

-Technologies for mitigating global warming and the role of Japan-

*Challenges for GHG Reduction
in Steel Industry*

January 18, 2007

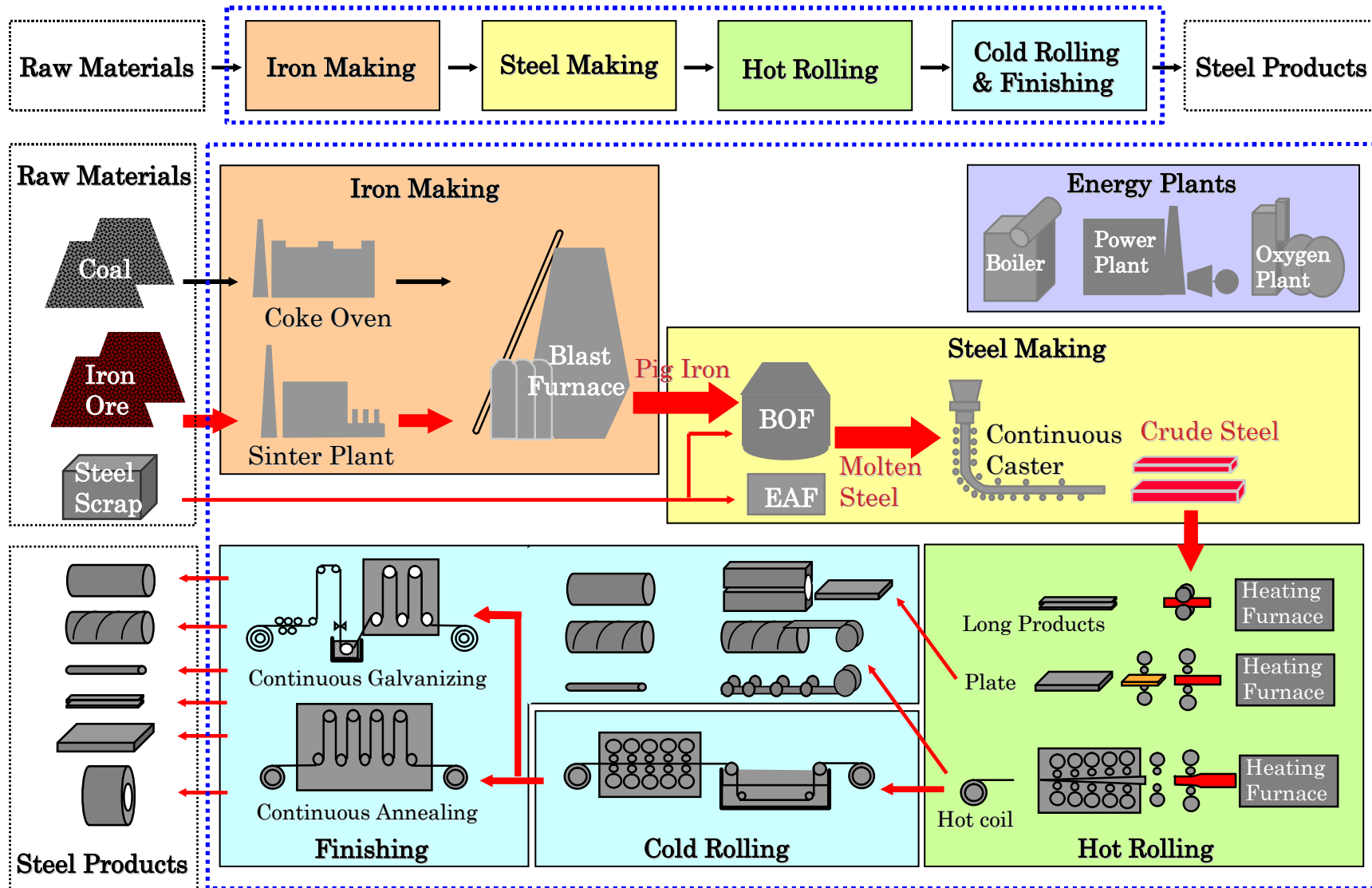
Toru Ono

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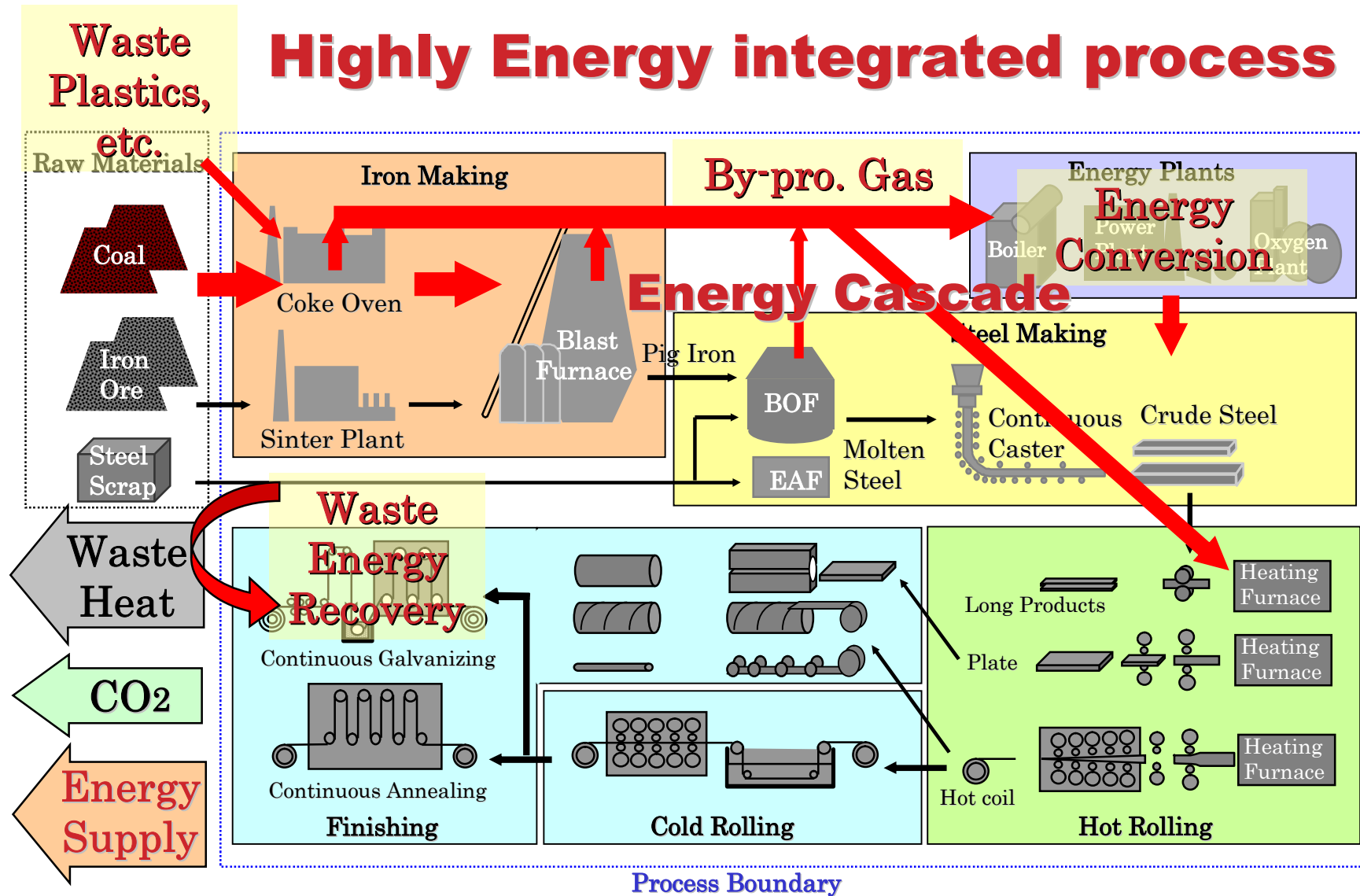
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Iron & Steel Making Process Flow

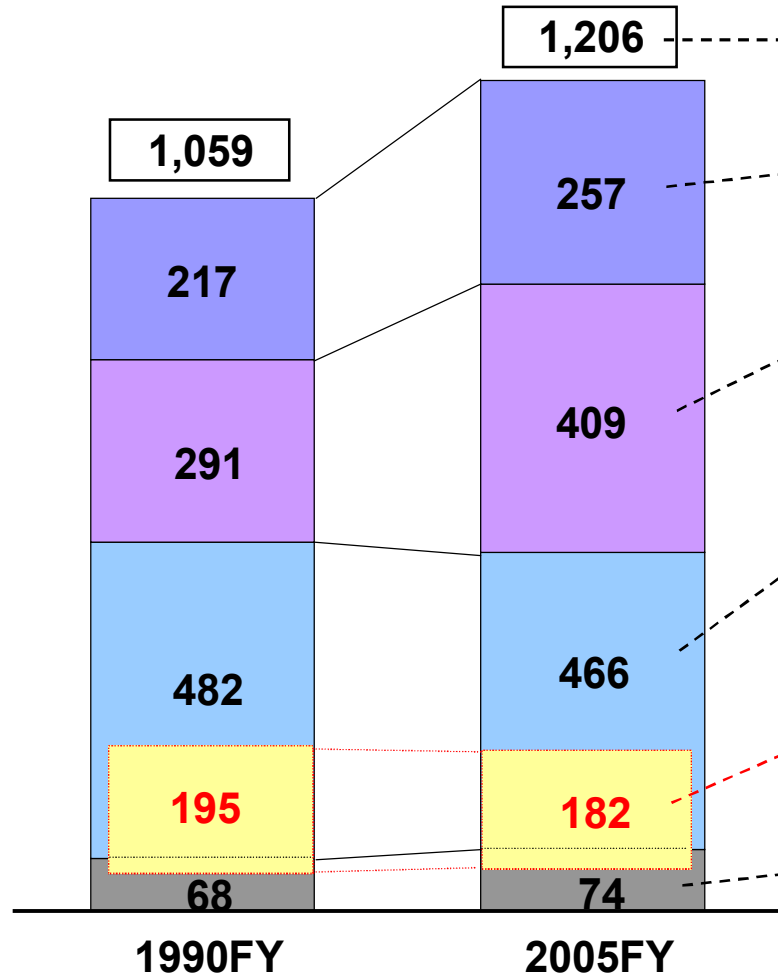


From the Point of View of Energy,



Energetic CO₂ Emission in Japan by Sectors

GDP 450Tyen → **503(+11.9%)**
Crude Steel Production 112Mt → **113(+0.9%)**



**Total Energetic CO₂ Emission :
 +143Mt-CO₂ (+13.9%)**

**Transportation :
 +40Mt-CO₂ (+18.4%)**

**House-H-holding & Business :
 + 118Mt-CO₂ (+40.5%)**

**Industry Sector :
 -16Mt-CO₂ (-3.3%)**

**Steel Sector :
 -13Mt-CO₂ (-6.9%)**

**Energy Conversion :
 + 6Mt-CO₂ (+8.8%)**

*Grid power is distributed to each sector with national average CO₂ emission by power generation

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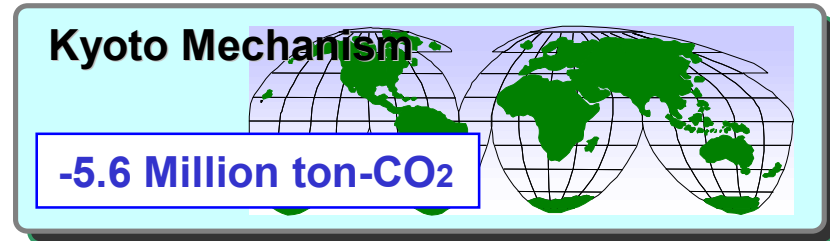
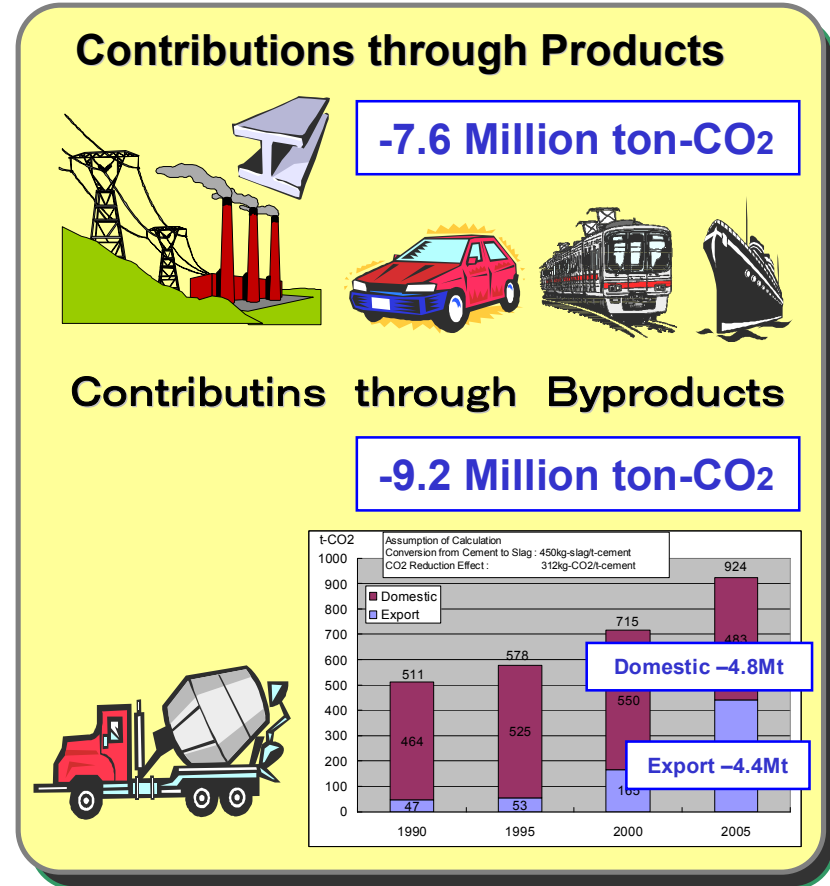
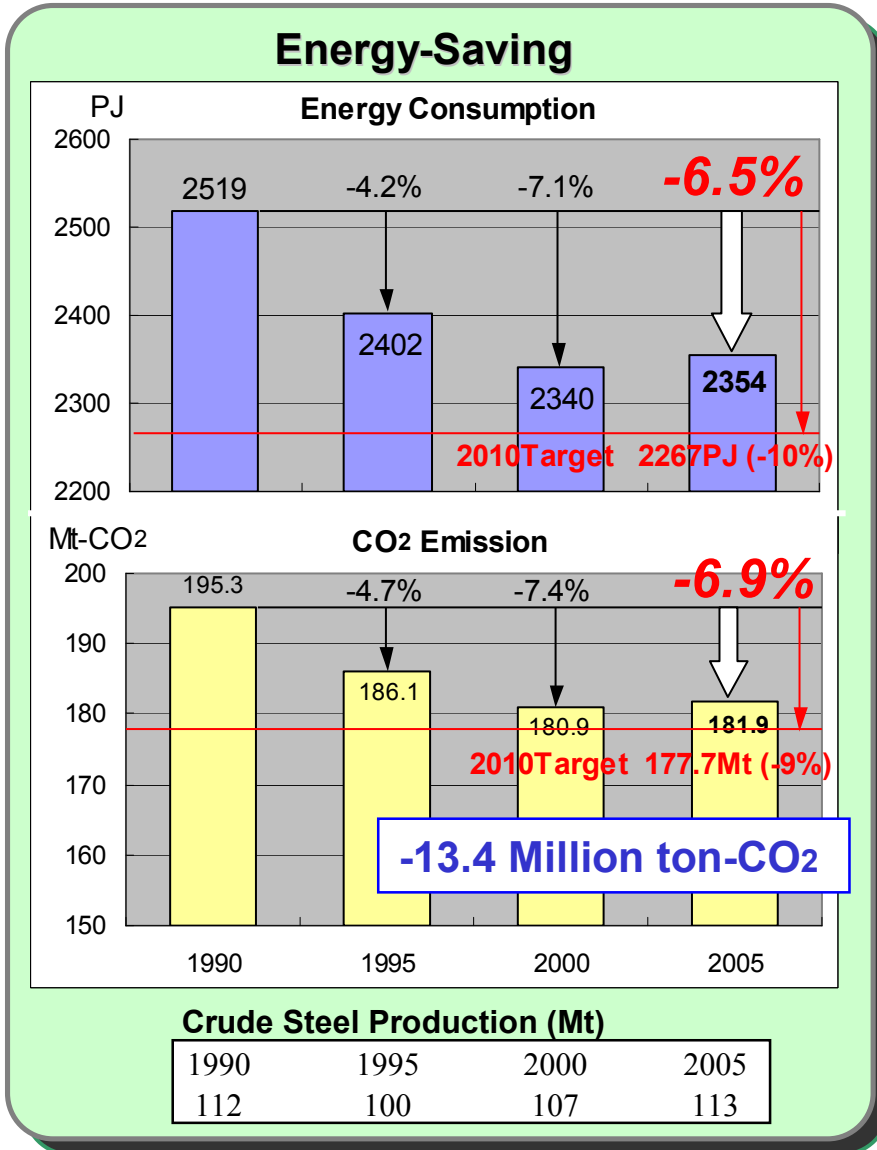
Voluntary Action Plan of JISF

*JISF:Japan Iron and Steel Federation

In 1996 the Japan Iron and Steel Federation launched its voluntary initiatives with the following action plans.

- 1) **Challenge to save energy in the process by -10% between 1990 and 2010**
- 2) **Challenge to use 1 million tons of waste materials in the process under the condition of establishing classification and collecting scheme by local government. (equals to -1.5% of energy).**
- 3) Further utilization of unused waste energy in the local communities.
- 4) Contribution to energy-saving in the communities through “Eco-products” and byproducts.
- 5) Contribution to world wide energy-saving through technology transfer.

Achievement of the Activities

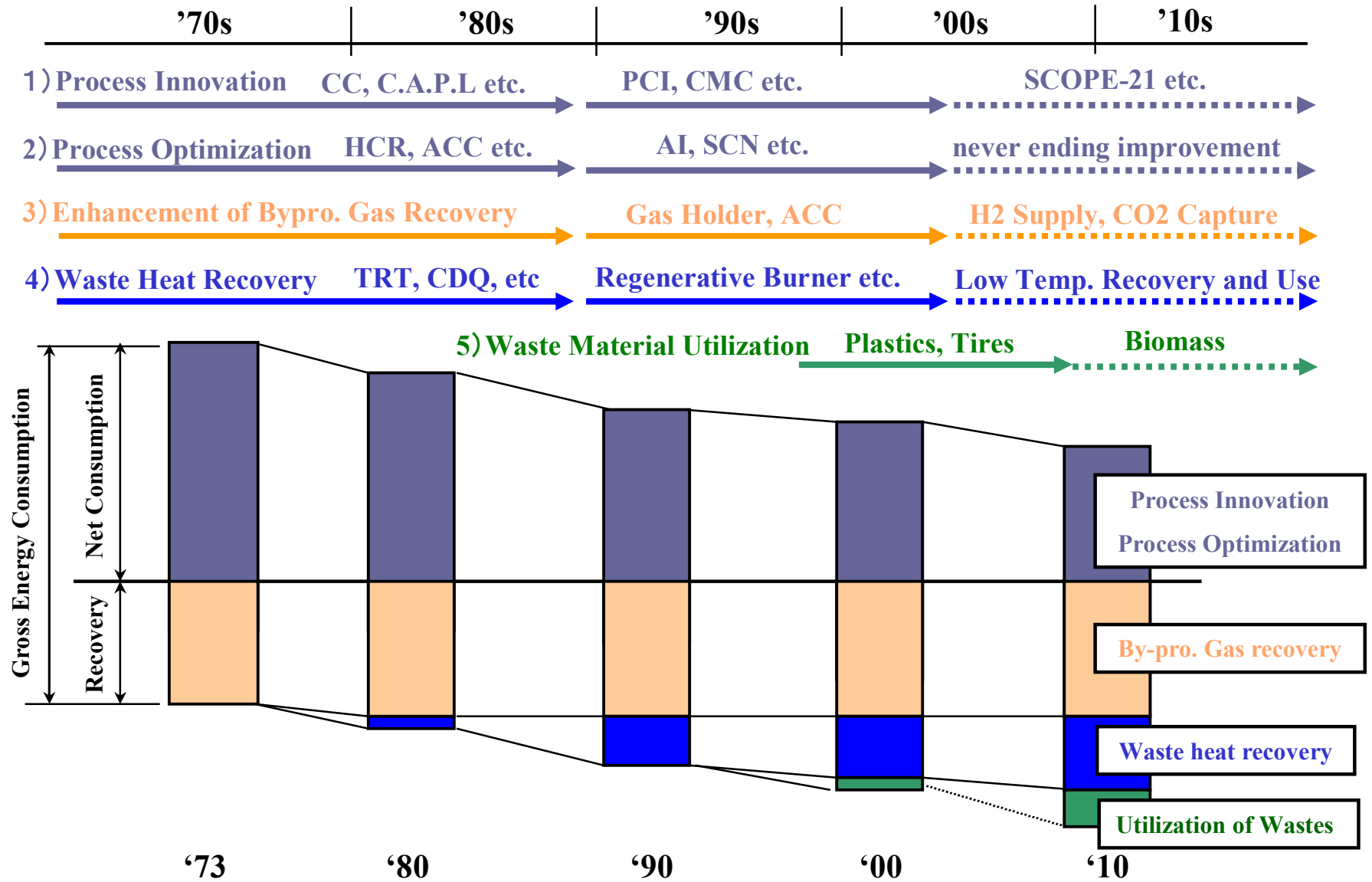


Keidanren's Voluntary Action Plan

- Targeting no increase in CO2 emission in 2010 from that in 1990
- 35 industrial sectors participants in the 2006FY follow-up.
- Covering 44% of the national total and 83% of industrial sector in Japan.

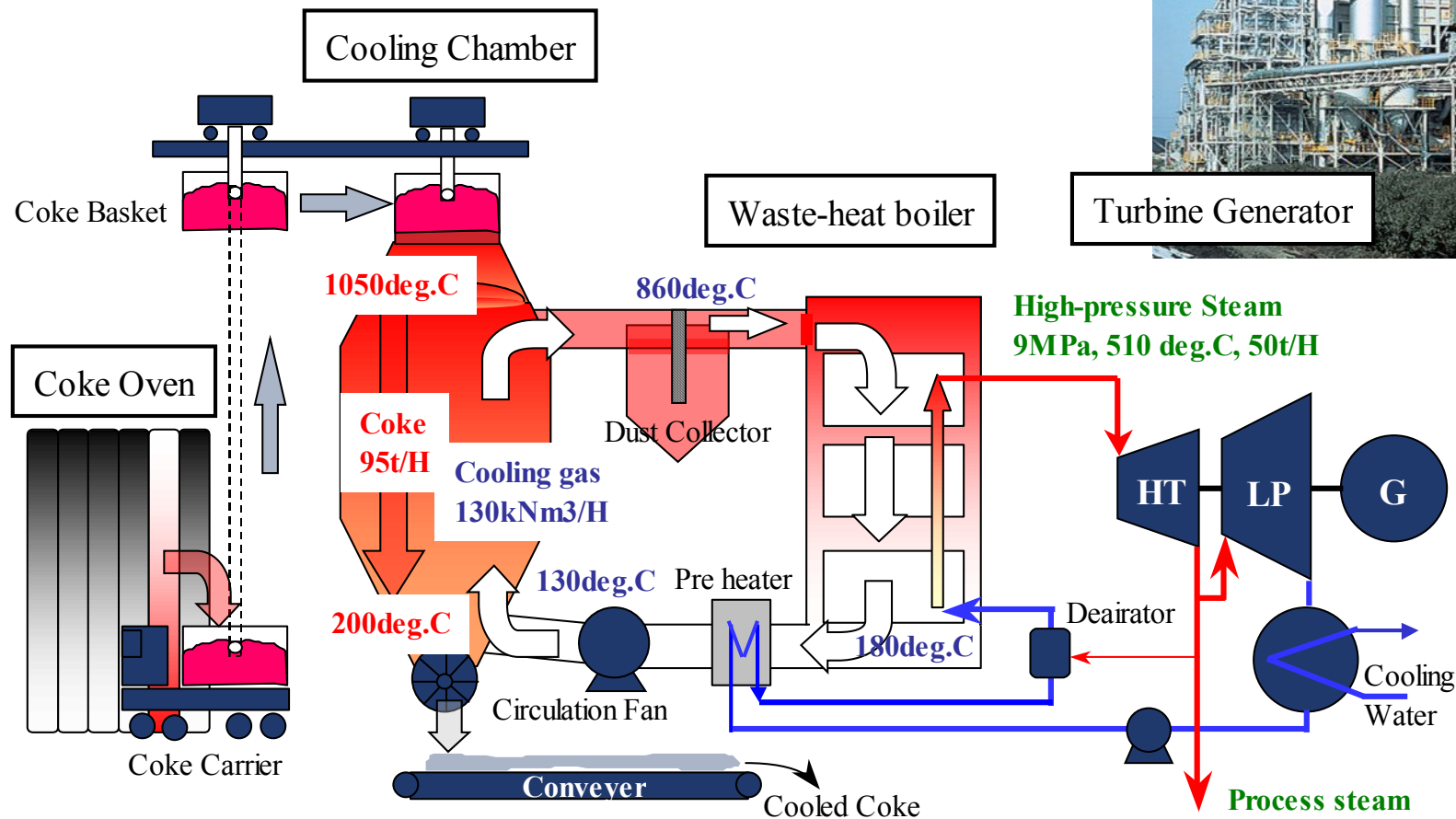
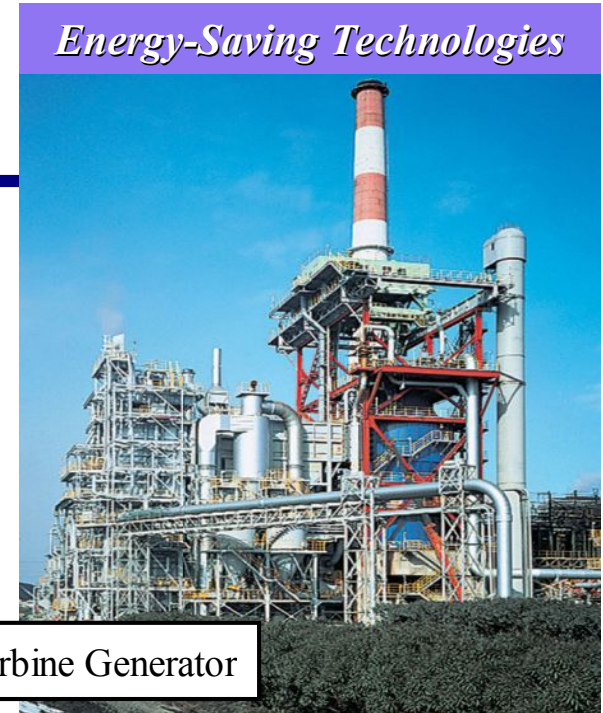
Industrial sector in Japan	1990 Mt-CO2	2005 Mt-CO2	Change Mt-CO2	Rate %
1. Iron and Steel Federation	195.3	182.0	-13.4	-6.9
2. Car manufacturing	7.6	5.7	-1.9	-24.4
3. Car parts	7.2	7.4	0.2	3.1
4. Petroleum Association	33.0	44.7	11.7	35.3
5. Chemical I. Association	68.3	75.2	6.8	10.0
6. Paper Association	25.4	25.1	-0.4	-1.4
7. Cement Association	27.4	21.8	-5.7	-20.6
8. Power companies (portion)	31.0	38.8	7.8	25.2
9. Electric appliances etc	11.8	18.7	6.9	58.0
10. Other sectors	39.0	33.4	-5.6	-14.4
11. Non-energy CO2	62.1	52.4	-9.6	-15.5
Keidanren Total	508.2	505.1	-3.1	-0.6

Efforts to Energy Saving

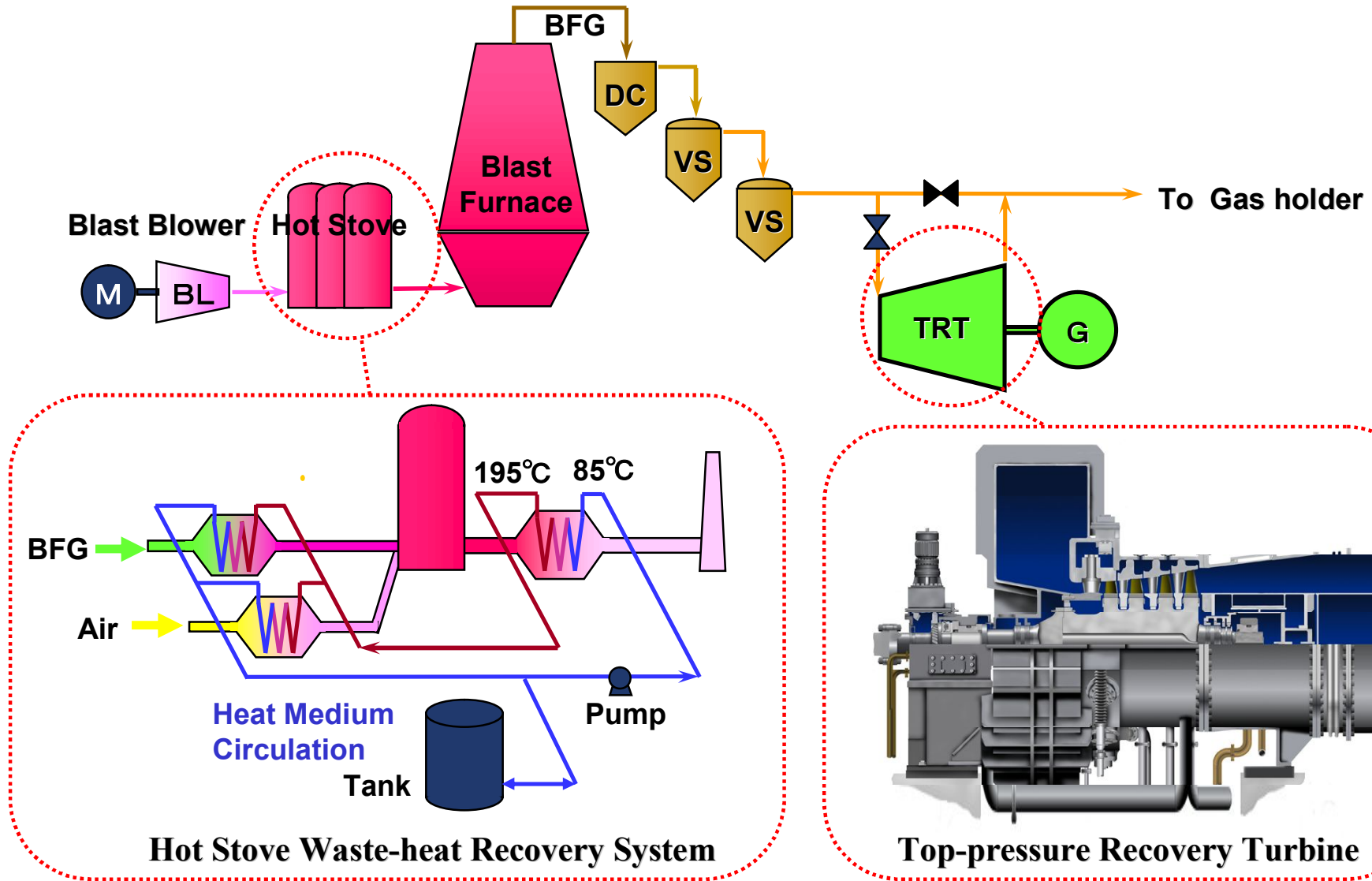


Coke Dry Quenching (CDQ)

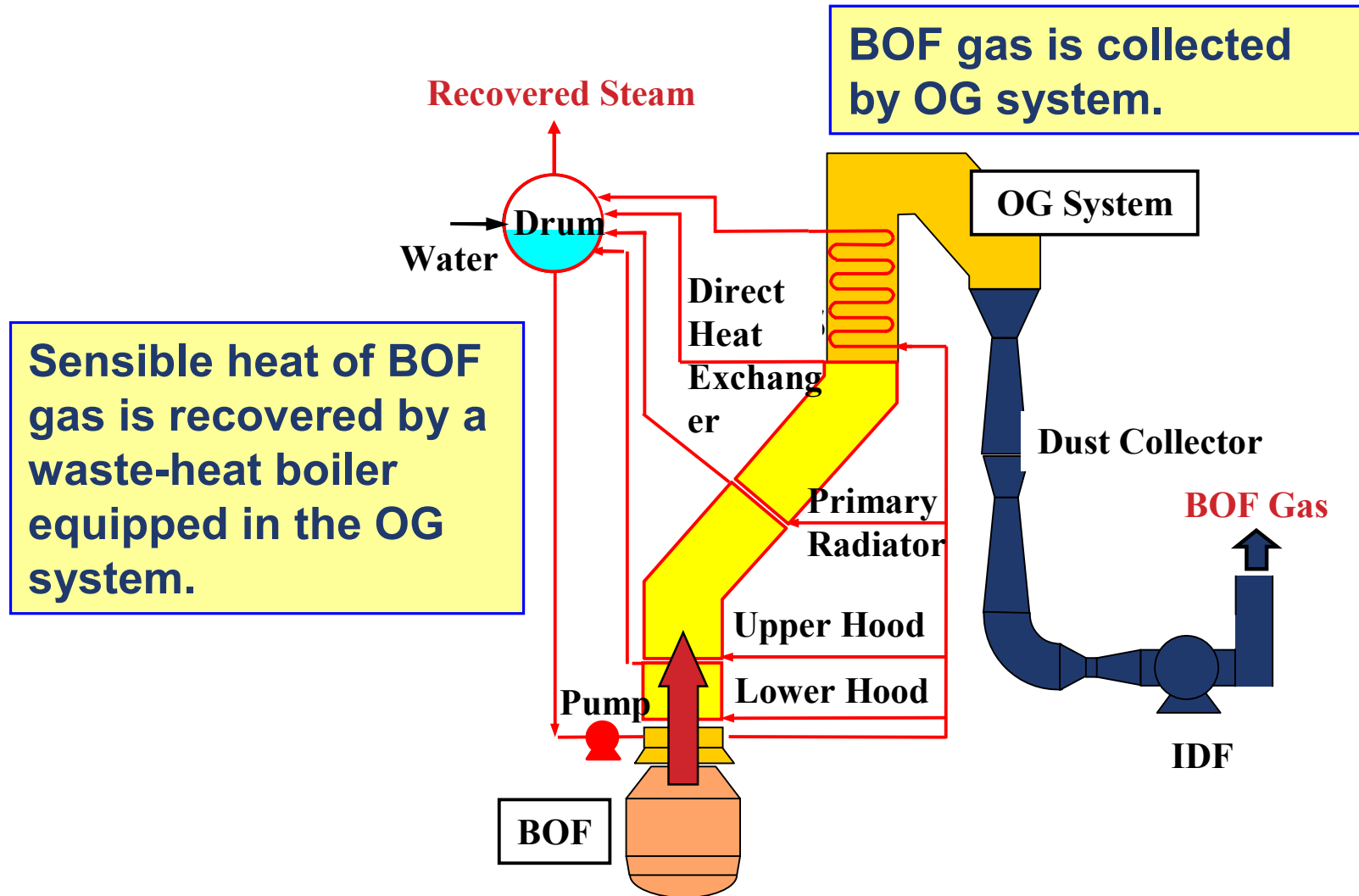
Waste-heat recovery from hot coke
Improvement in coke quality



Energy Recovery System in BF

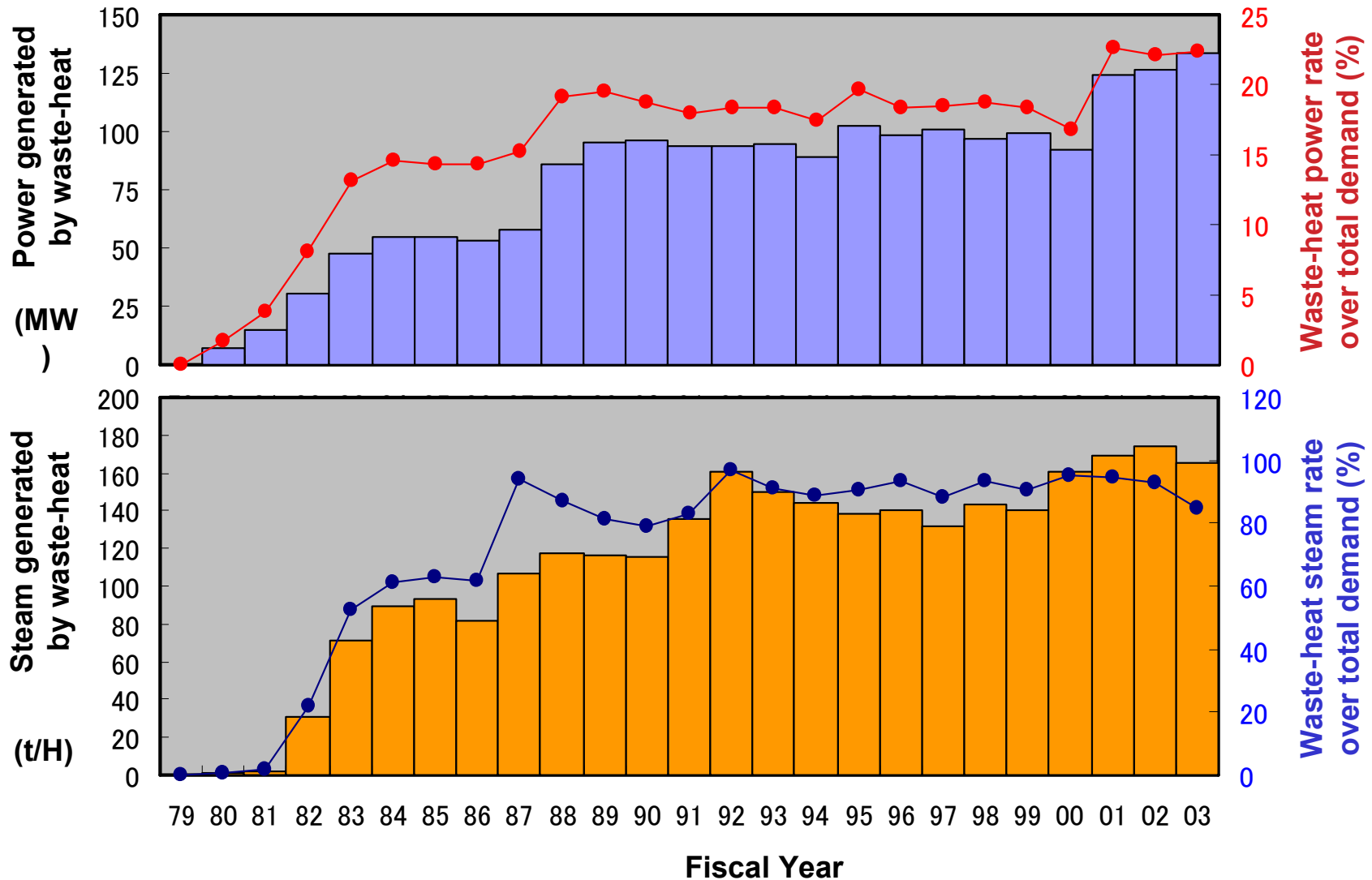


Energy Recovery System in BOF



Trends of Waste-heat Recovery

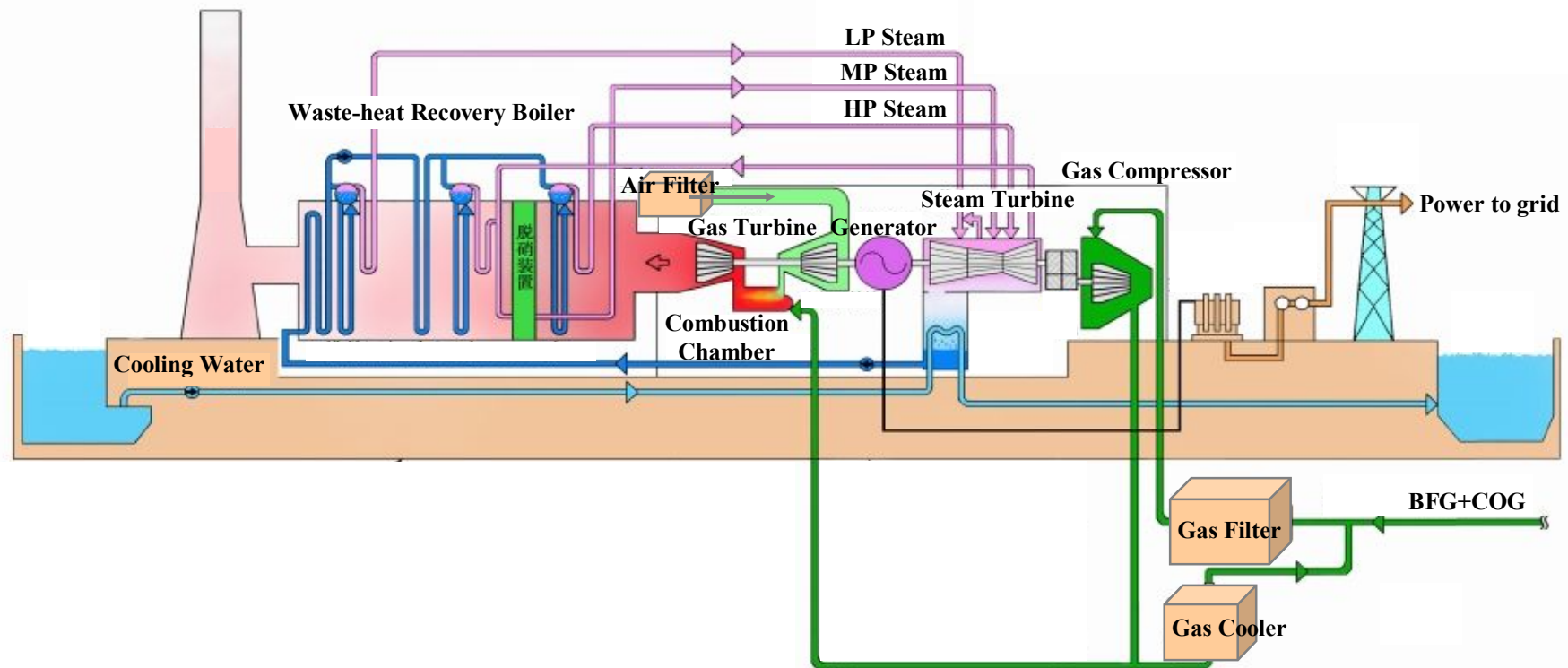
Results in Kimitsu Works of Nippon Steel



ACC for Byproduct Gas

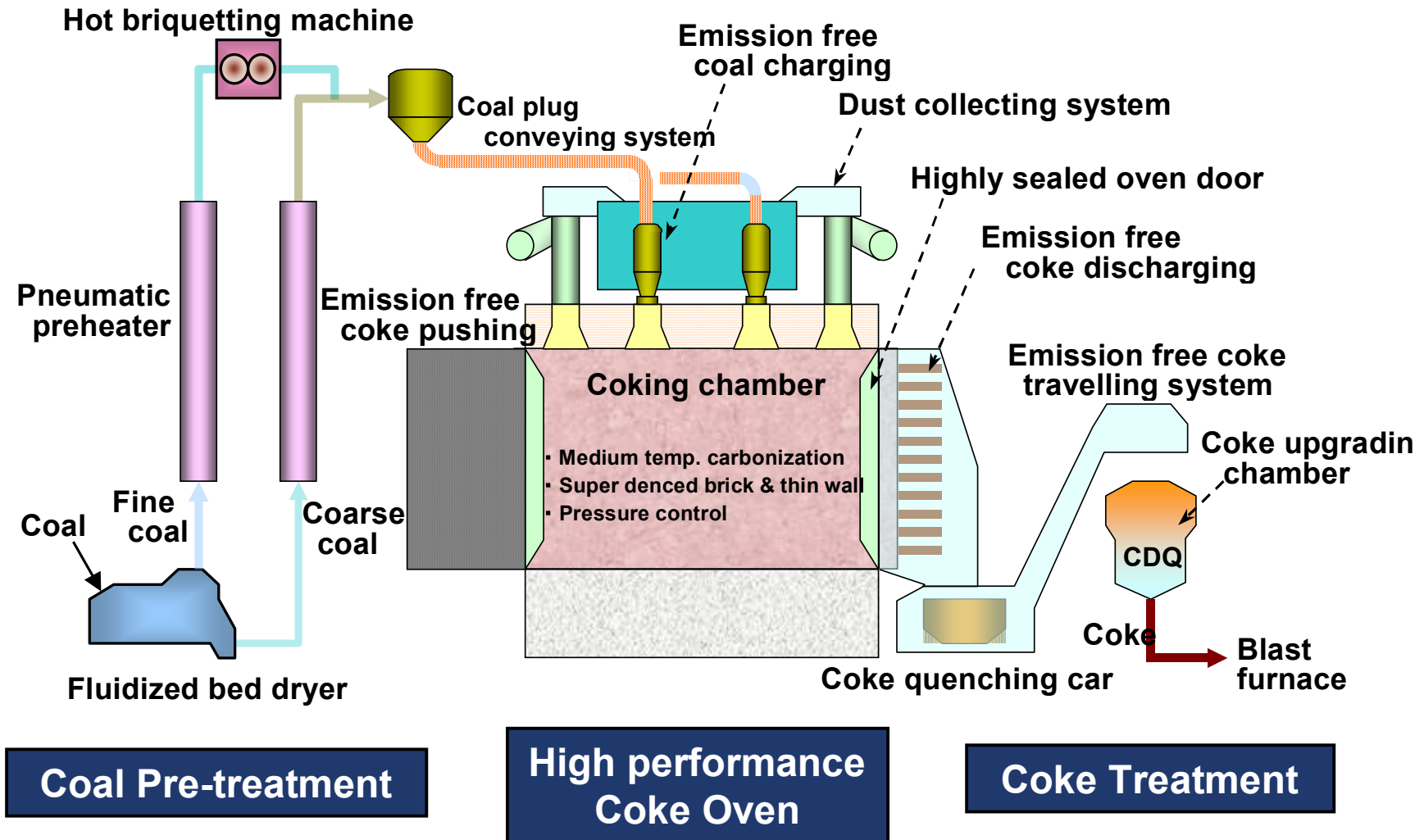
Advanced Combined Cycle

Capacity : 300MW
Fuel : mixed BFG (4.4MJ/Nm³)
Gas temp. : 1300deg.C
Efficiency : 47.5%



From Kimitsu Cooperative Thermal Power Company

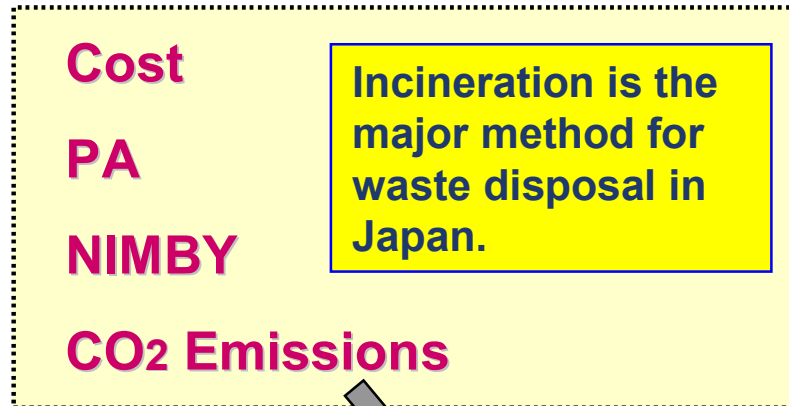
Advanced Coke Oven (SCOPE-21)



Cross Sector Approach

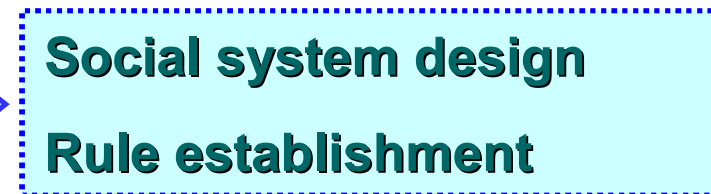
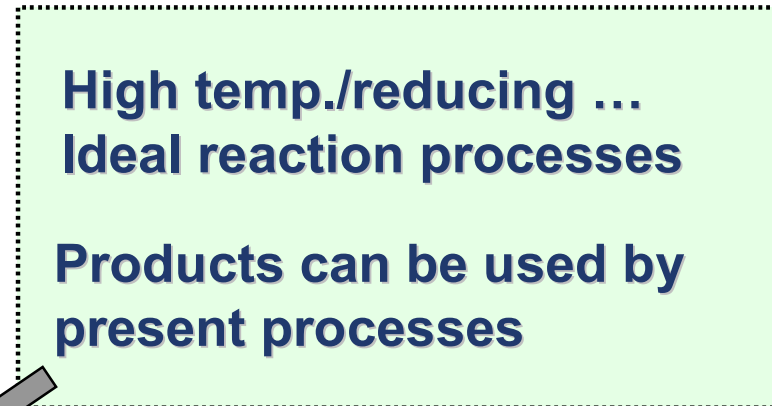
Civil Life

(Serious needs for waste disposal)



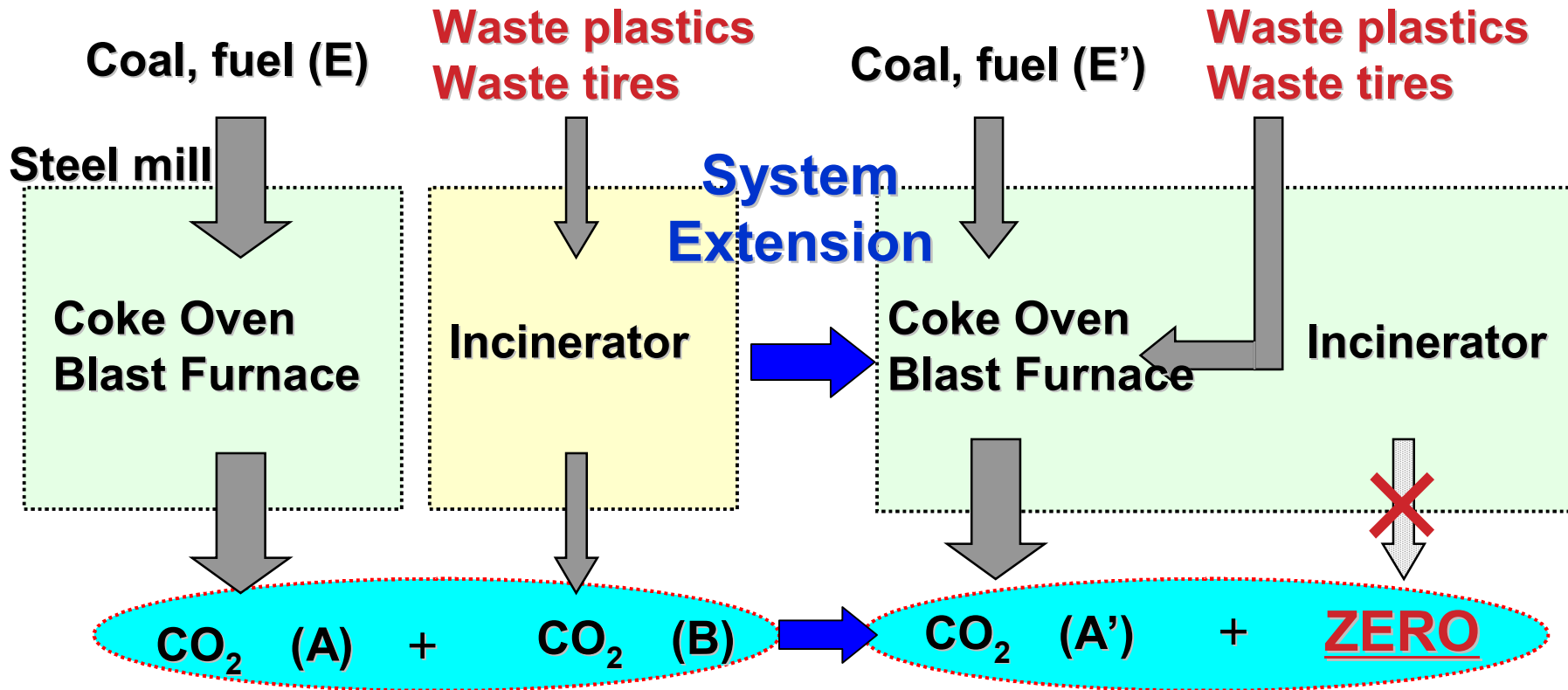
Iron/steel making process

(Big potential for effective uses of wastes)



To realize a material recycling society system across sectoral borders

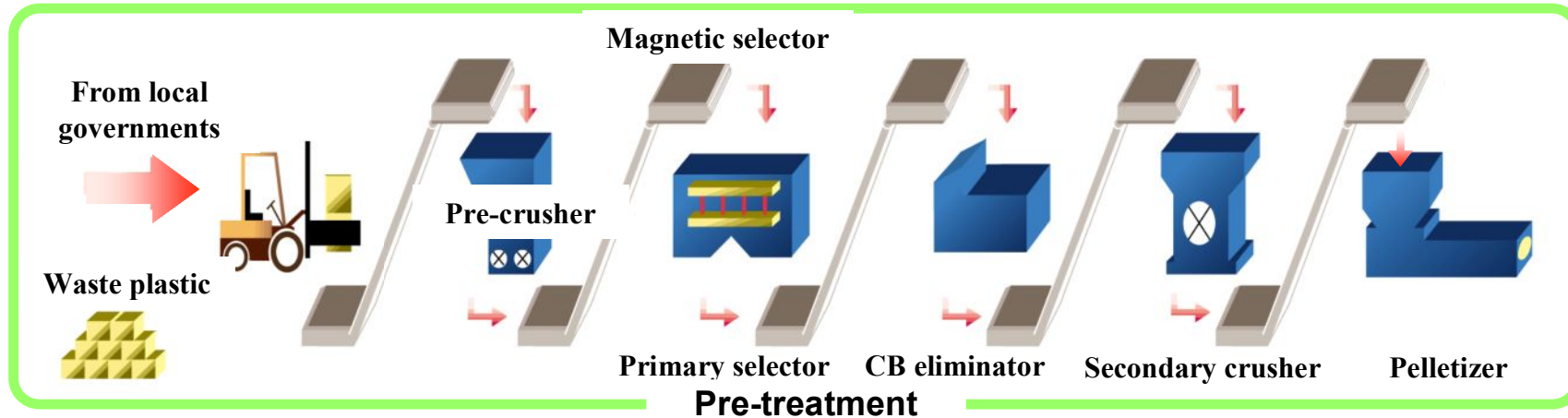
Evaluation of Utilization of Waste Materials



**Saving Natural Resources
Reduction of Total CO₂ Emission**

Methodology of Waste Plastic Utilization-1

Material Preparation Process



Compressed Package

1m x 1m x 1m

200 – 300 kg



Secondary Crushed tips

20 x 20 mm

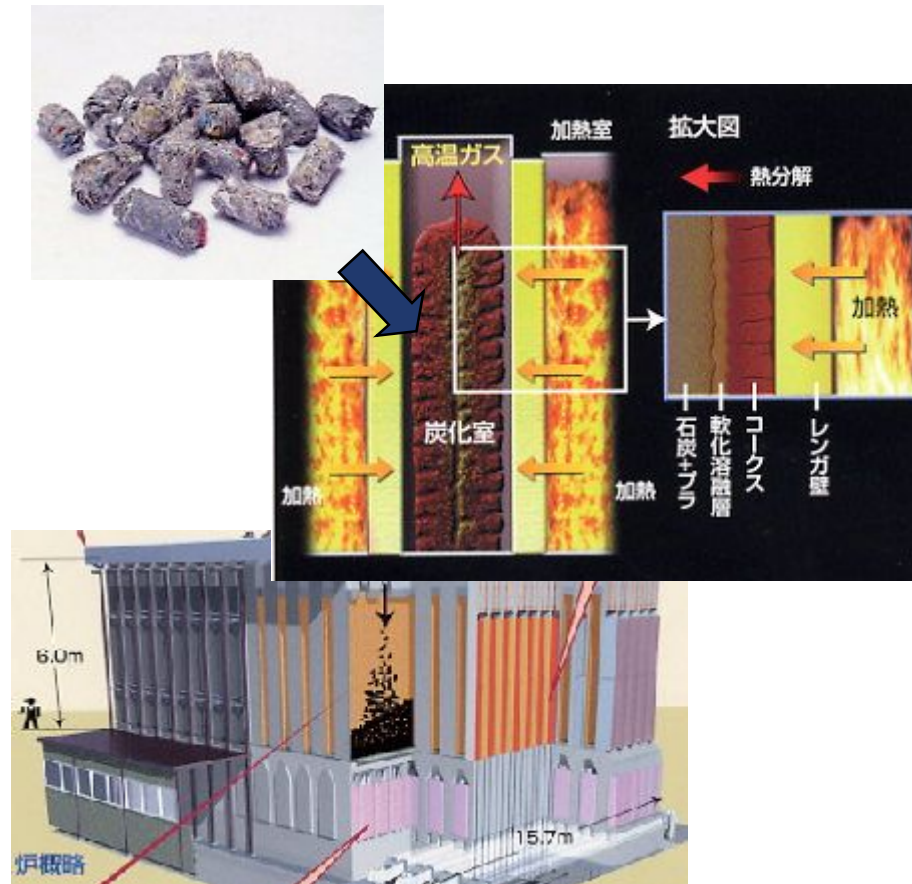


Plastic Pellets

25 mmD x 40 mmL

Methodology of Waste Plastic Utilization-2

Chemical Decomposition Process



Coke Oven

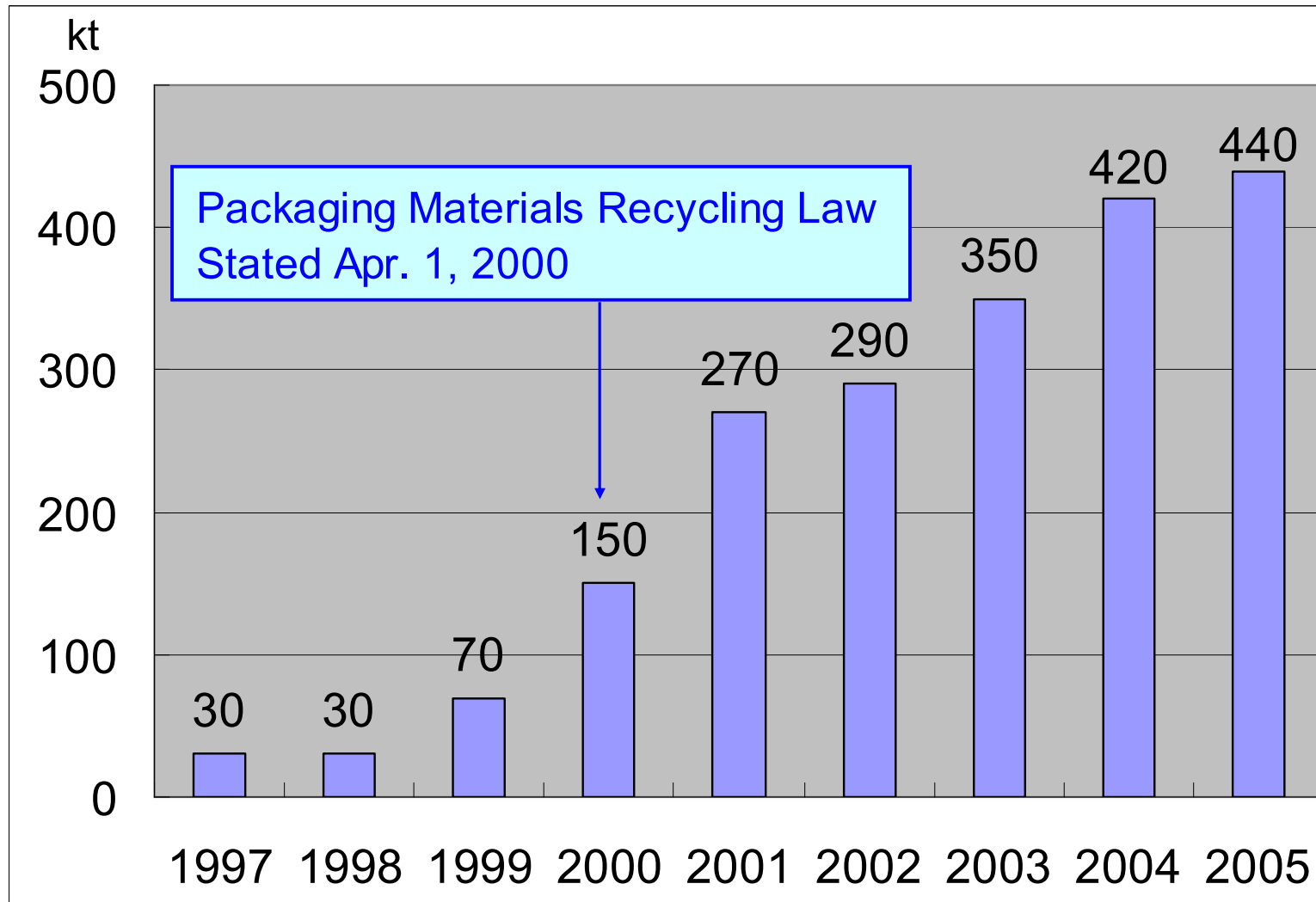
Products and Reuses

40% COG
Power Plant
Fuel Cell (in future)

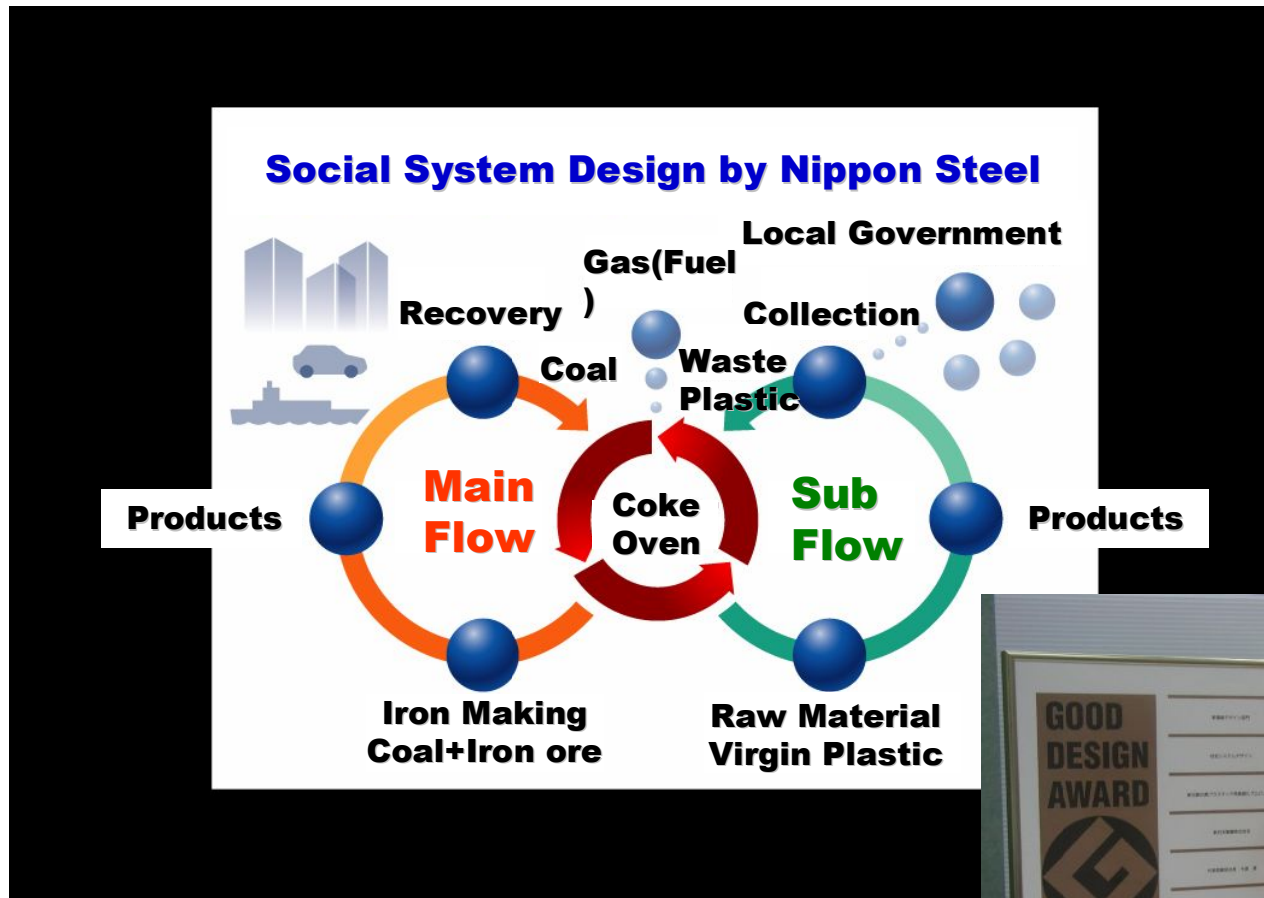
40% Oils
Plastic Materials
Paints etc.

20% Coke
Reducing Agent for BF

Trend of Utilization of Waste Plastics



Social System Design by Nippon Steel



In 2002, Good Design Award was granted to Nippon Steel for it's Social System Design of Waste Plastic recycling.



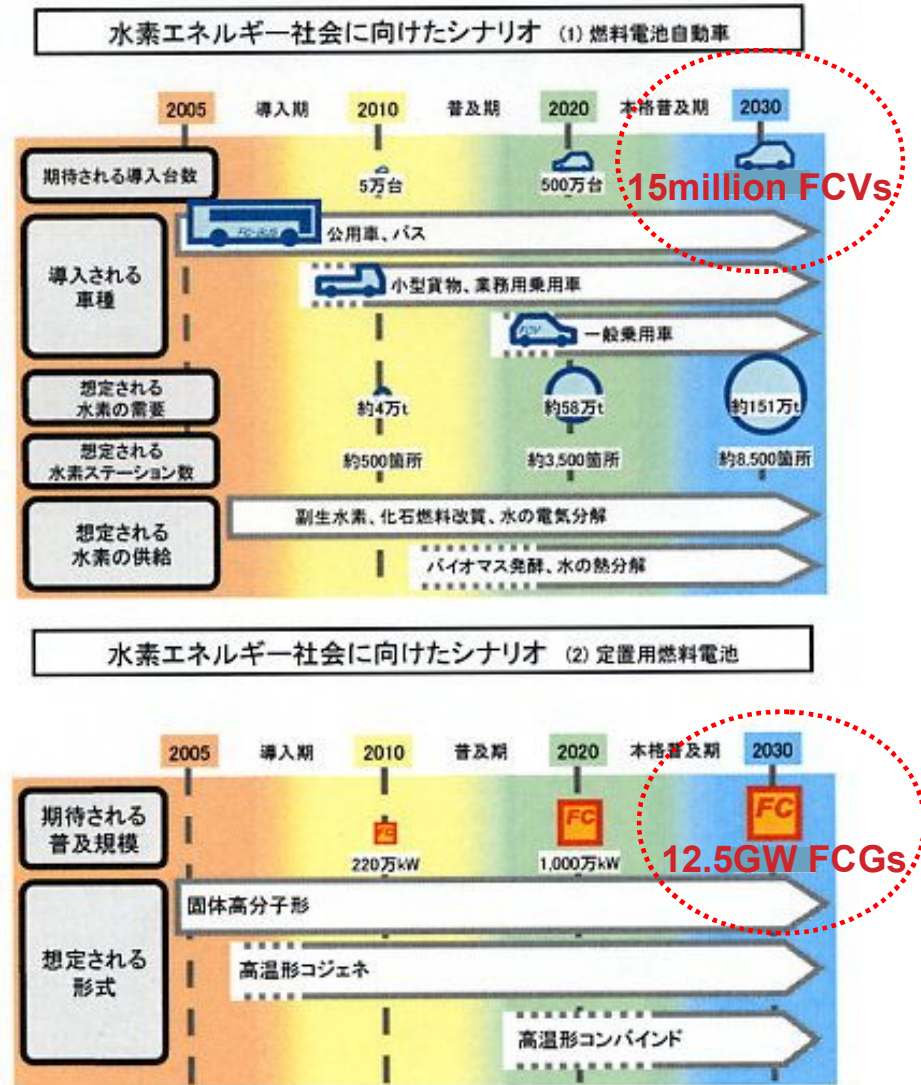
A Scenario for Hydrogen Based Society in Japan

Japanese government disclosed a scenario for establishing a hydrogen based society in the future.

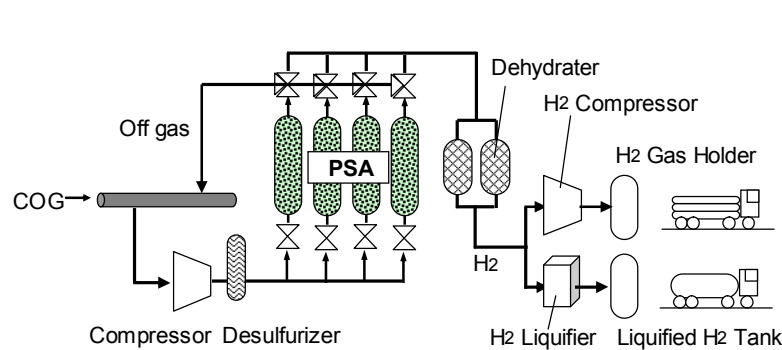
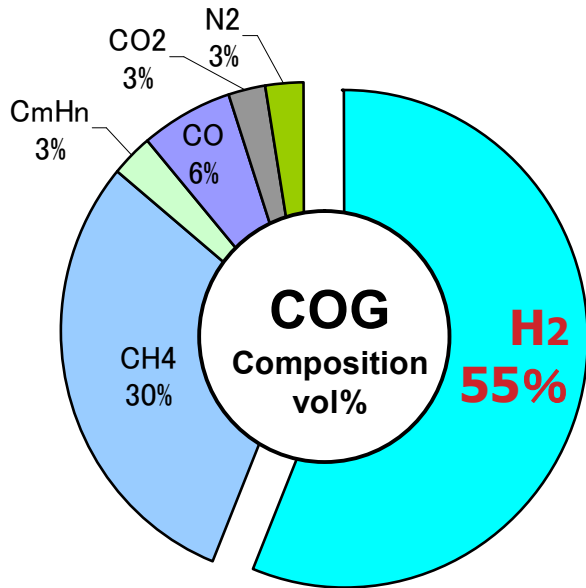
In 2030, **15 million FCVs** and **12.5 GW FCGs** are planned to be installed.

Hydrogen supply is one of the major concerns.

Coke oven gas in steel plant becomes a promising candidate for hydrogen source.



Potential of COG as a Hydrogen Source



Easy equipment

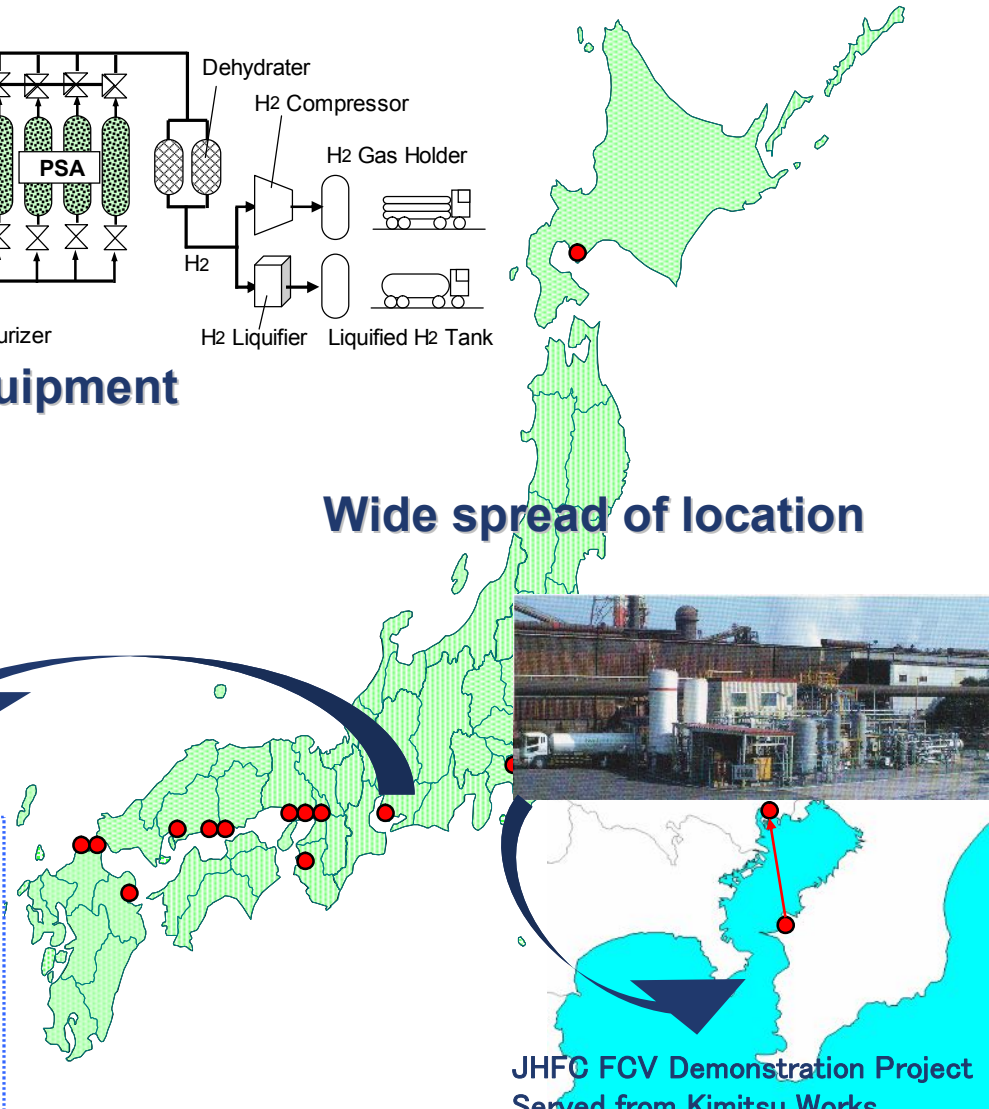
Huge amount of resource

Wide spread of location



FCV Demonstration in EXPO2005
Served from Nagoya Works

- 1) Number of FC bus 8
- 2) Total mileage 124,500km
- 3) Service term 185days
- 4) Total passengers 1million
- 5) Hydrogen consumption 11,430kg



JHFC FCV Demonstration Project
Served from Kimitsu Works



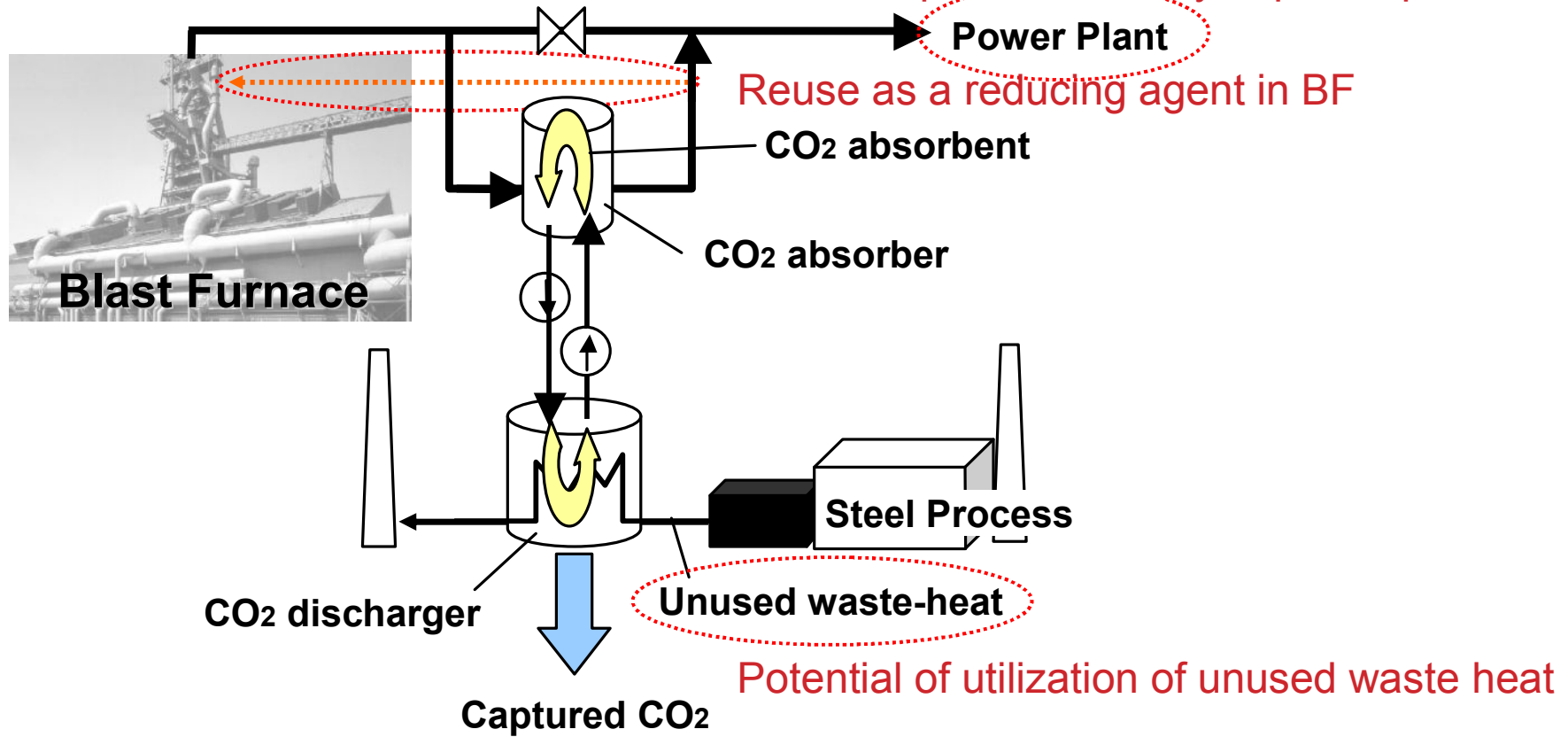
CO₂ Capture from Blast Furnace Gas

BFG

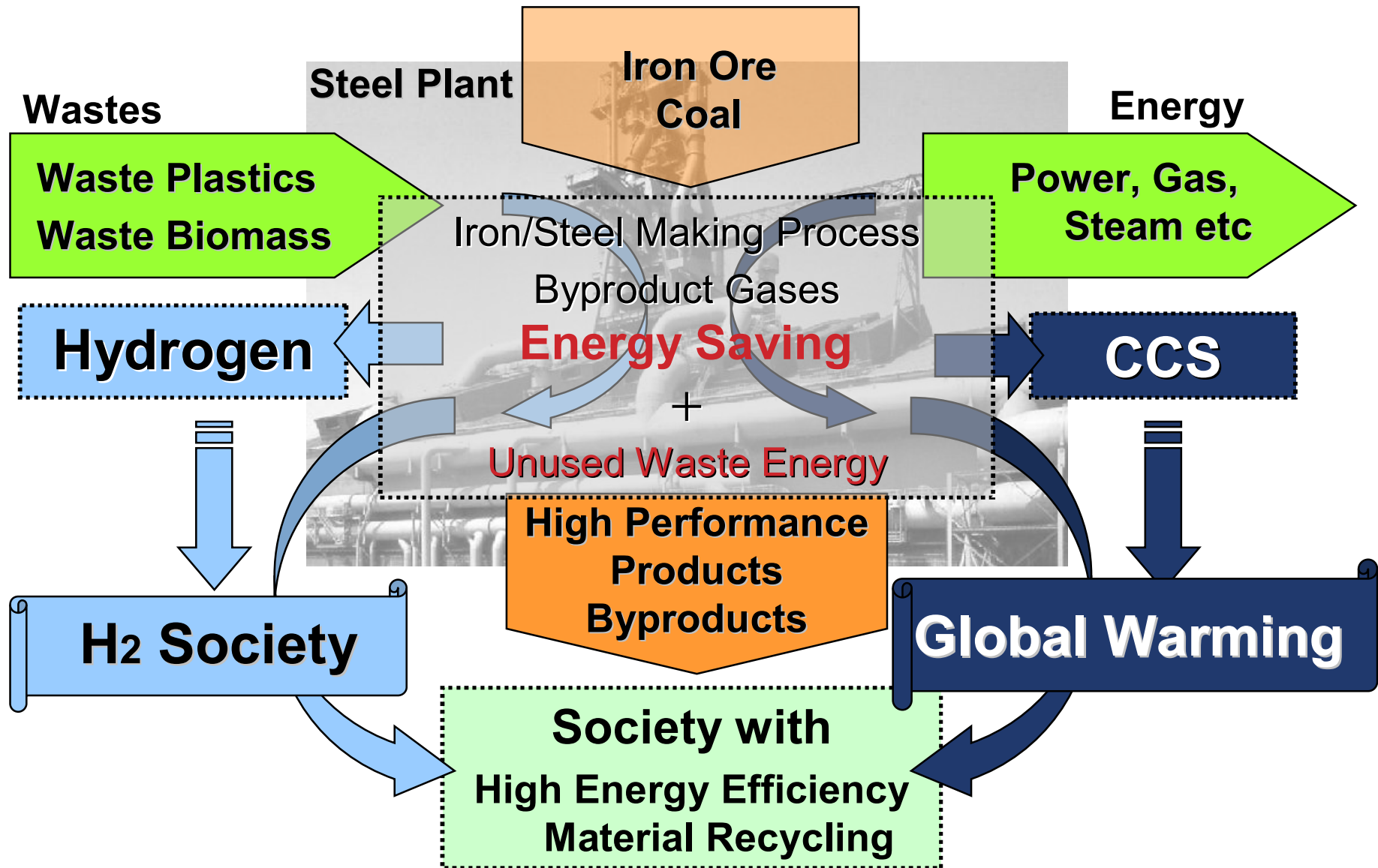
Composition	CO₂	CO	N ₂	H ₂
vol%	22	23	51	4

High concentration of CO₂ in BFG

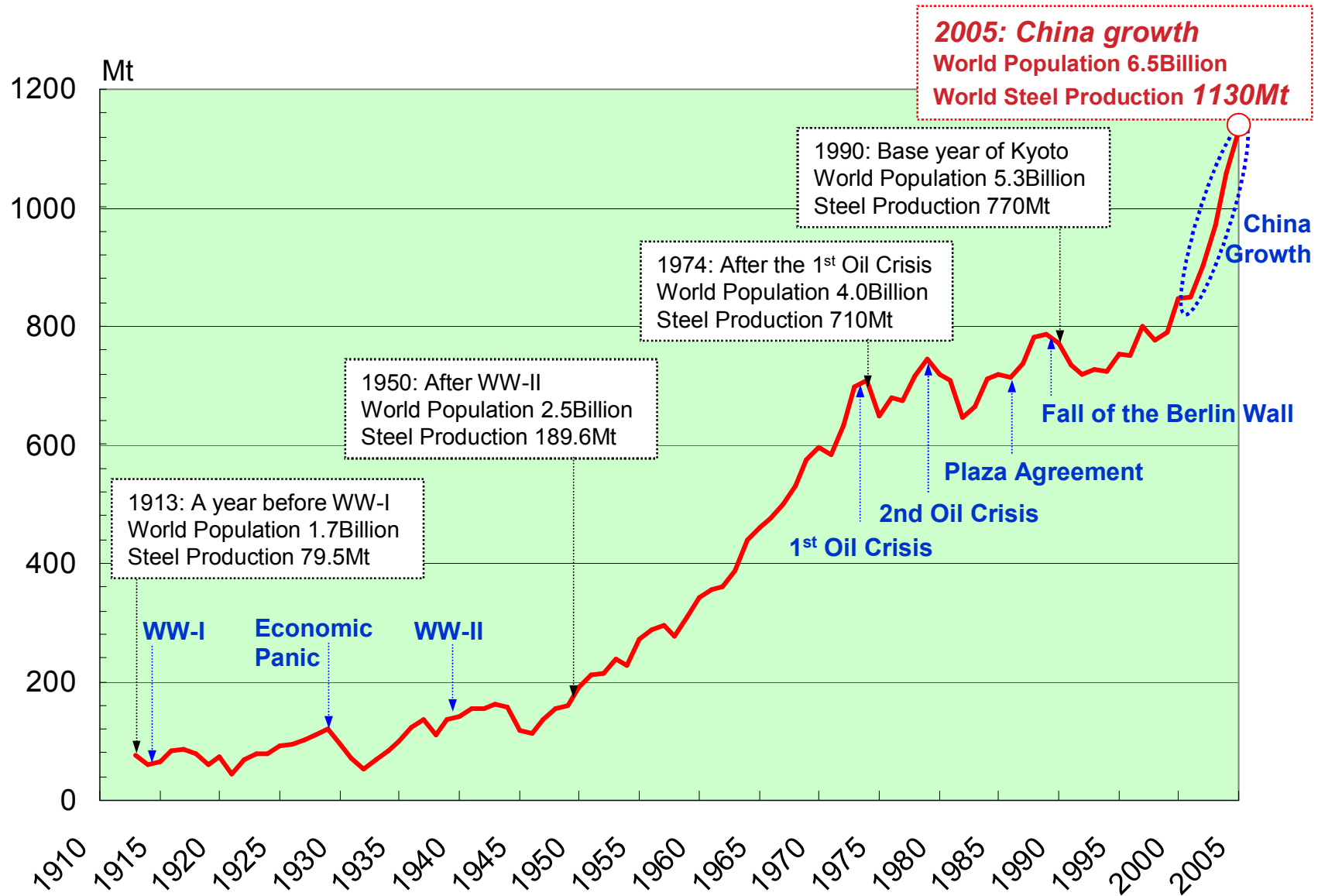
Improve efficiency of power plant



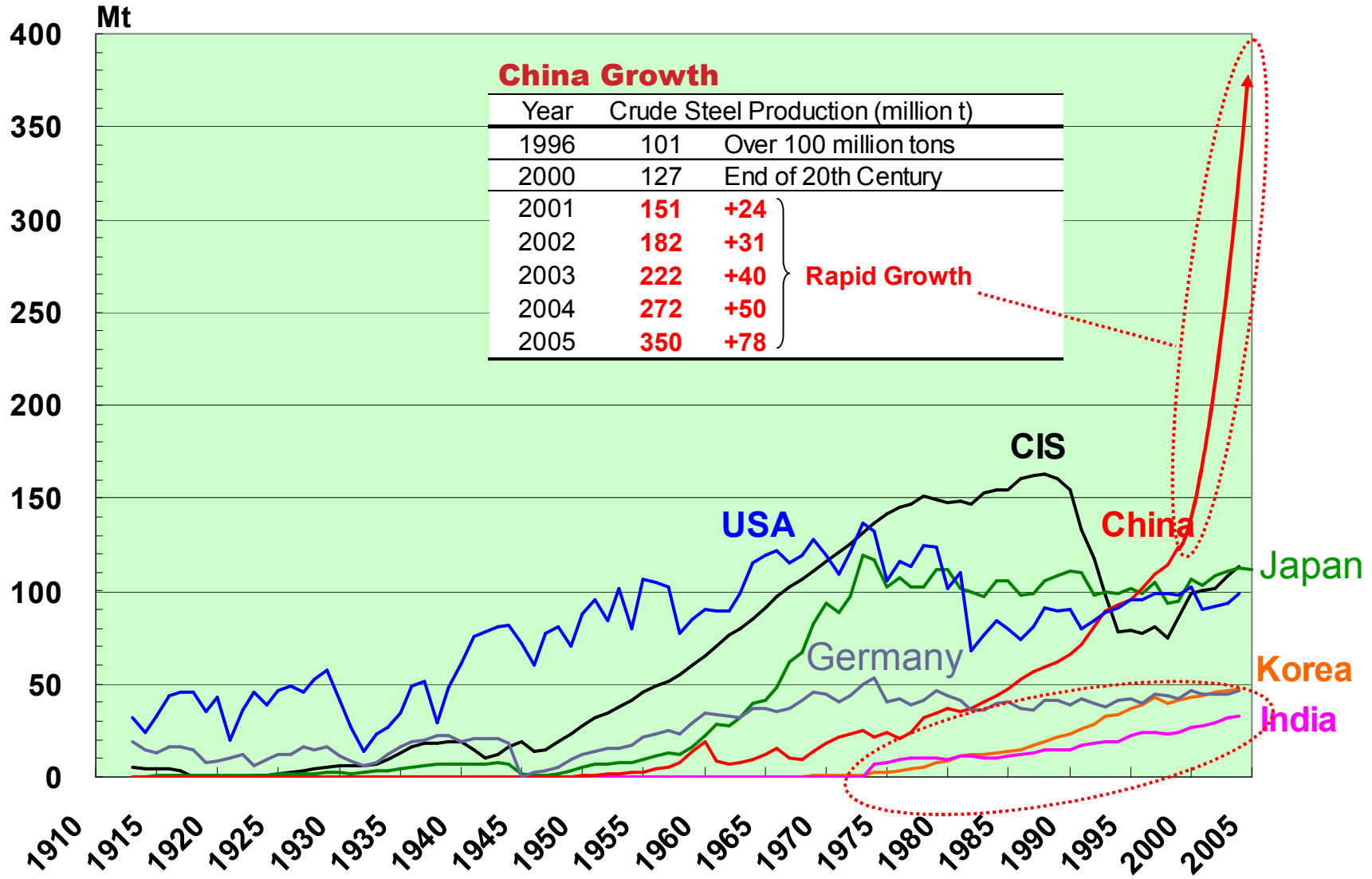
An Image of Future Iron/Steel Plant



Trend of World Steel Production

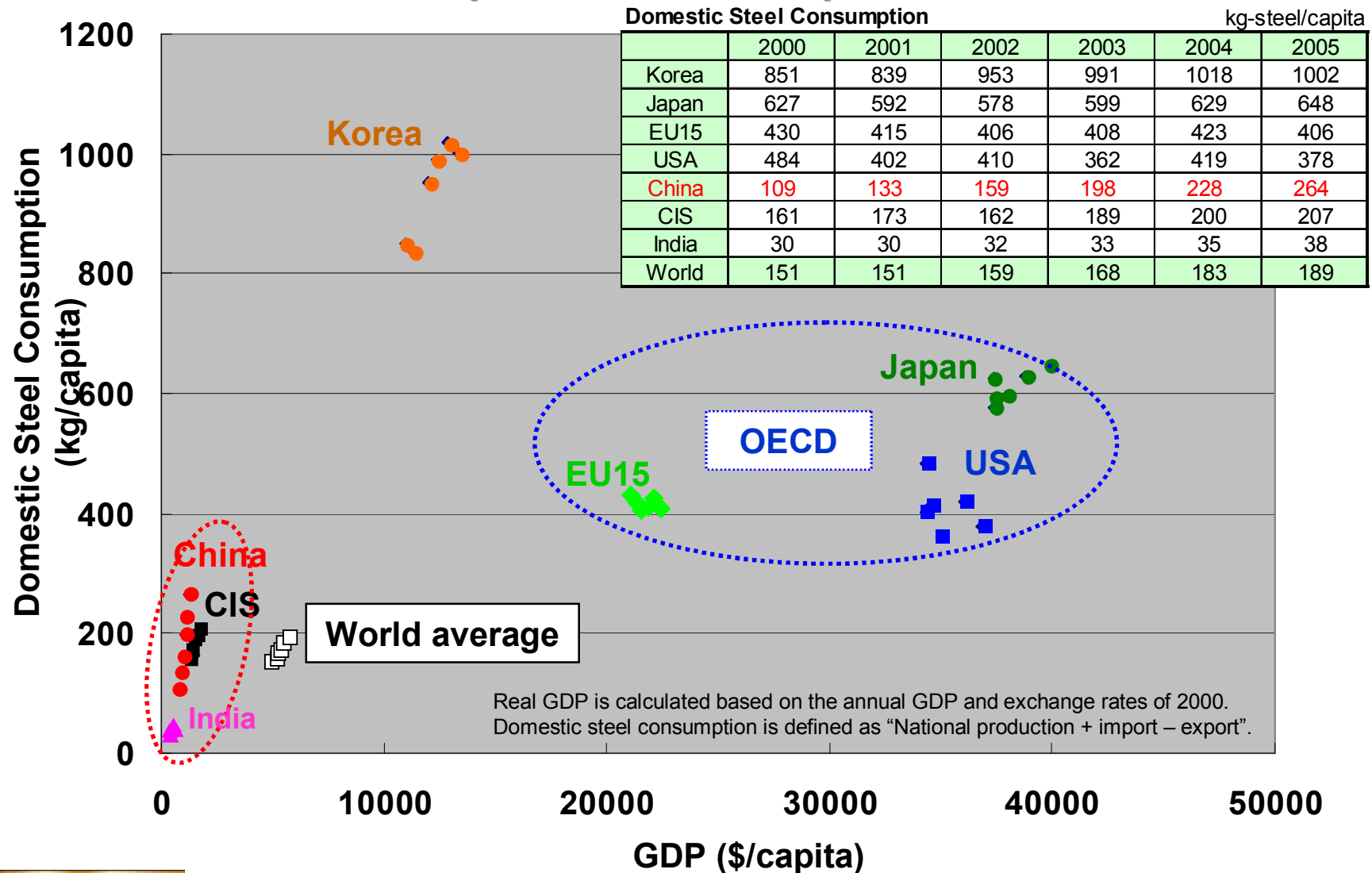


Trend of National Steel Production

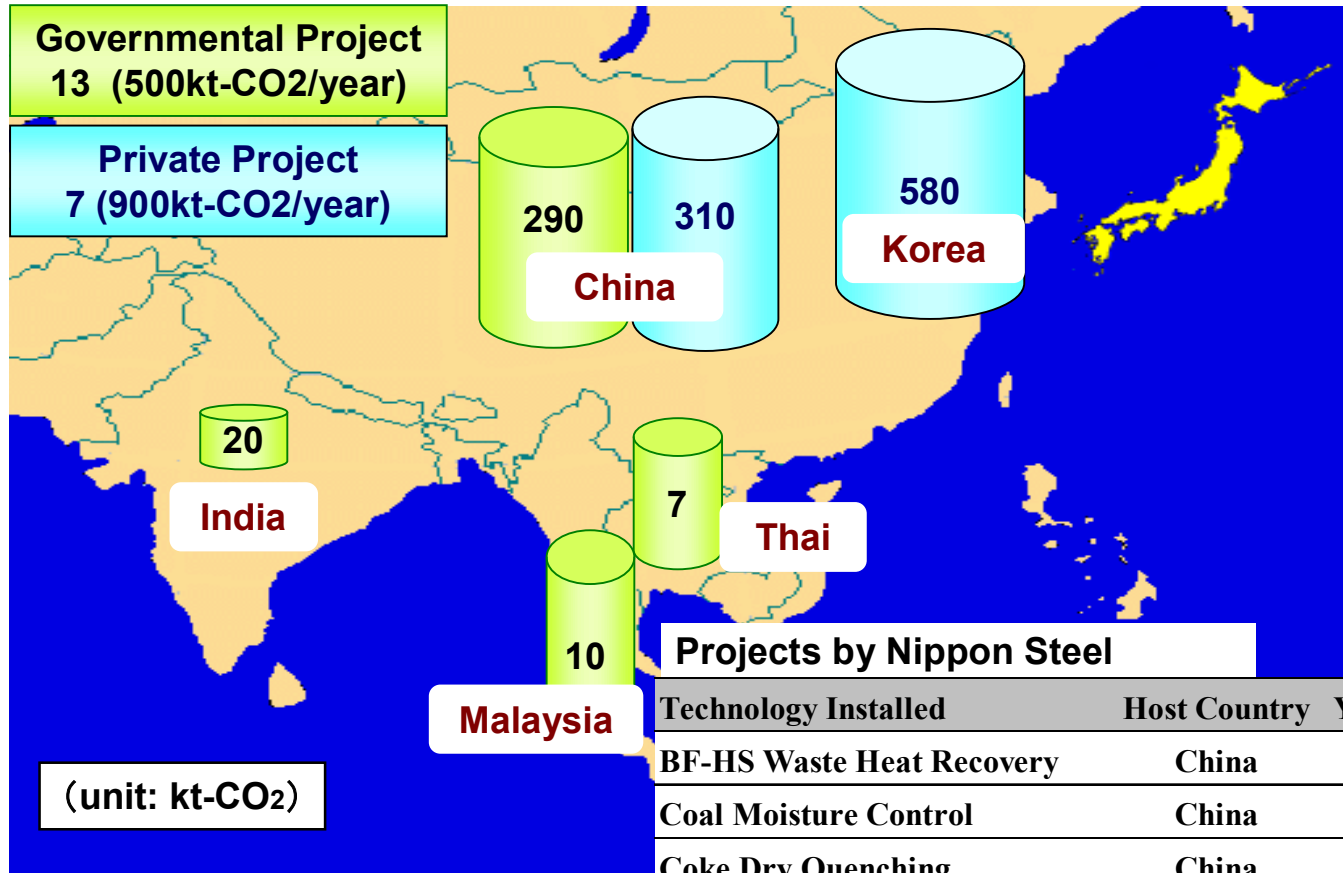


Economic Growth and Steel Consumption

Domestic steel consumption and GDP/capita between 2000 and 2005



Energy-Saving Model Projects

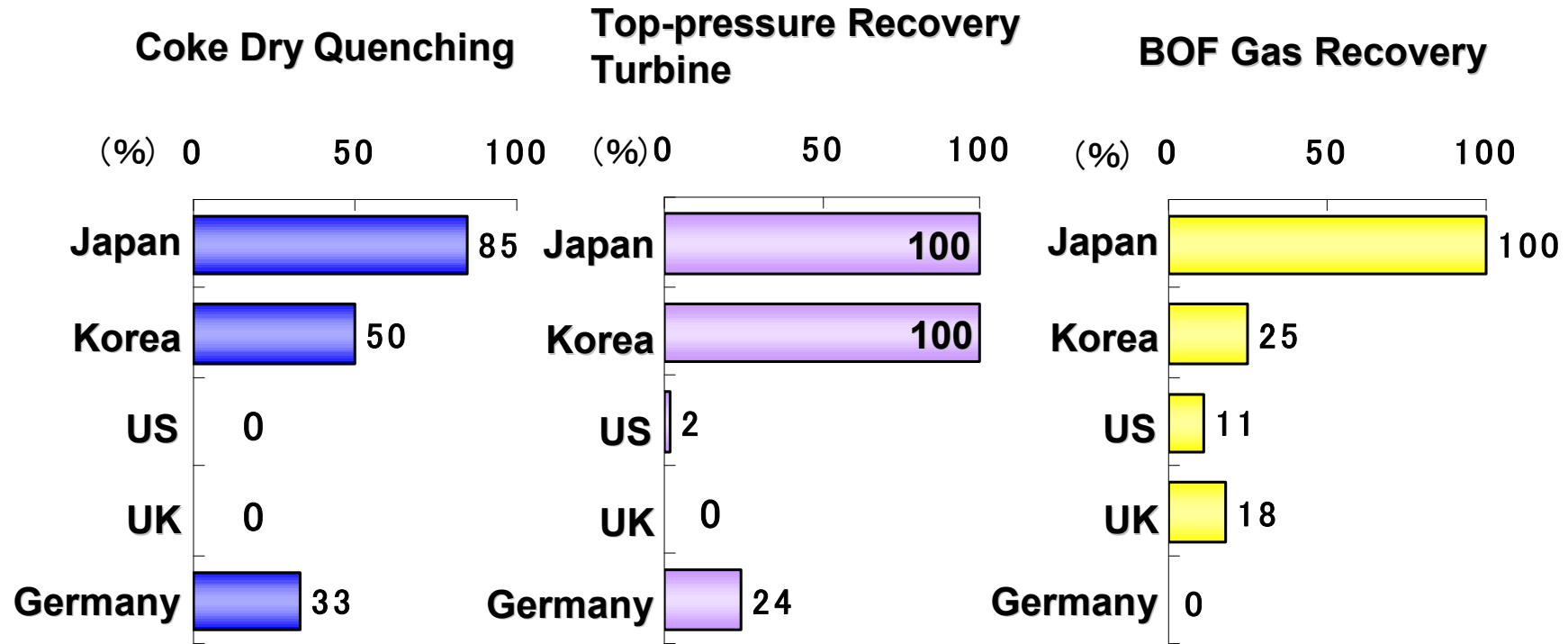


Projects by Nippon Steel

Technology Installed	Host Country	Year Completed	CO ₂ reduction
BF-HS Waste Heat Recovery	China	1995	29.8
Coal Moisture Control	China	1995	18.6
Coke Dry Quenching	China	2000	68.3
BOFG Recovery	China	2001	40.0
BF-HS Waste Heat Recovery	China	2001	17.8
BF-HS Waste Heat Recovery	India	2003	22.4
Total			196.9

kt-CO₂/year

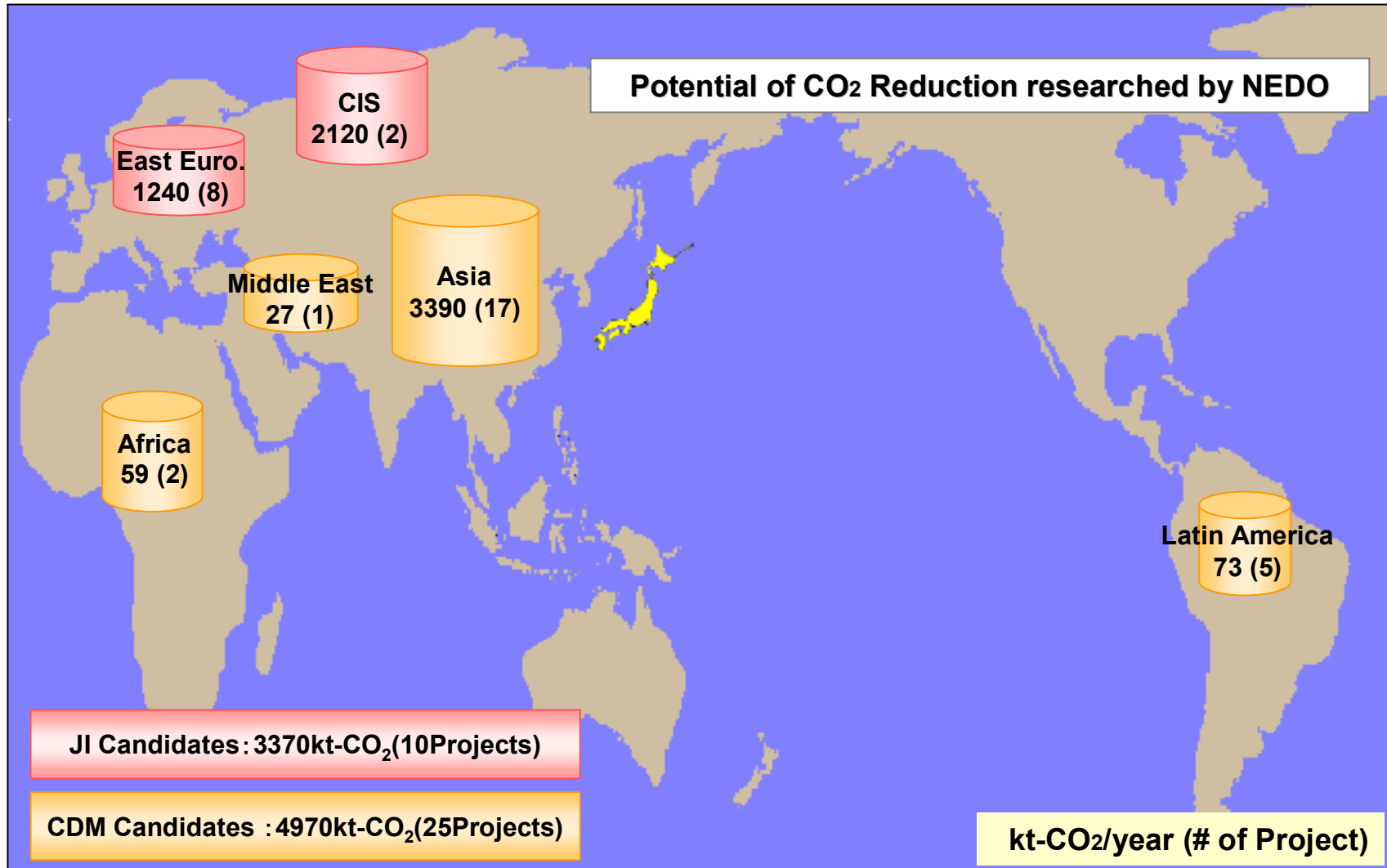
Status of Major Energy-Saving Technologies



The data above were gathered in 1996.

Efforts for updating the data are intensely carried out by IISI, IEA and APP to estimate potentials to be improved.

Future Potential of CO₂ Reduction



Japan-China Steel Industry Advanced Technology Exchange Meeting in Environmental Protection & Energy-Saving

July 4-5, 2005 :The first meeting held in Beijing, China

Nov. 1-2, 2006 :The second meeting held in Beppu, Japan

Common Understanding

Importance of technical exchanges in the area of environmental preservation and energy-saving technologies, from the standpoint of the effective use of resources and the preservation of the global environment.

Agreement

To realize the above, the Japan Iron and Steel Federation and the China Iron and Steel Association will continue exchanges of information and experts on environmental preservation and energy-saving.



Asia Pacific Partnership (APP)



Established in 2005

6 partners: Australia, China, India, Japan, Korea, US

To cope with both increasing energy needs and climate change

Focus on technology

To complement Kyoto Protocol

Cleaner fossil energy/ Renewable energy and distributed generation/ Power generation and transmission / **Steel / Aluminum/ Cement/ Coal mining/ Buildings and Appliances**

Steel Task Force chaired by Japan

2nd Steel TF Meeting and 1st WS, Sep. 27-29, 2006, Tokyo, Japan

Project#	Contents	Chair
Pro.-1	APP Steel workshop	Host Country
Pro.-2	Status Review of Steel Industry Related Indicators for Energy Saving etc	Japan
Pro.-3	Performance Indicators Setting	Korea
Pro.-4	Performance Diagnosis	China, India
Pro.-5-1	State-of-the-art Clean Technology Handbook	USA (co-chair JPN)
Pro.-5-2	Technology Deployment	Australia

Next meeting
Mar.14-16,2007
Calcutta, India

SOACT Handbook

SOACT:State-of-Art Clean Technology)

SOACT Handbook is under compiling to be shared state-of-art technologies relating environmental protection and energy saving by the member countries.

By the end of 2006,

53 of environmental protection technologies and 48 of energy saving technologies are compiled. 63 technologies are presented by Japan.

Iron and Steelmaking



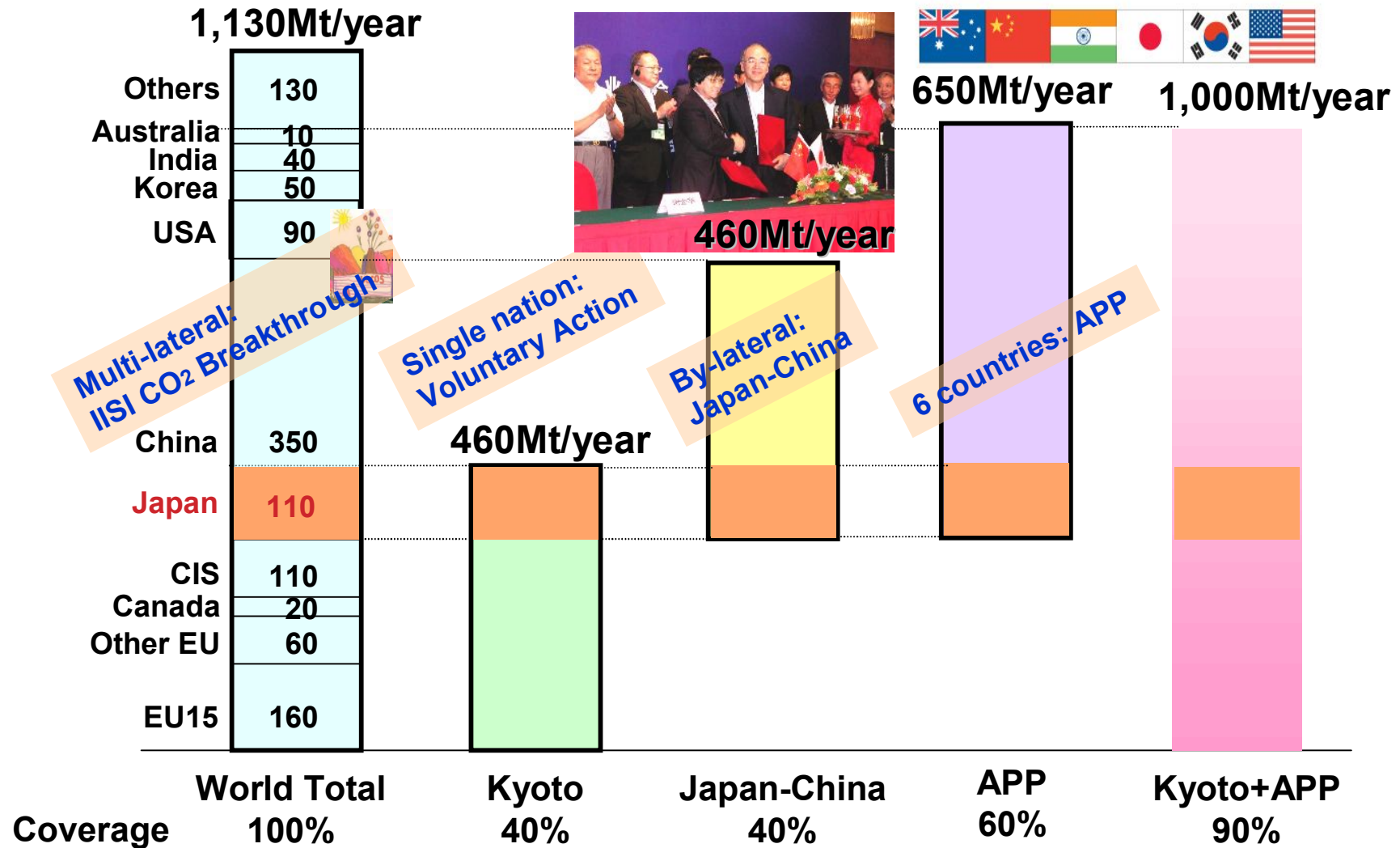
Best Available Technologies

- Sintering
- Cokemaking
- Ironmaking
- BOF Steelmaking
- EAF Steelmaking
- Recycling
- Common Systems
- General Energy Savings & Environmental Measures

Asia-Pacific Partnership for Clean Development and Climate



Importance of International Sectoral Approach



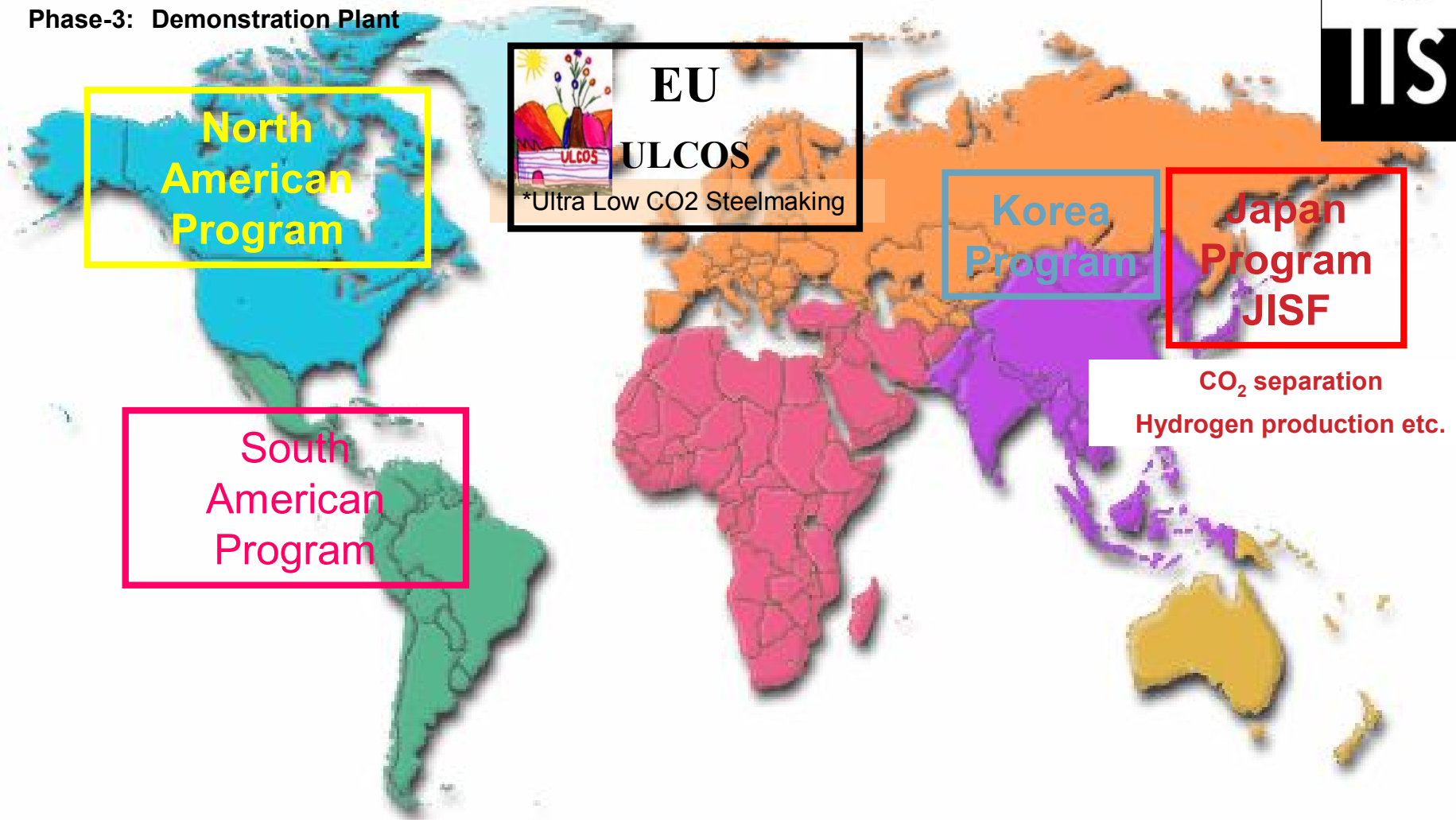
IISI's CO2 Breakthrough Program



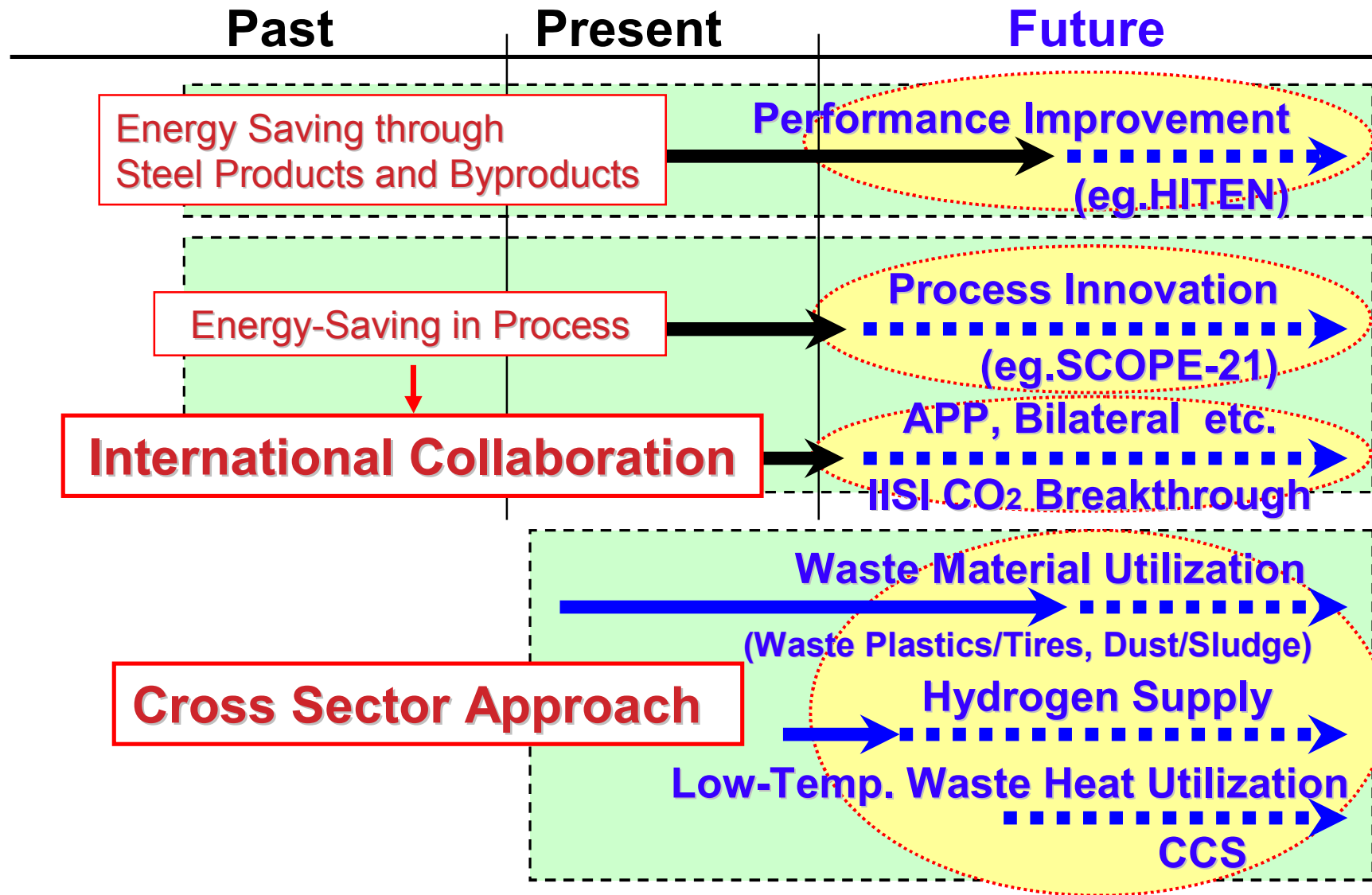
Phase-1: Seeds research and development (until 2008)

Phase-2: Pilot project (2~5 years)

Phase-3: Demonstration Plant



Future Directions





Arigato-gozaimashita!

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Wind farm in Hibikinada Coast