



**Development & Deployment of
Low Carbon technologies
~ Putting into practice with
NEDO's international Activities ~**

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**New Energy and Industrial Technology
Development Organization(NEDO)**

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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 Technology Development Activities



Energy Efficiency and Conservation



Renewable Energy



Storage Batteries



Smart Grids & Smart Community



Robots



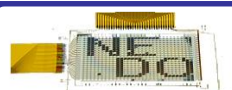
High-efficiency Clean Coal



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



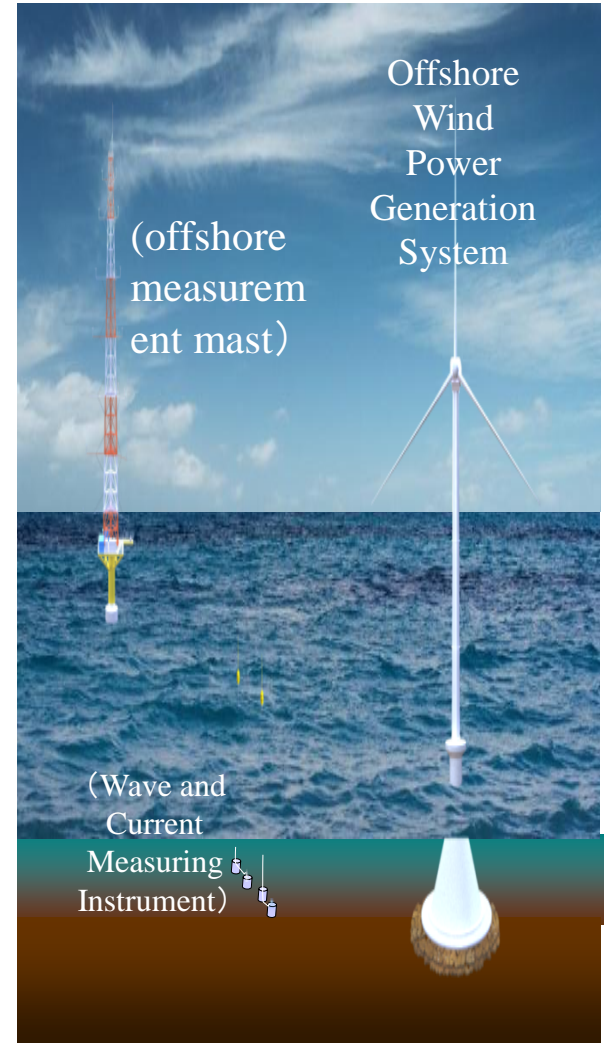
Electronic Vehicle



● Wind Power Generation



Wind Farm

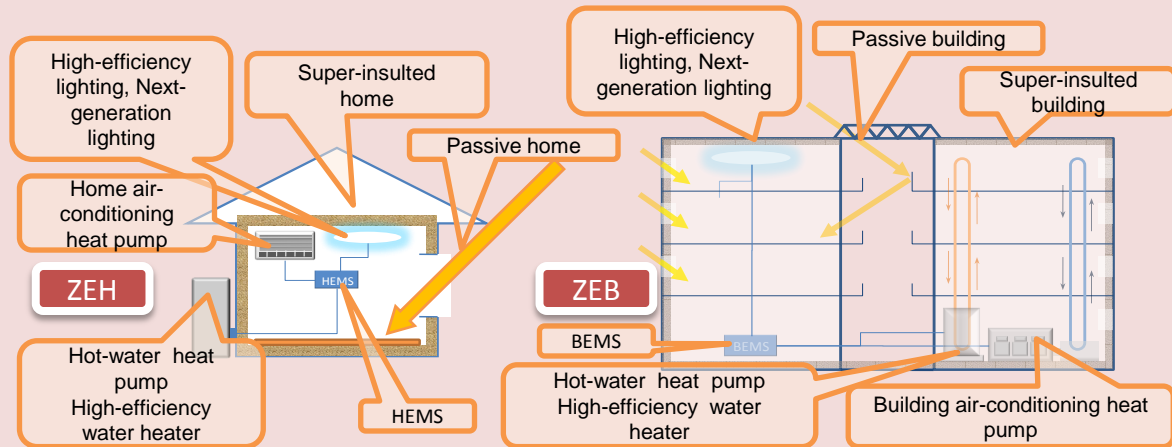




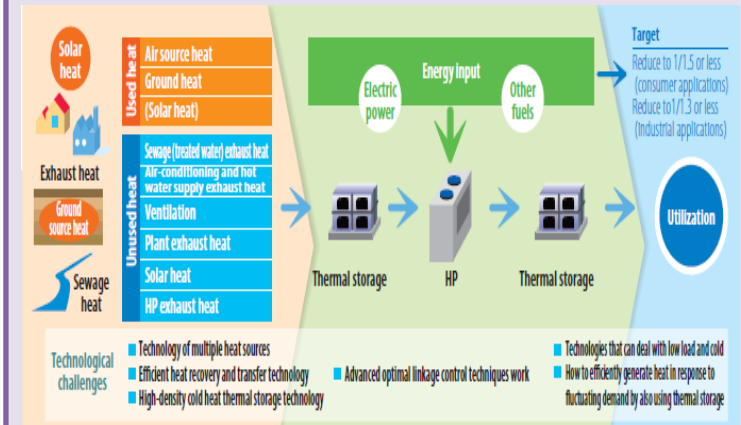
Renewable Energy and Energy Conservation

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

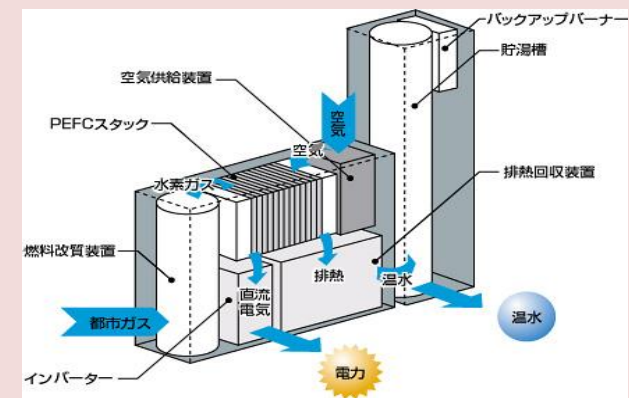
Next-generation vehicles such as electric vehicles have the potential for substantial improvements of fuel efficiency compared to conventional vehicles



Examples:

- Electric vehicles
- Plug-in hybrid vehicles
- Fuel cell vehicles

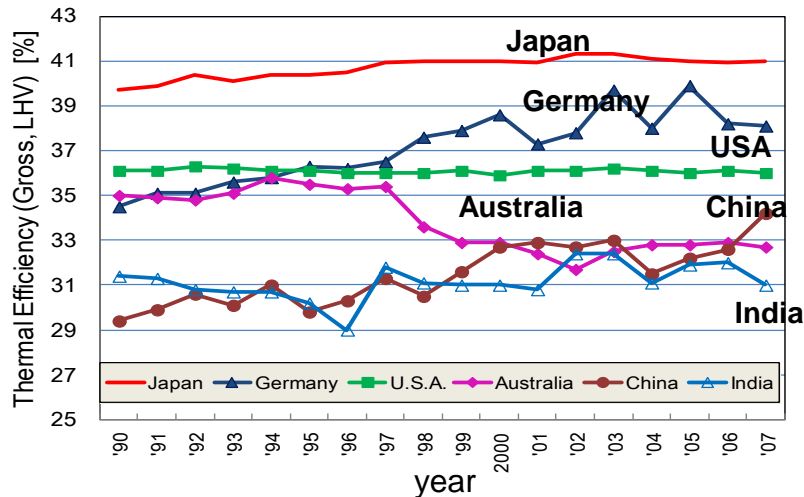
Stationary Fuel Cells





High-efficiency Clean Coal Technology

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



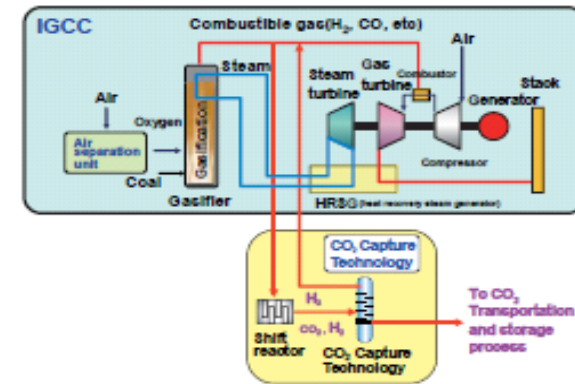
INTERNATIONAL COMPARISON OF FOSSIL POWER GENERATION EFFICIENCY (ECOFYS) (2010)

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 \times 600 $^{\circ}$ C/600 $^{\circ}$ C
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

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

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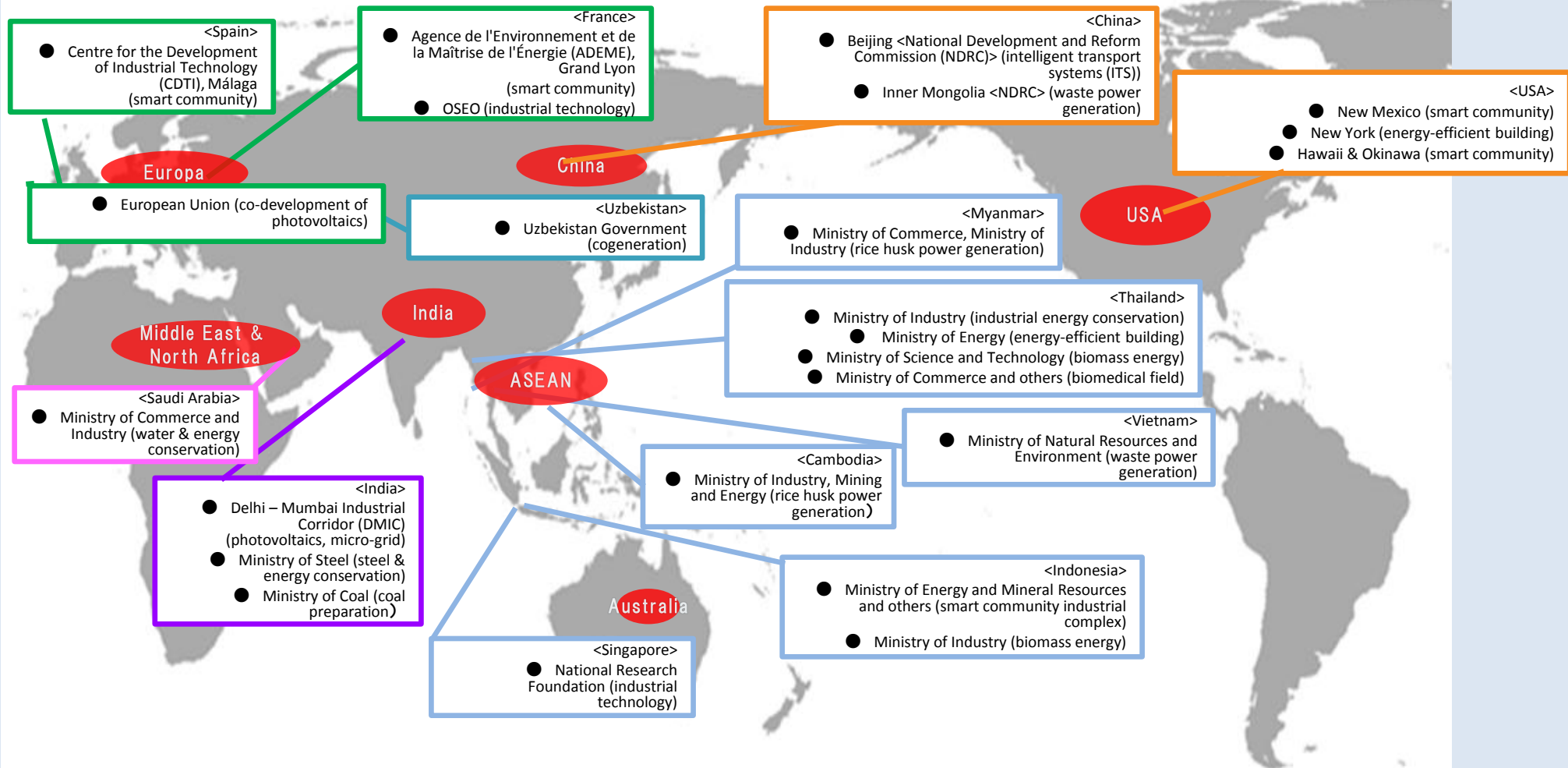
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Global Expansion of Demonstration Projects

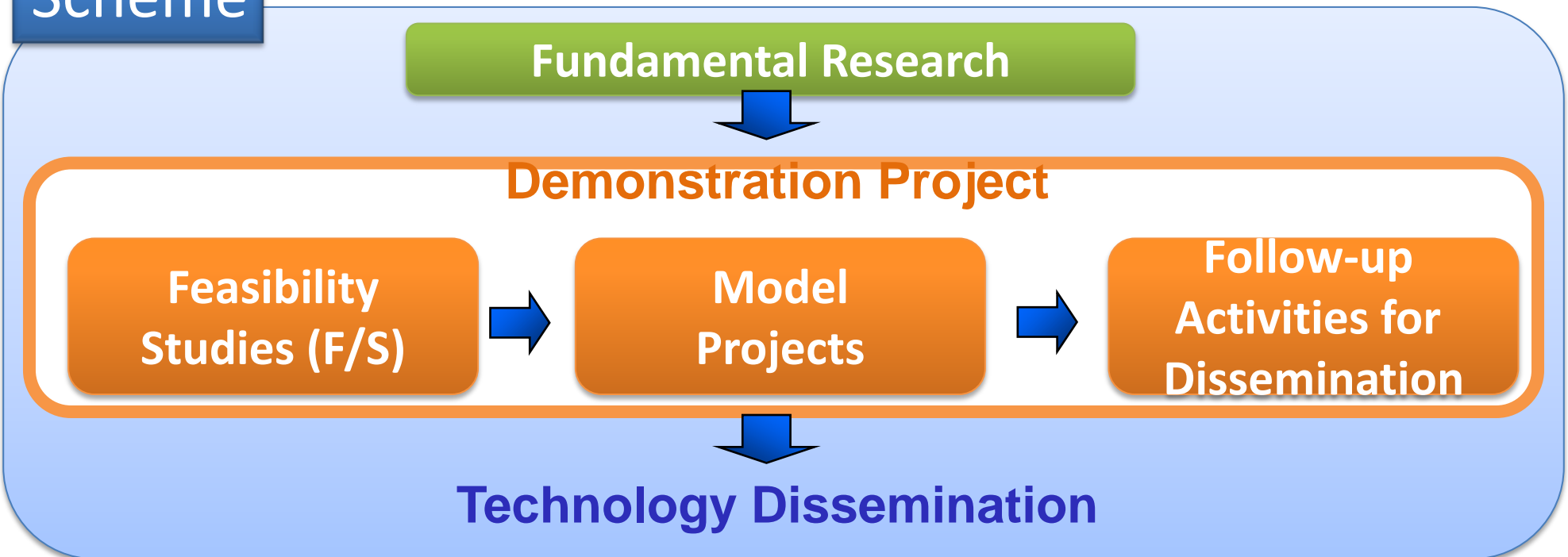
Demonstration projects, feasibility studies and other such initiatives which represent a means for Japanese corporations to gain an initial foothold in the global market for the **export of their systems** are undertaken in countries throughout the world. NEDO prioritizes smart community-related technologies and systems (including electric vehicles and zero energy buildings) in its allocation of resources.



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.

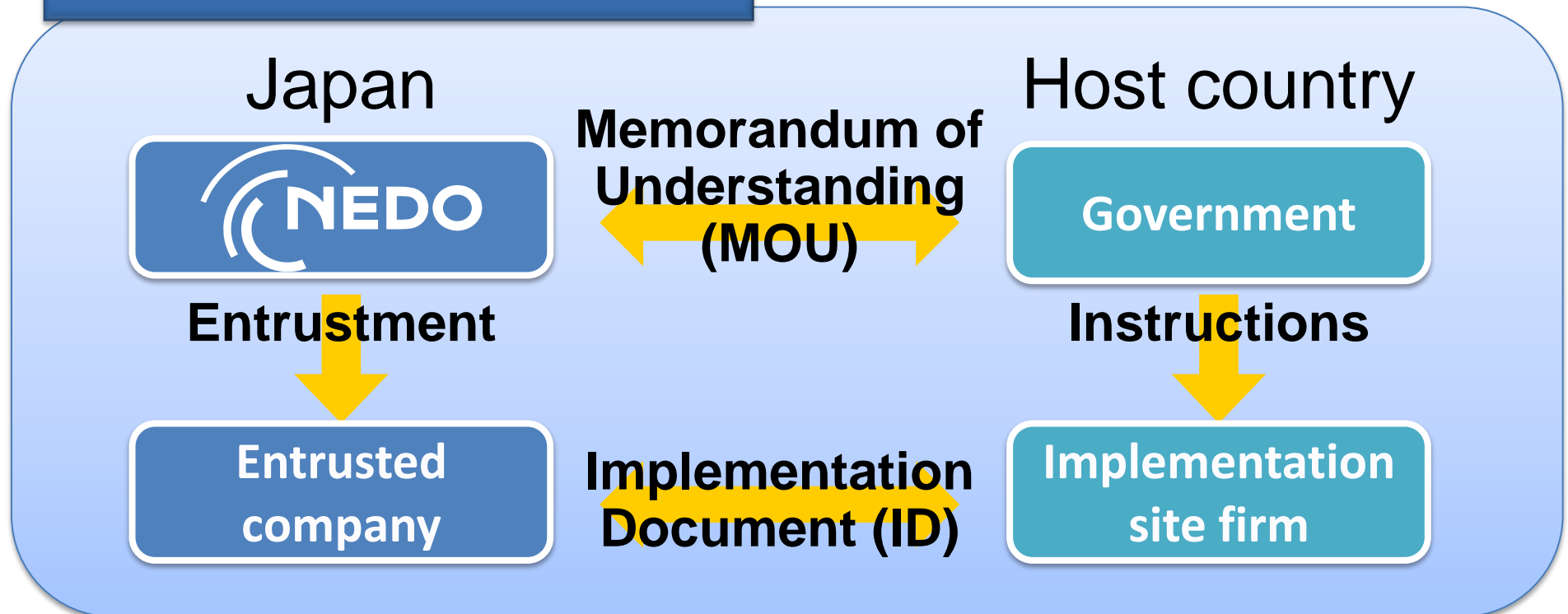
Scheme



Costs are shared between Japan and the host country

Demonstration Project Scheme

Contractual Framework





NEDO and United Nations Industrial Development Organization (UNIDO) signed a Memorandum of Understanding (MOU) on June 4th, 2013 with the aim

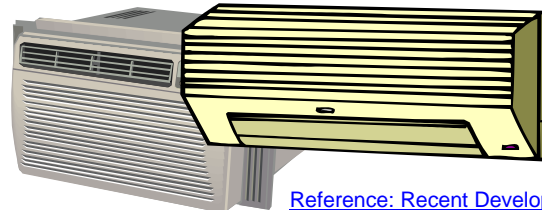
- to formalize a basis on which they may explore opportunities for cooperation and collaboration;
- to contribute to supporting the needs of developing countries, in particular promoting the use of renewable energy, energy efficiency and environmental technologies; and
- to pursue solutions for global energy and environmental issues in supporting green industry.

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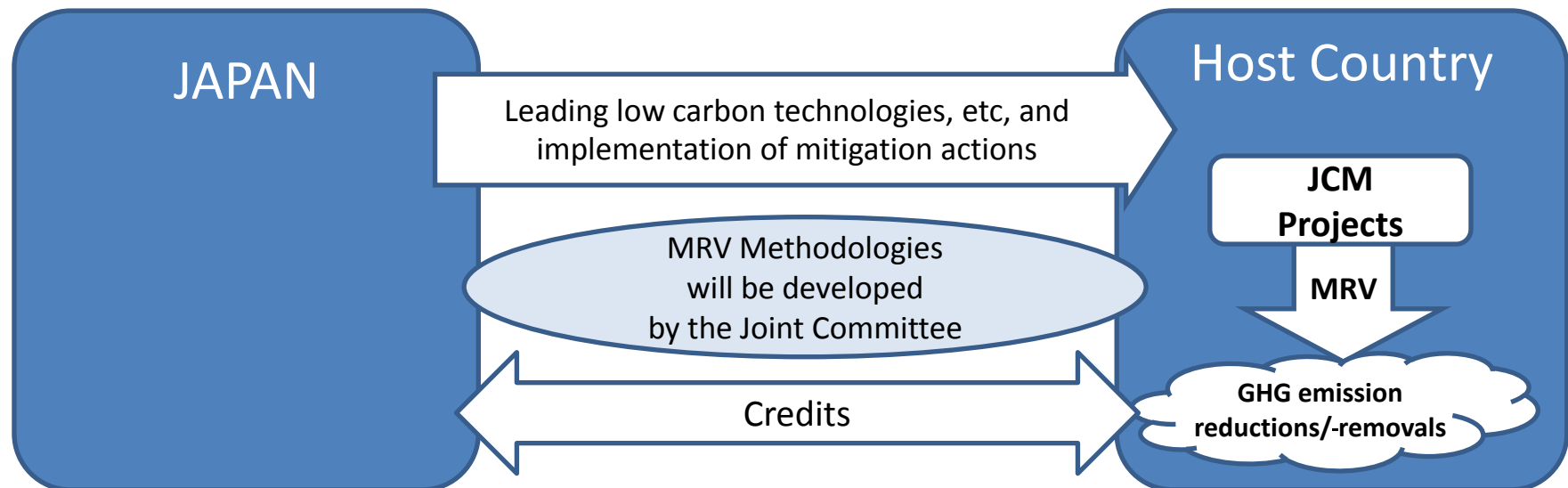
Low-Carbon Growth

- In order to effectively address the issue of climate change, it is necessary for both developed and developing countries to achieve low-carbon growth all around the world by fully mobilizing technology, markets and finance.
- Widespread use of advanced low-carbon technologies and products in various fields including renewable energy, highly efficient power generation, home electronics, low-emission vehicles, and energy-savings in factories must be accelerated.
- Realizing a low carbon society by combining these technologies and products with appropriate systems, services, and infrastructure is also crucial.



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.



Countries with which Japan has signed on bilateral documents

- Japan has held consultations for the JCM with developing countries since 2011 and signed the bilateral document for the JCM with Mongolia, Bangladesh, Ethiopia, Kenya, Maldives, Viet Nam, Lao PDR, Indonesia, Costa Rica, Palau, Cambodia and Mexico.



Mongolia
Jan. 8, 2013
(Ulaanbaatar)



Bangladesh
Mar. 19, 2013
(Dhaka)



Ethiopia
May 27, 2013
(Addis Ababa)



Kenya
Jun. 12, 2013
(Nairobi)



Maldives
Jun. 29, 2013
(Okinawa)



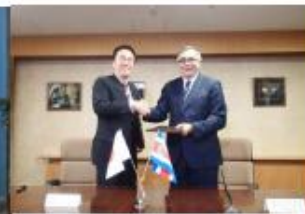
Viet Nam
Jul. 2, 2013
(Hanoi)



Lao PDR
Aug. 7, 2013
(Vientiane)



Indonesia
Aug. 26, 2013
(Jakarta)



Costa Rica
Dec. 9, 2013
(Tokyo)



Palau
Jan. 13, 2014
(Ngerulmud)



Cambodia
Apr. 11, 2014
(Phnom Penh)



Mexico
Jul. 25, 2014
(Mexico City)

- Japan held Joint Committee meetings with Mongolia, Bangladesh, Ethiopia, Kenya, Maldives, Viet Nam, Lao PDR, Indonesia and Palau respectively.

NEDO's JCM Related Activities

2011 40 FSs were selected (17 countries)

2012 FSs were selected (12 countries)

2013 5 FSs, 1 MRV Applicability Verification Study, and 6 demonstration projects were selected(5 countries)

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

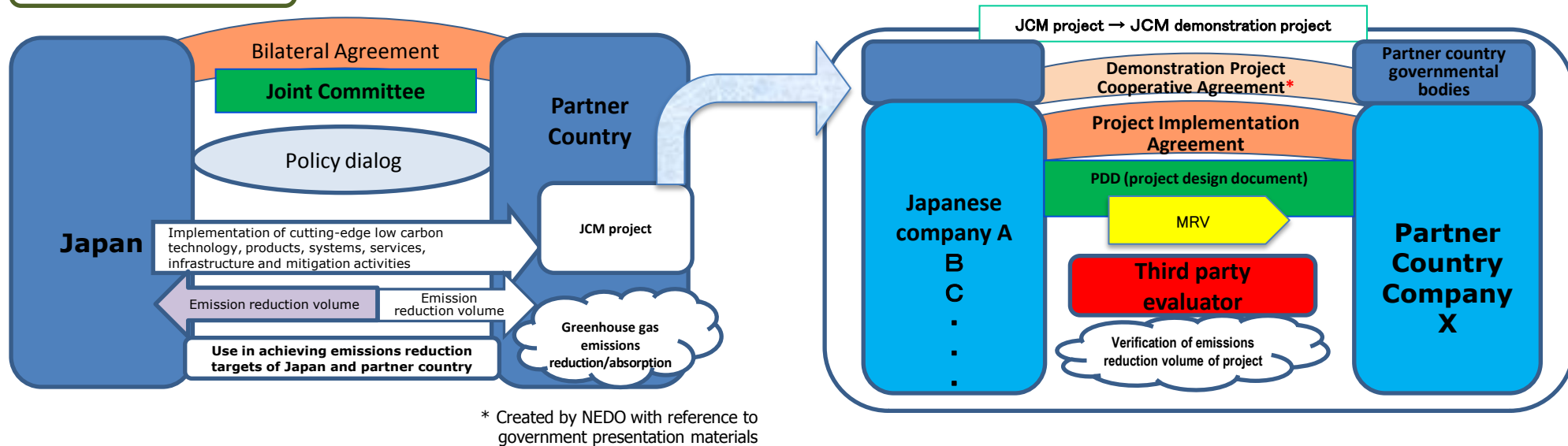
○From 2013, NEDO starts **JCM Demonstration and Verification Projects** to support JCM .

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

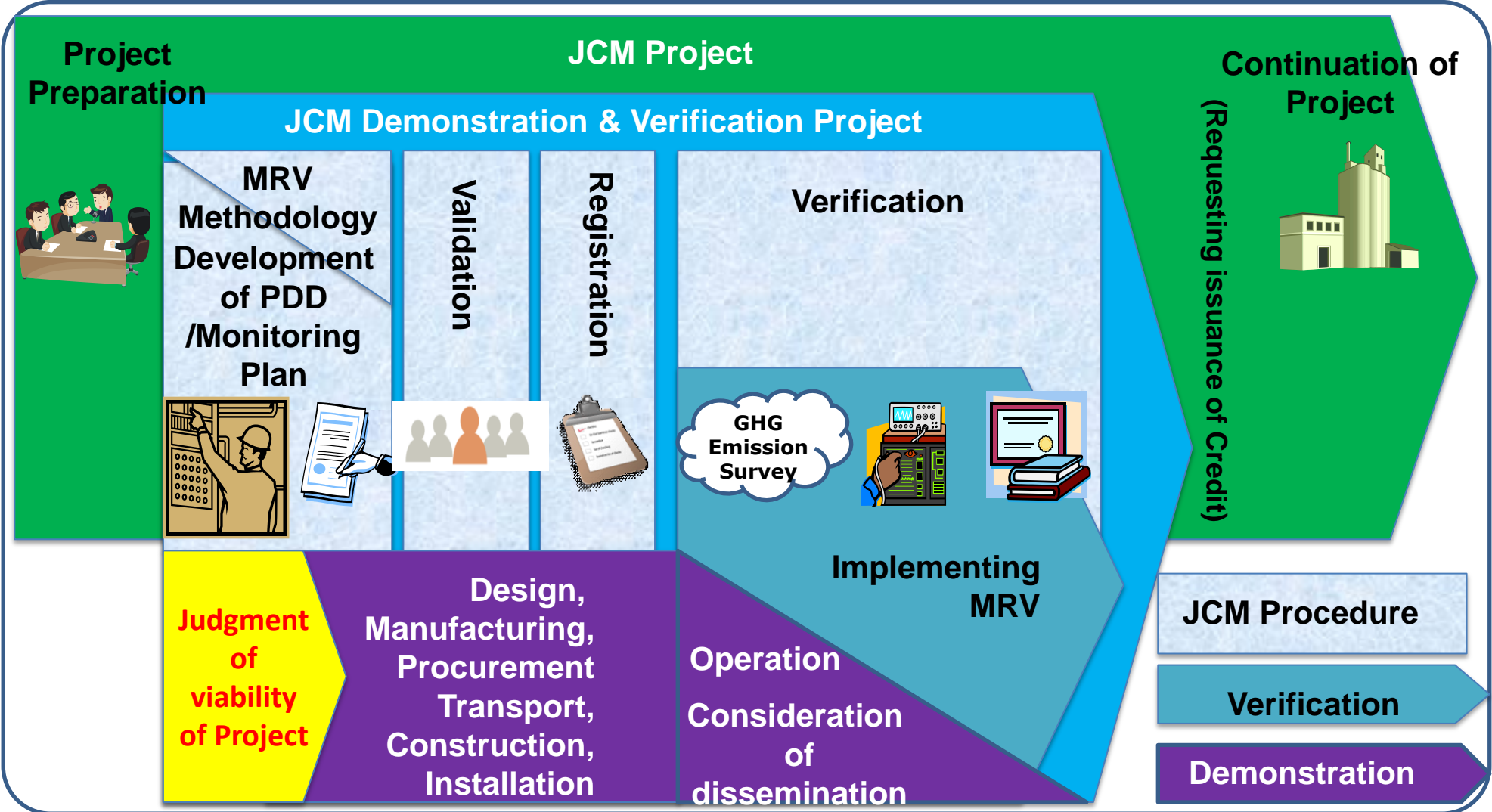
Scheme Overview



Project Content

- Project proposals are being sought from businesses which are prepared to implement, within the JCM framework, projects (JCM projects) aimed at introducing technologies which reduce greenhouse gas emissions in countries which have signed a bilateral agreement with regard to JCM.
 - JCM demonstration projects apply measurement, reporting and verification (MRV) methodologies to technology demonstrations which involve introducing technologies and equipment into a target country and utilize review procedures of a JCM joint committee to secure third party evaluator verification of the amount of greenhouse gas emissions reductions the demonstration project in question would produce.
- * In order to ensure that demonstration projects are carried out without complication, policy dialog as well as an agreement guaranteeing the minimum required level of cooperation from the governmental bodies of the partner countries which have administrative jurisdiction over each project will be pursued.

Activity Flow of JCM Demonstration and Verification Project



Promotion of “Green Hospitals” by improving efficiency/environment in national hospitals in Vietnam (2013~2015)

Outline of the Project

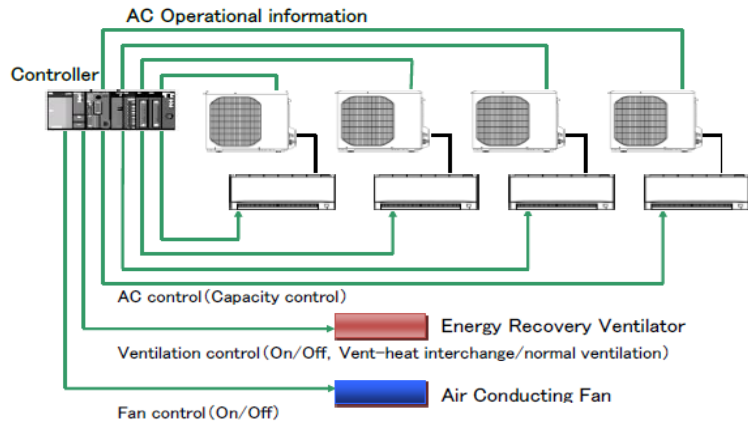
In this demonstration project, high efficiency performance inverter ACs, compliant to the energy efficiency rating standard in Vietnam, will be introduced in two state-owned hospitals, one located in Hanoi and the other in Ho Chi Minh City. Not only will the inverter ACs be installed, but energy management system (EMS) will be developed and installed to enhance the energy efficiency of the entire hospital. Together with the EMS, improving the ventilation will lead to a better indoor air quality, thus contributing to changing these hospitals into environmental friendly “green hospitals”. As a JCM Project, one year monitoring will be put into effect and the amount of CO2 emission reduction as well as energy efficiency effect will be verified.

| | |
|-------------------------------|---|
| Implementing Company (JAPAN) | Mitsubishi Electric Corporation Mitsubishi Corporation Mitsubishi UFJ Morgan Stanley Securities |
| Project Site | TVCI/IEMM(Hanoi) People’s Hospital 115 (Ho Chi Minh City) Viet Doc Hospital(Hanoi) |
| Counter Part Ministry | MOIT |
| GHG Emission Reduction Effect | Estimated emission reduction about 40% 1,749t-CO ₂ /y |

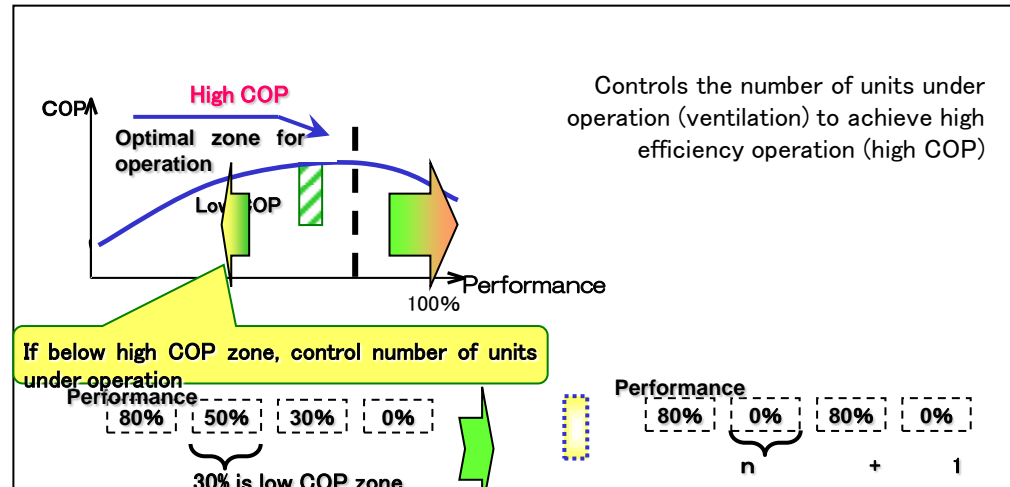
Introduced technologies

EMS for RAC

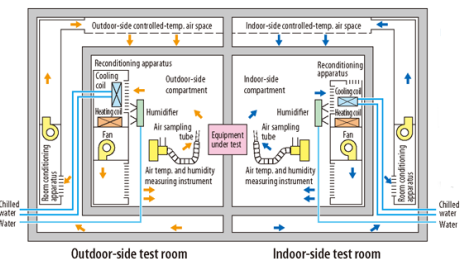
In the multiple AC system commonly used in Japan, each indoor unit is optimally controlled according to its operation conditions. However, in most hospitals in Vietnam where individual RACs are still used, EMS is yet to be introduced. By collecting data on operation condition (frequency, current, piping temperature, air speed, etc.), performance is assessed and optimal operation control of each unit is realized.



Development of EMS for RAC



Effectiveness assessment using balanced room type ambient calorimeter



NEDO's expectation for the JCM(1)

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

Each country has its 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)

② The 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.**

Emission reduction for JCM Projects

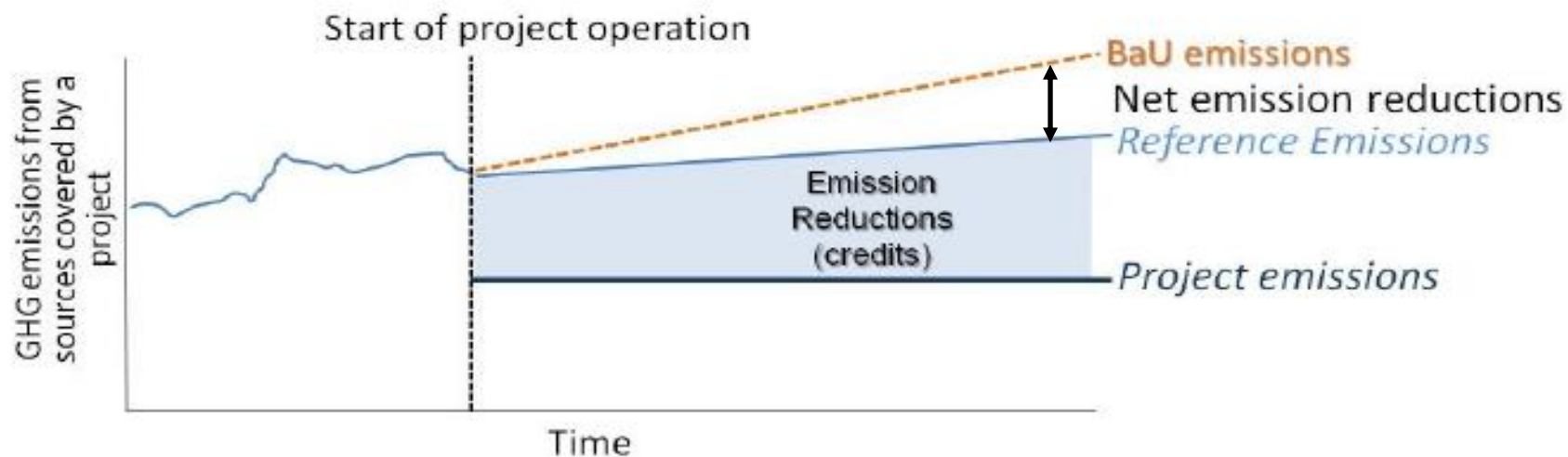


Figure: Indicative diagram of the relationship between the BaU emissions, reference emissions and project emissions

* from Indonesian JCM " methodology development guidelines"

NEDO's expectation for JCM(3)

③ JCM 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

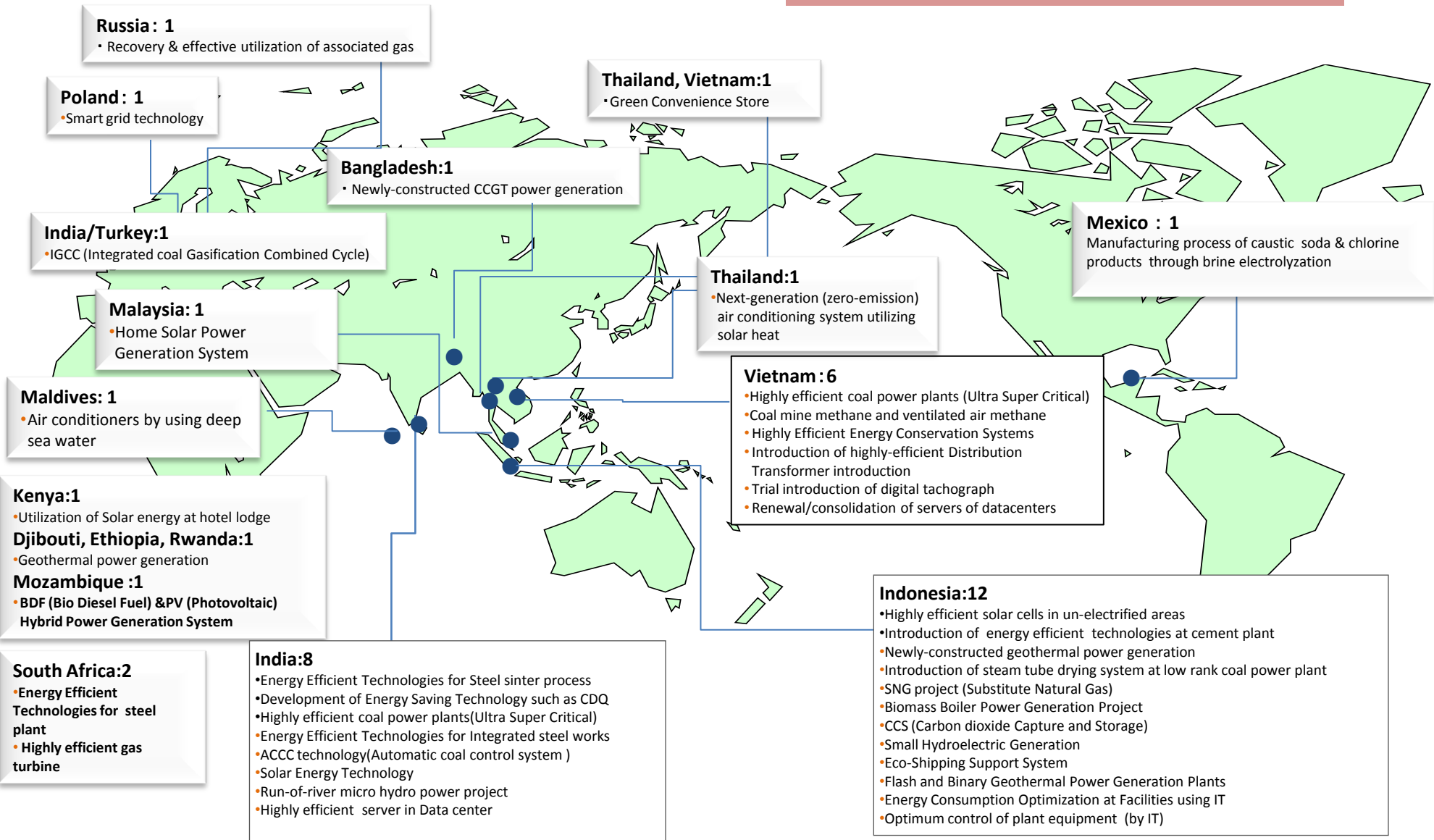
→ Sophisticatedly-**simplified** but **conservative** methodologies are developed and adopted under the JCM

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!

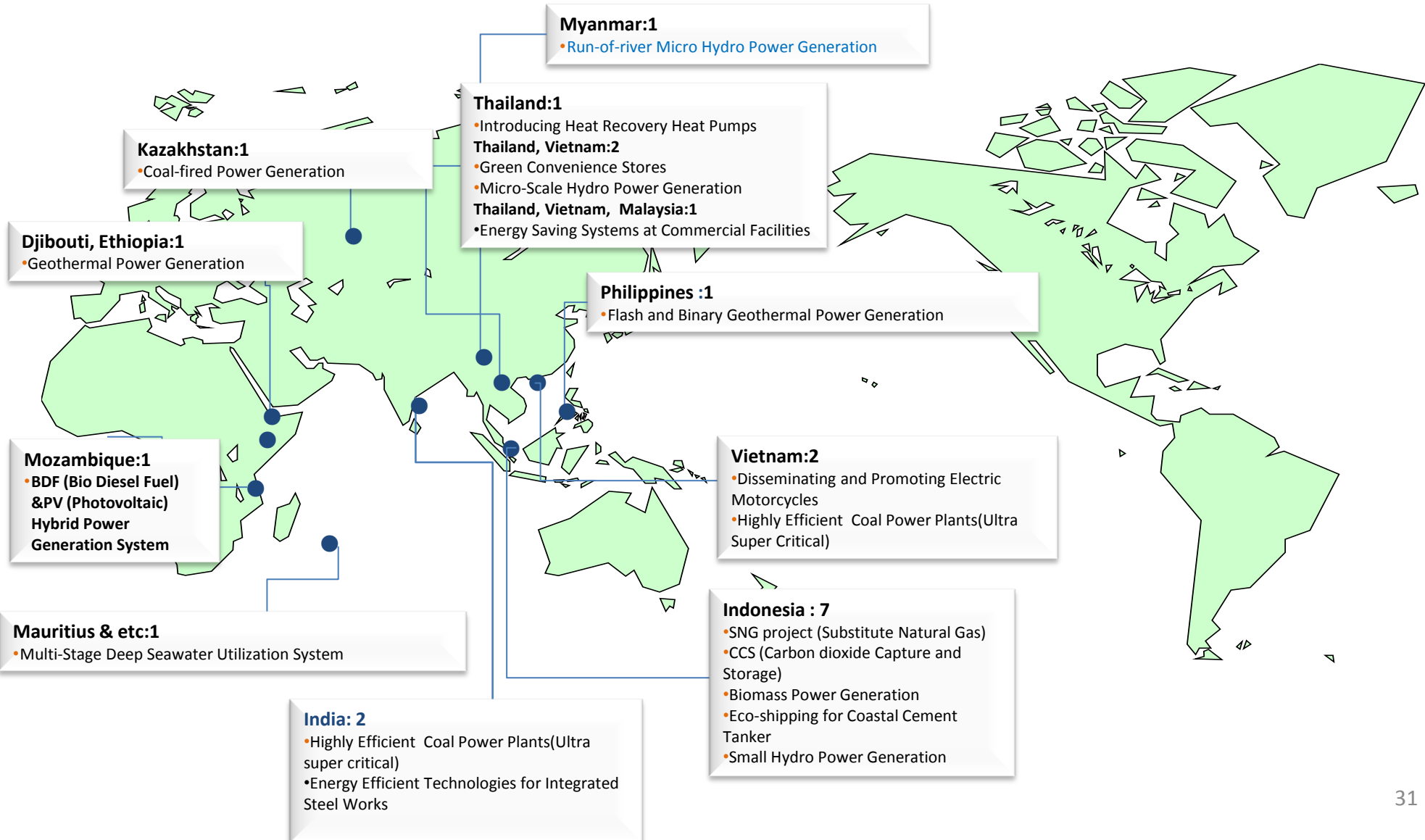
JCM Feasibility Studies (FSs) by NEDO in FY2011

40 FSs were selected (17 countries)



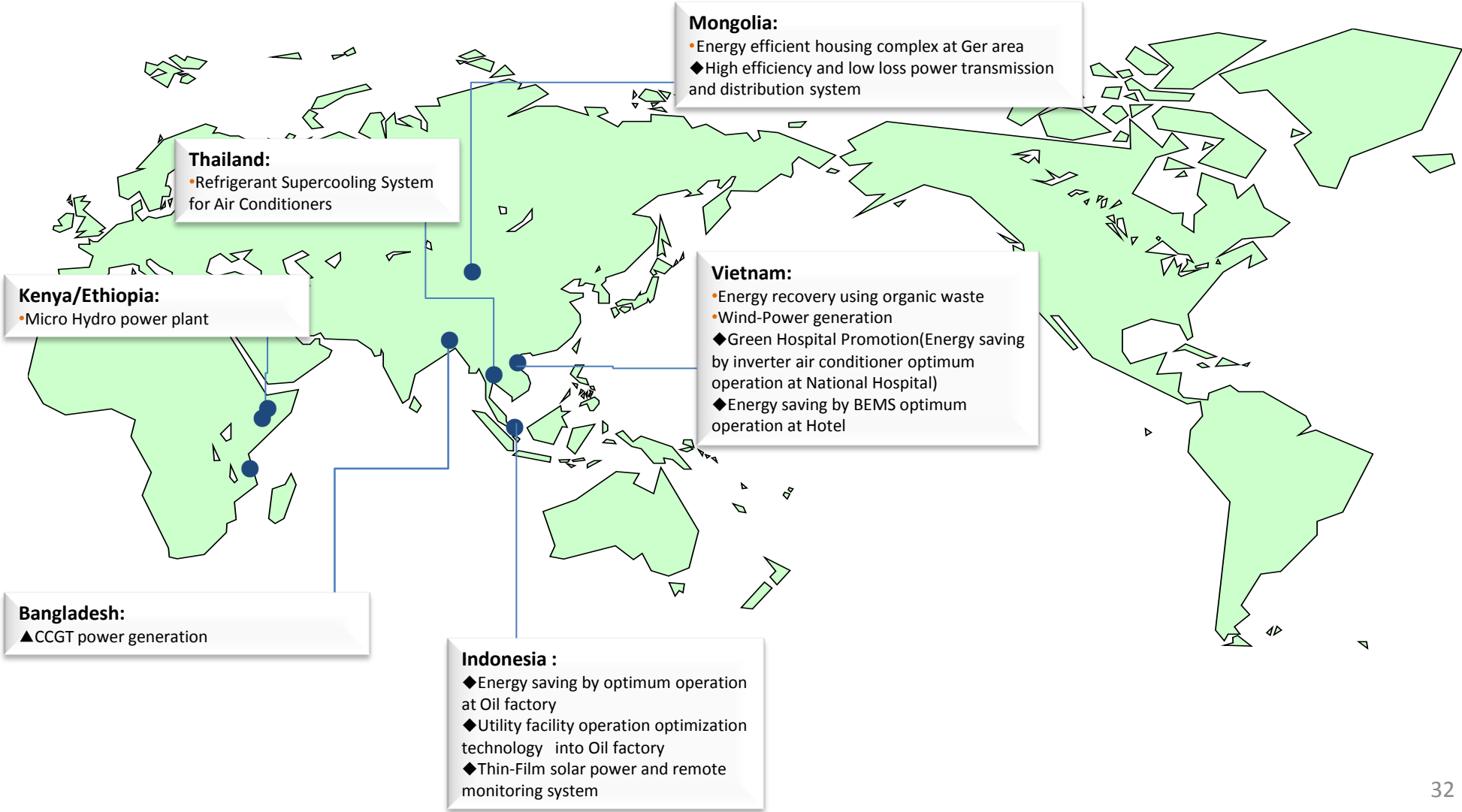
JCM Feasibility Studies (FSs) by NEDO in FY2012

21 FSs were selected (12 countries)



JCM Feasibility Studies (FSs) , MRV Applicability Verification Studies, and Demonstration Projects by NEDO in FY2013

5 FSs, 1 MRV Applicability Verification Study, and 6 demonstration projects were selected (7 countries)
● FSs ▲ MRV Applicability Verification Studies ◆ JCM Demonstration Projects



Conclusion

- In order to lead low carbon technologies to dissemination and commercialization, it is more effective to demonstrate and verify the technologies in accordance with host country's circumstances.
- Considering such conditions, JCM is expected to be effective approach to disseminate low carbon technologies.
- NEDO supports collaboration between Japanese enterprise and developing country's that is eager to introduce low carbon technologies.

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

CONTACT POINT

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Thank you !