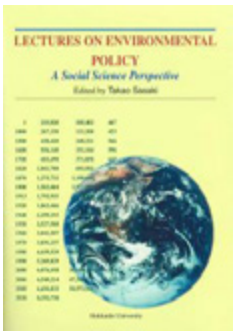
2. Websites of the Activities

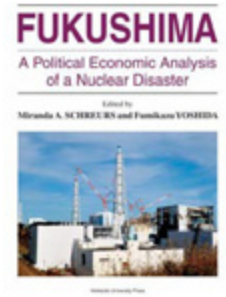
Publications

Lectures on Environmental Policy — A Social Science Perspective



Detail: http://hup.gr.jp/modules/zox/index.php?main_page=product_book_info&products_id=864

FUKUSHIMA — A Political Economic Analysis of a Nuclear Disaster



Detail: http://hup.gr.jp/modules/zox/index.php?main_page=product_book_info&products_id=835

Sustainable Low-Carbon Society III
- National Strategy, Policies to Various Areas, and International Policy

Editors: Fumikazu Yoshida, Masahito Fukami and Masahiko Fujii
2011, p273, Hokkaido University (in Japanese)

Is it really possible to achieve 25% reduction of CO^2 emissions by 2020 and 80% by 2050? This book provides an overview of these national strategies with mid- to long-term visions, and examines the policies for a low-carbon society regarding various areas, such as business administration, traffic planning, urban afforestation, cooperation between cities and rural communities, and the role of forests. Moreover, the book ingeniously introduces how to achieve a low-carbon society at both the local and global level, taking into considerations, such as international cooperation, emissions trading, and sustainable society and modern civilization theory which embrace a low-carbon society.

This is the third volume of *Sustainable Low-Carbon Society*. In the first volume, the causes of global environmental deterioration, in particular global warming, are described from aspects of both natural and social sciences. The second volume introduces the basis of environmental knowledge and some concrete examples of regional efforts. In this third volume, the mid- to long-term targets of national strategy, the efforts of various areas, and international policy will be discussed.

Sustainable Low-Carbon Society II

Editors: Fumikazu Yoshida, Motoyoshi Ikeda, Masahito Fukami and Masahiko Fujii
2010, p311, Hokkaido University (in Japanese)

This book is published based on a series of reputable lectures at Hokkaido University called the “Sustainable Low-Carbon Society”, which was a common course for all graduate schools as well as open lectures to the public. With the addition of some revisions, the book systematically and comprehensively provides basic knowledge on a wide range of disciplines regarding a sustainable low-carbon society, and realistic suggestions on how to develop such community.

It also focuses on the history and future predictions of global environmental change from the perspective of global environmental science, and considers how the “ideal low-carbon society” and its policies should be developed and grounded on the theories and studies in the field of social sciences. It also discusses the trend of Green New Deal Policy which various countries around the world have already started to implement, and describes an appropriate low-carbon society to people’s daily life and tourism, taking into consideration factors such as whether the community is an urban city, mountainous or fishing village.

We hope this book will be a useful primer and textbook on global environmental issues for undergraduate and post-graduate students.

Sustainable Low-Carbon Society

Editors: Fumikazu Yoshida and Motoyoshi Ikeda
2010, p202 , Hokkaido University

This is the English translation of a highly reputable book, *Sustainable Low-Carbon Society*, published in 2009. When the G8 Hokkaido Toyako Summit was held in 2008, Hokkaido University designated four weeks surrounding the summit as "Sustainability Weeks", during which the university held various kinds of events, and presented research achievements to the public. One of the efforts is the common course for all graduate schools called "Sustainable Low-Carbon Society", which included open lectures to the public. The content of a series of the lectures is compiled in this book.

It starts by looking at the basis of the mechanism of environmental change, such as environmental deterioration and global warming. In addition, from the perspective of environmental economics and international environmental law, it describes institutions for the realization of a low-carbon society. The book concludes with the analysis of the current situation of new technology development for the realization of a low-carbon society and Chinese initiatives which will likely become the world's biggest CO^2 emitter in the near future.

With a wide range of contents, this book provides a wealth of information to achieve a low-carbon society as a joint project of humanity, for not only Asian countries but also for all countries around the world.

Green Economy

Author: Fumikazu Yoshida
2011, p276, Chuokoron-Shinsha (in Japanese)

After the Great East Japan Earthquake on March 11th 2011, Japan is currently facing the challenges of abandonment of dependence on nuclear energy, economic restoration and development, and global warming. Although there are various kinds of skepticism to green economy, such as "natural energy could not be an alternative to nuclear power", "there is no room for saving energy anymore" or "global warming strategy will arrest the economic growth", it is crucial to promote new and innovative ideas to alter our limitation to the source of development.

Introducing and analyzing the cases of several foreign countries, such as Germany, Denmark, and an internal leading region, Hokkaido, the author shows the outline how to reconcile ideals with reality.

Overview of Education

The Public Policy School and the Graduate School of Environmental Science which foster professionals to meet the challenges of human society in the 21st century is now working on the educational program for “sustainable development” with an emphasis on the improvement of the masters course and the education program for exchange students from Asian countries.

Recommended Course

Sustainable Low-Carbon Society (2 Credits, common course for all graduate schools held in the second semester)

Under the principle of integration of humanities and sciences, notable academics and leading entrepreneurs are invited as guest lecturers to give lectures to students, which provide a wide range of knowledge related to sustainable low-carbon society.

Field training in Hokkaido (ECOSUS)（2 Credits for this intensive course held in September, in the first semester)

During the three-day field training in Furano Field (Furano Shizenjuku, in Furano city) whose president is Soh Kuramoto, a scriptwriter, students will join the environmental education program, hosted by Furano Field, that contains many outdoor activities including farming and tree planting.

Moreover, the Center for Sustainability Science, Hokkaido University has established a sub-major course called “Special coordinated Training Program for Sustainability Leaders and Sustainability ‘Meisters’” (StraSS) targeted at graduate school students and mature students. The program offers course clusters for fostering leaders for environment/sustainability and another cluster on sustainability which are designated as common courses for all graduate students, and various subjects regarding sustainable science are provided as core subjects for graduate school students. Please refer to these subjects, too.
http://www.census.hokudai.ac.jp/strass/

Recommended Courses in English: Creating a Sustainable Society Syllabus in 2012

	course	credit
Public Policy School	Topics on International Policy II - The Low Carbon Development and Renewable Energy’s Efficiency	2Credits for this intensive course held in August, in the first semester
	Politics of Sustainability - Challenges to the Global Crisis in Asia	2Credits, held in the second semester
Graduate School of Environmental Science	Environmental Policy in Japan	Elective Course for graduate students/Basic Course for science students, 2 Credits, held in the first semester
	Introduction to Environmental Earth Science	Elective Course for graduate students ; 2 Credits for this intensive course held in April, in the first semester
	Advanced Course in Dynamics of Global Warming	2 Credits, held in the second semester
	Study on Sustainable Society	2Credits, held in the first semester
	Study on Fostering Leaders for Environmental Conservation	4 Credits for this intensive course held in the first semester
	Natural Resource Management and Policy	2 Credits for this intensive course held in the first semester

	Advanced Course of International Communication Methods	2 Credits, held in the second semester
Center for Sustainability Science	Sustainability Science I & II	Introductory courses, Each course provided 2 Credits, held in the first semester
	Sustainability Science V- Frontiers of Sustainability Science	2 Credits, held in the first semester
	Sustainability Science IV- Collection of the Latest Information on Sustainability	2 Credits, held in the second semester
	Sustainability Science VI- ODA and Sustainability of Developing Country	2 Credits, held in the second semester
	Sustainability Science VII- Front of Land-use International Research	2 Credits, held in the second semester
	Environmental Policy	2 Credits, held in the second semester
	Environmental Ethics	2 Credits, held in the second semester
	Practical Environmental Leadership Theory	1 Credit, held in the second semester
	Asian/African Culture, Language and Local Regionalism	1 Credit, held in the second semester
	Field Training for Making a Sustainable Region (ECOSUS)	2 Credits, this intensive course will be held several times in the first and the second semester

Report

Field training in Hokkaido (ECOSUS)-Furano Field (*Furano Shizenjuku*) Report

My Thoughts on Furano Field Experience [part 1] (November 6th 2011)

The field training in Hokkaido (ECOSUS), which is one of the courses at the Center for Sustainability Science at Hokkaido University, was held over 3 days from 10th to 12th of September 2011, in which students were able to join an environmental education program hosted by the Furano Field. In this blog, I would like to look back at my experiences of the program and my thoughts and findings.

† Field training in Hokkaido (ECOSUS) is fully supported by the NPO C.C.C Furano Field, under the co-sponsorship of Sumitomo Mitsui Banking Corporation. (Furano Field http://furano-shizenjuku.com/)

1. Experience of the Environmental Education

"Just ask yourself whether you would choose a convenient life with the risk of nuclear power, or less convenient without the risk?" The president of Furano Field, Soh Kuramoto started the environmental education program at Furano Field by posing this a question at the opening lecture.

Following the opening ceremony, we moved onto the next program and were taken to see the "StoneEarth," a one-meter in diameter sphere of a model of the earth made by stone, which is a display at the entrance of the "Trails of the Earth." The instructors taught us the details of the earth's structure using this model earth, and reminded us that the spheres of activity of human beings are very narrow and limited. Now that I have learned the formation process of the earth, I realize that the earth was not created by the result of calculation, but the result of various miraculous "accidents."

Stone Earth

The “Trails of the Earth” is a 460-meters path, which represents the 4.6 billion-years history of the earth. As I walked along the path, I thought about the long history of the earth, comparing it to that of human race, which is relatively short. This program also taught us that prior to the existence of humanity, species on earth evolved and managed to find *niches* for themselves to survive, while human race have never adjusted to the environment but always forcing its way to create its own *niche*, in other words, changes the environment for its own sake.

At the end of the first day, the vice-president, Hayashibara, gave us a lecture entitled “Introduction of Environmental Issues.” In his lecture, he showed us a video and explained the following issues relating to the environment conditions, 1) the future of tropical rainforest and the impact of global warming and aridification, 2) issues on food wastes, 3) the impact of global warming on species, using polar bears as an example. At the end of the lecture, he quoted an expression by Hiroyuki Itsuki, *‘Gezan no Shiso*’, a thought of going down a mountain, which could be one of the answers for the question given by the president Kuramoto, mentioned above.

Planting Trees

After experiencing the first 2 days of the program while walking around the fields, digging the soil in the farmyard and understanding the condition of the earth, it offered me a chance to rethink about “what is the state of being natural,” regarding the use of my own senses within the environment or my life style, as well as human activity and the environment itself.

On the last day of the program, participants were given a task of performing a one-man play. We were expected to perform to express the thoughts of an element composing our nature as if they were telling us how they think of the environment. It was difficult to deliver a message specifically to others, but was very interesting to imagine and consider things as I got into the character of other species. Moreover, the instructors, Mr. Ogawa and Mr. Saito, gave each of us comments on our plays, which reminded us of our own characters and habits. I was moved by others’ ideas, performance, content of their messages and various ways of expression. Having experienced the program, I got a feeling that this is the program which expresses the very message from *Furano Shizenjuku*, “Imagination leads you to understanding”.
(By Satoko Baba)


Farming Training

My Thoughts on Furano Field (Furano Shizenjuku) Experiment [part 2] (November 7th 2011)

2. My Findings from Furano Field Method

The field training in Hokkaido (ECOSUS) offered me a precious experience to join the environmental education program of Furano Field, and to learn about the concept of each program.

What was most impressive was when an instructor pointed out the difference between German children that start to their environmental education by examining the gradation of the colour and shapes of the leaves, while children in Japan start by obtaining knowledge first. This struck me because I think that it's only after one gets interested in the existence of nature that you wish to *understand* the environment with fundamental questions, such as "what is the environment," "what is the circle of nature," or "why it is so important."

I believe that we must focus on the younger generation, and we must show them that it is fun to learn about the environment by touching things in nature with their senses, and to be inspired with pleasure at their first stage of life. Thorough their experiences, they will get interested in their surroundings, start to think about the environment, and finally they will gain the knowledge that they need.

You can say the same thing for grown-ups as they may have never played using their senses or through their inspiration. Above all, it could be a big step for the environmental education in Japan if those who are dedicated to education first play in the fields and explore their senses, and then combine their feelings to their own educational programs.

I feel that I have received a seed to think about how an environmental education should be, since I have learned these concepts from the various activities and programs offered by the Furano Field.

In the end, I'd like to express my sincere gratitude to all the staff and instructors at the Furano Field for giving us a chance to experience such a meaningful program.
(By Satoko Baba)

** It’ s not as if climbing but going down a mountain. There is no ever-lasting growth. When you climb to the top, you have to go down otherwise it won’ t be concluded. Going down is by no means valueless.*

When you are climbing you can only see the surface of the mountain, while when you go down, you may have a fine view of beautiful seas or cities before your eyes. Alpine plants may be in bloom at your feet, and grouses might show their faces by chance. You take steps to go down thinking about your life so far and the future.

We are all living in quite an extraordinary time, but we could perhaps call the “maturing period.” Why not take your time and go down at your own pace?”
(Excerpts from September 27th 2011 article, Mainichi Shimbun)

Event Reports

IPCC Open Symposium
New scientific findings on climate change and the importance of GHG inventory to assess mitigation progress

27th March 2014

Sustainable Low Carbon Project at Hokkaido University

"IPCC co-sponsorship does not imply IPCC endorsement or approval of these proceedings or any recommendations or conclusions contained herein. Neither the papers presented at the Symposium nor these proceedings have been subjected to IPCC review."

Summary

On December 10th 2013, an IPCC Open Symposium entitled "New scientific findings on climate change and the importance of greenhouse gas (GHG) inventory to assess mitigation progress" was held at Keio Plaza Hotel, Sapporo, Japan. The symposium was hosted by the Intergovernmental Panel on Climate Change (IPCC), co-hosted by Japan´s Ministry of the Environment, the Sustainable Low-Carbon Society Project and Faculty of Environmental Earth Science, Hokkaido University, and the Institute for Global Environment Strategies (IGES). Hokkaido Prefecture and the city of Sapporo provided support for the meeting.

This symposium was held in the context of the latest scientific findings on climate change as contained in the recently released IPCC Working Group I (WGI) Contribution to the IPCC's Fifth Assessment Report (AR5), and international efforts to cope with climate change as discussed during the 19th Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC/COP19) held in Warsaw, in November 2013. The meeting also addressed monitoring GHG emissions via GHG inventories, which is an essential element to guide climate change policy development.

In the opening session, on behalf of the organizers, Dr. Takuya Nomoto, Deputy Director, of the Research and Information Office, in the Global Environment Bureau of Japan´s Ministry of the Environment, and Prof. Atsushi Kubokawa, Dean of the Faculty of Environmental Earth Science, Hokkaido University, welcomed the participants.

In his opening address, Dr. Nomoto explained that the IPCC is a scientists' network dealing with climate change issues that presents scientific findings to policymakers all

over the world, and that, in 1998, the IPCC decided to establish a Task Force on National Greenhouse Gas Inventories (TFI). Since 1999, the Government of Japan has hosted the Technical Support Unit for the IPCC TFI. Dr. Nomoto also mentioned that as part of AR5, WGI had agreed to an updated assessment of scientific knowledge on climate change and that this was approved at the IPCC Plenary in Stockholm (Sweden) in September 2013. He said that the report supports the view that the advancement of global warming is clear and the drastic and continuous reduction of GHG emissions is needed to avoid the adverse effects of climate change.

Dr. Nomoto then commented on extreme events that had occurred all over Japan in the summer of 2013, and on the significant damage to Leyte Island, in the Philippines, caused by a huge typhoon. Scientists pointed out that the possible impact of climate change can be observed in the field of agricultural and ecological systems. Also, frequent heat waves due to extremely high temperatures, flash floods and damage due to land slides are all thought to be linked to climate change. In the future, it is possible that increases in both the scale and frequency of extreme phenomena will be resulted from increasing climate change.

Dr. Nomoto reported that the IPCC Plenary will be held in Japan for the first time, in March 2014, in Yokohama. The Plenary will consider the contribution of Working Group II (WGII) to AR5 to address the impact of climate change, as well as vulnerability and adaptation to climate change. In his view, it is necessary to advance steady and systematic efforts to adapt to the effects of climate change that are already taking place as well as the unavoidable medium and long-term effects of climate change in the future, based on the scientific knowledge including that reported in the WGII Contribution to AR5, among others.

He announced that the Ministry of the Environment will promote both adaptation and mitigation measures, and that by the end of summer, 2015, an adaptation plan will be prepared jointly by the ministries and agencies concerned for the first time.

Dr. Nomoto concluded his address by describing his anticipation that the symposium will be a good opportunity for the participants to reflect on the effects of climate change and future global warming mitigation action.

Next to speak was Dean of the Faculty of Environmental Earth Science, Prof. Kubokawa who referred to remarks of Ban Ki-moon, Secretary-General of the United Nations at UNFCCC/COP19 in November 2013, and said that climate change is the most serious issue among various environmental problems and it is becoming ever clearer that the anthropogenic contribution to climate change is consistent with the

findings of the WGI Contribution to the IPCC AR5.

Also, in Hokkaido, there has been a substantial problem regarding how to deal with global warming coupled with a rapidly aging population and lower birthrate. Prof. Kubokawa described the active role of the University in conducting research on climate change and that Dr. Shigeru Aoki, Associate Professor of the Institute of Low Temperature Science at Hokkaido University is a lead author of the IPCC AR5.
The activities of the Faculty of Environmental Earth Science include research in the field of earth science and ecology, tackling environmental issues, and presenting an annual lecture series on "Sustainable Low Carbon Society," which is open to citizens. These special lectures organized by the Sustainable Low Carbon Society Project reinforce the University's mandate to liaison with society.

Prof. Kubokawa concluded the welcome address by anticipating that the symposium will be a good opportunity for the participants to hear about the latest research results, to advance their understanding of and actions to counter climate change, which will contribute to the realization of a sustainable society.

There were seven presentations conducted by specialists from inside and outside the country. Dr. Thelma Krug, IPCC TFI Co-chairperson, made her presentation entitled "Climate Change and the Work of the IPCC". She summarized the process and the importance of the IPCC's establishment, its characteristics, functions and organizational structure, previous achievements and results to date. She referred to the IPCC Special Reports, Technical Papers and Methodological Reports too. Then, she linked the First Assessment Report to the UNFCCC negotiation process as an example of the IPCC's impact on international climate change policy. Finally, she mentioned that the Nobel Peace Prize was awarded in 2007 in recognition of many achievements of the IPCC whose assessment reports and other outputs have influenced international activities to address climate change.

Co-Chair Krug pointed out that the relation between human activities and climate change had been extensively discussed between scientists and politicians already in the 1980s, when it became clear that independent scientific and technical advisory efforts were necessary. The IPCC was established to give policymakers information on important and often complex climate related issues. She stressed that the work of the IPCC is to evaluate, in a comprehensive, objective, fair and transparent manner, scientific, technical and socio-economic information on the underlying science of anthropogenic climate change, its potential impacts and risks, and options for adaptation and mitigation. She insisted that the IPCC Reports should be neutral about

policy. Furthermore, since 1994, when the UNFCCC came into force there has been a systematic effort for scientists to address all issues relevant to policy making.

Prof. Masahide Kimoto, Vice Director of the Atmosphere and Ocean Research Institute at the University of Tokyo made a presentation entitled "New Scientific Findings on Climate Change – WGI Contribution to AR5", which introduced the findings of "The Physical Science Basis IPCC Working Group I - Contribution to the Fifth Assessment Report" published in September 2013.

He said that based on surface temperature data and temperature fluctuations in the surface layer at sea level, many observed changes have taken place since the 1950s, at a rate unprecedented for thousands of years, and therefore there is little doubt that global warming has been advancing.

He also pointed out that concentrations of carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) now substantially exceed the highest concentrations recorded in ice cores during the past 800,000 years.

Moreover, human impact on the climate system is tangible since simulation results show that the temperature increase cannot be reproduced without taking into account the increase in GHG emitted as a result of human activities since 1750. As for the future, scenarios indicate increasing average sea-level rise during the 21st century and a greater number of powerful typhoons. The report also points out that only drastic and sustained emission reductions will be able to mitigate climate change.

In Presentation 3 by Prof. Yasuhiro Yamanaka of the Faculty of Environmental Earth Science at Hokkaido University, entitled "Climate Change and Hokkaido", he showed quantitative estimates of fluctuations of daily average temperatures, the trend of the difference between the maximum and minimum daily temperatures and the fluctuation in snowfall in Sapporo when the average temperature rises by three degrees Celsius. Prof. Yamanaka also presented the results of updated research on the forecasted effects of snowfall in Tomamu, the Town of Shimukappu and the rice yield in Hokkaido. In addition, he pointed out that Hokkaido faces challenges not only from the adverse effects of intensified climate change, but also regarding population decline, an aging society and a falling birthrate.

Furthermore, he described a course in Practical Science for the Environment that the Division of Environmental Science Development established in the Graduate School of Environmental Science at Hokkaido University in April 2011, and said that "Another Environmental White Paper for Hokkaido" has been published in co-operation with

four environmental intermediate supporting entities, a part of which can be read on the homepage (http://enavi-hokkaido.net/wp/tsujii/tsujii1.html).

The purpose of the course is to foster personal development by considering the long-term perspective until 2050. Participants will endeavor to find solutions to both problems on a global scale and at the local community level in Hokkaido, and with this integrated approach seek overall improvements for society in the future.

In Presentation 4, Dr. Jim Penman, a member of the Bureau of TFI of the IPCC, and Honorary Professor of the Environment Institute, University College London, spoke about "International Efforts to Control Climate Change". He reviewed the international UNFCCC negotiation process and the role of the IPCC from the viewpoint of the relationship between scientists and policymakers, and said that significant benefits to both the UNFCCC and IPCC arose from the degree of interaction between the two. The UNFCCC was arguably the most effective of the agreements, negotiated at the Rio Earth summit, because of its linkage to continuously updated scientific consensus via the IPCC, and because GHG emissions are quantifiable through GHG inventories using a single metric.

Dr. Penman stated that the Kyoto Protocol includes the essential elements to mitigate climate change, but cannot alone be seen as a global solution because the coverage carried out by various Parties is not sufficient. Among other things, he felt that a future agreement should address the relationship between international compliance arrangements and national sovereignty. Moreover, what is s needed is greater flexibility on common but differentiated responsibility than can be provided by a list-based approach. As well, it must ensure that sufficient human resources are made available for a reporting and reviewing process.

Regarding current trends, he said that global emissions are currently rising at a 1.2% per annum, slower than GDP increase (3.2% pa), and that existing pledges for emission reductions by 2020 by countries are less than half the required amount to close the gap between emissions amount that will keep the temperature increase within 2 degrees Celsius above the pre-industrial value.

He argued that there is no possibility of reaching the 2 degrees Celsius goal if countries cannot forge a new legally enforceable agreement accompanied by effective actions endorsed by all countries. For he said the agreement requires full engagement of the global economy, strong and efficient international rules being set (though implementation could be as devolved as possible), agreement on a long-term goals with a pathway to short-term commitment, which would be reviewed internationally. If not

all of one type, commitments needed to be mathematically interconvertible to enable comparability. There needs to be an internationally-agreed GHG inventory methodology to ensure that estimating emissions and their subsequent reductions can be done consistently.

Mr. Nalin Srivastava, Deputy Head of the Technical Support Unit (TSU) of the IPCC TFI, in his presentation entitled "GHG Inventories: Their Importance to Monitor Progress in Climate Change Mitigation", presented the following topics, the importance of a GHG inventory[1], an explanation of GHG inventory guidelines and ways to ensure credibility of the GHG inventory information. He explained that GHG inventories provide a means to understand scientifically the relationship between environmental pollution and its sources, in relation to its effects (e.g. climate change). He pointed out that GHG inventories are critical to guiding the formulation of cost-effective climate change mitigation policies, monitoring progress towards policy goals and providing information to the public.

He mentioned that any international agreement to cope with climate change must set emission limits, targets and aims and monitor progress in an open and transparent way. However, presently we cannot measure all sources and sinks, therefore it makes sense to make estimates based on parameters associated with emissions and removal rates. In order to do so, we need reliable, generally accepted methods and guidelines.

He explained that in order to promote the development of high quality and credible national GHG inventories, a collection of methodological principles, actions and procedures have been provided in the IPCC guidelines. They are collectively referred to as good practice, which is widely accepted by countries as the basis for developing reliable inventories.

In Presentation 6 entitled "IPCC Inventory Task Force (TFI)", Mr. Kiyoto Tanabe, Head of the TFI TSU, explained the establishment of the TFI TSU in Japan, and the background of the IPCC TFI, as well as the purpose of TFI activities and the function of the TFI Bureau. Also, he addressed the development of the IPCC guidelines, their revisions, and the relationship between IPCC guidelines and UNFCCC, user support systems of IPCC guidelines, the Emissions Factor Database, and finally, the evaluation

[1] A GHG inventory is an estimate of GHGs emitted and absorbed within a specific period of time from various sources and sinks in a specific area. Generally, it provides an estimate of emissions and removals of GHGs by each country in a year.

of TFI activities to date and the expectation about its future activities.

In his presentation, Mr. Tanabe mentioned that the objectives of the TFI are to develop and improve internationally-agreed methodology to calculate and report GHG emissions and removals by country, as well as to encourage the implementation of the methodology by IPCC member countries and the Parties to the UNFCCC. He said that the TFI's duty is to develop methods of producing a GHG inventory that can be used by all countries, especially developing countries which tend to be short of information and data required for the inventory.

He stressed that IPCC guidelines present internationally-agreed calculation methods, and that the Parties to the UNFCCC were obliged to use the IPCC guidelines. Further, the 2006 IPCC guidelines would be used by Annex I Parties (mainly developed countries) from 2015 and onwards, and that the Emission Factor Database was accessible through the Internet as a working library.

In the end, he insisted that the activity provides essential underpinning for the UNFCCC and the need for its work is likely to expand in future to support its implementation. The support provided by Japan is recognized and appreciated internationally.

In the 7th speech, Mr. Kohei Sakai, GHG Inventory Expert at the Greenhouse Gas Inventory Office of Japan, at the Center for Global Environmental Research in the National Institute for Environmental Studies, made his presentation entitled "Japan's National GHG Inventory and Relevant Activities".

He summarized a calculation system of GHG emissions and absorptions that were subject to a report by the Kyoto Protocol of the UNFCCC, and annual trends of total GHG and CO_2 emissions in Japan, as well as how carbon dioxide emissions are influenced by the change of composition of energy sources for electricity generation.

Then, he explained the process of GHG emission estimations in Japan, especially setting a method to calculate an emissions coefficient and global warming potential, and he introduced CO_2 emissions in Hokkaido and GHG emissions in New Zealand as a means to show differences of GHG sources by country or region.

He reported that Japan's Kyoto Protocol target for the first commitment period (a reduction of 6 % in comparison to the base year for Japan) could be attained if total emission amounts in averaged annual total emissions from 2008 to 2012 were less than the reduction target value. It is estimated that the emissions would be - 8.2 % including removal by forest and credits gained under the Kyoto Mechanism, and in this way it would be possible for Japan to reach the target.

Finally, in the context of emissions reduction, he noted that "Visualization" by measuring electricity consumption and energy use of home appliances could help to raise energy conservation consciousness. In addition, he introduced "Uchi-Eco Shindan" (an investigation of CO_2 emissions and energy consumption in individual homes with advice from experts) which is helpful to practice power saving and CO_2 reduction in daily life.

In the subsequent Q & A session coordinated by Mr. Kiyoto Tanabe, Head of the TFI TSU, questions were collected by using a question sheet from the audience that was issued during the break.

The first question was about the origin of the 2 degrees Celsius relative to pre-industrial levels as a temperature increase to be avoided.

According to Dr. Jim Penman, the 2 degrees Celsius is reflected in the 2010 Cancun Agreement[2] and that in his view, agreement to include the 2 degrees Celsius gauge took into account the impact of climate change evaluated by the IPCC, reduction costs of GHGs and the results of impact assessments by countries. He added that 1.5 degrees Celsius was also discussed, because, for example, of the potential effect of sea level rise on island states.

The second question asked about an effective way to explain the seriousness of global warming to people skeptical about climate change and for those who think that global warming is unlikely since the trend in gradual temperature increase per year appears to have plateaued.

Prof. Kimoto answered this question by stressing that global warming is an urgent issue of human-kind, pointing out problems of how to report this issue by scholars and media. Furthermore, he insisted that professionals in charge of monitoring global warming need to persuade any skeptics to take action.

The third question focused on the existence of innovative remote sensing technologies that allow top-down measurement of GHG emissions by remote sensing technologies and whether they could be reliably used for developing national GHG inventories.

Mr. Nalin Srivastava answered that although there do exist some remote sensing platforms that allow limited measurement of GHG emissions, they cannot be reliably

[2] Note added following the Symposium: the 2 degrees Celsius and 1.5 degrees Celsius values are also featured in the 2009 Copenhagen Accord.

used for producing credible national-level GHG inventories due to a low level of accuracy. However, we can potentially use them to obtain a more reliable GHG inventory at a national level by using them for verification of estimation by the bottom-up approach. Dr. Thelma Krug pointed out, in her personal view, that while top down approaches are promising, top down measurement by remote sensing is not sufficient because of the impossibility of getting accurate information (e.g. forest biomass, in particular, those of tropical forests) without collecting data at ground level. Furthermore, Dr. Jim Penman noted that emissions' estimation required not just measurement of concentrations, but also knowledge of atmospheric transport processes.

The fourth question involved the extent to which a detailed calculation process is open to the public, and where citizens can find the information. Mr. Kohei Sakai answered that the calculation processes are disaggregated by a lot of emission sources and described in the 600-page "National Greenhouse Gas Inventory Report of Japan" and he explained using one example, how calculation of methane emissions by enteric fermentation from cattle can be classified into a dozen types.

Dr. Thelma Krug (TFI Co-chair) gave the closing address, reviewing each speaker's presentation. First of all, she mentioned that as an overall evaluation, the quality of GHG inventory in Japan is high, and that citizens can get information easily through a website.

Next, she commented on historical lessons, and the importance of getting consensus for policies based on empirically derived up to date scientific evidence. She reiterated that discussion on ambitious global warming policy should be based on the latest scientific results. Also, regarding the calculation and reporting of GHG emissions and absorption quantities, it was revealed that the comparison among countries in the UNFCCC became possible by utilizing the IPCC guidelines.

Furthermore, she mentioned the importance of making a GHG inventory in each country in order to create and carry out proper and effective GHG reduction policies.

In the end, Dr. Krug acknowledged Japan's Ministry of the Environment for sponsoring the symposium and Hokkaido University for being an excellent host, and closed her remarks by praising participants for their stimulating exchanges throughout the symposium.

Approximately 110 participants from inside and outside of the campus attended this Open Symposium. The symposium enabled sharing information on IPCC activities and international approaches to climate change, provided updated scientific findings and

deepened awareness with regard to the contents of the WGI Contribution to AR5, and GHG emission calculations and the TFI's activities.

Photo of the symposium in progress

北海道大学サステナビリティ・ウィーク2013

札幌・ノボシビルスク・大田姉妹都市科学シンポジウム

環境・エネルギー国際シンポジウム

持続可能な未来へ

～低炭素社会と再生可能エネルギー～

International Symposium on the Environment and Energy

主催：札幌市、北海道大学「持続可能な低炭素社会づくり」プロジェクト
共催：環境省北海道地方環境事務所
さっぽろGreener Week運営協議会
一般社団法人　北海道再生可能エネルギー振興機構

環境・エネルギー国際シンポジウム

開会挨拶　札幌市・上田市長

基調講演　吉田文和・北海道大学大学院経済学研究科教授

来賓講演Ⅰ　ススロフ・ニキタ　ロシア科学アカデミーシベリア支部工業経済経営研究所
部長　兼　ノボシビルスク国立総合大学経済学部教授

来賓講演　Ⅱ　李震石　韓国エネルギー技術研究院　主席研究員

パネルディスカッション「地域の先進的な取組みと今後の北海道」

閉会挨拶　鈴木亨　一般社団法人　北海道再生可能エネルギー振興機構理事長

目　　次

Introduction

For global warming, the 5th Assessment Report published by the Working Group I of the Intergovernmental Panel on Climate Change (IPCC) in September, 2013 reported that it is extremely likely that human influence has been the dominant cause of the warming observed since the middle of the 20th century, and it is necessary to make significant efforts to achieve the international goals to suppress the temperature rise within 2 degree centigrade by the end of this century comparing to the level before the start of the Industrial Revolution. International negotiations on measures to counteract climate change by 2020 and thereafter and to achieve sustainable development based on the newly formulated approach, known as 'Green Growth', which aims to develop the economy while conserving the environment, will be actively pursued.

In Japan, the commonly believed myth that nuclear power plants are infallible disappeared with the accident at the Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Stations in March, 2011, resulting in the standstill of all existing nuclear power plants. However, currently, the basic energy plans as well as measures to counteract climate change, both of which are closely interrelated, have been being reviewed. The introduction of Feed-in Tariffs (FIT) since July, 2012, and a variety of efforts have been made to promote renewable energy generation, and innovative approaches have been introduced by local authorities specifically in Hokkaido, which has an excellent potential to develop renewable energy, and which is expected to play an active role in its development. It is also important to make the best use of renewable energy sources in the planning to boost community development and revitalize the local economy, to which depopulation and aging are producing serious adverse effects. The city of Sapporo, for example, has developed the "Sapporo City Development Strategic Visions", which formulated the planning guidelines for the city as being an attractive one for citizens in the future, focusing on the creation of a low-carbon society and energy source transformation to renewable ones as one of the central issues of city planning.

With this background, Hokkaido University Sustainable Low-Carbon Society Project and Sapporo City government hosted the International Symposium on the Environment and Energy, "Towards a Sustainable Future - Through the Development of a Low Carbon Society and Renewable Energy." The symposium was held at the Hokkaido University Conference Hall on November 5th as an event of the Hokkaido University Sustainability Week. The symposium was co-hosted by the

Hokkaido Regional Environment Office of Ministry of the Environment (MOEJ), Sapporo Greener Week Consortium, and the Renewable Energy Organization of Hokkaido (General Incorporated Associations). This symposium also served as the "Sapporo, Novosibirsk (Russia) and Daejeon (Korea) Friendship Town Science Symposium", which has been held since 2011 by the three cities aiming to promote development of the North East Asian region through co-operation among the three cities.

The symposium had two main objectives: firstly, to share information on specific issues about energy and future perspectives through the presentations by leading researchers from Sapporo, and from its sister cities, Novosibirsk and Daejeon, and secondly, to provide the participants with an opportunity to discuss how to realize a low-carbon society and a sustainable society specifically in Hokkaido focusing on the roles of renewable energy, expectations toward the activation of the regional economy, and the necessity for co-operation among industry, government, academia, and citizens. The program also included presentations by the Mayor of Tomamae, the Mayor of Shikaoi, and the Mayor of Suttsu. These presentations introduced the innovative efforts in utilization of renewable energy sources and specific issues applying to each of these towns.

The symposium had 192 participants from on and off campus, citizens, businesses, specialists, and the administrative personnel involved. Through the symposium, we were able to conduct an active discussion by sharing information on the current situation and efforts to harness renewable energy in Korea, Russia, and Hokkaido. Further, we were able to deepen the vision for establishing a low-carbon society and move towards a sustainable future based on understanding the necessity for activation of the regional economy by returning benefits to the communities and creating employment through renewable energy development and for inter-regional and international co-operation.

This report summarizes the main points of the symposium. We were able to successfully carry out the international symposium with generous help from many people including researchers and presenters from Novosibirsk, Daejeon, Tomamae, Shikaoi, and Suttsu. We wish to express our thanks and appreciation to everyone involved.

１．環境・エネルギー国際シンポジウム開催概要

1.1 Agenda

International Symposium on Environment and Energy
Towards a Sustainable Future
Through the Development of a Low Carbon Society and Renewable Energy

【Date】13:30-17:00, 5th November 2013

【Venue】Hokkaido University Conference Hall

【Organizer】Sapporo City Government, HU Sustainable Low-Carbon Society Project

【Co-host】Hokkaido Regional Environment Office Ministry of Environment,
Greener Week Consortium, Renewable Energy Organization of Hokkaido
(General Incorporated Associations)

13：30 Opening
Opening Address Mr. Fumio Ueda, Mayor of Sapporo City

13：40 Part I
【Keynote Speech】
"Renewable Energy and Revitalization of Local Economy"
Prof. Fumikazu Yoshida, Graduate School of Economics and Business Administration, Hokkaido University
【Guest Speaker I】
"Renewable Energy Sources in the Energy Abundant Economy: the Case of Russia"
Prof. Nikita Suslov, Economic Faculty of Novosibirsk State University, The Head of a Department in Institute of Economics and Industrial Engineering, Siberian Branch, Russian Academy of Sciences
【Guest Speaker II】
"Bioenergy: Key tool for sustainable society: Korean experiences"
Dr. Jin-Suk Lee, Principal Researcher, Korean Institute of Energy Research
【Conclusion of Part I】
Prof. Fumikazu Yoshida, Hokkaido University

15:00－15:10 Break

15：10 Part II
【Panel Discussion】
"Progressive approaches by towns and future possibilities in Hokkaido"
Co-ordinator: Prof. Shinichi Arai, Graduate School of Environmental Science, Hokkaido University
Panelists: Mr. Toshio Mori, Mayor of Tomamae Town
Mr. Hiroshi Yoshida, Mayor of Shikaoi Town
Mr. Haruo Kataoka, Mayor of Suttu Town
Guests: Prof. Nikita Suslov, Siberian Branch, Russian Academy of Sciences
Dr. Jin-Suk Lee, Korea Institute of Energy Research

16：55 Concluding Remarks
Prof. Fumikazu Yoshida, Hokkaido University

17：00 Closing

1.2 Profile of Speakers

Fumikazu Yoshida　Graduate School of Economics, Hokkaido University, Prof.

Born 1950, Completed the doctoral program in the Kyoto Graduate School of Economics, Ph.D. Economics, Research themes include Environmental Economics, Industrial Technology, Social Scientific Research of material-cycle society and sustainable Low-Carbon Society, Books included, For a Sustainable Future (co-ed. Hokkaido University Press, 2013), Sustainable Low-carbon Society (co-ed. Hokkaido University Press, 2010), Lecture on Environmental Economics (Hokkaido University Press, 2012) , Green Economy (Chuo-Koron), Hokkaido in Post Nuclear Power Generation Era (Hokkaido Shinbun),

Nikita Suslov　Economic Faculty of Novosibirsk State University, Prof.
Siberian Branch, Russian Academy of Sciences, the Head of Dept.

Doctor of economics, Professor of economic theory at Economic Faculty of Novosibirsk State University, Novosibirsk, Russia and the head of a department in Institute of Economics and Industrial Engineering of Siberian Branch of Russian Academy of Sciences.
Research interests include Macroeconomics, Human Behavior and Institutional Economics, Comparative Economics, Energy Economics, Renewable Economics, Industrial Organization.
Author of 188 publications on economics and social science in Russian, English and German languages.

Jin-Suk Lee　Korea Institute of Energy Research, Principal Researcher

Ph.D. in Chemical Engineering (Lehigh University, USA), Principal Researcher, Clean Fuels Department, Korea Institute of Energy Research, He is also Steering Committee Member of Asia Biomass Association, Editorial Board Member of Bioresource Technology (SCI Journal), and Vice President of Korea Society of New and Renewable Energy. Major research interests include Biofuels (Biodiesel, Cellulosic ethanol). He contributed over 50 publications in international journals and 20 papers in Korean journals, and has over 30 patents on biofuel technologies.

Shinichi Arai　Graduate School of Environmental Science, Hokkaido University,Prof.

Born 1953, Graduated from Master's Course of Chemistry, Graduate School, University of Tokyo, Official of Environment Agency of Japan 1978, Joined Hokkaido University 2011, Previously served as Director of Global Environmental Issues Division, Ministry of the Environment, Japan, Project Researcher, University of Tokyo, Senior Research Fellow, United Nations University. Research themes include Environmental Policy and Technology, Environmental Risk Assessment. Contribution to books include Local Community Development Enjoying with Five Senses (Gakuyo-Shobo, 2011), Policies against Environmental Pollution in Japan (Mukogawa Women's University Press, 2012), For a Sustainable Future (Hokkaido University Press, 2012)

Toshio Mori　Mayor of Tomamae Town, Hokkaido

Born 1941, Mayor of Tomamae Town since 2003, President of "National Council of Cities, Towns and Villages for Promotion of Wind-power Generation ", Representative of "Research Group of Community Vitalization by means of Natural Energy Resources in the Ororon-Line Area ", Member of the "Certification Committee of Green Energy"

Hiroshi Yoshida　Mayer of Shikaoi Town, Hokkaido

Born 1939, Mayor of Shikaoi Town since 1999, Vice President of "Tokachi Towns and Villages Association", and Vice President of "National Biogas Project Promotion Council ",

Haruo Kataoka　Mayer of Suttu Town, Hokkaido

Born 1949, Mayer of Suttu Town since 2001, Vice President of "National Council of Cities, Towns and Villages for Promotion of Wind-power Generation ",

1.3 Summary of the Symposium

Hokkaido University Sustainability Week 2013
International Symposium on the Environment and Energy
Towards a Sustainable Future: Through Development of a Low Carbon Community and Renewable Energy
10th December 2013, Sapporo, Japan

Summary

On November 5th 2013, during Hokkaido University Sustainability Weeks 2013, the International Symposium on the Environment and Energy titled, *Towards Sustainability - Through the Development of a Low Carbon Society and Renewable Energy* was held at the Hokkaido University Conference Hall.

The Hokkaido University Sustainable Low-Carbon Society Project and Sapporo City government, co-hosted by the Hokkaido Regional Environment Office of the Ministry of Environment (MOEJ), Sapporo Greener Week Consortium, and Renewable Energy Organization of Hokkaido (General Incorporated Associations), hosted the event. This symposium also served as *the Sapporo, Novosibirsk and Daejeon Friendship Town Science Symposium*.

On behalf of the organizers, the Mayor of Sapporo, Mr. Fumio Ueda welcomed the participants and opened the symposium. This symposium involved lectures and panel discussions by both researchers who specialize in renewable energy in Japan, Korea and Russia, and mayors who are leaders in introducing renewable energy throughout Hokkaido.

In his opening address, Mayor Ueda explained that *the Sapporo, Novosibirsk and Daejeon Friendship Town Science Symposium* was initiated by Daejeon and started in 2011, and the objective of the Symposium is to promote development of the North East Asian region through co-operation between the three cities, each of which has advanced scientific technologies.

Also, he mentioned how the city of Sapporo declared itself the *Environmental Capital, Sapporo*, in 2008, where each citizen commits to taking action to improve environmental conservation. He referred to *Sapporo City Development Strategic Visions*, which are the city's planning guidelines for the next ten years. Then, he explained some key issues in city planning, such as how Sapporo has pursued the formation of a lower environmental-load-low carbon society, and energy source

conversion from conventional to renewable energy.

He insisted that, in order to pass on an attractive Sapporo to future generations, it is crucial to promote fostering renewable energy, which will contribute to achieving a low carbon society and one that discourages the use of nuclear power.

Mayor Ueda concluded the address by crediting the symposium as a prime opportunity for participants to share their interest in attaining a low carbon, renewable society, and ultimately promoting every effort in environmental conservation that helps to bring a sustainable society to fruition.

In his keynote lecture titled *Renewable Energy and Vitalizing Local Economy*, Prof. Fumikazu Yoshida of the Graduate School of Economics and Business Administration, Hokkaido University, proposed these four conditions for promoting renewable energy: *Legal/Economic Framework and Target Setting*, *Feed-In-Tariff (FIT) System and Financing Conditions*, *Transmission/Grid/Pre-emptive Purchasing*, *Facilities, Technology Development and Innovation*. He introduced specific features of potential renewable energy sources in Hokkaido and advanced cases in developing wind-power, solar-power, and biomass power generation and geothermal utilization. Then, he summarized several key issues taking into account the four conditions. In lessons learned from progressive approaches taken by communities, he emphasized that it is very important to get full co-operation from the people concerned regarding accurate understanding of basic conditions such as the local natural environment and properties of raw materials and how they change, planning and designing facilities whose specifications meet the expected conditions, while anticipating and preparing for any contingencies.

Prof. Nikita Suslov of the Economic Faculty of Novosibirsk State University and department head in the Institute of Economics and Industrial Engineering, Siberian Branch, Russian Academy of Sciences presented *Renewable Energy Sources in an Energy Abundant Economy: the Case of Russia*. This talk included the state and situation of energy development; particularly, renewable energy sources in Russia. The reason why renewable energy source development has failed in Russia is that, in addition to economic aspects of electricity production, renewable energy is not competitive with conventional energy sources, and he cited several impediments such as a lack of infrastructure, appropriate software and human resources. There is the possibility of introducing a FIT system and institutions to secure markups for renewable energy; however, the process has been hampered by implementation problems involving these two legislative acts, *On Energy Saving and Raising Energy Efficiency,* and *The Federal Law from on Electric Energy Sector*, both of which give the

Russian Government an institutional framework and guarantee the connection of renewable energy to grids, and secure power transmitters, and an all-quantity buyback system of renewable energy by using measures such as tradable green certificates.

He pointed out that the main reason for the very limited introduction of renewables even for Belgorod, which is a leading city in introducing renewable energy to European Russia, is that it takes an extremely long time and is quite expensive to process and authenticate the initial solar power generation and to connect everything to the grids. However, he insisted that renewable energy in Russia will continue to be pursued and the establishment of a new system, *a contract on power capacity supply* based on competitive bidding in the future is an important policy to promote renewable energy.

Dr. Jin-Suk Lee, a principal researcher at the Korean Institute of Energy Research, made his presentation titled *Bioenergy: A Key Tool for a Sustainable Society: Korean Experiences*. He addressed experiences with bioenergy in Korea and issues regarding the implementation of a plan to develop renewable energy. There is an increasing tendency to make renewable energy more and more significant in Korea. Under such circumstances, he emphasized that Korean policy makers attempted its implementation by introducing a FIT system in 2002; however, Korea faced a financial deficit due to complications related to tax exemption measures involved in introducing a promotion system. Since 2012, it has changed from a FIT to a *Renewables Portfolio Standard (RPS)*. Dr. Lee went on to describe the future schedule for renewable energy initiatives such as *Renewable Fuel Standard (RFS)* with regard to biofuels, for 2015, and *Renewable Heat Obligation (RHO)* regarding the monitoring of heat utilization, slated for 2016. Dr. Lee reiterated that bioenergy will play a key role in realizing a sustainable society in Korea, but he cautioned that securing a stable supply of feedstocks in the transport sector will be the most challenging issue, and speculated that organic waste and energy crops may become promising as feedstocks for bioenergy production.

In the subsequent panel discussion and Q&A session coordinated by Prof. Shinichi Arai, a professor in the Faculty of Environmental Earth Science, Hokkaido University, panelists made presentations and participants discussed issues under the theme of *Progressive Approaches by Local Towns and Future Possibilities in Hokkaido*. In these presentations, Toshio Mori, Mayor of Tomamae, Hiroshi Yoshida, Mayor of Shikaoi and Haruo Kataoka, Mayor of Suttsu, delivered their presentations about efforts in utilization of renewable energy and specific issues in each town.

Mr. Mori, Mayor of Tomamae, explained that there are 42 mills and wind power generating facilities in the Town of Tomamae whose total output is 52,800 kW. Specific cases included a fisheries cooperative association and Japan Agricultural Cooperatives

and the utilization of snow for cooling at the fish stocking facility, and power saving and the reduction of carbon dioxide through use of snow energy as the heat source of (JA) cooling in a grain storage house, and a *Green Hydrogen Use Project*. This last project involves renewable energy restricted to the city in the form of green hydrogen, which is produced through the use of wind power generation in the city.

Mr. Mori pointed out that Hokkaido and Tohoku districts have great potential for wind power generation and many suitable sites for installation, but that some districts have had to delay the introduction of wind power generation, due to the small transmitting capacity of their power systems. Consequently, construction of a prototypical power grid system that can serve as a model for the nation will be implemented and expanded nationwide.

Next, Mr. Yoshida, Mayor of Shikaoi, explained about the situation of renewable energy in the town of Shikaoi, Hokkaido, and the potential of biogas in Hokkaido. He emphasized environmental conservation in agriculture by using appropriate disposal methods, the background to the construction of a biogas plant, while describing cases of advanced utilization of bio-gasification.

Also, he pointed out issues including, dissemination of biogas plants using livestock manure and conditions for compensation for output control in applying a FIT system, the setting of an electric power sales price, subsidies in construction of biogas facilities, and the hardware and software requirements for research and development.

Following Shikaoi's, Mr. Kataoka, Mayor of Suttsu, presented his town's approach to wind power generation. This was the first municipality in Japan that attempted to construct wind power generation so the mayor discussed the steps taken including, an in-depth examination of wind conditions, establishing maintenance procedures and securing a reliable producer. Gradually the town was finally able to introduce wind power generation in 1999, with total operating outputs of 16,580kW from 11 mills. The town has been able to support its local industries and provide subsidies to its citizens at medical clinics as well as contribute to the municipal coffers by selling power to the local electric company. Finally, Mr. Kataoka described the lingering issue of seeking equipment to manage power output fluctuations with the wind energy generation systems, something that could involve storage batteries for when the town constructs new wind power generators.

Subsequent panel discussion with the three mayors and Prof. Suslov and Dr. Lee took place. The themes of the discussion included, *originality and creativity* and experiences in overcoming bottlenecks in progressive approaches by local towns in Hokkaido, direction for future improvement, issues and advice regarding setting up facilities in

other areas. In addition, the panel focused on how to elaborate and disseminate the exemplary efforts in Hokkaido, when fostering establishment of a sustainable society from the local level. Furthermore, through the Q&A session, ways to invigorate the local economy including improving employment, and the importance of reviewing the social system framework and the cost of infrastructure were discussed. Notably, from the floor came a few insights regarding the creation of local industry and employment through utilization of renewable energy and on the institutional conditions required to propagate renewable energy use.

Finally, Mr. Toru Suzuki, the president of Renewable Energy Organization of Hokkaido (General Incorporated Associations) and Prof. Fumikazu Yoshida closed the symposium. In Mr. Suzuki's concluding remarks, he pointed out that effective use of renewable energy facilities in Hokkaido is integral to disseminating renewable energy in Japan, and contributing to the broader long-term picture. In the end, Prof. Yoshida closed the symposium by anticipating that future symposia can only enhance cooperation and mutual understanding between cities and regions in advancements in Korea, Russia and Japan.

Approximately 190 participants from on and off campus attended this international symposium. Through the symposium, we could share information on current situations and efforts to harness renewable energy in Russia, Korea and inside Hokkaido. Moreover, we were able to deepen recognition of the benefits of a sustainable future and the realization of how information sharing and cooperation between regions and countries contributes to developing renewable energy and establishing low carbon sustainable societies.

２．講演等資料

再生可能エネルギーと地域経済の活性化

北海道大学
吉田文和

3つのリスクを減らす

再生可能エネルギーの普及拡大により、日本の抱える3つのリスクを解決できる:

①地球温暖化のリスク→京都議定書の重要性
②原子力事故と放射性廃棄物のリスク
③輸入化石燃料依存のリスク

但し、再生可能エネルギーに加え、

①省エネ（生産と消費）
②中継ぎとして化石燃料の利用効率向上

も併せ、民間投資を基礎に、新しい産業と雇用創出でグリーン・エコノミー推進が成功の条件。

再生可能エネルギー導入の4条件

（1）枠組み条件と目標設定

（2）買取価格と融資条件

（3）送電網への優先接続保証

（4）技術開発、イノベーション

北海道大学大学院経済学研究科　吉田文和　教授

再生可能エネルギー

- 風力
- 太陽光
- バイオマス
- バイオガス
- 小水力
- 地熱エネルギー

固定価格買取制度

電源		太陽光		風力		地熱		中小水力		
調達区分		10kW以上	10kW未満（余剰買取）	20kW以上	20kW未満	1.5万kW以上	1.5万kW未満	1,000kW以上30,000kW未満	200kW以上1,000kW未満	200kW未満
費用	建設費	32.5万円/kW	46.6万円/kW	30万円/kW	125万円/kW	79万円/kW	123万円/kW	85万円/kW	80万円/kW	100万円/kW
	運転維持費（1年当たり）	10千円/kW	4.7千円/kW	6.0千円/kW	－	33千円/kW	48千円/kW	9.5千円/kW	60千円/kW	75千円/kW
IRR		税前6%	税前3.2%（＊1）	税前8%	税前1.8%	税前13%（＊2）		税前7%	税前7%	
調達価格1kWh当たり	税込（＊3）	42.00円	42円（＊1）	23.10円	57.75円	27.30円	42.00円	25.20円	30.45円	35.70円
	税抜	40円	42円	22円	55円	26円	40円	24円	29円	34円
調達期間		20年	10年	20年	20年	15年	15年	20年		

電源		バイオマス						
バイオマスの種類		ガス化（下水汚泥）	ガス化（家畜糞尿）	固形燃料燃焼(未利用木材)	固形燃料燃焼（一般木材）	固形燃料燃焼(一般廃棄物)	固形燃料燃焼（下水汚泥）	固形燃料燃焼（リサイクル木材）
費用	建設費	392万円/kW		41万円/kW	41万円/kW	31万円/kW		35万円/kW
	運転維持費（1年当たり）	184千円/kW		27千円/kW	27千円/kW	22千円/kW		27千円/kW
IRR		税前1%		税前8%	税前4%	税前4%		税前4%
調達価格1kWh当たり	調達区分	【メタン発酵ガス化バイオマス】		【未利用木材】	【一般木材（含パーム椰子殻）】	【廃棄物系（木質以外）バイオマス】		【リサイクル木材】
	税込	40.95円		33.60円	25.20円	17.85円		13.65円
	税抜	39円		32円	24円	17円		13円
調達期間		20年						

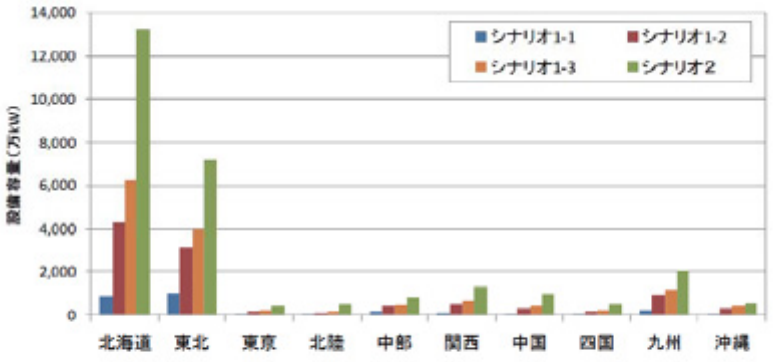
管内別の新エネルギー賦存量の特徴

総合振興局・振興局別の新エネルギー賦存量

※上位6位を網掛け

総合振興局・振興局	太陽光	風力発電		中小水力発電	バイオマス	管内別のポイント
	(平均日射量)		年間平均風速			
空知	3.61	61,281	3.03	590	8,199,486	中小水力、バイオマス（特に木質系バイオマス）の賦存量が大。
石狩	3.72	64,081	3.67	355	4,844,132	平均風速が大。バイオマス（特に食品残渣）の賦存量が比較的大。
後志	3.44	51,851	3.66	619	2,748,195	平均風速が大きく、中小水力発電のポテンシャルがある。
胆振	3.78	42,418	2.93	244	4,428,211	年平均日射量が大きい。
日高	3.77	65,572	3.06	1,784	1,680,719	中小水力発電のポテンシャル高く、年平均日射量も大きい。
渡島	3.57	60,225	3.57	365	3,261,208	平均風速、中小水力発電の賦存量が比較的大きい。
檜山	3.35	47,880	4.14	273	1,714,190	立地可能場所が限られるが年間平均風速は大きくポテンシャル高い。
上川	3.52	113,430	2.18	1,712	9,955,809	中小水力発電のポテンシャル高く、バイオマス（特に木質系バイオマス）が大。
留萌	3.45	64,847	3.67	48	1,780,493	年間平均風速が大きくポテンシャル高い。
宗谷	3.51	113,714	3.85	4	3,475,064	年間平均風速が大きくポテンシャル高い。
オホーツク	3.85	159,576	2.34	200	13,485,787	年平均日射量が大きく、木質系・畜産系バイオマス（ガス）の賦存量大。
十勝	4.07	75,379	1.93	2,198	13,261,596	太陽光、中小水力、バイオマス（木質系・畜産系）が何れも大きい。
釧路	3.97	82,027	2.95	182	7,316,164	年平均日射量が大きく、木質系・畜産系バイオマス（ガス）の賦存量大。
根室	3.85	70,357	2.76	32	2,951,132	年平均日射量が大きい。また、畜産系バイオガスのポテンシャルが高い。
	kWh/㎡・day	Gwh	m/s	Gwh	GJ	

※緑の分権改革推進会議（H23.3）「再生可能エネルギー資源等の賦存量等の調査についての統一的なガイドライン」などをもとに試算。【太陽光：平均日射量】管内市町村ごとの日射量の加重平均値 【風力発電】地上高80mで風速5.5m/s以上となるエリアに一定間隔で発電機を設置した場合に得られる発電量（年間平均風速は、管内市町村ごとの加重平均値）【中小水力発電】河川、農業用水、上下水道による発電量合計値 【バイオマス】畜産廃棄



		全国	北海道	東北	東京	北陸	中部	関西	中国	四国	九州	沖縄
シナリオ1-1	面積（km²）	2,437	803	984	25	7	136	123	45	31	232	52
	設備容量（万kW）	2,437	803	984	25	7	136	123	45	31	232	52
シナリオ1-2	面積（km²）	10,130	4,287	3,072	161	121	377	499	293	154	878	288
	設備容量（万kW）	10,130	4,287	3,072	161	121	377	499	293	154	878	288
シナリオ1-3	面積（km²）	13,764	5,243	3,941	200	158	425	631	394	216	1,165	392
	設備容量（万kW）	13,764	5,243	3,941	200	158	425	631	394	216	1,165	392
シナリオ2	面積（km²）	27,374	13,217	7,188	404	481	793	1,284	920	484	2,058	545
	設備容量（万kW）	27,374	13,217	7,188	404	481	793	1,284	920	484	2,058	545
電力会社別の発電設備容量（万kW）(*)		20,397	742	1,655	6,449	796	3,263	3,432	1,199	667	2,003	192

※電力会社別の発電設備容量は、北陸電力FACT BOOK 2010 の 2009 年度データを基としている。

図 4-20　陸上風力の電力供給エリア別のシナリオ別導入可能量分布状況

出典　環境省平成２３年度再生可能エネルギー導入ポテンシャル調査報告書第４章

２．１.（１）基調講演 「再生可能エネルギーと地域経済の活性化」

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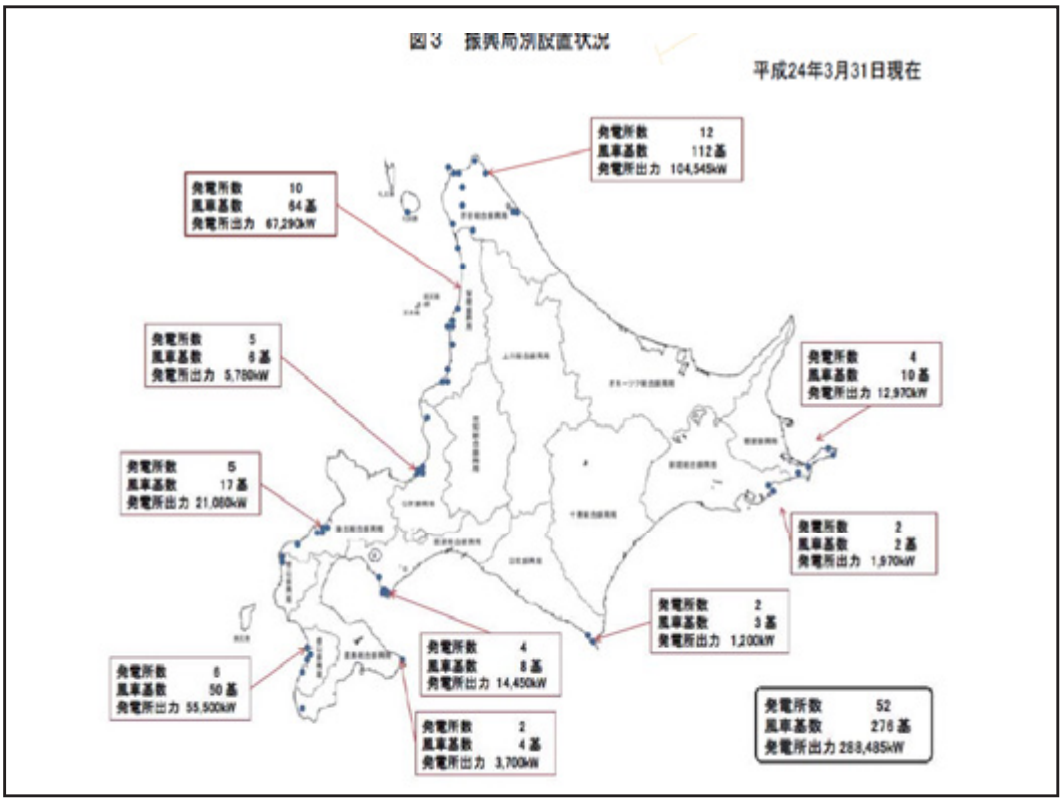

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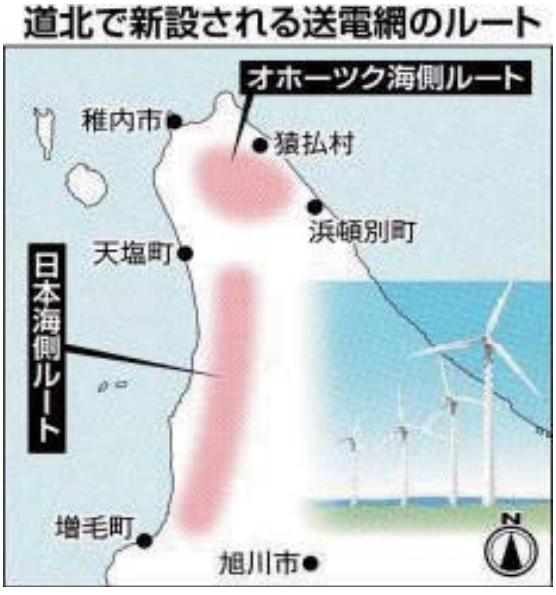
寿都町営風力発電

- ステップバイステップ
- 財源を得るための事業性
- 地元資源を活用する
- 高価だが信頼性のある発電設備を選ぶ
- 電力会社との直接交渉の重要性，北海道の姿勢も重要

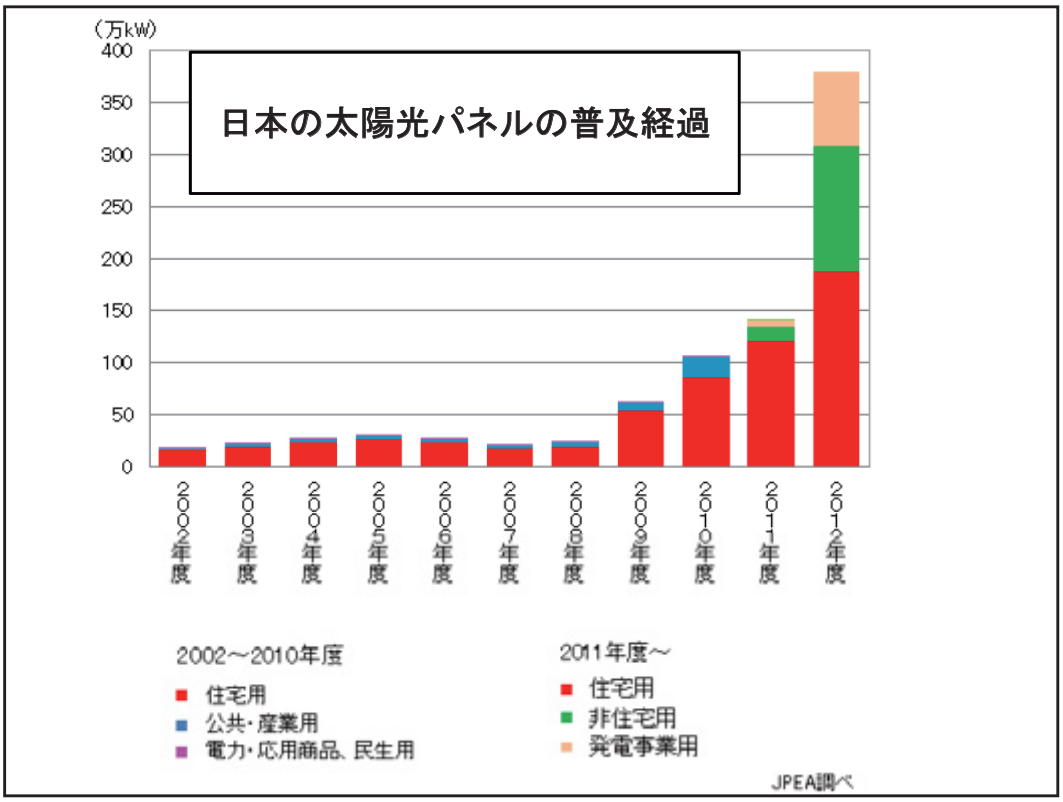
幌延町オトンルイ風車群
ラーガウエイ社製

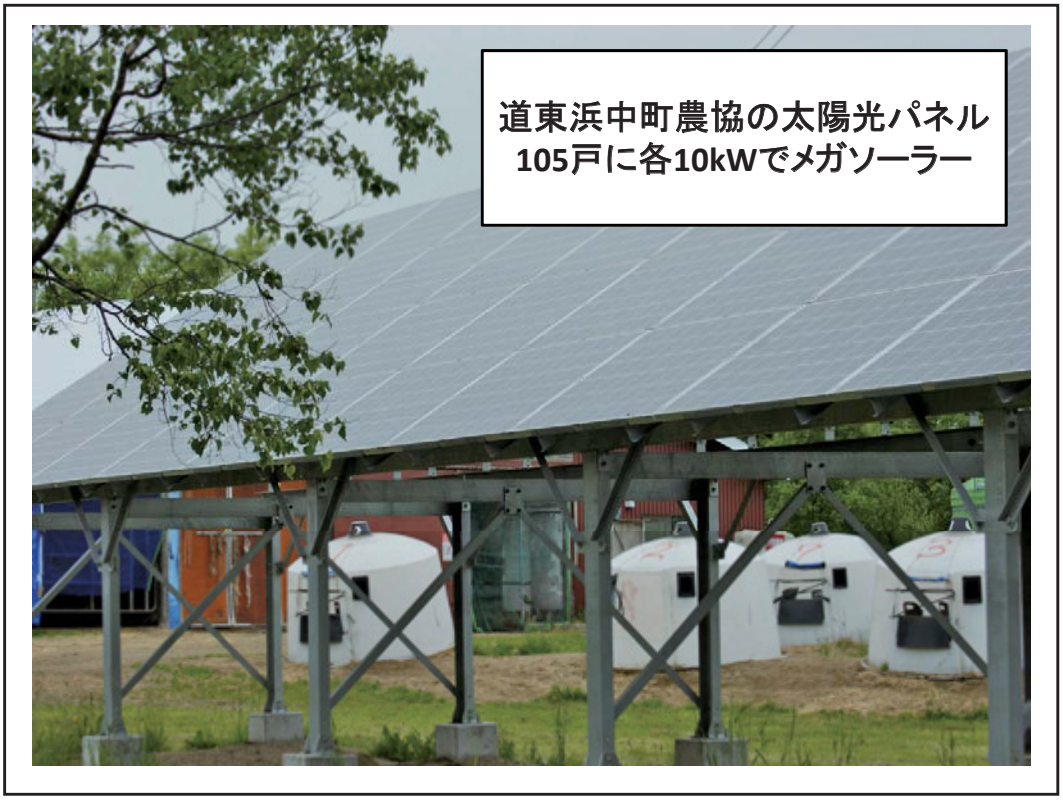
市民風車「はまかぜちゃん」
浜頓別村
ボーナス社製

北海道北部の送電網　丸紅など5社参入　風力200万キロワット分



北海道新聞
2013.10.19


日本の太陽光パネルの普及経過
（万kW）
400
350
300
250
200
150
100
50
0
2002年度
2003年度
2004年度
2005年度
2006年度
2007年度
2008年度
2009年度
2010年度
2011年度
2012年度
2002～2010年度
住宅用
公共・産業用
電力・応用商品、民生用
2011年度～
住宅用
非住宅用
発電事業用
JPEA調べ


道東浜中町農協の太陽光パネル
105戸に各10kWでメガソーラー

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鹿追町ﾊﾞｲｵｶﾞｽﾌﾟﾗﾝﾄの運転経験

http://www.town.shikaoi.lg.jp/machizukuri/seisaku-keikaku/kakusyu-sengen/kankyoubikasengen/kankyouhozencenter/biogasplant

プラントのトラブルとそのシューティング(植松・中崎)

システム	機器設備	トラブル 初期	トラブル 経年	トラブル 事象	トラブル対策	ﾄﾗﾌﾞﾙ原因
原料受入	ｺﾝﾃﾅ・ﾊﾞｷｭｰﾑ車	○		凍結	積込み後短時間で運ぶ	凍結
	受入れ槽	○		融解不足	攪拌不足	凍結
		○		破砕不足	融解処理	破砕機能力不足
ﾒﾀﾝ発酵	発酵槽(直方型) 発酵槽(円筒型)	○		攪拌機取付け箇所	改良部品交換	強度不足か
			○	レベルセンサー	交換	夾雑物に弱い
			○	ガスホルダー亀裂	交換	伸縮性能不足・劣化
脱硫脱水	脱水装置		○	脱水不安定	機器交換	腐食・季節変動
	活性炭脱硫装置		○	脱硫不安定	早期交換	水分過多・凍結
熱利用	温水ボイラー		○	自動着火(失火)	点検	停止期間が多い
	熱再循環設備	○		熱放失不足	原料槽循環	断熱効果向上
	発電機		○	オーバーヒート	エンジン冷却不足	クーラー容量不足
			○	プラグ早期摩耗	早期交換	ｶﾞｽによる摩耗促進
液肥利用	貯留槽		○	スカム発生	長期攪拌	夾雑物が多い
	貯留槽		○	移送配管つまり	配管清掃	スラッジ閉塞か
	消化液散布	○	○	作業開始同時	農家と日々打ち合わせ	個々の作業変更

原料の受入れ状態と量の把握・原料受入槽での均一化・冬場の融解が肝要、若手技術者への技術伝承が重要

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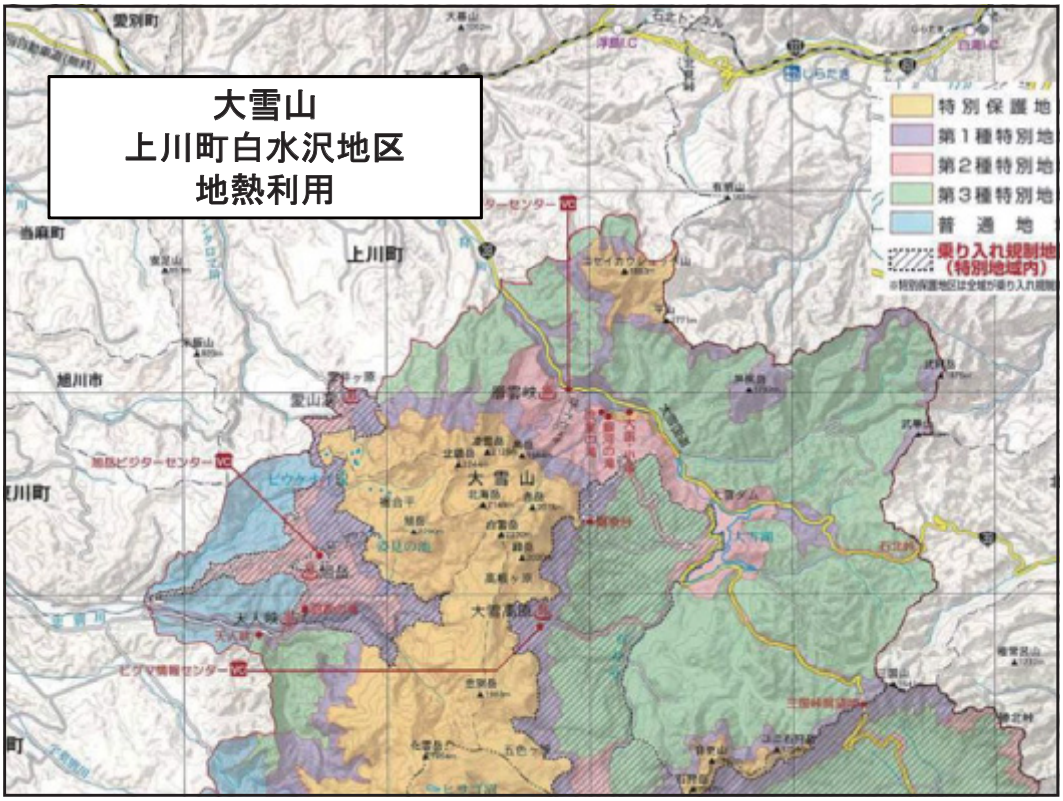

優良事例とは何か

自然環境の保全と地熱開発の調和を十分に図るための特段の取組が行われ、その成果が着実に獲得されていくケース。

現段階では次のとおり、いわゆる５地域の「優良事例」の候補は存在するが、現時点「優良事例」として認めたものではない。

国立・国定公園名	地　　域　（道県名）
阿寒国立公園	阿寒地域（北海道）
大雪山国立公園	白水沢地域（北海道）
磐梯朝日国立公園	一切経山、東吾妻、安達太良北、安達太良東、安達太良西、磐梯山北（福島県）
栗駒国定公園	小安地域（秋田県）
栗駒国定公園	木地山・下の岱地域（秋田県）

※　24年3月30日　超党派地熱発電普及推進議員連盟第5回総会において、「第2種・第3種特別地域を調査・開発範囲に含む地熱資源開発が計画されている地域」として、資源エネルギー庁から説明された地域。

4つの条件：まとめ

- 第1の条件、枠組み条件、目標に関して、再生可能エネルギーの導入目標設定と短期中期長期の見通しを立て、国・道・各自治体の協議・調整が必要である。
- 第2の条件、買取価格、融資条件については、FITの運用条件の改善、例えば、洋上風力の別枠化と、公的金融や地域金融機関の積極的参加を促す取組が必要である。
- 第3の条件、優先接続については、現状では十分保証されておらず、その改善が求められるだけでなく、調整電源の開発・設置（例えば、揚水発電、天然ガス火力）、送電線などのインフラへの国の補助、発送電分離の検討が急がれる。
- 第4の条件、技術開発については、北海道の厳しい気候条件に適合した、電気のみのFITからエネルギーの総合利用、地域暖房や熱電併給の計画普及を図る必要がある。

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地域の取組の教訓

風力発電やバイオガスプラントの建設と運転で大切なことは、

（１）関係者の十分な合意と協力を得て、

（２）前提となる自然条件や処理原料の性状と変動を正確に把握し、その性能要求を満たすプラントを計画設計することであり、

（３）厳しい条件で運転中に発生する各種トラブルと対策を予め予測、準備することである。

この３点において、成功した風力発電やバイオガスプラントは国内最大級の実績で運転を続けることができたのである。

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Renewable Energy Sources in the Energy Abundant Economy: the Case of Russia

Prof. Dr. Nikita Suslov

Institute of Economics and IE SB RAS & Novosibirsk State University
Novosibirsk, Russia

Russian Energy Sector in the World Economy in 2011

	Volume	World position	Share in the World	Net exports
Oil, mill. t	517	2	12,9	246
Gas, bill. cubic m	677	1	20	196
Coal, mill. t	334	6	4,3	99
Energy from HPS, bill. kWt-h	170	4	6,2	
Energy from NPS, bill. kWt-h	168	5	4,8	
Petroleum products, mill. t	240	3	6,3	111
Electric Energy, bill. kWt-h	1036	4	4,8	17
Energy production, mill. oil. equ.	1315	3	10,0	592
Energy consumption, mill. oil. equ.	731	3	5,6	
Renewables (RE), mill. oil equ.	17,7		1,34	
RE without HPS, mill. oil. equ.	3,5		0,25	
GDP, $ bill. PPP	2376	6	3,0	
Population, mill. of persons	142,9	9	2,06	

Sources: Rosstat RF, IEA, and IMF

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Russia and Some Other World Economies in 2010, USA=100%

	Per capita			Per GDP	
	GDP PPP	Energy use	Electricity use	Energy use	Electricity use
Canada	83	104	126	125	152
Czech Republic	54	60	60	112	110
Finland	74	97	109	131	146
Germany	76	56	54	74	72
Greece	63	36	38	57	60
Israel	62	44	56	71	91
Japan	72	55	62	76	87
Netherlands	85	70	50	81	58
Russia	**34**	**70**	**52**	**209**	**154**
Sweden	82	79	116	96	141

Calculated using WB & IEA data

Renewable energy (RE) in the World and selected world economies, t. of oil e., 2011

	Per capita energy output	Per capita energy use	Per capita RE output	RE share in energy output, %	RE output to ener. use ratio, %
Canada	12,02	7,40	1,33	11,04	17,93
Denmark	3,80	3,25	0,55	14,43	16,84
Finland	3,25	6,61	1,73	53,14	26,13
Germany	1,52	3,83	0,38	25,19	10,04
Iceland	15,45	18,42	15,45	100,00	83,83
Japan	**0,41**	**3,65**	**0,15**	**37,80**	**4,23**
Netherlands	3,82	4,60	0,19	4,88	4,06
Norway	41,64	6,00	2,55	6,12	42,50
Spain	0,68	2,69	0,29	43,31	10,96
United States	5,70	7,00	0,43	7,61	6,20
World	1,91	1,89	0,25	12,89	12,98
OECD Total	3,13	4,31	0,35	11,09	8,05
Russia	**9,20**	**5,12**	**0,12**	**1,35**	**2,43**

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Structure of renewable energy produced by sources, percent, 2011, Total RE=100%

	Russia	Japan	OECD Europe	OECD Total	World
Hydro	80,42	36,63	23,41	27,94	17,64
Geothermal	2,53	12,70	6,58	7,64	3,87
Solar Photovoltaics	0,00	2,27	2,09	1,16	0,31
Solar Thermal	0,00	2,10	1,51	1,49	1,08
Tide, Wave and Ocean	0,00	0,00	0,02	0,01	0,00
Wind	0,00	2,01	8,47	6,61	2,19
Renewable Muni. Waste	0,00	3,19	4,95	3,24	0,87
Solid Biomass	17,05	40,54	41,29	38,27	68,91
Landfill Gas	0,00	0,00	1,57	2,08	0,53
Sludge Gas	0,00	0,00	0,69	0,34	0,09
Other Biogas	0,00	0,56	3,34	1,53	0,90
Biogasoline	0,00	0,00	0,92	6,63	2,06
Biodiesel	0,00	0,00	4,29	2,61	1,02
Other Liquid Biofuels	0,00	0,00	0,86	0,42	0,50

Potential of Energy Production from RES in Russia*

	Potential, bill. kWt-h		
	Technical	Economic	Industrial
Small HPS (<25 Mh)	372	205	6-10
Wind PS	6517	326	70-90
Geothermal PS	34905	335	40-60
Biomass PS	412	203	90-130
Tidal PS	253	61,6	16-45
Solar HPS	2714	435	5-10
In Total	45173	1566	227-342

*Sourse: OAO “RusHydro” in 2010

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A specific reason to develop RES in Russia: an extremely large country

- About 2/3 of the country surface square with population of 20 mill is out of access to a centralized grid. The electricity prices here are extremely high (30-60 cent./kWt-h and even higher);
- The most of administrative regions of Russia lack their own energy sources and need to import fuels and energy from other regions. The problem of energy security is as important for them as for the energy importing countries;
- Only about 50% of urban and 35% of rural residential areas in Russia have access to gas networks. Both coal and petroleum fuels being ecologically harmful are used in this places to produce electricity and heat;
- Given a persistent growth of energy prices and costs to connect to the centralized energy networks offline energy production develops more rapidly. Consumers pursue to secure themselves with their own power and heat sources which generally reduces efficiency of use of fuels as compared with cogeneration.

What could be estimated as successes?

- Russia entered the number of the World leading pellets producing economies (2 mill t per a year). However, they are mainly produced for exports to Europe.
- There are certain results in constructing tidal energy devices based on original national designing.
- Some companies are concentrated on a development of large size production of photoelectric converters, though also for exports.

Summarized data on electricity production from renewable energy sources (RES) in Russia, 2010

Types of RES	Generation capacity, Mw	Power generation, mill. kwh	Share in industrial potential, %	Share in economic potential, %
Wind ES	13,2	14,2	0,02-0,02	0,04
Small HPS (<25 Mh)	700	2800	46,7-28,0	1,37
Geothermal PS	81,2	474	1,2-0,8	0,14
Solar PS	0	0	0,0-0,0	0,00
Tidal PS	1,1	1,2	0,0-0,0	0,00
Biomass PS	520	2600	2,9-2,0	1,28
In Total	1315,5	5889,4	2,6-1,7	0,38
Share of RES in total electricity production, %	0,57	0,58		

*Sourse: OAO “RusHydro” in 2010

- In ***Novosibirsk region*** (Oblast): Long Run Program «Energy supply and increasing of energy efficiency in Novosibirsk region for the period up to 2015» It foresees elaboration of several investment programs and among them:
- Investment program «Small size energy in Novosibirsk region»
- «Investment programs in life-support systems and local energy objects of municipal units in Novosibirsk region»

- RES resources in Novosibirsk region:

- ***Wind ES*** is used now and will be used for individual consumption. Engines of 5-40 kWt. There are no conditions favorable for wind energy development in the size comparable with centralized energy system due to climate peculiarities
- ***Agriculture wastes*** 5 mill t per a year, wastes from wood processing and forest sanitary felling - 2 mill t per a year.
- ***Peat reserves*** - about 2 bill t, annual increment of reserves - 50 mill t. This increment equals a half electricity and heat production need for fuels. Peat is the most promising type of RES in Novosibirsk region

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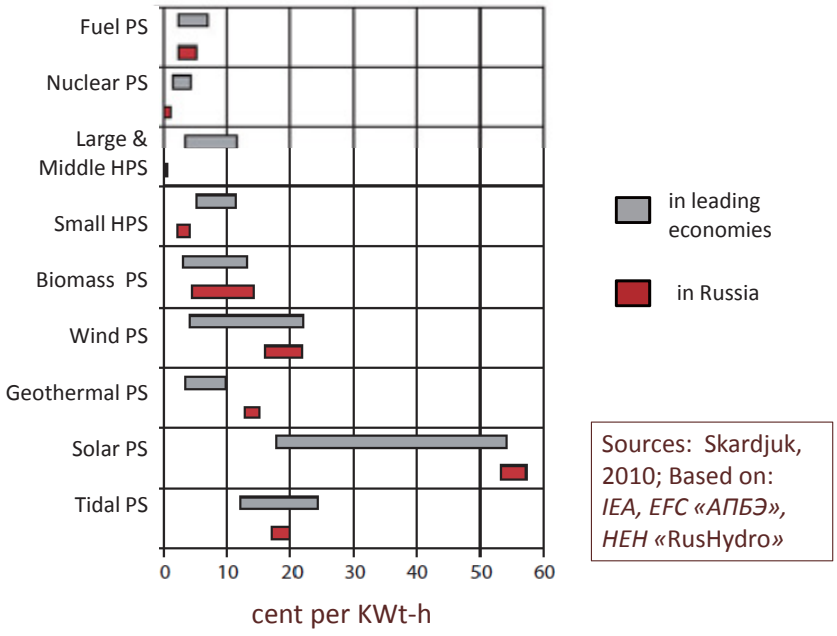
The Reasons why RES development fails in Russia:

- General market uncompetitiveness of RES developing projects with respect to the energy projects based on the fossil fuels;
- Institutional barriers associated with the lack of legislative acts promoting RES in the sphere of electricity production and absence of federal and regional programs of large scale support of RES usage;
- Absence of infrastructure necessary for successful development of RES energy generation; in that number:

- lack of scientific support,
- lack of information environment including the data on both existing RES and their probable technical and economic parameters,
- absence of regulatory technical and methodical documentation, and appropriate software required for projection, construction, and exploration of RES PS,
- lack of personnel support.

Electricity Production ***Cost*** in Leading World Economies and in Russia, 2007



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Two Legislative Acts:

- The Low "On Energy Saving and Raising Energy Efficiency" - version from November 23, 2013
- The Federal Low from March, 26, 2003 r. N 35-Ф3 "On Electric Energy Sector (revised)"

✓provide for possibility to set feed-in tariffs or markups for RE,

✓promise a Government commitment to guarantee access to grid with budget compensations,

✓guarantee obligations of network companies to purchase all the RE produced (e. g. using green certificates)

But these institutions set do not work

The main reason for this is extremely long and expensive certification procedure.

Belgorod (a city in European Russia) is a leader in using RES. Even in this place given a high experience and strong lobbing power it took a year to certificate a pilot solar power station (100 kWt)

As a rule local grids reject to accept the connection of RES plants due to their unstable character. The power provided by them is considered to be of law quality

The degree of capacity utilization by RES types, in %

Fuel PS in Russia	52,9
Large Hydro PS	40
Small Hydro PS	~ 45
Wind PS	~ 25-40
Solar PS	~ 20

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Draft of Government Act: "On measures to stimulate the use of RES using wholesale market mechanisms". This Act is expected to provide for -

the main tool to promote the use of RES – a contract on power capacity supplying (which guarantees investment return) on the basis of the results of competitive selection

"RusHydro" Company Suggestions:

Expected normative acts determining concrete measures to support and stimulate RES development

Project of Government Resolution «On the order of subsidizing expenses to create a technical connection of RES objects…»	Compensation provided from the Federal budget of the cost of technological access to grid. (Expert estimation of the access cost is $70 thous. per a MWt of capacity).
Project of Government Resolution «On setting markups to market prices for RES objects in order to ensure returns to …»	Foresees markups to market prices as fixed size fractions sufficient to ensure returns to investment into construction of these objects
Project of Government Resolution «On measures of the government support in the sphere of RES objects …»	Foresees the following support measures: 1. Compensation of a certain fraction of interest rate payments; 2. Compensation of a certain fraction of payments for leasing services; 3. Compensation of a certain fraction of cost associated with obligatory insurance contracts.

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What is being Expected?

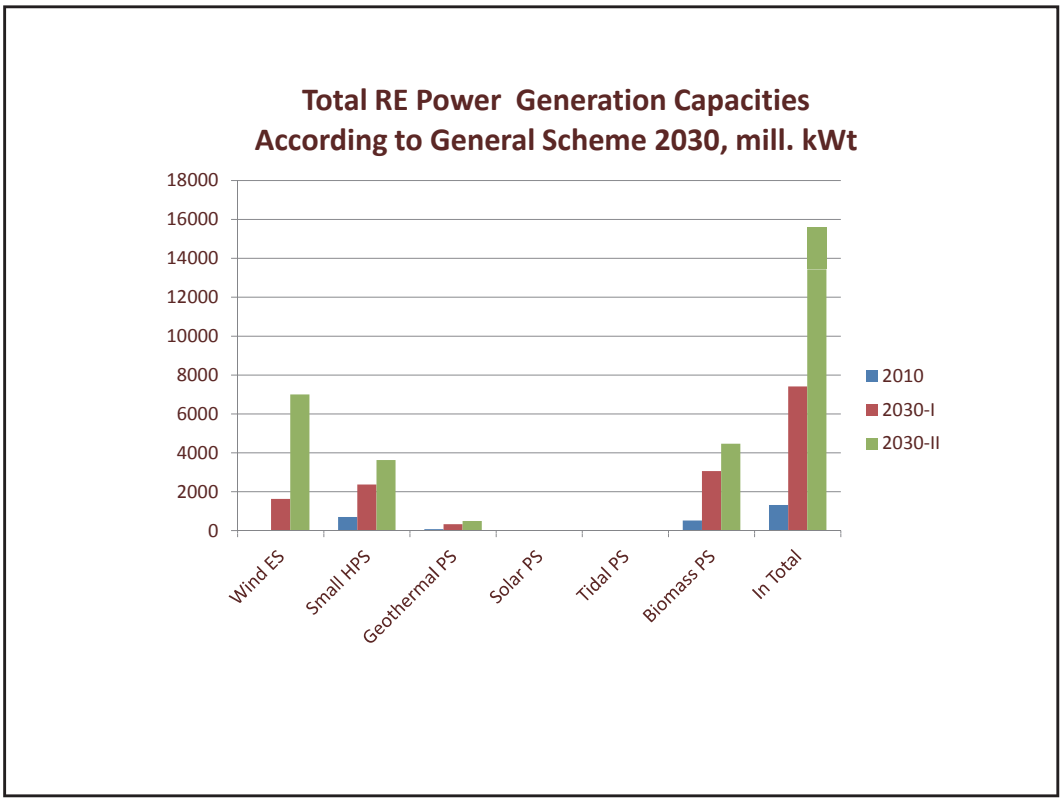
"General Directions of the Government Policy in the Sphere of Increasing Energy Efficiency of Power Generation Sector Based on RES Usage for the period up to 2020": RES based electricity production share in its total generation in ***2020*** r. should reach 4,5%, i.e. 51 bill. kWt-h (about 14,7 mill. kWt of installed capacity)

At the same time :

"General Scheme of Location of Power Generation Objects for the period up to ***2030*** ": foresees Installation of only 6,1 mill. kWt of generation capacity in the minimum variant and 14,3 mill. kWt –in the maximum one.

RES Installed Power Generation Capacities Structure according to "General Scheme of Location of Power Generation Objects for the period up to 2030", in %

	2010	2030-I	2030-II
Total in ths. kWt	1315,5	7400	15600
Wind ES	1,0	26,6	48,9
Small HPS (<25 Mh)	53,2	27,4	20,5
Geothermal PS	6,2	4,1	2,9
Solar PS	0,0	0,0	0,0
Tidal PS	0,1	0,2	0,1
Biomass PS	39,5	41,7	27,6
In Total	100,0	100,0	100,0



Approach to Modeling National Economy and Estimation of RES Investment Projects

•Inter-sector interactions: Leontief Input-Output framework;

•inter-region interactions (spillovers): each region of a large country is described by its own input-output (intra-regional) block; inter-region transportations of sector products are modeled using transport modeling techniques incorporating transport technologies;

•the model includes both a scope of input-output tables and transport blocks, thus optimization is feasible;

•all the endogenous variables are defined for the last year of a long period considered; at the same time investments (gross fixed capital formation) for this year are non-linear functions of investments in initial (base) year of the period;

•the total volume of investment for all the years of the period considered is also an endogenous variable;

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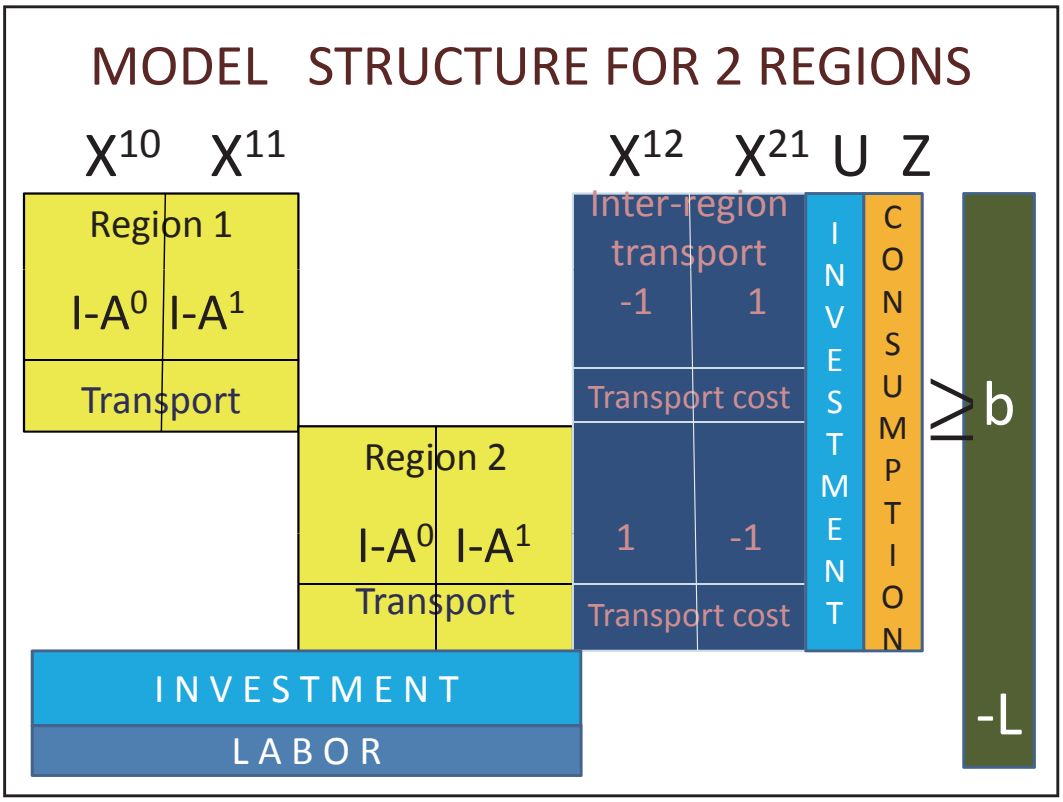

Estimation of consequence of propagation of heat pumps in Russia

Annual market for compression heat pumps – 40-55 mill. of coal equivalent.

Spreading compression heat pump :

- Energy intensity reduction: reduction of fuel consumption as compared to situation when using only traditional energy generation technologies

Increase of capital intensity because of:

1) Heat pumps are more expensive,
2) Additional electricity generation capacity is needed,
3) Additional gas pipelines could be needed

- Heat pumps are efficient in Siberia under the transformation coefficient of 4
- Heat pumps are efficient in European Russia under the transformation coefficient of 5
- ***Volume of fuels saved per a unit of electricity consumption averages 270 gram of coal equivalent per a kWt-hour***

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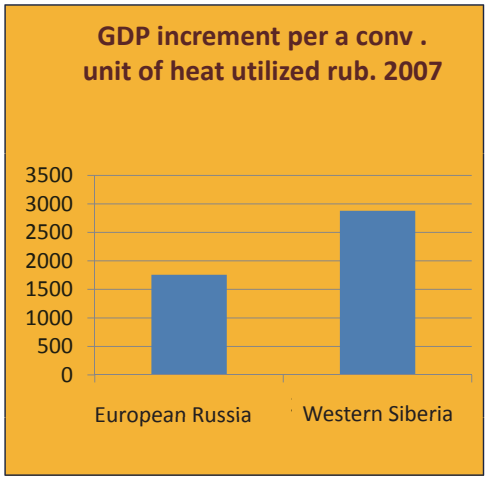
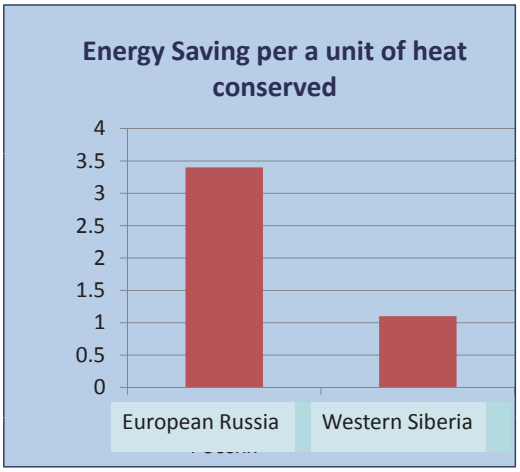
Effects of Heat Utilization and Further





Recent result: both in European Russia and in Western Siberia RES based electricity generating technologies are efficient given cost of 1 kWt of installed capacity not higher than $1100

Summary

1.Though Russia is an energy abundant country certain conditions favorable to develop RES are present here. Its extremely large surface square is a specific reason to increase their usage and share in energy balance and electricity generation.

2.In general RES are less competitive as compared to traditional energy technologies. However, there are areas where RES based technologies are effective just at present time. Probably future conditions will change in favor of RES.

3.It is doubtful that the role of RES in Russia will ever be as important as in Europe, Japan, Northern America, or in the most of other countries. Though their importance is expected to grow in Russia as well.

Summary

4. In order to facilitate the RES development Russian Government should elaborate and conduct sound policy measures to support the RES business.
5. Current Russian legislative foresees the possibility to set feed-in tariffs, promises a Government commitment to guarantee access to grid with budget compensations, guarantees obligations of network companies to purchase all the RE produced (e. g. using green certificates) .

Summary

6. The main reason why these institutions set do not work is extremely long and expensive certification procedure. As a rule local grids reject to accept the connection of RES plants due to their unstable character. The power provided by them is considered to be of law quality
7. The main tool to promote the use of RES is a contract on power capacity supplying (which guarantees investment return) on the basis of the results of competitive selection. But legislation necessary to implement it is not completely prepared

韓国エネルギー技術研究院　李震石　主席研究員

Bioenergy:
Key tool for Sustainable Society
(Korean Experiences)

2013. 11. 5.

Jin-Suk Lee

한국에너지기술연구원
KOREA INSTITUTE OF ENERGY RESEARCH

Agenda

I. Introduction

II. Bioenergy Experiences in Korea

- **Biogas**
- **Biodiesel**
- **Wood Pellets**

III. Other Issues

IV. Summary

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I. Introduction

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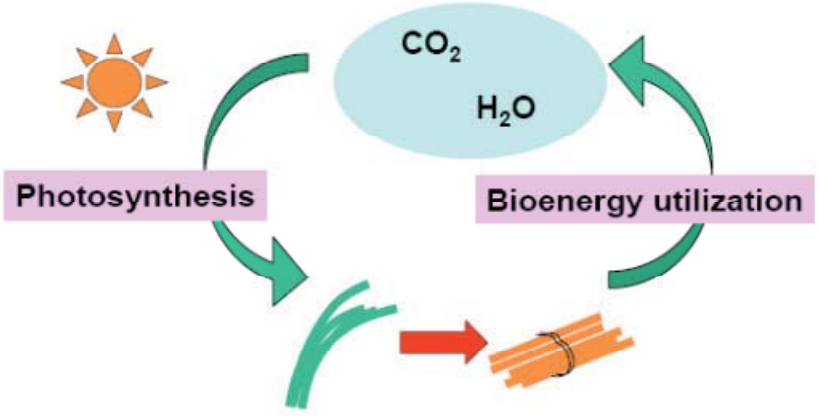
Advantages of Bioenergy

(Y. Matsumura, 2008)

- Sustainable Energy
- CO_2 neutral



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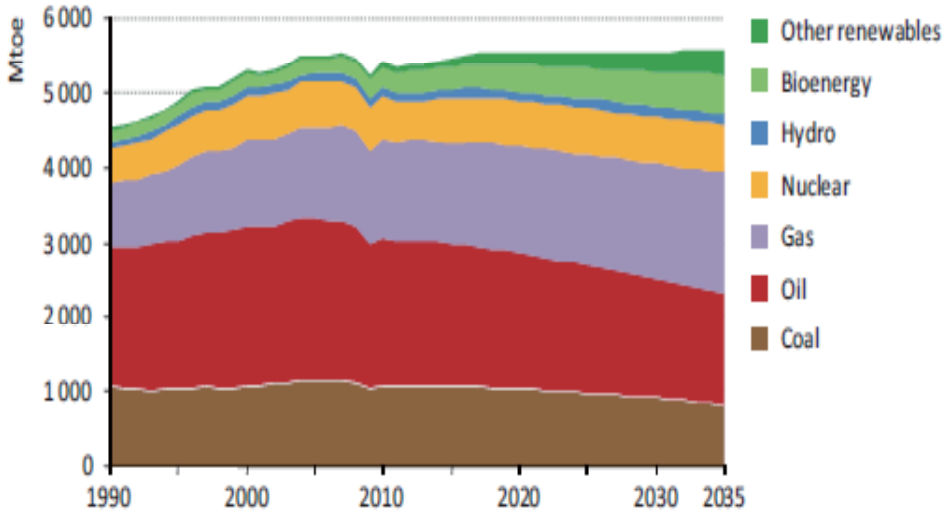
OECD Primary Energy Demand
(IEA, WEO 2012)



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II. Bioenergy Experiences in Korea

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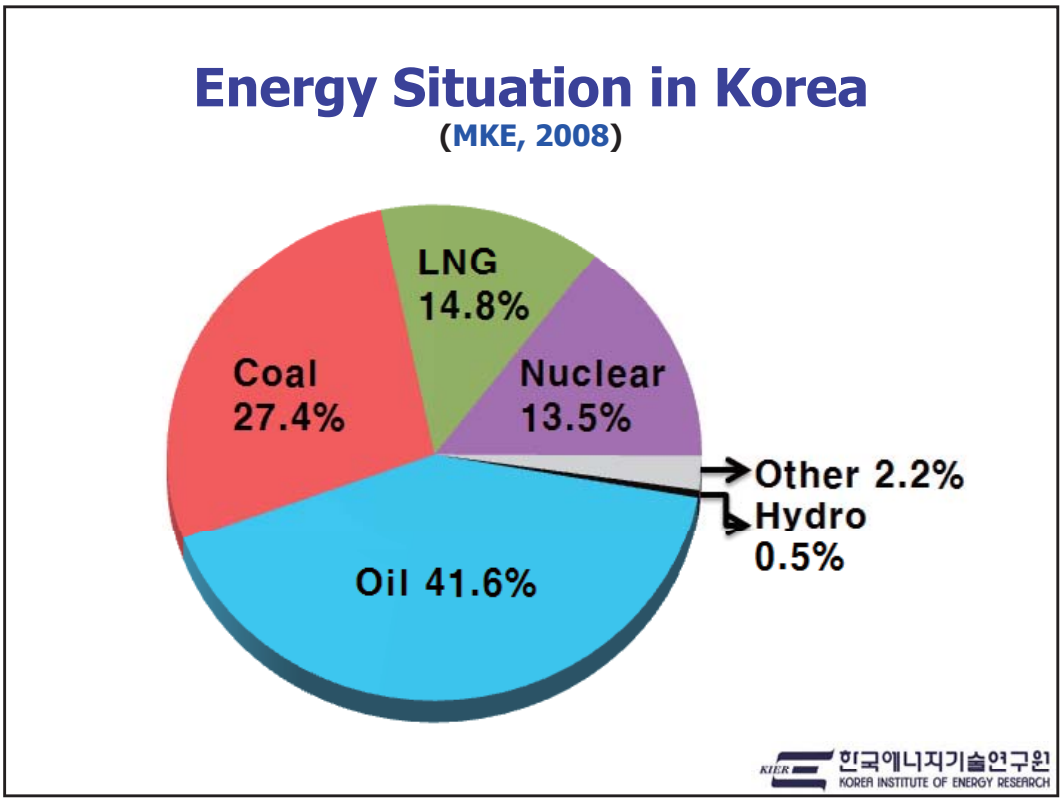

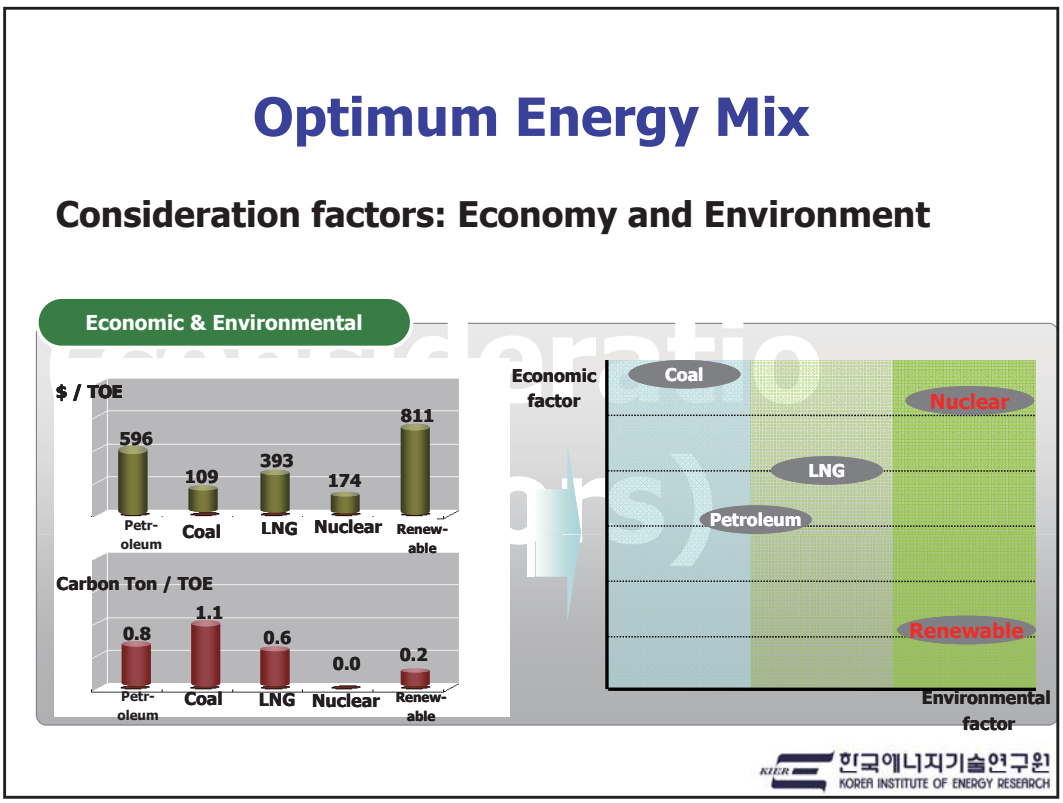

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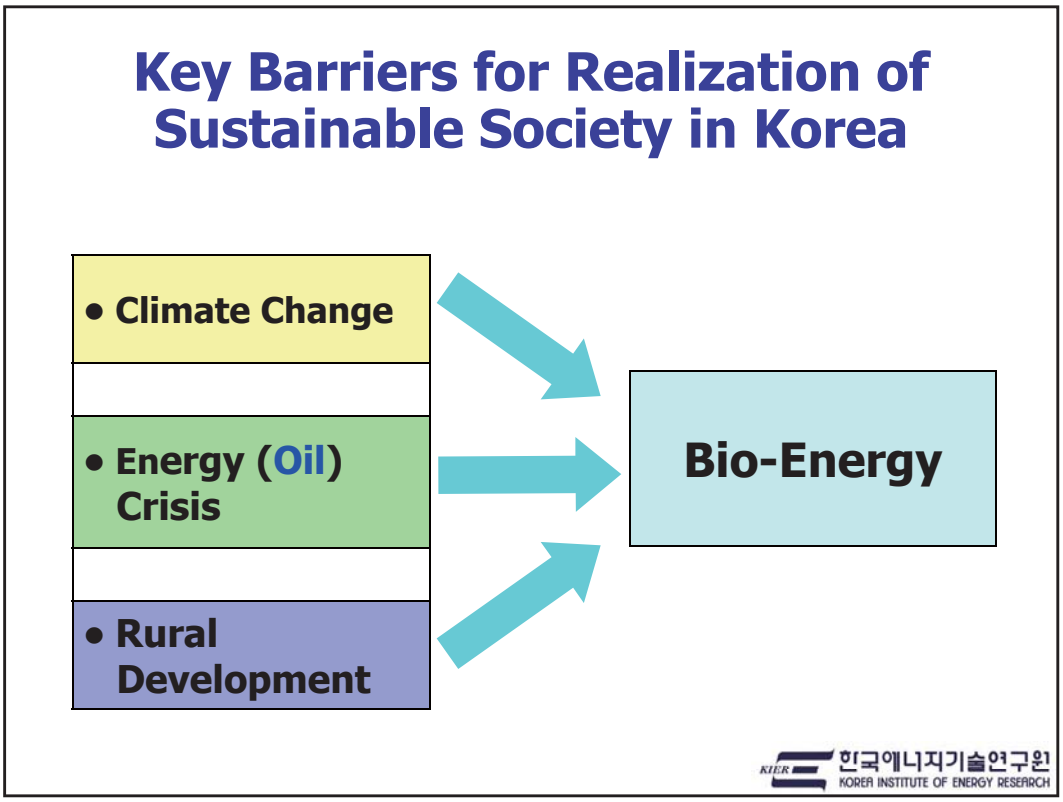
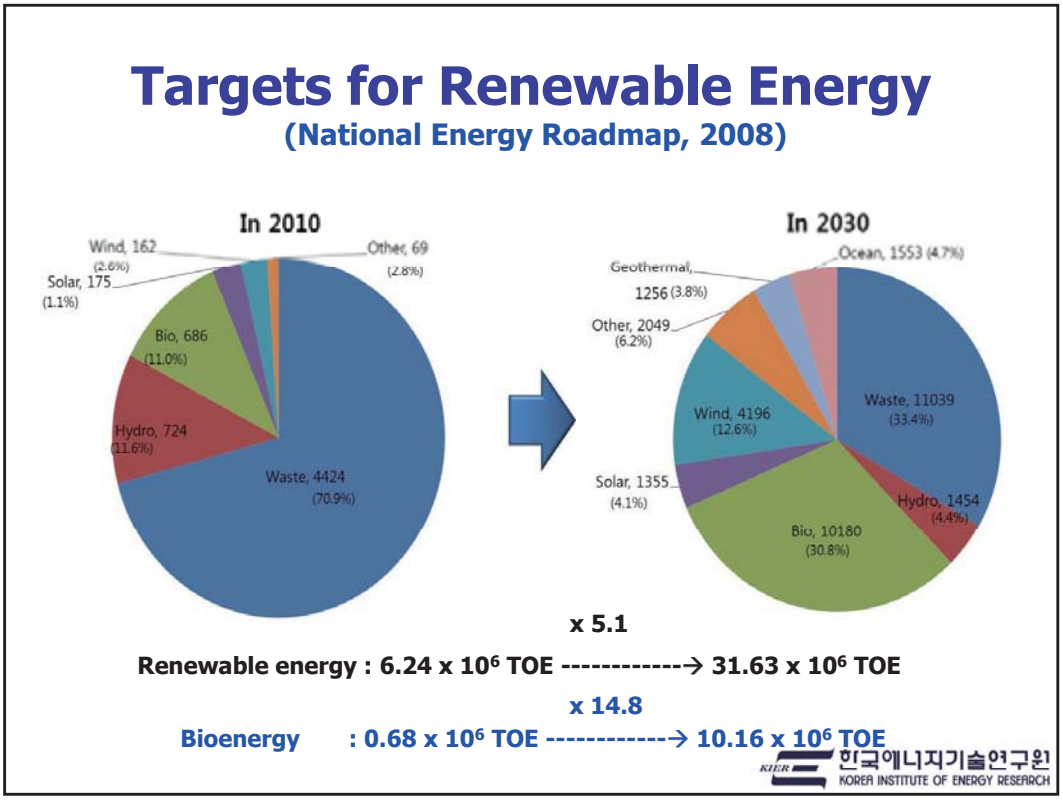
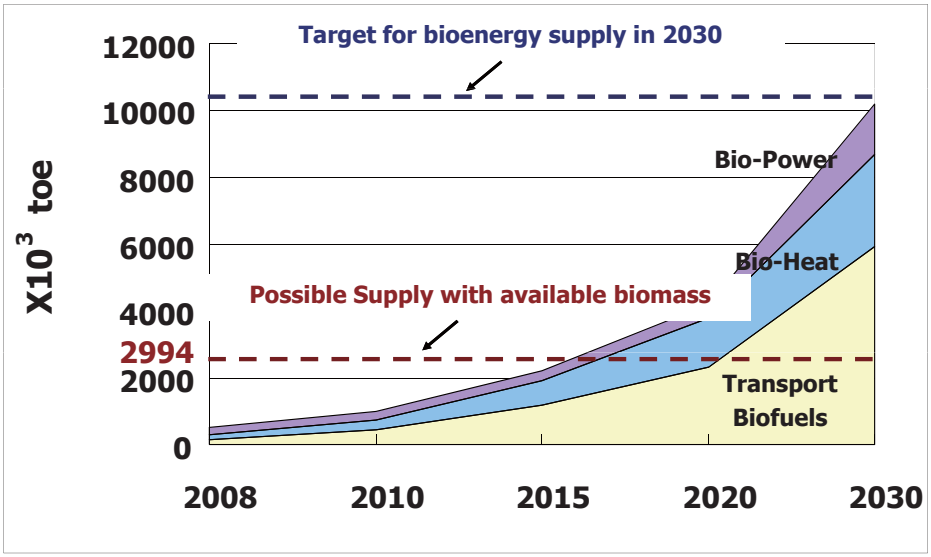




Targets for Bioenergy
(National Energy Roadmap, 2008)



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Priority for Bioenergy in Korea

- **Utilization of Organic Wastes (Biogas, Waste fats)**
- **Transport Biofuels**
- **Unutilized Resources (Agricultural and Forest Residues)**

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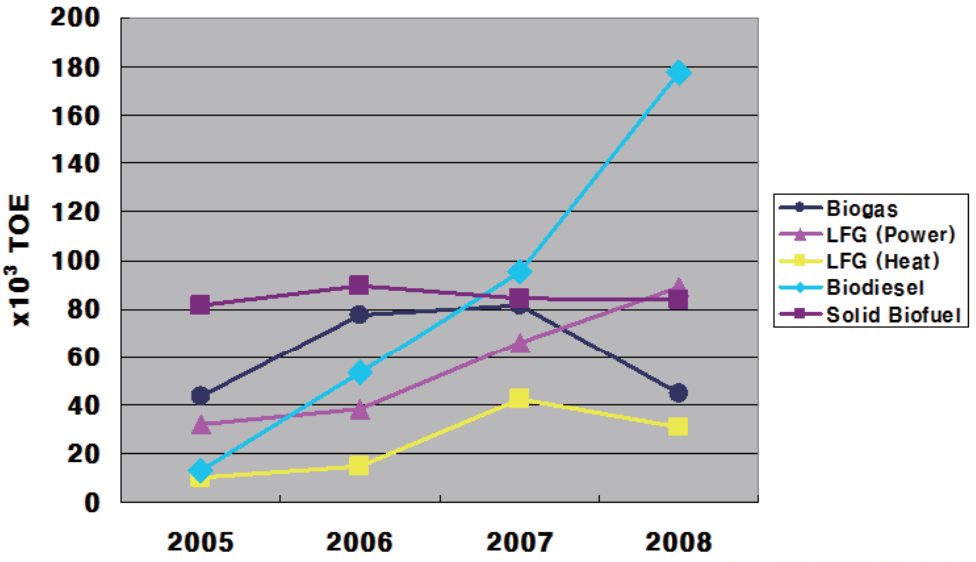
Current Status of Bioenergy Supply
(KEMCO, 2009)



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Challenges for Bioenergy Supply

- **High cost** of bioenergy
- **Limited biomass resources** in Korea
- Low stakeholder-group acceptance of transport biofuels

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Feed-in tariffs for Biopower

	Maximum Capacity	Capacity	Compensation rates, $/kWh		Remarks
			Minimum Baseline Compensation	Feed-in Tariffs	
LFG	≤ 50MW	20MW ≤	0.052	SMP+0.004	Fossil fuel lower than 30%
		≤ 20MW	0.058	SMP+0.008	
Biogas		150kW ≤	0.056	SMP+ 0.008	
		≤ 150kW	0.066	SMP+0.011	
Biopower		Wood	0.053	SMP+0.004	

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Biogas from Food Wastes

- **Korean food waste takes about 30% of total organic wastes (6.6million ton/year). The water content of food waste is about 90%. Because of the characteristics, it is difficult to treat the waste by conventional technologies like land filling or incineration.**
- **KIER developed a two-phase anaerobic digestion process in which acidic fermentation and methane formation were done in separate reactors. The technology was found to be quite effective for the treatment of Korean food waste.**
- **After a series of test runs, the technology was commercialized. Two full scale commercial plants have been constructed to treat food waste and produce methane. The research for the electricity generation using methane was finished in 2008.**

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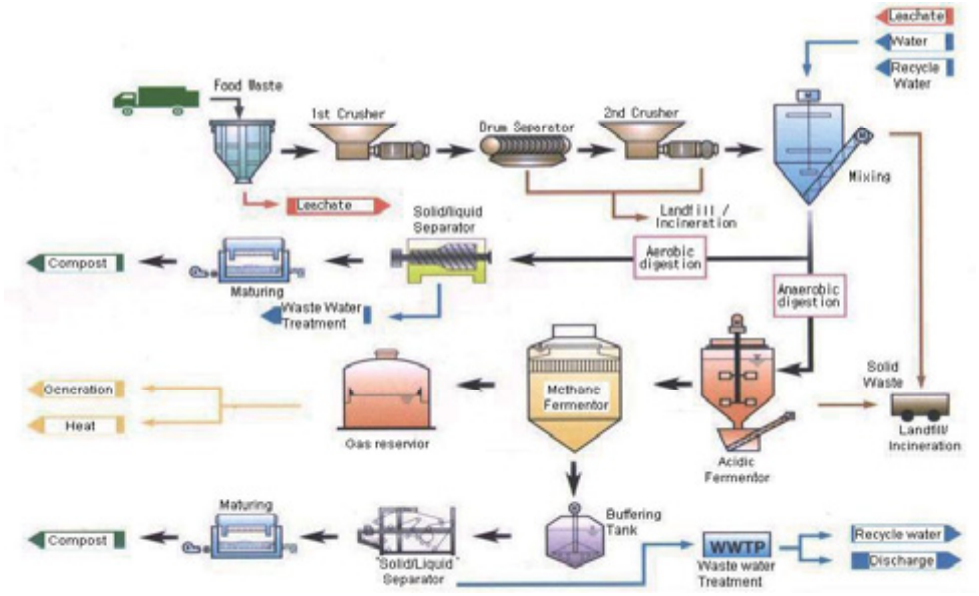
Two-phase Anaerobic Digestion



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Paju Biogas Plant (110 tons/day)

- 1996 : 30 (tons/day) food waste
- 2004 : 50/60 (tons/day) food waste/ manure

- 4,800 m³/day
- 600kW E.G.

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LFG Power Generation in Busan

- Busan Sangkog Landfill
- Capacity : 6MW

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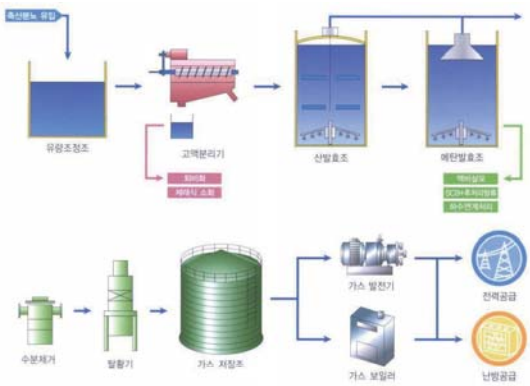
Biogas from Waste Manure (Demo)



- Location : Mojun, Kyunggido, Korea
- Swine manure : 20 tons/day
- Process : 2 stage UASB treatment after solid removal
- Biogas : 250m³/day max. (30kW micro-gas engine)
- Fund : $1 mil.

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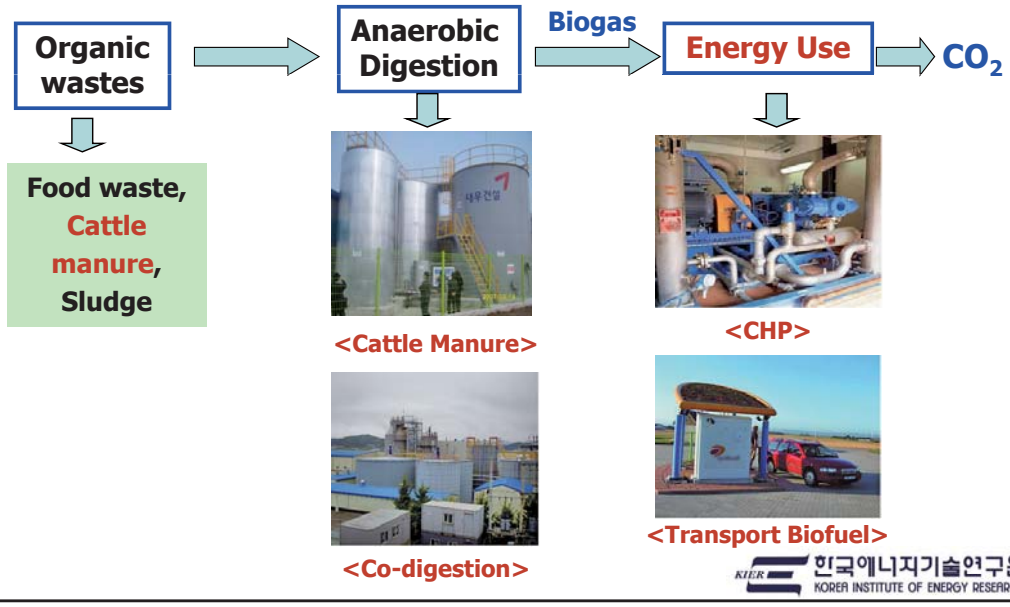
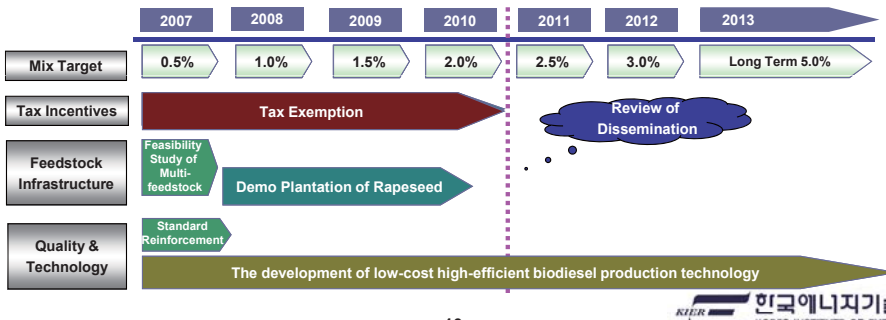
Transport Biofuels from Waste



Tax Exemption on Biodiesel

- Began in 2002 as demonstration project.
- Biodiesel is used 1.5% in 2009, and 3.0% in 2012 of total diesel consumption.
  - 0.5% increases in each year
- BD5 is commercialized in Korea in 2006, marked as the first country in Asia.
- BD20 is limited on the vehicles enabling to repair in their own facilities due to the technological problems.



KIER 한국에너지기술연구원 KOREA INSTITUTE OF ENERGY RESEARCH

Biodiesel Distribution in Korea

- **BD5** is subject to diesel fuel specification, and supplied only by refiners.
- Bus and truck company can use **BD20** with their own accord.

BD100 → Biodiesel Suppliers (21 companies in 2009) * 900,000kL/yr

BD5 → Refiners (4 refiners)

BD5 → Gas Station

→ Customer

1) 10% during winter season(11/1~3/13)

BD20 1)

Bus, truck and construction equipment operators who are equipped with 'certified storage tank' and 'self-repair shop'

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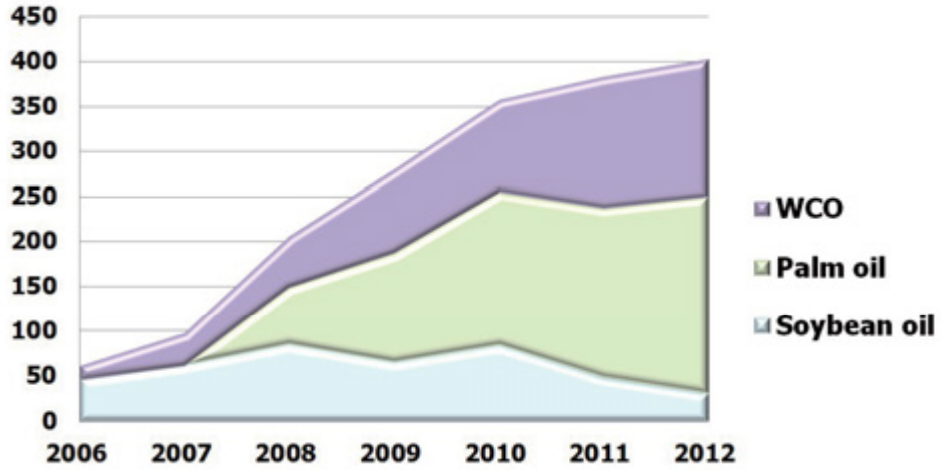
Feedstocks for Biodiesel in Korea

(Korea Bioenergy Association, 2013)



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Solid Biomass Utilization in Korea

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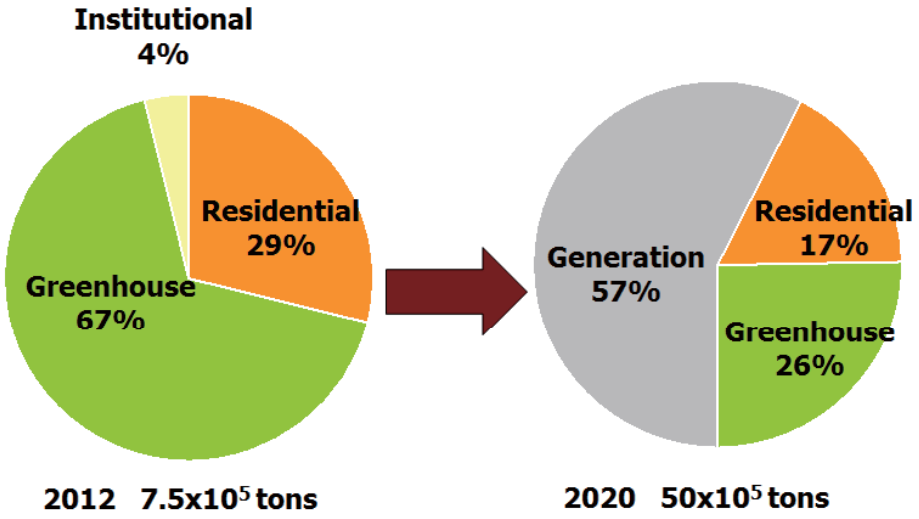
Demand for wood pellets in Korea



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Strategy for Securing Stable Supply of Feedstocks

Utilization of Available Biomass
(Organic wastes, Agricultural/Forest residues)

Identification and New Biomass
(Aquatic biomass, Energy crops

Utilization of Foreign Biomass
(Plantation residues)

Stable Supply of Feedstocks for Transport biofuels

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Demonstration Cultivation of Rapessed
(RDA Bioenergy Center, 2008)

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III. Other Issues

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Issues for RE Implementation

- **Map of RE sources**
- **Financial deficit**

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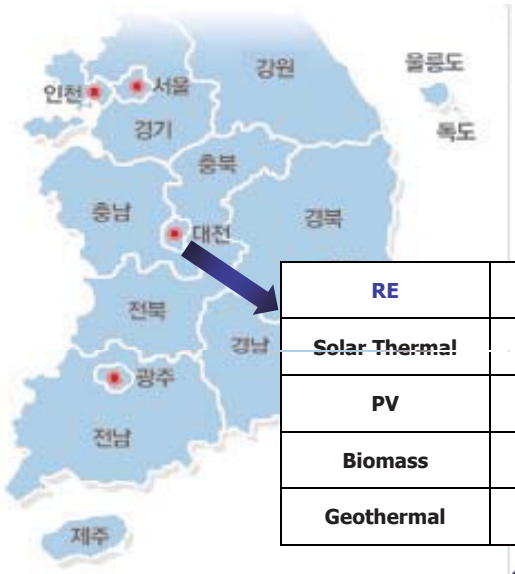
Map of Renewable Energy Resources

(New & Renewable Energy Data Center, http://www.kredc.net/)



RE	Potential, x 10^6
Solar Thermal	22,054 Gcal/yr
PV	2560 GW/yr
Biomass	12.6 Gcal/yr
Geothermal	11.4 kTOE

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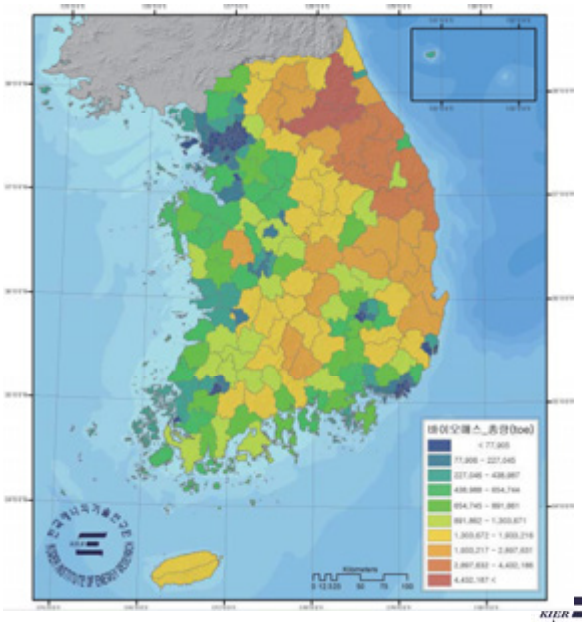
Map of Biomass Resources

(New & Renewable Energy Data Center, http://www.kredc.net/)



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RPS

- **Effective in Korea from 2012**
- **Accelerates the implementation of renewable enrgy**
- **Impose quota for each renewable energy**
- **Total installed capacity – 1,914 MW**

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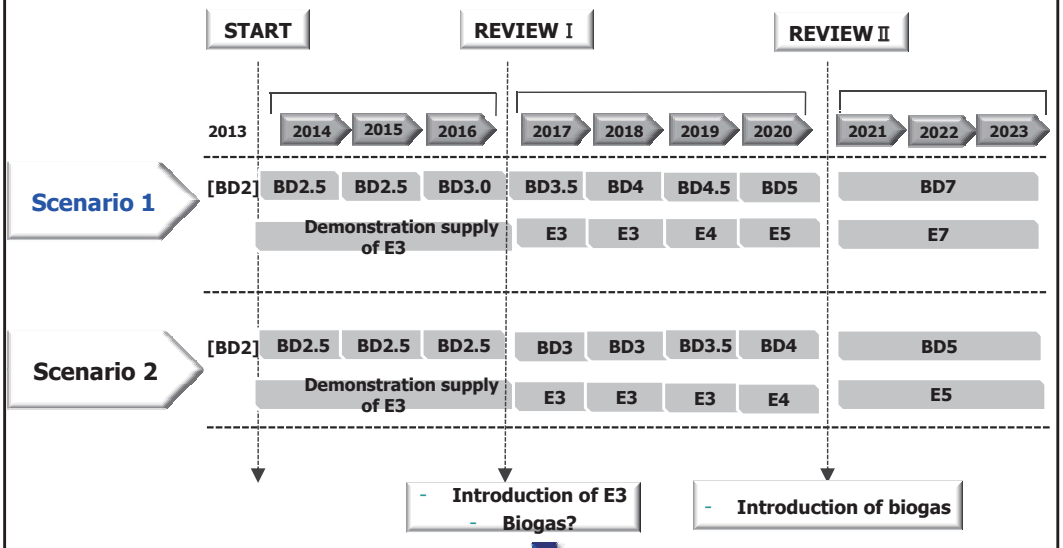
RFS in Korea



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IV. Summary

- **Korean supporting policy for renewable energy implementation is changed from "Subsidy" to "Mandatory" (RPS (2012), RFS (2015) and RHO (2016))**
- **Bioenergy will play a key role for realizing the sustainable society in Korea**
- **Securing stable supply of the feedstocks will be the most challenging issue**
- **Organic wastes and energy crops may be the promising candidates as the feedstocks for bioenergy production**

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Thank you for your kind attention!

For questions, bmjslee@kier.re.kr!

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パネルディスカッション
地域の先進的な取り組みと北海道
苫前町の取り組み

平成25年11月5日
苫前町長　森利男

苫前町内にある風力発電施設

発電所名	苫前夕陽ヶ丘 風力発電所	苫前グリーンヒル ウインドパーク	苫前ウィンビラ発電所
総発電出力	2，200kW	20，000kW	30，600kW
設備概要	600kW　2基 （NORDEX） 1,000kW　1基 （BUNUS）	1,000kW　20基 （BONUS）	1,500kW　5基 （ENERCON） 1,650kW　14基 （VESTAS）
事業対象面積	約3.97ha	約100ha	約200ha
総事業費	699,574,518円	約45億円	約65億円
事業主体	苫前町	㈱ユーラスエナジー 苫前	㈱ジェイウインド
運転開始日	平成11年3月12日	平成11年11月26日	平成12年12月1日

総発電出力：52，800kW・42基

苫前夕陽ヶ丘風力発電所

事業主体：苫前町

総事業費：699，574，518円
（補助金：326，958，750円）

設備概要：
平成10年度　NORDEX　600kW　1基
平成11年度　NORDEX　600kW　1基
平成12年度　BONUS　1，000kW 1基

総発電出力：2，200kW

事業対象面積：約3．97ha

苫前グリーンヒルウィンドパーク

事業主体：㈱ユーラスエナジー苫前

総事業費：　約 45億円

設備概要：
BONUS　1，000kW　20基

総発電出力：20，000kW

事業対象面積：約100ha

工事期間：H10．11．15～
H11．12．15

商用運転開始日：H11．11．26

苫前ウィンビラ発電所

事業主体：㈱ジェイウインド

出資者：　電源開発㈱

総事業費：　約 65億円

設備概要：
VESTAS　1，650kW　14基
Enercon　1，500kW　5基

総発電出力：30，600kW

事業対象面積：約200ha

工事期間：H11．10．1～
H13．3．31

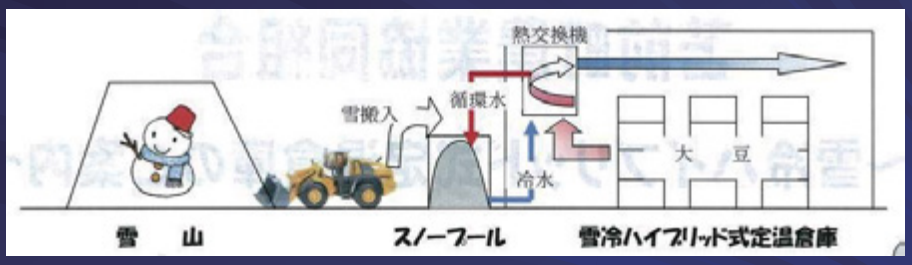
商用運転開始日：H12．12．1

北るもい漁業協同組合 衛生管理型荷捌所雪貯蔵室

荷捌所内の室温が上昇する時期に、雪氷熱を利用した衛生管理と鮮度保持の徹底により、安全・安心な水産物を供給するエコ漁港としてのPRと、雪氷ロゴマーク導入によるブランド化を図っている。

JA苫前　雪冷ハイブリッド定温倉庫

雪エネルギーの融解した冷水を穀物倉庫へ供給して冷房の熱源とし、約15度の安定した温度に保つことにより、高品質な大豆を安定的な品質で保管することができる。 ハイブリッド方式の採用により、省電力化とCO2削減を図っている。





苫前町におけるグリーン水素プロジェクト

テーマ「既設風力発電機を活用した事業モデルの構築」
「風力水素事業全般のインキュベート」

風力発電機　　水電気分解装置


電気

風力発電の電気からグリーン水素を製造

水素

ふわっと　ボイラ燃料　燃料添加　水素ステーション　燃料電池自動車

再生可能エネルギー資源を町内で使用する（町内循環型エネルギー）

苫前町におけるグリーン水素プロジェクト

期待される効果

- ◆ 純国産クリーンエネルギーの地産地消
- ◆ 化石燃料の使用量削減と地球温暖化ガスの排出抑制
- ◆ 風力発電機や太陽光発電を活用したエネルギービジネス、社会システムの形成
- ◆ 国際環境モデルタウン
- ◆ 産業の創出、基幹産業への期待、雇用の創出～まちの活性化
- ◆ 売電を主たる目的としない風力発電の推進モデル
- ◆ グリーン水素の備蓄による防災体制の構築
- ◆ 来る燃料電池自動車社会の供給基地としての役割

今後の課題など

- ◆ グリーン水素製造の効率化と安定化
- ◆ グリーン水素を燃料とするエンジンや発電機、ボイラ、燃料電池等の開発
- ◆ プロパンガス等の既存燃料への添加（混合）技術

風力発電の適地と電力系統

北海道や東北の一部には、風状況が良好で、大規模な土地の確保が可能な風力発電の適地でありながら、電力需要が小さいことから系統の容量が大きくなく、風力発電の導入が進まない地域が存在する。

＜地内系統の整備＞
風力発電の重点整備地区に対する政策的支援の具体的方策について、検討を進める。
（地域間連系線等の強化に関するマスタープラン中間報告書の概要より）

<道内の風力ポテンシャル>
陸上：約6,600万kW
洋上：約2億5,000万kW
（日本風力発電試算より）

活きて（経済の発展）
生きる（福祉の増進）
まちづくり

グリーン（G）・クリーン（C）・エコエネルギー（E）

鹿追町長　吉　田　弘　志

鹿追町の紹介

◇ 地　　形　大雪山東山麓　標高200～300m
東西17.7km　南北39.8km

◇ 気　　候　年平均気温6.1℃(夏17℃　冬－12℃)
降水量　932mm

◇ 人　　口　約6千人

◇ 土地利用

森林(ha)	農　地	その他	計	林野率
20,906	12,364	7,199	40,469	52%

◇ 産　　業　1次産業35%　2次産業8%　3次産業57%
極端に2次産業が少ない構成

◇ 農　　業(H24年度実績)
農業産出額174億円　畑作30%　酪農51%　畜産19%
乳牛1万8千頭　出荷乳量　10万トン(23年)
肉牛1万1千頭　(乳牛雄及びF1)

◇ 主要作物　牛乳、牛肉、ビート、馬鈴薯、豆類、小麦、
飼料作物、キャベツ、アスパラガス、そば

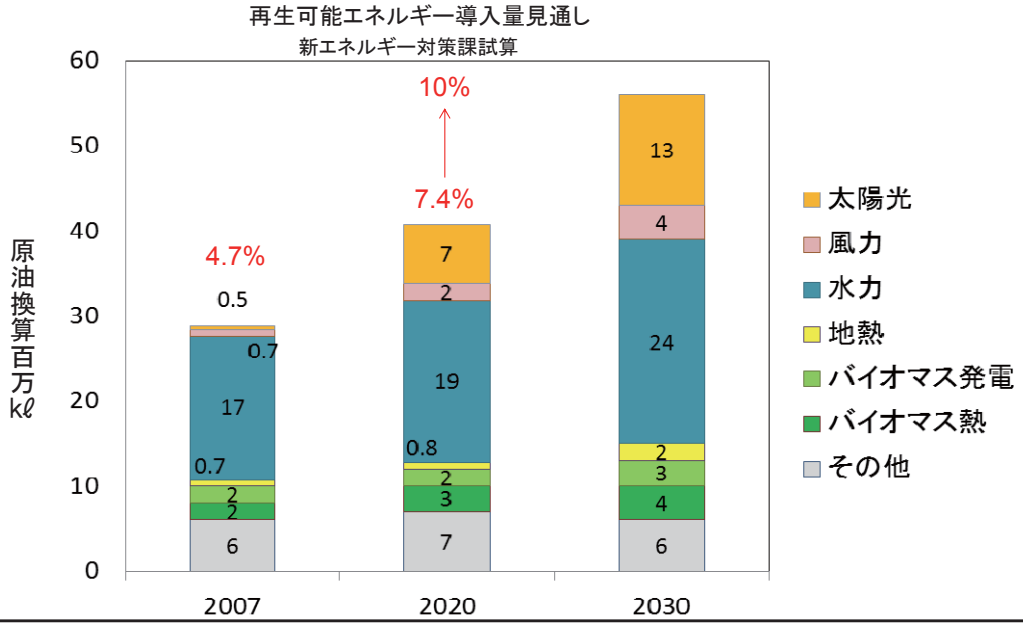
◇ その他産業　然別湖を核とした観光産業
観光客入込数　80万人　グリーンツーリズム等

まちづくり

鹿追町第6期総合計画で、「活きて(経済の発展)生きる(福祉の増進)まちに」をスローガンに、基幹産業である農業では、循環型農業の推進・地産地消や「食育」の推進を図り、更に観光産業の活性化、また、保健、福祉、医療の充実(高齢者施設の建設)、景観形成(花と芝生のまちづくり)を進めています。

再生可能エネルギーの導入見通し

●一次エネルギー供給に占める比率を2020年に10%
（エネルギー基本計画及び新成長戦略、2010年6月閣議決定）

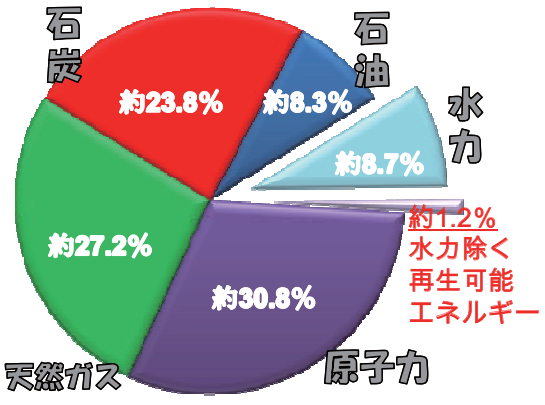


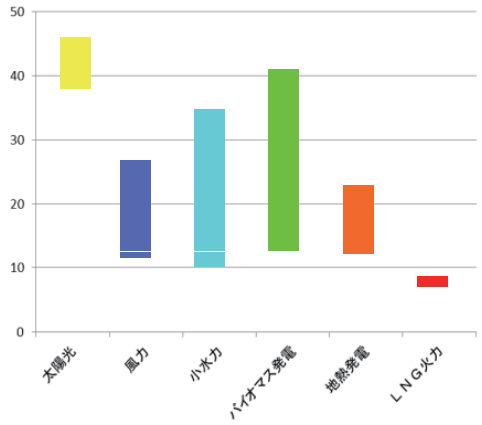
日本の電源構成に占める再生可能エネルギーの導入量

■2010年度の発電電力量のうち、水力発電を除く狭義の再生可能エネルギーは約1．2%。コスト高が課題。

■再生可能エネルギーには、まだまだ潜在力あり。再生可能エネルギー特別措置法（固定価格買い取り制度：FIT）の施行をきっかけに大幅導入拡大の道筋をつけることが必要。

→　今年を「再生可能エネルギー元年」に





（注）「再生可能エネルギー等」の「等」には、廃棄物エネルギー回収、廃棄物燃料製品、排熱利用熱供給、産業蒸気回収、産業電力回収が含まれる。
（出所）資源エネルギー庁「平成22年度電源開発の概要」を基に作成

管内別の新エネルギー賦存量の特徴

総合振興局・振興局別の新エネルギー賦存量

総合振興局・振興局	太陽光	風力発電		中小水力発電	バイオマス	管内別のポイント
	（平均日射量）		年間平均風速			
空知	3.61	61,281	3.03	590	8,199,486	中小水力、バイオマス（特に木質系バイオマス）の賦存量が大。
石狩	3.72	64,081	3.67	355	4,844,132	平均風速が大。バイオマス（特に食品残渣）の賦存量が比較的大。
後志	3.44	51,851	3.66	619	2,748,195	平均風速が大きく、中小水力発電のポテンシャルがある。
胆振	3.78	42,418	2.93	244	4,428,211	年平均日射量が大きい。
日高	3.77	65,572	3.06	1,784	1,680,719	中小水力発電のポテンシャル高く、年平均日射量も大きい。
渡島	3.57	60,225	3.57	365	3,261,208	平均風速、中小水力発電の賦存量が比較的大きい。
檜山	3.35	47,880	4.14	273	1,714,190	立地可能場所が限られるが年間平均風速は大きくポテンシャル高い。
上川	3.52	113,430	2.18	1,712	9,955,809	中小水力発電のポテンシャル高く、バイオマス（特に木質系バイオマス）が大。
留萌	3.45	64,847	3.67	48	1,780,493	年間平均風速が大きくポテンシャル高い。
宗谷	3.51	113,714	3.85	4	3,475,064	年間平均風速が大きくポテンシャル高い。
オホーツク	3.85	159,576	2.34	200	13,485,787	年平均日射量が大きく、木質系・畜産系バイオマス（ガス）の賦存量大。
十勝	4.07	75,379	1.93	2,198	13,261,596	太陽光、中小水力、バイオマス（木質系・畜産系）が何れも大きい。
釧路	3.97	82,027	2.95	182	7,316,164	年平均日射量が大きく、木質系・畜産系バイオマス（ガス）の賦存量大。
根室	3.85	70,357	2.76	32	2,951,132	年平均日射量が大きい。また、畜産系バイオガスのポテンシャルが高い。
	kWh/㎡・day	Mwh	m/s	Gwh	GJ	

※緑の分権改革推進会議（H23.3）「再生可能エネルギー資源等の賦存量等の調整についての統一的なガイドライン」などを基に試算。
【太陽光：平均日射量】管内市町村ごとの日射量の加重平均値　【風力発電】地上高80mで風速5.5m/s以上となるエリアに一定間隔で発電機を設置した場合に得られる発電量（年間平均風速は、管内市町村ごとの加重平均値）　【中小水力発電】河川、農業用水、上下水道による発電量合計値　【バイオマス】畜産廃棄物、汚泥、食品残渣、木質系バイオマスによるバイオガス発生量に基づく熱量

バイオガスの潜在能力

	家畜排せつ物量 万トン	発電可能量 億KWh	消費電力量 億KWh
鹿追町	43　(31)	0.2	0.2
北海道	2,000　(960)	10.6	300.0
全　国	8,700(2,006)	46.1	9,565

※（　）は乳牛ふん尿量を再掲

バイオマス発電実績：17．5億KWh（H24）

北海道には家畜排せつ物等のバイオマス資源も消化液を散布するフィールド（畑地）も豊富にある。

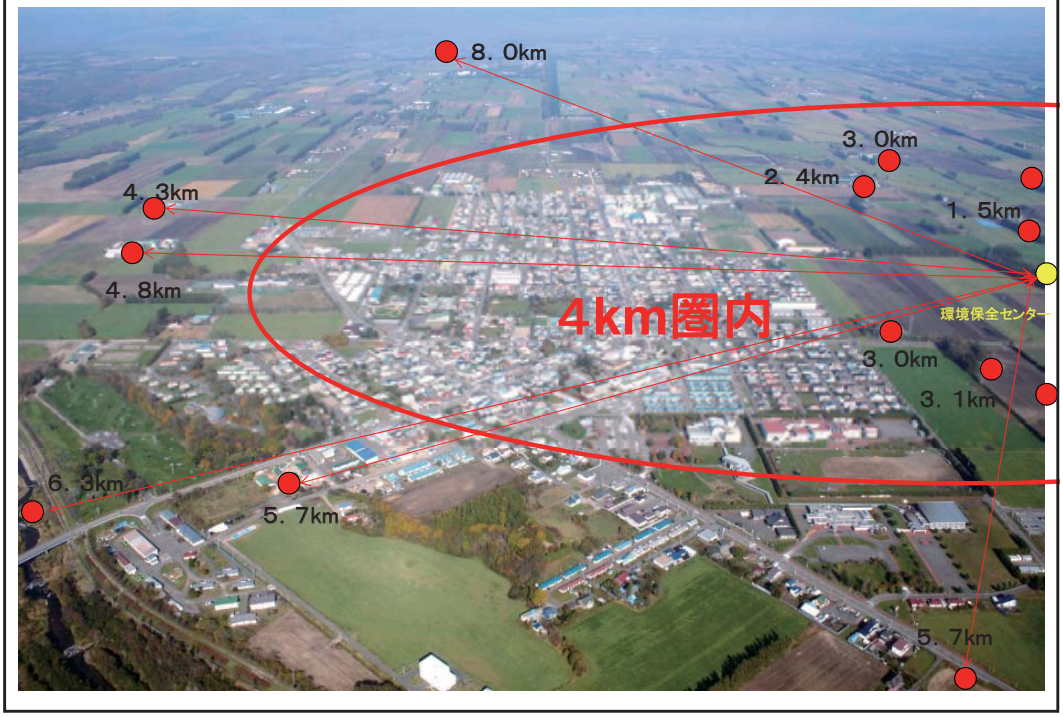
農業の生産性向上・地域資源循環型農業の確立

北海道　鹿追町環境保全センター

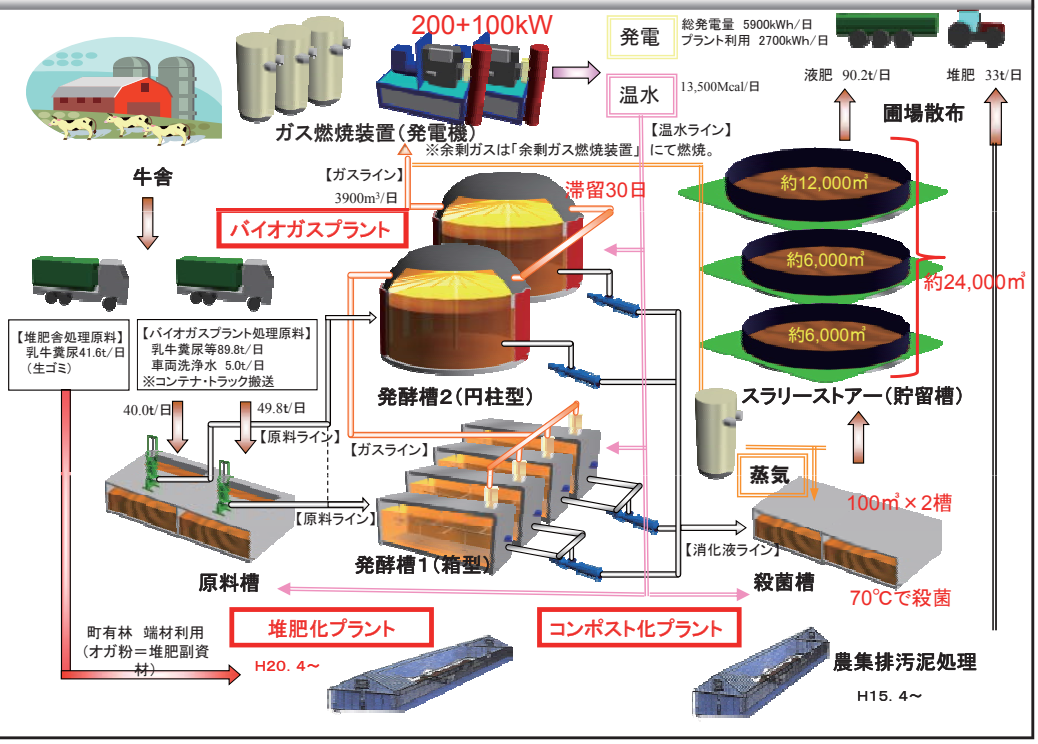
・敷地面積　約５１，５００㎡
・稼動開始　平成１９年１０月１日
・処 理 量　家畜ふん尿　１３４．４ｔ／日
　　生ゴミ　２．０ｔ／日
　　浄化槽汚泥等　１．５７ｔ／日
・建設理由　家畜排せつ物適正処理→農業環境改善
　　消化液の液肥利用→農業生産力の向上
　　バイオガスのエネルギー利用
　　→循環型社会の形成
　　CO_2削減→地球温暖化防止

北海道は、圃場面積が広く、メタン発酵消化液を全量液肥利用できている。→本州以南では困難が伴う。

家畜ふん尿収集農家と収集距離



鹿追町環境保全センターシステムフロー図



バイオガスプラントの稼動状況

◆処理量・ガス発生量・発電量・熱量

	処理量 t	ガス発生量 m3	総発電量 KWh	消　費　量 KWh	売　電　量 KWh	熱　　量 Gcal
Ｈ２４	35, 325	1, 255, 906	1, 902, 230	988, 294	913, 936	4, 253

◆消化液の成分値　（単位：%）

	窒　素	リ　ン	カリウム	カルシウム	マグネシウム
H23	0. 350	0. 127	0. 373	0. 135	0. 059
H24	0. 340	0. 150	0. 360	―	―

◆消化液の年度別散布状況

	飼料作物		耕種作物		合　計	
	面積（ha）	散布量（t）	面積（ha）	散布量（t）	面積（ha）	散布量（t）
H23	425. 2	13, 677	348. 2	14, 337	773. 4	28, 014
H24	489. 5	13, 987	358. 2	14, 242	847. 7	28, 229

◆年 度 別 収 支 状 況　（単位：千円）

名　　称	H19年度	H20年度	H21年度	H22年度	H23年度	H24年度
収入合計	20, 431	27, 341	38, 390	44, 051	69, 644	47, 787
支出合計	17, 793	24, 591	34, 965	39, 008	45, 041	46, 325

※売電料金：H19.5～H24.7はRPS、H25.4～はFITによる売電（14年10ヶ月間）

バイオガスの高度化利活用

町民利用

湯沸し器

ガスコンロ

農業用利用

温室ハウス

ガスボイラー

自治体利用

バイオガス
自動車

温室ハウスの利用状況

ソウジュツ（生薬）の育苗

バイオガスプラントからの熱供給により様々な栽培を実施しています。

イチゴの栽培

さつまいもの育苗

キャベツ・白菜の栽培

家畜排せつ物による
バイオガスプラント普及の課題

１．ＦＩＴ適用にあたって家畜排せつ物バイオガスプラントは、本来農業廃棄物処理施設であることから、発酵槽並びにガスホルダーはバイオガス施設として不可欠である。このことから発電施設としての除外は発電機のみとするべきである。

２．ＦＩＴによる売電価格設定は、投入廃棄物種別価格設定とすべきと考える。これは、原料のガス発生量、逆有償の有無によって収入構造、費用構造に大きな違いがあることから、想定するＩＲＲを過不足なく達成できる売電価格とすべきである。

３．プラント建設における補助金との関係については、二重補助となる等の議論があるが、家畜排せつ物処理バイオガスプラントは売電収入を入れてＩＲＲ１％以下であること、一義的には酪農政策の観点からの補助金であり、買取制度と重複するものではない。

４．売電にあたって電力会社に対し、家畜排せつ物処理バイオガスプラントから創出される再生可能エネルギー発電枠を農業施設支援の視点から設定すべきことを法によって義務付けてほしい。

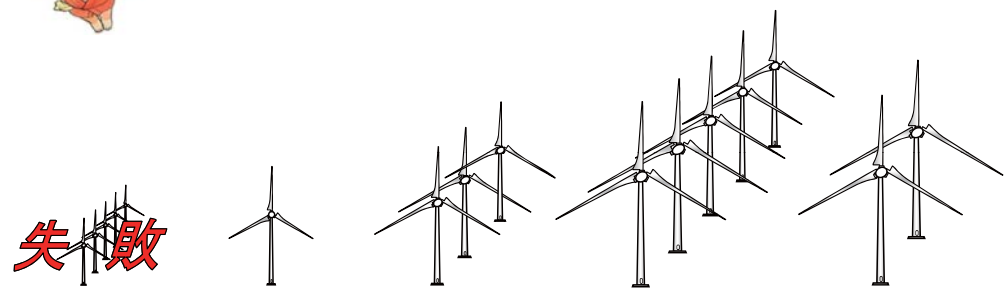
５．プラント建設、発電機、人材育成等々、ハード・ソフト面にわたる研究開発を図るべきと考える。

寿都町における風力発電への取組み

～ 夢をのせて 私たちの風力エネルギー ～

北海道寿都町 1

寿都町風力発電設備導入経緯



失敗により学んだこと・・・

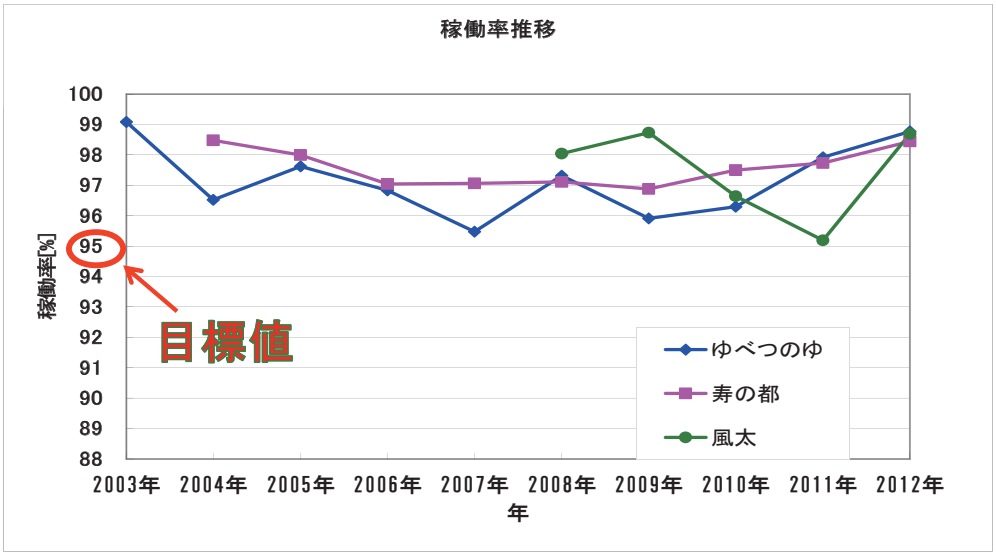
1　風況調査の徹底

2　メンテナンス体制の確立

3　信頼できるメーカーとの出会い

北海道寿都町 2

メンテナンス体制の構築による効果



売電利益の活用

売電益（売電収入－維持管理経費）
約370，200千円（H25予算）

産業振興

・施肥対策事業
・密漁対策補助
・観光誘致宣伝事業　等

約33，700千円

他会計繰り出金

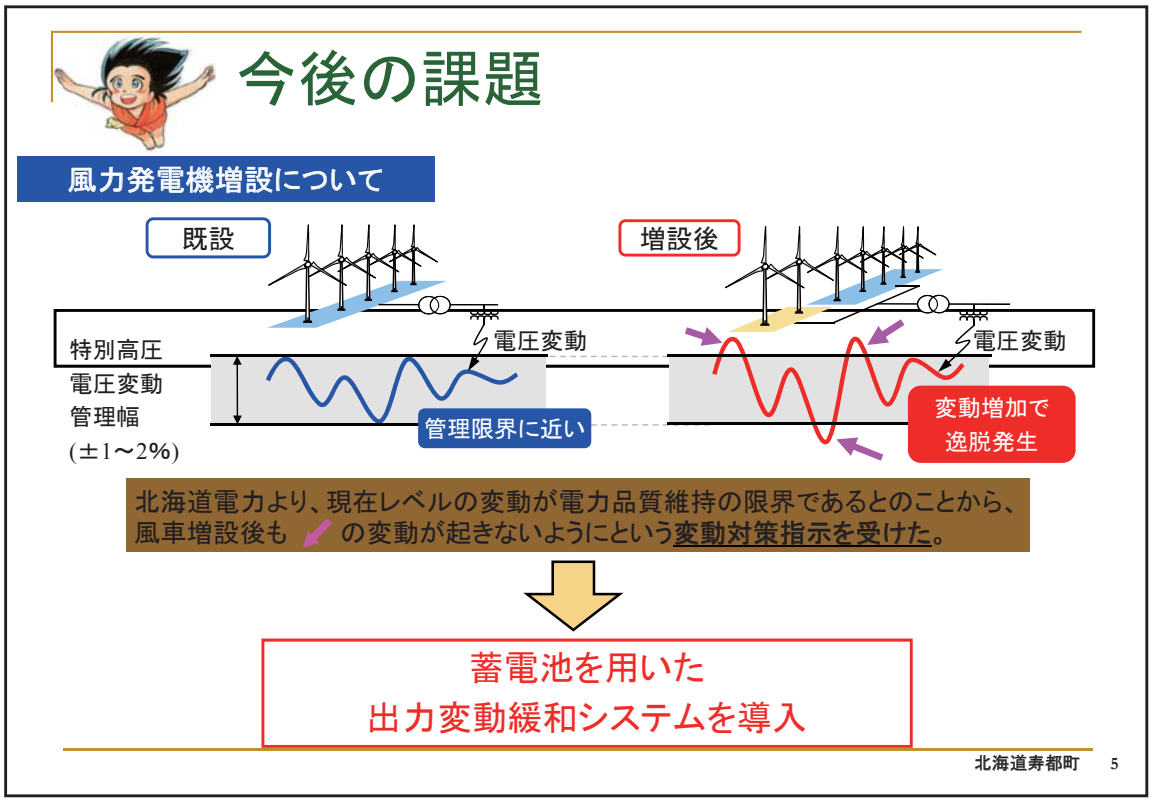
・診療所運営費
・他会計繰り出金
・基金積立金　　等

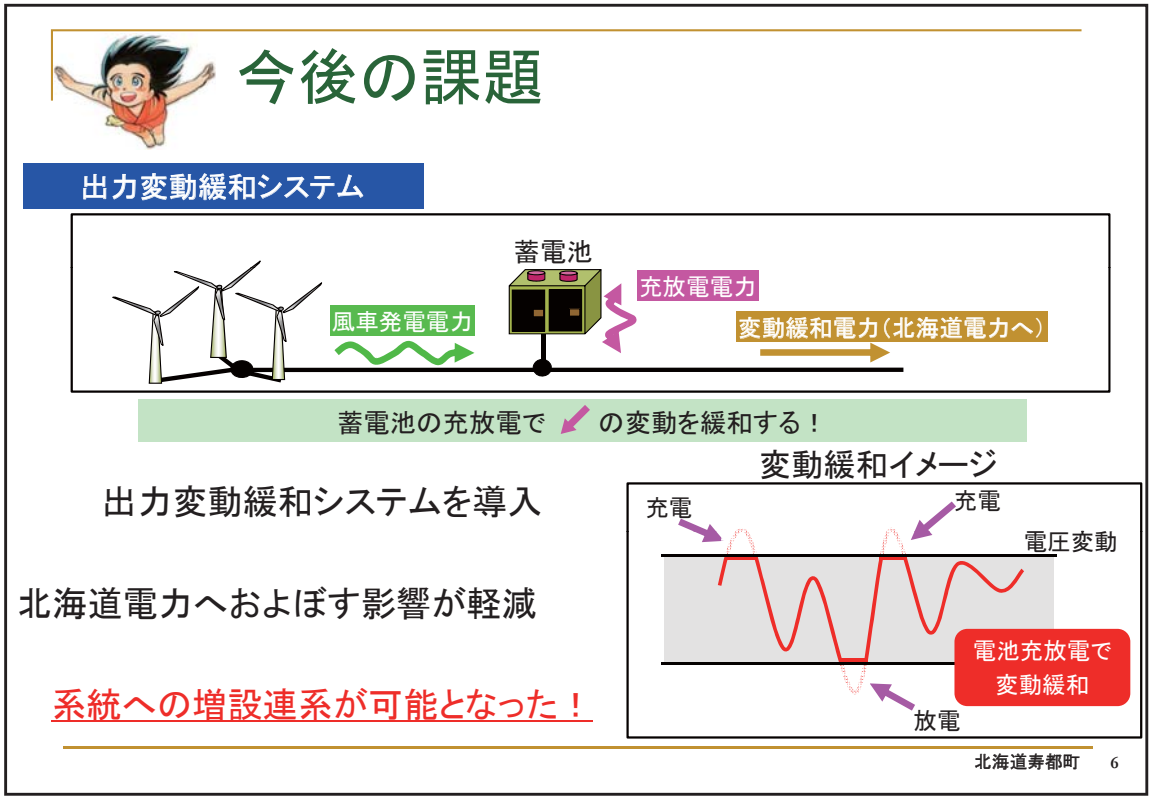
約294，300千円

町民還元

・プレミアム商品券
・水道料の軽減対策　等

約42，200千円


今後の課題
風力発電機増設について
既設
増設後
特別高圧
電圧変動
管理幅
(±1～2%)
電圧変動
管理限界に近い
電圧変動
変動増加で
逸脱発生
北海道電力より、現在レベルの変動が電力品質維持の限界であるとのことから、
風車増設後も の変動が起きないようにという変動対策指示を受けた。
蓄電池を用いた
出力変動緩和システムを導入
北海道寿都町 5


今後の課題
出力変動緩和システム
蓄電池
充放電電力
風車発電電力
変動緩和電力（北海道電力へ）
蓄電池の充放電で の変動を緩和する！
出力変動緩和システムを導入
北海道電力へおよぼす影響が軽減
系統への増設連系が可能となった！
変動緩和イメージ
充電
充電
電圧変動
電池充放電で
変動緩和
放電
北海道寿都町 6

３．参加者アンケート集計結果について

3. 参加者アンケート集計結果について

平成 25 年 11 月 5 日（火）に、北海道大学サステナビリティ・ウィーク 2013 のプログラムのひとつとして開催された「環境・エネルギー国際シンポジウム 持続可能な未来へ～低炭素社会と再生可能エネルギー～」の参加者に対し、アンケート調査を行った。アンケート回収数は 61 であり、参加人数 190 名（想定人数：200 名）に対し回収率は 32.1%であった。

表0 アンケート回収数

参加人数	190
アンケート回収数	61
回収率（%）	32.1%

設問１．あなたご自身について

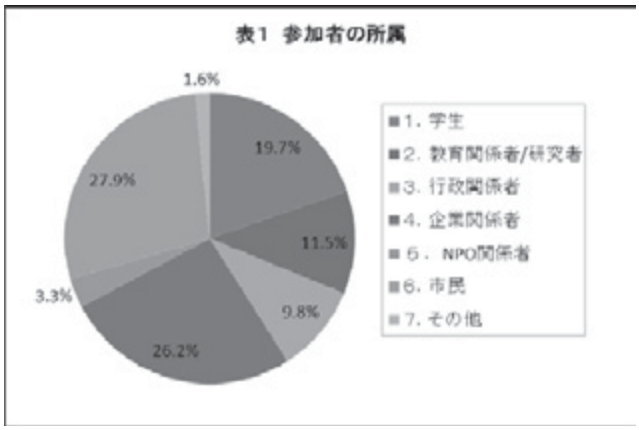
a) 所属を教えてください。

b) 北海道大学の関係者ですか？

結果については表１の通り。所属については、６．市民、４．企業関係者、及び１．学生、で全体の８割を占めている。また、北大の関係者は全体の 27.9%であった。

表1 参加者の所属

回答内容	回答数	割合	うち、北大関係者	割合
1. 学生	12	19.7%	12	100.0%
2. 教育関係者/研究者	7	11.5%	2	28.5%
3. 行政関係者	6	9.8%	1	1.6%
4. 企業関係者	16	26.2%	0	0.0%
5. NPO関係者	2	3.3%	0	0.0%
6. 市民	17	27.9%	2	3.3%
7. その他	1	1.6%	0	0.0%
合計	61		17	27.9%



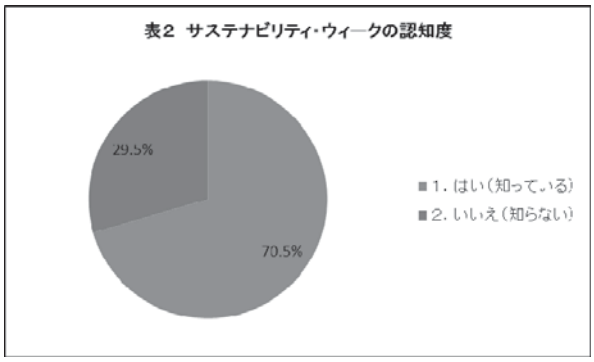
設問２．北海道大学の取組について

a) この行事に参加する前から北海道大学が毎年”サステナビリティ・ウィーク“を開催していることをご存知でしたか？

参加以前からこの行事について知っている人は全体の７割程度、知らなかった人は全体の３割程度を占めている。

表2 サステナビリティ･ウィークの認知度

回答内容	回答数	割合
1. はい(知っている)	43	70.5%
2. いいえ(知らない)	18	29.5%



b) 来年は 2014 年 10 月下旬に開催の予定です。8 年目となるサステナビリティ・ウィークへ期待することがありましたらご記入ください。

テーマ
（持続可能性）
・市民にアピールできるシンポジウム（例：地球温暖化、人口爆発と食糧事情、原発の位置づけとエネルギー確保、ロシアの領土問題など）
・脱原発の可能性、アジアのサステナビリティについて聞きたい。
・持続可能性に関する最新のトレンドについて知識が深まるようなもの。
・経済、環境、生物多様性等のパラドックスをいかに解決するか、それには哲学的な観点が必要であり、そういった点を盛り込んでほしい。
（低炭素社会）
・低炭素社会という言葉の認知度が高まることを期待したい。
・エネルギーのベストミックスが叫ばれているが、温暖化が忘れられているように思う。地球環境全体からの観点でセミナーを検討してほしい。
（エネルギー）
・再生可能エネルギーを主要項目として続けてほしい。
・再エネに関する成功事例だけでなく、失敗事例も聞きたい。

※設問２．ｂ）続き

（北海道関連）
・エゾシカ問題について。（いかに個体数を減らすか？）
（形態）
・参加者の質疑の時間をもう少し長くしてほしい。
・各活動の効果の報告会を実施してほしい。
・多くの参加と実現実証を目指し、北海道が先進者となれるようなシンポジウムを企画してほしい。
・市民が何らかの形で継続して参加できるイベント。市民一般に広く広めてほしい。
・ワークショップのように市民の意見を集約できるものをより多くしてほしい。
・市町村、企業、学生等から、それぞれが実践していることや課題、提案の発表を組み込んでみてはどうか？
・北海道の産業、環境、行政、経済、農業漁業について、持続可能性と付加価値を付けるような自立性が必要であり、サステナビリティという言葉をプラットホームにして各分野の地位を高めること、共通の土台に乗せて横のつながりを強めるようなイベントにしてほしい。
・自治体関係者、事業者、金融機関など多くの人が参加できる内容。PR をしてさらに盛大なイベントにしてほしい。

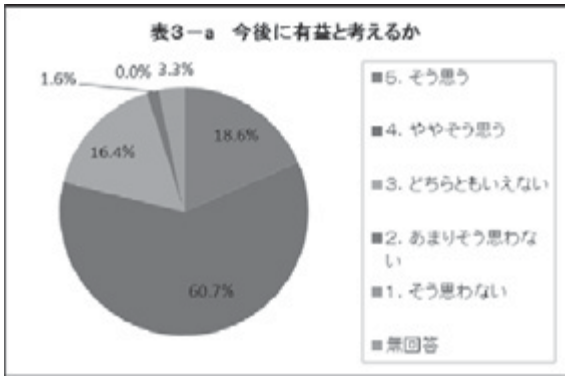
設問３．本日参加した行事について

a)　あなたの今後の活動に有益となりそうですか？

全体の８割弱が、今回のシンポジウムについて、今後の活動に有益、もしくはやや有益だと回答している。

表3－a　今後に有益と考えるか

回答内容	回答数	割合
5. そう思う	11	18.6%
4. ややそう思う	37	60.7%
3. どちらともいえない	10	16.4%
2. あまりそう思わない	1	1.6%
1. そう思わない	0	0.0%
無回答	2	3.3%

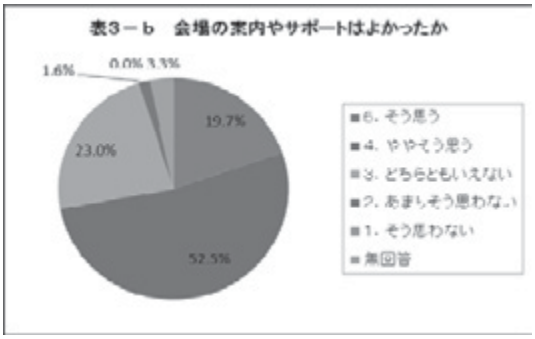


b)　当日の会場での案内やサポートは十分でしたか？

全体の７割強が、今回のシンポジウムについて、会場の案内やサポートが十分、もしくはどちらかといえば十分だったと回答している。

表3－b　会場の案内やサポートはよかったか

回答内容	回答数	割合
5. そう思う	12	19.7%
4. ややそう思う	32	52.5%
3. どちらともいえない	14	23.0%
2. あまりそう思わない	1	1.6%
1. そう思わない	0	0.0%
無回答	2	3.3%



c)　当行事は、どのようにして知りましたか？

・大学からのメール、学内に設置してある看板、ポスター、パンフレット
・講義を通じて
・EPO 北海道のメルマガ、再生可能エネルギー振興機構のメール、Facebook
・知人の紹介
・北大の HP
・会社からの案内、庁内回覧
・札幌市、北商連、道経連からの案内
・道新の広告
・国際プラザ行事案内チラシ

d)　特に印象に残った講演や議論はどのようなものでしたか？

・（北海道の）風力発電を始めとする自然エネルギーの体制
・北海道において再エネを普及させる上での課題とそれに対する取組
・風や糞尿など、ある面では地域の害になるものを資源として生かしていくという考え方、エネルギー政策と同時に地域振興を進めようという全体の話は、経済成長の鈍化した日本においても前向きに感じ、印象に残った。
・日本送電網株式会社の話と 500ｋＷ以上接続拒否の話
・ロシア、韓国の国情を踏まえた再エネの取組と実情
・研究者ではない３町長のお話（パネルディスカッション）、地域における具体的な進め方、課題が参考になった（*←大半はよかったという意見だが、逆に面白くなかったとの意見もあり*）
・３人の講演者が短時間で必要項目を全て網羅していたことに感銘を受けた
・吉田教授の講演

※設問３．d） 続き

・バイオガス利用など地域に根差した資源の活用、利益を生む取組が増えればと思った
・電力を作り出す技術と電力を使うビジネスの必要性

e） 再生可能エネルギーの活用による地域経済の活性化について、どのようにお考えですか？

・バイオガスを使った再エネの普及を進めなければならないと思った
・再エネは様々な観点から重要であるが、コストをどのように、どの程度管理していくのかという点に関しても議論を進める必要があるのではないか。
・少子高齢化、財政難など多くの問題を抱えた日本では、「環境問題」単独ではなく「雇用の創出」「経済的なインセンティブ」なども絡ませて継続的に対応していくことが必要だと改めて感じた。バイオマス燃料や市民の排出したごみを利用しようとする姿勢が地域経済の活性化に必ず役立つと思う。
・地域経済の活性化を目的とした再エネ事業については、可能性と事業性について十分に検討するプロセスが不可欠。その意味で、経済活性化のみを前面に据えたプロジェクトについては特に注意すべきという実感。導入することによる効果のみではなく、本来的には運用することによる効果こそ重要であるので、その点においても悪い前例を増やさないよう、着実な実績を積んでいければよいと思う。
・３町の現状を聞くと、いずれも国の対応の不十分さが挙げられているので、再エネの活用をしている市町村に対して国がもっと積極的に十分な対応をすべき
・地域経済の活性化にはまず「街づくり」がキーになる。従前よりコンパクトシティづくりがあるが、なかなか実現しない。自治体・官が主体で進めなければならないところ、自治体の独り相撲の感がある。
・これから北海道では最重要課題となると思うが、北電との戦いが本当に大変だと思う。
・経済効果がやや見えにくく、PR 不足を感じる。
・再エネの活用は地産地消的に導入し、地域経済の核となるようなものにして行きたい。一極集中をこれ以上悪化させるべきでない。
・地域経済への再エネへの取り込みを進めて、経済サイクルとして自律的に回る仕組みづくりが必要。
・資源の豊富な北海道だからこそ、それらを生かした再エネはまだまだ可能性の広がる分野だと思う。再エネが安定的に共有される、安心・安全でクリーンな日本になっていくことを期待。

※設問３．e)の続き

・民間の資金・施設を活用することにより、地域経済の活性化につながる。
・送電網の拡充はもちろんのこと、地産地消できる産業の育成や地域の工夫が必要。
・電力を人の集まっているところへ送るのではなく、電力のあるところに人が集まる政策を考えるべき。
・投入設備の費用が高位安定では導入が進まない。メーカーの利益優先の感。地域企業自らで設計、製造可能なインフラ、マシンがキーとなるので、小さな設備を中心にエネルギーの地産地消を考えるべき。
・地域を細分化してエネルギー問題を検討すべき。
・地域経済の活性化よりも持続可能な地域環境作りが必要。人口減等すべてが右肩下がりの状況下では、生活維持が課題。
・廃棄物を有効利用した鹿追町といい、迷惑な風を利用する逆転の発想をした寿都町といい、自ら進める行動力は素晴らしい。地元の意見を聞きながら進めるのがよい。
・北海道は大変恵まれた地域であるので、インフラを整備することで地域の活性化につながり、低炭素地域づくりが促進されることを期待。
・一石二鳥でよい。
・（後志管内の町民より）自分の街に何が可能性としてあるのか、専門家のアドバイスを得る機会がないので、総論ではなく具体的、実効性のあるアドバイスを得られるつながりがあればと思う。
・小規模水力発電所はもっと作ることが可能。また、メンテナンスを行う地域企業、地域の技術者の育成を進める必要がある。
・脱原発を加速させなければならない、という前提で、①送電インフラの早急な整備が必要、②資金面での政府の援助や金融機関の強力な支援が不可欠
・補助金が無くなった時、採算が取れることが必要。無意味な補助金とならないよう、行政による正確な情報公開を求める。
・大送電網も大事だが、地産地消も大事ではないか。

f） 当行事の感想・ご意見を自由にご記入ください。

・学部４年ということで、このような形のシンポジウムは初めての参加だったが、どの先生からも最新、最先端の話を聞くことができて有意義だった。
・（位置関係がわかりにくかったので）北海道内の市町村を記した簡単な地図がほしい
・「姉妹都市シンポジウム」と「低炭素社会と再生可能エネルギー」の組み合わせは無理がある。「再エネ」中心ならば、デンマークやスウェーデンから研究者を招待すべき。
・パワーポイントの操作など事前に説明しておいた方がよかったのでは？
・久しぶりにためになるシンポジウムに参加できた。北電やその他既得権者とのバトルが見たい。
・さまざまな話や意見を聞くことができて有益だった。
・海底資源の可能性や地場で再エネを活用する取組について具体的な動き等今後聞きたい。
・通訳がもう少し聞きやすければよかった。
・配布資料の日本語版もあると助かる。
・友好都市間でのこのような交流は極めて有意義。特に今回は再エネの具体例を紹介したこと、３町長の話をまとめて聞けたことがよかった。
・もう少し具体化した話、突っ込んだ話を聞きたかった。

設問４．自由記入

・再エネの利用は個々の市町村が率先して行っているのが現状と思うが、全体のバランスを考慮した政策が必要である。また電源立地条件を考慮しないで送電線を増やしても安定したものにはならない。電源…のアンバランスの解消、さらに電源立地条件の更なる見直しを提案する。こうすることで、再エネの利用が生きて地域活性化につながる。
・エネルギーの消費地である都市が地方の再エネに対してどのような協力ができるのか。
・FIT の開始で電気エネルギーばかりが注目されているが、北海道の大きな熱需要に対しては電気は効率が悪いので、他のエネルギー利用、電気でない伝達方法も開発し、支持すべきと思う。
・北海道はこれまで国のお金を頼っているが、有り余るエネルギー供給力で自立すべき。
・見た感じでは、企業の関係者や金融機関、自治体関係者の出席者が少ないように思われる。また、北大のロシア・韓国からの留学生の参加ももっと多いものと期待していたのだが。
・問題解決のためには省庁間の横の連携が必要である。

以上

Administrative Information 行政情報 #02

環境・エネルギー国際シンポジウム
持続可能な未来へ
～低炭素社会と再生可能エネルギー～

一般社団法人北海道再生可能エネルギー振興機構

2013年11月５日、北海道大学学術交流会館講堂で札幌市、北海道大学「持続可能な低炭素社会づくり」プロジェクトチームが主催、環境省北海道地方環境事務所、さっぽろGreener Week 運営協議会、一般社団法人北海道再生可能エネルギー振興機構が共催する、環境・エネルギー国際シンポジウム「持続可能な未来へ～低炭素社会と再生可能エネルギー～」が開催されました。シンポジウムは、札幌市、ロシアノボシビルスク市、韓国大田広域市の三つの姉妹都市が、2011年から進めてきた交流事業の一環としての姉妹都市科学シンポジウムも兼ねています。学内外から約190名が参加し、参加国の研究者、実務家による講演とパネルディスカッションが行われました。

開催に先立ち、上田文雄札幌市長から、世界に誇れる環境都市を目指し、「環境都市札幌」の宣言を行い、「札幌市まちづくり戦略ビジョン」の策定を行いましたが、これは「札幌」という魅力的な街を将来に引き継いでいくためには、一層の省エネの推進や太陽光発電などの再生可能エネルギーを普及させる取り組みが重要な課題で、その先にある低炭素社会と脱原発依存社会の形成につなげるための試みです。シンポジウムがその一助になることを切に希望していますとの開催挨拶がありました。

第１部
基調講演
再生可能エネルギーと地域経済の活性化

吉田　文和 氏
北海道大学大　院経済学研究科教授

なぜ再生可能エネルギーを拡大・普及させていく必要があるかといえば、それは三つのリスクを下げることです。三つのリスクとは、第一に地球温暖化のリスク、第二に原子力事故や放射性廃棄物のリスク、第三に化石燃料に依存することに起因する輸入に伴う変動リスクです。

再生可能エネルギーの拡大のため

には、生産や消費に係わる省エネルギーの推進が不可欠であり、再生可能エネルギーはいっぺんに増やすことはできないことから、化石燃料である天然ガス等の利用効率向上により、環境負荷の少ないエネルギー利用を中継ぎとして導入する必要性もあります。この場合も当然ながらできるだけ民間投資を基礎に、新しい産業や雇用をつくりながら、地域の活性化とグリーンエコノミーを進めていくことが重要です。

再生可能エネルギー導入の条件としては、第一に枠組み条件と目標設定、第二に買取価格と融資条件、第三に送電網への優先接続保障、第四に北海道の気象条件に合った技術開発やイノベーションの四つです。

第一の条件である枠組みや目標に関しては、再生可能エネルギーの導入目標を設定、または中期・短期の目標と見通しを立て、そこでの国と道と各自治体との協議や調整が必要であり、国のレベルでのエネルギー計画が見直し段階ですが、上の動きを待つだけではなく、北海道が主体的に進めていく必要があります。

第二の買取価格や融資条件については、洋上風力の別枠化などFIT※1の運用条件の改善、公的金融や地域金融機関などの融資能力などの力量の向上の必要性があります。ドイツではエネルギー協同組合が全国に850近くもできており、市民や都市住民が参加できる仕組みをどのようにつくるのかが今後の大きな課題です。

第三の優先接続保障は、現実に十分保障されていないため、事業の停滞が発生しています。電力小売りの自由化、発送電分離の検討が今後の大きな課題となります。

第四の技術開発とイノベーションについては、北海道の厳しい気候条件を考慮し、売電だけのFITからさらにエネルギーの総合利用、特に熱の利用を促進させることが重要であり、地域暖房や熱電供給の計画的普及が重要です。

再生可能エネルギー事業の大事な教訓は、関係者の十分な合意と協力を得て進めること、北海道の厳しい気候条件に合致した計画とすることです。厳しい条件で運転するリスクを理解し、予測して準備することが重要です。これらを踏まえて、道内でできるだけ多くの再生可能エネルギーを地産地消し、地域経済の活性化を図っていくことが非常に重要です。

来賓講演１

エネルギーが豊富な経済における再生可能エネルギー源～ロシアの場合～

スロフ・ニキタ　氏
ロシア科学アカデミーシベリア支部工業経済経営研究所部長、ノボシビルスク国立総合大学経済学部教授

ロシアは天然ガス、石油等で世界第３位のエネルギー資源の産出国である一方で、再生可能エネルギー事業はまだスタート地点にもついていない状態です。

ロシアにおける再生可能エネルギーは、その多くは水力エネルギーで飛びぬけて多く、次に木質ペレットを中心とした固形バイオマス燃料、廃棄物等と続きます。再生可能エネルギーが中々普及しない原因は、低いエネルギー効率のための高コスト体質やインフラストラクチャーの未整備などが原因です。加えて、再生可能エネルギーの開発のためのさまざまな手続きに長い時間を要してしまう等、関係する法体系の整備が不十分で機能していません。

しかしながら、今後のロシアにおいては再生可能エネルギーの開発を行う必要性があります。その理由は、広大な国土を有するロシアにおいて国土の３分の２が中央に集中したエネルギー・グリッド※2から離れたところにあり、この人口だけで2,000万人にもなることから、エネルギーのセキュリティが中央以外の地域では非常に大事になってきているという現実があるということです。

ロシアはエネルギーの豊富な国である一方、地方の多くが中央のエネルギー・グリッドに接続できない現状を改善するためにも、再生可能エネルギーの開発が

※１　FIT(Feed-in Tariff)
エネルギーの固定買取制度。

※２　エネルギー・グリッド(energy grid)
既存の電力供給網を指す。オバマ政権のグリーンニューディール政策で、既存電力供給網に対峙する概念として「スマートグリッド（次世代電力網）」が注目された。

必要で、ロシアではオフラインのエネルギーが中央よりも急速に発達しており、再生可能エネルギーに競争性があることを表しています。再生可能エネルギーを開発していく上で関係者が待ち望んでいる重要な法律「卸市場のマーケットメカニズムを使用する」ことを可能にする法律があります。可決されればパワーキャパシティの増加が期待できます。ロシアにおいても一般的には再生可能エネルギーの競争力は低いという認識がある中で、現実には競争力を有しているところもあり、これから再生可能エネルギーの普及を推進していくためには、ロシア政府は入念な政策を立てるべきであると考えています。

来賓講演２

バイオエネルギー、持続可能な社会への鍵となる手段 ～韓国の経験～

李（イ）　震石（ジンソク）　氏
韓国エネルギー技術研究院主席研究員

エネルギーの持続可能な社会をつくるには、二つの問題があります。一つは化石燃料に関する問題であり、もう一つが気候変動に関係する問題です。これらを解決するために、再生可能でカーボンニュートラルなバイオエネルギーが大きな貢献をすることになると考えています。

推計では、韓国では2035年頃までには再生可能エネルギーのうち70%がバイオエネルギーとなります。韓国では、2012年に固定価格買取制度から再生可能エネルギー利用割合基準（RPS）に変更し、今後再生可能燃料基準（RFS）等を導入する予定であり、この制度によりバイオエネルギーは一層重要な役割を果たすことになります。

韓国が発展途上のときにエネルギーを選択する条件は資源のコストでしたが、今はいかに資源が環境に優しいものかという観点でも選択をするため、再生エネルギーはコスト面では非常に競争力が低くなるものの、カーボン排出量では非常に少ないという利点があり、環境面を考えると、原子力、再生エネルギーがよいとなりますが、原子力には安全の問題があることから、将来的には再生エネルギーに焦点を当てることになると考えています。

韓国においては､持続可能な社会をつくるためには、気候変動の問題を把握し、エネルギー危機を考え、そして農村の開発を進めること、これは韓国にとってとても重要であり、そのためにバイオエネルギーが大きく貢献すると思われます。

韓国は支援制度から強制制度に変えることで、再生可能エネルギーを促進しようとしています。RPSは2015年から、RFSは2016年から開始します。そしてバイオエネルギーというのはこれから重要な役割を果たしていくと韓国では期待されています。他のバイオマスも、これからますます活用していきたいと考えています。そして､有機廃棄物や作物もバイオエネルギーのフィールドとして重要なものになると思われています。

第１部総括

吉田　ロシアの天然ガスや資源が豊富である一方、中央グリッドにアクセスできないグリッド外の広大な地域ではエネルギーが足りないところが相当あり、このような地域では再生可能エネルギーの重要度が今後増大し、活用していく必要性があることや制度的にも新しい取り組みがされていることがとても参考になりました。

韓国に関しては、韓国における現在までの詳しいバイオエネルギーの取り組みが、北海道の場合は農業という観点からいっても、韓国のバイオエネルギーに関する取り組みが非常に参考になります。特に、バイオディーゼルとして自動車の燃料に使う取組みや食品廃棄物を回収、利用してエネルギーとして使っていく取り組み、FITを改めてRPS、つまり割当に変えていくという制度上の違いが今後どのような効果を生んでいくかということも、注目に値します。また、韓国も日

本と同じように原子力発電の比率が高いことから、安全上の問題で停止しているということで、原子力への依存を減らし安全確保を行うことも共通の課題であり、ロシアについても同じですし、そういう意味で、まず再生可能エネルギーの利用の前段で、まだ十分省エネができていないところへ、省エネを進めながら再生可能エネルギーの普及拡大のための制度の拡張と、それぞれの地域に適した開発が非常に重要だという点が大変貴重でした。

これまで再生可能エネルギー先進地域のヨーロッパのドイツやデンマークを研究してきましたが、一番近くかつ実際の協力の可能性がある北海道であれば、まさにすぐ隣のロシア、隣国である韓国と共通の課題を抱えているということ、それらの実情がどうなっているかを詳しく聞く機会が持て、今後、政策面や技術面であるいは研究面で大いに提携していける可能性ができたという意味でも非常に有意義でした。

パネルディスカッション

地域の先進的な取り組みと今後の北海道

苫前町の取り組み

パネリスト
森　利男 氏
苫前町長

苫前町の再生可能エネルギーは、苫前町所有で総事業費約７億円の2,200kWの苫前夕陽丘風力発電所、㈱ユーラスエナジー苫前所有の総事業費45億円の苫前グリーンヒルウィンドパーク20,000kW、㈱J－ウインド所有の総事業費65億円の苫前ウェンビラ発電所30,600kW、合計42基52,800kWで、建設当時は全国でも一番大きく、一番先に建設したところでしたが、今は４～５番くらいになっています。

できるだけ自然エネルギーを導入してエコの町にしようという思いもあり、国直轄漁港という特性を活かし漁業協同組合が設置し町も支援している屋根掛け岸壁と衛生管理型雪貯蔵室では漁獲物の鮮度保持、JA苫前農協が行っている雪氷を使った雪冷ハイブリッド定温倉庫では高品質の大豆や小豆が安定的に保管されています。北海道のクリーン農業基準に準じたクリーン米、野菜、メロン、スイートコーン、かぼちゃ、ミニトマトを売り込んでいます。クリーン米は三重県津市にどんどん送り込んでいる状況です。

また、苫前町ではクリーン水素プロジェクトを進めており､季節発電を活用した事業モデルの構築として、道の駅「ふわっと」において水素を使うボイラー燃料、燃料点火、水素ステーション、水素電池自動車等の実験を札幌商工会議所も入り進めており、徐々に町の中に気運が盛り上がってきました。

今後の課題は、グリーン水素の効率化と安定化、燃料とするエンジンや発電機、ボイラーや燃料電池の開発を進め、プロパンガス、既存燃料からの転換、混合技術等を含め水素ガスの利用を普及させていこうということで進めています。

現在の固定価格買取制度は20年で終わりますが、終了後の買取りや買取単価によっては水素ガス利用を進める必要があるという可能性を含めて進めています。

送電インフラについては、風力発電の適地としては北海道や東北は非常にポテンシャルが大きいのですが、系統の容量が小さく接続できない状況を改善するため送電線を引くための具体的対策を国の金を２分の１入れながら進めています。これには、民間活力で地域の底上げもしながら展開をしてはどうかということで、宗谷留萌管内11市町村で200kmくらいの距離で送電線を引くべく国へ要望を出し、国も250億円の予算を計上し、モデル的要素の送電線を引こうということでやっています。

北海道では末端の系統は線が細く、これ以上電気が入らないところばかりです。したがって、私のところをモデルとして､最終的に北海道ならびに本州､東北､鳥取県あたりにも積極的に送電線を引き、同時に北海道と本州をつなぐ北海道本州ルートは現在60万kWですが、増強が必要です。北海道電力が30万kWを独自

で引いたとしても焼け石に水で、試算では２倍くらいの180～270万kWは必要と考えています。

鹿追町の取り組み

パネリスト
吉田　弘志　氏
鹿追町長

鹿追町の町づくりの考え方は､「生きて生きる町」ということで、経済の発展と福祉をしっかりと結びつけてやっていきたいと考えています。

再生可能エネルギーでは、鹿追町の産業の特徴でもある畜産業の廃棄物であるふん尿を利用してのバイオマスプラントを進めてきており、導入の経緯は発電ではなく、環境の問題からです。

五つの課題があります。一つ目は、FITの適用で40円95銭で販売できるようになったことは非常にありがたいのですが、全量買い上げについて、発電施設、発電機のみについて自家消費分として除外することはやむを得ないですが、発酵槽については買い上げの対象にしてほしいと要望しています。

二つ目はFITによる売電価格の設定です。具体的には通常の家畜ふん尿によるものと、ドイツのようにとうもろこしを投入するような別なものを入れてガス発生量を多くし、料金をもらって処理をしているゴミ処理場等のバイオのような逆有償の場合の売電価格が同じというのは、内部利益率（IRR）で不利になることの観点からも問題があるのではないでしょうか。

三つ目は、建設にかかる補助金等です。全体的には徐々に補助金を得ている施設は削減の対象にするということですが、そうなれば前述の内部利益率での不利な状況はますます問題が大きくなり、次の更新について積み立てもできない状況が予想できます。

四つ目は系統連系です。どうしても早い者勝ちとなり、太陽光のように開発リードタイムが短い何万kWもの発電をするような案件と鹿追町が次に予定している700kWのような案件がある場合、500kW以上については抑制の対象にするというのが国の考え方であり、これは今後の北海道の農業を持続をさせ応援するという内容の性格をもっているプラントが初めから抑制をされていることになってはいけない。

五つ目は、日本の技術開発であり、国を挙げてやるべきです。国は日本のエネルギーの需給率をさらに高めようという考え方をもっており、当然、再生可能エネルギーを入れるということは、CO_2の削減、環境への配慮という問題としっかりとリンクをさせていこうという考え方で、技術開発によりコストの安いプラントをつくって普及をさせていくべきと考えています。

寿都町の取り組み

パネリスト
片岡　春雄　氏
寿都町長

寿都町の積年の悩みの種であった四季を通じた強い風を逆転の発想により町づくりに生かし、風車を建設してクリーンなエネルギーを生み出す風力発電を事業化してきました。平成元年から始めた全国自治体初の風力発電所を寿都中学校への電力供給を目的に建設を開始しましたが、十分な知見もなく結果的に失敗に終わりましたが、そこから得られた知見の一つは風況調査の徹底です。二つ目はメンテナンス体制の確立。三つ目は信頼できるメーカーとの出会いです。得難い教訓でした。

特に、定期的な点検、故障の対応や予防的保守の内容も含め、設備稼働率を向上させようと包括契約によるメンテナンス体制をとった結果、現在までの稼動実績は目標値の95%を維持しており、さらにFIT制度の導入によりかなり増収し、約３億7,000万円の収益が見込まれており、産業振興、町立寿都診療所の運営経費、町民への還元、一部基金積み立てと幅広く活用できています。

今後の課題として、風車の増設の際に追加コストが発生する電圧変動の緩和を目的とした蓄電池による出力変動緩和システムを導入せざるを得なかった経緯があり、これも系統連系のキャパシティの問題と関連していることから、送電網の増強が待たれています。

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コーディネーター
荒井　眞一　氏
北海道大学大学院地球環境科学研究院特任教授

各町の再生可能エネルギーの取り組みの現状と課題についての事例報告の後のディスカッションでは、北海道の再生可能エネルギーの普及には送電網の整備が絶対条件であること、家畜ふん尿を利用したプラントのメリットは農村の生産性をしっかりと維持をする完全循環型の農業を持続させる意味で意義が高く、結果的に再生可能エネルギーの普及に寄与できること、またコスト低減による事業性を向上させるための日本の技術力を用いたプラントの開発、独自財源の確保のためにリスクヘッジを行いながら自治体自ら事業を行い、メリットを享受し、北海道外の大企業に資源や利益を奪われないようにすること、そのためには少しでも地元にお金が落ちるシステムを導入すること、産業振興と再生可能エネルギーをどう結び付けていくか等の指摘や提言が出されました。

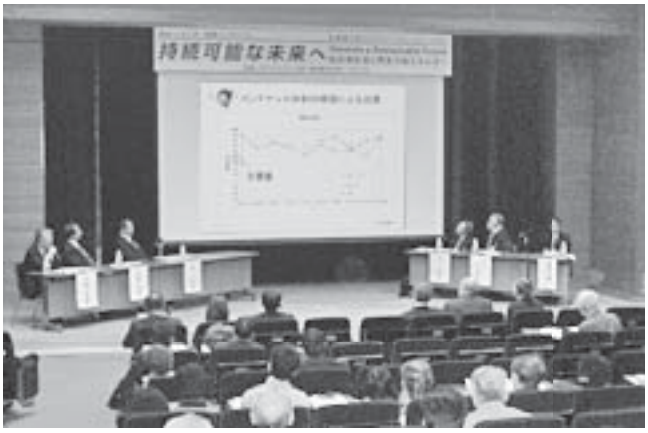
海外招待者のロシアのススロフ教授からは、再生可能エネルギーの普及の障害として、単に導入コストだけではなく､インフラの問題が存在することを理解し、中央グリッドにアクセスできないグリッド外をどうしていくかに工夫が必要との感想がありました。

また、韓国のイ博士からは、グリッドへの接続には蓄電池のシステムを用いて解決を図ることが可能ではないかとの印象を持ったこと、韓国でも鹿追町と同様のバイオマス工場の事業採算性の課題を抱えているが、処理ができなければ環境問題となり、追加的コストも発生することから、気候変動対応や環境配慮をコンセプトに経済性が確保できるような持続可能な社会を研究することの必要性が提唱されました。

会場からの意見には、再生可能エネルギーで大事なことの一つは電気を発生させ、熱をつくるということではあるが、もう一つ非常に重要なことが「その地域に産業をつくり、雇用を創出すること」で、地域活性化の視点で再生可能エネルギーを見ていく必要性、再生可能エネルギー利用を通じた地域産業及び雇用の創出の重要性、バイオマス利用等北海道の実情に即した再生可能エネルギーの重要性等が指摘されました。

最後に、鈴木亨（一社）北海道再生可能エネルギー振興機構理事長から、北海道の再生可能エネルギー資源を活かさなければ日本のエネルギーの基本的政策で再生可能エネルギーを日本の電力の２割にしようというような野心的な目標は絶対に達成できず、そういう立ち位置に私たちは住んでいることを自覚することが大事だという点、次に雇用、地域の経済振興には地道に一つ一つ現場をつくっていくことが非常に重要であること、地球温暖化、環境重視といった少し広い視野で見ることの必要性の三点の説明があり、北海道の自治体、企業、市民、みんなが力を合わせて、ワンボイスで北海道の再生可能エネルギーを広げていくその片隅で、北海道再生可能エネルギー振興機構がお役にたてればとの感想がありました。

議論全体を通じた大きなテーマは、再生可能エネルギーを軸にして地域の活性化を図っていく必要性、コスト及びインフラを含めた仕組みの見直し、また、地域に適合した技術を作っていくことの重要性について共通認識の醸成が重要とのことでした。



北海道大学「持続可能な低炭素社会づくり」プロジェクト

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Overview of the Environmental Policy Seminar "Policy for Climate Change in Japan and China" on 12th July 2013

1. On July 12, 2013 an Environmental Policy Seminar entitled "Policy for Climate Change in Japan and China" was held at room D-201 of the Hokkaido University Graduate School of Environmental Science. The seminar was co-hosted by Ministry of the Environment, Japan, and the Faculty of Environmental Science, Graduate School of Environmental Science, Public Policy School, and the Sustainable Low-Carbon Society Project of Hokkaido University.

2. At the opening address, Professor Noriyuki Tanaka, director of the Division of Environmental Science Development of the Graduate School of Environmental Science emphasized that the problems of the global environment, including climate change, cannot be solved by the efforts of a single country, therefore it is important to seek solutions through discussion among many countries. Professor Tanaka expressed the view that the relationship between Japan and China is very important and the dialog among specialists conducted before the seminar had been very significant. Professor Tanaka next presented an outline of the activities of the Faculty of Environmental Science and Graduate School of Environmental Science, Hokkaido University as well as details of the objectives of the seminar. He concluded his speech expressing the wish that the seminar would be an opportunity for participants to think about what they can achieve by learning from the attending specialists as it is the duty of each and everyone to carry out activities to help alleviate problems arising from climate change.

3. The first item on the program of the seminar was a presentation by Liu Qiang, Director and Associate Professor, Strategy and Planning Department, National Center for Climate Change Strategy and International Cooperation. He reported the present situations around energy consumption and carbon dioxide emissions in China, and talked about the present efforts and situation related to climate change in China under the title "The Latest Trends in Measures related to Climate Change in China". The report detailed how the Chinese government has designated some areas of China as low carbon emission pilot districts and

carbon offset pilot districts. He emphasized the importance of developing low carbon emission approaches in China by creating new types of industries that feature low carbon energy and emission characteristics and by making urban areas low carbon emitters. Further, Liu Qiang reported details of the "National low carbon day" which was held in China for the first time in June, 2013 and the life styles with low carbon consumption that have been proposed there. At the question period, there were questions about when an emission trading system would be introduced nationwide and what the policies related to a carbon tax in China would be like. He answered that for the emission trading system the government has conducted investigations in the model districts and that the introduction depends on the progress in the model districts, and that for a carbon tax, this is still under consideration.

4. The next speaker, Eisaku Toda, Director of the Department of International Cooperation, Global Environment Bureau, Ministry of the Environment, Japan reported on "Japan's Strategic Actions on Climate Change", introducing details of international negotiations related to climate change policies and Japan's domestic and international commitments. Toda noted that Japan is likely to reach the goal of a 6% emission reduction over that of 1990 for the first commitment period, as specified by the Kyoto Protocol of the United Nations Framework Convention on Climate Change, however, Japan will have to further strengthen measures to control carbon emissions after 2013 because there has been increases in emissions since 2009. The talk further detailed the domestic commitments of Japan, including the action plan based on the revision of the Act on Promotion of Global Warming Countermeasures, the implementation of the feed-in tariff for promotion of renewable energy use, and implementation of a carbon tax from 2012, and mentioned the announcement by prime minister Abe to revise the current target that is a 25% emission reduction by 2020 over the emissions of 1990. Related to international commitments, he also provided details of the Bilateral Offset Credit Mechanism
(Joint Crediting Mechanism, JCM) .
At the question period, there were questions about the effort to agree on a Bilateral Offset Credit Mechanism with China and the Clean Development Mechanism (CDM), and he explained that China and Japan are learning from each other here and that both countries are working to strengthen the collaboration through various activities including that of the creation of a low carbon society.

5. Next Gao Hu, Deputy Director, Center for Renewable Energy Development, Energy Research Institute, National Development and Reform Commission reported the details of policies to support and develop renewable energy resources in China including development planning, in a talk entitled "The Present Situation and Future Strategies for Renewable Energy Development in China". He reported that China has established a policy framework which promotes renewable energy development by a Renewable Energy Law, and that China is in a major, large-scale development phase. For renewable energy development, China has set the target for 2015 (amount of renewable energy equivalent to 400 million tons of coal, accounting for more than 9.5% of the total energy consumption). For renewable energy, such as hydro power, wind, sunlight, and biomass, China has set goals for such energy sources for 2015: an installed capacity of 100 million kW, and 190 billion kWh of annual energy production for wind power generation, with photovoltaic installations that generate 10 million kW. The speaker also reported that China has addressed the institutional and technological challenges, with an emphasis on the necessity of promoting renewable energy through technological innovation.

6. Professor Fumikazu Yoshida of the Graduate School of Economics and Business Administration, Hokkaido University, introduced his work under the title "Perspectives of a sustainable low-carbon society in Japan and Hokkaido ", focusing on the characteristics and conditions surrounding renewable energy, and the potential for developing renewable energy in Japan, specifically the very large potential offered by Hokkaido, including the variety of committed installations for generating renewable energy in various parts of Hokkaido. Professor Yoshida summarized the issues and problems with existing projects related to renewable energy as follows: (1) to train enthusiastic leaders and competent talented people, because excellent facilities can be constructed with subsidies for the projects under government initiatives, but it is difficult to operate and maintain such facilities, and also to pay attention to collaboration with local industries including forestry, agriculture, and dairy farming to ensure priority to providing benefits for the immediately surrounding region, (2) residents must be involved in projects from the location planning stage to ensure a return of benefits to the region, and to institutionalize the Denmark-type obligation of local communities controlling a share of the projects, and (3) power generation has to be carried out involving local residents because there is not sufficient grid capacity and there are limits to the energy volumes that power companies have to purchase from producers. Therefore, it is essential that power companies fulfill their duty to purchase the electricity with a feed-in tariff (FIT) by giving producers involving local residents priority to connect to the gird.

At the conclusion, professor Yoshida emphasized the importance of considering the "electricity crisis" to be an opportunity to develop new energy sources that can be developed in close proximity to communities, and revitalizing local areas by saving energy and generating renewable energy.
At the question period, there were questions about problems related to renewable energy in Japan, professor Yoshida pointed out that the problems in Japan arise as there is no clear long-term goal for renewable energy development, unlike that existing in China.

7. The last presenter, Yasuko Kameyama, the chief of the Sustainable Social System Study team, the Social Environment System Research Center of the National Institute for Environmental Studies delivered a report entitled the "On the Post 2020 International Institution: Its Implications for China and Japan". Firstly, she summarized the present situation growing out of the recent international negotiations over climate change issues, and reported the results of an international web-based question naire about international frameworks which aim to arrive at an agreement in 2015 based on the Durban agreement of 2011. The questionnaire was conducted targeting researchers, international institutions, and consultants in January and February, 2013. The responses from 100 suggested that the next framework should be based on a new protocol, include a carbon market in some form, and set up a funding aid mechanism for developing nations with a large investment from the private sector. However, there are significant differences between the positions of developed and developing nations as well as there are regional differences.
Kameyama also summarized a policy dialogue conducted by specialists of Japan and China and carried out prior to the present seminar as: (1) because there are countrie s that prefer a framework other than a new protocol, it is necessary to establish measures to ensure that it is legally binding together with other legal arrangements, (2) although the level of emission reduction targets is set by decisions of each country, this emission level may not be the lowest possibly; therefore, it is important to be able confirm the sufficiency of reduction targets, and that (3) the participants arrive at a consensus that will ensure that all countries will make efforts to develop a low-carbon society, and establish a policy package which also contributes to purposes other than climate change by learning from successful policies for climate change pursued by other countries.

8. The seminar was concluded with a closing address by Eisaku Toda, the Director of the Department of International Cooperation, Global Environment Bureau of the Ministry of the Environment, Japan. He stressed the importance of the seminar as very meaningful because a variety of commitments and developments in climate change policy and renewable energy

in China as well as community-based activities for renewable energy in Hokkaido were reported, and expressed the wish that the seminar will be of help for participants to conduct research, business, and policy development.

9. With about 100 participants from Hokkaido University as well as other institutions, the participants and lecturers engaged in active discussion in this seminar. With the detailed expositions and reports of policies related to climate change and renewable energy presented here by leading experts and practitioners from Japan and China, this seminar became a valuable opportunity for us to understand the present situation, thinking about and sharing the problems that we are facing.

Note: This report has been drawn-up and edited by the Sustainable Low Carbon Society Project, Hokkaido University and the views expressed in this report are not necessarily those of the individuals and their home institutions.

Presentation Materials

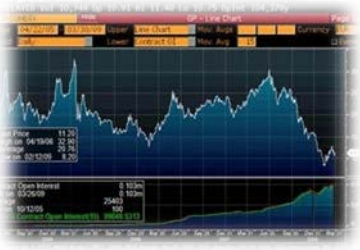
1. The Latest Trends in Measures related to Climate Change in China
Liu Qiang, Director and Associate Professor, Strategy and Planning Department, National Center for Climate Change Strategy and International Cooperation

2. Japan's Strategic Actions on Climate Change
Eisaku Toda, Director of the Department of International Cooperation, the Global Environment Bureau, Ministry of the Environment, Japan

3. The Present Situation and Future Strategies for Renewable Energy Development in China
Gao Hu, Deputy Director, Center for the Renewable Energy Development, Energy Research Institute, National Development and Reform Commission

4. Perspectives of a sustainable low-carbon society in Japan and Hokkaido
Fumikazu Yoshida, Professor of the Graduate School of Economics and Business Administration, Hokkaido University

5. On the Post 2020 International Institution: Its Implications for China and Japan
Yasuko Kameyama, chief of the Sustainable Social System Study Team, Social Environment System Research Center, National Institute for Environmental Studies


仮訳

中国における気候変動対策の最新動向

劉　強

戦略計画研究部

国家気候変動対応戦略研究・国際協力センター

2013年7月

主な内容

NCSC

仮訳

- 中国のエネルギー消費及び炭素排出の現状
- 中国の気候変動対策の道のり
- 中国の気候変動対策の現状

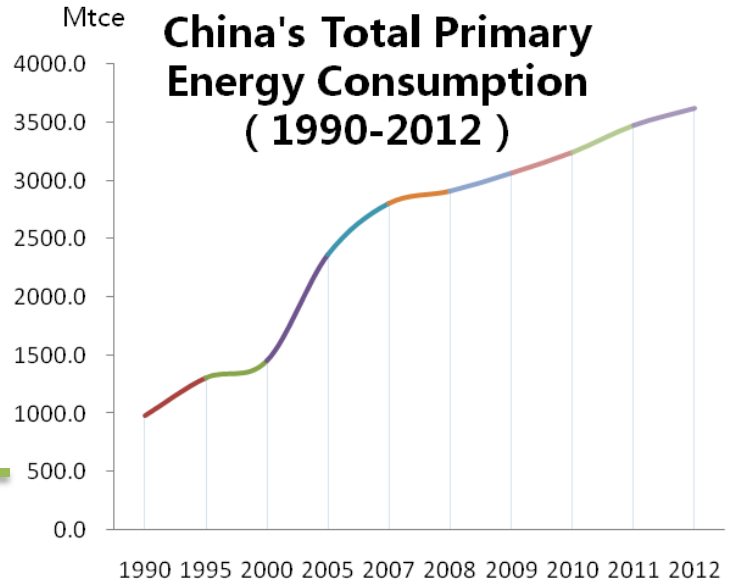
エネルギー消費の現状

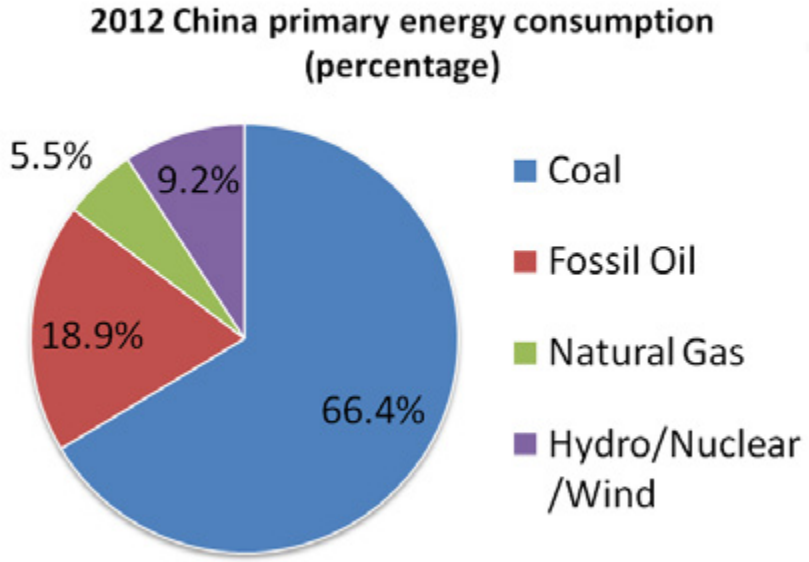
NCSC

仮訳

エネルギー消費の急増

- 2012年の消費は石炭換算36.2億トン、前年比4.0%増
- 2020年に中国のエネルギー需要は石炭換算約47～50億トンに達する見込み





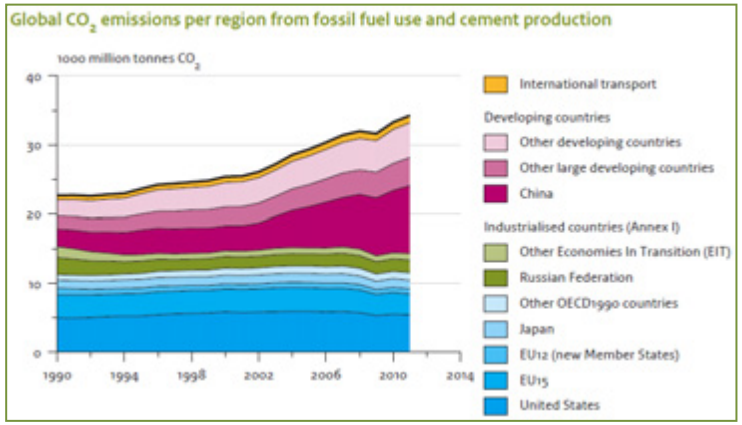
化石エネルギー消費の割合が高い

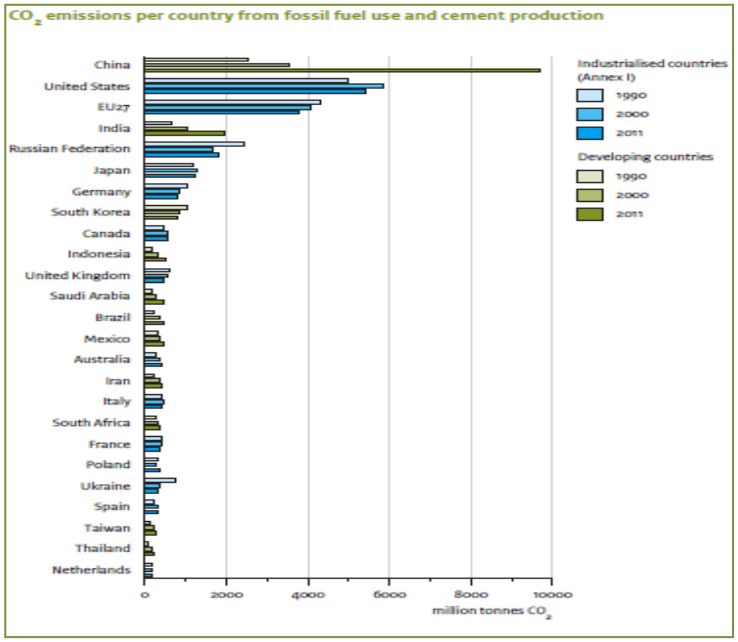
- 2012年の中国において石炭が一次エネルギー消費に占める割合は66.4%
- クリーンエネルギーが一次エネルギー消費に占める割合は約9.2%

炭素排出の現状

NCSC

仮訳





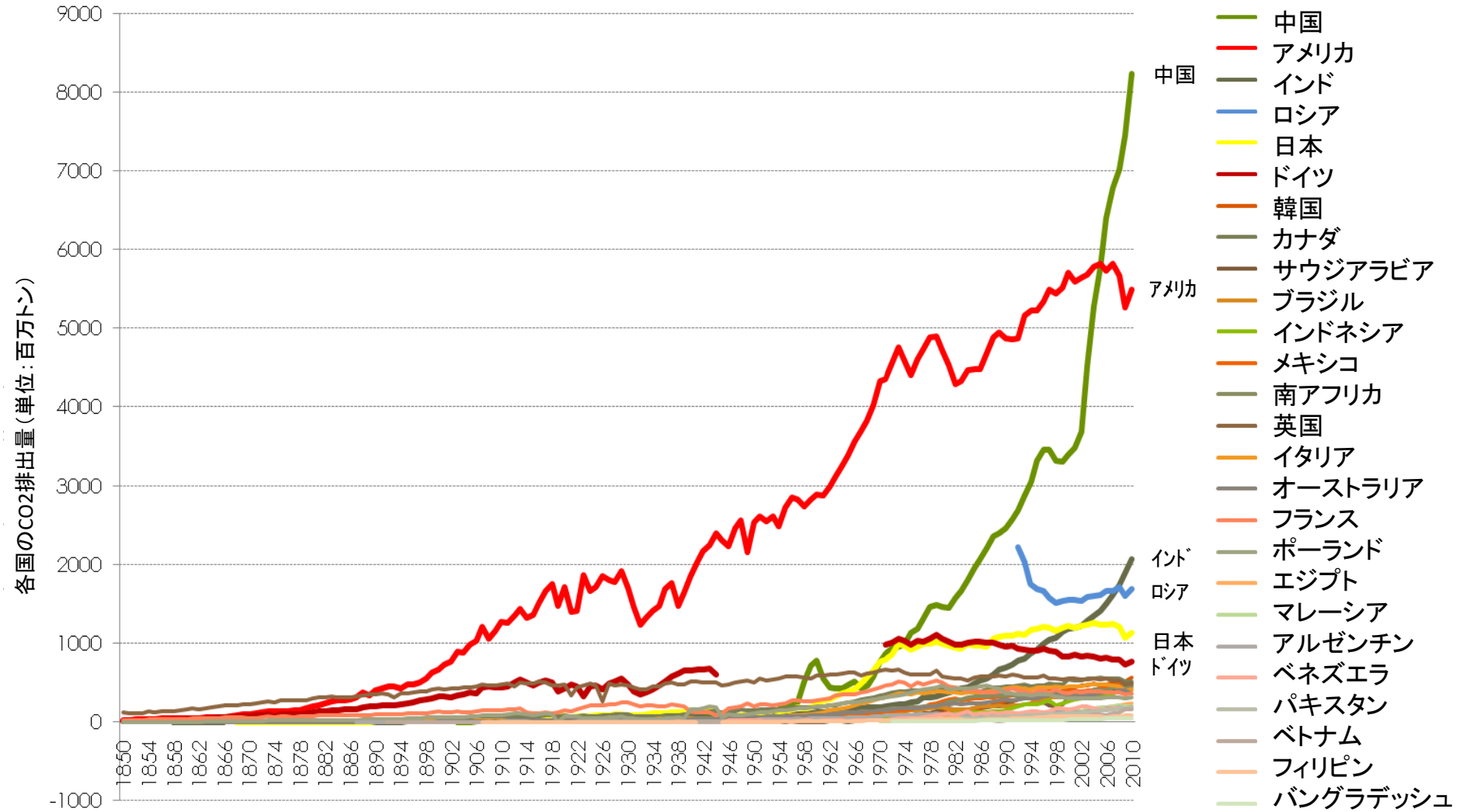
- 2011年、全世界のCO2排出量は既に340億トンに達し、前年比3%増
- 中国（29%）、アメリカ（16%）、EU（11%）、ロシア（5%）、日本（4%）は排出大国の上位5カ国
- 2011年、中国の一人当たりCO2排出量は7.2トン／年であり、前年比9%増

Source出典: *Trends in Global CO2 Emissions 2012 Report. Jos G.J. Olivier, Greet Janssens-Maenhout, Jeroen A.H.W.Peters. PBL Netherlands Environmental Assessment Agency, The Hague Bilthoven, 2012.*

炭素排出変化の傾向

NCSC

仮訳



出典：CO2排出量データは主にCarbon Dioxide Information Analysis Center (CDIAC) 及びOak Ridge National Laboratory, 2011より。
化石燃料を燃焼及びCO2セメント製造工程で発生したCO2を含む。
ドイツの1971～1990年のデータはIEA, CO2 Emissions from Fuel Combustion 2011より。

仮訳

中国の気候変動

対策の道のり

中国の気候変動対策の道のり

NCSC

仮訳

- 《中国気候変動対応活動方案》(2007)
- 国務院が2020年の温室効果ガス排出規制行動目標を設定した(2009)
  - 2020年までに国内総生産当たりの二酸化炭素排出を2005年比で40～45%減
  - 2020年までに中国における非化石エネルギーが一次エネルギー消費に占める割合を15%前後
- 《中国国民経済・社会発展第12次五ヵ年計画綱要》(2011)
  - 初めて国内総生産当たりの二酸化炭素排出を17%削減することを制約的指標とした
  - 国内総生産当たりのエネルギー消費を16%削減し、非化石エネルギーが一次エネルギー消費に占める割合を11.4%まで増加する
  - 省レベル地方政府も相応の原単位の削減目標を制定した
- 《第12次五ヵ年計画期間における温室効果ガス排出規制活動方案》(2011)

仮訳

第12次五ヵ年計画目標

第11次五ヵ年計画の省エネ・排出ガス削減状況及び第12次五ヵ年計画の省エネ・排出ガス削減目標

第11次五ヵ年計画

	2005年レベル比の削減目標	実質削減率	2010年レベル比の削減目標
GDP当たりのエネルギー消費削減	20%	19.1% →	16%
工業総生産当たりの水消費量	30%	31.3% →	30%
化学的酸素要求量 (COD)	10%	12.45% →	8%
二酸化硫黄 (SO2)	10%	14.29% →	8%

第12次五ヵ年計画

	目標（2010年レベル比）
GDP当たりのCO2排出原単位削減率	**17%**
非化石エネルギー比率	**11.4%**
戦略的新興産業増加率	**8%** (推定)
2015年エネルギー消費量	**石炭換算40億トン** (推定)

第12次五ヵ年計画内のエネルギー政策

仮訳

第12次五ヵ年エネルギー計画目標

エネルギー総量	• エネルギー消費原単位及び消費総量のデュアルコントロールを実施し、2015年までにエネルギー消費総量を**石炭換算40億トン**まで規制する
化石エネルギー	• 天然ガスが一次エネルギー消費に占める割合を**7.5%**まで引き上げ、石炭消費の割合を**65%**前後まで削減する
非化石エネルギー	• 非化石エネルギー消費の割合を**11.4%**まで引き上げ、非化石エネルギー発電出力の割合を**30%**にする
電力消費量	• 2015年までに年間電力消費量を**61500億キロワット時**にする
シェールガス	• 2015年までに年間生産量を**65億立方メートル**、2020年までに**600～1000億立方メートル**にする
炭層メタン	•2015年までに年間生産量を300億立方メートルにする

7つの戦略新興部門の中で、3つはグリーン技術とクリーンエネルギーに直接関連する

省エネとエコ	• Energy saving equipment, ESCOs, recycling
新エネルギー	• Renewable energies, nuclear, clean coal
エコカー	• EV, PHEV, energy-efficient vehicles, advanced batteries

《第12次五ヵ年温室効果ガス排出規制活動方案》 NCSC

仮訳

多様な規制措置の総合的運用

- 産業構造の調整を加速
- 省エネを全力で推進
- 積極的に低炭素エネルギーを開発
- 炭素吸収源の増加に努める
- 非エネルギー消費活動による温室効果ガスの排出を規制
- 高排出製品の節約と代替を強化

低炭素開発のパイロット地区の展開

- 着実に低炭素省と都市のパイロット地区を推進
- 低炭素産業試験団地のパイロット地区を展開
- 低炭素コミュニティのパイロット地区を展開
- 低炭素商業・製品のパイロット地区を展開
- パイロット地区やパイロット事業に対する支持力を拡大

温室効果ガス排出の統計と算定体系の確立

- 温室効果ガス排出の基礎統計制度を確立
- 温室効果ガス排出算定事業を強化

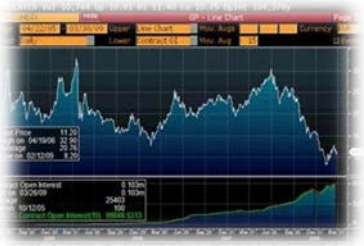
炭素排出量取引市場の検討と確立

- 自発的排出削減取引メカニズムを確立
- 炭素排出権取引のパイロット地区を展開
- 炭素排出量取引サポート体制の確立を強化

その他

- 全社会の低炭素行動
- 国際協力を広く展開
- 科学技術と人材の育成を強化
- 資金保証を確実に実行

仮訳


- 中国低炭素パイロット地区
- 中国炭素取引パイロット地区

低炭素パイロット事業を着実に推進

NCSC

仮訳

低炭素省と低炭素都市のパイロット事業についての通知

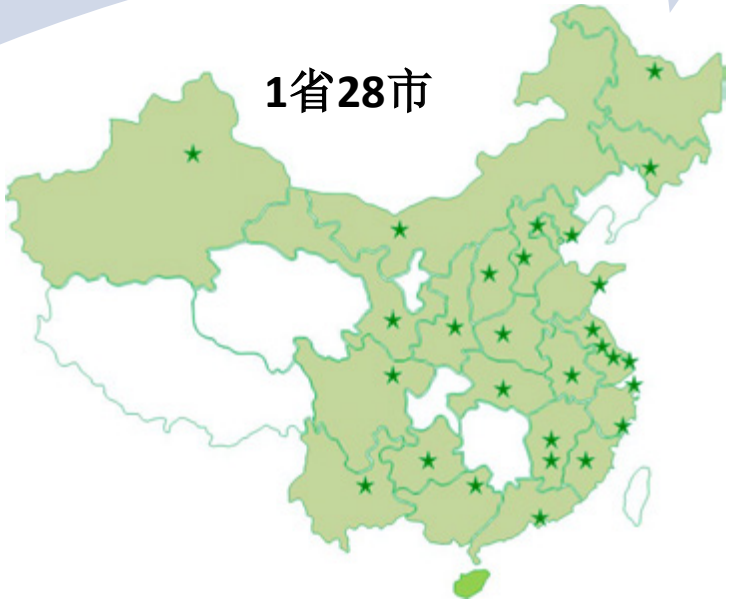
2010.7

第二弾のパイロット地域（省と市）の組織推薦申告についての通知

2012.4

低炭素省と低炭素都市の第二弾パイロット事業についての通知

2012.11



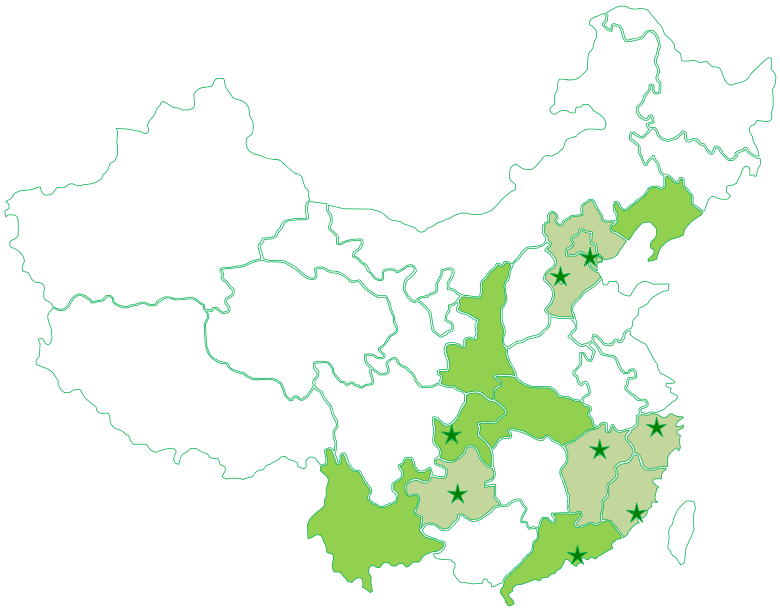
第一弾低炭素パイロット地域の基礎条件

NCSC

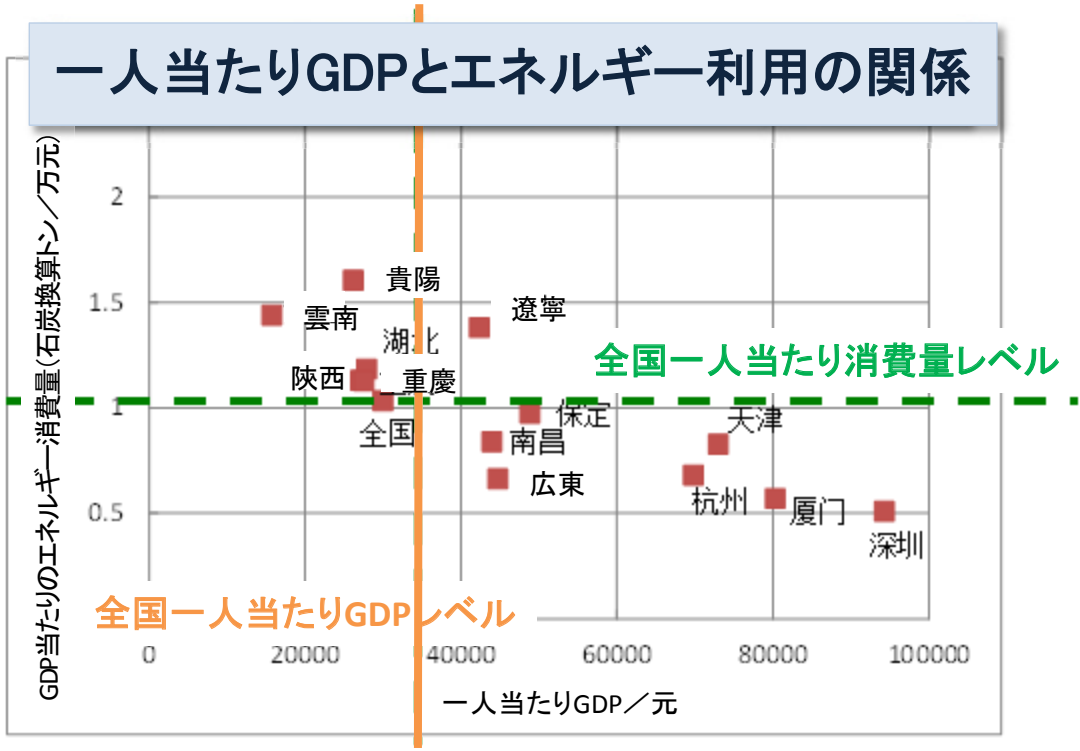
仮訳

- 五省：広東、遼寧、湖北、陝西、雲南
- 八市：天津、重慶、深セン、廈門、杭州、南昌、貴陽、保定

地理分布

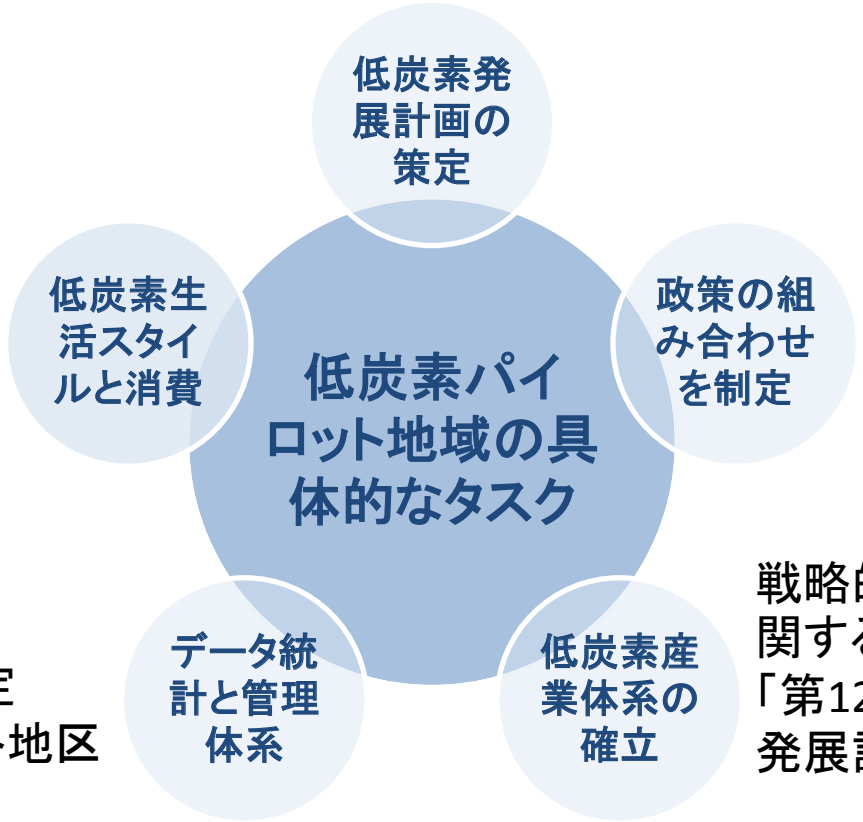


一人当たりGDPとエネルギー利用の関係



低炭素パイロット地区の関連政策 NCSC

仮訳



五省市
炭素排出権取引の
パイロット地区
（2011.10）

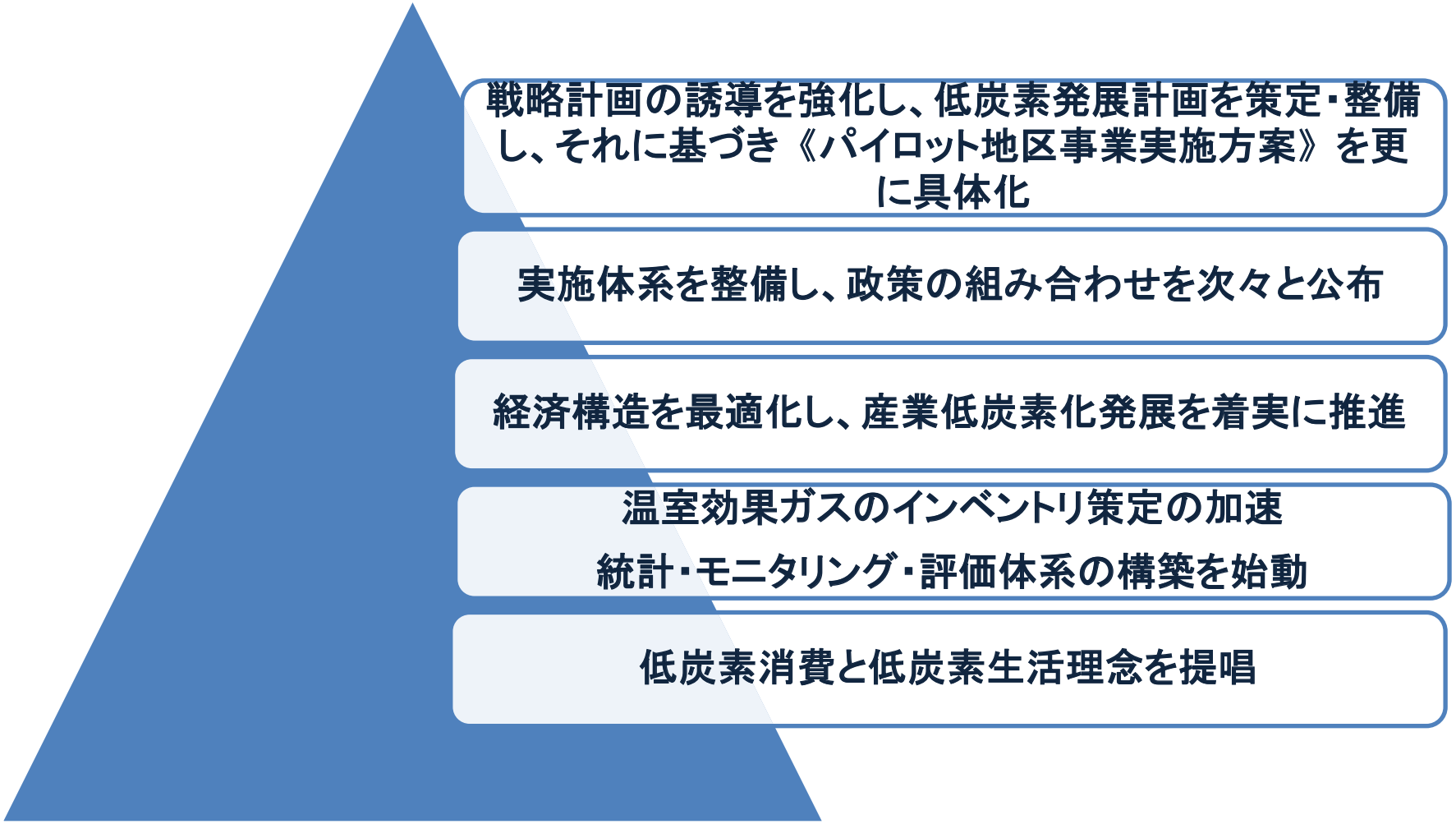
七省市の
リスト策定
パイロット地区
（2010.9）

戦略的新興産業の育成と展開の加速に関する決定（2010.10）
「第12次五ヵ年」国家戦略的新興産業の発展計画（2012.7）

低炭素パイロット地区の事業は、
「石を触りながら川を渡る（慎重にことを運ぶの意）」
各地で先駆けて新たな政策を試行し、
ボトムアップでの低炭素発展のパターンを探索する

低炭素パイロット地域の事業進捗 NCSC

仮訳



中国炭素排出取引パイロット地区の進捗 NCSC

仮訳

中国は国外の炭素排出取引制度の経験を汲み取り、市場メカニズムを革新し、中国ならではの炭素排出取引体系を確立する。

2011年11月、NDRCは北京、天津、上海、重慶、湖北、広東、深センで炭素排出取引パイロット地区の事業を展開することを発表した。

パイロット地域の選択肢は中国東部、中西部及び北部に分布し、様々な産業構造と経済発展水準を有しており、中国のGDPの約3割とCO2排出量の2割を占める。

炭素取引パイロット地区のロードマップ NCSC

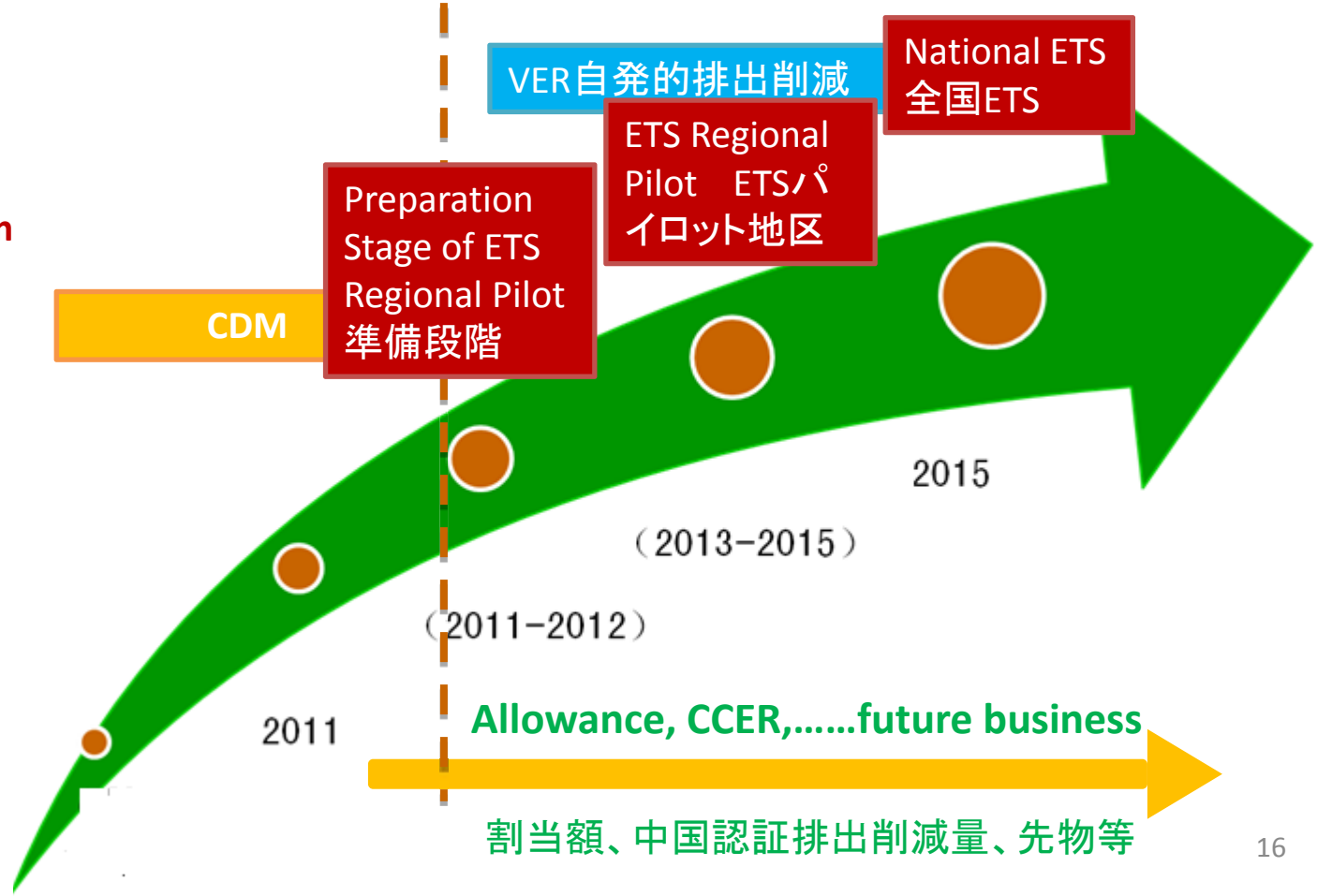
仮訳

Policy
政策的背景

Kyoto Protocol
《京都議定書》

China: Notice *ETS Pilot Program & Local Policy*
中国:ETSパイロット地区作業の通知

China: VER *Interim Measurement*
中国:VER暫定手段



Market mechanism
市場メカニズム

Carbon Finance
カーボン
ファイナンス及び
デリバティブ

パイロット地区のまとめと比較 NCSC

仮訳

パイロット地区の作業内容

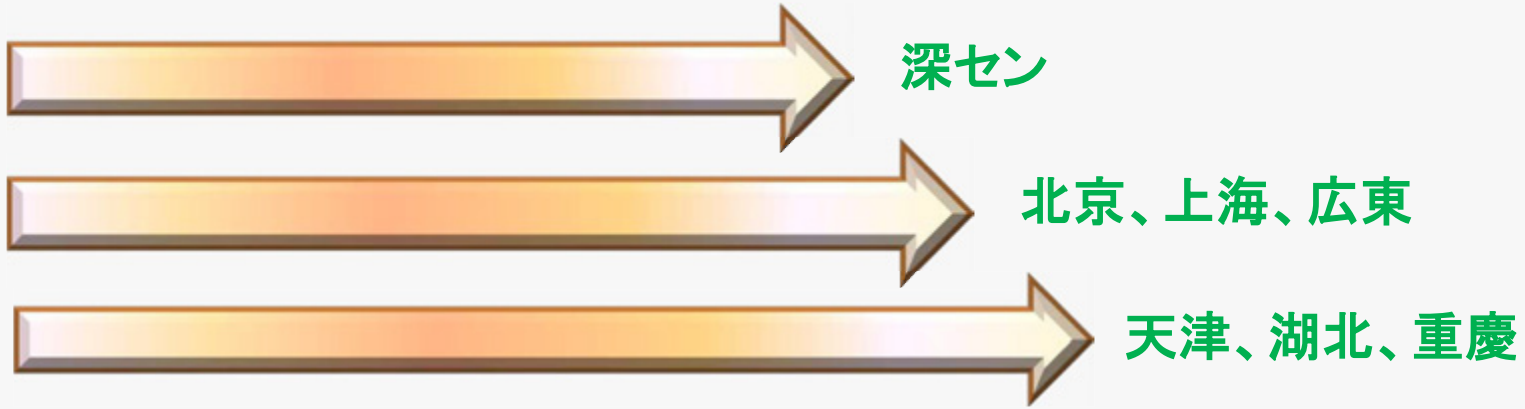
- 地方の法規制を制定
- 排出総量を設定
- 対象領域
- 割当額の配分
- MRV制度
- 取引制度と監理
- 登録簿の体系
- 補償メカニズム
- コンプライアンスメカニズム

既存の問題

- 理念：低炭素の発展と経済成長のバランス
- 制度：法律の基礎固め
- 技術：データ、MRV、企業参加

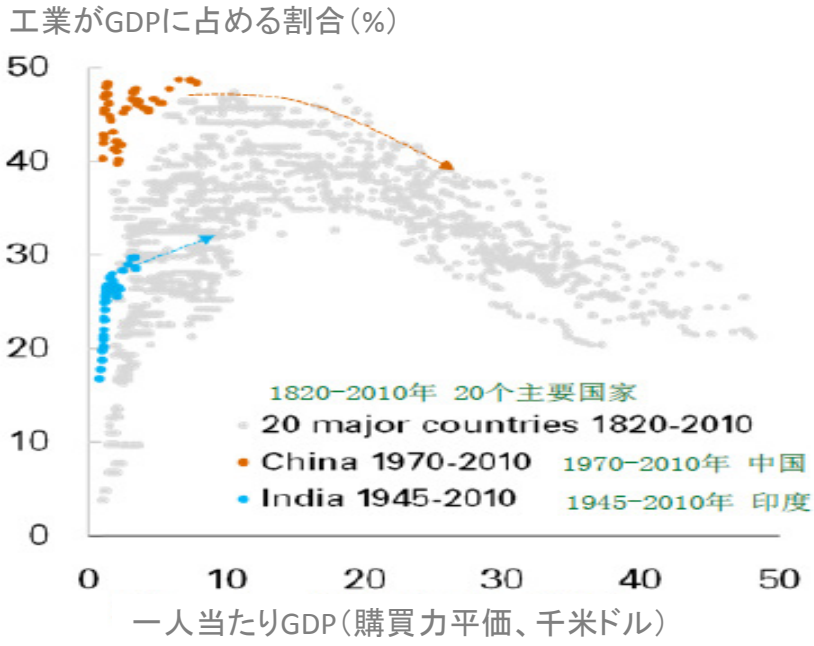
中核的目標：
排出削減のコスト低減、
インセンティブメカニズムの確立

進捗度



仮訳

未来の中国は低炭素発展の道を歩まなければならない！



《BP 2030世界エネルギー展望》

低炭素発展の推進に努める

NCSC

仮訳

低炭素エネルギー化

- エネルギー消費原単位、エネルギー消費総量デュアルコントロールを実施し、行動を促す制度的メカニズムの形成を促進する
- エネルギー構造を最適化し、非化石エネルギーの発展を加速する
- 省エネとエネルギー効率を高め、電力・工業・交通・建築・公共機構等の重点領域の省エネをやり遂げ、エネルギー需要側の監理を強化する

新型工業化

- 経済発展のアプローチの転換を加速させ、産業構造の調整・最適化する
- 工業化、情報化、都市化、農業現代化を並行発展させる
- 戦略的新興産業とサービス業の発展を加速させ、低炭素排出の特徴を持つ産業体系を徐々に形成する
- 産業の発展を最適化し、低炭素産業の試行を強化する

都市の低炭素化

- 集約・智能・グリーン・低炭素の新型都市化の道を歩む
- 科学的に都市体系を配置し、空間配置を最適化する
- 低炭素建築と低炭素交通を全力で強化する
- 低炭素ビジネスと低炭素コミュニティの発展を激励し、関連するパイロット地区を強化する

低炭素生活と低炭素消費の提唱

NCSC

仮訳

- 2013年6月17日は初の「全国低炭素デー」
- テーマ:「省エネ・低炭素を実践、美しい故郷を建設する」
- 低炭素生活:低炭素家庭を築き、低炭素製品を使い、低炭素旅行を奨励する

仮訳

ご清聴ありがとうございました！

liuqiang@ncsc.org.cn

NCSC

中国应对气候变化政策概述

刘 强

战略规划研究部

国家应对气候变化战略研究和国际合作中心

2013年7月

主要内容

NCSC

- 中国能源消费及碳排放现状
- 中国应对气候变化政策历程
- 中国气应对候变化政策现状

能源消耗现状

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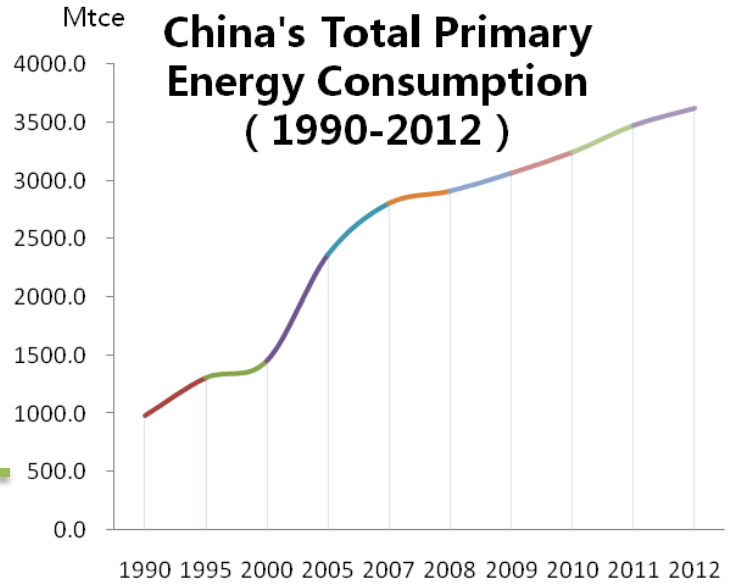
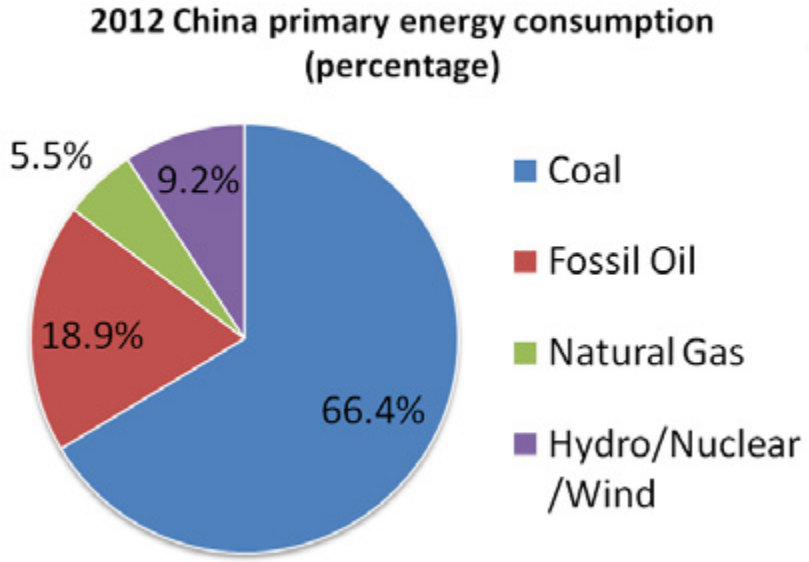
能源消费快速增长

- 2012年消耗36.2亿吨标煤，比上年增长4.0%。
- 预计2020年，中国能源需求将达到约47-50亿吨标煤。

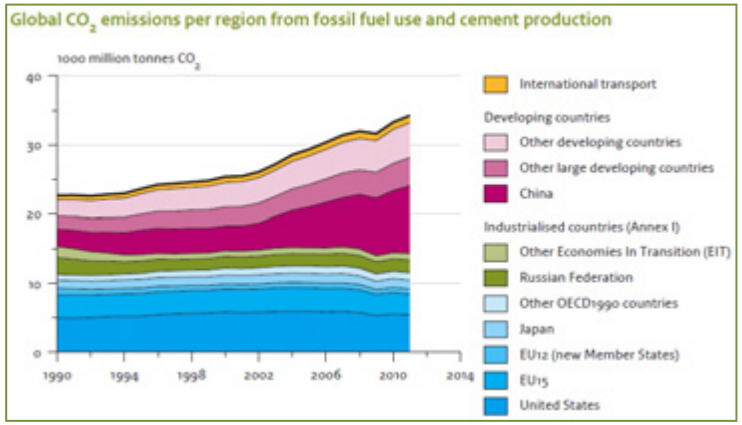


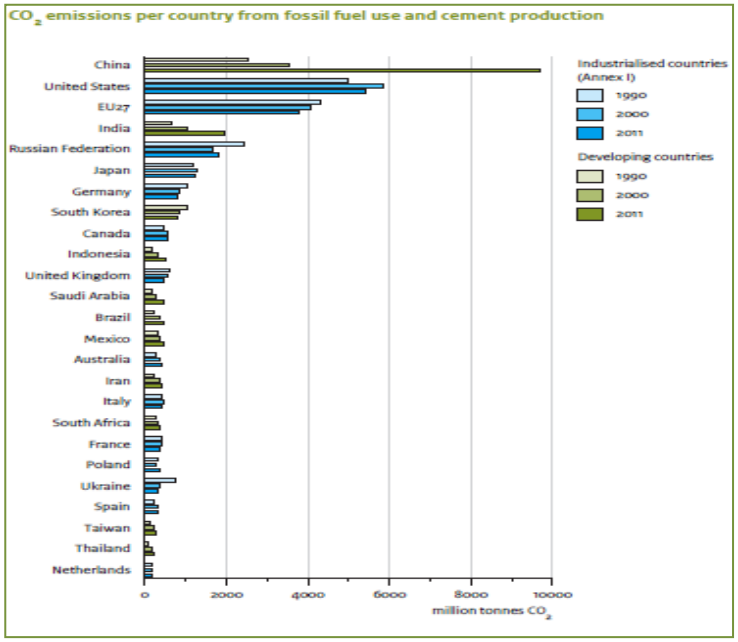


化石能源消费占比较高

- 2012年中国消耗煤占消耗一次能源的比例为66.4%
- 清洁能源占消耗一次能源比例约9.2%。

碳排放现状



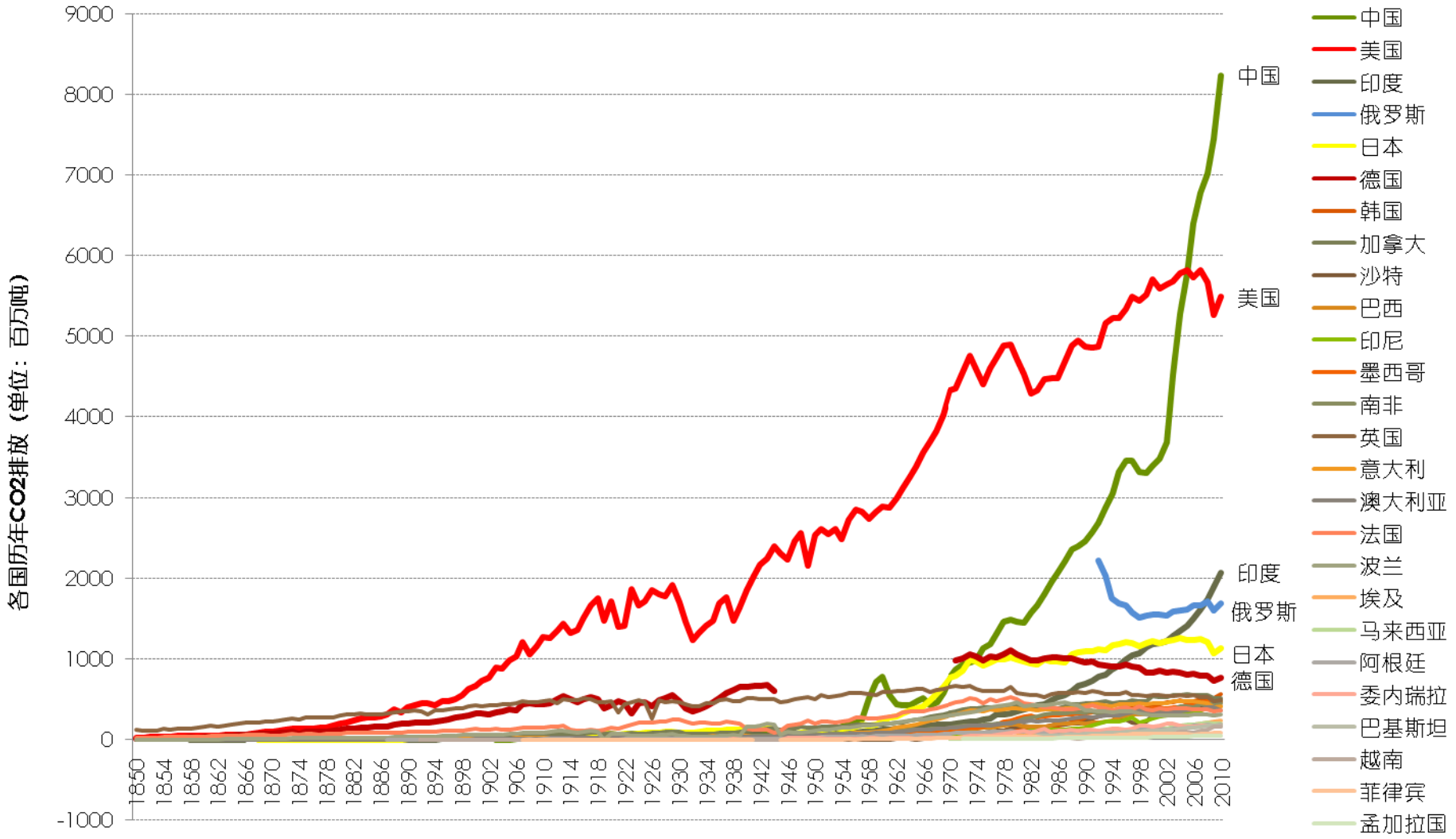


- 全球2011年CO2排放已达340亿吨，比上年增长3%。
- 中国（29%）、美国（6%）、欧盟（11%）、俄罗斯（5%），日本(4%)是全球前5位排放大国
- 2011年，中国人均CO2排放量为7. 2吨/年，比上年增长9%

Source数据来源: *Trends in Global CO2 Emissions 2012 Report. Jos G.J. Olivier, Greet Janssens-Maenhout, Jeroen A.H.W.Peters. PBL Netherlands Environmental Assessment Agency, The Hague Bilthoven, 2012.*

碳排放变化趋势

NCSC



数据来源：CO2排放数据主要来自二氧化碳信息分析中心(Carbon Dioxide Information Analysis Center，CDIAC)，美国橡树岭国家实验室（Oak Ridge National Laboratory），2011，包含化石燃料燃烧的CO2和水泥工艺过程的CO2。德国1971-1990年数据来自IEA, CO2 Emissions from Fuel Combustion 2011

中国应对气候变化政策历程

中国气候变化政策历程

NCSC

- 《中国应对气候变化工作方案》（2007）
- 国务院研究确定了2020年控制温室气体排放的行动目标（2009）
  - 到2020年中国单位国内生产总值二氧化碳排放比2005年下降40%-45%
  - 到2020年中国非化石能源占一次能源消费的比重达到15%左右；
- 《中国国民经济和社会发展十二五规划纲要》（2011）
  - 首次将单位国内生产总值二氧化碳排放降低17%作为约束性指标
  - 单位国内生产总值能耗降低16%，非化石能源占一次能源消费比重达到11.4%
  - 省级地方政府也制定了相应的碳强度减排目标
- 《十二五控制温室气体排放工作方案》（2011）

十二五规划目标

及十一五节能减排情况及十二五规划中的节能减排目标

十一五规划

	相比2005年水平的下降目标	实际下降率	相比2010年水平下降率
单位GDP能耗降低	20%	19.1% →	16%
单位工业产出消耗水量	30%	31.3% →	30%
化学需氧量(COD)	10%	12.45% →	8%
二氧化硫(SO2)	10%	14.29% →	8%

十二五规划

	目标(与2010水平相比
单位GDP的CO2排放强度下降率	**17%**
非化石能源比例	**11.4%**
战略新型产业增加值	**8%** (预期性)
2015年能耗总量	**40亿吨标煤** (预期性)

十二五规划中的能源政策

十二五能源规划目标

能源总量	• 实施能源消费强度和消费总量双控制，到2015年能源消费总量控制在**40亿吨标煤**
化石能源	• 天然气占一次能源消费比重提高到**7. 5%**，煤炭消费比重降低到**65%**左右
非化石能源	• 非化石能源消费比重提高到**11. 4%**，非化石能源发电装机比重达到**30%**
用电量	• 到2015年年用电量达到**6.15万亿千瓦时**
页岩气	• 2015年前年产量达到**65亿立方米**，2020年前达到**600-1000亿立方米**
煤层气	•2015年前年产量达到**300**亿立方米

7个战略新兴部门中的3个与绿色技术和清洁能源直接相关

节能和环保	• Energy saving equipment, ESCOs, recycling
新能源	• Renewable energies, nuclear, clean coal
新能源汽车	• EV, PHEV, energy-efficient vehicles, advanced batteries

《十二五控制温室气体排放工作方案》

NCSC

综合运用多种控制措施

- 加快调整产业结构
- 大力推进节能降耗
- 积极发展低碳能源
- 努力增加碳汇
- 控制非能源活动温室气体排放
- 加强高排放产品节约与替代

开展低碳发展试验试点

- 扎实推进低碳省区和城市试点
- 开展低碳产业试验园区试点
- 开展低碳社区试点
- 开展低碳商业、产品试点
- 加大对试验试点工作支持力度

建立温室气体排放统计核算体系

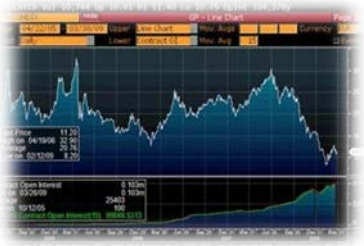
- 建立温室气体排放基础统计制度
- 加强温室气体排放核算工作

探索建立碳排放交易市场

- 建立自愿减排交易机制
- 开展碳排放权交易试点
- 加强碳排放交易支撑体系建设

其它

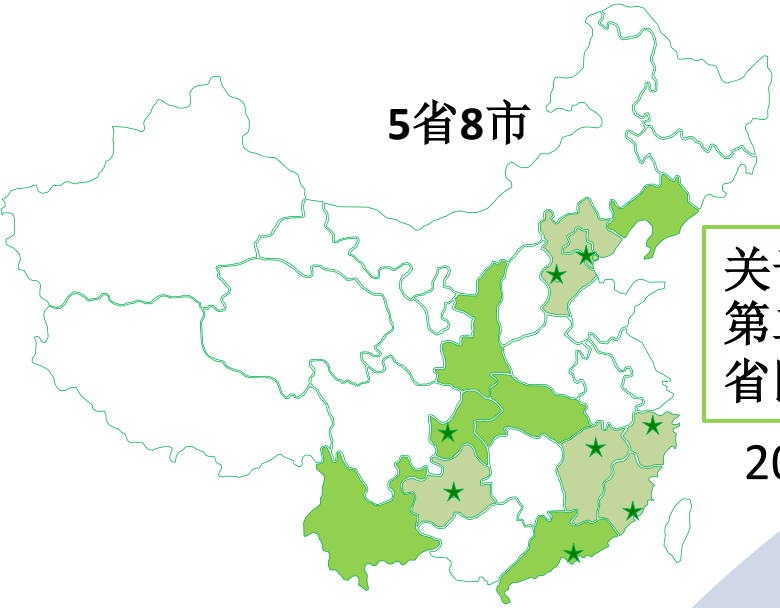
- 全社会低碳行动
- 广泛开展国际合作
- 强化科技及人才支撑
- 落实资金保障


- 中国低碳试点
- 中国碳交易试点

低碳试点工作稳步推进

NCSC



关于开展低碳省区和低碳城市试点工作的通知

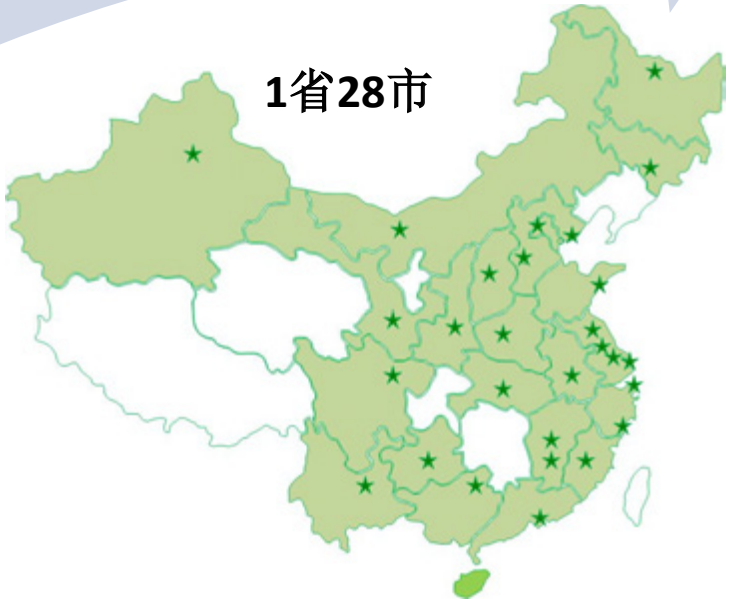
2010.7

关于组织推荐申报第二批低碳试点省区和城市的通知

2012.4

关于开展第二批低碳省区和低碳城市试点工作的通知

2012.11

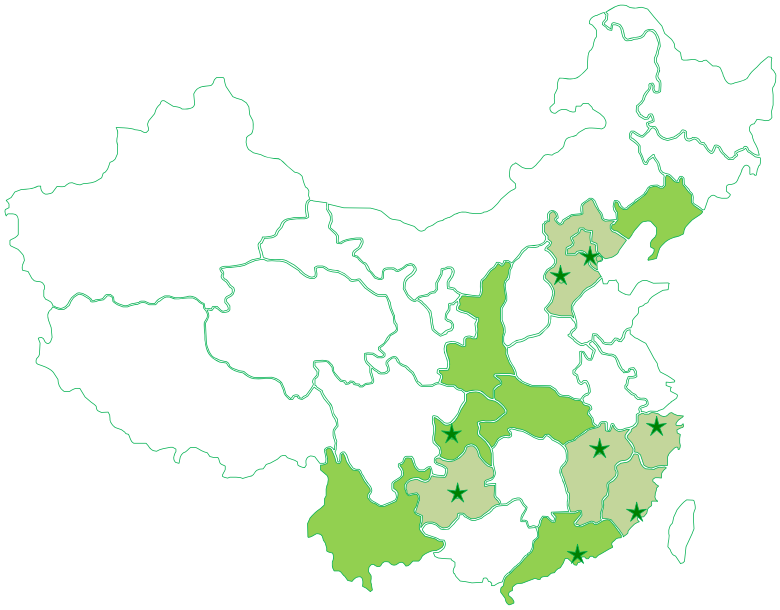


第一批低碳试点地区的基础条件

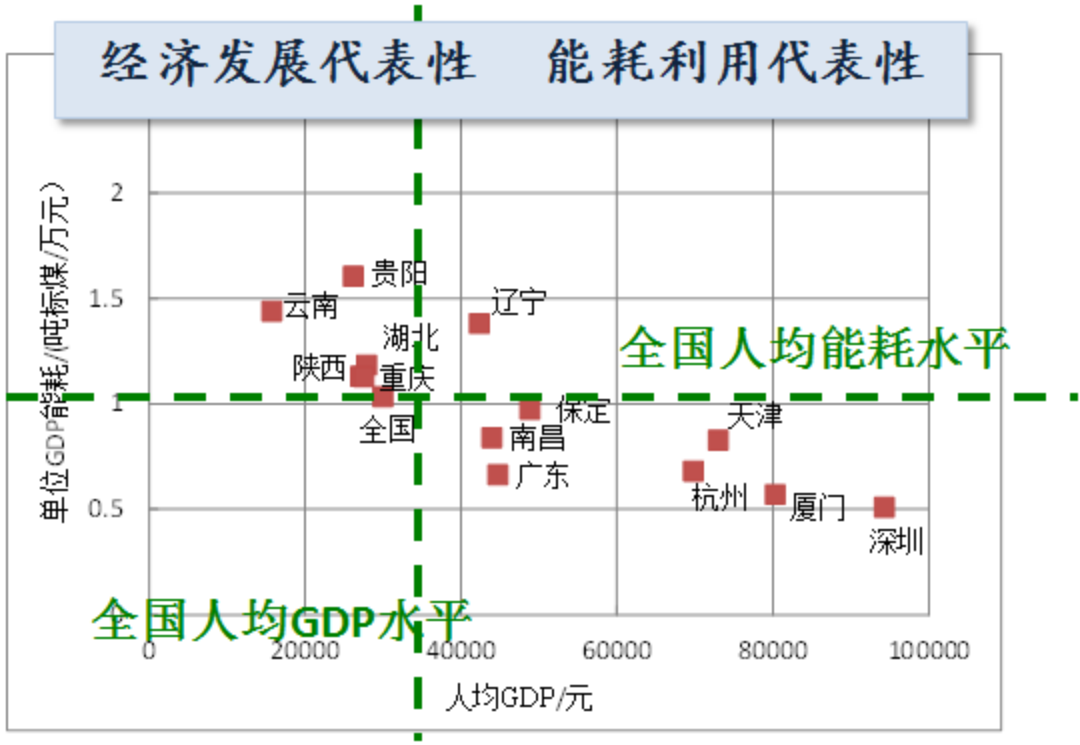
NCSC

- 五省：广东、辽宁、湖北、陕西、云南
- 八市：天津、重庆、深圳、厦门、杭州、南昌、贵阳、保定

地理布局代表性

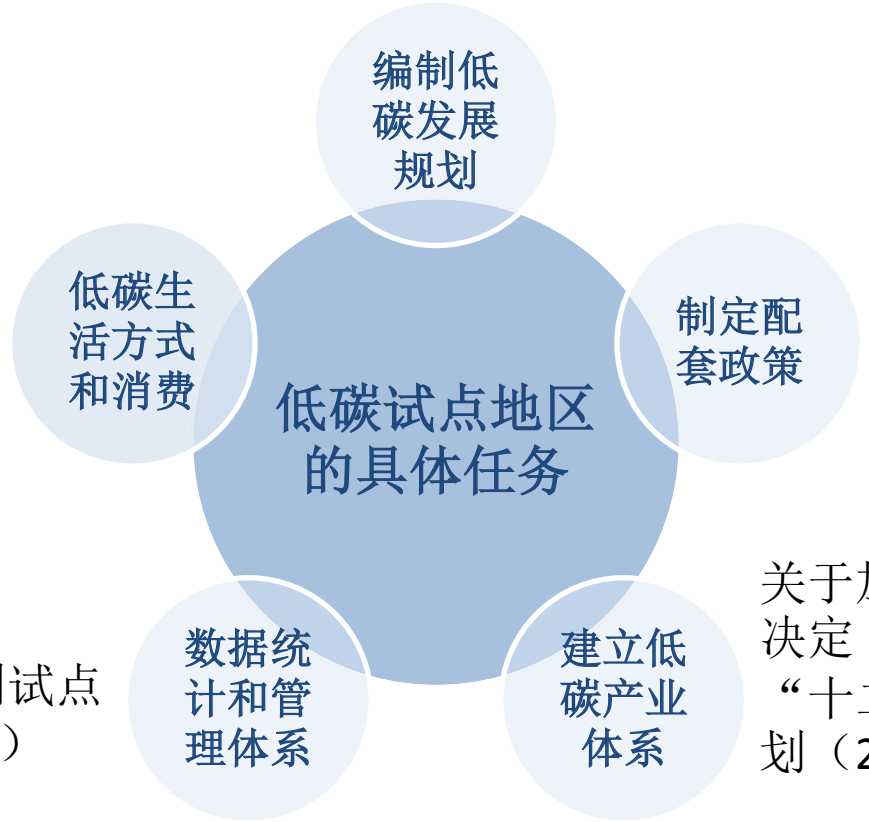


经济发展代表性　能耗利用代表性



低碳试点相关政策

NCSC



五省市
碳排放权交易试点
（2011.10）

关于加快培育和发展战略性新兴产业的决定（2010.10）
“十二五”国家战略性新兴产业发展规划（2012.7）

七省市
清单编制试点
（2010.9）

低碳试点工作是“摸着石头过河”
地方先行先试，自下而上的低碳发展模式探索

低碳试点地区的工作进展

NCSC

加强战略规划引领，编制、完善了低碳发展规划，结合规划进一步细化了《试点工作实施方案》

完善实施体系，支持配套政策陆续出台

优化经济结构，稳步推进产业低碳化发展

加快温室气体清单编制

启动统计、监测与考核体系建设

倡导低碳消费和低碳生活理念

中国碳交易试点进展

NCSC

中国将汲取国外碳排放交易制度的经验，创新市场机制，建立具有中国特色的碳排放交易体系。

2011年11月，NDRC宣布：在北京、天津、上海、重庆、湖北、广东和深圳开展碳排放交易试点工作。

试点地区的选择具有。试点地区分布于中国东、中、西和北部，具有不同的产业结构和经济发展水平，占中国约30%的GDP和20%的CO2排放量。

碳交易试点路线图

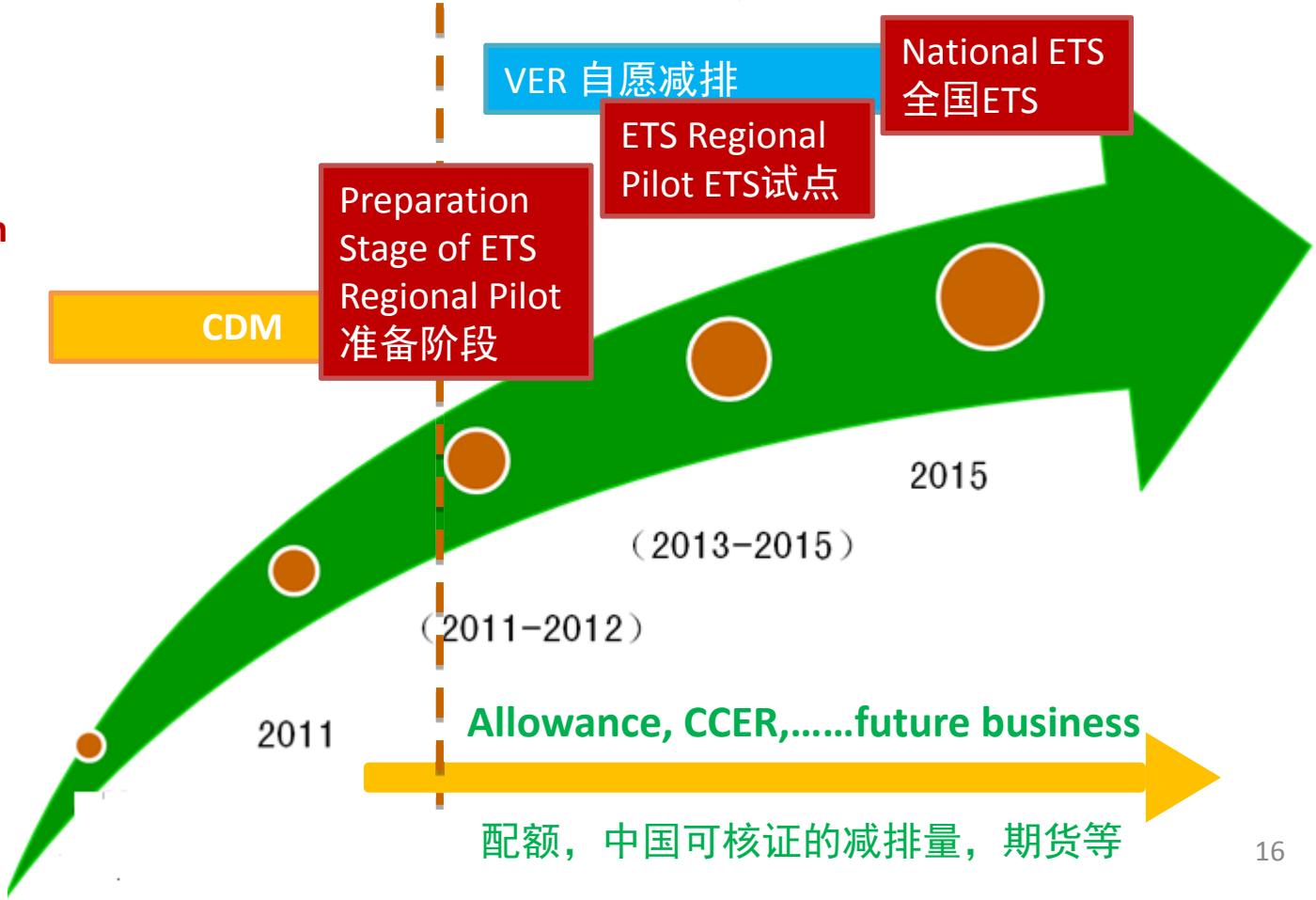
NCSC

Policy
政策基础

Kyoto Protocol
《京都议定书》

Cihina: Notice *ETS Pilot Program & Local Policy*
中国：ETS试点工作通知

China: VER *Interim Measurement*
中国：VER暂行办法



Market mechanism
市场机制

Carbon Finance
碳金融及衍生物

试点总结和比较

NCSC

试点工作内容

- 制定地方法律法规
- 设定排放总量
- 覆盖范围
- 配额分配
- MRV 制度
- 交易制度和监管
- 登记簿体系
- 补偿机制
- 遵约机制

存在问题

- 理念：平衡低碳发展与经济增长
- 制度：奠定法律基础
- 技术：数据、MRV、企业参与

核心目标：

降低减排成本、建立激励机制

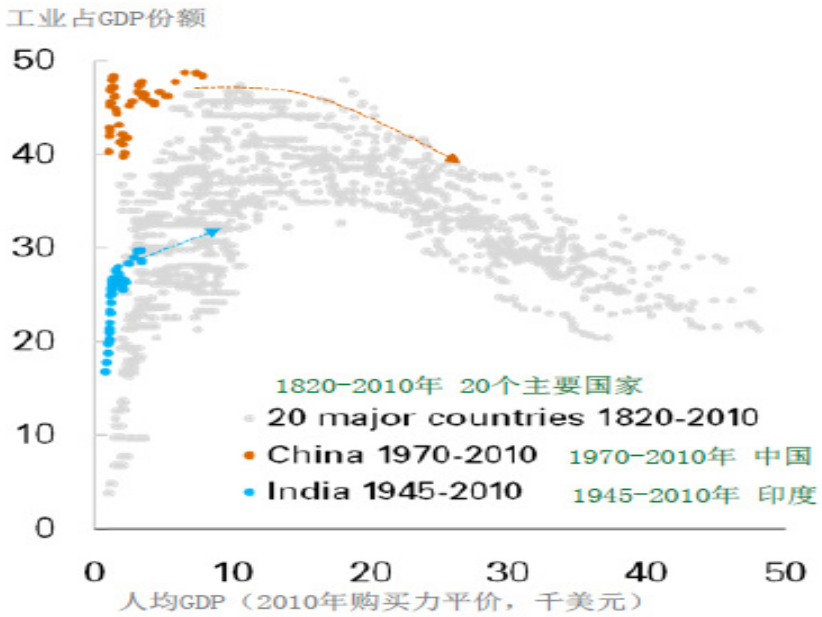
进度

深圳

北京、上海、广东

天津、湖北、重庆

未来中国必须走低碳发展之路！



《BP 2030 世界能源展望》

努力推进低碳发展

NCSC

低碳能源化

- 实施能源消耗强度、能源消费总量双控机制，推动形成倒逼机制
- 优化能源结构，加快发展非化石能源
- 节能和提高能效，做好电力、工业、交通、建筑、公共机构等重点领域节能，加强能源需求侧管理

新型工业化

- 加快转变经济发展方式、调整优化产业结构
- 工业化、信息化、城镇化、农业现代化同步发展
- 加快发展战略性新兴产业和服务业，逐步形成以低碳排放为特征的产业体系。
- 优化产业发展布局，加强低碳产业园区试点

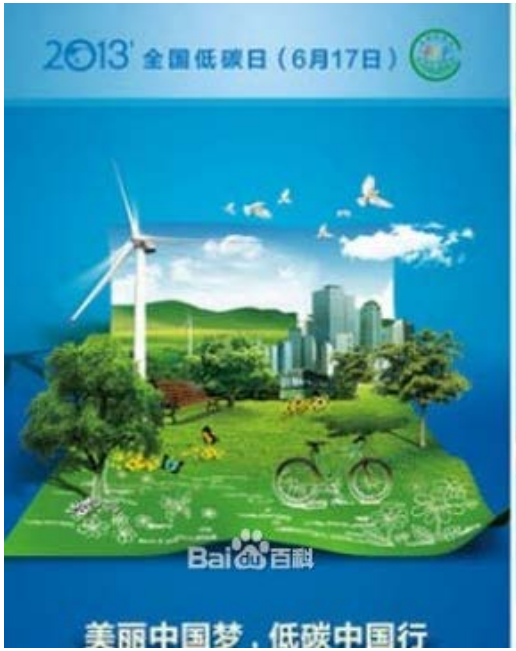
低碳城镇化

- 走集约、智能、绿色、低碳的新型城市化道路
- 科学布局城镇体系，优化空间布局
- 大力加强低碳建筑和低碳交通
- 鼓励发展低碳商业和低碳社区，加强相关试点

倡导低碳生活和低碳消费

NCSC

- 2013年6月17日为首个“全国低碳日”
- 主题：“践行节能低碳，建设美丽家园”
- 低碳生活：打造低碳家庭、使用低碳产品、鼓励低碳出行



谢谢！

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NCSC

Ministry of the Environment
Government of Japan

Doha Climate Gateway: Assessment and Opportunities from the EU and Japanese Perspectives

Japan's Strategic Actions on Climate Change

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Agenda

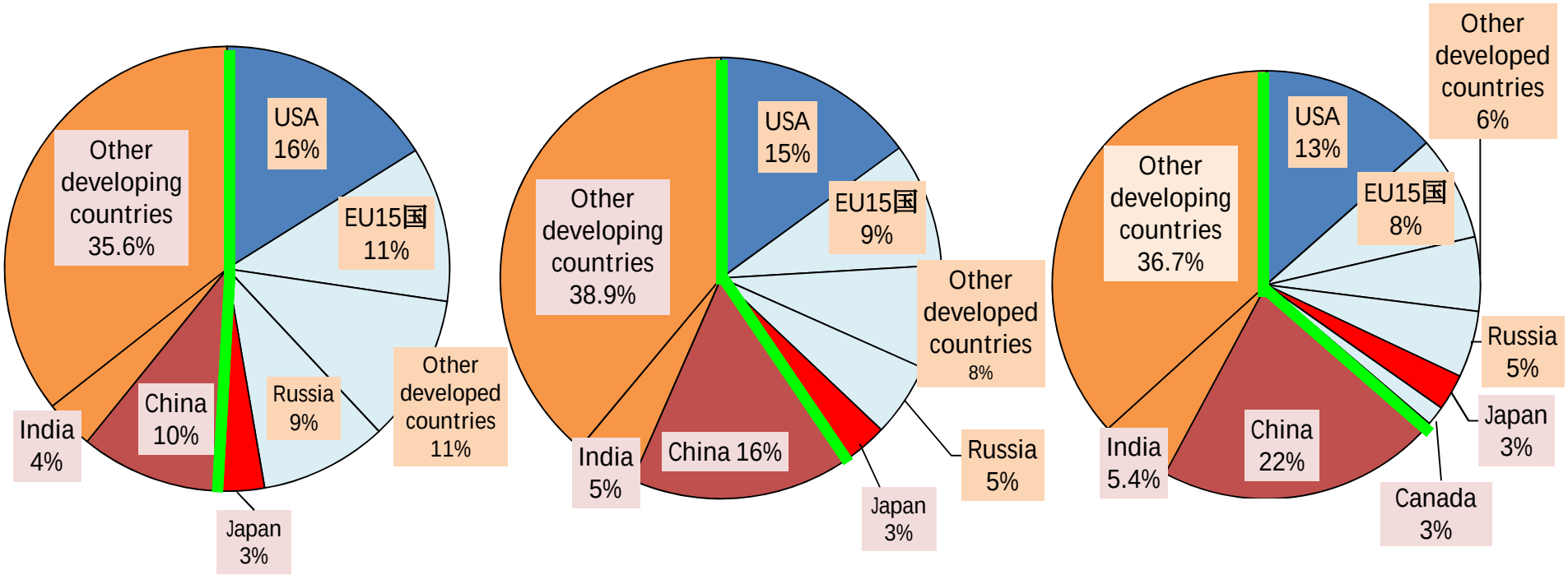
1. Background: Process of International Negotiation on Climate Change
2. Japan’s Actions (Domestic)
3. Japan’s Actions (International)

1. Background: Process of International Negotiation on Climate Change

Change of GHG emission per country

Change of GHG emission in the world (CO2 basis)

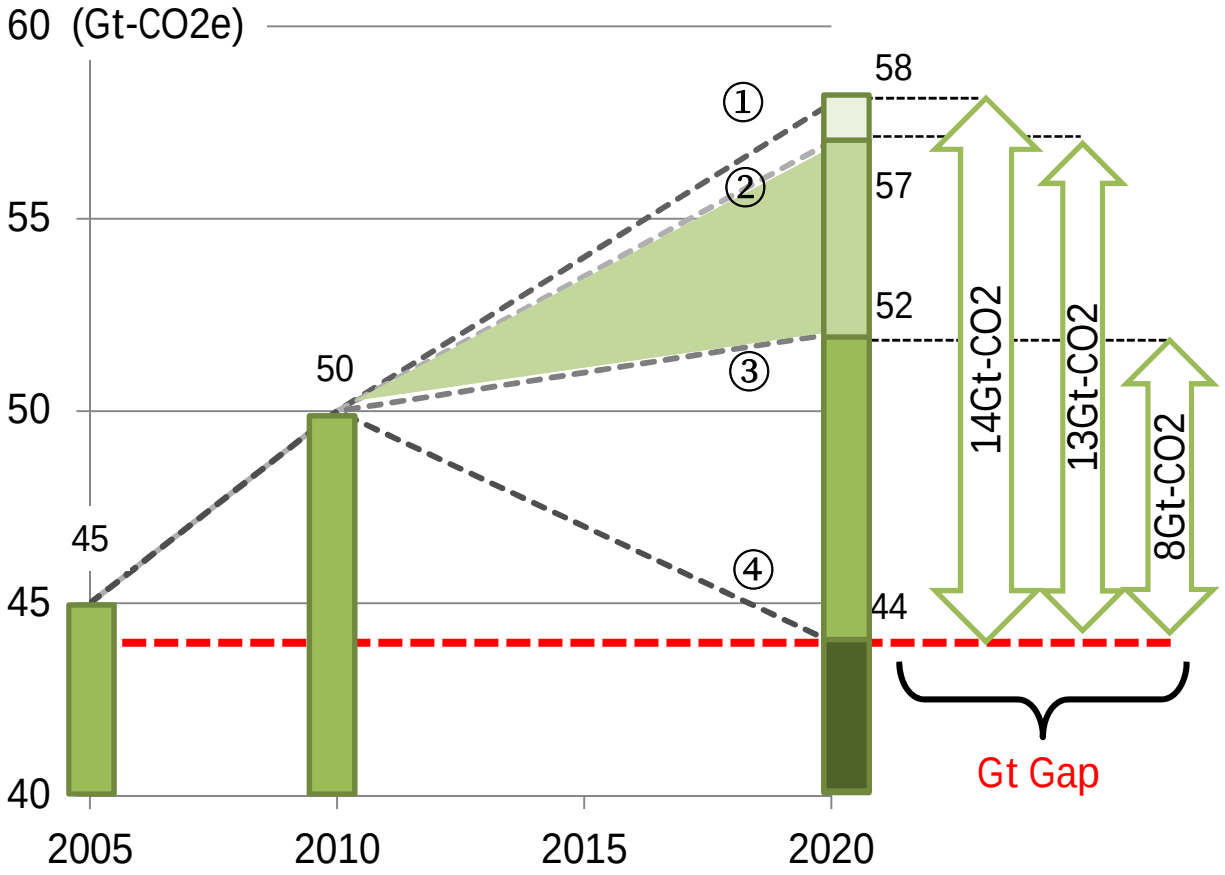
1990: 8 billion ton → 2005: 47 billion ton → 2010: 49.5 billion ton



Source: IEA CO2 EMISSIONS FROM FUELCOMBUSTION 2012EDITION

The Emissions Gap Report 2012
(Published in Nov 2010, Revised in Nov 2012)

- ✓ Emission scenarios analyzed in this report and consistent with a "likely" chance of meeting the 2 degree target have a peak before 2020, and have emission levels in 2020 of about 44 Gt-CO2e
- ✓ Fully implementing the conditional pledges and applying strict rules brings emissions more than 40% of the way from BaU to the 2 degree target
- ✓ From a technical standpoint, the gap can be bridged by 2020



1. business as usual (BAU) (58 Gt)
2. Unconditional pledges, lenient rules (57 Gt)
3. Conditional pledges, strict rules (52 Gt)
4. a "likely" chance of meeting the 2 degree target have a peak before 2020 (44 Gt)

Progress of International Negotiation on Climate change

2007.12 COP13 Bali Action Plan (BAP)

Agreed the adoption of the Bali Road Map, through launching a two-year negotiation process to be finalized in 2009

2009.12 COP15 Copenhagen Accord

Cannot adopt the agreement that Annex I and non-Annex I submit the mitigation targets and actions, and review them

2010.12 COP16 Cancun Agreement

* Japan expressed that it does not participate in the 2nd commitment period of the KP

COP took note targets and actions that Annex I and non-Annex I submit under the Copenhagen Accord based on the compilation of targets and actions as a UN document

2011.12 COP17 Durban Agreement

Agreed that the ADP shall complete its work no later than 2015, and the work will be come into effect and be implemented from 2020

2012.12 COP18 Doha Climate Gateway

Agreed the post-2012 work plan of ADP
-> All parties submit 2020-targets by January 2014 and their targets will be reviewed.

2007.5 Prime Minister Abe (then) "Invitation to Cool Earth 50"

Propose the 50% emission reduction target compared to the present by 2050 as the global common target

2007.6 G8 Heiligendamm Summit

Consider seriously that global emission will be reduced at least 50% by 2050

2008.7 G8 Hokkaido Toyako Summit

Share the vision that global emission will be reduced 50% by 2050 with all Parties and aim for its adoption under the negotiation

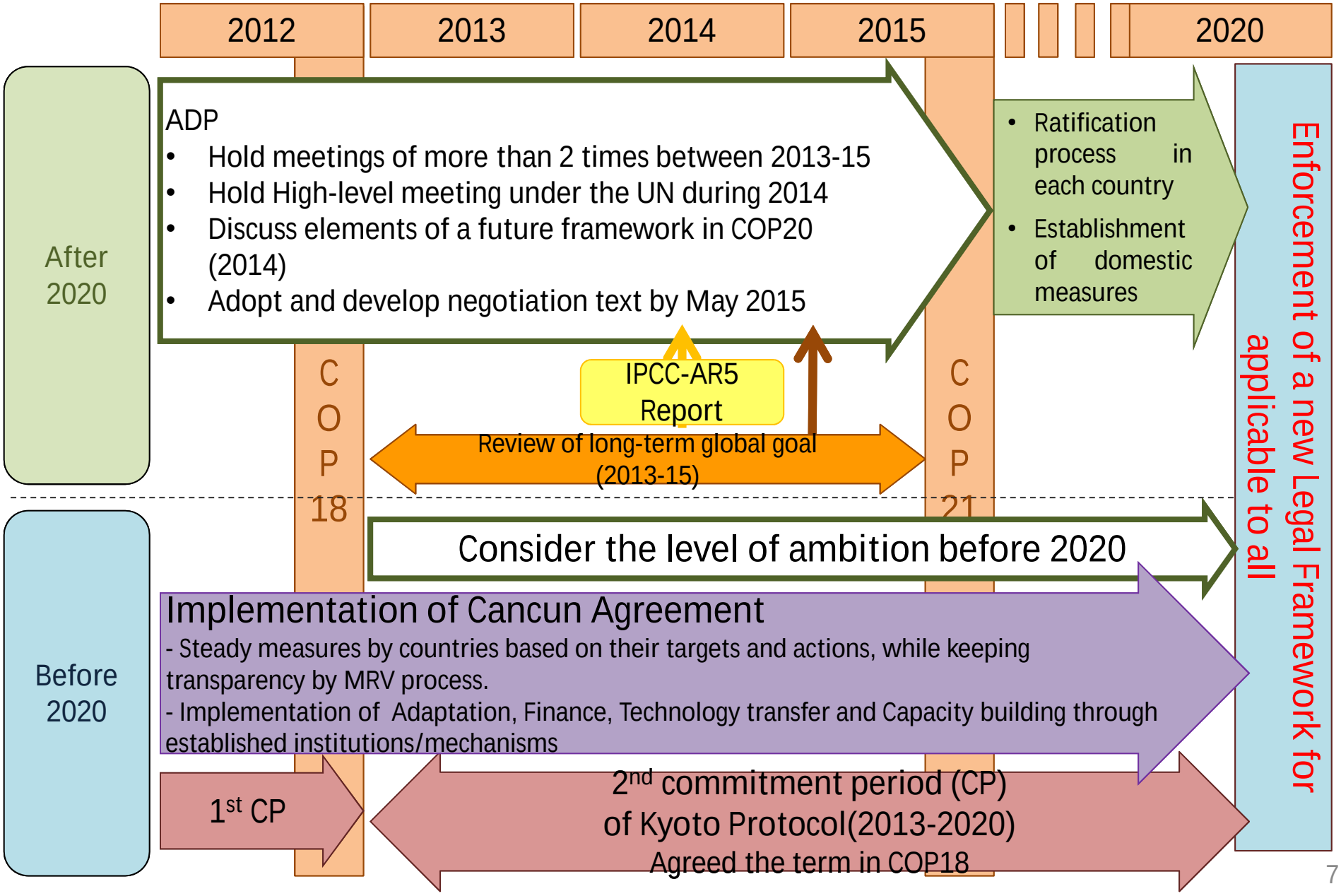
2009.7 G8 L'aquila Summit

Support the target that all developed countries reduce 80% or more than 80% by 2050, as a part of the target that global emission will be reduced at least 50% by 2050

2009.9 UN General Assembly

Prime Minister Hatoyama (then) propose the 25% emission reduction target with precondition

Outcome of COP18: the path for future framework



Durban Agreement

Path to post-2020 future framework

- Establishment of an Ad Hoc Working Group on the Durban Platform for Enhanced Action
- Adopt “the protocol, another legal instrument or an agreed outcome with legal force under the Convention applicable to all Parties” as early as possible but no later than 2015 and come into effect and be implemented from 2020
- Work plan relating the level of mitigation ambition (until 2020)

Agreed the path of developing the future legal framework applicable to all Parties that Japan aims

2. Japan’s Actions (Domestic)

Measures (until 2012 & from 2012)

Target of 1st commitment period of KP

- Committed to 6% GHG emission reduction target compared to the base year (1990) during the 1st commitment period (2008-2012)

2020 Target

- Based on the Copenhagen Accord, registered the 25% emission reduction target by 2020 with preconditions compared to the base year (1990) to the UNFCCC

  *Expressed that Japan is considering post-2012 global warming countermeasures as well as revision of energy policies

Kyoto Protocol Target Achievement Plan

- Based on "Law Concerning the Promotion of the Measures to Cope with Global Warming"
- Developed in April 2005 and revised in March 2008 to achieve the 6% reduction target under the KP

Plan for global warming countermeasures from 2013

"Voluntary Actions"

- From FY 1997, each industrial sector set voluntary reduction targets and measures to achieve them
- Based on the KP Target Achievement Plan, the Government carries out evaluation and verification by relevant meetings to secure achievement

Commitment to a Low-Carbon Society

- Continuation of "Voluntary Actions"
- Not only set new emission reduction plan (until 2020) as reduction target, but also include development and diffusion of low-carbon products, international contribution and innovative technology development

Main points of Kyoto Protocol Target Achievement Plan

Policies & Measures to Achieve the Target

1. Policies and measures regarding the reduction and absorption of GHG

(1)Policies and measures for reducing GHG emissions

[Examples of measures]

- Promotion of voluntary action plans by industries
- Improvement of energy efficiency of houses and buildings, equipment, factories and automobiles.
- Measures regarding agriculture, forestry and fisheries, water supply and sewerage systems and traffic flows
- Measures regarding waste and CFC substitutes (HFC, PFC and SF_6)
- Measures to promote the use of new energy

(2)Measures regarding greenhouse gas absorption sources

- Forest management and national campaigns for the development of beautiful forests

2. Cross-sectional measures

- System for the calculation, reporting and publication of data on emissions
- National campaigns for environment friendly life style etc.

Issues to be reviewed promptly

- Domestic emissions trading
- Environment taxes
- Review of late-night life/work styles
- Introduction of a summer time system

Target of Reduction and Sinks of GHGs

		Targeted Emission in FY2010 ※1		Targeted Emission in FY2011 (QE)
		Million t-CO_2	Compared to the Base Year	
CO_2 from Energy Use		1,076～1,089	+1.3%～+2.3%	1,173
	Industries	424～428	-4.6%～-4.3%	420
	Commercial and other	208～210	+3.4%～+3.6%	247
	Residential	138～141	+0.9%～+1.1%	189
	Transport	240～243	+1.8%～+2.0%	230
	Energy Industries	66	-0.1%	86
CO_2、CH_4、N_2O from non-energy source		132	-1.5%	111
HFCs, PFCs, SF6		31	-1.6%	24
Total GHG emission		1,239～1,252	-1.8%～-0.8%	1,307

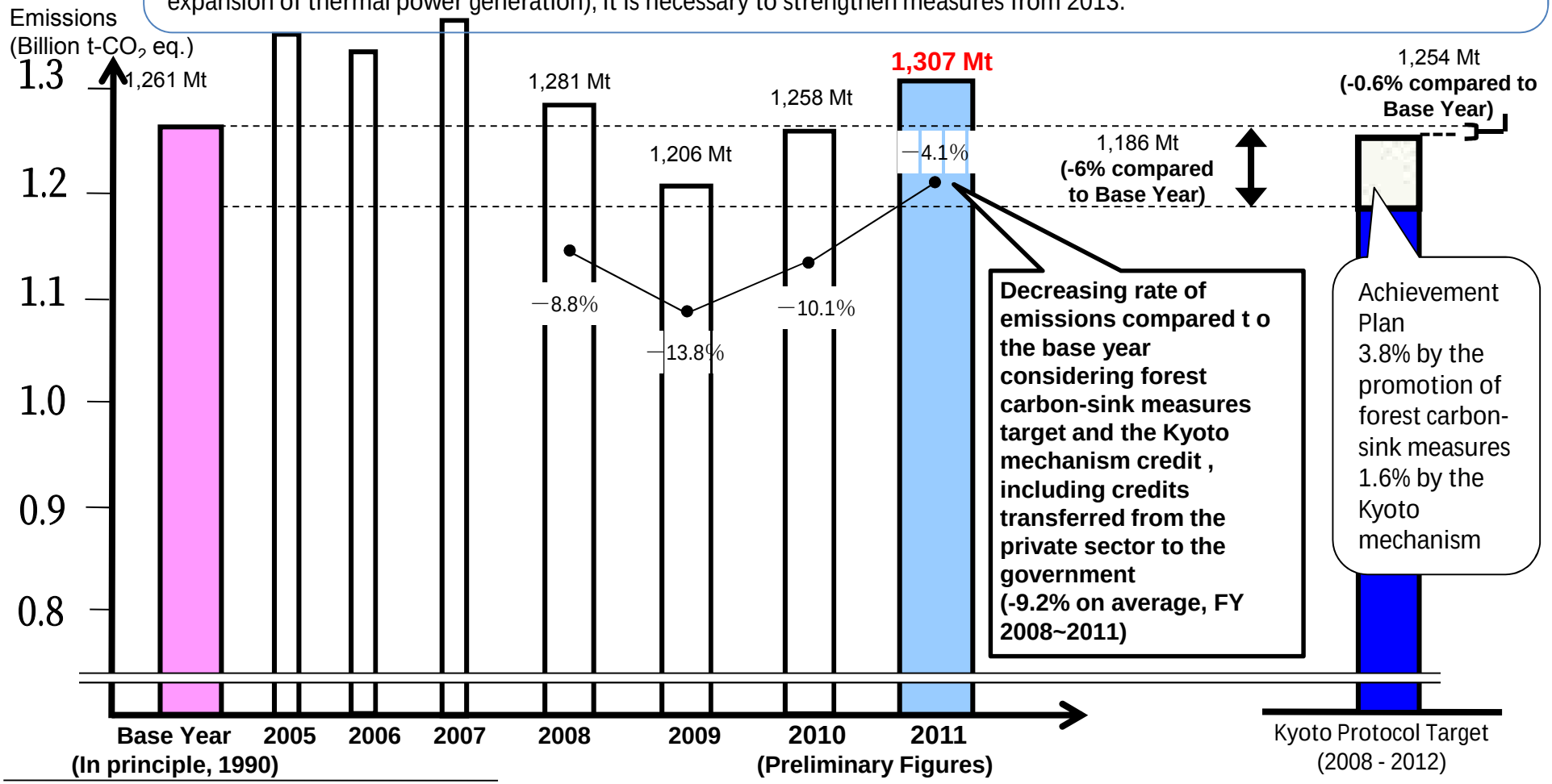
※Estimation of emission shows emissions where countermeasures' effect is maximum and where it is minimum. While the maximum case should be pursued, the estimation is set to clear the Kyoto Protocol target even in the minimum case.

Will achieve the 6% reduction target of the KP, including Carbon-sink measures and Kyoto Mechanism

Japan's Greenhouse Gas Emissions in FY 2011

Japan's GHG emissions in FY2011 increased 3.6% compared to the base year and 3.9% compared to the previous year.

Average emissions for 4 years of the first commitment period (FY2008-2011) under the Kyoto Protocol decreased 9.2% compared to the base year (1990), when considering the forest carbon-sink measures target and Kyoto mechanism credits.
-> While it is considered to be possible to achieve the target of the first commitment period, as GHG emissions have increased since 2009 (CO_2 from industrial power generation in FY2011 increased 60 million ton compared to the previous year, due to the expansion of thermal power generation), it is necessary to strengthen measures from 2013.



Source: Japan's National Greenhouse Gas Emissions in Fiscal Year 2011 (Preliminary Figures) <Executive Summary>

Concept of a revision of "the Law Concerning the Promotion of the Measures to Cope with Global Warming"

- In the current "Law Concerning the Promotion of the Measures to Cope with Global Warming," it is considered that the Kyoto Protocol (KP) Target Achievement Plan is formulated, corresponding the reduction commitment based on the Kyoto Protocol. However, the 1st commitment period of the KP finished at the end of March in 2013 and the current initiative based on the KP Target Achievement Plan also finished at the same time.
- Though Japan are not participating in the 2nd commitment period of the KP (2013-2020), Japan continues to tackle climate change measures, based on the Cancun Agreement under the UNFCCC.
- Therefore, to promote the future global warming measures in a comprehensive and systematic way, it is necessary to regulate required measures, such as the formulation of the climate change action plan by the government.

Revised Content

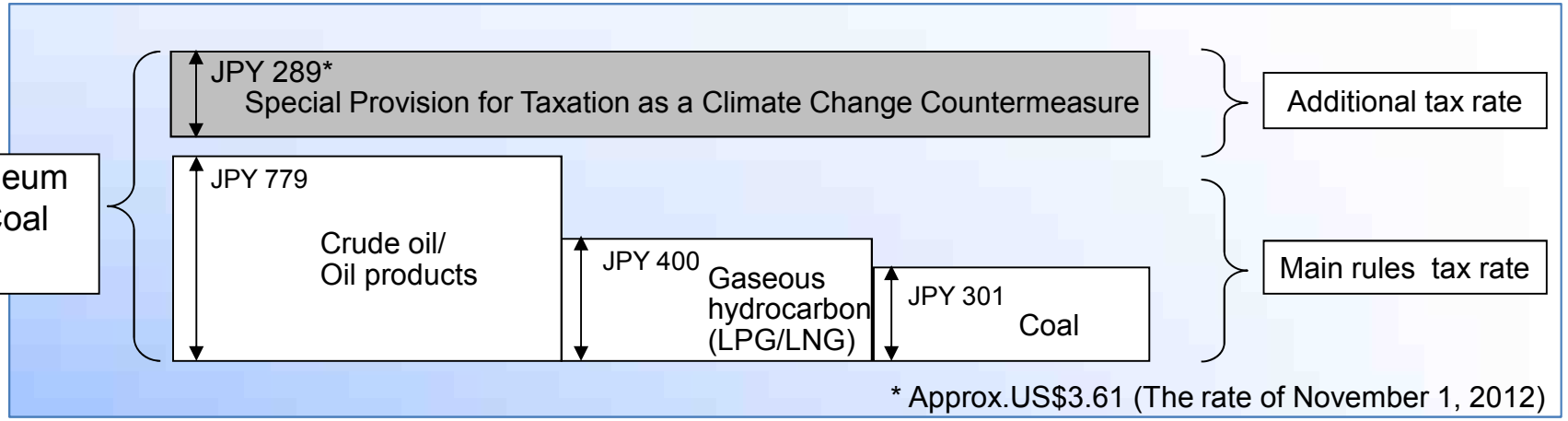
1. Addition of a kind of Greenhouse Gas (GHG)
   Add nitrogen trifluoride as a new GHG
2. Formulation of a climate change action plan
   To promote climate change measures, Japan will formulate a climate change action plan, whose content consists of targets of emission reduction and absorption of GHG, concrete actions relating measures taken by organizations and citizens, measures which should be taken by national/ local public bodies to achieve the target. (Consider at least every three year and change if necessary)
3. Change of affairs under the jurisdiction of the Global Warming Prevention Headquarter
   Climate change action plan (draft) will be formulated under the Global Warming Prevention Headquarter. From the long-term viewpoint, considering the knowledge acknowledged internationally and the enforcement situation, legal measures and others will be taken by 2015.

Carbon Tax (Special Provision for Taxation as a Climate Change Countermeasure)

- Tax rate corresponding to the amount of CO2 emissions for all fossil fuels (JPY 289/t-CO2)
- Enforced from Oct. 2012 and increases in the tax rate gradually over 3 and a half years
- All the tax revenue will be allocated for curbing energy-oriented CO2 emissions

Tax Rate

Tax Rate of CO2 Emissions per Ton



Enforcement Stage

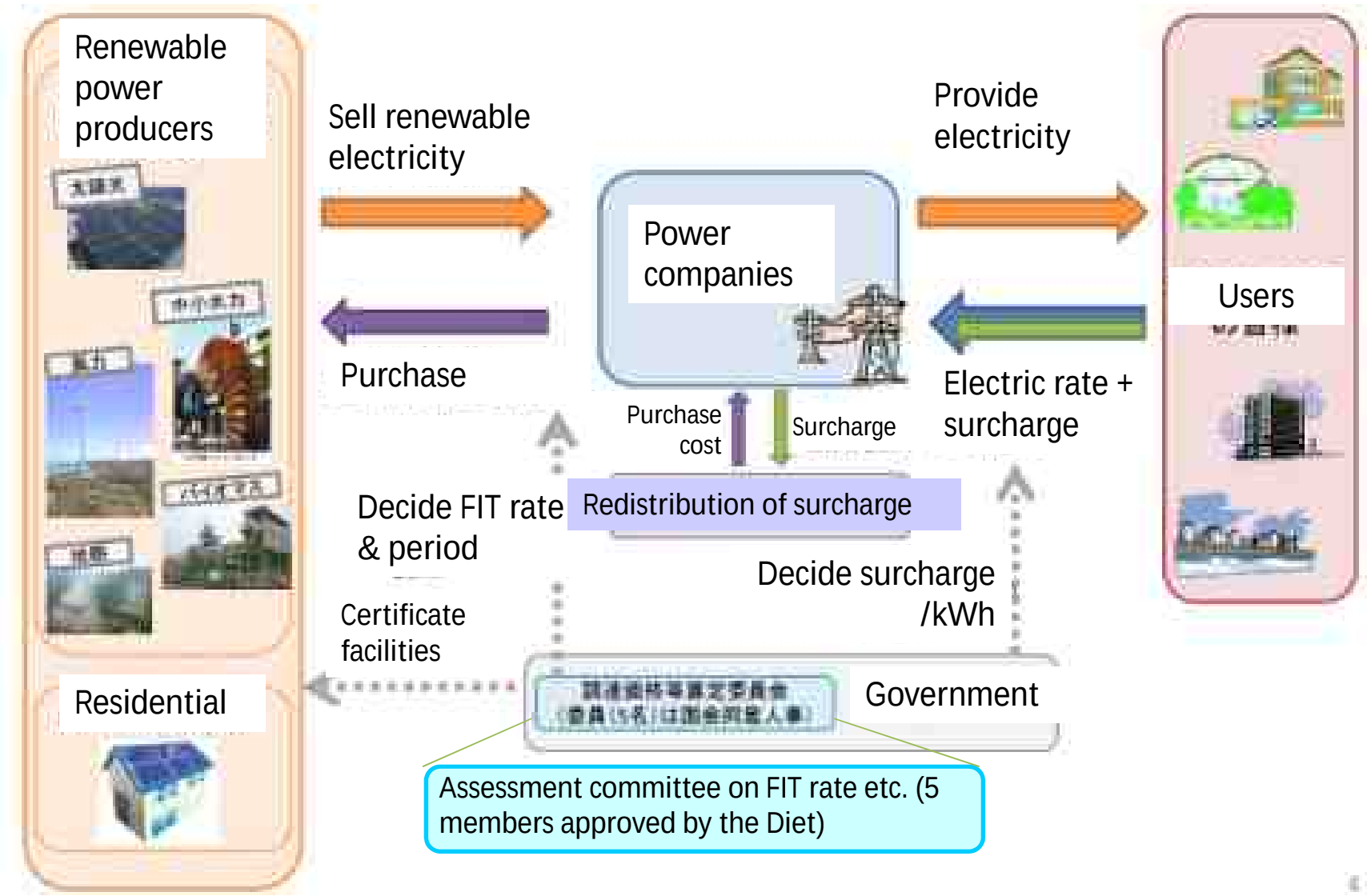
Object of Taxation	Main rules Tax Rate	From Oct. 1, 2012	From Apr. 1, 2014	From Apr. 1, 2016
Crude oil/Oil products [per kl]	JPY 2,040	+ JPY 250	+ JPY 250	+ JPY 260
		(JPY 2,290)	(JPY 2,540)	(JPY 2,800)
Gaseous hydrocarbon [per t]	JPY 1,080	+ JPY 260	+ JPY 260	+ JPY 260
		(JPY 1,340)	(JPY 1,600)	(JPY 1,860)
Coal [per t]	JPY 700	+ JPY 220	+ JPY 220	+ JPY 230
		(JPY 920)	(JPY 1,140)	(JPY 1,370)

Tax Revenue

[1st year] JPY 39.1 billion ; [Normal year] JPY 262.3 billion (about US$3.27 billion)

To be used for introduction of renewable energy and enhancement of energy-saving measures, etc.

Feed-in Tariff (FIT) from July 2012



Source: METI

(Reference) Procurement price and term of FIT

Electricity		Solar		Wind		Geothermal		Middle and Small Hydro		
Procurement Classification		10kW以上	10kW未満（余剰買取）	20kW以上	20kW未満	1.5万kW以上	1.5万kW未満	1,000kW以上30,000kW未満	200kW以上1,000kW未満	200kW未満
Cost	Construction Cost	28.0万円/kW	42.7万円/kW	30万円/kW	125万円/kW	79万円/kW	123万円/kW	85万円/kW	80万円/kW	100万円/kW
	O&M (per year)	10千円/kW	4.7千円/kW	6.0千円/kW	－	33千円/kW	48千円/kW	9.5千円/kW	69千円/kW	75千円/kW
IRR		pretax 6%	Pretax 3.2%（＊1）	Pretax 8%	pretax 1.8%	pretax13%（＊2）		pretax7%	pretax7%	
Procurement price per 1kWh	Including tax（＊3）	37.80 yen	38.00 yen（＊1）	23.10 yen	57.75 yen	27.30 yen	42.00yen	25.20 yen	30.45 yen	35.70 yen
	Excluding tax	36yen	38yen	22yen	55yen	26yen	40yen	24yen	29yen	34yen
Procurement Term		20 yrs	10yrs	20yrs	20yrs	15yrs	15yrs	20yrs		

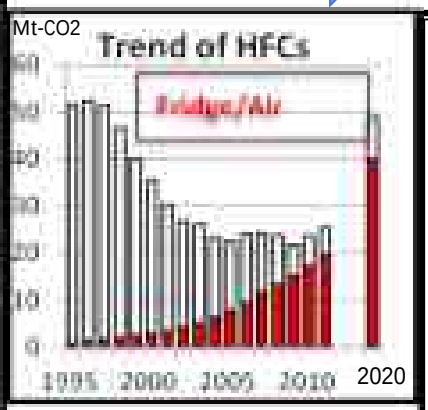
Electricity		Biomass						
Kinds of Biomass		Gas production (sewage sludge)	Gas production (animal waste)	Solid fuel burning (unused timbers)	Solid fuel burning(general timber)	Solid fuel burning (general waste)	Solid fuel burning(sewage sludge)	Solid fuel burning(recycle timber)
Cost	Construction Cost	392万円/kW		41万円/kW	41万円/kW	31万円/kW		35万円/kW
	O&M (per year)	184千円/kW		27千円/kW	27千円/kW	22千円/kW		27千円/kW
IRR		pretax1%		pretax8%	pretax4%	pretax4%		pretax4%
Procurement price per 1kWh	Procurement classification	【methane fermentation gas biomass】		【Unused Timber】	【General Timber (including palm coconut shell】	【waste (excluding timber) biomass】		【recycled timber】
	Including tax	40.95yen		33.60円	25.20 yen	17.85 yen		13.65 yen
	Excluding tax	39yen		32yen	24yen	17yen		13 yen
Procurement Term		20yrs						

Source: the Agency of Natural Resources and Energy

Revision of the Law for countermeasures to CFCs, HCFCs and HFCs

Current status

- CFCs emissions reduced significantly.
- On the contrary, emissions of HFCs are increasing rapidly: expected to be doubled in 2020.
- Current scheme obligates to collect and destruct CFCs and HFCs while dumping products which contain CFCs/HFCs only.
- The scheme is not enough due to relatively low collection rate (about 30%) and leakage during the use of products.
- Internationally HFCs countermeasures become more and more important



Revision planned

Comprehensive measures to cover whole life cycle of CFCs/HFCs

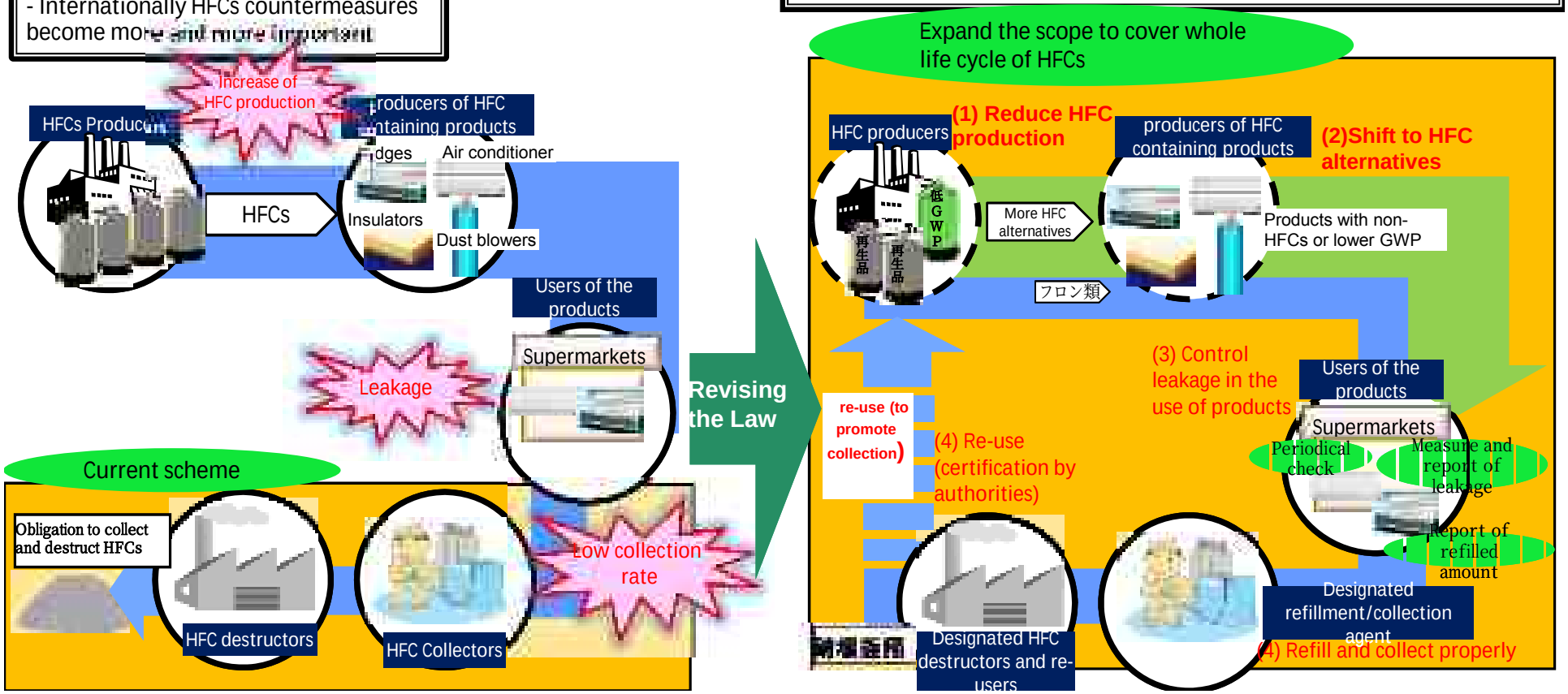
-The government will develop guidelines to reduce emissions at each stage of production and use.

(1)Producers and importers of HFCs: enhance to introduce alternatives (with no or less GWP) and/or reused HFCs

(2) Producers of HFCs containing products: shift to products with HFC alternatives by a target year to be decided for each product

(3) Large-scale Users of the products (e.g. Supermarkets): conduct a periodical check for reducing leakage. measure and report of amount of leakage

(4) Collectors/destructors plus re-users of HFCs: to be designated by local authorities



3. Japan’s Actions (International)

Directions by Prime Minister Shinzo Abe

On policy deployment for the time being based on the discussion at the first meeting of the Industrial Competitiveness Council

Friday, January 25, 2013

The third meeting of the Headquarters for Japan's Economic Revitalization

Chair Prime Minister Shinzo Abe

The Minister of the Environment and other relevant ministers are to conduct a zero-based review of the 25% emission reduction target by COP19 in next November as well as to develop assertive diplomatic strategies to tackle climate change with the aim of contributing to the world by fully utilizing Japanese advanced technologies.

◆ GHG emission reduction target for 2020

✓ Registered the 25% emission reduction target compared with 1990 levels to UNFCCC

✓ After the Earthquake, expressed that target is under consideration

◆ Global warming countermeasures from 2013

✓ Kyoto Protocol Target Achievement Plan will end in March 2013

Japan's emission reduction target for 2020

25% reduction, which is premised on the establishment of a fair and effective international framework in which all major economies participate and on agreement by those economies on ambitious targets.

Factors to Consider

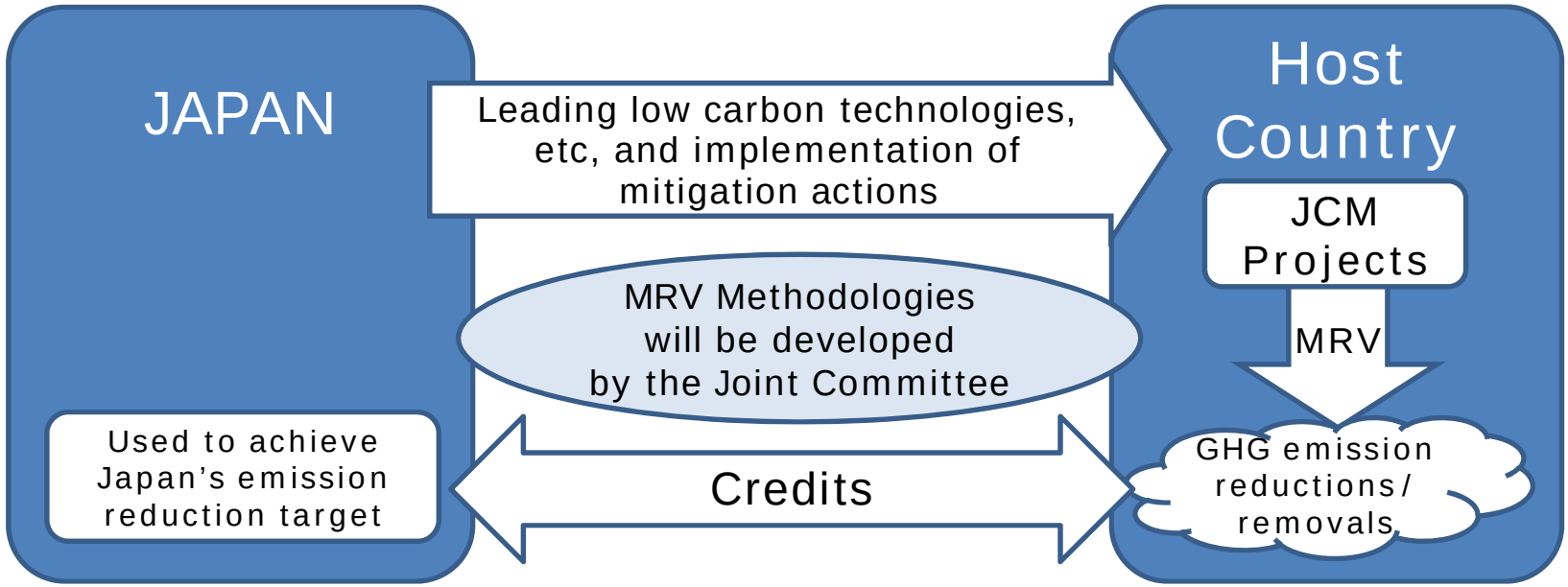
✓ The progress of energy policy

✓ Communicate to both inside and outside Japan the stance to tackle climate change seamlessly from 2013

✓ Report based on COP16 Cancun Agreement (including emission reduction target for 2020, measures and policies for its accomplishment, precondition etc. by 1st Jan 2014)

Basic Concept of the JCM

- Facilitating diffusion of leading low carbon technologies, products, systems, services, and infrastructure as well as implementation of mitigation actions, and contributing to sustainable development of developing countries.
- Appropriately evaluating contributions to GHG emission reductions or removals from Japan in a quantitative manner, by applying measurement, reporting and verification (MRV) methodologies, and use them to achieve Japan's emission reduction target.
- Contributing to the ultimate objective of the UNFCCC by facilitating global actions for GHG emission reductions or removals, complementing the CDM.



Thank you for your kind attention

仮訳

中国における再生可能エネルギー開発の現状と将来戦略

高　虎

国家発展改革委員会エネルギー研究所

二〇一三年七月

主な内容

仮訳

- 中国再生可能エネルギー支援政策
- 中国再生可能エネルギー開発の現状
- 中国再生可能エネルギー開発計画

仮訳

中国再生可能エネルギー政策フレームワーク

《再生可能エネルギー法》

仮訳

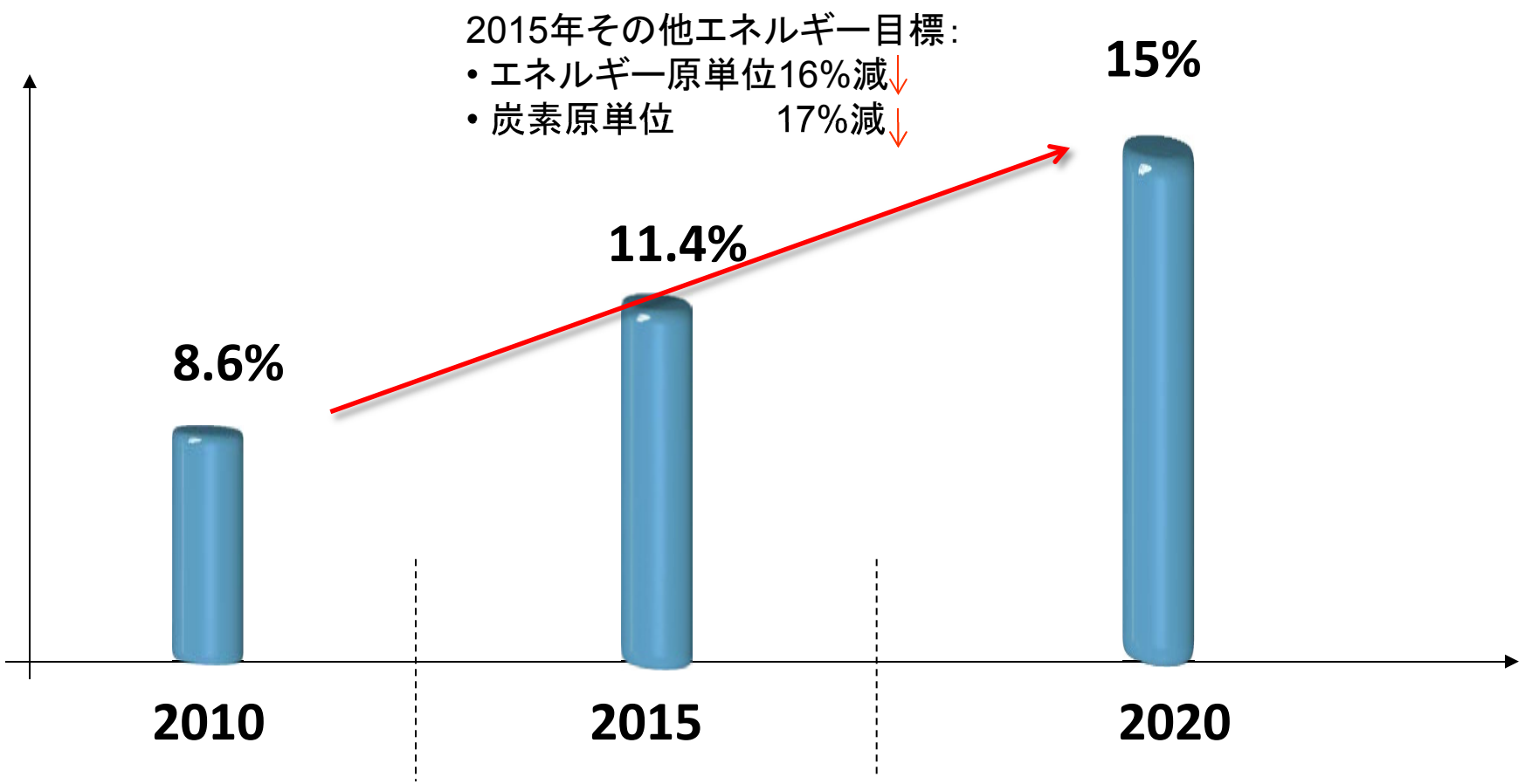
《再生可能エネルギー法》

- 2005年公布
- 2009年改訂

- 中長期目標、開発計画
- 電力料金優遇、分担メカニズム
- 全額買取、優先度スケジュール
- 開発基金、財政支援

非化石エネルギー開発目標

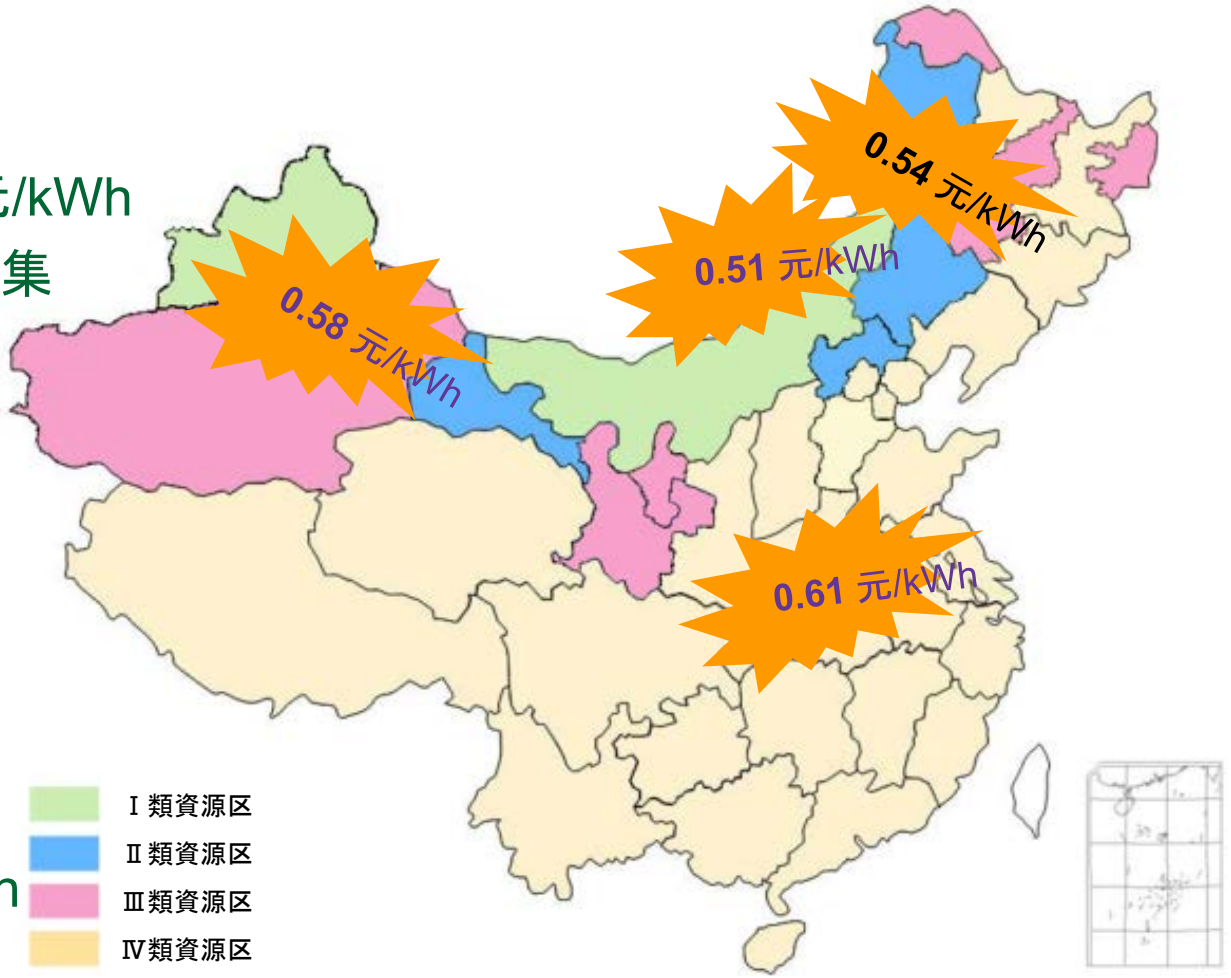
仮訳



系統連系価格

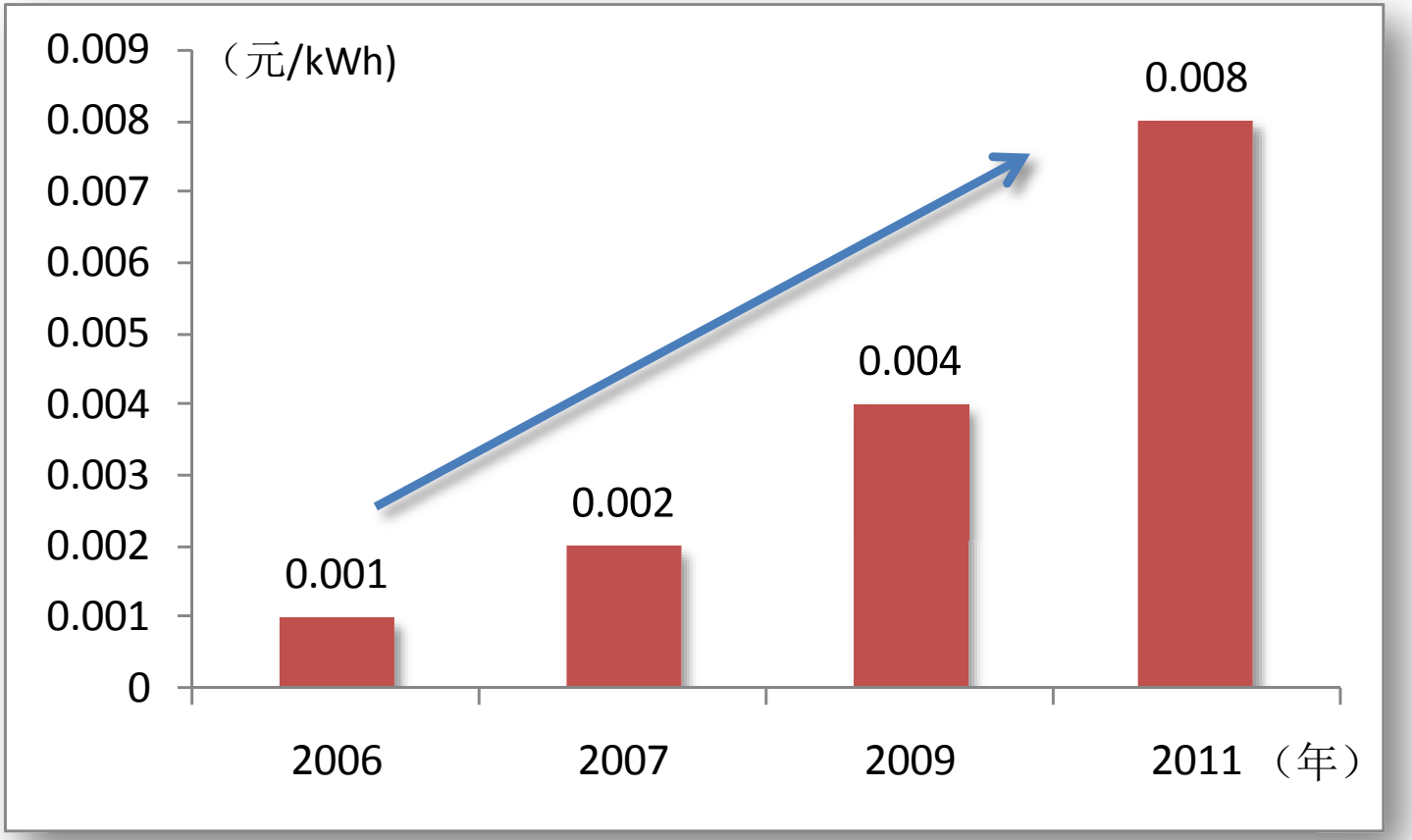
仮訳

- **風力発電**
  - 風力発電：0.51-0.61元/kWh
  - 洋上風力発電：入札募集
- **バイオ発電**
  - 農林業廃棄物
    0.75元/kWh
  - ごみ発電
    0.65元/kWh
- **太陽光発電**
  - 2011年1.15 元/kWh
    2012年以降1.0元/kWh
  - 金太陽プロジェクト：
    初期投資補助



資金支援メカニズム

仮訳



再生可能エネルギー電力料金の賦課金の徴収を徐々に高める

仮訳

中国再生可能エネルギー開発の現状

資源のポテンシャル

仮訳

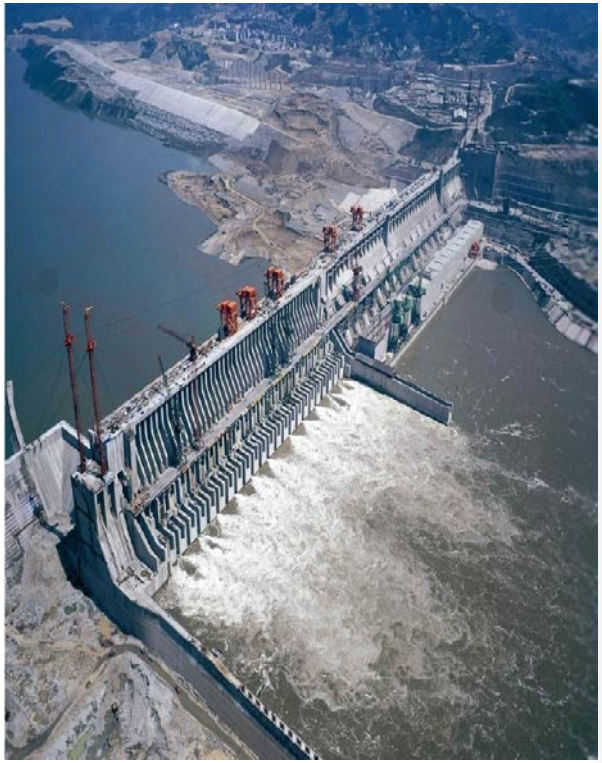


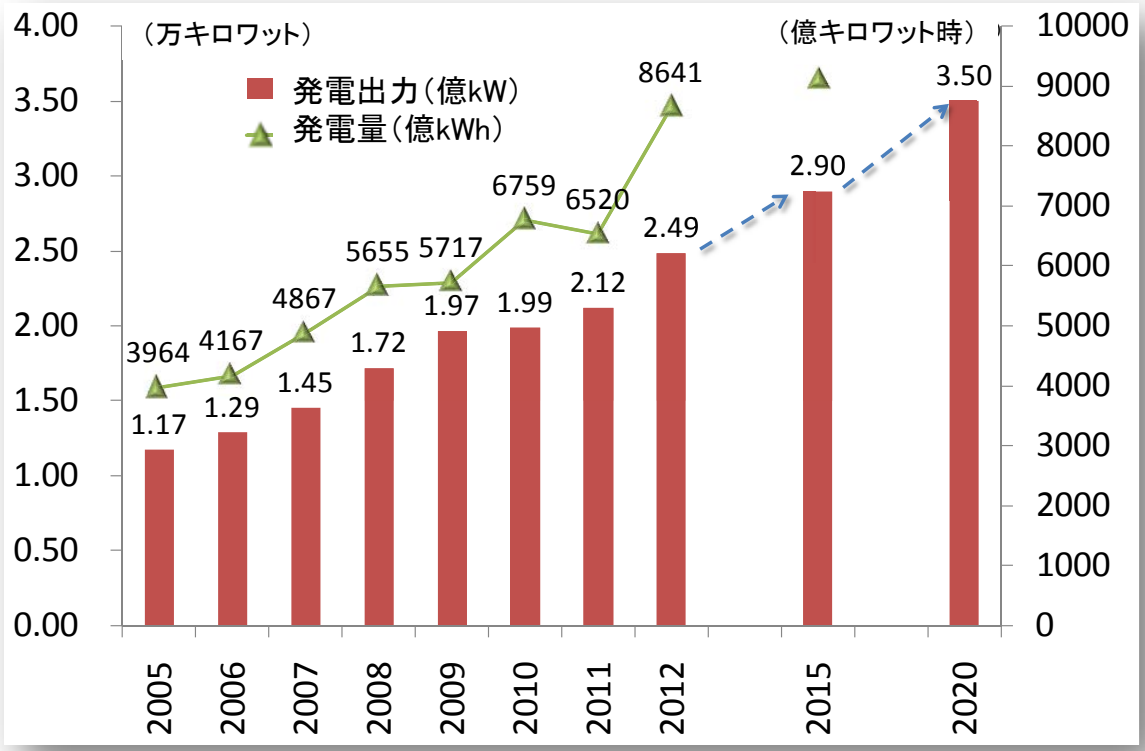

- 水力：技術的に開発可能な総容量は5.4億キロワットであり、経済的に開発可能な総容量は4億キロワット
- 風力：陸上の風力発電で技術的に開発可能な総容量は25.8億キロワットであり、海上の風力発電で技術的に開発可能な総容量は5.1億キロワット
- 太陽エネルギー源：国土面積の3分の2は年間日照時間2200時間以上を有し、特に西部地域は太陽エネルギー源が豊富である
- バイオマスエネルギー源：農作物の残渣と林業残留物資源量は毎年石炭換算5億トンに相当する

水力発電

仮訳

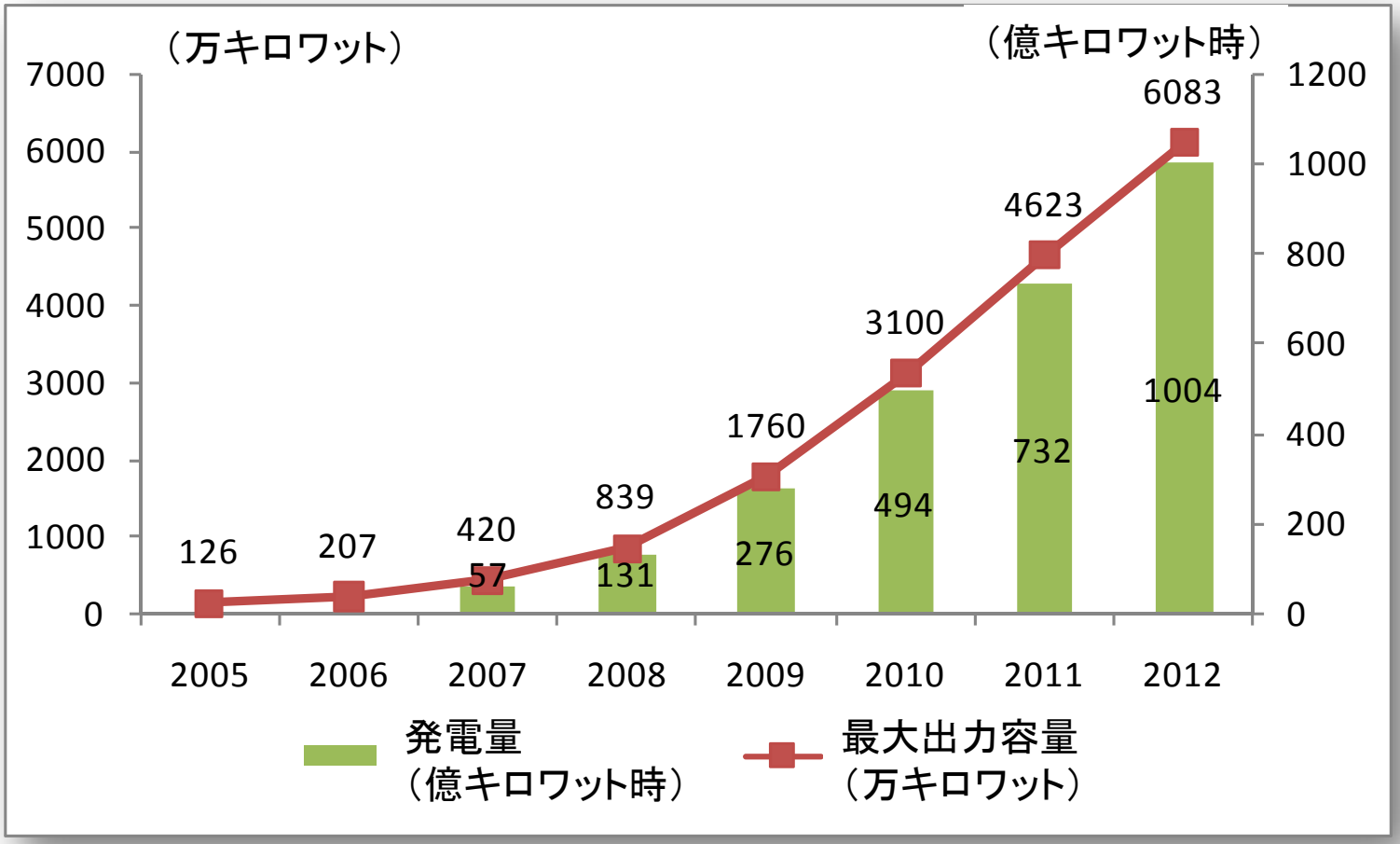
2012年末までに、水力発電の出力は2.49億キロワット、水力発電量は8641億キロワット時に達した





風力発電

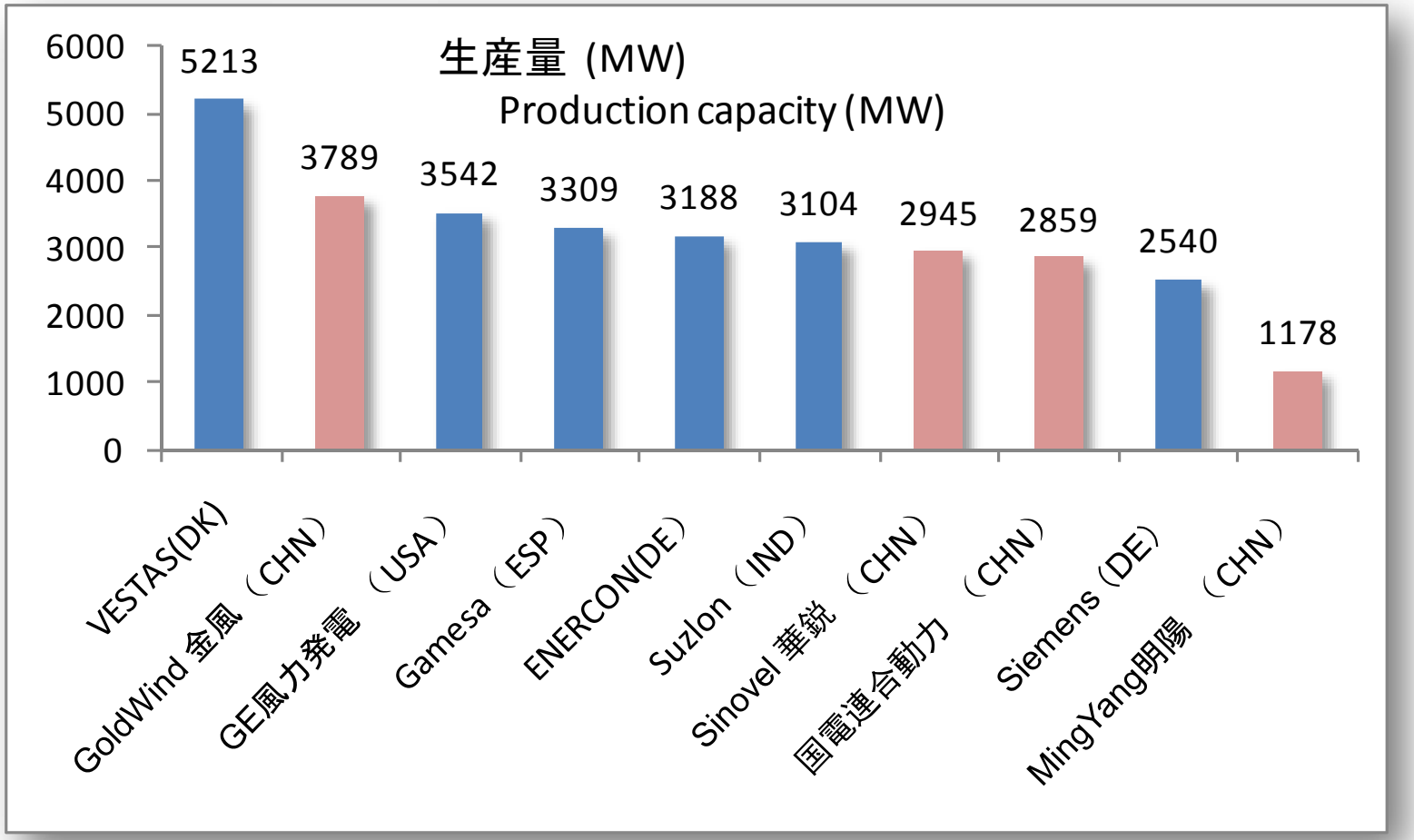
仮訳



風力の発電出力容量（系統連系設備容量）は6080万キロワット、年間発電量は1004億キロワット時であり、第三のエネルギー源となった

風力発電

仮訳



- 2011年には金風、華鋭、連合動力、明陽等設備製造企業が、世界風力発電装備10強に入った。

風力発電

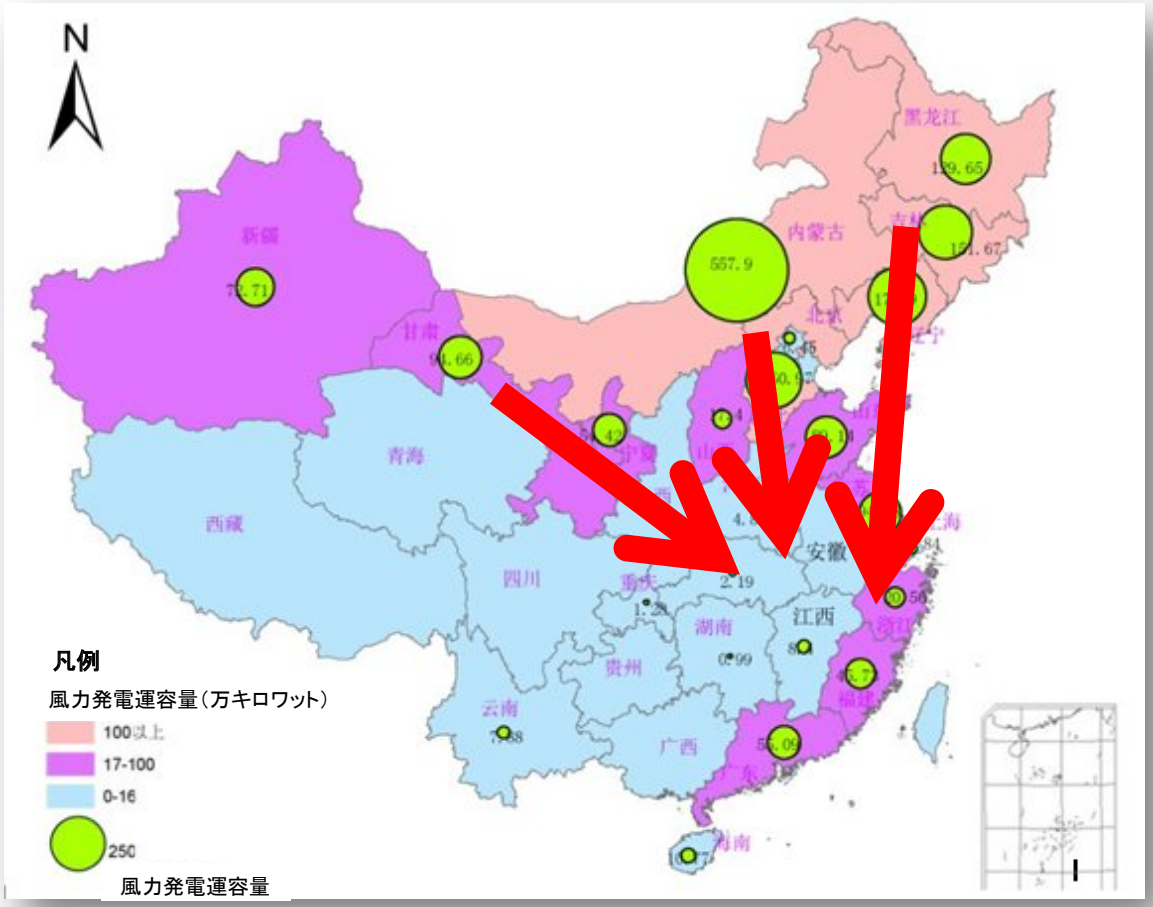
仮訳

上海東海大橋海上風力発電所

洋上風力発電が始まり、設備容量は30万キロワット。0.3万キロワットが運用を開始し、0.5-0.6万キロワットは建設済み。

風力発電の挑戦――系統連系による風力発電の不安定さの吸収

仮訳



太陽光発電

仮訳

- 大規模地面発電所

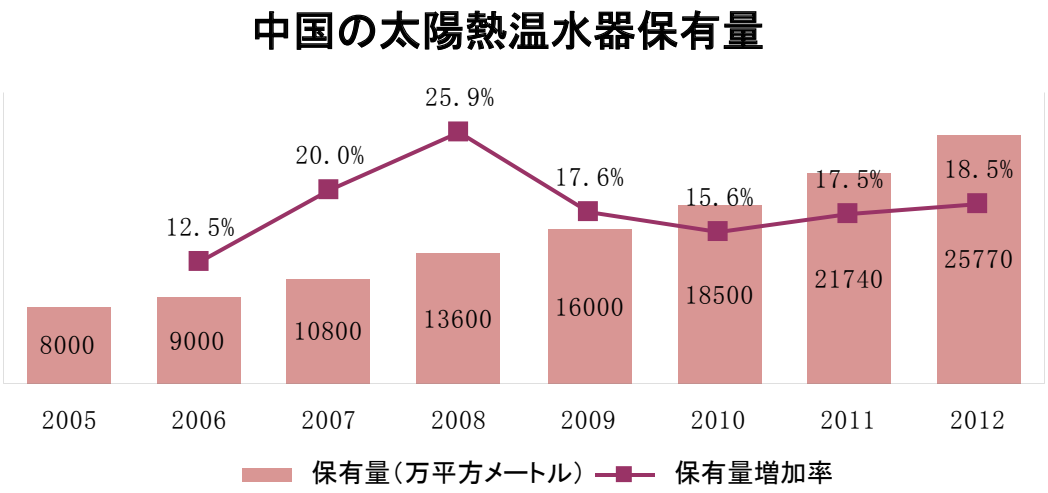
- 分散型屋上太陽光発電

金太陽プロジェクトを実施するとともに、屋上太陽光発電の活用を支援し、さらに電力価格を固定化することで、大規模に系統連系発電所を建設する。
2012年末までに、太陽光発電は700万キロワットに達し、太陽電池の生産量は約2000万キロワットになった。

太陽熱温水器

仮訳

太陽熱温水器市場の発展により、2012年末までに、太陽熱温水器の設置総保有量は2.57億平方メートルに達した。



太陽熱発電（集光型）

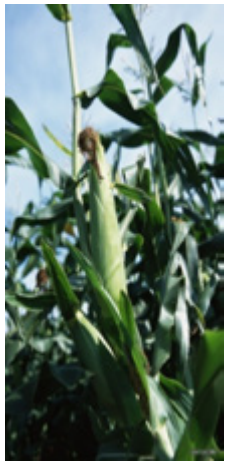
仮訳

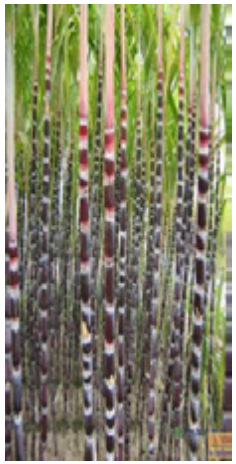
太陽熱発電（集光型）モデル事業の開始を受け、北京市延慶県でタワー型太陽熱発電所の建設及び発電が始まった。2012年末までの出力は、0.1万キロワットであった。

バイオマスエネルギー

仮訳

- **各種バイオマスエネルギーの総活用量は石炭換算約2000万トン**
  - バイオマス発電出力750万キロワット
  - メタンガス供給量165億立方メートル
  - 成型燃料600万トン
  - バイオエタノール180万トン、バイオディーゼル約50万トン





地熱エネルギー

仮訳

高温地熱発電出力容量は24.2メガワット。

通常の中深層地熱の直接暖房面積は4000平方メートルを超える。

浅層地温エネルギーによる暖房利用（ヒートポンプ）面積は1.8億平方メートル。

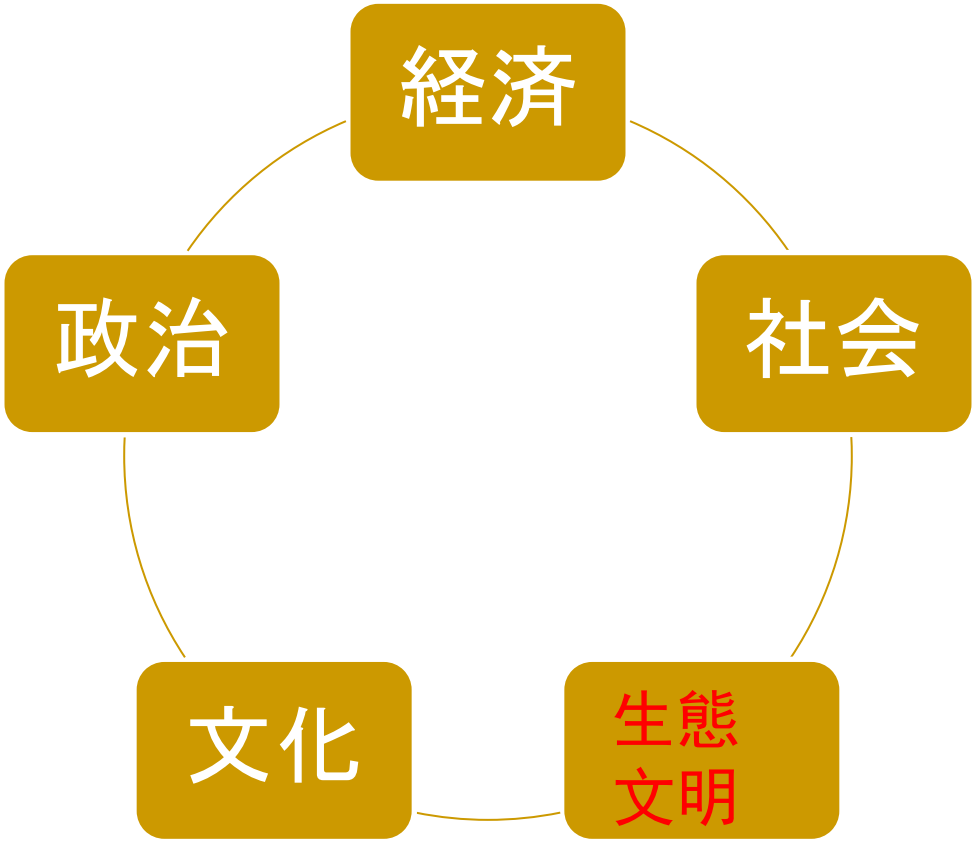
仮訳

再生可能エネルギー開発計画

第十八回全国人民代表大会以来のエネルギーに対する考え方

仮訳

- 五位一体



生態文明建設のための考え方

仮訳

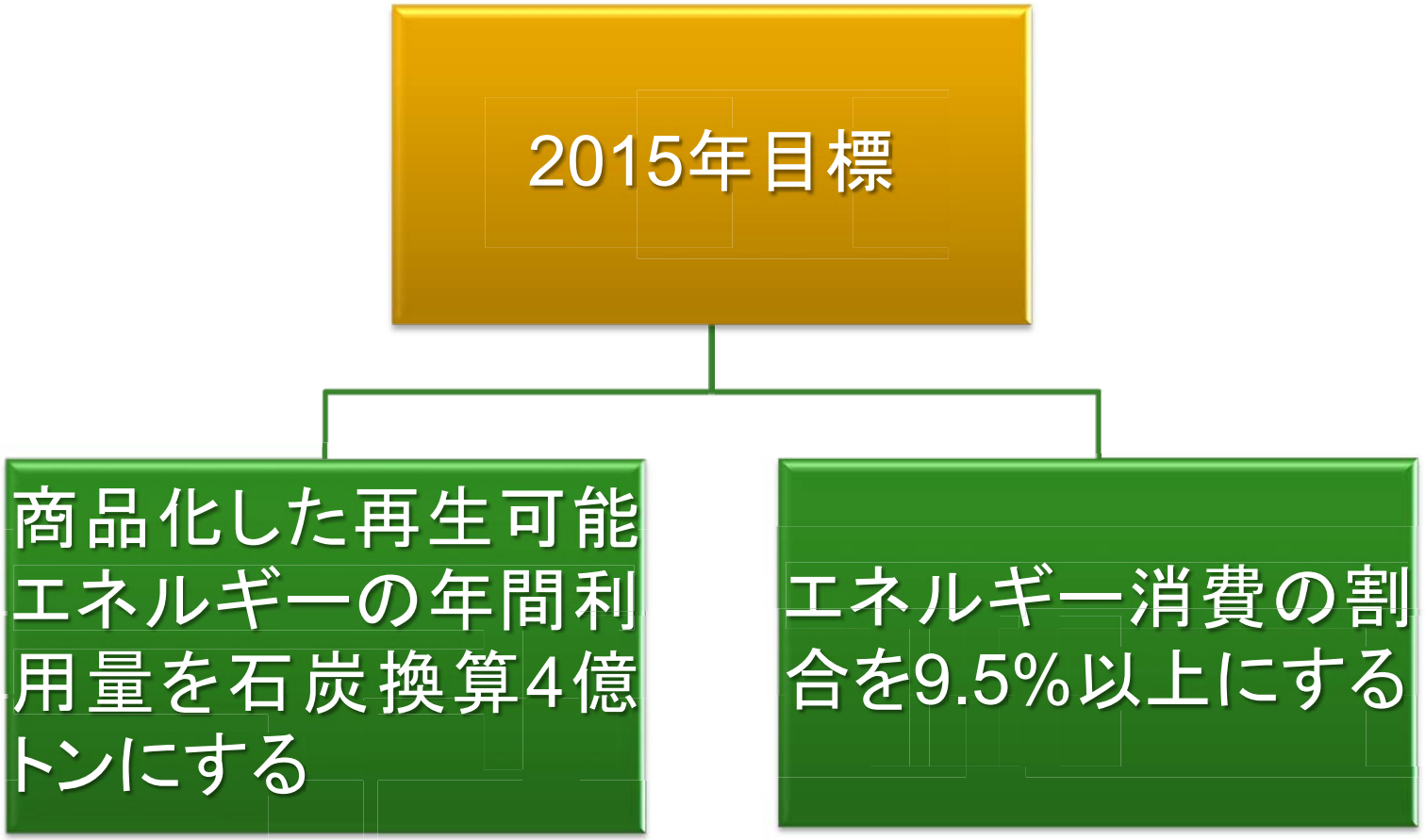
- 資源の節約を全面的に推進

エネルギー生産と消費革命を促進

(合理的に)エネルギー総消費量を規制

再生可能エネルギー開発の全体目標

仮訳



水力発電

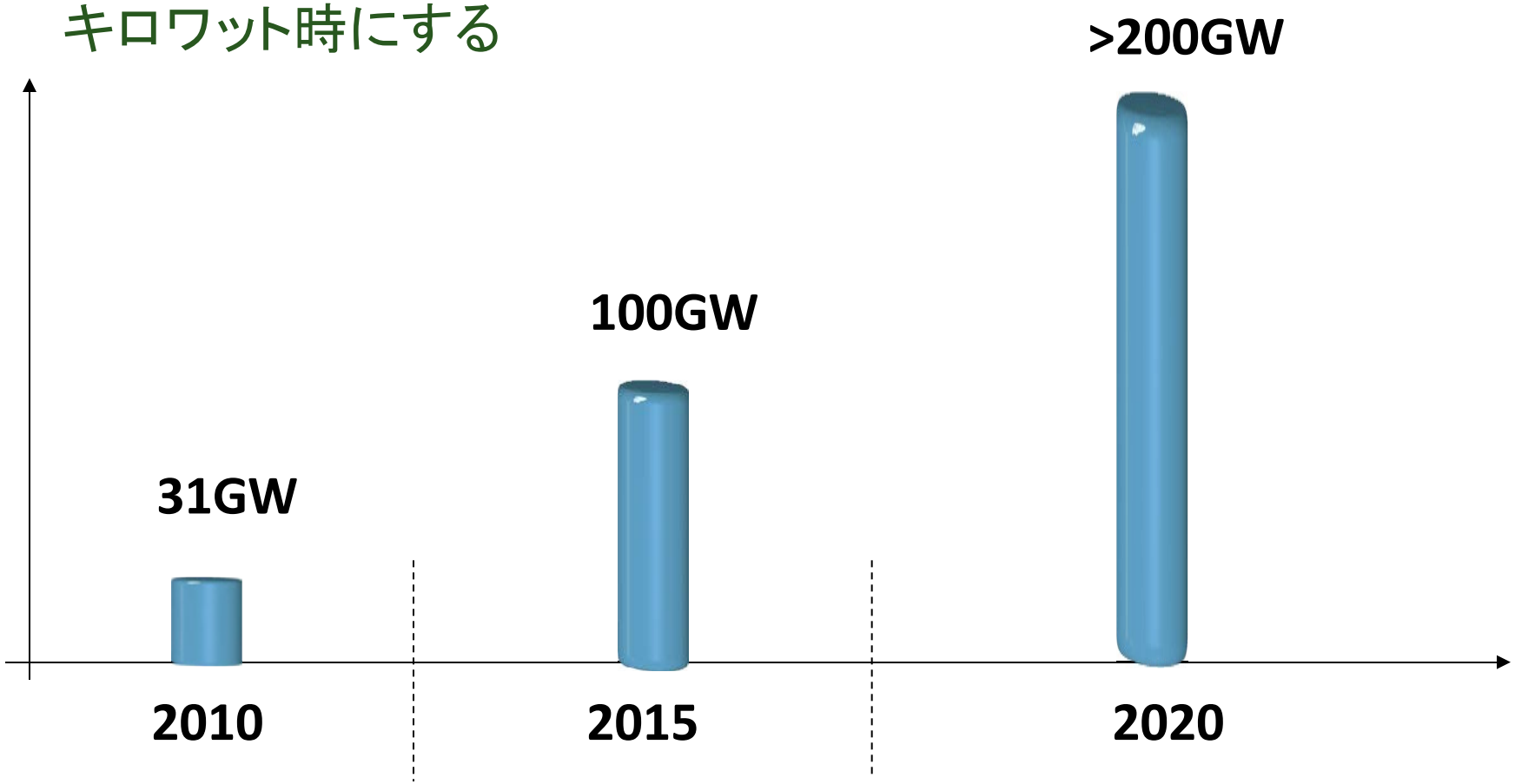
仮訳

- 2015年までに2.9億キロワット
  - 通常の水力発電により2.6億キロワット
  - 揚水式貯水池により3000万キロワット

風力発電

仮訳

2015年風力発電出力を1億キロワット、年間発電量を1900億キロワット時にする



太陽光発電

仮訳

1、重要な領域

1 建築物と結びついた太陽光発電

2015年末までに、1000万キロワット分散型太陽光発電システムを建設

2 大規模太陽光発電所

2015年までに、出力1000万キロワット大規模系統連系太陽光発電所を建設

太陽熱発電 – 光熱利用

仮訳

1、重要な領域

1 光熱発電

2015年末までに、100万キロワット光熱発電所を建設

2 熱利用

2015年までに、太陽エネルギー集熱利用面積を4億平方メートルにする

バイオマスエネルギー

仮訳

各種バイオマスは年間石炭換算約5000万トンに代替できる

分類目標

1 発電

- 出力を1300万キロワットにする
- 重点を穀物生産地域に置く

2 燃料ガス

- 5000万戸の世帯をまかなう大中型メタンガスプロジェクト6000箇所、メタンガス年間利用量220億立方メートルにする

3 液体燃料

- 燃料エタノール年間利用量400万トン、バイオディーゼル年間利用量100万トンにする

4 成型燃料

- 農林バイオマス成型燃料の年間利用量1000万トンにする

分散型総合利用モデルプロジェクト

仮訳

- 新エネルギーモデル都市：100都市
- グリーンエネルギーモデル県：200県
- 「エネルギー小型送電網モデル：30個

まとめ

仮訳

- 再生可能エネルギー開発を促進する政策フレームワークを確立した
- 再生可能エネルギーの大規模な開発段階に入った
- 体制的・技術的なチャレンジに取り組み始めている
- 更なる再生可能エネルギーの開発を進めなければならない

仮訳

ご清聴ありがとうございました！

高虎

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中国可再生能源发展的形势与展望

高 虎

国家发改委能源研究所

二〇一三年七月

主要内容

- 中国可再生能源支持政策
- 中国可再生能源发展现状
- 中国可再生能源发展规划

中国可再生能源政策框架

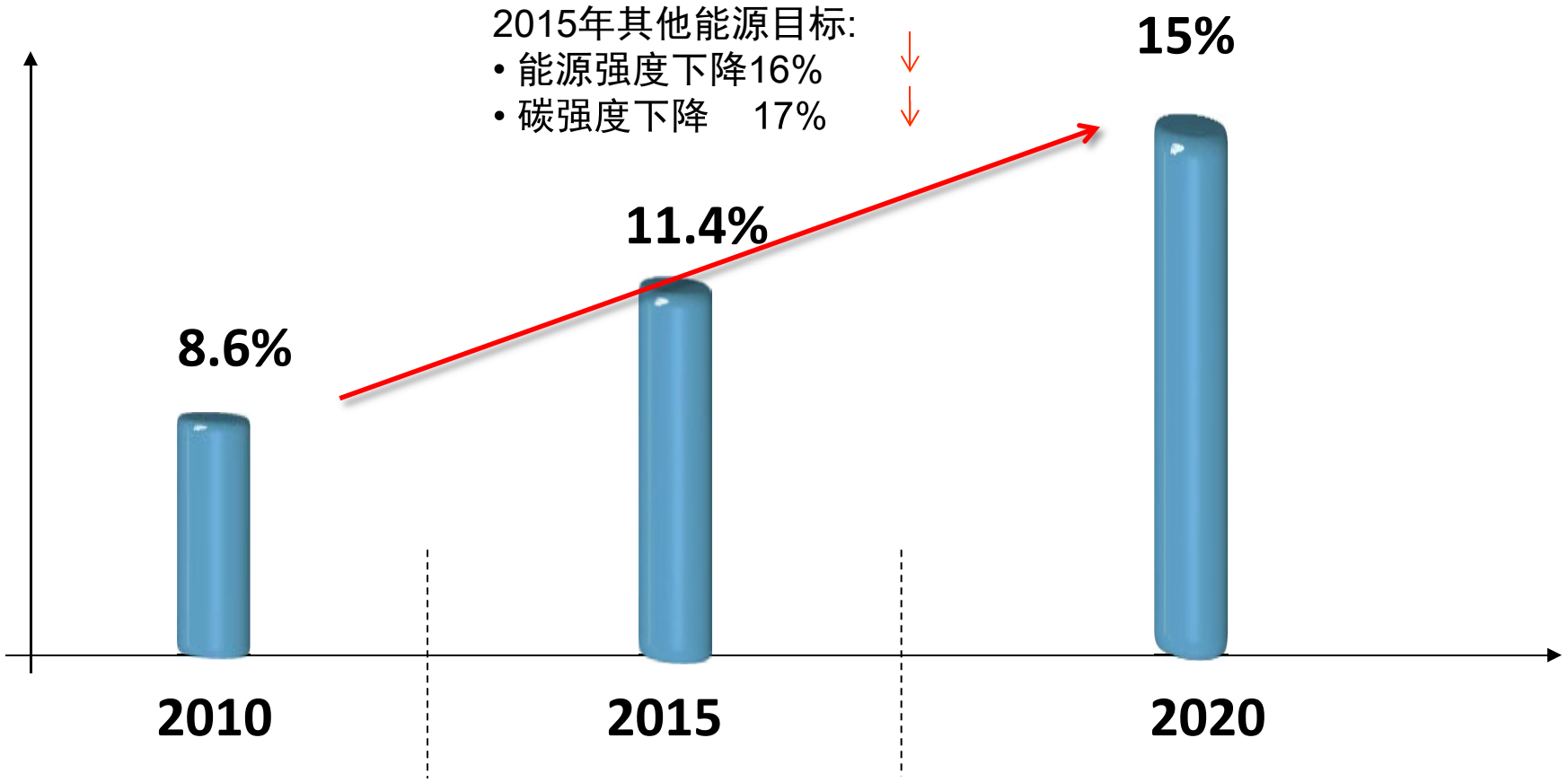
《可再生能源法》

《可再生能源法》

- 2005年颁布
- 2009年修订

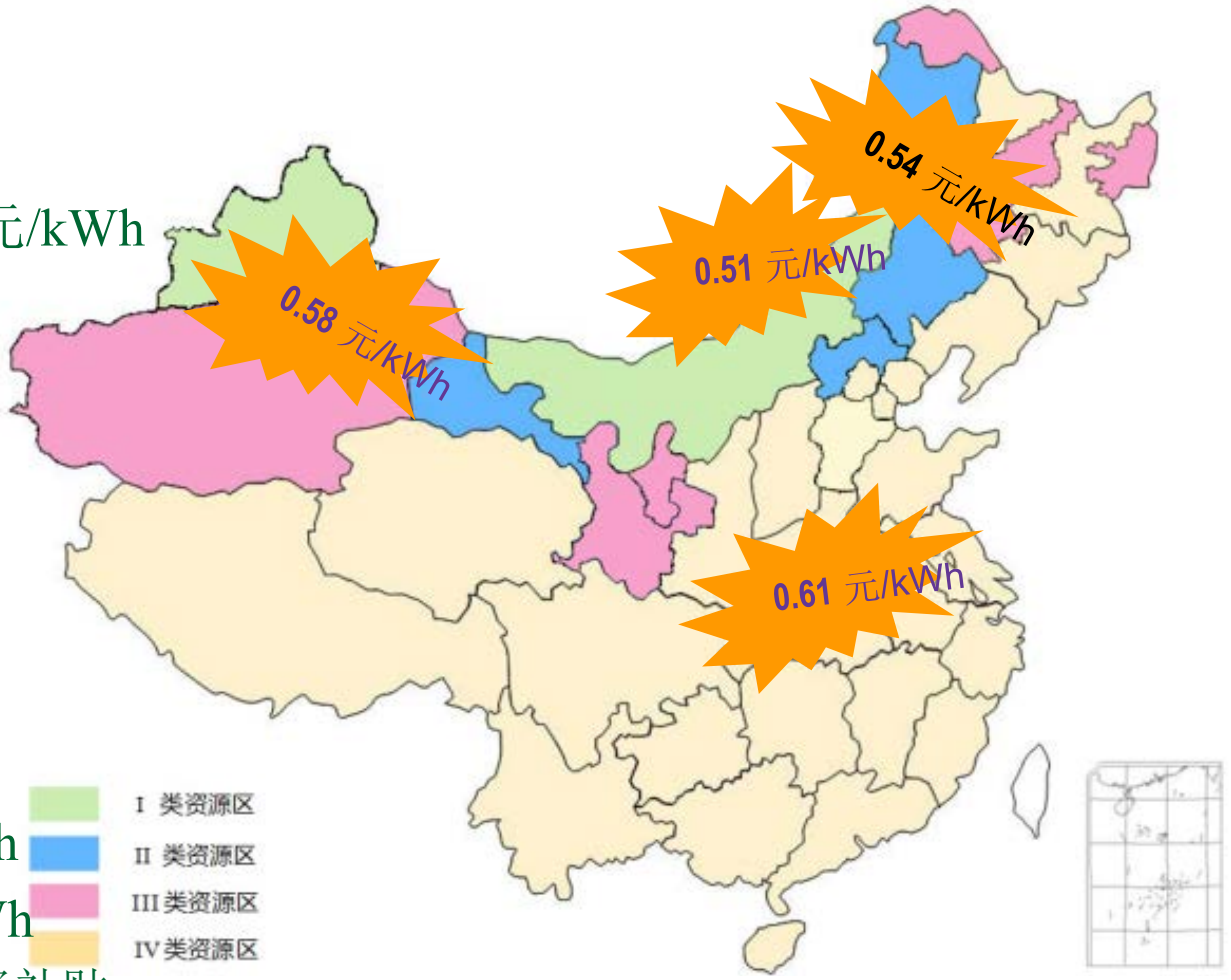
- 中长期目标、发展规划
- 优惠电价、分摊机制
- 全额收购、优先调度
- 发展基金、财政支持

非化石能源发展目标

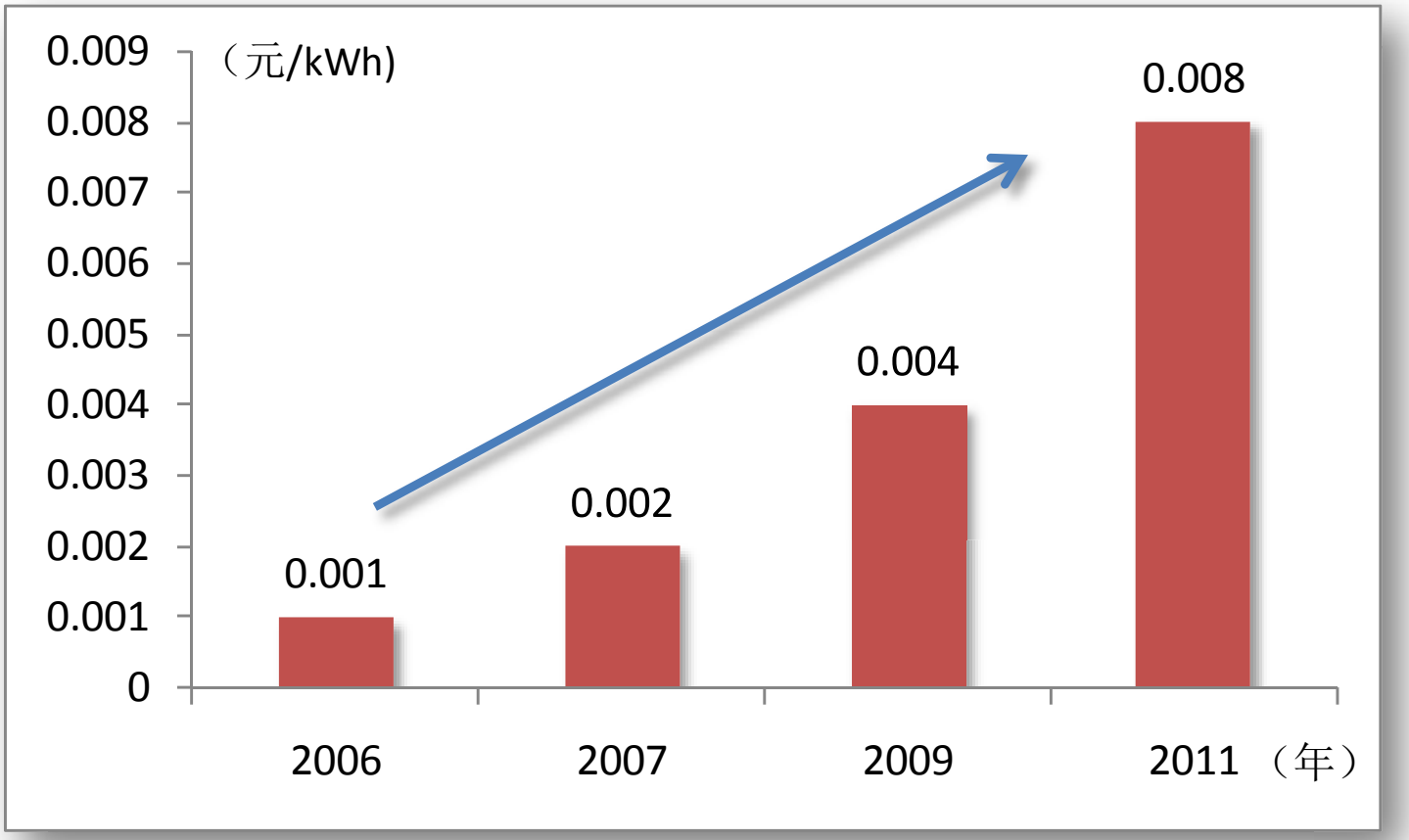


分类上网电价

- 风电
  - 风电：0.51-0.61 元/kWh
  - 海上风电：招标
- 生物质发电
  - 农林废弃物
    0.75 元/kWh
  - 垃圾发电
    0.65元/kWh
- 光伏发电
  - 2011年1.15 元/kWh
    2012年后1.0元/kWh
  - 金太阳工程：初投资补贴



资金支持机制



逐步提高征收的可再生能源电价附加

中国可再生能源发展状况

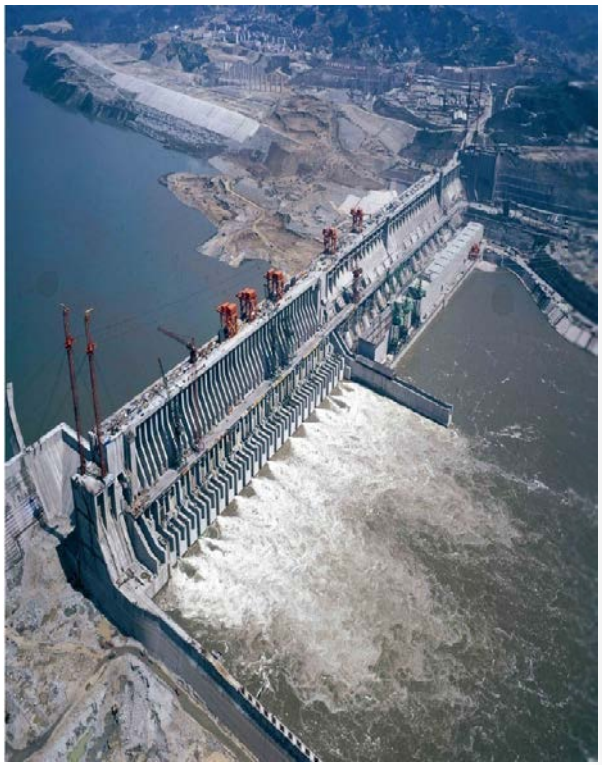
资源潜力

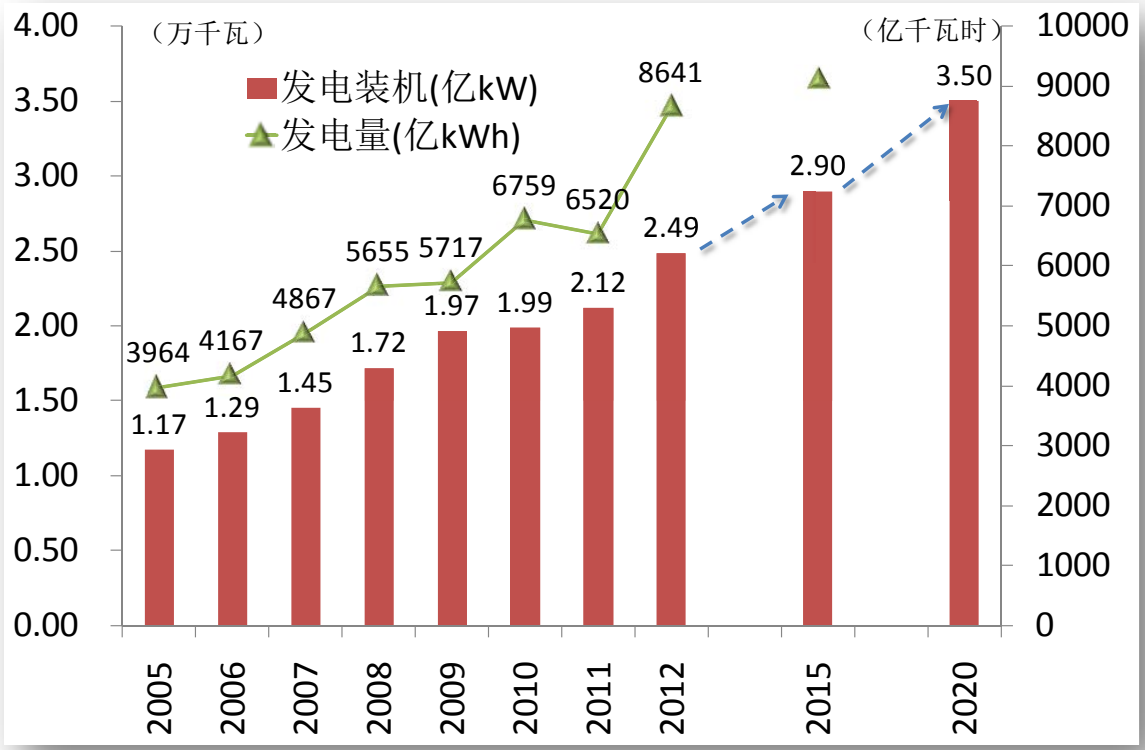



- 水能：技术可开发总容量为5.4亿千瓦，经济可开发总容量为4亿千瓦
- 风能：陆上风电技术可开发量25.8亿千瓦，海上风电技术可开发量5.1亿千瓦
- 太阳能资源：有三分之二的国土面积年日照小时数在2200小时以上，特别是西部地区太阳能资源丰富
- 生物质能资源：农作物秸秆和林业剩余物资源量相当于每年可提供5亿吨标准煤

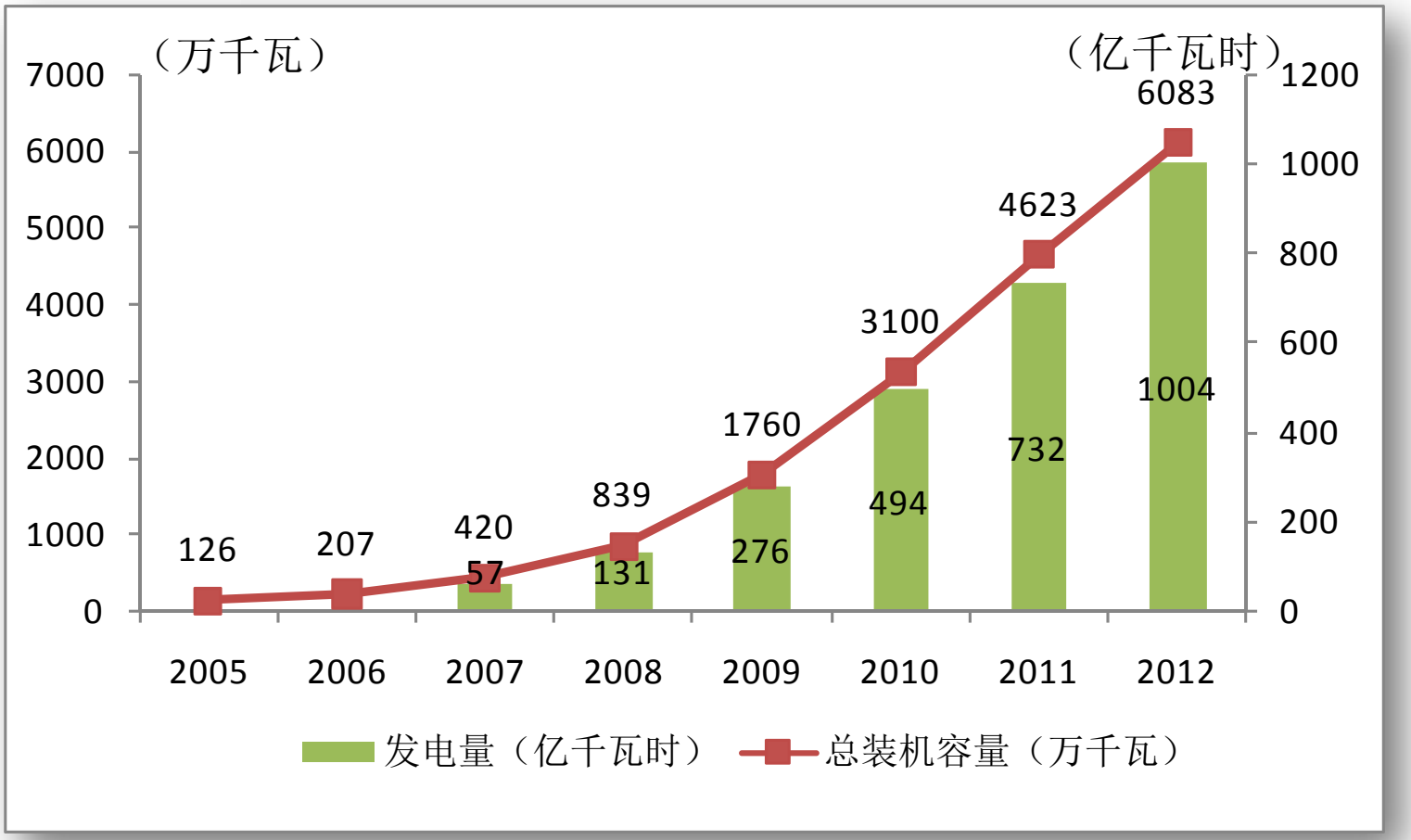
水电

到2012年底，水电装机达到2.49亿千瓦，水电发电量8641亿千瓦时



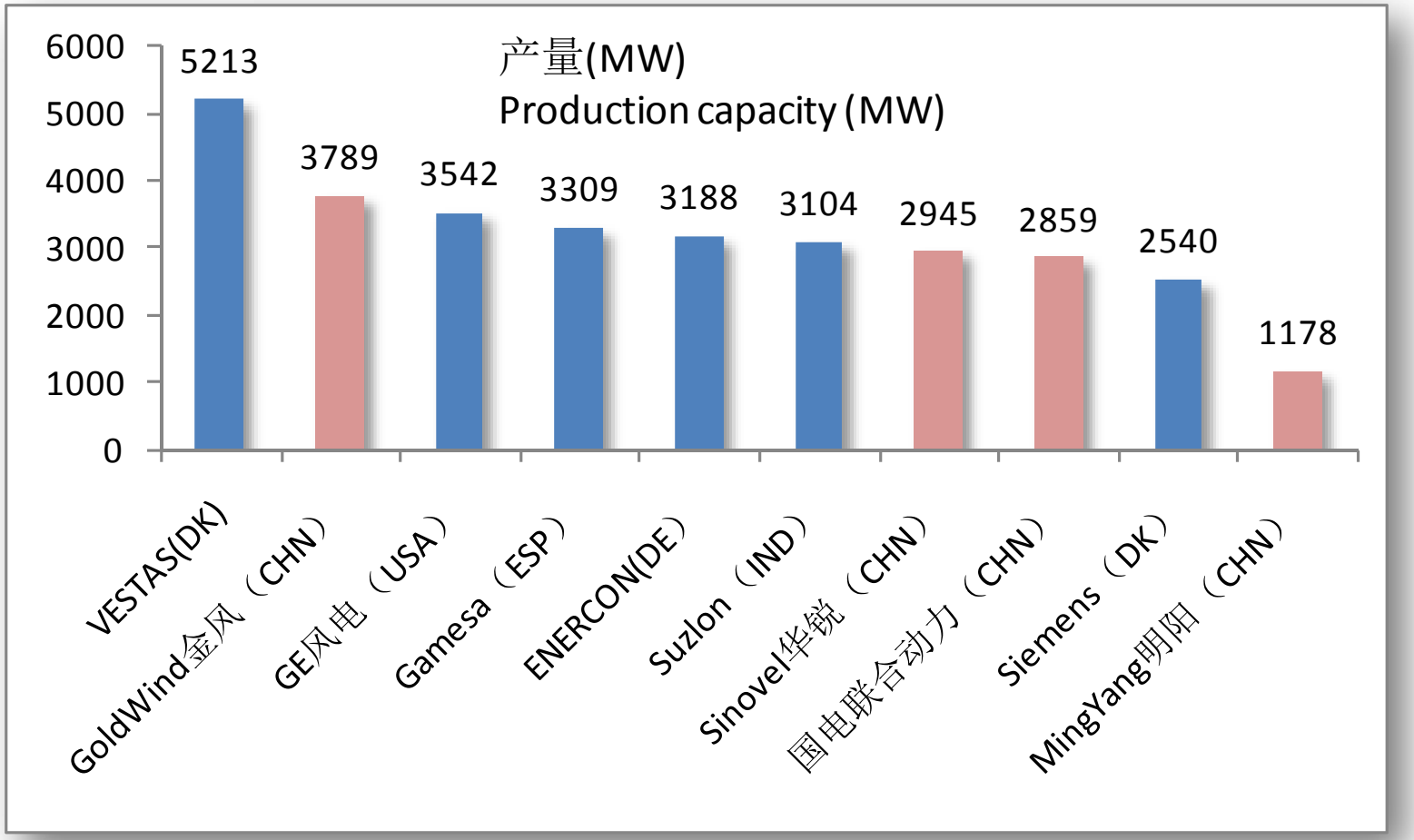


风电



风电并网装机容量6080万千瓦，年发电量1004亿千瓦时，成为第三大电源

风电



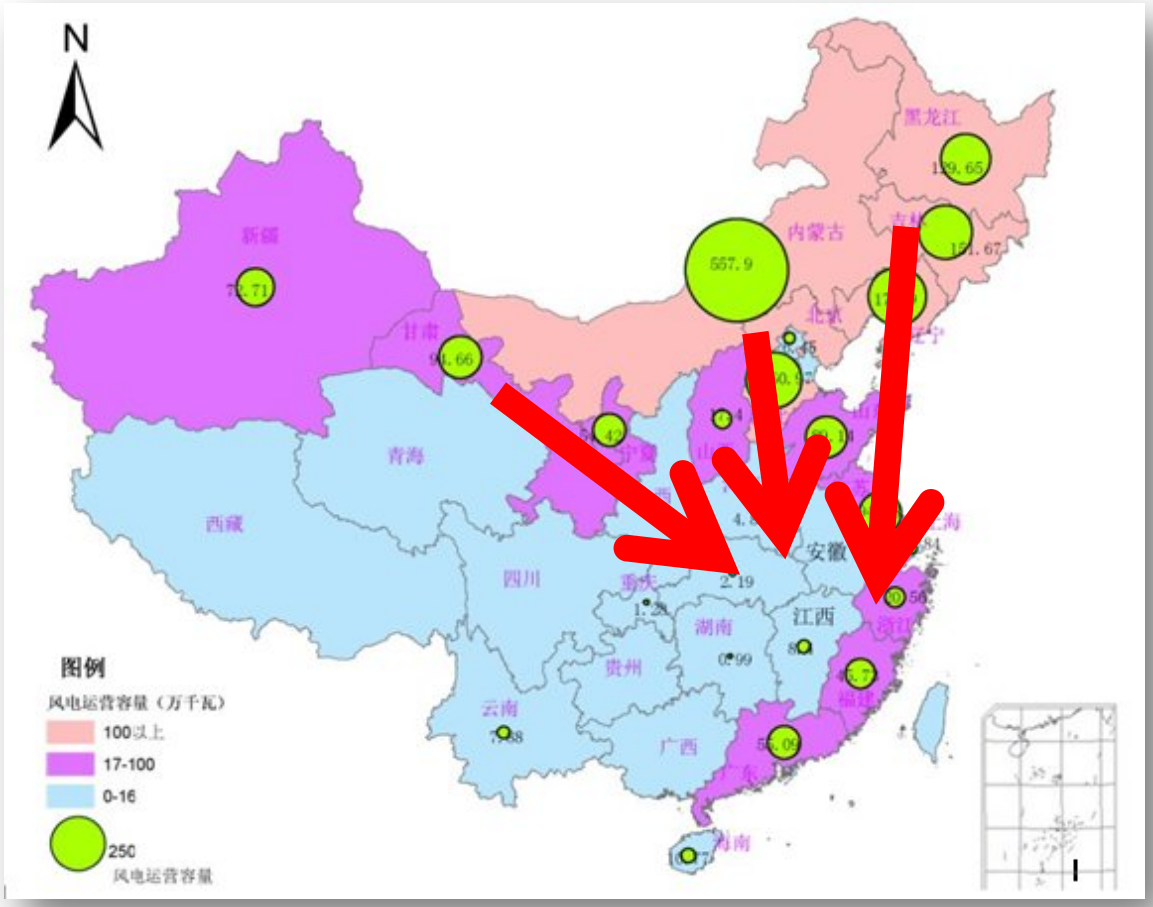
- 2011年金风、华锐、联合动力、明阳等设备制造企业进入世界风电装备10强

风电

上海东海大桥海上风电场

海上风电开始起步，装机30万千瓦。3兆瓦开始应用，5-6兆瓦完成样机

风电的挑战——并网和消纳


N
黑龙江
内蒙古
新疆
甘肃
青海
西藏
四川
重庆
湖南
贵州
云南
广西
安徽
江西
557.9
图例
风电运营容量（万千瓦）
100以上
17-100
0-16
250
风电运营容量

太阳能 – 光伏

- 大型地面电站

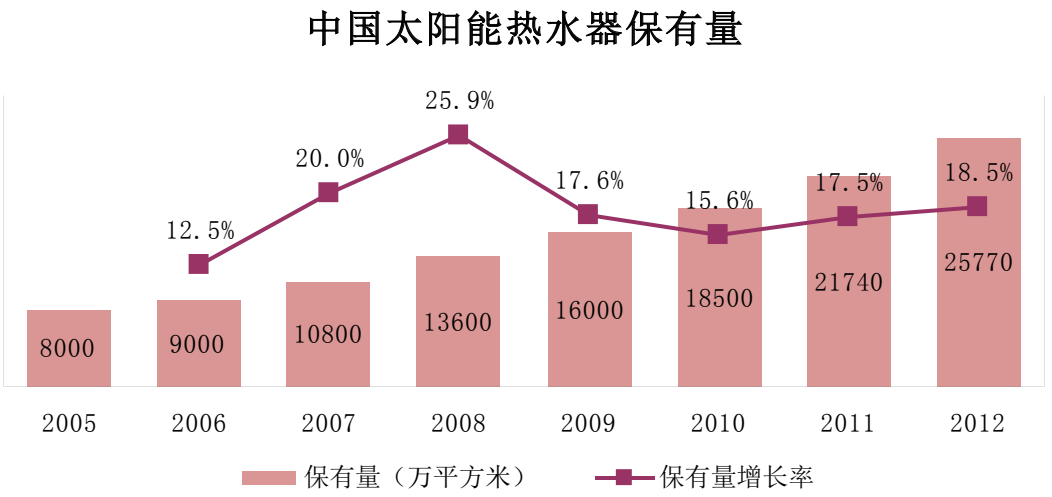
- 分布式屋顶光伏

实施金太阳工程，支持屋顶光伏应用，实施固定电价建设大型并网电站。

到2012年底太阳能光伏发电达到700万千瓦。光伏电池产量约20GW。

太阳能 – 热水器

太阳能热水器市场化发展，到2012年底，太阳能热水器安装使用总量达到2.57亿平方米。

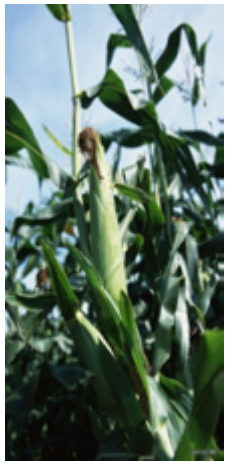


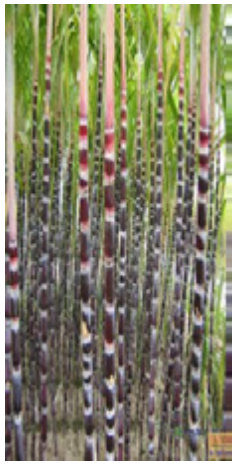
太阳能 – 热发电

太阳能热发电开始示范，北京延庆塔式热电站建成投产，2012年底，装机0.1万千瓦。

生物质能

- 各类生物质能应用总量约2000万吨标准煤
  - 生物质发电装机750万千瓦
  - 沼气供气量165亿立方米
  - 成型燃料600万吨
  - 生物乙醇180万吨，生物柴油约50万吨





地热能


羊八井地热电站

高温地热发电装机容量24.2兆瓦。

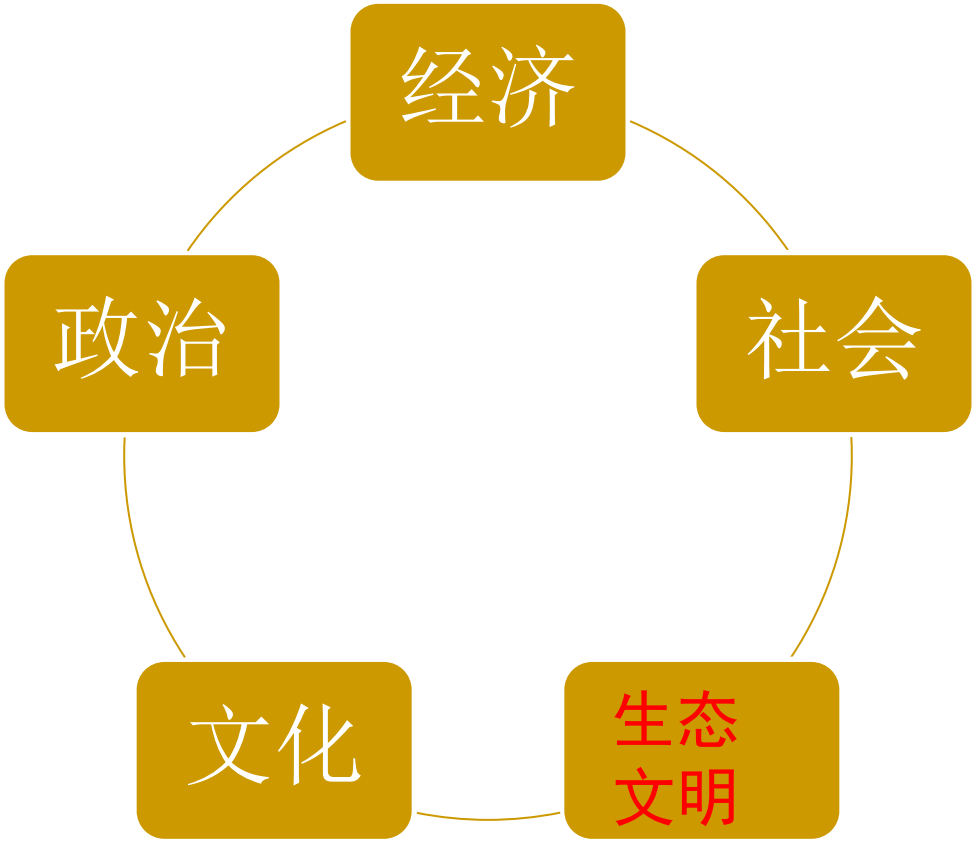
常规的中深层地热直接供暖面积超过4000万平方米。

浅层地温能利用（热泵）面积超过1.8亿平方米。

可再生能源发展规划

十八大以来的能源要求

- 五位一体



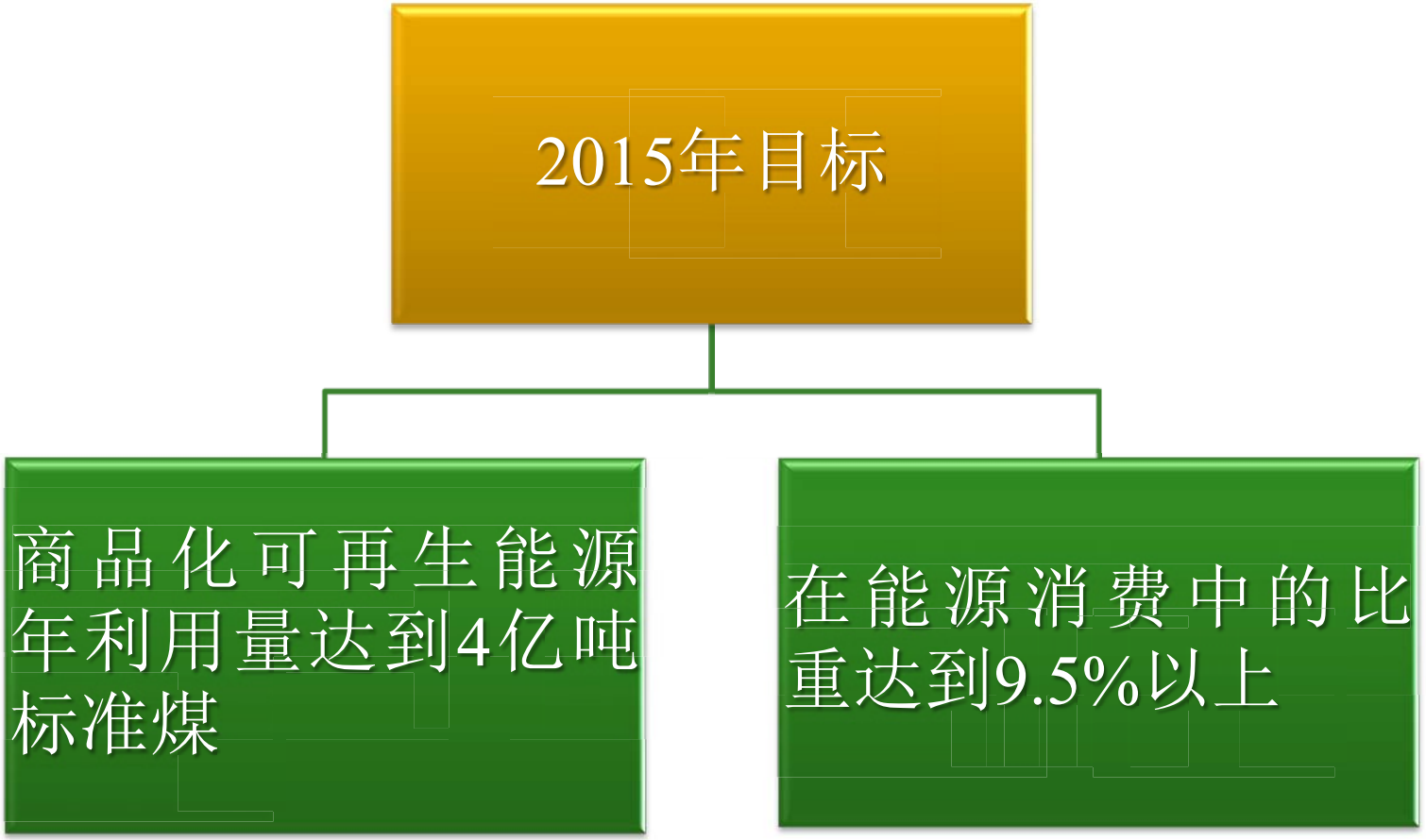
生态文明建设要求

- 全面促进资源节约

推动能源生产和消费革命

(合理)控制能源消费总量

可再生能源发展总体目标

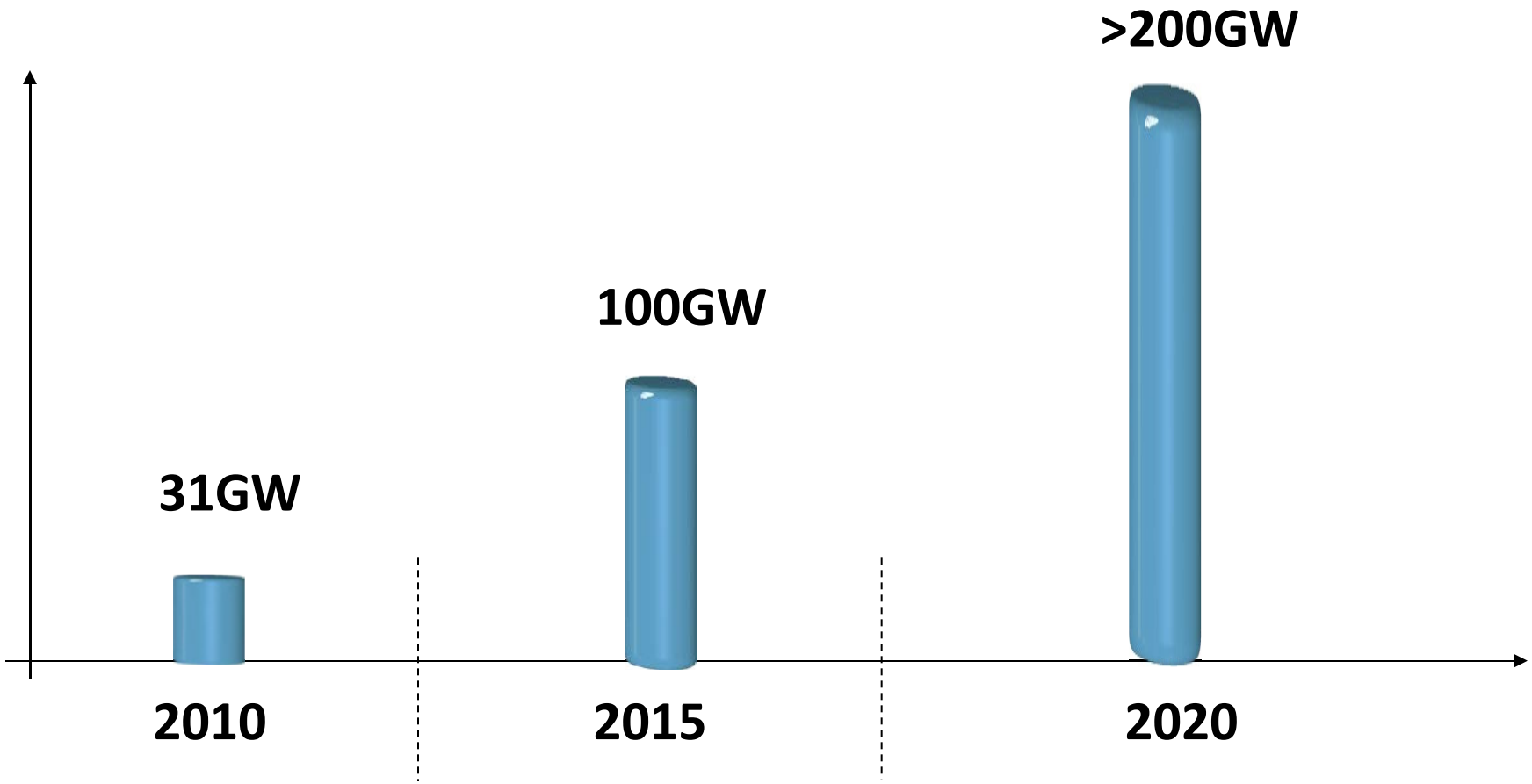


水电

- 2015年，达2.9亿千瓦
  - 常规水电2.6亿千瓦
  - 抽水蓄能3000万千瓦

风电

2015年风电装机达到1亿千瓦，年发电量达到1900亿千瓦时



太阳能 – 光伏

1、重点领域

1 与建筑结合的光伏发电

到2015年底，建成分布式光伏发电系统1000万千瓦

2 大型光伏电站

到2015年，建成大型并网光伏发电装机1000万千瓦

太阳能 – 光热利用

1、重点领域

1 光热发电

到2015年底，建成光热发电100万千瓦

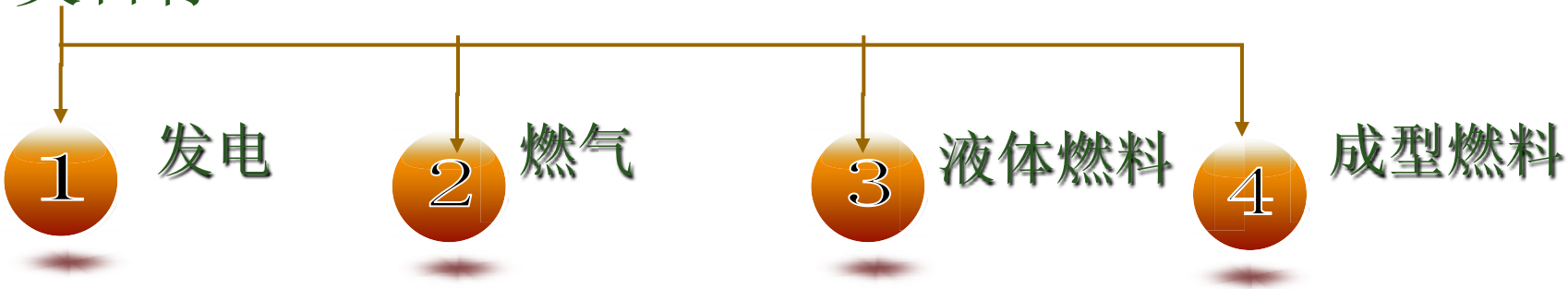
2 热利用

到2015年，太阳能集热利用面积4亿平方米

生物质能

各类生物质能年替代合计约5000万吨标准煤

分类目标



- 装机达到1300万千瓦
- 重点在粮食主产区

- 户用5000万口，大中型沼气工程6000处，沼气年利用量达到220亿立方米

- 燃料乙醇年利用量达到400万吨，生物柴油年利用量达到100万吨；

- 农林生物质成型燃料年利用达到1000万吨

分布式综合利用示范工程

- 新能源示范城市：100个
- 绿色能源示范县：200个
- 新能源微网示范：30个

总结

- 已建立了促进可再生能源发展的政策框架
- 可再生能源步入规模化发展阶段
- 开始面临着体制机制和技术方面的挑战
- 需要进一步加大创新

谢谢！

高虎

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The prospects of a sustainable low-carbon-society in Japan and Hokkaido

Prof. Yoshida Fumikazu

University of Hokkaido

The characteristics and prospects of renewable energies

- Natural energy resources like windpower, photovoltaic, biomass, geothermal energy, low head hydro power etc.

- Domestically produced energies that are independent from imports; although the amount of natural energies is big, their spacious existence is weak→ the production and utilization methods differ from those of former centralized energies (heat energy, nuclear energy, large scale hydropower)

- To promote the spread of renewable energies, not only new technologies, but also a new social organizational framework is needed. → An all-feed-in-tariff system of renewable energies

The potential of the introduction of renewable energies to Japan

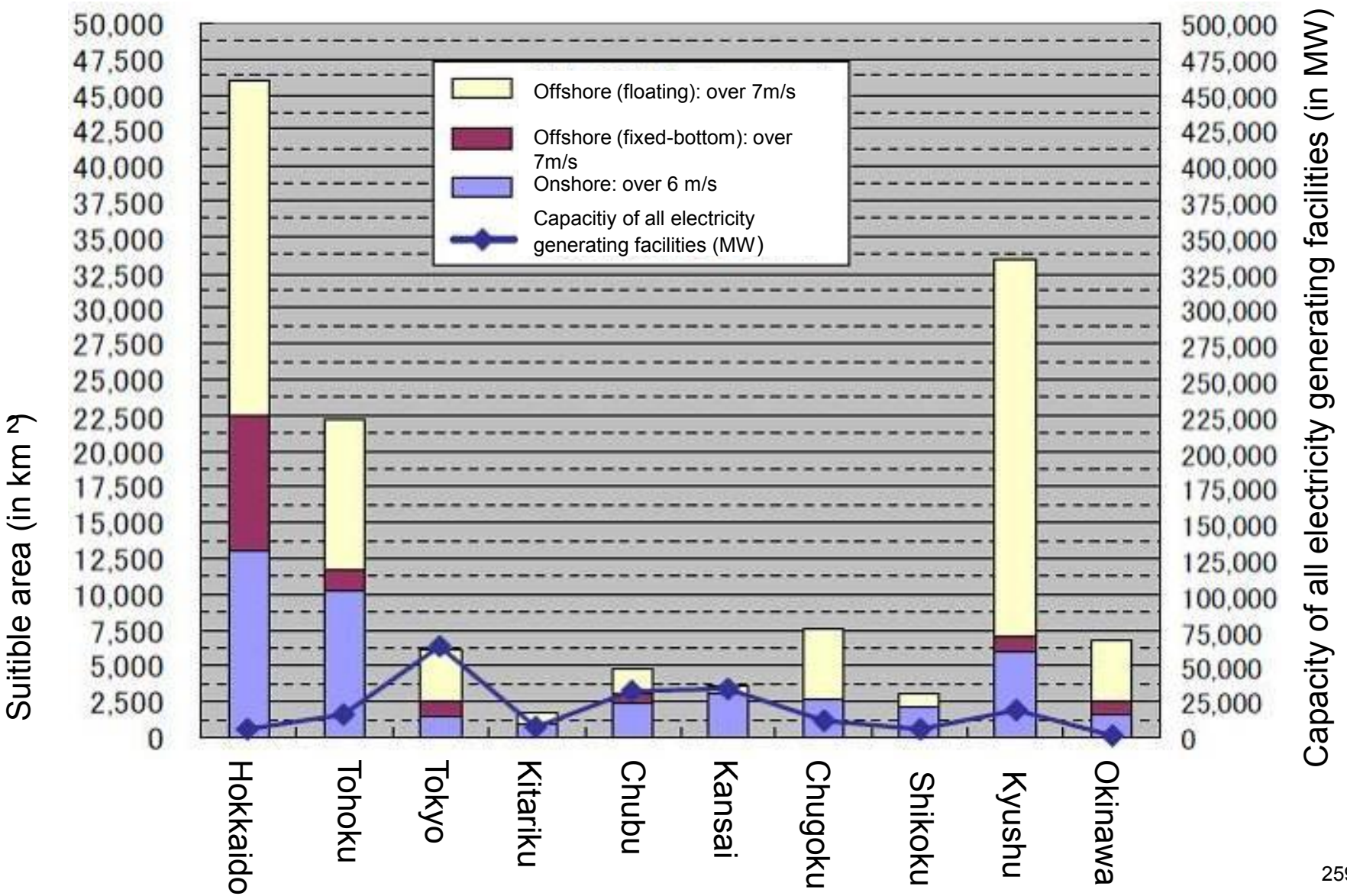
Under the consideration of the realizability, and not only the physical potential (amount of sunshine – wind velocity)

	Installed capacity (in MW), including facilities already in operation	Amount of electricity (in GWh/year) new installed facilies only
Photovoltaic energy (non-private residences)	150, 000	150, 000
Onshore wind power	280, 000	580, 000
Offshore wind power	1, 600, 000	4, 300, 000
Middle and low head hydro power	14, 000	25, 000
Geothermal energy	14, 000	89, 000
Biomass energy	?	?

Annual amount of the sold energy by the ten energy companies: 8,585,000 GWh, including 2,611,000 GWh produced from nuclear power energy

- based on a survey of the Ministry of Environment of March 2011 -

Suitable area for on- and offshore windpower generation and capacity of all electricity generating facilities (of 2008)



The overwhelming potential abilities of Hokkaido

- Wind power companies imminent to be target of the FIT from all over Hokkaido like those in Soya, Ishikari, Nemuro, Hiyama etc. have a potential of about 1,900 MW, including the over 70 mega solar modules of about 2,700 MW.
- Problems:
  - The new construction of transmission facilities for the supply of the urban areas in the consumer regions of Hokkaido with the energy produced + incurred expenses
  - Without the estimation of environmental influences (to the ecological system, disasters, headwaters, bird strike, noise), the connection to the land-use plans on site, new destructive environmentally irresponsible development might occur.

  →Plans concerning the siting projects and the usage of existing agricultural and industrial land shall be made through the participation of local residents and specialists

Model of the production business of renewable energies

Electricity-selling model

Side business of agriculture/forestry and fishery
Denmark, Germany; local entrepreneurs of agricultural land, farms, harbors etc. make investments through bank loans

Large-scale entry of businessmen from outside the region
Denmark model; regional participation in the siting plans
Return of share ownerships / employment etc. to the region

Citizen participation model
Denmark, Japan (Green Fond)
Cooperative ownership; shares from electiricity sales according to the investment

Regional dispersion model

Local consumption of locally produced products ＋electricity sales
Germany's energy self supply village Feldheim
Some notable small scale examples in Japan, too

Regional economy and regenerative energies: the model of Hokkaido

Biomass
heat or cogeneration of heat and power
waste wood from the forestry

Photovoltaic
wide participation of citizens in the production of energy

Wind power
onshore – related to agriculture
offshore – related to fishery
external entrepreneurs – large scale investments
cooperation with the cities– citizen wind wheels

Low head hydro power
water supply facilities related to agriculture
landslide prevention dams,
water- and waste water system
cooperation with the Central Union of Agricultural Cooperatives and the municipals

Electricity- and heat supply for the region
households, offices, scools, hospitals, shops, restaurants, greenhouses, industry for the processing of marine products, Factories for milk products

Electric power companies
purchase guaranty
priority connection

Geothermal energy
cooperation with the operators of hot spring tourism
participation of extern entrepreneurs due to the need of large scale investments

Biogas
cogeneration of heat and power
only for generation of electricity
excrements of the cattle from the agricultural and stock-raising industry

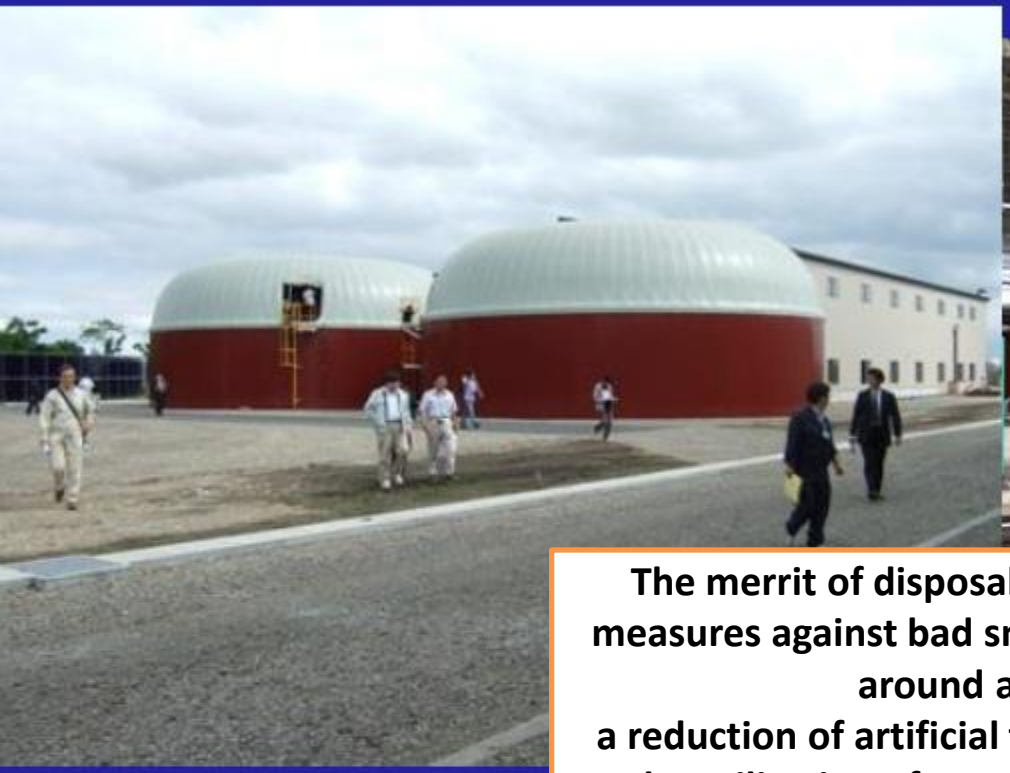
As renewable energies are regional resources, local participation and the return of profits to the region are the key to success!

The solar panels of the Central Union of Agricultural Cooperatives in Hamanaka, Eastern Hokkaido - 1050kW for 105 houses, produced based on the idea of a sustainable dairy industry

Local consumption of locally produced energy, expenditure cut

Conservation of the global environment through the reduction of CO2

Photographs provided by the Central Union of Agricultural Cooperatives Hamanaka



Excrements of cows

The merrit of disposal of excrements: measures against bad smell in the regions around and a reduction of artificial fertilizers through the utilization of excrements as liquid fertilizer

Self-consumption of electricity

Partial sale

Profitable in the case of 20 Yen/kWh

Biogas plant of Shikaoi-cho

Photographs provided by Matsuda Juji

Tsubetsu-cho　Marutama Industry – wood processing and generation of electricity

Logging debris and woody materials for district heating
Wood biomass boiler in Shimokawa-cho, Northern Hokkaido

Raw materials

Logging debris

Energy crops

Shredder machine manufacturing woody materials

Production of wood chips

Site area 9,790 ㎡

Storage facility for woody materials 320 ㎡

Manufacture facility for woody materials

- Fiscal year 2009
- Wood biomas boiler
- Fixed heat capacity: 1,200 kW
- Use: heating of the facility

District heating supply system with the public hall at its center

Introduction of a seperate wood biomass boiler to a public institution

Photographs: HP Shimokawa-cho

Soyamisaki : Japan’s largest windfarm

The struggle for the citizen wind wheel：Number One “Hamakaze-chan”（Hamatonbetsu）is opperating smoothly for 10 years already – the initiative spread over the whole of Japan.

The names of the investors are engraved into the wind wheel

The problems and tasks of the existing businesses

- Even if businesses lead by local authorities and excellent facilities financed through equipment subsidies could be built, the management and maintainance are difficult → enthusiastic leaders, the raising of excellent talented people, the precedence of the profit of the region through simple facilities, cooperation with the industries of the region (forestry, agriculture / stock raising, fishery, marine products industry) have to be given great importance

- The nature of business is clear for the entrepreneurs of large-scale businesses, but the cooperation with the region and the return of profits is insufficient → instituionalization of local participation beginning at the level of siting planning and an obligatory fixed ratio of local share holders (Denmark model) etc.

- Citizen participation model: lack of a feed-in framework and transmission lines→ An FIT, especially the complete realization of priority connections and an obligatory purchase system are needed

The teachings of Uchimura Kanzo

- “The story of Denmark”（1911）*Iwanami Bunko*
- Denmark lost to Germany and overcame the national crisis through human education and a redevelopment of the country
- Reference to renewable energies, looking for resources close to onself, local studies
- Advanced training of humans, vocational training
- Discussing together, democracy
- A “crisis” is a chance - the energy crisis as a starting point for regional revitalization through energy savings and renewable energies

On the post-2020 international institution: its implications for China and Japan

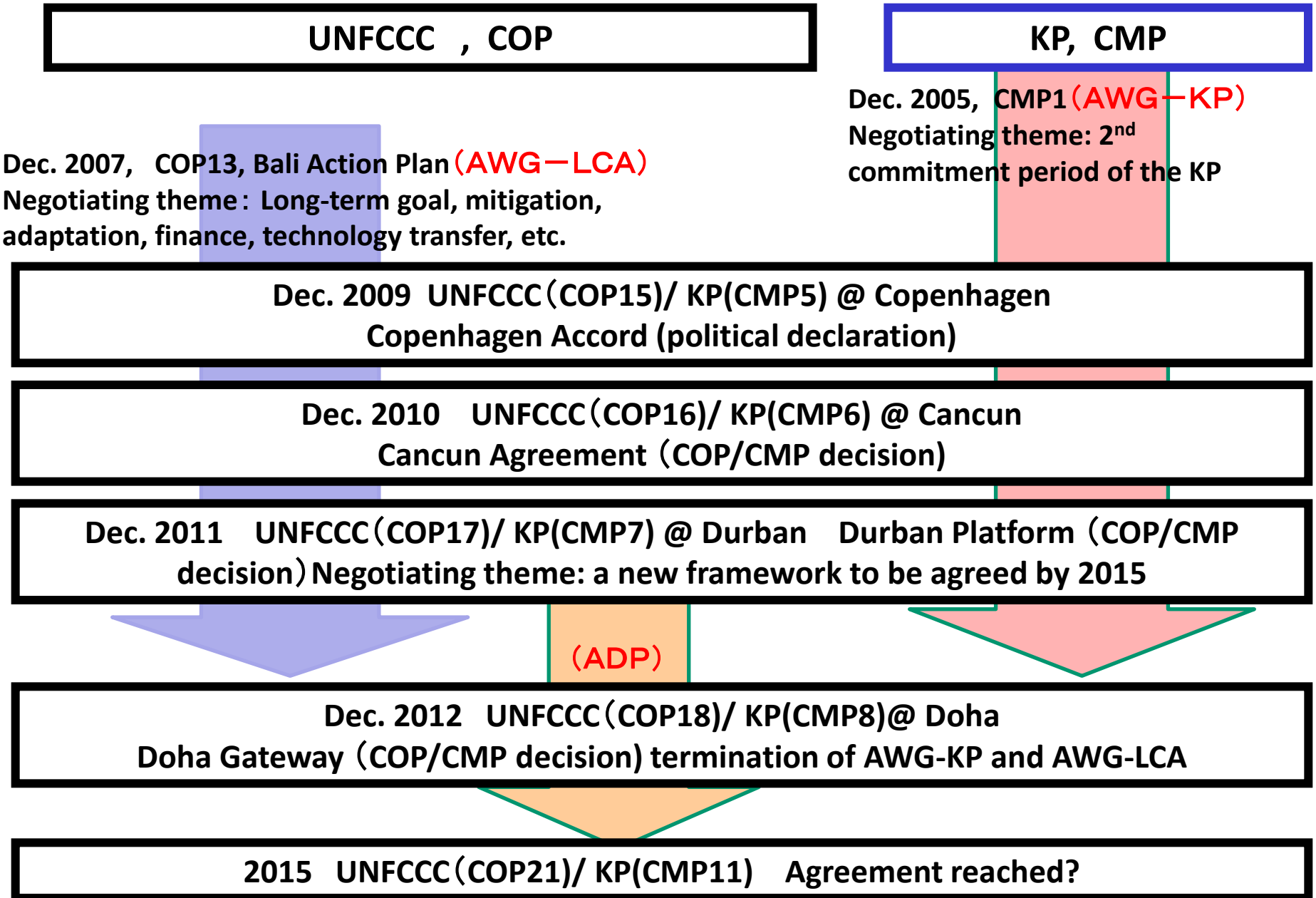
A report from a research project 2E-1201,
Environment Research Fund of Ministry of the Environment

The syposium

July 12, 2013

Dr. Yasuko Kameyama,
National Institute for Environmental Studies

Negotiation Process under UNFCCC



Research Project on post-2020 international institution (2011-2014) funded by ERF, MOE

- An online questionnaire survey was introduced to examine preferences of countries for the outcome of the Durban Platform.

- The survey was conducted between 9 January and 4 February 2013. The timing was chosen so that the respondents would be able to see the outcomes of the COP18/CMP8 before completing the survey. The announcements were made on various mailing lists related to climate change policies.

- The questions asked the respondents' opinions on the options *their countries* were most likely to support in the negotiation process under the Durban Platform, not the respondents' own personal preferences. In all cases, these results should be interpreted as respondents reporting the option they believed their countries would most likely support in the context of the question.

Results of the survey (1)

About respondents

・One hundred people cooperated in the survey. Among the respondents, 64 were from Annex I countries, and 36 were from non-Annex I.

・ About half of all the respondents were either researchers or those working for international organizations. Others belonged to the governments, businesses and environmental NGOs.

Results of the survey (2)

Legal form

- Many expected a protocol to be devised, but about 30 percent of the respondents preferred COP decisions and political declarations, which normally are considered as not legally binding.
- There was a diversity of views among the Annex I countries. The European countries preferred a protocol, while the United States and other countries preferred COP decisions and political declarations.

・All respondents

	Total	Annex I	Non-Annex I
A. Protocol	64	39 (60.9)	25 (69.4)
B. COP decision	20	14 (21.9)	6 (16.7)
C. Political declaration	12	8 (12.5)	4 (11.1)
D. Others	4	3 (4.7)	1 (2.8)

・Annex I countries only

	Annex I total	Europe	Japan & Russia	Others
A. Protocol	39 (60.9)	26	11	2
B. COP decision	14 (21.9)	4	6	4
C. Political declaration	8 (12.5)	1	0	7
D. Others	3 (4.7)	1	1	1

Results of the survey (3)

Future of Kyoto Protocol beyond 2020

・Half the total respondents assumed that the Kyoto Protocol would terminate and merged with the new framework after the year 2020. However, most of the respondents for this choice was from Annex I countries. Two-thirds of respondents from non-Annex I countries preferred continuation of Kyoto Protocol. Among Annex I countries, the Kyoto Parties prefer to see Kyoto Protocol terminate, while other non-Kyoto countries do not mind continuation of Kyoto Protocol.

・All respondents

	Total	Annex I	Non-Annex I
A. The Kyoto Protocol would continue to coexist with the new institution.	25	11 (17.2)	14 (38.9)
B. The Kyoto Protocol would be terminated and converged into the new institution.	50	41 (64.1)	9 (25.0)
C. The Kyoto Protocol would remain, but most of its substantial commitments and mechanisms are likely to be shifted to the new institution.	23	10 (15.6)	13 (36.1)
D. Other (please specify)	2	2 (3.1)	0 (0.0)

・Annex I countries only

	Annex I total	Europe	Japan & Russia	Others
A. The KP would continue to coexist	11 (17.2)	3	2	6
B. The KP would be terminated	41 (64.1)	22	12	7
C. The KP would remain, without substantial force	10 (15.6)	6	4	0
D. Other (please specify)	2 (3.1)	1	0	1

Results of the survey (4)

Emission reduction / limitation targets

・About 60% of all respondents said their countries would prefer to commit to a legally-binding emission reduction/limitation targets. Even more than half the non-Annex I countries showed readiness to commit to emission limitation targets. Among Annex I countries, the European countries preferred legally-binding emission reduction targets, while other countries supported voluntary targets.

・All respondents

	Total	Annex I	Non-Annex I
A. An institution with legally binding numerical emissions limitation targets (e.g., Commitments in the Kyoto Protocol)	60	40 (62.5)	20 (55.6)
B. An institution with non-binding voluntary numerical goals	35	21 (32.8)	14 (38.9)
C. An institution without any reference to national emissions targets	3	3 (4.7)	0 (0 .0)
D. Other (please specify)	2	0 (0.0)	2 (5.6)

・Annex I countries only

	Annex I total	Europe	Japan & Russia	Others
A. Legally binding numerical emissions targets	40 (62.5)	29	8	3
B. Non-binding voluntary numerical goals	21 (32.8)	2	10	9
C. An institution without any reference to national emissions targets	3 (4.7)	1	0	2
D. Other (please specify)	0 (0.0)	0	0	0

Results of the survey (5)

Carbon markets (emissions trading, carbon offsets)

・In both Annex I and non-Annex I countries, both "cap & trade" type and "linking of regional carbon markets" gained support. Although there is a wide support for inclusion of carbon markets in the new instrument, it is yet to determine types of market mechanisms.

・All respondents

	Total	Annex I	Non-Annex I
A. Utilizing the "cap & trade" mechanism at the international level, full use of other crediting mechanisms	50	29 (45.3)	21 (58.3)
B. An institution that allows linkages of domestic emissions trading schemes, with some offsets and crediting	43	29 (45.3)	14 (38.9)
C. An institution that does not consider carbon market mechanisms	4	3 (4.7)	1 (2.8)
D. Other (please specify)	3	3(4.7)	0 (0.0)

・Annex I countries only

	Annex I total	Europe	Japan & Russia	Others
A. Utilizing the "cap & trade" mechanism	29 (45.3)	21	3	5
B. Linkages of domestic emissions trading schemes,	29 (45.3)	10	13	6
C. Not consider carbon market mechanisms	3 (4.7)	0	1	2
D. Other (please specify)	3 (4.7)	1	1	1

Results of the survey (6)

Financial mechanism

・80% of all respondents supported financial mechanism financed by various resources including private investments. Meanwhile, there was a quarter of non-Annex I respondents supporting a financial mechanism financed by public finance only. Public finance would need to be allocated to LDCs and the most vulnerable countries.

・All respondents

	Total	Annex I	Non-Annex I
A. Financed only by public funding from developed countries	13	4 (6.3)	9 (25.0)
B. Financed by various resources including private investments	80	54 (84.4)	26 (72.2)
C. Not refer to financial mechanisms	4	4 (6.3)	0 (0.0)
D. Other (specify)	3	2 (3.1)	1 (2.8)

・Annex I countries only

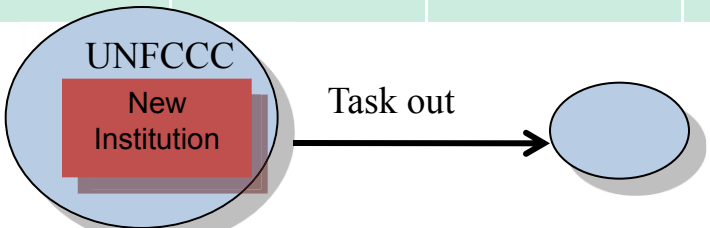
	Annex I total	Europe	Japan & Russia	Others
A. Public funding from developed countries	4 (6.3)	2	1	1
B. Various resources including private investments	54 (84.4)	28	15	11
C. Not refer to financial mechanisms	4 (6.3)	1	1	1
D. Other (specify)	2 (3.1)	1	1	0

Results of the survey (7)

Elements to be tasked out to other arrangements and organizations

Emission targets, long-term goals, and MRV are elements that is preferable to be included in the new institution. Meanwhile, there was relatively more support for emission targets, mitigation actions, and adaptation to be left for each country to decide. A part of carbon markets, financial mechanisms and technology transfer could be tasked out to other international organizations.

Elements	Included in the new institution	Included in the UNFCCC arrangements	Institutions outside the UNFCCC	Left for each country to decide
A. Emission targets	66	15	3	16
B. Mitigation actions	57	14	5	24
C. Carbon markets	51	25	14	10
D. Financial mechanism	54	29	12	5
E. Long-term goals	66	24	2	8
F. Adaptation	42	35	5	18
G. REDD+	52	33	8	7
H. MRV	63	25	5	7
I. Technology Transfer	46	34	13	7



Implications to China and Japan

- It is important to discuss overall architecture (legal form) of the new framework. As a number of countries do not support adoption of a new protocol, other ways to ensure legal force need to be sought for.

- Emission reduction/limitation target setting is an indispensable component of the new instrument, but determination of targets need to be made in a bottom-up process. Long-term goal is indispensable to check overall emission gap at global level, and to discuss how the gap could be closed.

- Low Carbon Development is a "must" in all countries. It would be useful to investigate other countries' success stories and experiences over climate change mitigation policies that are effective also for other policy goals.

Thank you!

For any questions;

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Overview of the seminar "Towards Sustainable Hokkaido, Japan and the World ~Renewable Energy and Green Economy~" on 19th October 2012

On October 19 th 2012, during the Hokkaido University Sustainable Weeks 2012, an environmental policy seminar titled "Towards Sustainable Hokkaido, Japan and the World ~Renewable Energy and Green Economy~" was held at the Hokkaido University Conference Hall. The event was co-hosted by the Hokkaido University Sustainable Low-carbon Society Project and the Hokkaido Regional Environment Office of the Ministry of Environment (MOEJ). Mr. Toshio Izue, Director of the Hokkaido Regional Environmental Office, MOEJ, on behalf of the organizers, welcomed the participants and opened the seminar. This seminar involved lectures and discussions with researchers who specialize and entrepreneurs who engage in renewable energy fields including officials who are in charge of United Nations Conference on Sustainable Development (RIO + 20).

The first lecture by Prof. Fumikazu Yoshida of the Graduate School of Economics and Business Administration, Hokkaido University, entitled "Full Implementation of the Feed-in Tariff (FIT) and Renewable Energy in Hokkaido", focused on the FIT system which has been implemented in Japan since July 2012 along with the information concerning how FIT operates in Japan and Hokkaido, as well as a business overview of wind power, solar power and biogas in Hokkaido. Based on this overview, he pointed out several key issues such as the difficulties in keeping management and maintenance, lack of the cooperation with the local communities, insufficient profit redistribution in the local region, and shortage of purchase quota and undeveloped power grids. In addition to the importance of solving these issues, he emphasized that through efficient energy conservation and utilization of fossil fuels as a bridge between current and renewable energy, we should create new industries and new form of employments based on private investments, and should promote green economy.

Next speaker, Mr. Keisuke Takegahara, the Manager of Environment and CSR Department, Development Bank of Japan, in his work entitled, "Finance of Renewable Energy and Possibility of Regional Development", presented his basic idea on the financial aspect of

renewable energy projects, difficulties in management in terms of regional development, and suggested a potential solution to the problem. From the viewpoint of finance while taking into consideration the concept of "regional development", he pointed out that we must make a shift to a new structure where both the public and private sectors are able to enter the business and share the risk and cost amongst each other at an appropriate level, rather than maintaining the traditional method where either the public or private sector has to responsible for the full cost and risk. In order to do so, he emphasized that it is important to allow local institutions to take an active role in management and costs such as documentation fees, cost of legal examination and legal procedures (legal costs) should be reduced by means of standardization and modularization.

Next, Mr. Toru Suzuki, the Chairman of Hokkaido Green Fund NPO, delivered his presentation entitled "Efforts of Citizens' Windmills in Hokkaido", which addressed their efforts in the community up to the present and introduced the "Energy Change 100 Road Map". In addition, he pointed out the need to strengthen the power grids in Hokkaido, secure finance through the active participation of local financial institutions, solve the problems of bird-strikes, noise and low-frequency sounds as well as discuss ways to obtain social consensus before implementing wind power generation projects in Hokkaido,

In the last lecture entitled "Achievement of RIO+20 and Follow-up Directions of Japan", Mr. Yasukuni Shibata, from the International Strategy Division, Global Environment Bureau of Ministry of the Environment, introduced the contents of the agreement and the assessment of United Nations Conference on Sustainable Development (RIO+20) held in Rio de Janeiro, Brazil, in June 2012. He put an emphasis on "green economy" as one of main subjects of RIO+20, and elaborated on the discussion of renewable energy and how Japan is able to contribute to the international society in following up the Conference.

In the subsequent panel discussion and Q&A session moderated by Prof. Shinichi ARAI, Professor, Faculty of Environmental Earth Science, Hokkaido University, participants discussed issues such as target setting of renewable energy utilization and the importance of infrastructure development including the reinforcement of power grids. They also focused on the necessity of devising ways on how to return the profits to the community and create profit cycle processes in the community. Through the panel discussion and the Q&A session, a general recognition was reached by the participants.

Professor Fumikazu Yoshida closed the Seminar by expressing his hope that the results of the seminar will be utilized for promoting sustainable society thorough facilitating introduction of renewable energy in communities.

Approximately 140 participants from both inside and outside of the campus attended this seminar. The questionnaires filled out by the audience after the seminar showed that the contents were very useful and many of them learnt about the relations among renewable energies, finance and the revitalization of community's economy. In addition, the questionnaires also demonstrated that many of the audience made a new discovery regarding the current situations in foreign countries and efforts of local communities in Japan.

Hokkaido University Sustainable Low-carbon Society Project and the Hokkaido Regional Environment Office of the Ministry of Environment will continue their endeavors through their active involvement in the Sustainability Weeks of Hokkaido University as means to proliferate the information on the latest trend and innovation in environmental issues and policies to the people.