Development &Deployment of GHG emission reduction technologies ～Putting into practice with NEDO's international Activities～

Toshihiko Kasai

New Energy and Industrial Technology Development Organization(NEDO)

Presentation at COP19/CMP Warsaw on Nov 20th, 2013

Table of Contents

Presentation at COP19/CMP Warsaw on Nov 20th, 2013

Table of Contents

Presentation at COP19/CMP Warsaw on Nov 20th, 2013

About NEDO

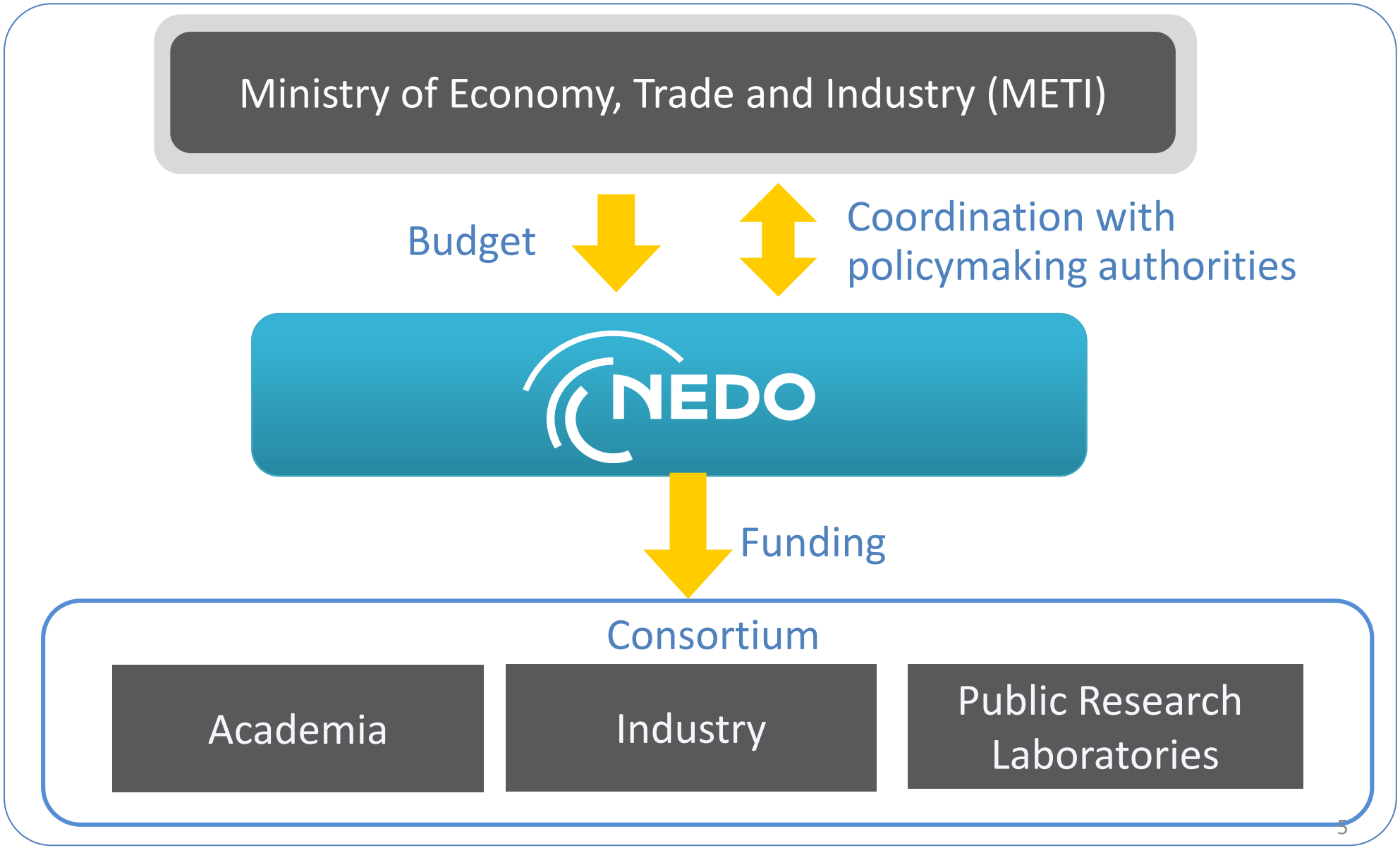
New Energy and Industrial Technology Development Organization (NEDO)

Promotes research and development as well as the demonstration of industrial, energy and environmental technologies.

Mission

- Addressing energy and global environmental issues
- Enhancing Japan's industrial competitiveness

NEDO's Role


Ministry of Economy, Trade and Industry (METI)
Budget
Coordination with policymaking authorities
NEDO
Funding
Consortium
Academia
Industry
Public Research Laboratories

NEDO's Technology Development Activities

Technology seed development activities → **R&D /Demonstration projects** → Practical application

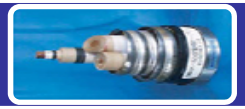
Research and Development

- Renewables and energy efficiency
- Information and telecommunications
- New manufacturing technology
- Life science
- Nanotechnology and materials
- Environment technology

Demonstration

- Renewables and energy efficiency
- Environment technology
- Medical systems

NEDO's Technology Development Activities


Energy Efficiency and Conservation

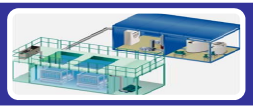

Renewable Energy


Storage Batteries

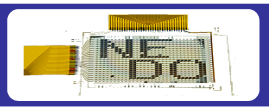

Smart Grids & Smart Community


Robots


High-efficiency Clean Coal


Water Treatment


Electronics


Materials & Nanotechnology


Biotechnology & Medical Technology

Technologies for Countermeasure against Climate Change

- Energy Conservation
  - Energy management – HEMS, BEMS, CEMS
  - Energy Storage
  - Heat Pump
  - Combined heat and power
- New Energy
  - Smart Grid
  - Photovoltaic power generation
  - Wind power generation
  - Energy from Waste
  - Fuel Cell technology (PEFC, SOFC)
  - Solar power generation
  - Ocean energy utilization
- Fuel for Transportation
  - E.V., Hybrid V., Fuel cell V.
  - Secondary battery
  - Gas to liquid (GTL) technology
  - Biomass fuel production
  - Hydrogen production
- Fossil fuel production and clean technology
  - Clean coal technology
  - CO2 capture and storage
  - New coke-making technology
- Non-fluorocarbon technology
  - Non-fluorocarbon refrigerator
  - Non-fluorocarbon insulator
  - Fluorocarbon decomposition

Renewable Energy

●Photovoltaic Technology

Mega Solar

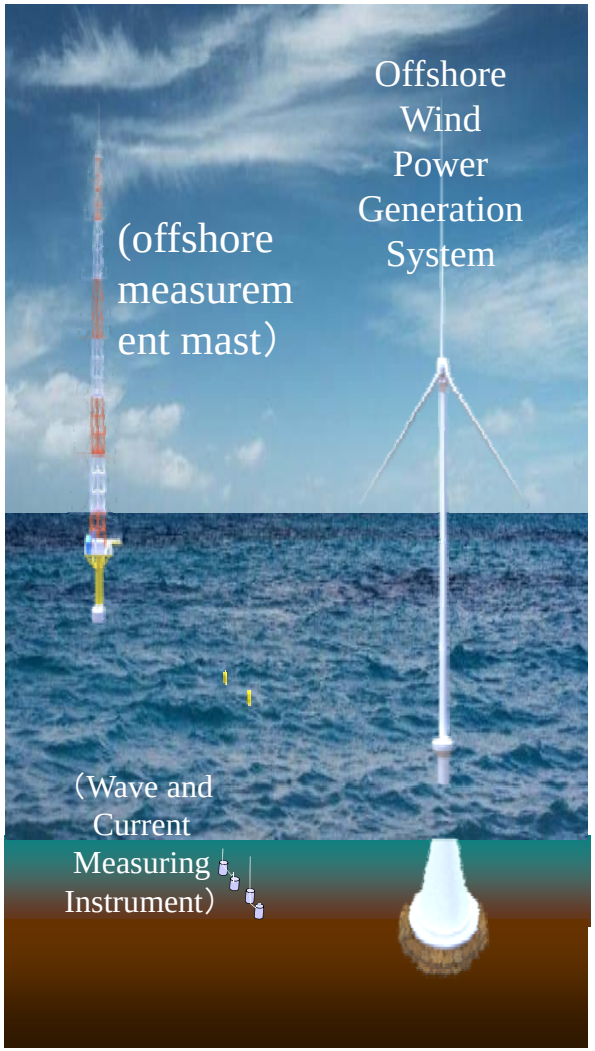
Highest efficiency in the world

●Storage Batteries

Electronic Vehicle

●Wind Power Generation

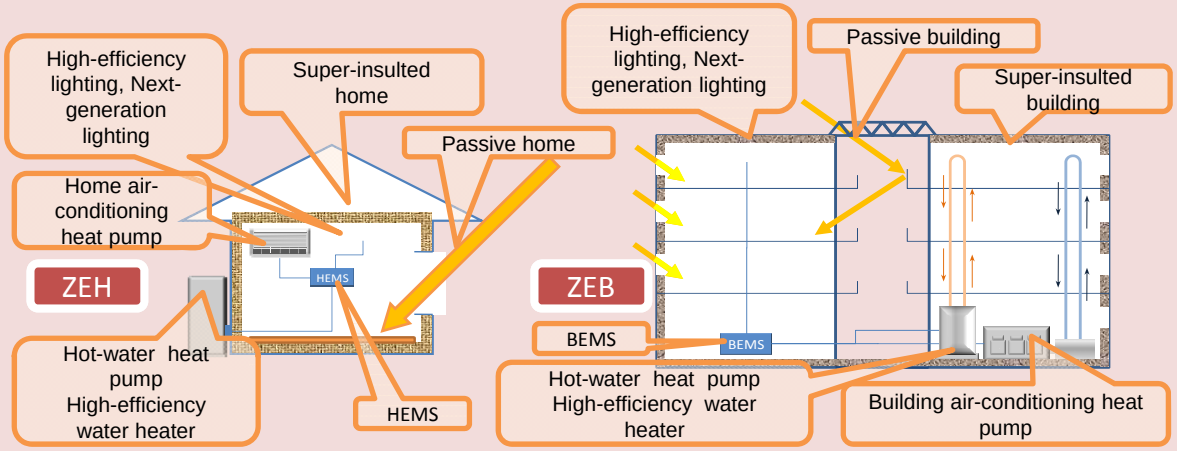
Wind Farm



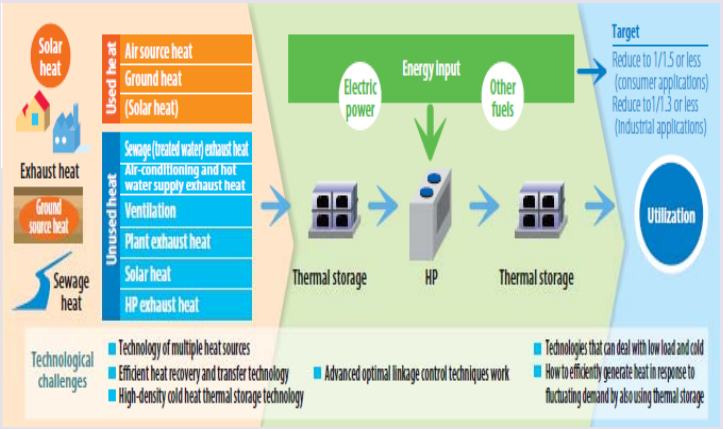
Renewable Energy and Energy Conservation

ZEB (Net-zero Energy Building)
ZEH (Net-zero Energy Home)

Improving energy-saving efficiency for building frameworks and equipment in homes and buildings, and comprehensively designing systems such as load controls and integrated controls would reduce energy consumption amounts in homes and buildings to virtually net zero.



Next-generation Heat Pump Systems



Next-generation Vehicles

Next-generation vehicles such as electric vehicles have the potential for substantial improvements of fuel efficiency compared to conventional vehicles

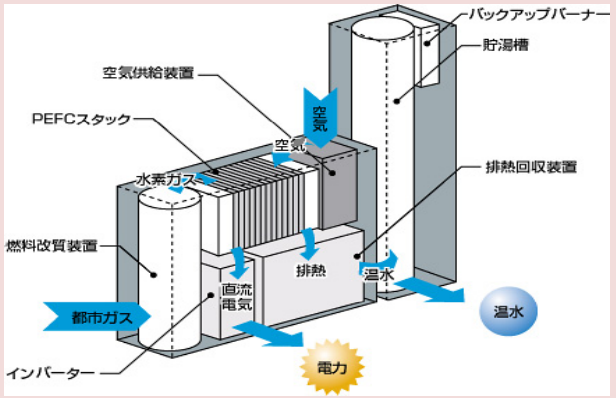






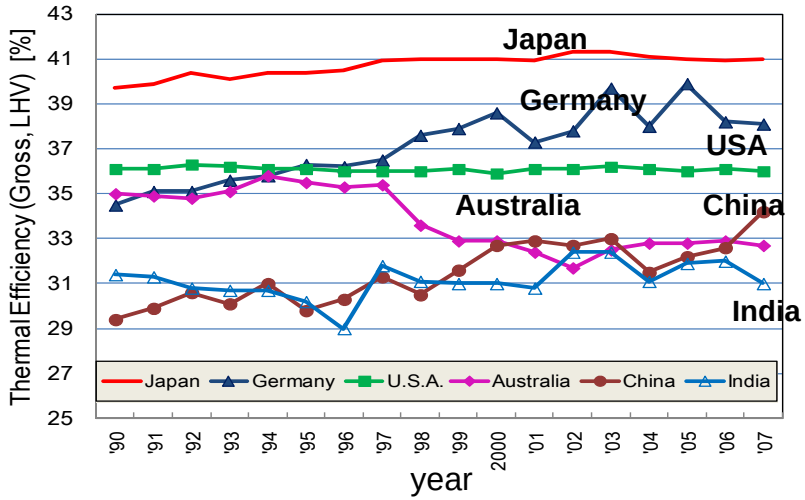
Examples:
・Electric vehicles
・Plug-in hybrid vehicles
・Fuel cell vehicles

Stationary Fuel Cells



High-efficiency Clean Coal Technology

~ Japan has achieved the world's highest efficiency levels for coal-fired thermal power generation technology. ~

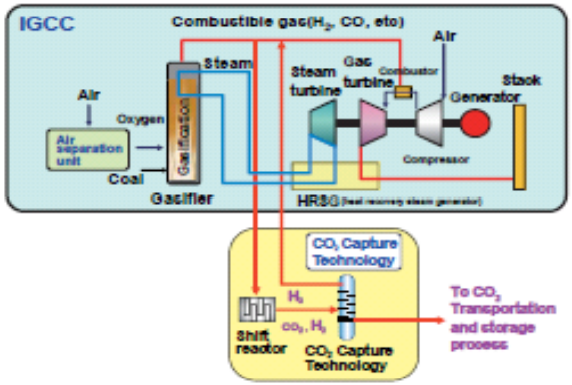


INTERNATIONAL COMPARISON OF FOSSIL POWER GENERATION EFFICIENCY (ECOFYS) (2010)

USC + CCS

Result of FS on 500 MW USC + CCS

IGCC + CCS



IGCC Technology Development
~EAGLE demonstration plant~

USC power plant

Misumi coal-fired power plant
1000 MW, 24.5 MPa×600℃/600℃
operation started in 1998

IGCC plant

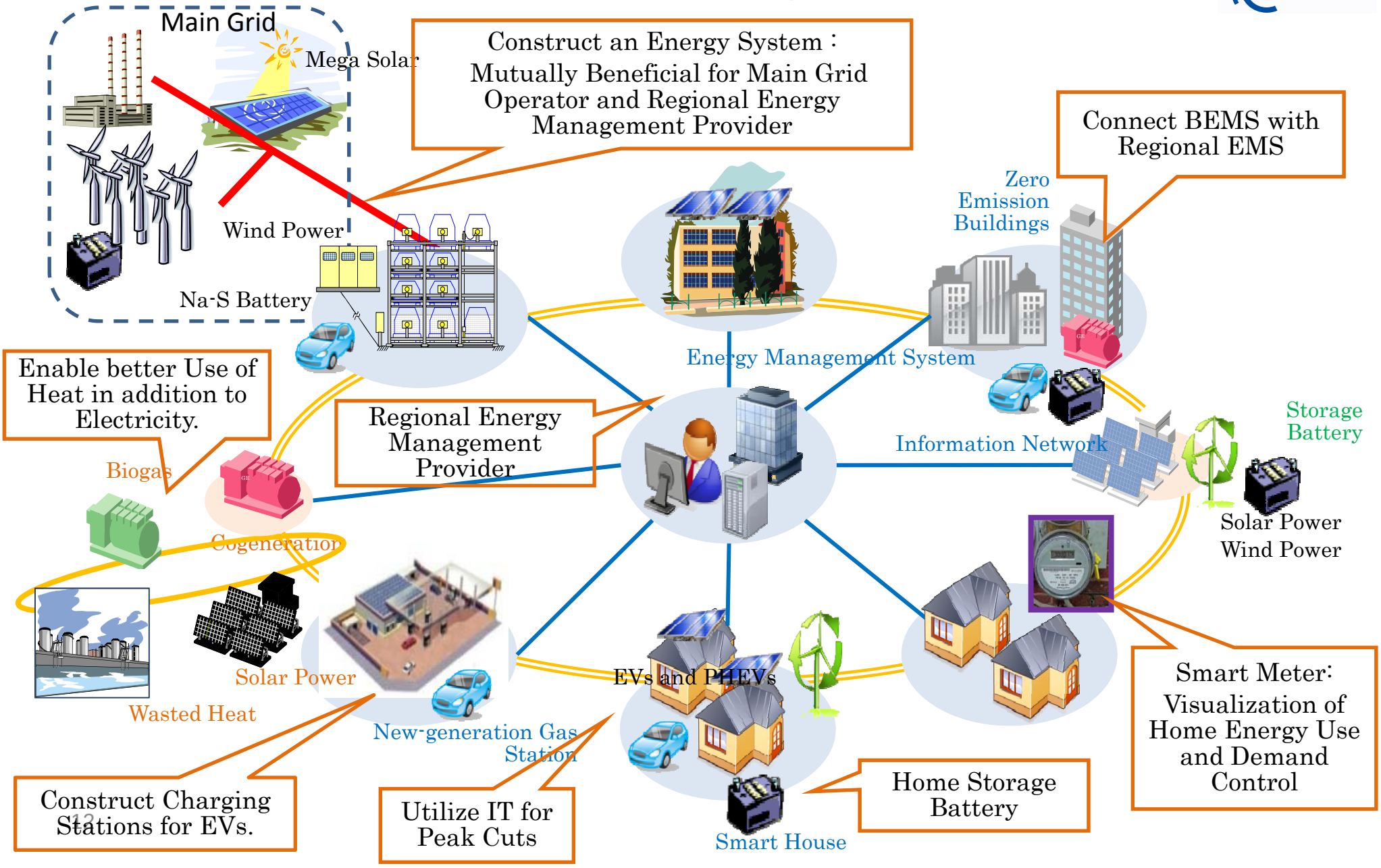
Nakoso IGCC demonstration plant
250 MW operation started in 2007

USC
: Ultra-supercritical

IGCC
: Integrated coal gasification combined cycle

CCS
: Carbon dioxide capture and storage

Smart Community



The way to realize a **low carbon society** through technology

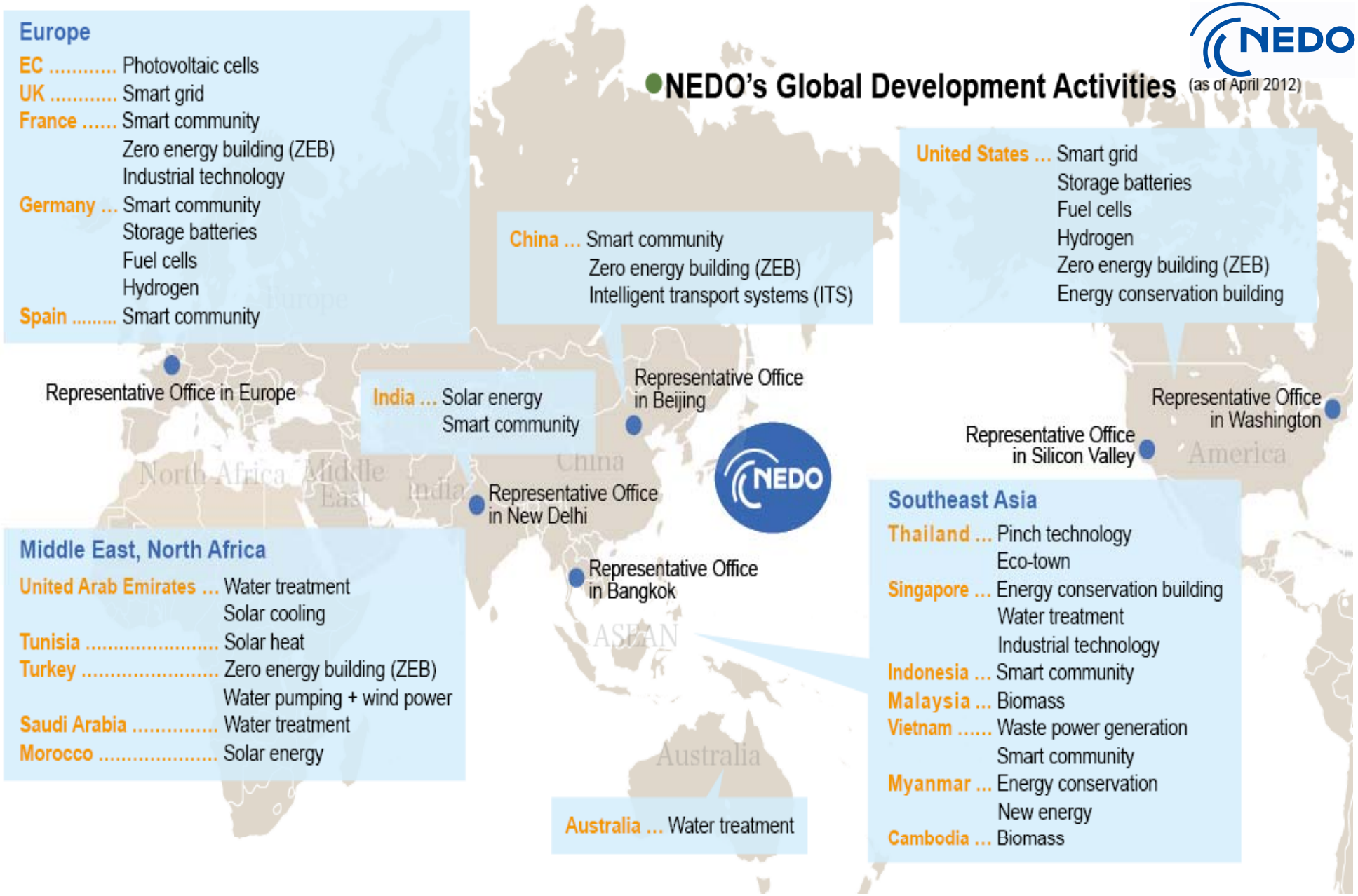
Development of low carbon breakthrough technologies

Dissemination of low carbon technologies
to all over the world

It leads to reduce the emission of GHG worldwide

Table of Contents

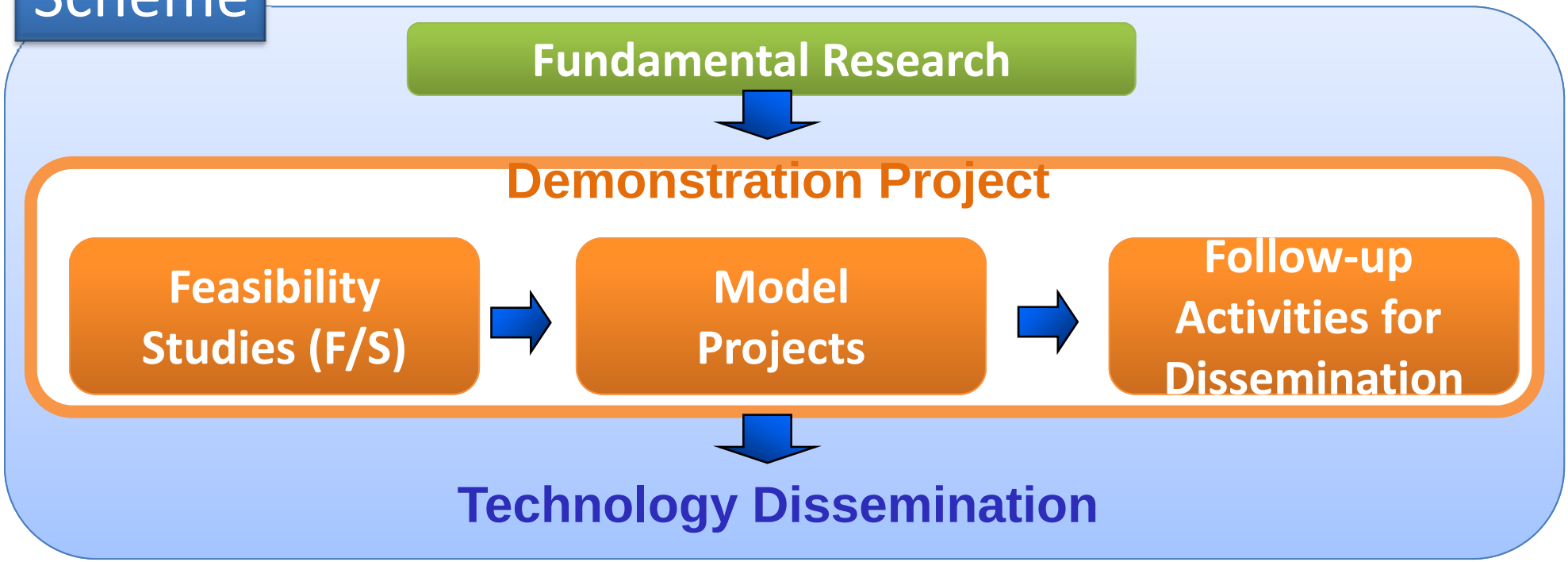
Presentation at COP19/CMP Warsaw on Nov 20th, 2013


NEDO's Global Development Activities (as of April 2012)
Europe
EC ..... Photovoltaic cells
UK ..... Smart grid
France ..... Smart community
Zero energy building (ZEB)
Industrial technology
Germany ... Smart community
Storage batteries
Fuel cells
Hydrogen
Spain ..... Smart community
Representative Office in Europe
China ... Smart community
Zero energy building (ZEB)
Intelligent transport systems (ITS)
India ... Solar energy
Smart community
Representative Office in Beijing
Representative Office in New Delhi
Representative Office in Bangkok
United States ... Smart grid
Storage batteries
Fuel cells
Hydrogen
Zero energy building (ZEB)
Energy conservation building
Representative Office in Washington
Representative Office in Silicon Valley
Middle East, North Africa
United Arab Emirates ... Water treatment
Solar cooling
Tunisia ..... Solar heat
Turkey ..... Zero energy building (ZEB)
Water pumping + wind power
Saudi Arabia ..... Water treatment
Morocco ..... Solar energy
Southeast Asia
Thailand ... Pinch technology
Eco-town
Singapore ... Energy conservation building
Water treatment
Industrial technology
Indonesia ... Smart community
Malaysia ... Biomass
Vietnam ..... Waste power generation
Smart community
Myanmar ... Energy conservation
New energy
Cambodia ... Biomass
Australia ... Water treatment

Demonstration Project Scheme

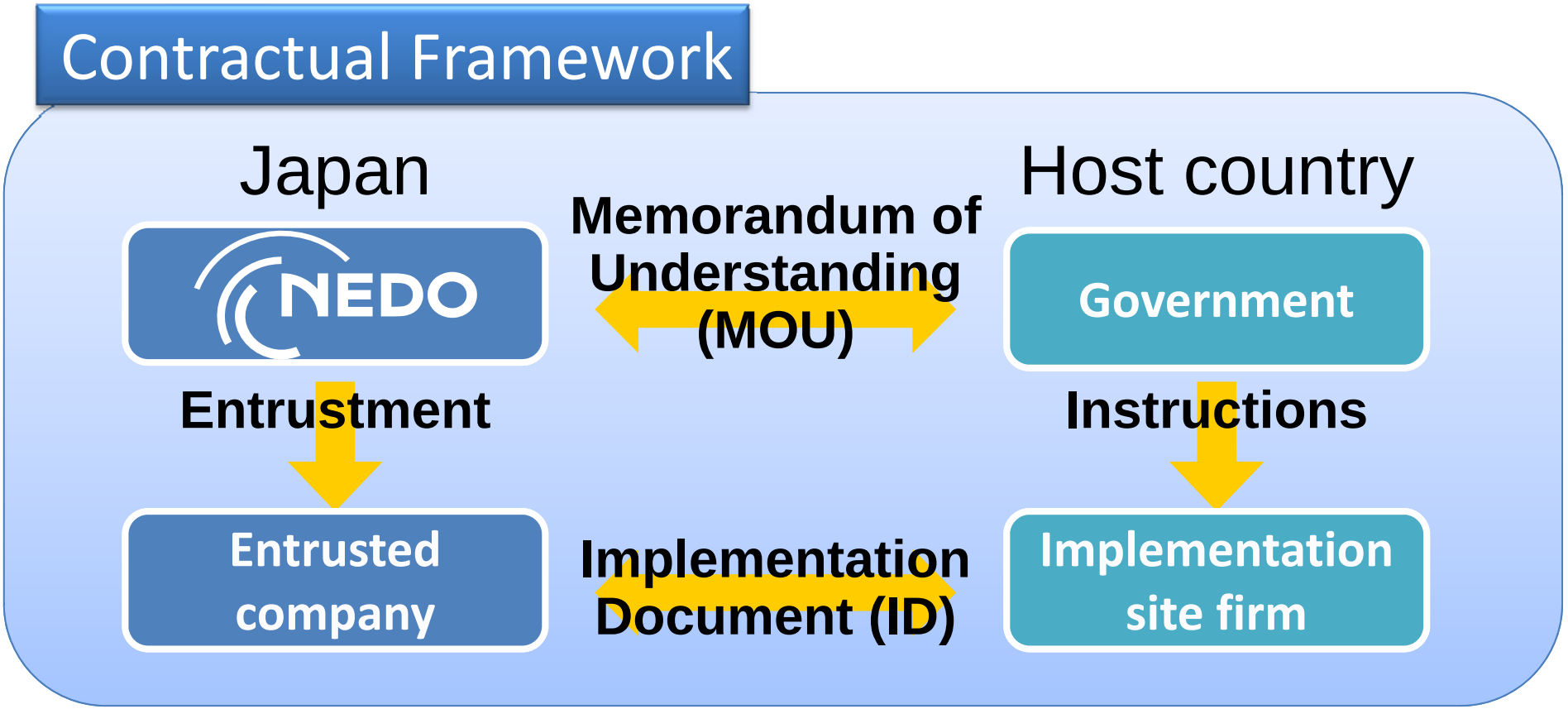
The purpose of NEDO's demonstration projects is to demonstrate the effectiveness of advanced Japanese clean energy and environmental technologies through the introduction of such technologies in overseas countries.

Scheme



Costs are shared between Japan and the host country

Demonstration Project Scheme

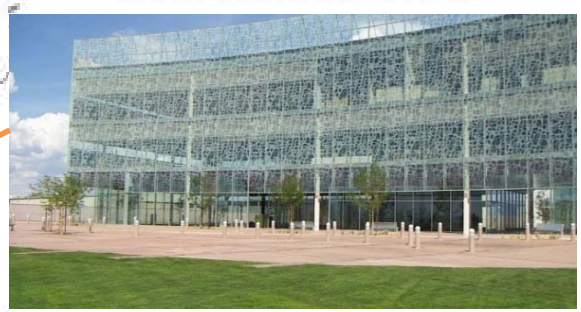


Smart Grid & Energy Management

Smart Grid Demonstration Overseas (2010-14)

Lyon, France

New Mexico, USA



Malaga, Spain

Gongquingcheng City, Jiangxi Province, China

Maui Island, State of Hawaii, USA

Water Technologies

Overseas Demonstration of Water Solutions

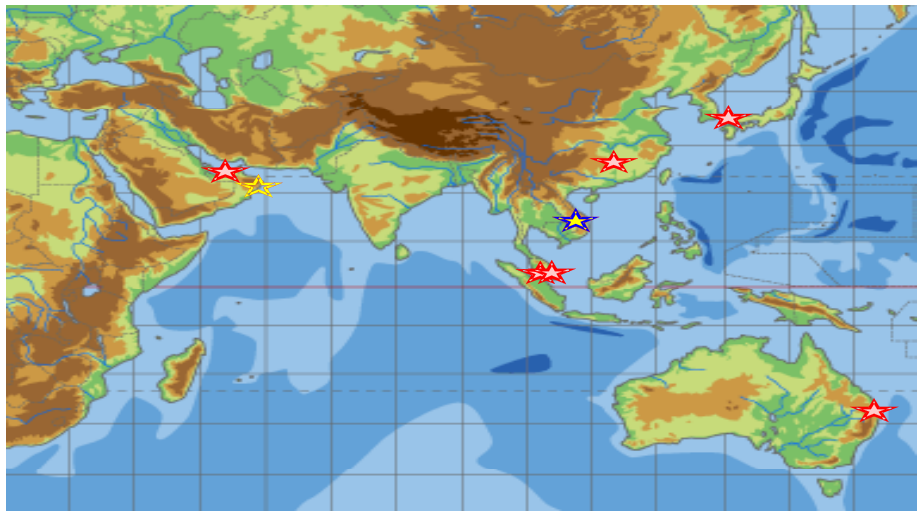
1. Development for advanced technologies
   RO, NF, MBR, Metal recovery, AOP, etc

©Toray

2. Test-bedding for dissemination
   of newly developed systems

   7 countries (Australia, KSA, UAE, China, Vietnam, Singapore, Oman)

   8 projects (SWRO, MBR, Reuse, Leakage control, Distribution control, Rainwater harvesting.)



Energy Conservation

Overseas Demonstration of Japanese Energy Conservation Solutions

Model Project for Coke Dry Quenching FY1997-2000

Utilization of Waste Heat from a Cement Plant FY1995-1997

The Model Project for Waste Heat Recovery Power Generation in the Cement Industry (FY2009-2012)

Outline of the Demonstration Project

1. Project Overview

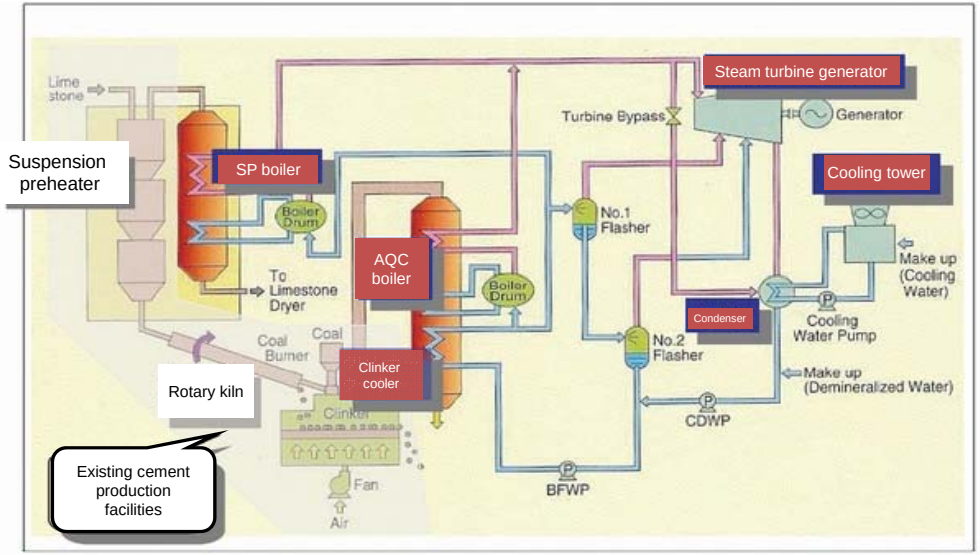
Using the waste heat recovery power generation system introduced in this project, heat from exhaust gases is recovered and used to generate electricity. The electricity is used in the operation of cement productions process, thereby decreasing the power required to operate a cement plant.

Country	Indonesia
Entrusted company	JFE Engineering Corporation
Implementation site	PT. Semen Padang
Counterpart	Ministry of Industry
Energy Saving	643 TJ/y
GHG Saving	43,100 t-CO_2/year

2. Outline of Technology

1) Exhaust gas energy is recovered to generate steam through the use of an SP boiler and an AQC boiler.
2) A steam turbine generator is then used to convert the steam into electrical energy.
3) The system is equipped with a special dust-removal mechanism that requires little maintenance and generates electricity with consistent efficiency, thereby ensuring long-term stable operations .

3. System Flow



The Model Project for Waste Heat Recovery Power Generation in the Cement Industry (FY2009-2012)

Schedule, Dissemination

Progress to date

- Feasibility Study (FY2007-2008)
- Model Project (FY2008-2012)

Energy saving: 643 TJ/yr
(GHG saving: 43,100 t/yr)

Ongoing in FY2012

- Technology dissemination activities

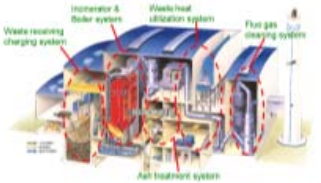
Asian Projects

Myanmar
High-efficiency Gas Turbine Technology

Laos
Hybrid PV Power Generation Systems

Thailand
Synthetic Energy Conservation of Industrial Parks

Vietnam
Industrial Waste Power Generation System



Cambodia
Rice Husk Power Generation Systems

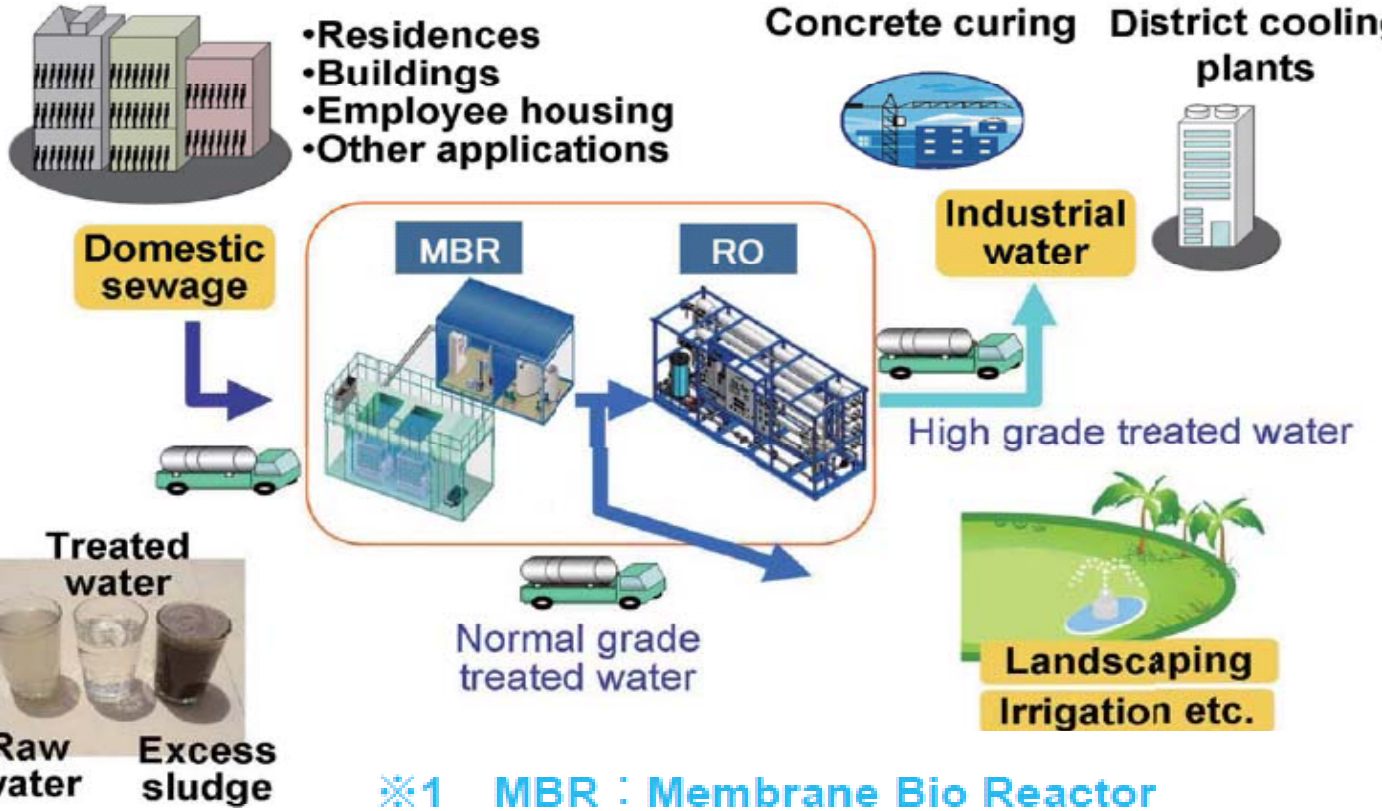
Philippines
PV Capacity

Malaysia
Smart Communities on Putrajaya

Singapore
Wastewater Treatment System

Indonesia
Smart Community Technologies in Industrial Parks

NEDO Project in Ras Al Khaimah, UAE



※1 MBR：Membrane Bio Reactor
※2 RO： Reverse Osmosis membrane

MBR TANK 500m³×4 LINES

RO UNIT 500m³×3 LINES

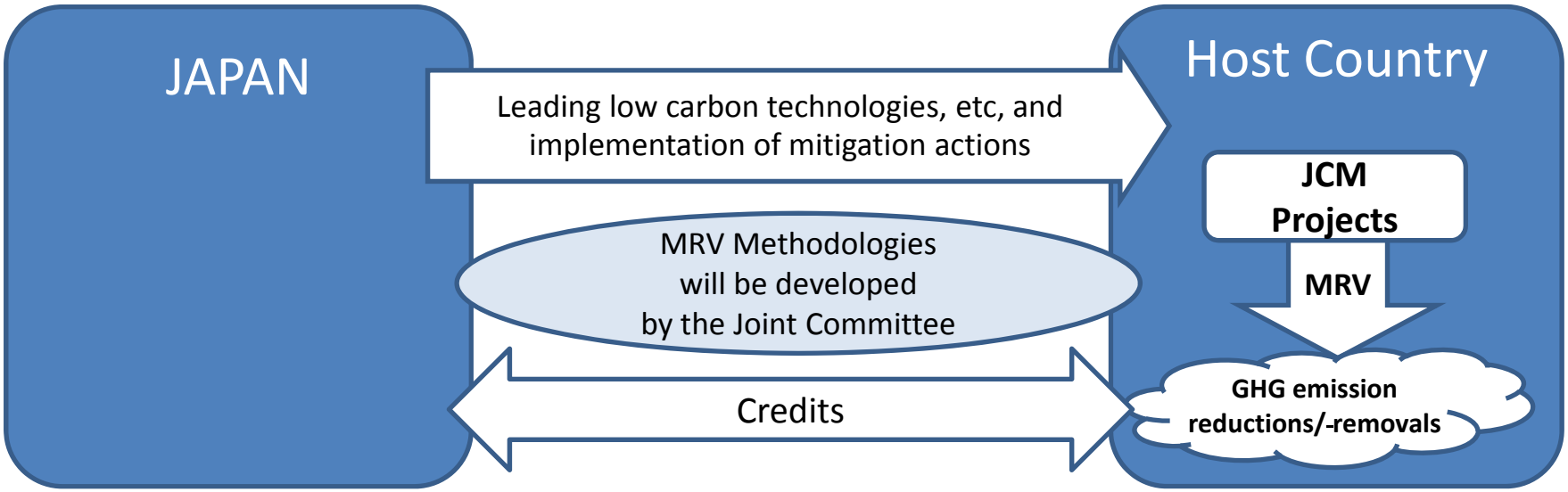
Completion ceremony for the Water Saving and Environmentally-friendly Water Recycling Project facility held in Ras Al Khaimah of the UAE in April 2010

Table of Contents

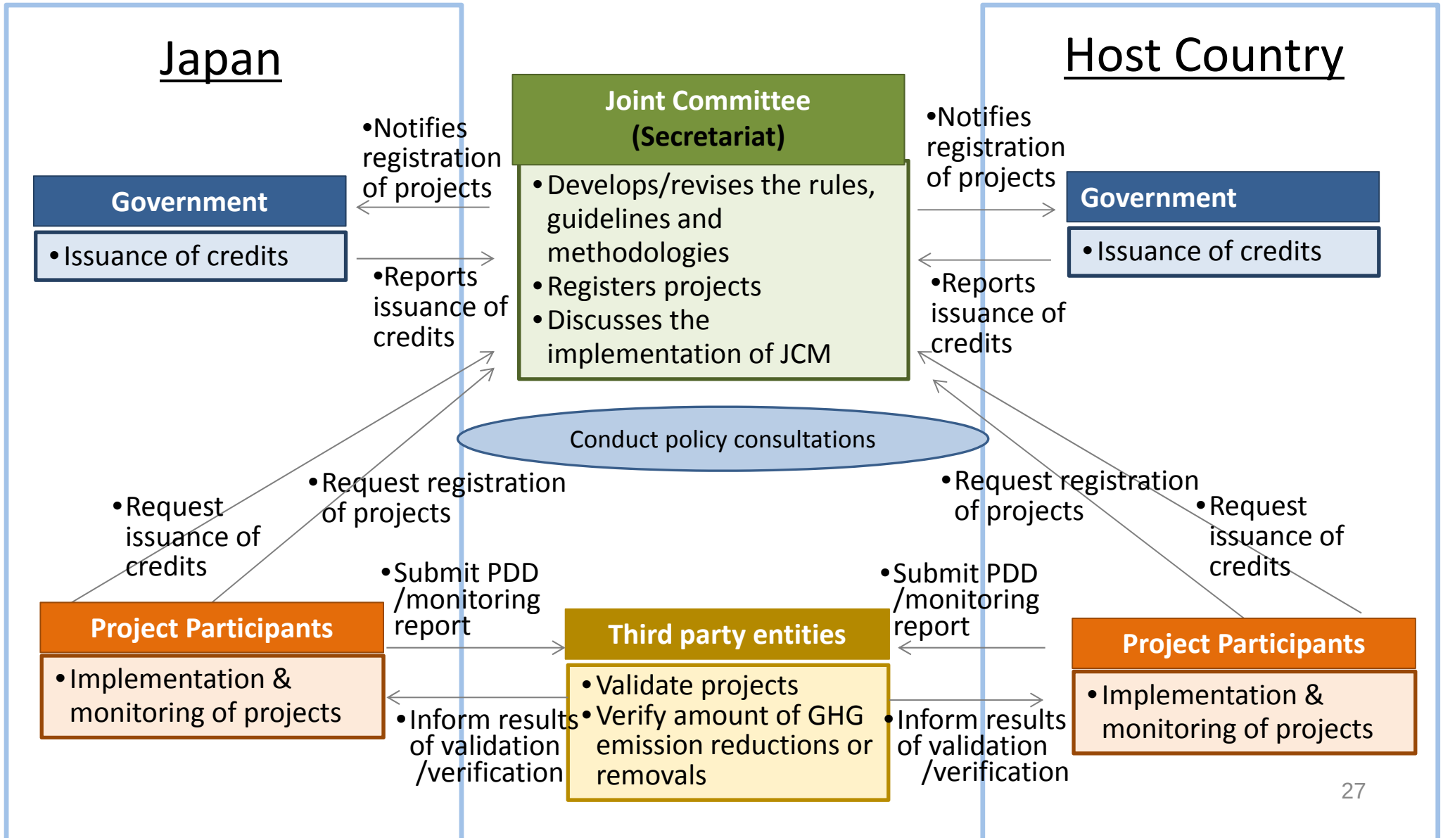
Presentation at COP19/CMP Warsaw on Nov 20th, 2013

Basic Concept of the JCM

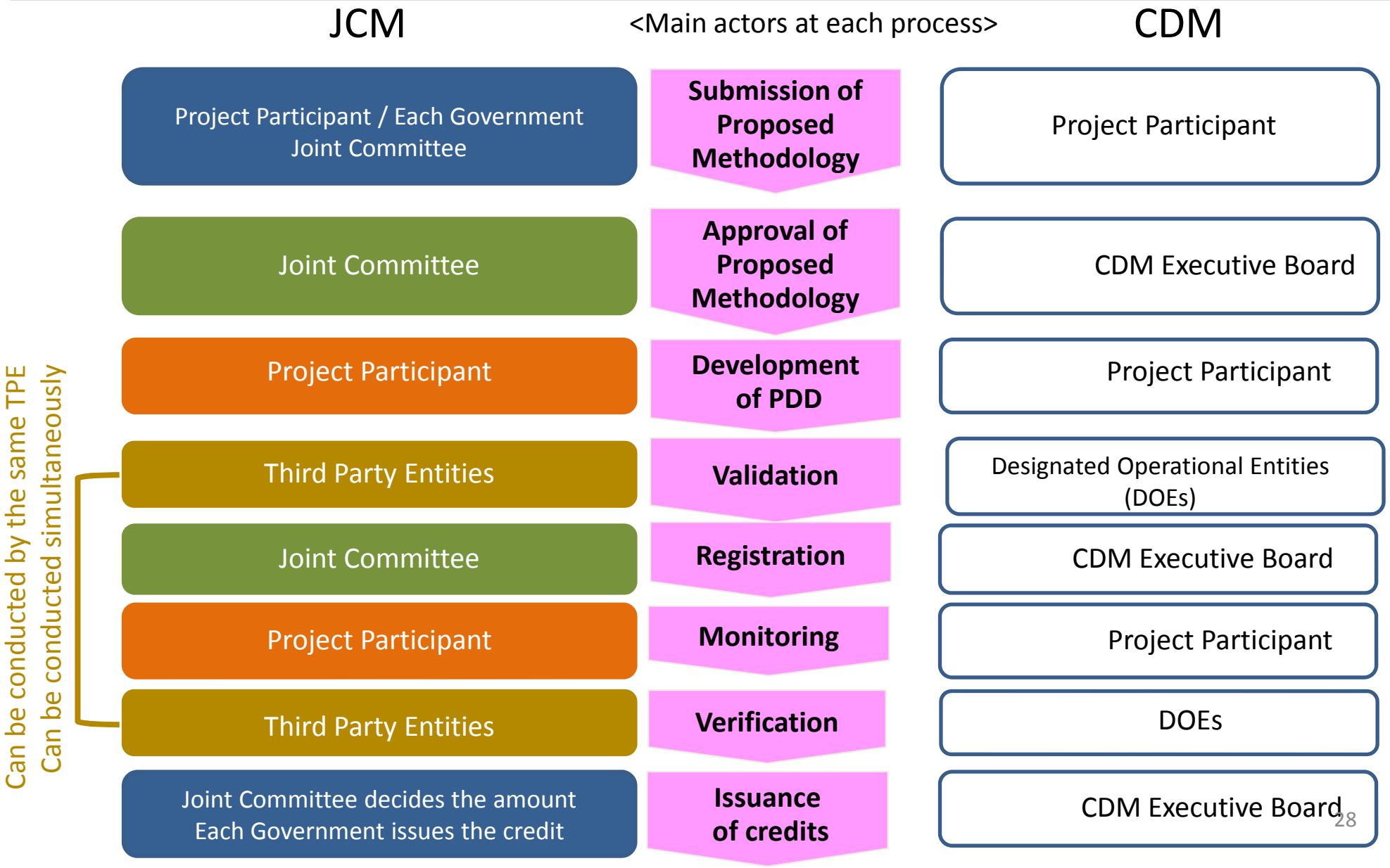
- Facilitating diffusion of leading low carbon technologies, products, systems, services, and infrastructure as well as implementation of mitigation actions, and contributing to sustainable development of developing countries.
- Appropriately evaluating contributions to GHG emission reductions or removals 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.



Scheme of the JCM



Project Cycle of the JCM and the CDM

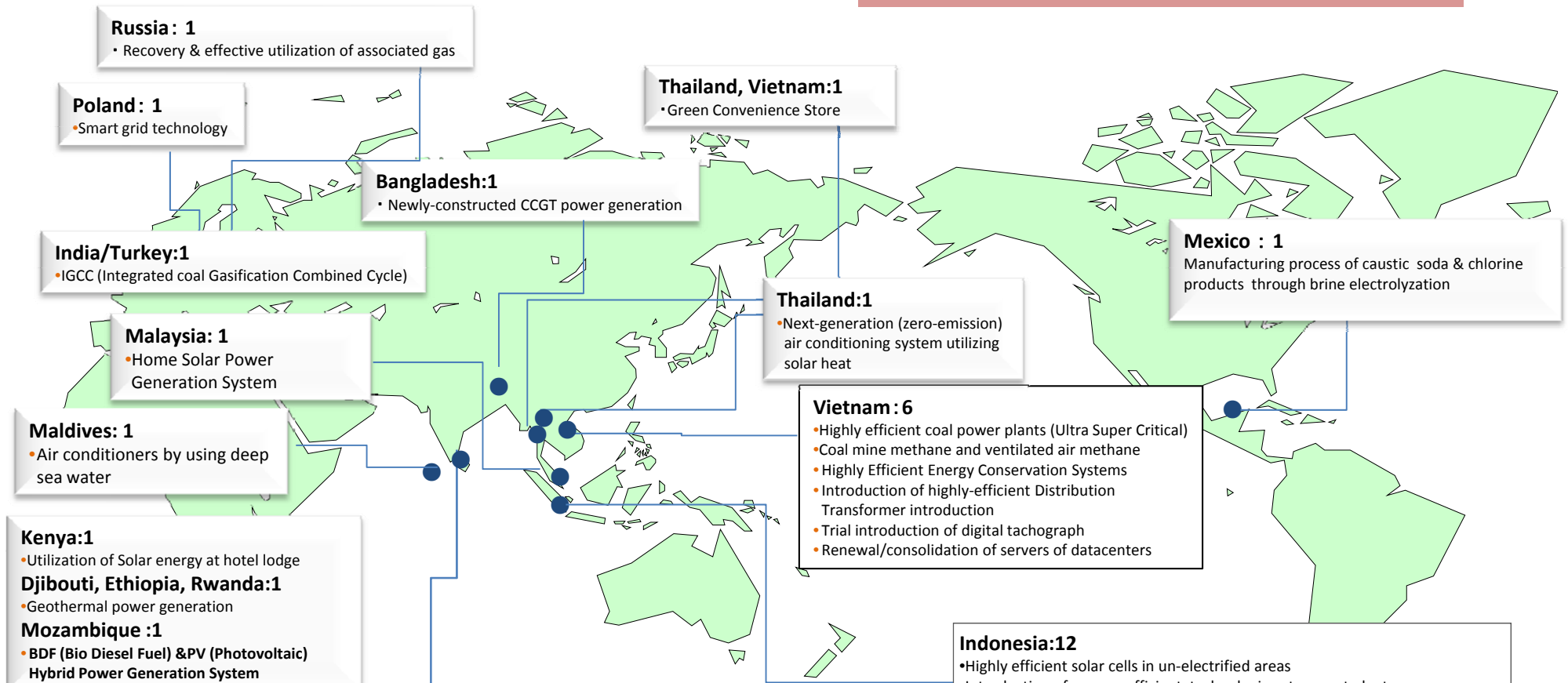


Signed Bilateral Document with

- Mongolia on 8th January, 2013.
- Bangladesh on 19th March, 2013.
- Ethiopia on 27th May, 2013.
- Kenya on 12th June, 2013.
- Maldives on 29th June, 2013
- Vietnam on 2nd July, 2013
- Lao PDR on 9th August, 2013
- Indonesia on 26th August, 2013.

JCM Feasibility Studies (FSs) by NEDO in FY2011

40 projects were selected (17 countries)



Russia : 1
・Recovery & effective utilization of associated gas

Poland : 1
•Smart grid technology

Thailand, Vietnam:1
・Green Convenience Store

Bangladesh:1
・Newly-constructed CCGT power generation

India/Turkey:1
•IGCC (Integrated coal Gasification Combined Cycle)

Mexico : 1
Manufacturing process of caustic soda & chlorine products through brine electrolyzation

Thailand:1
•Next-generation (zero-emission) air conditioning system utilizing solar heat

Malaysia: 1
•Home Solar Power Generation System

Vietnam : 6
•Highly efficient coal power plants (Ultra Super Critical)
•Coal mine methane and ventilated air methane
• Highly Efficient Energy Conservation Systems
• Introduction of highly-efficient Distribution Transformer introduction
• Trial introduction of digital tachograph
• Renewal/consolidation of servers of datacenters

Maldives: 1
•Air conditioners by using deep sea water

Kenya:1
•Utilization of Solar energy at hotel lodge

Djibouti, Ethiopia, Rwanda:1
•Geothermal power generation

Mozambique :1
• **BDF (Bio Diesel Fuel) &PV (Photovoltaic) Hybrid Power Generation System**

South Africa:2
•**Energy Efficient Technologies for steel plant**
• **Highly efficient gas turbine**

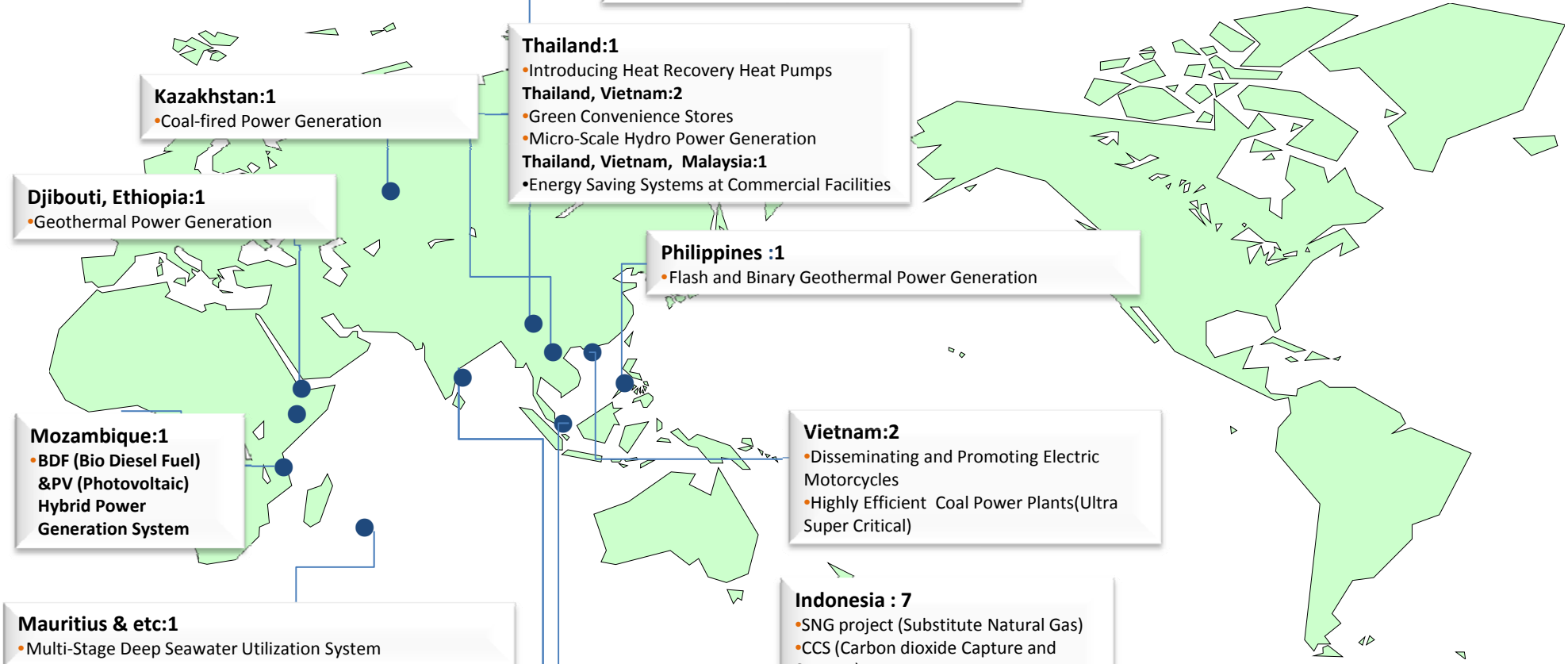
India:8
•Energy Efficient Technologies for Steel sinter process
•Development of Energy Saving Technology such as CDQ
•Highly efficient coal power plants(Ultra Super Critical)
•Energy Efficient Technologies for Integrated steel works
•ACCC technology(Automatic coal control system)
•Solar Energy Technology
•Run-of-river micro hydro power project
•Highly efficient server in Data center

Indonesia:12
•Highly efficient solar cells in un-electrified areas
•Introduction of energy efficient technologies at cement plant
•Newly-constructed geothermal power generation
•Introduction of steam tube drying system at low rank coal power plant
•SNG project (Substitute Natural Gas)
•Biomass Boiler Power Generation Project
•CCS (Carbon dioxide Capture and Storage)
•Small Hydroelectric Generation
•Eco-Shipping Support System
•Flash and Binary Geothermal Power Generation Plants
•Energy Consumption Optimization at Facilities using IT
•Optimum control of plant equipment (by IT)

JCM Feasibility Studies (FSs) by NEDO in FY2012

21 projects were selected (12 countries)

※ As of Oct, 2012



Myanmar:1
- Run-of-river Micro Hydro Power Generation

Thailand:1
- Introducing Heat Recovery Heat Pumps

Thailand, Vietnam:2
- Green Convenience Stores
- Micro-Scale Hydro Power Generation

Thailand, Vietnam, Malaysia:1
- Energy Saving Systems at Commercial Facilities

Kazakhstan:1
- Coal-fired Power Generation

Djibouti, Ethiopia:1
- Geothermal Power Generation

Philippines :1
- Flash and Binary Geothermal Power Generation

Mozambique:1
- **BDF (Bio Diesel Fuel) &PV (Photovoltaic) Hybrid Power Generation System**

Vietnam:2
- Disseminating and Promoting Electric Motorcycles
- Highly Efficient Coal Power Plants(Ultra Super Critical)

Mauritius & etc:1
- Multi-Stage Deep Seawater Utilization System

Indonesia : 7
- SNG project (Substitute Natural Gas)
- CCS (Carbon dioxide Capture and Storage)
- Biomass Power Generation
- Eco-shipping for Coastal Cement Tanker
- Small Hydro Power Generation

India: 2
- Highly Efficient Coal Power Plants(Ultra super critical)
- Energy Efficient Technologies for Integrated Steel Works

NEDO's JCM Related Activities

40 projects were selected (17 countries)

21 projects were selected (12 countries)

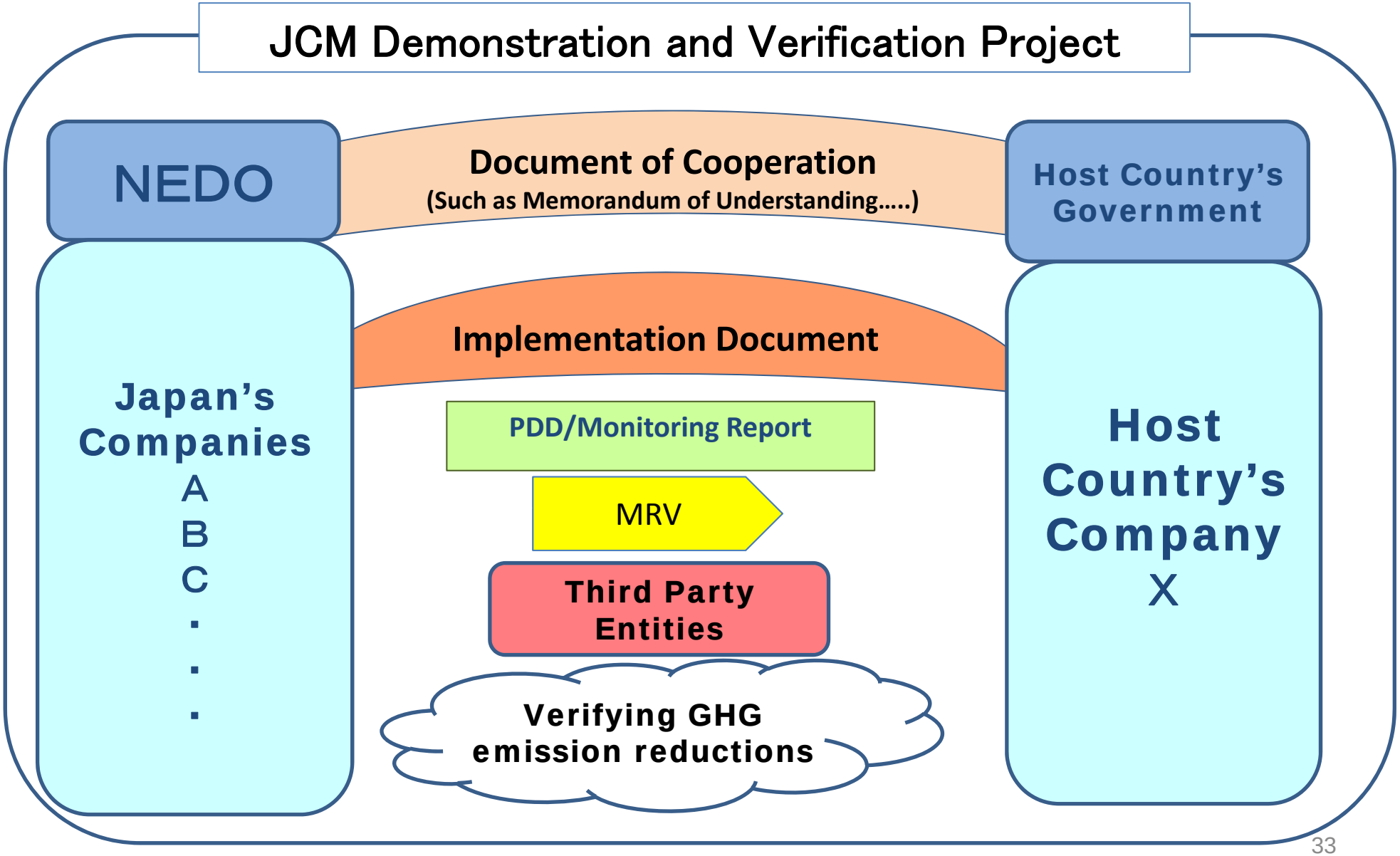
Through these Feasibility Studies, NEDO developed various types of MRV methodologies to use under JCM.

○From 2013, NEDO starts JCM Demonstration and Verification Projects to support JCM .

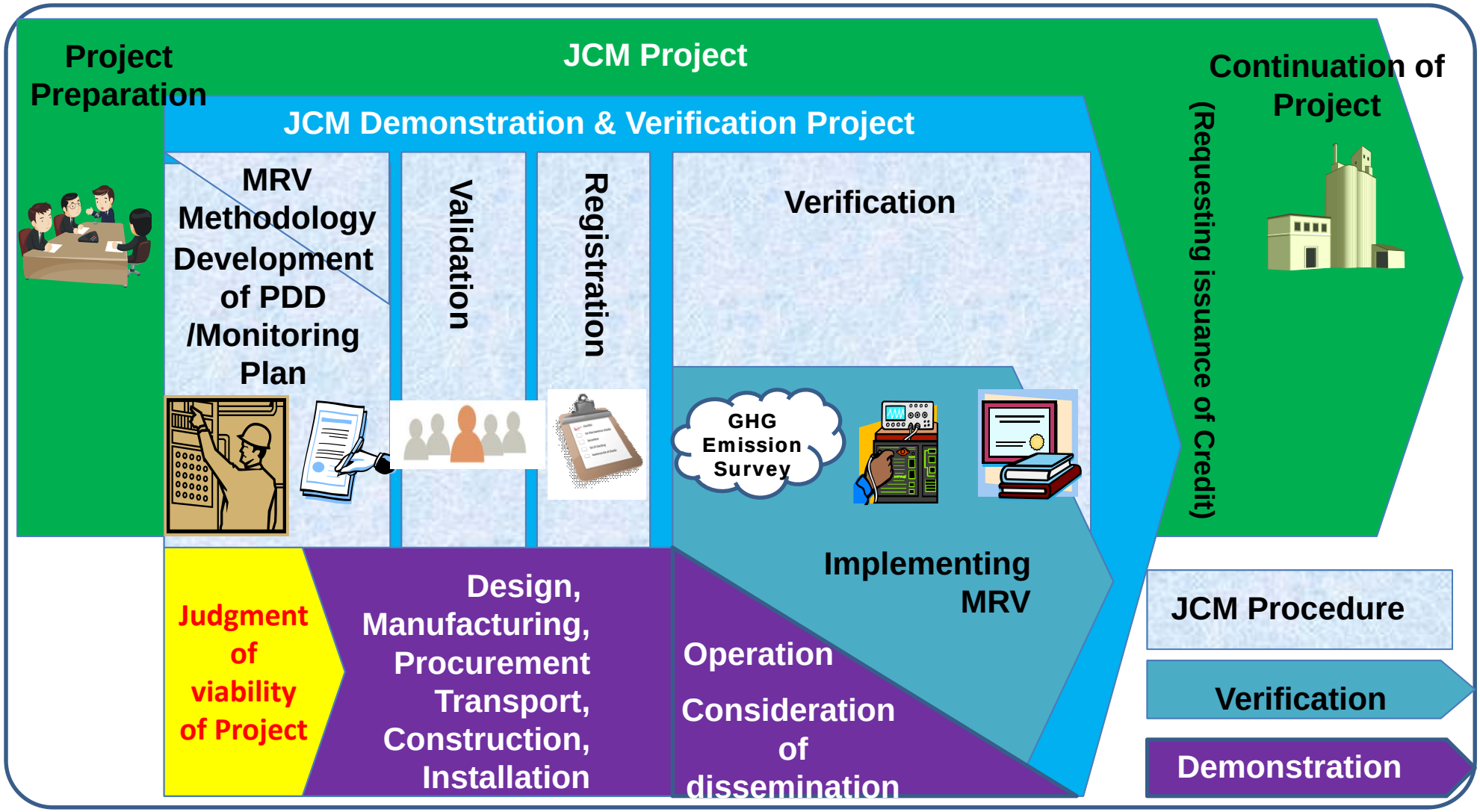
JCM Demo and Verification Projects

- **Inviting application by Japanese companies who have agreed with host countries company to organize the GHG emission reduction project**
- **Installing and operating a plant/facility in host country**
- **Applying MRV methodology**
- **Emission reduction and MRV-methodology are verified**

Outline of JCM Demonstration and Verification Projects



Activity Flow of JCM Demonstration and Verification Project



NEDO Program For Dissemination and Promotion of Global Warming Countermeasure Technology Program

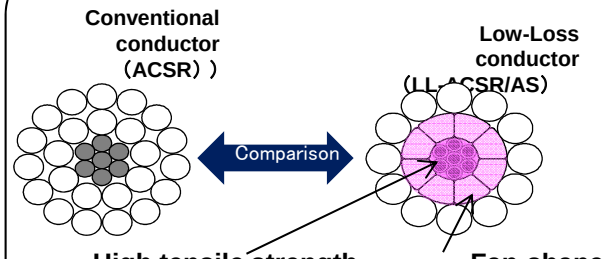
"High Efficiency and Low Loss Power Transmission and Distribution System in Mongolia"

Summary

Ensuring stable supply and promoting efficient use of power supply is one of the key challenges Mongolia is facing today. Introducing Japanese technology to construct energy saving transmission and distribution system will provide a solution in undertaking this issue and ultimately contribute to the prevention of global warming using Joint Crediting Mechanism(JCM).

Technical Study Item

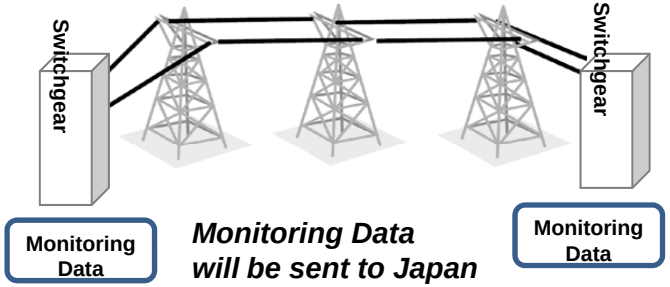
①Applicability study of New Low-Loss conductor
② Power System Analysis of Mongolian Power network



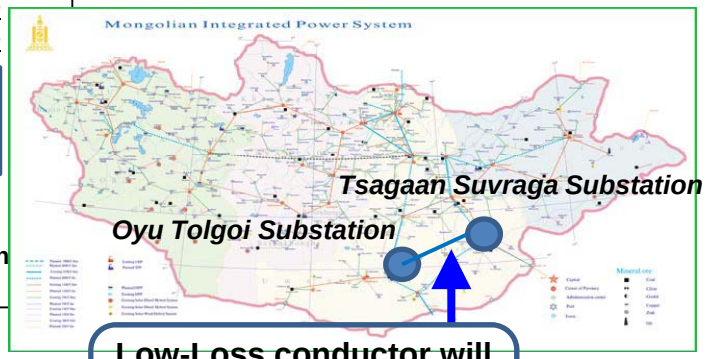
High tensile strength Aluminum clad wire
1770MPa (Conventional:1340)

Fan-shape Aluminum wire
Become Low-Loss by increase of cross-section area

Advantage of Low-Loss conductor
1)Transmission Loss is reduced 10 – 15%
2)The Tower using conventional conductor can
3)The expected lifetime is longer



Monitoring Data will be sent to Japan



Low-Loss conductor will be installed at 220kV line (160km)

MOU on 12th September 2013

Expected reduction

11,787 ton CO_2/year

NEDO's expectation for the JCM(1)

①The JCM would consider **each Country's Circumstances much more!**

Each country has it's distinctive natural or social circumstances.

ex. Energy Supply structure.

→The JCM is designed more **adjustable** for many countries since the JCM is governed by the Joint Committee under the bilateral document.

→ These circumstances may be reflected to respective countries' NAMA.

The JCM visualizes emission reduction

○Emission reduction of a project is estimated from each country's circumstances

Natural Circumstance

- land (inland/coastal island/desert)
- natural resources (coal, gas, crude oil, water, biomass, etc.)
- climate(temperature, humidity, tropical/desert, etc.)
- day light hours, wind direction & speed

Social Circumstance

- population, population structure
- fuel composition structure
- energy supply structure
- dissemination of technologies(products, facilities, infrastructure)
- GHG emission

NEDO's expectation for the JCM(2)

②The JCM would deploy **less GHG emission technologies widely!**

CDM strictly requires "additionality", which makes it difficult to achieve "economic viability".

- JCM ***wouldn't require*** economic additionality
- In the JCM, emission reductions to be credited are defined as the difference between "reference emissions" and project emissions.
- The reference emissions are calculated below business-as-usual(BaU) emissions which represent plausible emissions in providing the same outputs or service level of the proposed JCM project in the host country.

For countries that are facing **(rapid) economic growth**, it is necessary for them ;

a) to choose **less GHG emission technologies** which meet each projects having economic viability, and

b)to mitigate GHG emission while **supporting domestic growth and business activities.**

NEDO's expectation for JCM(3)

③JCM would simplify the Procedure in MRV!

MRV(Measurement, Report, Verification) of the project is often a big burden for Project participants in the host country (less trained and/or experienced).

ex. number of items, collection of various data, difficulty to follow up original monitoring plan…etc

→Sophisticatedly-**simplified** but **conservative** methodologies are developed and adopted under the JCM

ex. Reasonable data collection policy, **simpler** measurement and calculation, **effective and efficient** monitoring…etc

→Low carbon growth projects in developing countries may be more viable under JCM!

Conclusion

- NEDO's international demonstration projects lead low carbon technologies to dissemination and commercialization in line with host country's proper policy

- NEDO supports collaboration between Japanese enterprise and developing country's that is eager to introduce low carbon technologies.

- Considering each country's condition, JCM is expected to be effective approach to disseminate GHG emission reduction technologies.

NEDO would like to co-operate with you on low carbon development partnership!

CONTACT POINT

NEDO　Kyoto Mechanisms Promotion Department
JCM/BOCM　Group

Director Masanori KOBAYASHI
kobayashimsn@nedo.go.jp

Thank you !