HOW WE CAN STRENGTHEN INDIA/JAPAN TECHNOLOGICAL COOPERATION IN THE ENERGY & ENVIRONMENTAL AREA?

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OUTLINE

1. Huge potential for cooperation
2. Challenges for accelerating cooperation
    a. energy conservation
    b. nuclear
    c. solar energy
    d. smart grid
1. DMIC as a show case for cooperation

1. HUGE POTENTIAL FOR COOPERATION

1. General
   - India : the fastest growing economy among G20
   - Japan : the most advanced eco-friendly technology
2. Energy/Environment
   - Features of India :

   a. energy consumption will increase by almost 290%
      (2008-2035; IEEJ Energy Outlook of 2010)

   b. CO2 emission will increase by around 270%

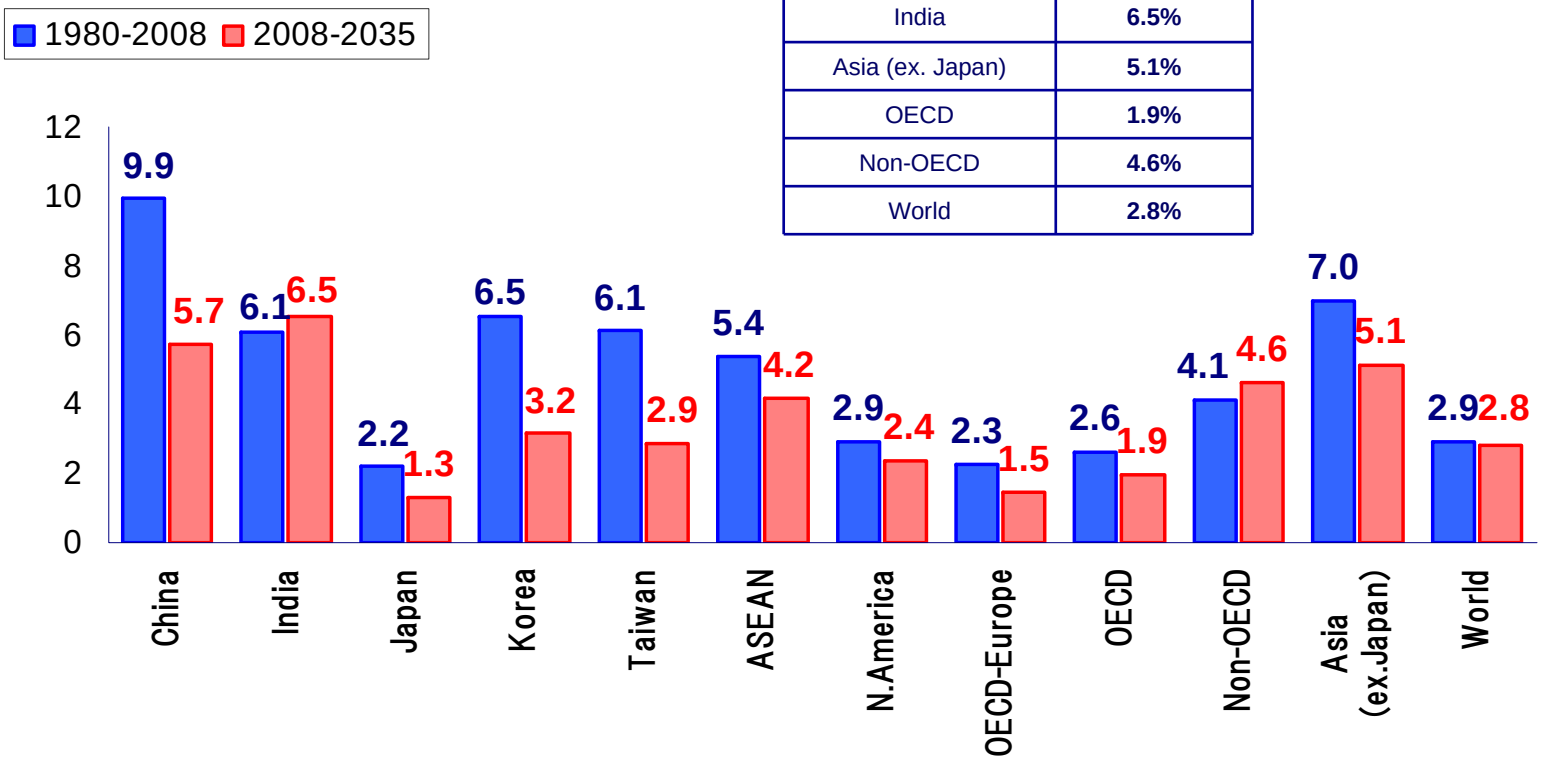
   c. Furthermore
      * low energy intensity
      * continuing insufficient supply of electricity
      * increasing dependence in energy imports

   - If Japan can be of considerable help……

<Reference1> Major Assumption： GDP

Average Annual Growth Rate (%)

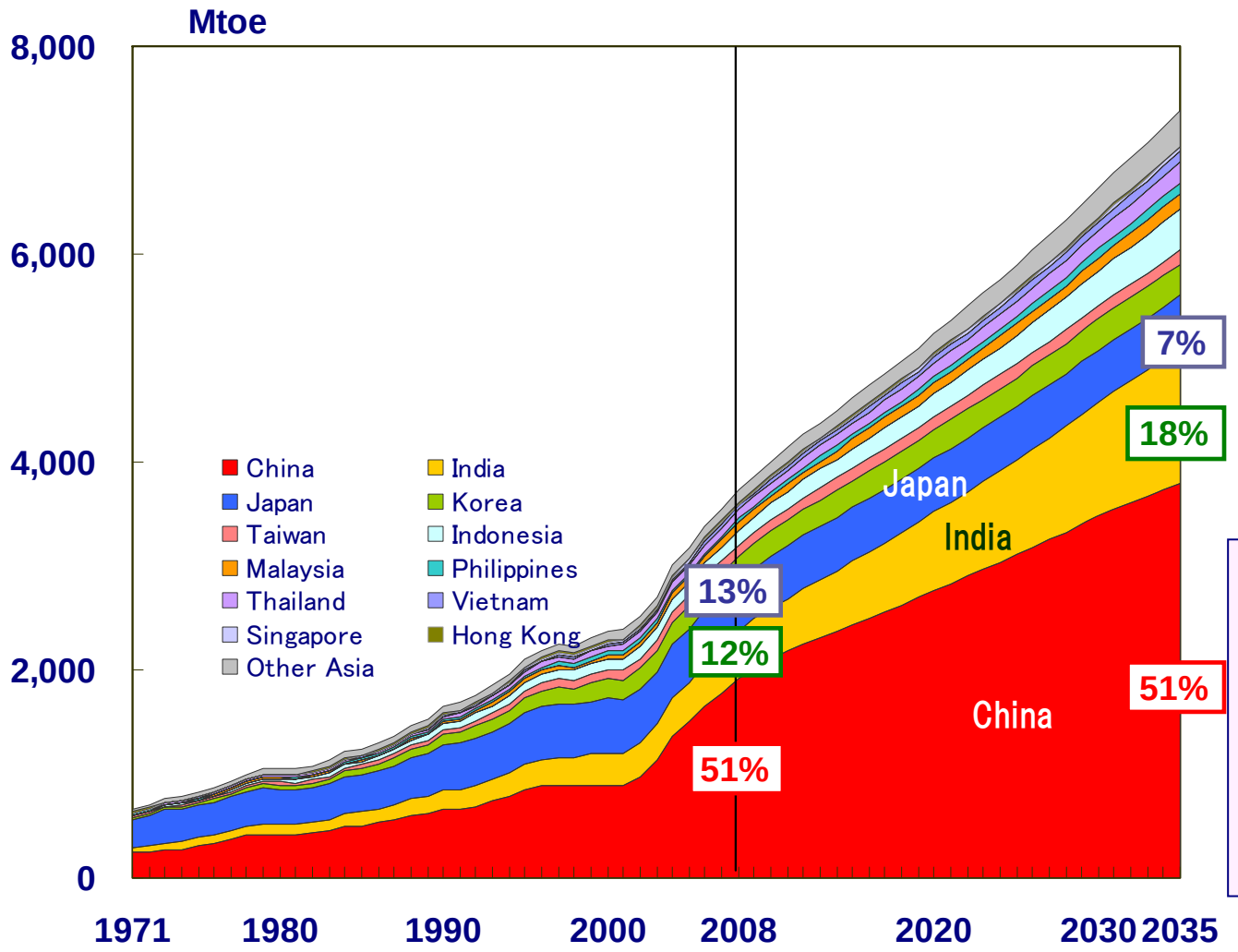
	2008-2035
China	5.7%
India	6.5%
Asia (ex. Japan)	5.1%
OECD	1.9%
Non-OECD	4.6%
World	2.8%



- World economy will continue to grow steadily at 2.8% per annum through 2035. Repercussions from the recent financial crisis were globally felt to slow the economic growth, but with the economic stimulus measures by numerous countries will lead to early recovery.
- GDP in China will continue to achieve an annual growth rate of 5.7% per year shifting from the investment- and export-driven growth to the domestic demand-driven one.
- GDP in India will register a high growth rate at 6.5% per year, reflecting increases in improved labor quality, and liberalization and direct investment from foreign countries.
- ASEAN countries will achieve steady economic growth supported by industrialization and export increases.

<Reference2> Primary Energy Demand (Asia)

Reference



Asia

2008

3.7 bil. toe

↓

2035

7.4 bil. toe

(2.0-fold increase)

China / India

2008

1.9 bil. toe / 0.46 bil. toe

↓

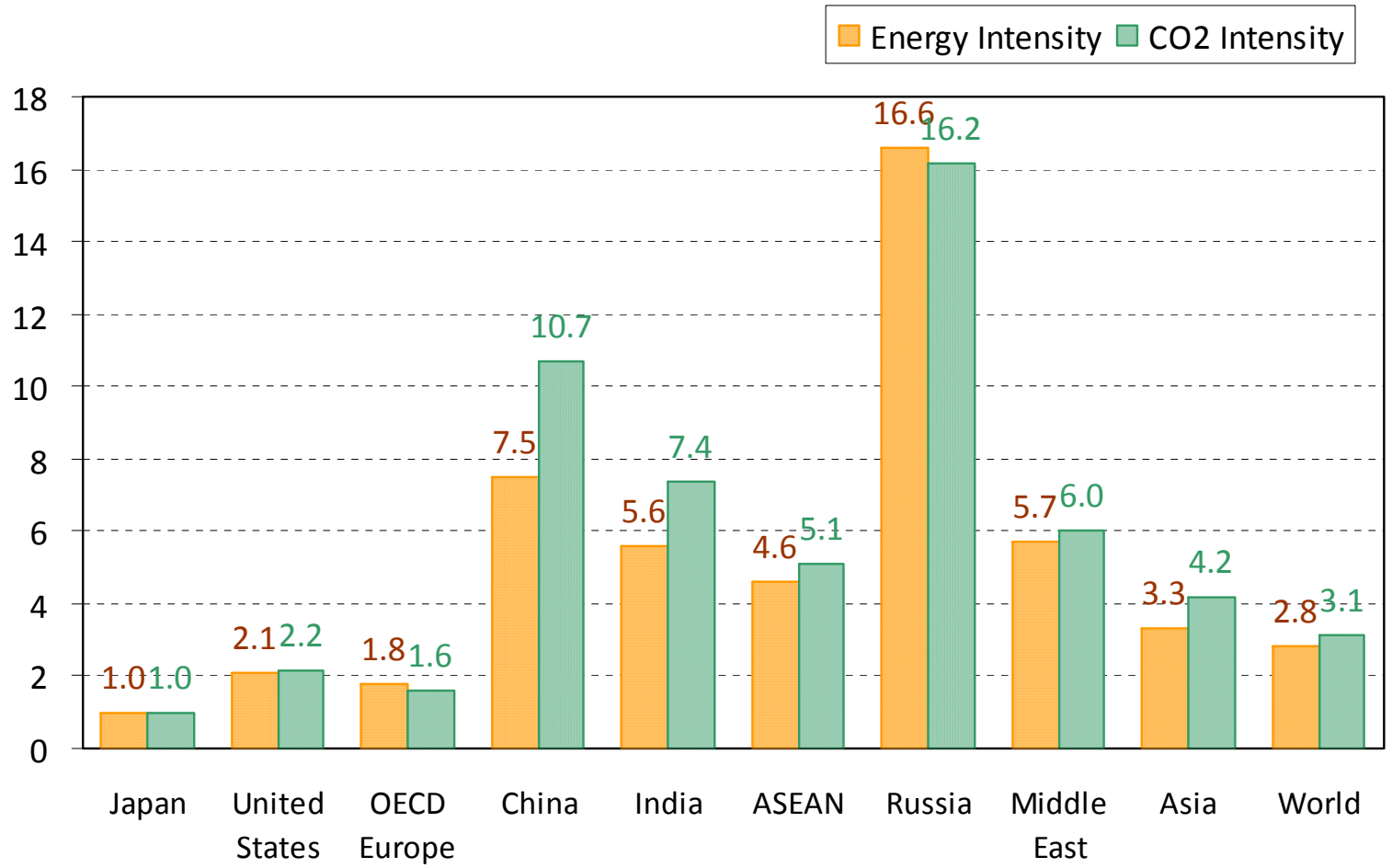
2035

3.8 bil. toe / 1.3 bil. Toe

(2.0-fold inc. / 2.9-fold inc.)

- At the back of steady economic growth, the share of China and India together in Asian primary energy demand will significantly increase to 69% by 2035.
- Japan's energy share in Asia will decline from 13% in 2008 to 7% in 2035 resulting from slow growth in energy demand.

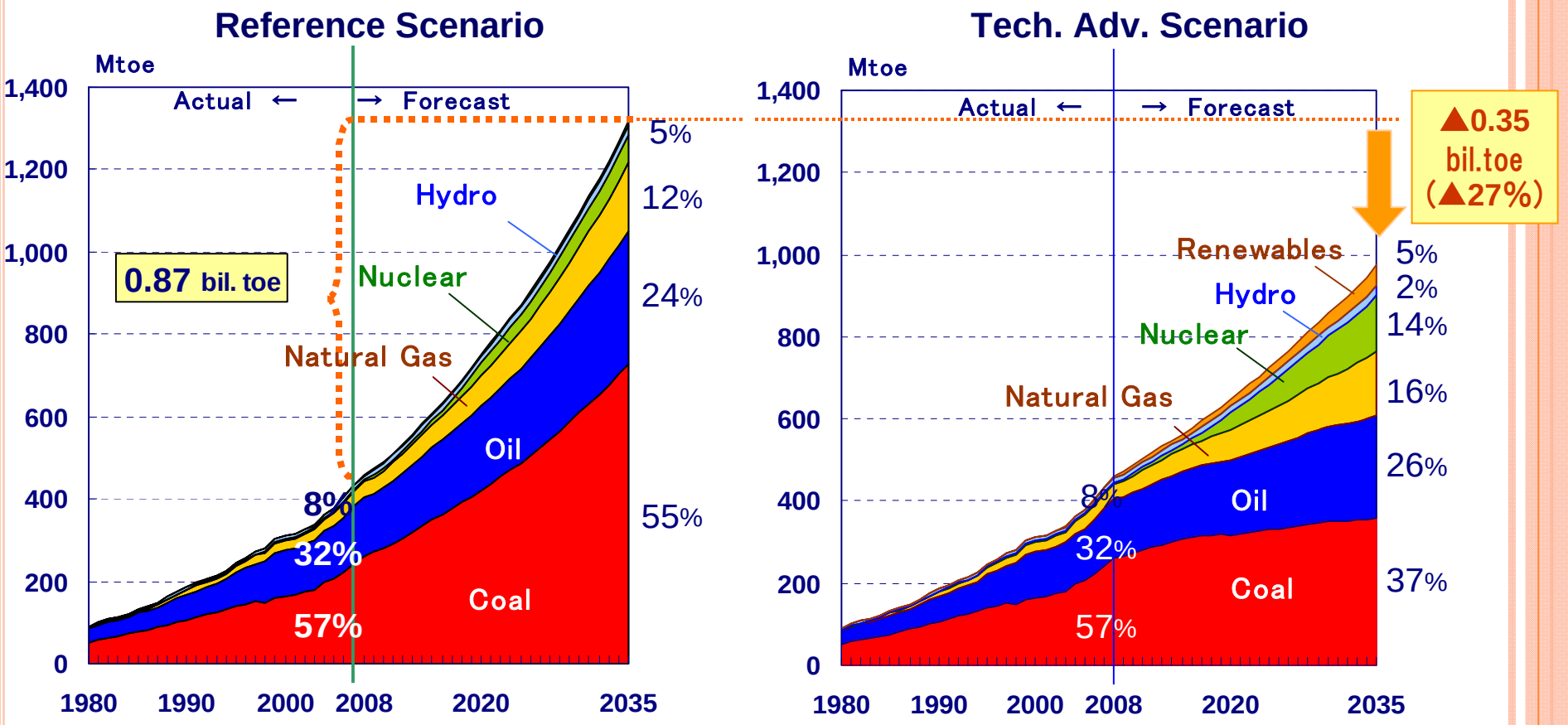
<Reference3> Energy and CO_2 Intensity (2008)



- The energy intensities (primary energy consumption per GDP) and CO_2 intensities (CO_2 emission per GDP) of developing countries are several times larger than those of advanced countries.

<Reference4> Primary Energy Demand in India

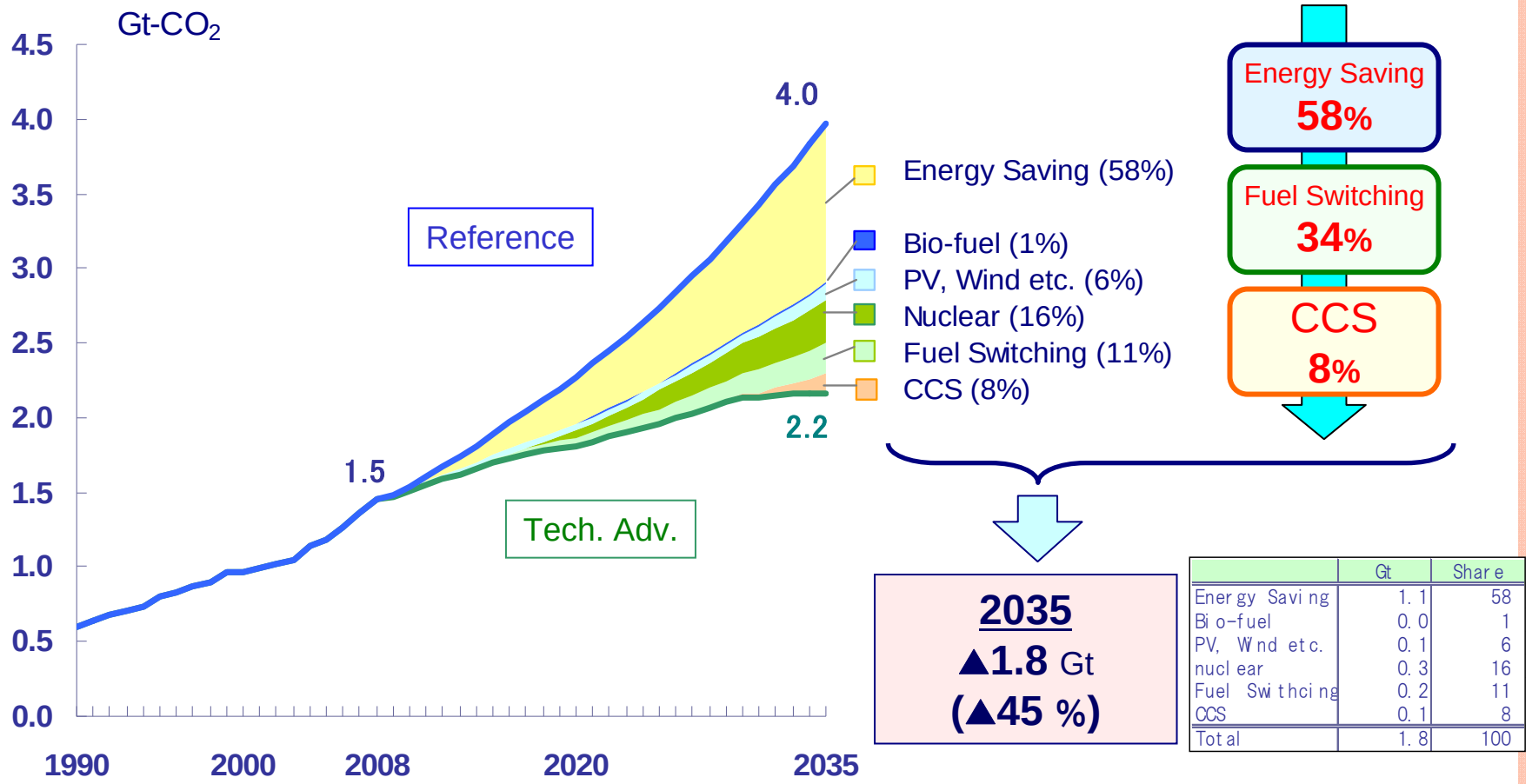
Reference
Tech. Adv.



- In the Reference Scenario, TPED will increase rapidly at annual rate of 4%. Fossil fuels will account for 90% of the incremental energy growth by 2035.
- Driven by the power and industry sectors, coal demand will represent the largest share in TPED accounting for 55% in 2035.
- The power and industry sectors will lead natural gas demand growth. Development of domestic resources is expected, while much of the natural gas demand should be met by import.
- By 2035, compared with the Reference Scenario, TPED will be 350 Mtoe lower (27%) in Tech. Adv. Scenario.

<Reference5> CO_2 Emissions Reduction in India

Reference Tech. Adv.



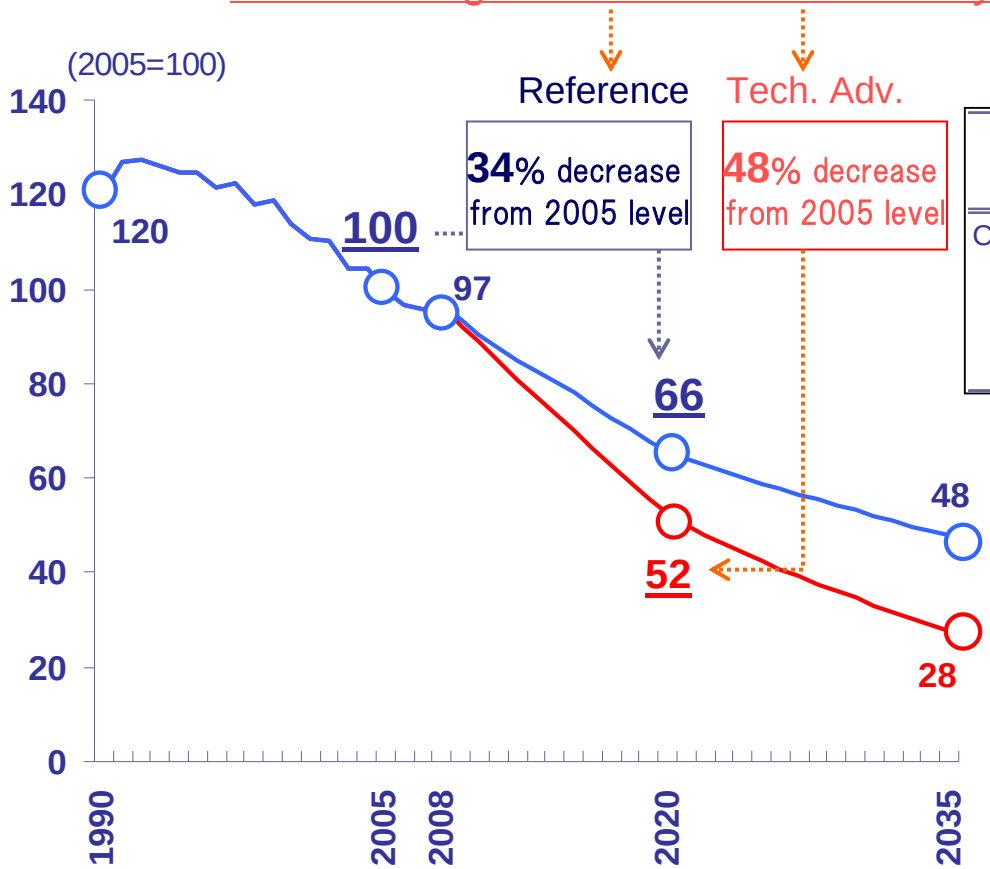
	Gt	Share
Energy Saving	1.1	58
Bio-fuel	0.0	1
PV, Wind etc.	0.1	6
nuclear	0.3	16
Fuel Swithcing	0.2	11
CCS	0.1	8
Total	1.8	100

- In the Reference Scenario, CO_2 emission will increase by 2.5 Gt (173%) in 2035 from 2008.
- In the Tech. Adv. Scenario, CO_2 emissions will be 1.8 Gt (46%) lower from the Reference Scenario.

<Reference6> CO_2 Emissions per GDP

Reference
Tech. Adv.

National Target : 20 to 25% reduction by 2020



Decomposition Analysis of CO_2 Emissions

		1990-2005	2005-2020	
			Reference	Tech. Adv.
$CO_{2Emissions}$	ΔC	4.7	4.4	2.8
Carbon Intensity	Δ(C/E)	▲ 0.2	▲ 0.2	▲ 0.8
Energy Saving	Δ(E/Y)	▲ 1.0	▲ 2.5	▲ 3.5
Economic Growth	ΔY	6.0	7.4	

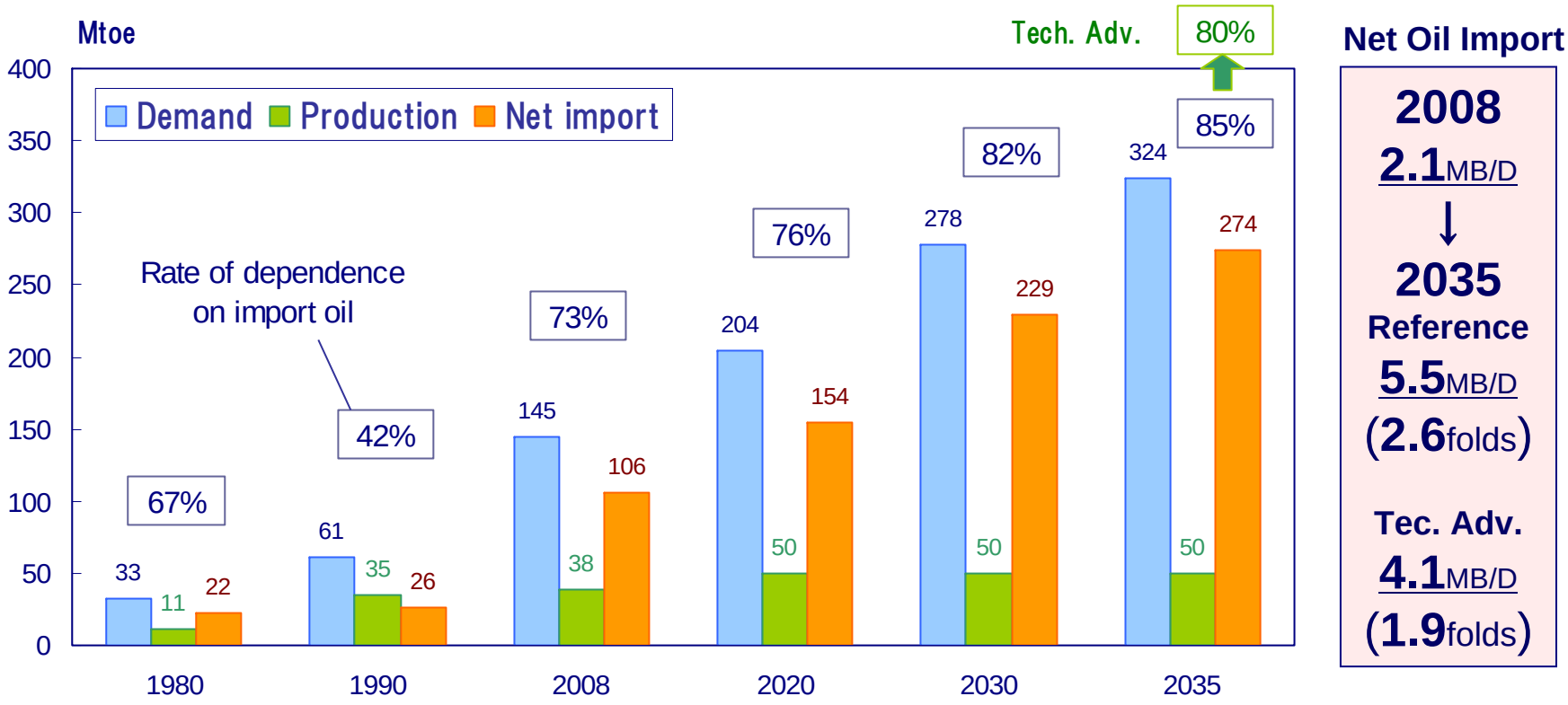
$$C = (C/E) * (E/Y) * Y$$

$$\Delta C = \Delta(C/E) + \Delta(E/Y) + \Delta Y$$

Decarbonization / Energy-Saving/ Economic-Growth

- India announced to improve its CO_2 intensity (calculated as CO_2 emissions per GDP) by 20 to 25% from 2005 level by 2020.
- CO_2 emissions per GDP in 2020 will improve from 2005 level by 34% in the Reference Scenario and 48% in the Tech. Adv. Scenario.

<Reference7> Oil Demand and Supply in India



Net Oil Import

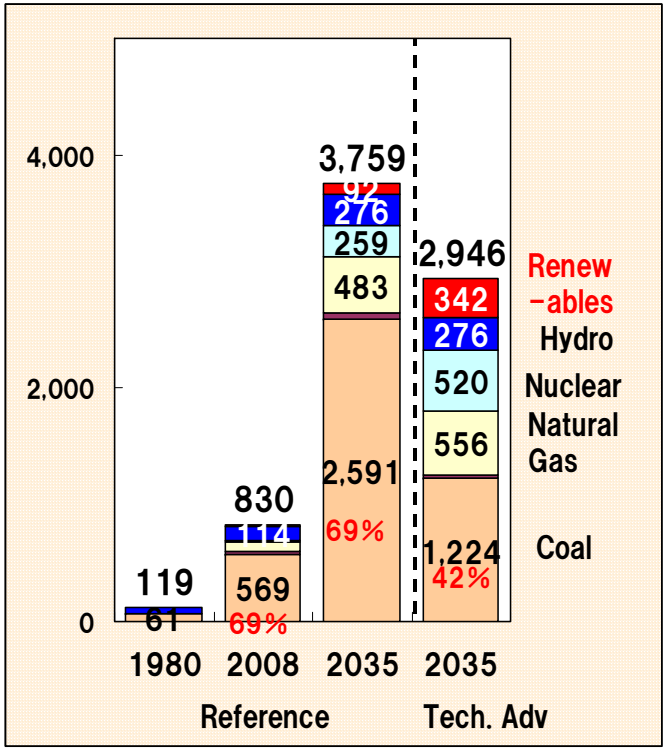
2008
2.1MB/D
↓
2035
Reference
5.5MB/D
(**2.6**folds)

Tec. Adv.
4.1MB/D
(**1.9**folds)

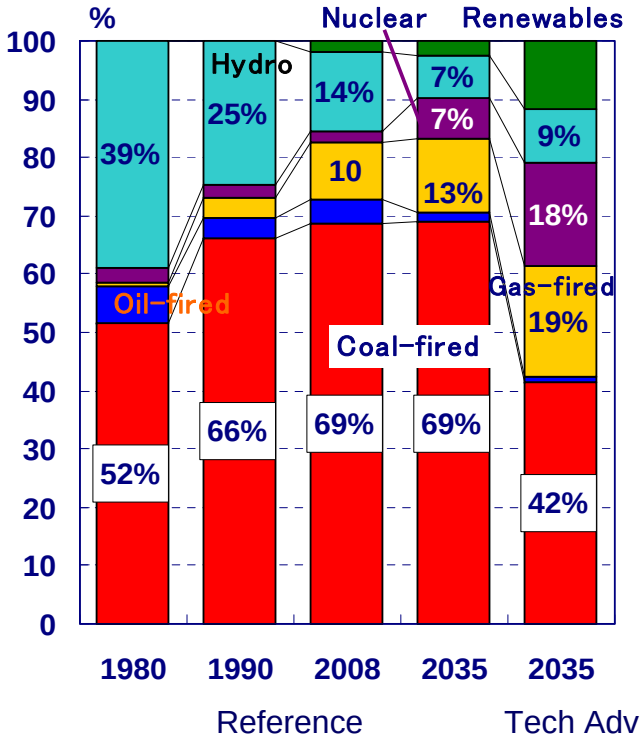
- Net oil import is projected to expand from 110 million ton (2.1 mb/d) in 2008 to 270 million ton (5.5 mb/d) in 2035. Net oil import ratio will reach 85% in 2035.
- In the Technologically Advanced scenario, net oil import ratio will reach 80% by 2035.

<Reference8> Power Generation Mix in India

【Power Generation】



【Power Generation Mix】



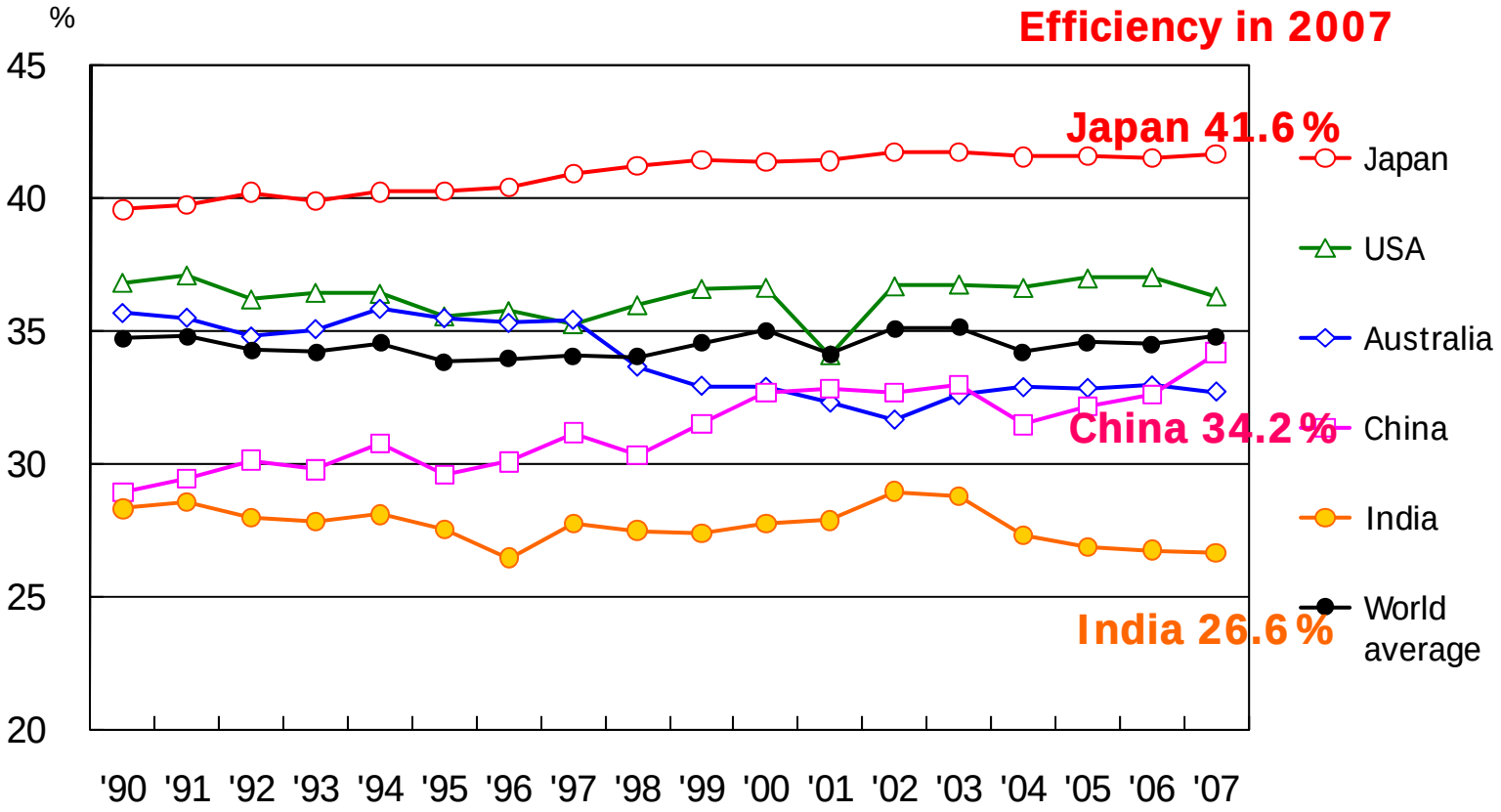
- In the future, coal-fired power will continue to account for the largest share, while generation efficiency may improve led by the government's Ultra Mega Power Project to introduce several 4GW-class super critical coal-fired power plants.
- On the other hand, the share of natural gas and nuclear will gradually expand and power generation mix will become more diversified.
- Capacity of nuclear will increase from 4.1 GW in 2008 to 33 GW in 2030 (an 8.8-fold increase).

2. CHALLENGES FOR ACCELERATING COOPERATION

a. Energy conservation
   i) review pricing policy
   ii) introduce energy efficiency technology
      Ex. Clean Coal Technology
   iii) introduce top-runner method and labeling

<Reference9> Efficiency of Coal-thermals by Country

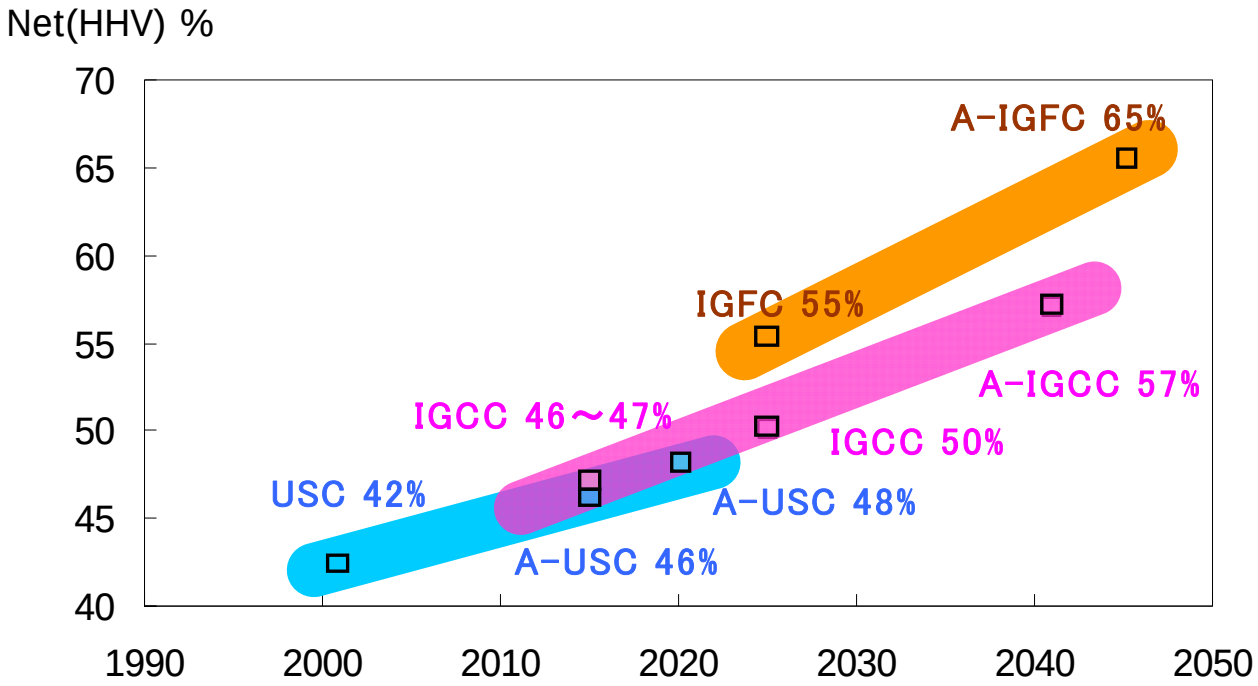
1. As a national average, Japan has achieved the world highest thermal efficiency for coal-fired power generation.
2. Many low-efficiency coal-fired plants are in operation worldwide, in particular in emerging economies.



Source: IEA (Energy balances of OECD/Non-OECD countries – 2009)

<Reference10> Technologies of Better Efficiency

1. **At present, a generating efficiency of 43% is achieved in Japan by the Ultra-Super Critical (USC) technology (No.2 Unit at Isogo PS).**
2. **R&D on Integrated Coal Gasification Combined Cycle (IGCC) and Advanced USC (A-USC) is underway aiming at higher efficiencies. In future, development of Integrated Coal Gasification Fuel Cell Combined Cycle (IGFC) is highly expected.**



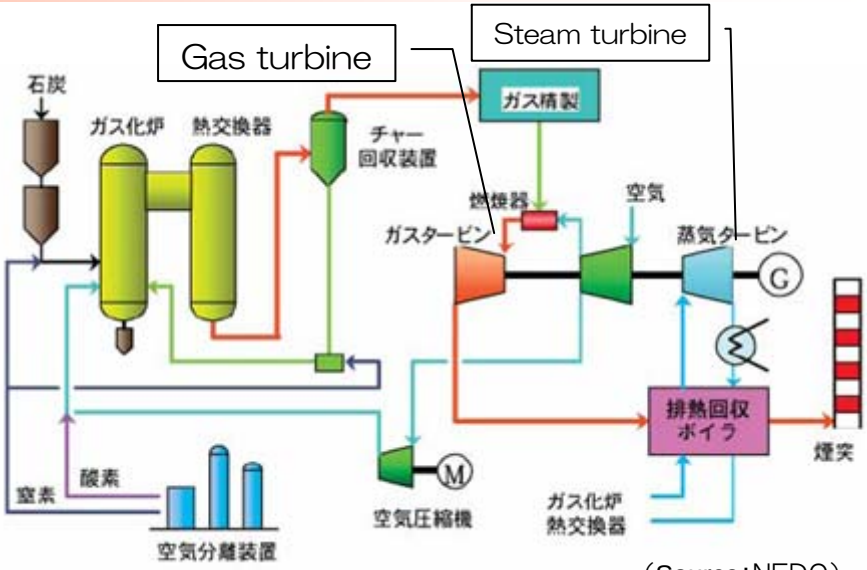
Source: Cabinet Office of Japan “Cool Earth 50 – Energy Innovative Technology Plan”

<reference10-2> Integrated Coal Gasification Combined Cycle (IGCC)

Outline of the IGCC Technique

- Convert coal into high-temp. gas, which runs the turbine directly and generate. And flue gas makes steam, which runs steam turbine and generate.
- Generation efficiency can be 50% in 2015, which is better than the existing coal-fired power plant of 41% by 20%. CO2 emission can also be reduced by 20%.

※Coal Fired Power Plant：810g-CO2/kWh
IGCC：690g-CO2/kWh



（Source：NEDO）

Technical Issues

For the commercialization

- Credibility in long-term operation
- Economics
- Securing Safety
- Oxygen combustion technique

Project in Japan

- Next page
- Commercially operated in 2015

International situation

- 2 demo-plants of 300MW scale are being operated n Europe, and other 2 are in US.
- 50% of generation efficiency can not be attained but the project in Japan.

2. CHALLENGES FOR ACCELERATING COOPERATION

b. Nuclear –Clean technology

i) improve hard business infrastructure

ii) improve soft business infrastructure

*accelerate negotiation for India/Japan nuclear power agreement

* tighten up safety regulation

* improve nuclear accident compensation scheme

iii) capacity building

iv) stabilize supply of uranium

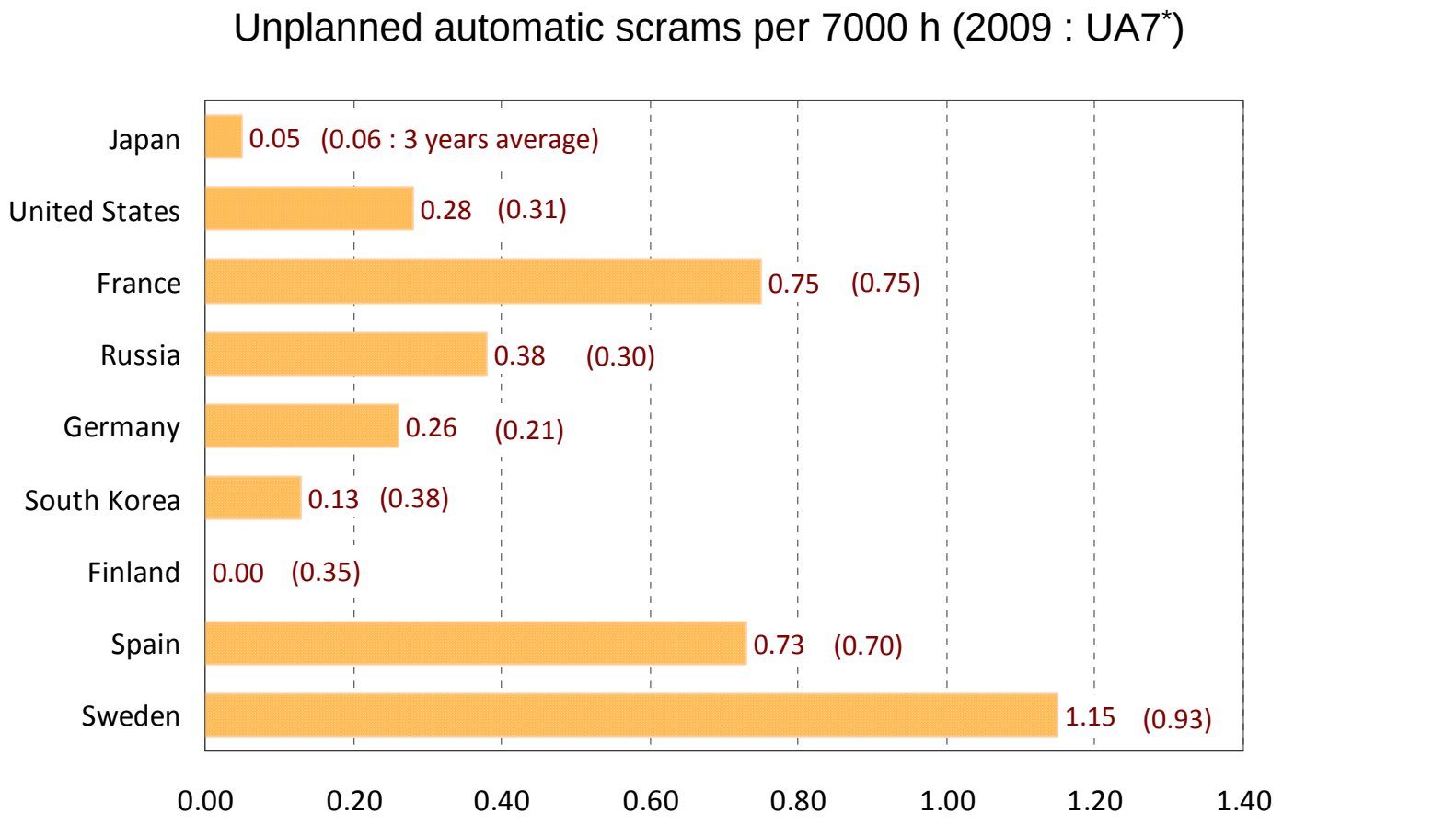
Note: goals announced by Indian Gov.

> 2009// 4 mil.kw

> 2020// 20 mil.kw

> 2030// 63 mil.kw

<Reference11> Nuclear Power Plant Safety



* UA7 = (number of unplanned automatic scrams while critical) * 7000 / (total number of hours critical)

Source : IAEA-PRIS

2. CHALLENGES FOR ACCELERATING COOPERATION

c. Solar energy

i) provide incentives for foreign investment

* provide subsidy and/or low interest loan
* tax incentive
* accelerated depreciation
* local contents

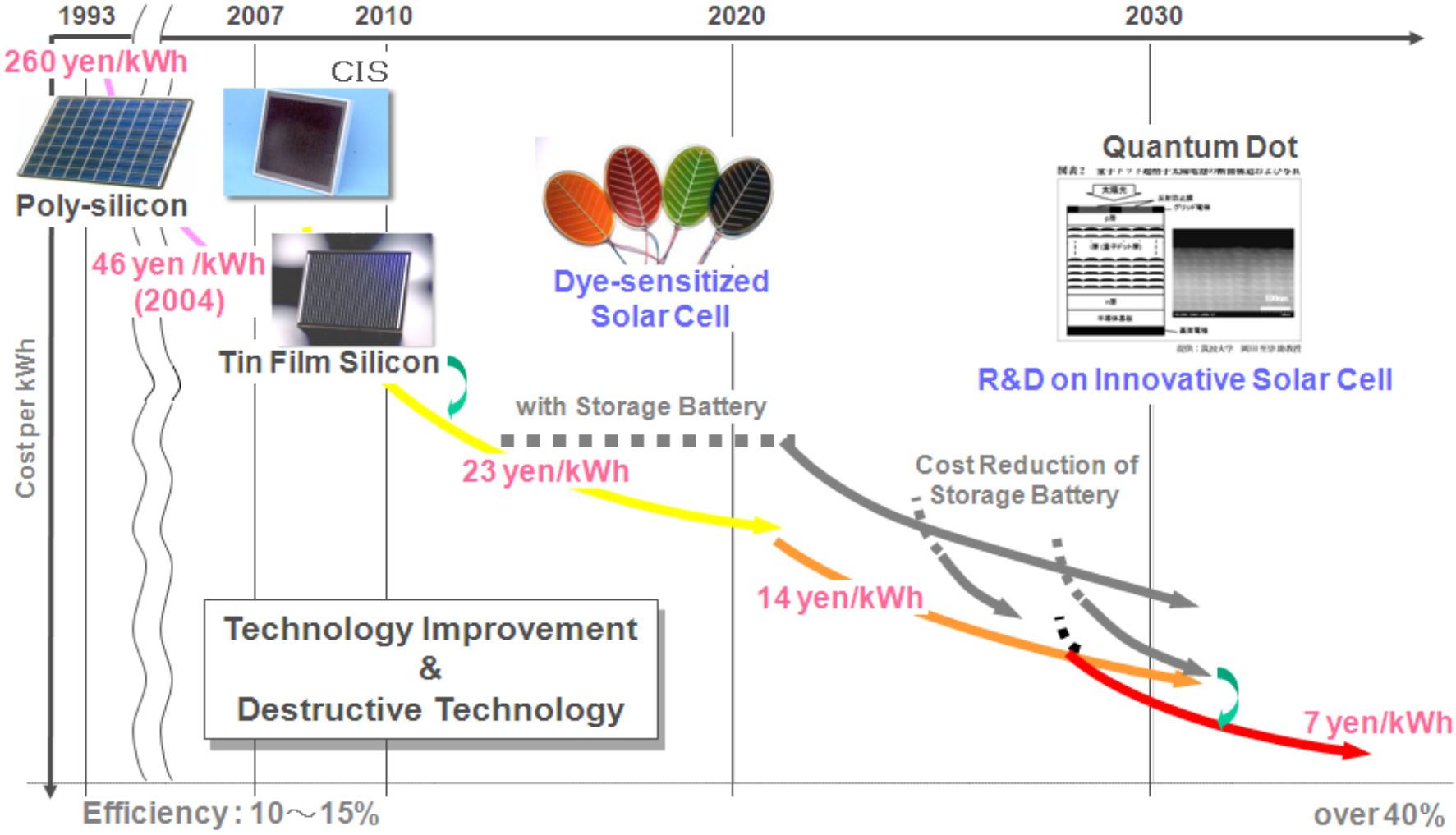
ii) expand feed in tariff

Note : goals announced by Indian Gov.

>2010//15MW

>2022// 22GW (Solar mission plan; 2009)

<Reference12> PV Cost Reduction Scenario by R&D



METI arranged the Report of the committee on Road-map toward 2030（PV2030）, NEDO, June 2004

2. CHALLENGES FOR ACCELERATING COOPERATION

d. Smart Grid/ Micro-grid

i) demonstrate successful cases

Ex. NEDO/IIU collaboration

ii) incentive for foreign investment

<Reference13> How to Promote Smart Community Initiative

Commercializing projects based upon knowledge of demonstration experiment and exploring **promotion of projects in other countries**

Realization of Smart Community

Formulating Consortium
GOJ supports formulation of consortium at four sites

Identifying needs of Japanese companies and signing a MOU on development cooperation with DMIC

Commercial-ization

Demonstration Experiment

Feasibility Study

Agreement on Development Cooperation

Conducting demonstration experiment at the sites and proving Japan's technological capability

Approach at the top level
METI Min. Naoshima visited India with leaders of consortium companies

Summit Diplomacy
PM Hatoyama visited India and agreed to conduct F/S

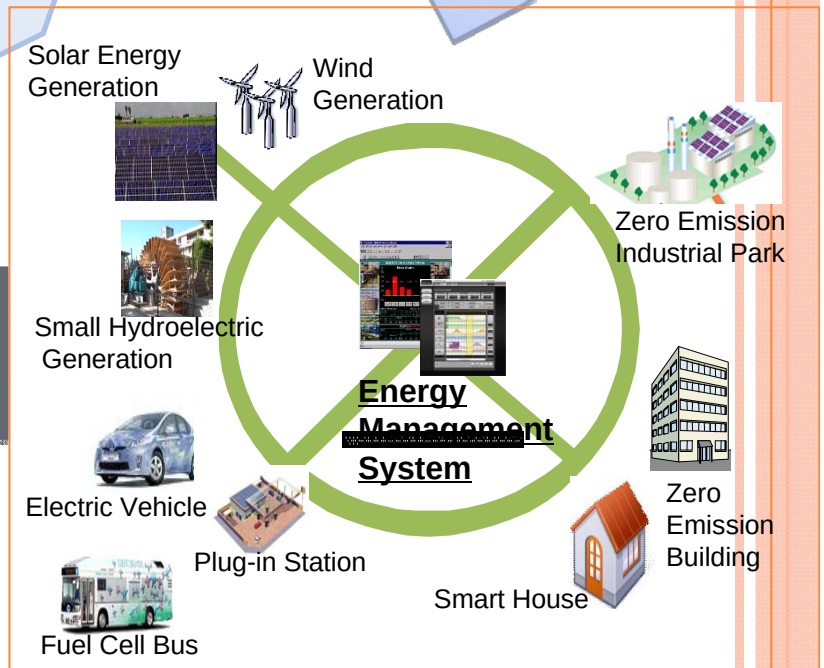


Image of Smart Community

3 . DMIC AS A SHOW CASE FOR COOPERATION

1. What is DMIC(Delhi Munbai Industrial Corridor)?

Delhi-Mumbai Industrial Corridor : DMIC

Major cities and trunk roads & railways

Project outline

- Building 1,500-kilometer Dedicated Freight Corridor (DFC) between Delhi and Mumbai
- Advancing regional development cooperation between India and Japan on the promotion of private investment in the infrastructure development of industrial & logistic parks, roads, ports, residential zones, commercial facilities, etc.

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3. DMIC AS A SHOW CASE FOR COOPERATION

2. Why is DMIC important?

- provide better business environment in a large scale

Note: comparison of problems for Japanese investment between India and China

- good example of India/Japan cooperation
- good example of ecofriendly development

<Reference14> Business Risks in India and Major Asian Countries

India ranks second after China as a potential investment destination in the medium term (in the next three years).

	2004	2005	2006	2007	2008	2009
1st	China	China	China	China	China	China
2nd	Thailand	India	India	India	India	India
3rd	India	Thailand	Vietnam	Vietnam	Vietnam	Vietnam
4th	Vietnam	Vietnam	Thailand	Thailand	Russia	Thailand
5th	USA	USA	USA	Russia	Thailand	Russia
6th	Russia	Russia	Russia	USA	Brazil	Brazil

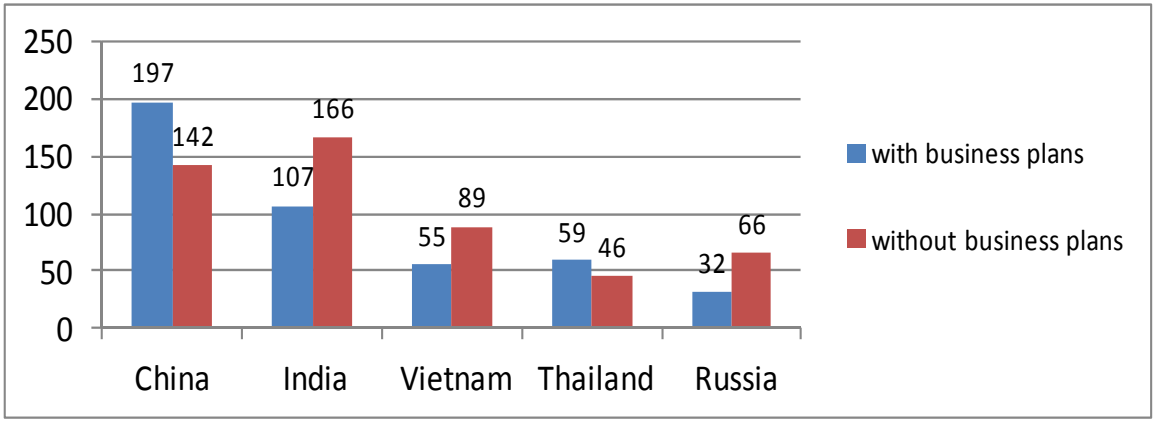
Reasons for valuing India

1)Market growth potential **90%**
2)Cheap labor **39%**
3)Production site for assemblers **19%**

(Reference) Reasons for valuing China

1)Market growth potential 85%
2)Cheap labor 44%
3)Current market size 33%

High evaluation as an investment destination does not lead to concrete business plans.



Major challenges of India

1)Inadequate infrastructure **47%**
2)Unstable public security **30%**
3)Intense competition with rivals **30%**

(Reference) Major challenges of China

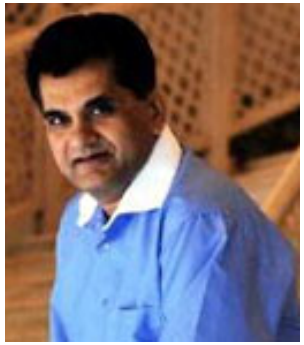
1)Rising labor costs 56%
2)Opaque operation of laws 56%
3)Intense competition with rivals 50%

(Note) Excerpts from JBIC's "Report on Japanese Manufacturers' Overseas Business Operations in FY2009 "

<Reference15> Joint Establishment of Project Development Fund (PDF)

Establishing Project Development Fund (PDF) with loans from JBIC and DMICDC for drawing up development plans, formulating development projects and managing project implementation in cooperation with IL/FS

Mr. Singh
Secretary, MOCI



Mr. Kant
CEO, DMICDC

(DMICDC)

Project Development Fund (US$150 million)
Indian Government (US$75 million)
JBIC (US$75 million)

Development plan (Overall and individual areas)

Formulating projects Conducting F/S etc.

Selling projects (Bidding)

(Private Sector)

Development through private investment

(Indian government)

Building Dedicated Freight Corridor **(ODA Loan)**

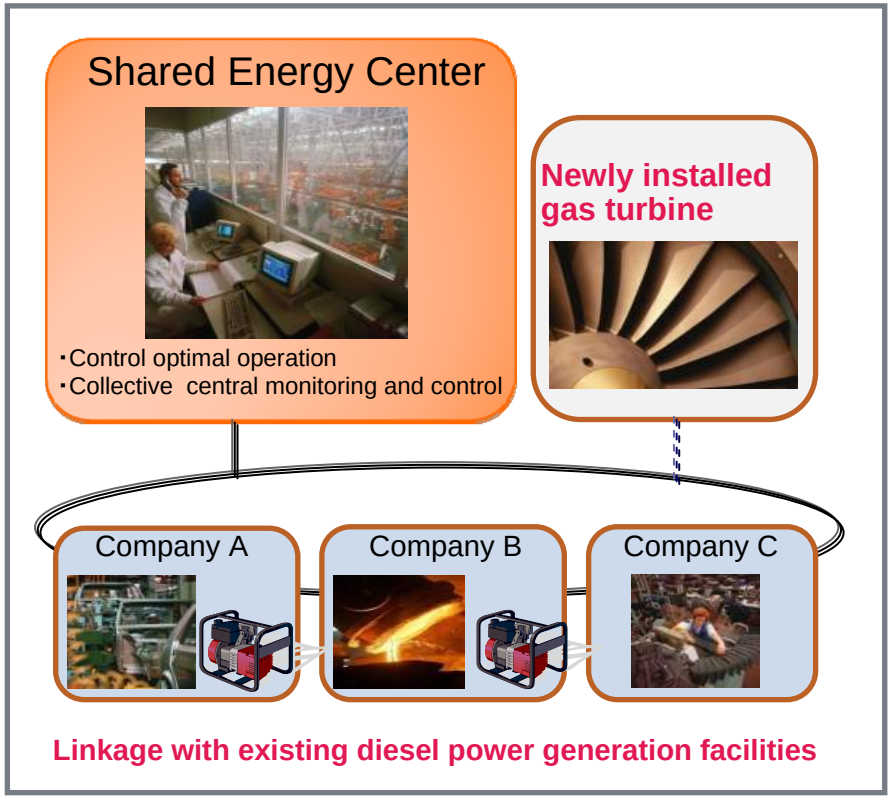
<Reference16> Neemrana Shared Energy Center (N-SEC) Business Establishment Committee

Concerns of companies operating in Neemrana Industrial Park

✓ Individual companies have their own private electric generators due to unstably supply of electricity with constant quality

✓Necessary to obtain cooling water for operating diesel power generation facilities

Japanese companies operating in Neemrana Industrial Park established linkage between their own existing diesel power generation facilities and jointly installed gas turbine power generation facilities to secure a stable supply of power and reduce quantity of water intake.



Merits of Early Bird Projects

- ➢Raising awareness of Indian government
- ➢Providing proactive support from state government
- ➢Facilitating coordination with gas suppliers

Nimurana Industrial Park is located about 105 kilometers from Delhi

Thank you

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