed power generation etc..	4	10	14
2-3	Renewable energy sources and energy storage technologies	Renewable energy sources and energy storage systems. Solar, wind, geothermal, biomass, micro-hydro power, secondary battery. Integration to the power systems.	4	17	21
2-4	Energy saving and efficient energy use	High efficiency devices and systems, Technologies for energy loss reduction. Power-electronics. Information and Communication Technology (ICT), Power transmission , transformation and distribution. Energy efficient manufacturing process. Combined heat and power systems. SOFC.	5	33	38
2-5	Energy management	Energy management and energy saving technologies in demand-side. HEMS (Home Energy Management System), BEMS (Building Energy Management System), FEMS (Factory Energy Management System), CEMS(Community Energy Management System). Demand Response (DR). Thermal management. Solution of Energy service company.	4	4	8
2-6	Smart grid, smart community	Smart grid and smart community technologies and demonstration projects. Prospect of realizing low-carbon and sustainable society.	4	5	9

A large number of poster presentations from various areas including developing countries

2-3
(Renewable energy sources and energy storage)
Taipei, Poland, China (3), Thailand (2), Nigeria, Iran, UK

2-4
(Energy saving and efficient energy use)
China (3), Thailand (5), Nigeria, Malaysia, France, Australia, Pakistan

Strategic Energy Plan in Japan

- The 1st Strategic Energy Plan (October, 2003)
- The 2nd Strategic Energy Plan (March, 2007)
- The 3rd Strategic Energy Plan (June, 2010)
- (Japan Revitalization Strategy, June 15, 2013)

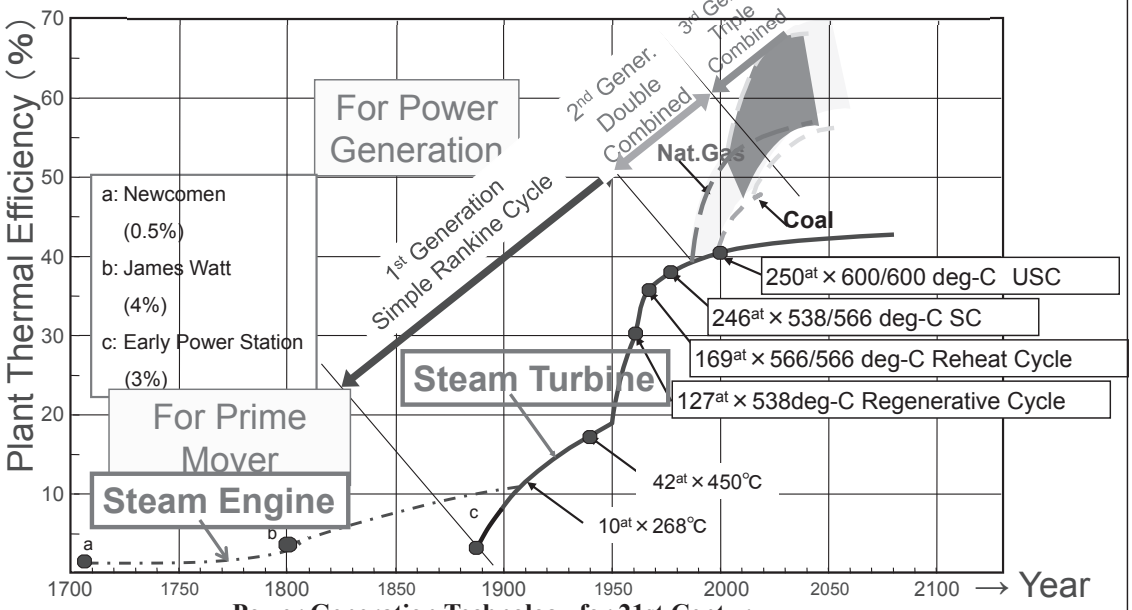
The 4th Strategic Energy Plan (Cabinet Decision, April 11, 2014)

The First Strategic Energy Plan after the Great East Japan Earthquake (March 11, 2011)

◎ **Important Items related to energy issues**

2.1.2 Multi-layered and diversified flexible energy supply-demand structure
2.2.3 Policy timeframe and **energy best mix**
3.1.4 Promotion of domestic resources such as methane hydrate
3.2 Ultimate **energy-saving** society, efficient energy supply
3.3 Acceleration of introducing **renewable energy**
3.4 Re-structuring of **nuclear energy** policy
3.5 Efficient and stable use of fossil fuels (**high-efficiency coal power stations**)
3.6.2 System reform of electricity, gas and **thermal energy management**
3.8 Advanced secondary energy structure (acceleration to **hydrogen society**)
3.9 Growth strategy on energy through international expansion
3.10 **International cooperation** through Japan's advanced energy technologies

History of Thermal Efficiencies

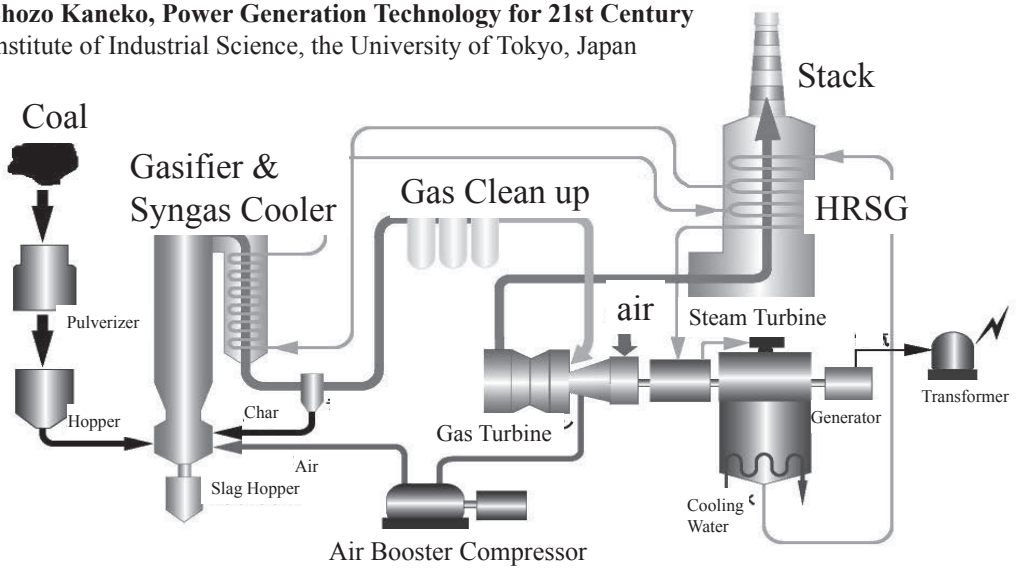


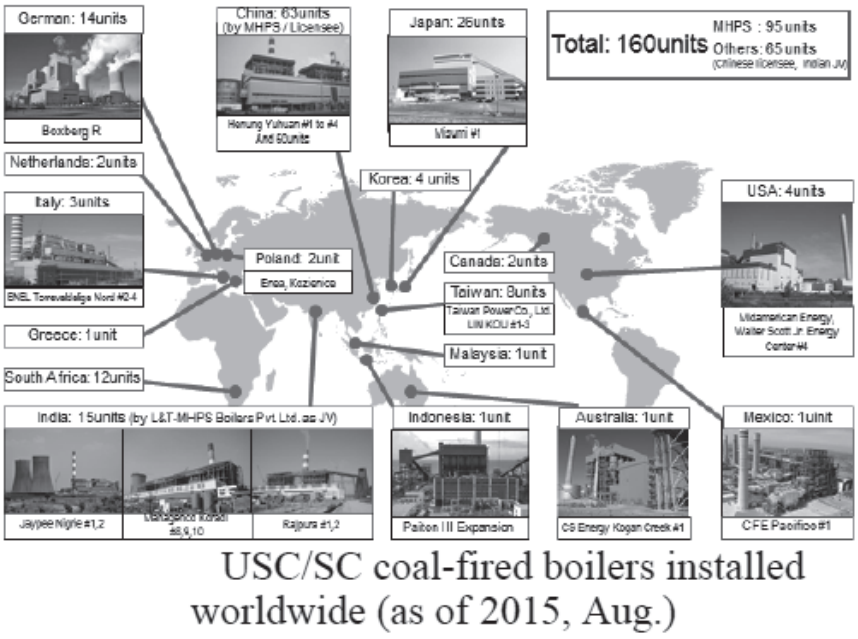
Power Generation Technology for 21st Century
Shozo Kaneko
Institute of Industrial Science, the University of Tokyo, Japan

Integrated coal Gasification Combined Cycle---IGCC

- Plant Efficiency (net, on HHV) : 46 – 48 % !

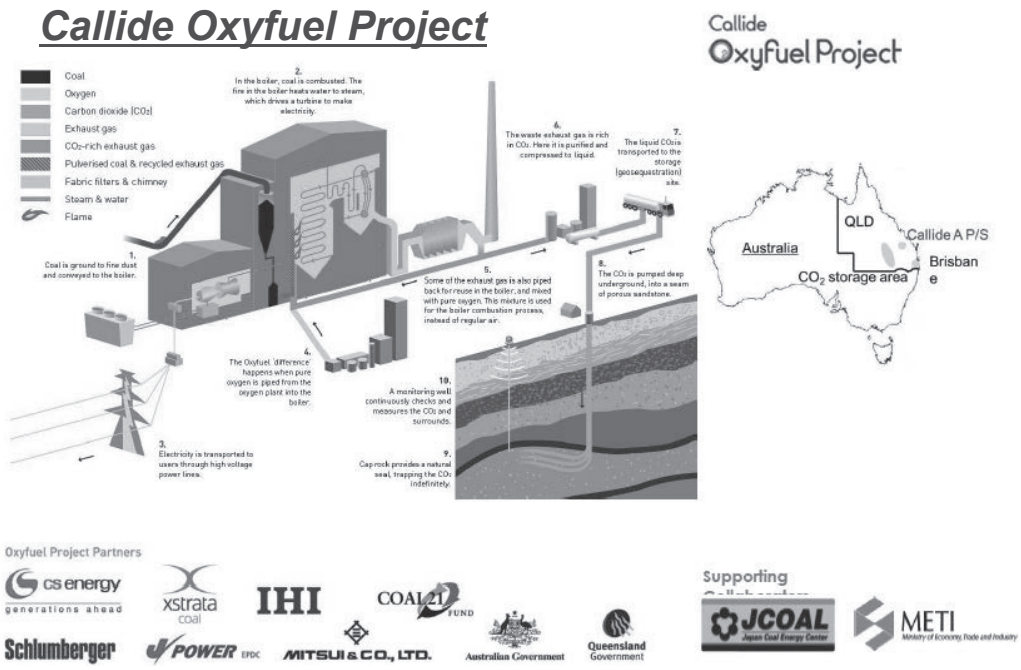
Shozo Kaneko, Power Generation Technology for 21st Century
Institute of Industrial Science, the University of Tokyo, Japan



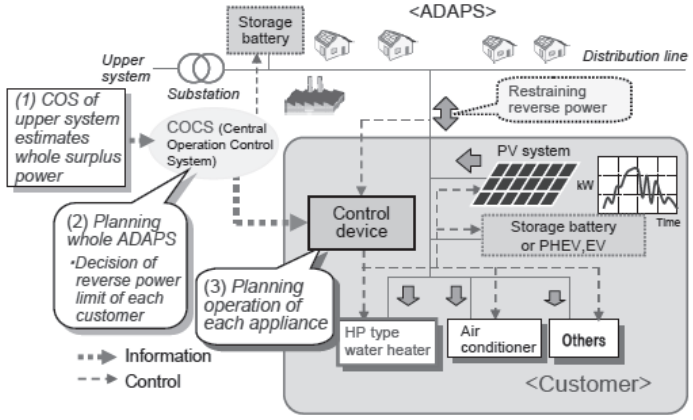


USC/SC coal-fired boilers installed worldwide (as of 2015, Aug.)

Environmentally Friendly Advanced Power System Technology
Satoshi Uchida
Headquarters of Mitsubishi Hitachi Power Systems, Ltd., Japan



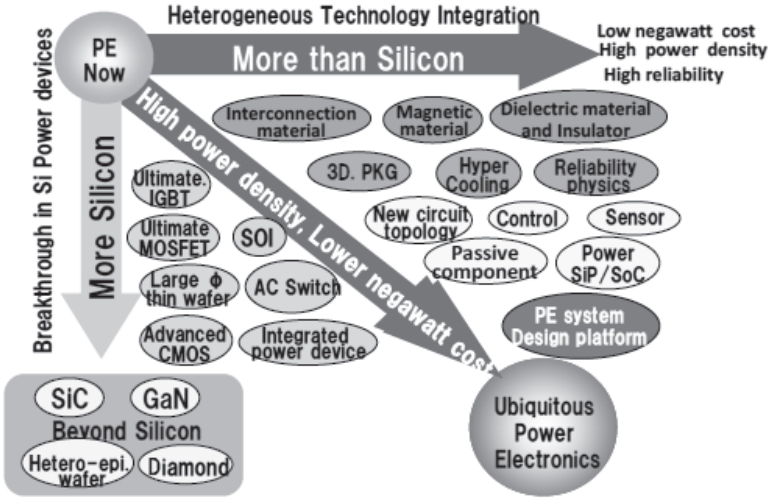
Oxyfuel power plant for CO_2 capture in Callide Oxyfuel Project (Poster)
Toshihiko Yamada (R&D Dept, Energy & Plant Operations, IHI Corporation, Japan)



Note) - COS: Central Operation System of utility.
- ADAPS: Autonomous Demand Area Power System which is a kind of smart grid in distribution system area.

. Information and control signal flows of PV surplus power utilization method using HP type water heater and storage battery

Grid Interconnection Requirements and Techniques for Distributed Power Generation in Japan
Hiromu Kobayashi
System Engineering Research Laboratory, Central Research Institute of Electric Power Industry, Japan



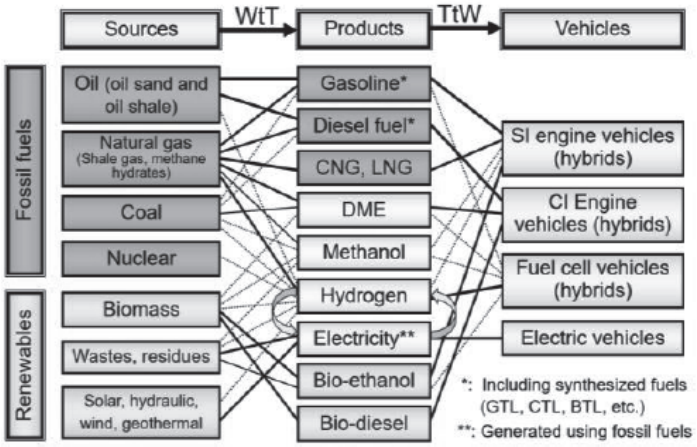
Technology platform for the new-generation power electronics

New Generation Power Electronics for Tomorrow
Hiromichi Ohashi
NPERC-J (New generation power electronics and system research consortium Japan)

Track 5: Mobility and Communication Technology			Oral	Poster	Total
5-1	Railway technology, high-speed train, urban transportation, maintenance technology	The railway technology on topics of environmental friendly, safe and comfortable transportation systems. Furthermore, advanced infrastructure, domestic and international high-speed trains, urban transportation systems, and maintenance technology.	4	7	12
5-2	Automotive technology, society and mobility in2030	Massive improvement in fuel efficiency in developed countries, low pollution in emerging countries. Future automotive technology, automobile society of developed countries toward 2030. Collaboration between countries. Key words : Motorbike, Micro commuter car, Passenger car, Truck, Fuels, Vehicle fleet by type, Incremental gains in efficiency of new vehicles, ITS, Sustainable mobility.	5	2	7
5-3	Marine technology, ships, ocean energy utilization, marine resource developments	Engineering technologies associated with oceans as global frontier. Energy-saving technology for ships, marine renewable energy utilizations and developments of ocean resources such as oil, natural gas and methane-hydrate.	4	2	6
5-4	Aeronautical technology	Technologies for aircraft design, weight reduction, and higher performance, and aircraft operation technology. MRJ	3	1	4
5-5	Innovative telecommunications technologies	Innovative telecommunications technologies realizing secure and safe society. Broadband, diverse and intelligent services, researches on vast number of connected terminals and sensors along with network infrastructures supporting these activities.	3	8	11
5-6	Information security and privacy	Big data generated by social networks and Internet of things (IoT) enriches its value while it threatens users privacy. Security and privacy issues not only from technical but also from ethical point of view.	3	0	3

Standard EMU in China
(4M4T, with the maximum operating speed of 350km/h and the maximum axle load of 17t)

Development of High-speed Train Technology in China
Zhongping Yang
School of Electrical Engineering, Beijing Jiaotong University, China

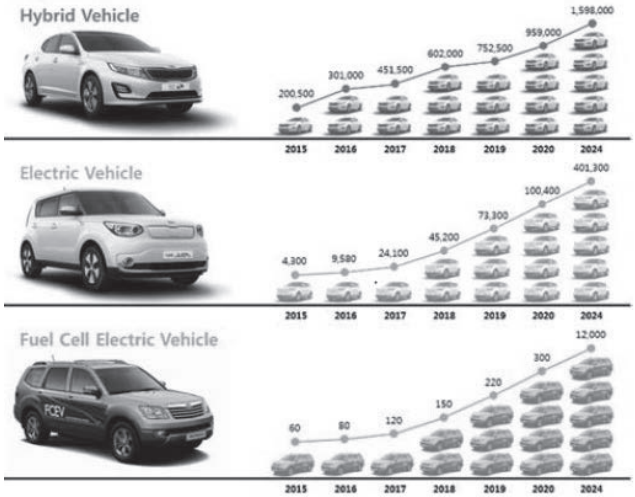


Sources and products for future vehicle fuels

Developing Advanced High Efficiency and Low Emission Motor Vehicles toward 2030 and beyond

Yasuhiro Daisho[1]

[1] Dept. of Modern Mechanical Engineering, Waseda University, Japan



Eco-friendly motor vehicle distribution strategies and roadmap by 2020 and beyond

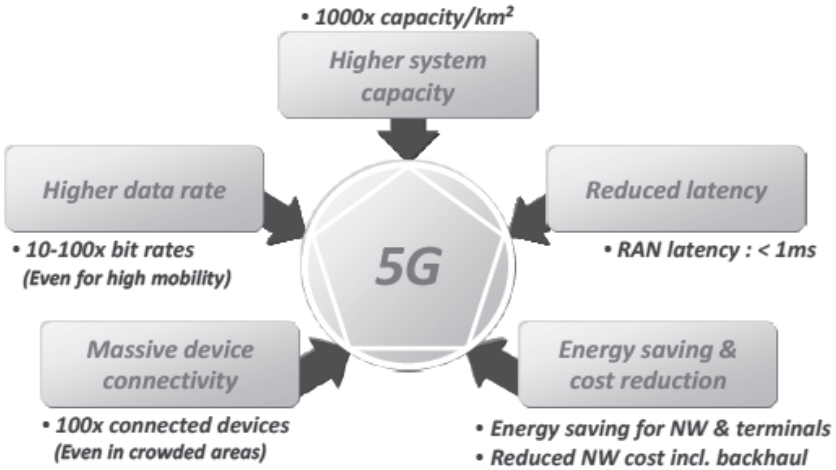
Next Generation Vehicle Activity in Korea

Simsoo Park1*, Cha-Lee Myung1, Woo-Tae Kim2, Ki-Sang Lee2, and Youngjae Lee3
1 School of Mechanical Engineering, Korea University, Korea
2 Eco-Friendly Vehicle System Development Division, Hyundai Motor Group, Korea
3 Energy Saving Laboratory, Korea Institute of Energy Research

Mitsubishi Regional Jet (MRI)

Nobuo Kishi
MITSUBISHI AIRCRAFT CORPORATION

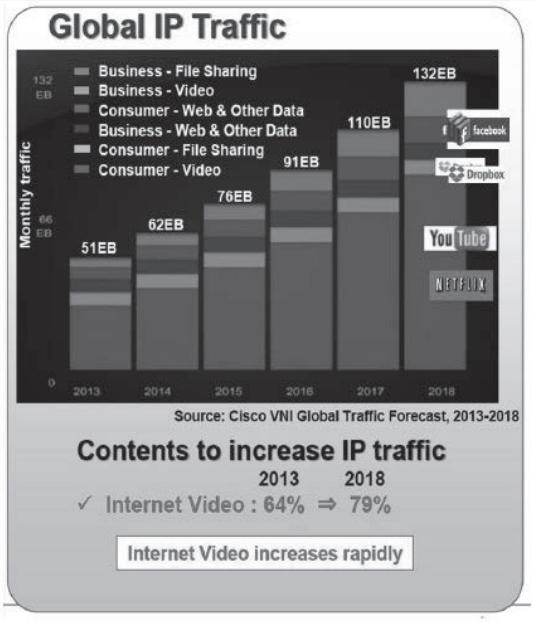
Corresponding e-mail: nobuo_kishi@mitsubishiaircraft.com



The five major targets for 5G

Latest Trends in Mobile Wireless Systems and Towards Actualization of the Next Generation 5G System

Narumi Umeda
Research Laboratories, NTT DOCOMO, INC., Japan



Internet monthly traffic growth forecast 2013-2018. Source Cisco VNI Report[2]. Primary drivers of Internet traffic growth are IP Video and Wireless Mobile devices.

Optical Networks for Global Human Networking

Atul Srivastava
CTO, NTT Electronics America

(5) Track 3 & 4


WECC2015 Summary and Concluding Remarks Track 3 and Track 4
Engineering: Innovation and Society
Track 3: Natural Resources for a Sustainable Society
Track 4: Urban Development and Infrastructure
Wrap-up
by
Teruhiko Yoda
(Waseda University)
①Natural Resources: ②Sustainable Society: ③Urban Development: ④Infrastructure


WECC2015 Summary and Concluding Remarks Track 3 and Track 4
Innovation and Society
Society needs Innovation.
Innovation needs Society.
Major topics of Track 3 and Track 4 are devoted to
Natural Resources for a Sustainable Society,
Urban Development and Infrastructure.
①Natural Resources: ②Sustainable Society: ③Urban Development: ④Infrastructure

Track 3

Track 3 Natural Resources for a Sustainable Society

Data: Oral:27 Poster:50 Total:77

・Water Resources and Environmental Management

Track 4

Track 4 Urban Development and Infrastructure

Data: Oral:27 Poster:88 Total:115

・Sustainable cities & housing

・Construction technology and management

・Innovation for maintenance and renovation of sustainable civil infrastructure

WECC2015 Summary and Concluding Remarks Track 3 and Track 4

Track 3

Track 3 Natural Resources for a Sustainable Society

・As climate change is feared to extreme hydrological events, international community should urgently address disaster risk reduction challenges.

・Utilization of multiple constellation contributes to more effective and sustainable growth of our society.

・To promote safe societies against water related disasters and at the same time to conserve environment and ecosystems is essential in order to sustain social and natural fundamental frames under climate-change impacts.

①Natural Resources: ②Sustainable Society: ③Urban Development: ④Infrastructure

WECC2015 Summary and Concluding Remarks Track 3 and Track 4

・Water and environmental management takes into account the economic, ecologic and social criteria for long term sustainable development.

・The concept of water reclamation and reuse can be expected as prospective alternative to comply with future water demand in urban area.

・Integration of water and wastewater system in urban area based on water reclamation can contribute to the reduction of energy consumption by developing a new water reclamation system with the help of membrane filtration and ozonation processes.

・World is worrying about not only food safety and security but also how to produce the large amount for growing global population into 9 billion in 30 years, because the food production is a trade-off relation with the environmental conservation.

①Natural Resources: ②Sustainable Society: ③Urban Development: ④Infrastructure

・Precision agriculture is a methodology to conduct agricultural operations with Minimum investment and Maximum benefits.

・Stabilizing scrap supply will enhance the value of recycling as less-risky metal sources for resource-poor country.

・An ideal assessment of material criticality would be forward looking, anticipating future needs and supply-chain risks in time to allow for responses.

・Waste electrical and electronic equipment, i.e. e-waste, has been an emerging issue in recent years around the world.

・The way of production innovation in chemical plant has brought more than 200% of productivity.

Track 4

Track 4 Urban Development and Infrastructure

・Building energy efficiency has already became the key issue related to sustainable development.

・In order to realize a zero-energy building (ZEB), the building envelope should have sufficient thermal insulation, good solar shading, high air tightness, and various other functions.

・Research on human behavior and the indoor environment is essential for smart society.

WECC2015 Summary and Concluding Remarks Track 3 and Track 4

・Heating, cooling and ventilation systems play a significant role in the energy use and for the indoor environment quality in a building.

・The management system for combining both the energy operation technology and community planning method is very important as the approach to realizing the new concept of smart city applicable to Asian high density cities.

・Industrial control systems are essential to the operation of society's critical infrastructures in sectors such as electricity, gas, telecommunications, water, chemical processing, and transport.

・By simplified construction process, the construction time can be reduced. Furthermore, the light weight superstructures and material reduction make structures sustainable, because CO_2 can be reduced.

①Natural Resources: ②Sustainable Society: ③Urban Development: ④Infrastructure

WECC2015 Summary and Concluding Remarks Track 3 and Track 4

・The economic sustainability, security and well-being of a nation depend heavily on the reliable functioning of infrastructure.

・In recent years, using robotic technology, including a multi-rotor helicopter, robot utilization has been attracting attention in infrastructure maintenance and disaster response.

・Good exact repetition inspection by robot with advanced sensors makes it possible to catch changes of infrastructures, and efficient repair can be possible.

・Life cycle maintenance framework consists of a maintenance planning procedure, an evaluation method of maintenance effectiveness, and a management cycle for improving maintenance performance throughout the life cycle.

・In combination with risk-based inspection and monitoring, a conclusive technology is available for condition assessment and finally for decision making on service life extension.

①Natural Resources: ②Sustainable Society: ③Urban Development: ④Infrastructure

Remarks

①Natural resources are finite and they will not last forever. Global warming is increasing, causing heavy rains and droughts.

②The building of infrastructure and industrialization requires engineering.

③The engagement in engineering must achieve engineering innovation according to the regional characteristics.

WECC2015 Summary and Concluding Remarks Track 3 and Track 4

④Engineering is the activity of utilizing the output of science and technology to create safe and prosperous lives.

⑤Engineers must, not only work for the advancement of special knowledge in the areas of science, engineering and technology, but they must also take into account societal concerns.

①Natural Resources: ②Sustainable Society: ③Urban Development: ④Infrastructure

(6) Track 7

Aim of Track 7

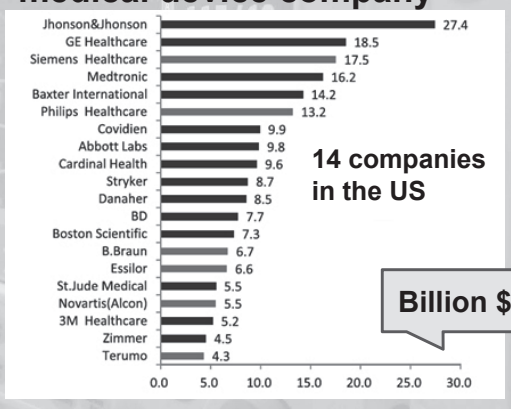
The aim of life innovation is not only for paper but for people.
We should find the benefit of life innovation to achieve the health and welfare of people in the society.

OS 7-2	OS 7-3,4,5	OS 7-6	OS 7-1
Protection	Recovery	Sustaining	Safe, secure and healthy community
➢ Bio-imaging ➢ Preventive medicine ➢ Non-invasive diagnosis	➢ Nano-medicine ➢ Minimum invasive surgery ➢ Regenerative medicine ➢ Biomedical robotics	➢ BMI ➢ Rehabilitation ➢ Wearable monitoring	➢ Human assist robot ➢ Nursing care ➢ Telemedicine

- These subjects of research are rapidly growing and advancing to achieve the life innovation by multidisciplinary approaches.
- To benefit the life innovation to people, we need the industrialization of medical and life innovation.

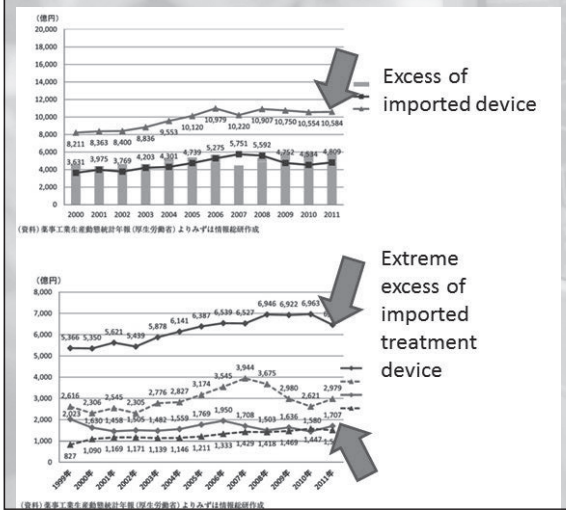
The US achieved the success in the industrialization of life innovation including the medical devices.

The top 20 ranking of medical device company

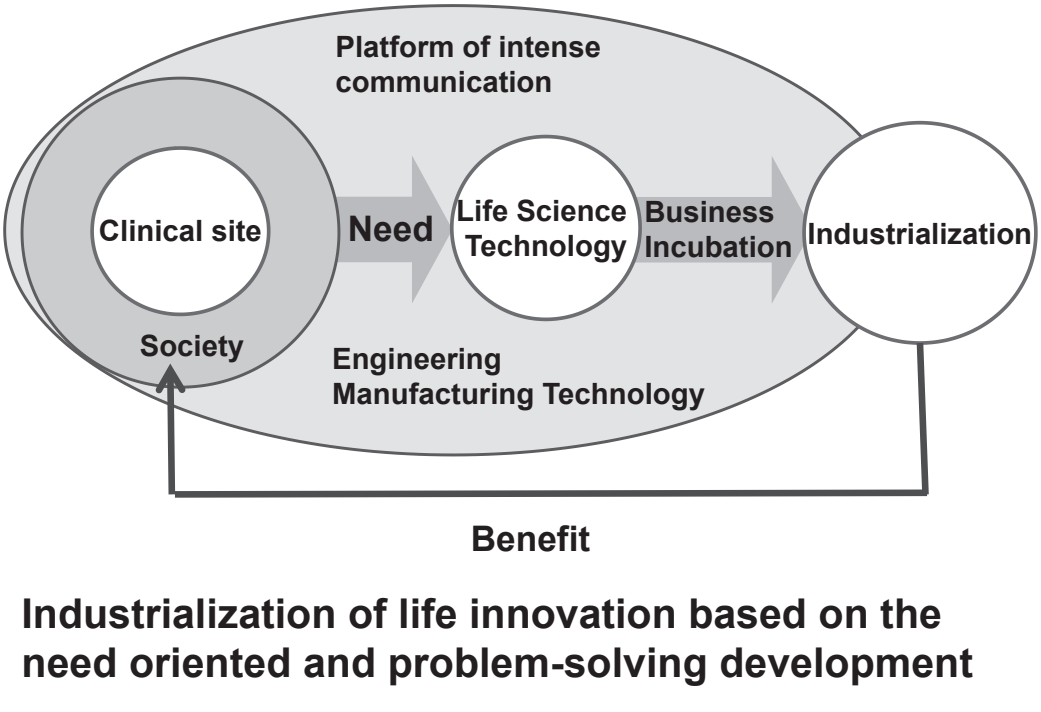


(Mizuho Information & Research Institute Report in 2014)

- The industrialization of life innovation in Japan is not fully advanced.
- The excess of imported device is not changed in Japan and the industrialization must be accelerated as soon as possible.



The imports and exports of medical devices in Japan until 2011 (Mizuho Information & Research Institute Report in 2014)



Industrialization of life innovation based on the need oriented and problem-solving development

The life innovation should benefits to people by industrialization. To achieve the industrialization of life innovation, we should consider the followings.

- **The industrialization of life innovation should be achieved based on the social and clinical needs such as aging society, and must be satisfied with the ethical standard given by the society.**
- **We should create the platform for mutual communication between multidiscipline.**
- **The interdisciplinary education system should be widely established to increase the experts for tackling the life innovation industries.**

Track 7 was composed of sessions on life innovation that followed the track set out below, which were based on the standpoint that life innovation will be indispensable to realizing the medical welfare needed for the world's aging societies from here on. In other words, life innovation will make it possible to protect health, restore health and maintain health, and ultimately come up with safe and secure community designs, as well as clarify the concepts of community healthcare and home healthcare. The content of the respective sessions that made up this track are as follows:

- Protecting health (OS7-2): There have been remarkable advances in the bio-imaging needed for the prevention and early diagnosis of illnesses, and the circumstances on the frontlines of that were reported. With the molecular biology approach, extremely high-level outcomes are being obtained academically, but the task of progressing on to commercializing the academic research results is a major challenge.
- Restoring health (1) (Nano-medicine) (OS7-3): Progress with nano-technology is having a major impact on the healthcare sector and it is becoming possible to accurately deliver anti-cancer drugs enclosed in nanomicelles to lesions, defying the conventional wisdom of chemotherapy. The clinical trials currently taking place also face many challenges, and the expectation is that utilization in clinical practice is not far off.
- Restoring health (2) (Minimally invasive individualized treatment) (OS7-4): Minimally invasive individualized treatment, as represented by endoscopic technology, is quite simply bringing about dramatic changes to the appearance of clinical practice. In particular, the arrival of medical robots is changing the accepted practices of medicine that existed up to now, and a new medicine that is based on medical robots is appearing.
- Restoring health (3) (Achieving innovative medicine as a result of regenerative medicine) (OS7-5) Regenerative medicine based on cell sheet technology is now approaching the point of being applied practically, and groundbreaking results are being seen in the treatment of heart disease and other conditions.
- Maintaining health (OS7-6)
- Safe and secure community designs, community healthcare and home healthcare (OS7-1): As a result of progress with nursing care robots, telemedicine and other technologies, community healthcare and home healthcare are beginning to be put into place.

A notable feature of the content announced in the sessions at Track 7 was that considerable progress is being made with basic research and development in the various paths of medical welfare, and those outcomes are being obtained through the cooperation of researchers from different disciplines. Life innovation is expected to contribute to the medical welfare of aging societies, which are projected to increase in the future, but for that to happen industrialization will be indispensable. In other words, in order to carry superior academic research results on to industrialization, further hurdles will have to be overcome. It must be said that at the present stage many research results are still not reaching the point of being industrialized. A look at the medical devices industry reveals that a Japanese company ranks 20th in a global Top 20 ranking, for example, and so the strengthening of Japan's medical welfare industry is desired. Accelerating life innovation by capitalizing on Japan's superior manufacturing techniques and bringing it to the industrialization stage will be a major challenge for life innovation going forward.

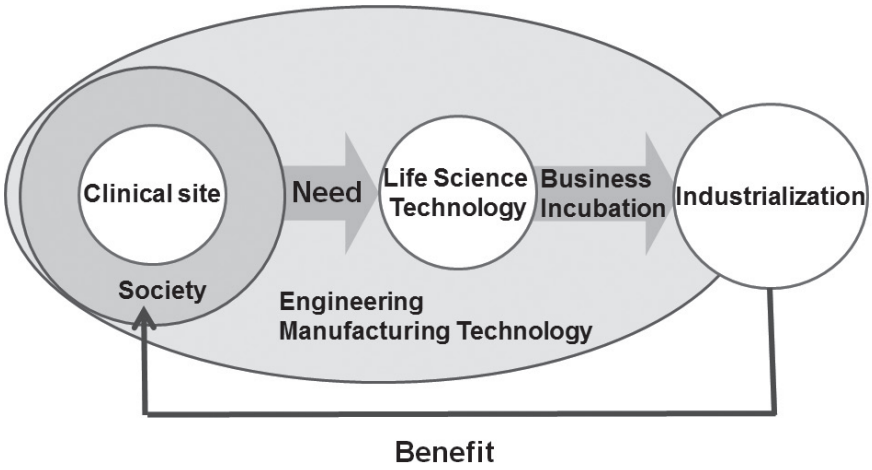


Diagram Ⅱ−1
Based on the frontline needs of medical welfare in society, in order for life science technology to advance and for its outcomes to bring significant benefits to society, industrialization is indispensable. Industrialization is a major challenge facing life innovation.

(Text composed by Kazuo Tanishita)

(7) Track 8 & 9

World Engineering Conference and Convention (WECC 2015)
"Engineering: Innovation and Society"
Kyoto International Conference Center, Kyoto, Japan
November 30 – December 2, 2015

Summary of Track 8 and Track 9

Shin-ichi Nakao

Kogakuin University

Track 8:Engineering for Society and Engineering in Society

8-1 Social missions of engineering and ethics for engineers

8-2 Science & technology based on the societal trust & communication
Part 1: Fukushima Daiichi
– the lessons learned

8-3 Part 2: For the society of robust and secure infrastructure

8-4 Engineering qualification systems and ethics

Track 8:Engineering for Society and Engineering in Society

8-1 Social missions of engineering and ethics for engineers

- The action of each country was presented and discussed about the social missions of engineering and ethics.

Track 8:Engineering for Society and Engineering in Society

8-2 Science & technology based on the societal trust & communication

Part 1: Fukushima Daiichi
– the lessons learned

- Four years and eight months has passed. What has been clarified and What has not been discussed?
  What is necessary not to happen this kind of accident?
  What should we learn from this accident?

Track 8:Engineering for Society and Engineering in Society

8-3 Science & technology based on the societal trust & communication

Part 2: For the society of robust and secure infrastructure

- Social infrastructures has damaged catastrophically by the earthquake and the following Tsunami. Robustness and resilience required were discussed.

Track 8:Engineering for Society and Engineering in Society

8-4 Engineering qualification systems and ethics

- The situation of each country was presented and discussed about the engineering qualification systems and ethics.

Track 9:Engineering Education and Women in Engineering

9-1 Promoting female leaders in engineering

9-2 Promoting young women in engineering
Part 1: Information and communication technology
Part 2:Social infrastructure technology

9-3 World human resource development and engineering education

9-4 Development and contribution of the Japanese engineering education to the world

Track 9:Engineering Education and Women in Engineering

9-1 Promoting female leaders in engineering

- Policy and activity for Women in Engineering were presented and discussed by representatives in Kuwait, Korea and Japan.

Track 9:Engineering Education and Women in Engineering

9-2 Promoting young women in engineering Part 1 and Part 2

- What are the issues for young female engineers to be more active to contribute to the society and what they have to do by themselves were discussed to get the strategies to the next action.

Track 9:Engineering Education and Women in Engineering

9-3 World human resource development and engineering education

- Present conditions concerning the engineering education of each country in the World were reported and discussed.

Track 9:Engineering Education and Women in Engineering

9-4 Development and contribution of the Japanese engineering education to the world

- The spread of the Japanese engineering education into the World, relation between the actual circumstances of each country and the contribution of the Japanese style engineering education were reported and discussed.

Summary of Track 8 and Track 9

Keywords

- ➢ Engineering Ethics
- ➢ Engineering Education
  "Engineering Liberal Arts"
- ➢ Women in Engineering
- ➢ Human Resources

Engineering for Society and Engineering in Society

Because the themes in Track 1-7 concerned specific technological details of engineering, it was decided to adopt items that provide a platform for engineering to be useful to society as the themes in Track 8 and 9. Consequently, the titles assigned to the Tracks were 'Engineering for Society and Engineering in Society' for Track 8 and 'Engineering Education and Women in Engineering' for Track 9. For both Tracks, the key phrases established were 'Engineering Ethics,' 'Engineering Education' (and particularly the new concept of "Engineering Liberal Arts"), 'Women in Engineering' and 'Human Resources.'

Specifically, Track 8 centered on 'Engineering Ethics,' and issues such as engineering's social acceptability and credibility were raised. In particular, the Fukushima Daiichi Nuclear Power Station (NPS) accident was covered as a case study, with a general overview of the lessons engineering has learned. In Track 9 the themes were 'Engineering Education' and 'Women in Engineering.' The titles of each session are as follows:

Track 8
- 8-1 Social missions of engineering and ethics for engineers
- 8-2 Science & technology based on the societal trust & communication
  Part 1: Fukushima Daiichi – the lessons learned
- 8-3 Science & technology based on the societal trust & communication
  Part 2: For the society of robust and secure infrastructure
- 8-4 Engineering qualification systems and ethics

Track 9
- 9-1 Promoting female leaders in engineering
- 9-2 Promoting young women in engineering
  Part 1: Information and communication technology
  Part 2: Social infrastructure technology
- 9-3 World human resource development and engineering education
- 9-4 Development and contribution of the Japanese engineering education to the world

The announcements and discussions at all the sessions in Track 8 and 9 are summarized below.

We engineers have conventionally thought of ourselves as technicians and engineers who simply solve problems. However, in the 21st Century, engineering is not simply a method of solving problems: It responds to various demands from society and humankind by utilizing science and technology, while driving new innovations in society. However, although the new engineering that brings forth innovations wields considerable influence over society and people, due to its complexity it can be difficult to understand for mainstream members of society lacking specialized knowledge. People do not attempt to grasp the risks lurking in new engineering and technologies, opting instead to simply enjoy the benefits of them alone. Consequently engineers must strive to exchange opinions openly with society and people and endeavour to build relationships of understanding and trust, and must act based on the engineering code of ethics. Engineering ethics, and compliance with them, is becoming increasingly important in the 21st Century.

In Sessions 8-2 and 8-3, the causes of the Fukushima Daiichi NPS accident and the catastrophic collapse in social infrastructure triggered by the Great East Japan Earthquake were considered, and strategic measures for preventing similar accidents and infrastructure collapse were debated. In addition to nuclear engineers and civil engineers, specialists from different disciplines also participated in these discussions, including technicians and researchers working in engineering in many levels as well as social scientists. As a result of this, the importance of collaboration among specialists in different fields and of communication and risk information-sharing between engineers and the general public was confirmed. The need for engineering education for the general public and the necessity for training personnel with specialized expertise in the field of engineering was also reconfirmed.

The themes in Track 9 were 'Engineering Education' and 'Women in Engineering,' but to begin with, in the area of engineering education the new concept of "Engineering Liberal Arts" was proposed by Dr. Ayao Tsuge, former President of the Japan Federation of Engineering Societies. Up until now engineering education has been viewed as education for training engineers and researchers in the engineering field, but Dr. Tsuge proposes that the engineering education of the 21st Century must also cover average citizens. Whereas "Liberal Arts" refers to liberal arts education covering humanities, social sciences and natural science, "Engineering Liberal Arts" should be liberal arts education covering fundamental competencies

for specialist engineers as well as fundamental competencies for average citizens. Such education would result in average citizens giving careful consideration to the risks of innovations alongside the value of innovations, and allow them to decide how to accept them. The importance of this "Engineering Liberal Arts" in establishing relationships of trust and establishing communication between engineers and average citizens will undoubtedly increase in the future.

As engineering education methods, a discussion took place on various approaches to engineering education that are predicted to become popular in the future, such as Open Course Ware (OCW) and Massive Open Online Courses (MOOC), were also discussed. These education approaches that utilize ICT enable participants to study regardless of where they are. "Engineering Liberal Arts" education should no doubt also be incorporated into this type of open access education.

Women account for roughly half the population, but are almost absent in the field of engineering. For example, the ratio of women in the STEM (Science, Technology, Engineering and Mathematics) fields in Japan is just 14.4%, making Japan one of the lowest-ranked countries even worldwide. It is an extremely low number even when compared to the U.S.' figure of 33.6%. In response to the argument that Japan must therefore further boost its number of women engineers and that engineering education is vital to achieving that, a key point that was raised was that 14.4% is still a good number considering that many developing countries actually have lower numbers, and it must not be forgotten that in many countries the figure is a few percent.

The shortage of personnel who have received adequate training in the engineering field is a significant problem particularly in developing countries, and educating such personnel is a pressing issue. In Session 9-3's oral announcements and poster announcements, the efforts that are being pursued in many countries including Australia, Bangladesh, China, Finland, South Korea, Poland, Thailand, the US and Japan to train personnel in various engineering fields, electronics, electrical engineering, architectural design, global environmental engineering, management engineering, programming and river engineering were reported.

Finally, Track 8 and 9 are summed up below. Engineering education not only develops human resources for the field of engineering, it also encourages women to enter the field. "Engineering Liberal Arts" will undoubtedly become necessary as education for promoting the general public's grasp of the risks as well as the benefits that innovations possess, innovations that will become increasingly complex going forward. And as a result of that, engineering must move away from the conventional concept of simply being for problem solving, and become "engineering for society, engineering within society. We engineers must continue to strive to achieve that.

(Text composed by: Shin-ichi Nakao)

10. Kyoto Declaration

The participants at the 5th World Engineering Conference and Convention on "Engineering: Innovation and Society", held in Kyoto, Japan, from November 29th to December 2nd , 2015, discussed the current state, future, and expected innovations of the various fields of engineering in regard to the problems facing the world and humanity, and the relationship between these problems and society. Major topics of discussion were devoted to: Resilient Infrastructure for Society, Energy for a Sustainable Society, Natural Resources for a Sustainable Society, Urban Development and Infrastructure, Mobility and Communication Technology, Industry for Society, Life Innovation, Engineering for Society and Engineering in Society, and Engineering Education and Women in Engineering. The results of these discussions are presented in the following Declaration.

Considering that:

- the United Nations has unanimously adopted a set of Sustainable Development Goals and an associated 2030 Development Agenda to address extreme poverty and grand challenges of development;
- the development of agriculture is important for solving the problems of poverty in less developed communities and of malnutrition across many regions;
- to meet world's future energy demand, it is necessary to secure diversified safe, inexpensive and stable energy sources including natural energy and biomass energy which currently comprises roughly 10% of the total energy production;
- global warming is steadily increasing, causing an increase in the size of typhoons and hurricanes and more frequent heavy rains and droughts, in addition to tornadoes and strong winds;
- the atmosphere is contaminated by countless man-made substances such as sulfur, nitrogen oxide, and fine particulates, which have a major effect on human health;
- many people in the world today have no available drinking water, and many live in unsanitary conditions due to inadequate wastewater facilities;
- natural resources are finite and if their consumption continues at the present rate, they will last for roughly 100 years;
- damages resulting from natural disasters are incurred by many countries throughout the world every year;
- the building of infrastructure, agricultural reforms, and industrialization all require large numbers of engineering graduates;
- development proposals and projects require thorough analysis of their technical, economic and environmental feasibility and social and cultural impacts, before their approval and implementation, and
- international governance institutions must strengthen the involvement and linkages between science, engineering, education and policy for sustainable development.

Declare that:

1. Substantial technological improvements as well as sound, evidence based policies are needed to assure access to fresh and safe drinking water, energy, sanitation and waste management, communications, shelter, and transport services in communities.
2. By exchanging and applying scientific knowledge, engineering creativity and practice, and up-to-date technology, engineers are able to substantially introduce sustainable solutions into most areas of activity that contribute to a society's quality life.
3. Engineering is the activity of utilizing the output of science and technology to create safe and prosperous lives for humanity. Engineers must, not only work for the advancement of specialist knowledge in the areas of science, technology, and engineering, but they must also take into account societal concerns.
4. Those engaged in engineering must achieve engineering innovation appropriate to the characteristics of each region and country for the development of food production and industry, in order to solve the problems of poverty and famine.
5. Engineers must not only work for the improvement of food, energy, and industry in order to address the rising global population, but must also contribute to the development of a better life for the people living in a globally aging society expected to occur in the near future.

6. The emission of greenhouse gases such as carbon dioxide is accelerating global warming. Climate change causes effects such as drought, heavy rains, extreme cold, and extreme heat throughout the world, which in turn affects the survival of plants and animals and has a major impact on food production. Engineering must intensely apply its proficiency to reduce carbon dioxide emissions in numerous fields including development of diversified energy sources, power generation technology, energy usage technology, and energy conservation technology.
7. In order to mitigate the effects of natural disasters, that create problems in the water environment and in food production, Engineering has to implement measures to protect infrastructure with the most resilient technologies.
8. The contamination of the atmosphere, water, and soil has a severe effect on the lives and livelihoods of humanity. Engineering must promote innovations to assure the quality of the air, of drinkable water, and of clean soil.
9. Engineering education is important for enabling people to make good use of up-to-date scientific knowledge and engineering means and processes to advance the state-of-the-art technology to improve the quality of life of citizens of a given region. Engineering education must be introduced into every area of society, as for example "Engineering Liberal Arts", and included at each educational stage in schools.
10. The entry of women, who comprise roughly half of the population, into the realm of engineering is essential for assuring the availability of sufficient engineering professionals to take charge of economic development through implementation of feasible engineering projects. The number of opportunities in engineering education for women must be increased.
11. Engineers as members of society must carry out their work providing for the enhancement of the life conditions of society, focusing their activities on the creation of a prosperous and safe society.
12. There is a need to develop through engineering a sustainable society that leverages both science and technology.

We urge the world's leaders to accept this opportunity to engage the World Engineering Community as a full partner in addressing the complex challenges as we evolve toward a sustainable planet. The World Engineering Community is ready, willing and able to contribute its expertise, creativity and dedication to achieve the elements of this Declaration.

December 2nd, 2015

Engr. Marwan Abdelhamid
President
World Federation of Engineering Organizations

Prof. Dr. Shahbaz Khan
Director and Representative,
Regional Science Bureau for Asia and the Pacific,
UNESCO Office, Jakarta

Prof. Takashi Onishi
President
Science Council of Japan

Dr. Jun'ichi Sato
President
Japan Federation of Engineering Societies

11. Closing Ceremony/Distinguished Persons' Awards

(1) Opening Remarks

The Closing Ceremony began from 3:50 p.m. on Wednesday, December 2. WFEO President Marwan Abdelhamid gave an opening remark, and this was followed by a guest's address from Shanghai Jiao Tong University Professor Xila Liu, the WFEO National Member for China.

(2) Adoption of the Kyoto Declaration and Signing Ceremony

The Kyoto Declaration was read aloud by Jun'ichi Sato, Chair, WECC2015 Organizing Committee and President, the Japan Federation of Engineering Societies (JFES), and following that a signing ceremony was held. The declaration was signed by the representatives of four organizations - the Science Council of Japan, JFES, WFEO and UNESCO - but on the day in question, December 2, WFEO President Marwan Abdelhamid and JFES President Jun'ichi Sato held the signing ceremony on stage. The Kyoto Declaration was formally adopted accompanying the completion of the signing ceremony.

(3) Awards Ceremony

An awards Ceremony was held for the members of the World Engineering Conference and Convention Executive Committee who made outstanding contributions. Barry Grear, Chair, International Advisory Board, Teruhiko Yoda, Chair, Steering Committee, Ken Okazaki, Chair, Technical Program Committee, Akira Murakami, Co-chair, Kyoto Local Organizing Committee, and Kazumasa Ito, international liaison, were presented with certificates of appreciation by Yumio Ishii, Executive Committee Chair.

(4) Ceremony to transfer the emblem to the next host country

JFES President Jun'ichi Sato handed the emblem to Engineers Australia President Marlene Kanga of Australia, the host country for the next World Engineering Conference (WEC2019). Following that, Engineers Australia President Marlene Kanga presented a message and introductory promotion of the 6th World Engineering Conference (WEC2019).

(5) Closing Remarks

Closing remarks were given by Botaro Hirosaki (Vice-President, JFES / Vice-chair, WECC2015 Organizing Committee), and the WECC2015 closed. (Text composed by Teruhiko Yoda)

12. Outline of the WFEO Committees, General Assembly and Gala Dinner

Accompanying the holding of the WECC2015, the WFEO held meetings of the Executive Council, General Assembly and Standing Technical Committees, and meetings of administrative personnel, as well as a Gala Dinner by WFEO personnel. Additionally, Engineers Australia, which will host the WEC2019, held the WEC2019 Reception at this WECC2015 as a related meeting. It invited WFEO personnel as well as representatives from the institutions that organized the WECC2015 to the Reception.

Schedule	Saturday 28 Nov	Sunday 29 Nov		Monday 30 Nov	Tuesday 1 Dec.	Wednesday 2 Dec	Thursday 3 Dec	Friday 4 Dec
08:00–9:00	Registration (Hoyer ofEvent Hall) Congress Bag Distributeion (Annex Hall)	Registration (Hoyer ofEvent Hall) Congress Bag Distributeion (Annex Hall)	Registration (Hoyer ofEvent Hall) Congress Bag Distributeion (Annex Hall)	Registration (Hoyer ofEvent Hall) Congress Bag Distributeion (Annex Hall)	Registration (Hoyer ofEvent Hall) Congress Bag Distributeion (Annex Hall)	Registration (Hoyer ofEvent Hall) Congress Bag Distributeion (Annex Hall)	Registration (Hoyer ofEvent Hall)	Registration (Hoyer ofEvent Hall)
09:00–13:00	9:00–18:00 Committee on Engineering and the Environment (Room 501)	9:00–18:00 Committee on Women in Engineering (Room 554)	9:00–13:00 President's Advisors Meeting (Room J)	9:00–12:30 WECC 2015 Opening Ceremony and Conference Plenary Lecture	9:00–13:00 WFEO Executive Board Meeting (Room 510)	9:00–13:00 WFEO Executive Council (Room 510)	9:00–18:00 WFEO General Assembly (Room A)	9:00–18:00 WFEO General Assembly (Room A)
	9:00–13:00 Committee on Education in Engineering (Room 554)	9:00–13:0 Committee on Anti Corruption (Room						
		9:00–13:00 Committee on Energy (Room 501)	11:00–13:00 STCs Review Group (Room 552)	11:0–13:00 Finance Committee (Room 552)	9:00–13:00 All STC Chairs Meeting (Room 554)			
13:00–14:00	**12:30–14:00 Lunch**	**12:30–14:00 Lunch**		**12:30–14:00 Lunch (Sakura, Swan)**	**12:30–14:00 Lunch (Sakura, Swan)**	**12:40–14:00 Lunch (Sakura, Swan)**	**12:30–14:00 Lunch**	**12:30–14:00 Lunch**
14:00–18:00	9:00–18:00 Cont. Committee on Engineering and the Environment (Room 501)	9:00–18:00 Cont. Committee on Women in Engineering (Room 554)	14:00–18:00 WFEO/UN Relations Commitee (Room J)	14:00–18:00 Strategic Planning Committee (Room 554)	14:00–15:00 WEC 2019 Meeting (Room 555)	14:00–15:30 WECC2015 Summary and Concluding Remarks of the Session 15:50–17:00 WECC2015 Closing Ceremony	9:00–18:00 WFEO General Assembly (Room A)	14:00–18:00 WFEO New Executive Council (Room B-1)
	14:00–18:00 Committee on Engineering Capacity Building (Room 554)	14:00–18:00 Committee on Young Engineers/ Future Leaders (Room 555)			15:00–18:00 WFEO Executive Council (Room 510)			
		14:00–18:00 Committee on Information and Communication (Room		16:00–18:00 Marketing Task Group (Room 555)				
		14:00–18:00 Committee on Engineering for Innovative Technologies (Room 502)	16:00–18:00 Nominations Committee (Room K)					
		14:00–18:00 Committee on Disaster Risk Management (Room 501)		18:00–19:00 CEC Meeting (Room552)				
Night		**18:00–20:00 Reception (Swan)**			**19:00–20:30 WEC 2019 Reception (Grand Prince Hotel) (Invitation Only)**	**19:00–21:00 Banquet (Westine Miyako Hotel 4F Mizuho no Ma)**	**19:00–21:00 WFEO Gala Dinner (Sakura)**	

Diagram Ⅱ−2　WFEO Committees, General Assembly and Gala Dinner

Overviews of the meetings are as follows.

(1) Standing Technical Committee meetings

The following 10 meetings were held.

(1) Committee on Engineering and the Environment, (2) Committee on Education in Engineering, (3) Committee on Engineering Capacity Building, (4) Committee on Women in Engineering, (5) Committee on Anti Corruption, (6) Committee on Energy, (7) Committee on Young Engineers / Future Leaders, (8) Committee on Information and Communication, (9) Committee on Engineering for Innovative Technologies, (10) Committee on Disaster Risk Management

(2) WFEO administrative personnel meetings

The following 8 meetings were held.

(1) President's Advisors Meeting, (2) STCs Review Group Meeting, (3) WFEO/UN Relations Committee Meeting, (4) Nominations Committee, (5) Finance Committee, (6) Strategic Planning Committee, (7) Marketing Task Group, (8) All STC Chairs Meeting

(3) WEC 2019 Meeting

A report on the state of preparations for the WEC2019: Melbourne took place in Room K between 2:00 and 3:00 p.m. on December 1, and around 30 WFEO Executive Council members and country representatives participated.

Additionally, from 7:00 to 9:00 p.m. on December 1, the Australian Ambassador to Japan hosted a reception at the Grand Prince Hotel. Approximately 100 people attended the event, at which Australia's preparations toward a successful WEC2019 were introduced.

(4) Executive Council

From 3:00 to 6:00 p.m. on December 1 and from 9:00 a.m. to 1:00 p.m. on December 2, expanded Executive Council meetings with participation from Executive Members and country representatives were held in Room 510, and the deliberation agenda and report agenda for the General Assembly were confirmed.

(5) General Assembly

A WFEO General Assembly was held on December 3 from 9:00 a.m. to 6:00 p.m. and on December 4 from 9:00 a.m. to 1:00 p.m., and elections were held for the President-Elect, the WEC2023, the Executive Vice President and the Executive Council. Engineering Australia's Marlene Kanga was elected as President-Elect, and Slovenian Chamber of Engineers President Crtomir Remec was elected to the vacant Executive Vice President seat.

(6) Gala Dinner

The WFEO's Gala Dinner was held at the Sakura Banquet Hall from 7:00 p.m. to 9:00 p.m. on December 3, and around 180 people attended.

(Text composed by Kazumasa Ito)

13. The Japan Federation of Engineering Societies/Sponsors and Grant Organizations/ Secretariat and Professional Congress Organizer

(1) The Japan Federation of Engineering Societies

	Name	Title	Affiliation
1	Jun'ichi SATO	President	IHI Corporation
2	Botaro HIROSAKI	Vice-President	NEC Corporation
3	Shin-ichi NAKAO	Vice-President	Kogakuin University
4	Sunao ISHIHARA	Board Director	The University of Tokyo
5	Tsuguo SAWADA	Board Director	Japanese Science and Technology Agency / The University of Tokyo
6	Hiroshi FUKUTOMI	Board Director	Yokohama National University
7	Seiya UENO	Board Director	Yokohama National University
8	Ryuichi NAKATA	Board Director	Toshiba Corporation
9	Makoto SUZUKI	Board Director	Chiba Instutute of Technology
10	Toyohisa FUJITA	Board Director	The University of Tokyo
11	Toru OGAWA	Board Director	Nagaoka University of Science
12	Akira NISHITANI	Board Director	Waseda University
13	Naoki YOKOYAMA	Board Director	Fujitsu Laboratories Ltd.
14	Takeshi NAEMURA	Board Director	The University of Tokyo
15	Toshio YAMANAKA	Board Director	Osaka University
16	Mari INOKI	Board Director	Kogakuin University
17	Yumio ISHII	Board Director	CTI Engineering Co., Ltd.
18	Teruhiko YODA	Board Director	Waseda University
1	Ikuo KURIHARA	Auditor	Central Research Institute of Electric Power Industry
2	Masao HIRAKAWA	Auditor	Society of Polymer Science, Japan

(2) Sponsors and Grant Organizations

Category	Organization	Amount (JPY)	Remarks
Association	River Center of Hokkaido	2,000,000	
	Tohoku Regional Development Association	2,000,000	
	Kanto Regional Development Association	1,000,000	
	Hokuriku Regional Management Service Association	1,000,000	
	Chubu Regional Development Association	1,000,000	
	Chugoku Kensetsu Kosaikai	1,000,000	
	Shikoku Create Association	1,000,000	
	Kyusyu Regional Management Service Association	1,000,000	
	The Japan Civil Engineering Consultants Association	1,000,000	
	Kinki Construction Association	500,000	
	Okinawa Shimatate Association	500,000	
	Japan Commission on Large Dams	100,000	
Private Company	Consolidated Contractors Company	2,457,600	
	BroadBand Tower, Inc.	1,500,000	
	IHI Corporation	1,000,000	
	Idemitsu Kosan Co.,Ltd.	1,000,000	
	Kawasaki Heavy Industries, Ltd.	1,000,000	
	Komatsu Ltd.	1,000,000	
	Shimadzu Corporation	1,000,000	
	Sumitomo Chemical Company, Limited	1,000,000	
	Sumitomo Heavy Industries, Ltd.	1,000,000	
	Sumitomo Electric Industries, Ltd.	1,000,000	
	Chiyoda Corporation	1,000,000	
	Toshiba Corporation	1,000,000	
	Union of Japanese Scientists and Engineers	1,000,000	
	NEC Corporation	1,000,000	
	Hitachi, Ltd.	1,000,000	
	FUJITSU LIMITED	1,000,000	
	Maeda Corporation	1,000,000	
	Mitsubishi Heavy Industries, Ltd.	1,000,000	
	Mitsubishi Electric Corporation	1,000,000	
	MEIDENSHA CORPORATION	1,000,000	
	The Japan Society of Industrial Machinery Manufacturers	500,000	
	Rocket Software Japan Ltd.	120,000	
	Top Runners of Japan Local Construction	250,000	
	SURVEY RESEARCH CENTER CO.,LTD.	200,000	
Total		35,127,600	①

Category	Organization	Amount (JPY)	Remarks
	The Tokyo Club	1,500,000	
	Kyoto City	3,000,000	
	Kyoto City (Operation: Kyoto Convention Bureau)	300,000	
	The Murata Science Foundation	800,000	
Total		5,600,000	②
	Grand Total (①+②)	40,727,600	
Science Council of Japan (Government Financial Contribution)	Venue	3,502,742	Directly paid to ICCK
	Invitation from oversea speakers	510,300	Directly paid to speakers
Total		4,013,042	

(3) Secretariat

Position	Name
Secretary General of The Japan Fedration of Engineering Societies	Takashi Sawada
Chief Secretary of WECC2015	Tsutomu Nakajima
WECC2015 Staffer	Akira Fukushima

Professional Congress Organizer (PCO)

Position	Name
General Manager of WECC2015, Congress Corporation	Hirokazu Tanaka
Main Coordinator of WECC2015, Congress Corporation	Shiori Morita
Congress Corporation	Mika Doshida
Congress Corporation	Hyejin Kim

14. Overview of the Accounting Report

(1) First budget draft deliberation

In launching the conference preparations, the first challenge was establishing a financial base. For that reason, to begin with the committee asked related public organizations and companies to provide monetary support, and then began its activities with that monetary support as funding.

Because the Kyoto International Conference Center was scheduled as the venue, to come up with the first budget draft the committee calculated the cost of using the venue and the cost of using equipment and so on, and it also had Congress Corporation, which was to be entrusted with operations across the overall conference such as the participant registration duties, public relations (Website, distribution of circulars etc.) and lecture-related duties, to prepare quotes for each of the items being entrusted to it. In doing so, the thing the committee paid the most attention to was the cash flow in each fiscal year. With no sources of funding other than the monetary support, the committee composed quarterly income and expenditure forecasts for each fiscal year to ensure it would not face a cash shortfall along the way, and it also created the first budget draft based on the condition that the fiscal 2014 component of the money to be paid to Congress Corporation would be paid in a lump sum in fiscal 2015.

(2) Working budget (First: May 2015)

The deadline for submitting applications for the technical exhibition was the end of April, so the first working budget was created based on the results of those applications. (Nevertheless, applications to exhibit continued to be accepted while there were exhibition slots left). This working budget was compiled based on an envisaged 1,500 regular registrants, registrations from a total of 300 students and people accompanying them, and a technical exhibition comprising 100 booths of nine square meters apiece. Including revenue from supplementary events such as the banquet, the budget totaled JPY243 million.

(3) Working budget (Second: September 2015)

The deadline for advance registrations for the conference was the end of August 2015, but the number of participating registrants was considerably fewer than the figure envisaged in the first working budget, raising the possibility of a cash shortfall. As a result, at the end of September the budget was urgently reviewed, and was revised into a budget based on 1,000 regular registrants.

In order to trim the budget, various items were cut to hold down costs, but the implication was that these items would be restored if the registration revenue reached the figure that was initially envisaged. And in fact, thanks to the all-out efforts of the committee members and those concerned, the number of participants increased and it was possible to resurrect many items.

(Text composed by Tsutomu Nakajima)

Report on the World Engineering Conference and Convention (WECC2015)

Issued in March 2016

Issued by The Organizing Committee of the World Engineering Conference and Convention

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