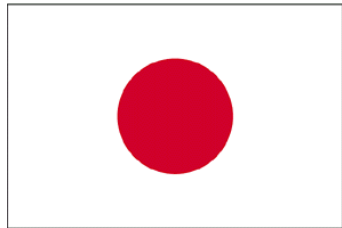


# Remote Open Seminar

## “Benchmark Approach” : Procedure and Plan of Survey



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- 2. “Questionnaire” for “Survey” :  
(Sample for Iron and Steel Industry)**
- 3. “Survey” :  
Proposed Procedure and Plan**

# 1. Main Points of “Survey”

# 1. “Survey” : Main Points

## Purpose

- (1) To Identify the Actual Situations of Energy Use and Energy Efficiency in the Targeted (Showcase) Sub-Industry including Iron and Steel Industry**
- (2) To Collet and Analyze the Data and the Information to Assess the Baseline**
- (3) To Study and Propose the Targets (Benchmarks) and the Possible Measures to Achieve the Targets (Benchmarks)**

## Basic Procedure

- (1) Prepare the “Questionnaire” for Survey**
- (2) Request the Industrial Organization(s) for the Sub-Industry to Fill the “Questionnaire”**
- (3) Collect the Filled “Questionnaire”**
- (4) Check, Analyze and Study the Data and Information Collected through the “Questionnaire”**

# Basic Flow of "Survey"

Survey : Collect Data and Information by "Questionnaire"

## Analysis of Survey Results

### Analysis 1 Baseline

- The EnPIs (The Actual Results of Energy Consumption, Production and Product Mix etc. for 2-3 years)
- The Existing Factors to Affect EE (Operation & Maint. Conditions, Qualities of Raw Materials & Products, Technologies and Equipment)

### Analysis 2 Targets

- Identification of Possible Improvements in Factors to Affect EE
- Sensitivity Analysis / Simulation Using the "Database" by Adding the Affecting Factors or Changing Conditions of the Factors
- Assess the Results and Propose the Targets of EnPIs and Measures

### Output Report

- Actual Baseline : EnPIs and The Existing Main Factors to Affect EE
- Recommended Targeted EnPIs (Benchmarks) and Measures to Achieve the Targets (Improvements in the Affecting Factors)
- The Expected EE Potential and Effects

Guideline for EC

•Database  
•Analysis Tools

Study Report : Proposed Targets (Benchmark) and Measures

## **2. “Questionnaire” for “Survey” : (Sample for Iron and Steel Industry)**

## **2. “Questionnaire” : Main Contents**

### **Introduction**

- (1) Background and Purpose**
- (2) Requirement for Cooperation and Guidance to Fill the Questionnaire**

### **Required Data and Information**

#### **General Information**

- (1) Production Capacity and The Actual Results of the Sub-Industry**

#### **Specific Information and Data**

- (2) Energy Efficiency Indicators and Numbers Published by Associations**
- (3) Status to Promote Introduction of Energy Management System**
- (4) Issues to Promote Energy Conservation**
- (5) Status and Conditions to Affect Energy Efficiency**

### **ANNEX**

**Data to Evaluate Energy Efficiency Indicators Including Benchmark**

# 2. "Questionnaire" : Required Data & Information (1)

## 1. General Information (Production)

Blue Cells to Fill

### 1-1 Iron and Steel Production in Brazil : Capacity and The Actual Results

Item	2017	2018	2019
A. Capacity (t / y)			
B. Actual Production (t/y)			
C. Availability (B*100/A) (%)			
(Products : Breakdown - 1)			
Iron including Cast Iron (t/y)			
Steel ; Total Crude Steel (t/y) (*)			
Slab, Billet, Cast etc. (t/y)			
Finished Steel (t/y)			
(Products : Breakdown - 2)			
Ordinary Steel (t/y)			
Special Steel (t/y)			
Alloy Steel (t/y)			
Iron Products (t/y)			
Other Steel Products (t/y)			
BF and LD slags etc. (t/y)			
D. Number of Companies			
E. Number of Plants			
F. Amount of Sales (US\$/y)			

(\*) Crude Steel : Amount of steel after refining by BOF and/or EAF



## 2. “Questionnaire” : Required Data & Information (2)

### 1. General Information (Process)

Blue Cells to Fill

#### 1-2 Breakdown of the Actual Results by Production Process

Process	2017	2018	2019
1. Integrated Process (*1)			
1-1. BF Based Process			
Number of Plants			
Production (t/y)			
1-2. DRI-EAF or EAF Based Process			
Total Number of Plants			
Total Production. (t/y)			
(1) DRI – EAF (Steelmaking Process) (*2)			
Number of Plants			
Production – Slabs and Billets etc (t/y)			
(2) EAF (Steelmaking) – Finishing Process (*3)			
Number of Plants			
Production (t/y)			
3. Single Process			
3-1. Finishing (*4)			
Number of Plants			
Production (t/y)			
3-2. Iron and Steel Casting			
Number of Plants			
Production (t/y)			

(\*1) Integrated Process : Ironmaking – Steelmaking – Hot Rolling – Cold Rolling / Finishing

(\*2) DRI – EAF (Steelmaking) Process : Ironmaking (DRI) – Steelmaking (EAF) – CC etc. – Finishing

(\*3) EAF (Steelmaking) – Finishing Process : Steelmaking (EAF) – CC etc. - Hot Rolling – Cold Rolling / Finishing

(\*4) Reheating – Rolling / Finishing

# 2. “Questionnaire” : Required Data & Information (3)

## 2. Specific Data and Information (EE Performance)

Blue Cells to Fill

**Energy Performance Indicators : Actual Results / Benchmark (BM) of Iron and Steel Industry**

Item with EE (Benchmark) Indicators (Units)	2017	2018	2019
1. Unit Energy Consumption (GJ/t-Crude Steel)			
1-1 Integrated Process (BF and/or EF Based)	EE : BM :	EE : BM :	EE : BM :
(Breakdown, if there are)			
Thermal Energy (GJ/t-Crude Steel)			
Electrical Energy (GJ or kWh/t-Crude Steel)			
1-2 EAF Steelmaking – Finishing Process	EE : BM :	EE : BM :	EE : BM :
(Breakdown, if there are)			
Thermal Energy (GJ/t-Crude Steel)			
Electrical Energy (GJ or kWh/t-Crude Steel)			
2 Steelmaking – Rolling / Finishing Process			
2-1 Ordinary Steel - EAF Based Steelmaking	EE : BM :	EE : BM :	EE : BM :
(Breakdown, if there are)			
Thermal Energy (GJ/t-Crude Steel)			
Electrical Energy (GJ or kWh/t-Crude Steel)			
2-2 Special Steel - EAF Based Steelmaking	EE : BM :	EE : BM :	EE : BM :
(Breakdown, if there are)			
Thermal Energy (GJ/t-Crude Steel)			
Electrical Energy (GJ or kWh/t-Crude Steel)			
3. Finishing Process			
3-1 For Ordinary Steel (GJ/t-Product)	EE : BM :	EE : BM :	EE : BM :
(Breakdown, if there are)			
Thermal Energy (GJ/t-Crude Steel)			
Electrical Energy (GJ or kWh/t-Crude Steel)			
3-2 For Special Steel (GJ/t-Product)	EE : BM :	EE : BM :	EE : BM :
(Breakdown, if there are)			
Thermal Energy (GJ/t-Crude Steel)			
Electrical Energy (GJ or kWh/t-Crude Steel)			

If there is data available to evaluate energy efficiency, it would be much appreciated if you could fill data in ANNEX-1.

## 2. “Questionnaire” : Required Data & Information (4)

### 2. Specific Data and Information (Promotion of EnMS)

#### 3. Status to Promote Introduction of Energy Management System (EnMS)

##### 3-1 **Status : Introduction of Energy Management System (EnMS ) Based on ISO 50001**

The industrial association(s) for the iron and steel industry in Brazil such as the Brazil Steel Institute promote or recommend the member companies to introduce EnMS ?

<b>YES</b>	→	Are there any plans or programs to promote EnMS based on ISO 50001 ? ----- YES / NO
	→	How many companies have been certified for ISO 50001 ? -----
<b>NO</b>	→	Are there any plans or programs to promote EnMS in the industry? ----- YES / NO
		If “YES”, please brief the plan or program. -----

##### 3-2 **System to Share Best Practices in Energy Conservation**

Are there any system(s) or program(s) by the association(s) to share information of best practices in energy conservation in the iron and steel industry, especially among the member companies ?

<b>YES</b>	→	Please describe the name(s) of the system(s) and/or program(s) -----
<b>NO</b>	→	Are there any plans or ideas to develop such system or program ? ----- YES / NO
		If “YES”, please brief the plan or program. -----

## 2. “Questionnaire” : Required Data & Information (5)

### 2. Specific Data and Information (Issues - 1)

#### 4. Issues to Promote Energy Conservation

Please describe issues on the following for the iron and steel industry in Brazil such as the Brazil Steel Institute to promote energy conservation, if any.

##### 4-1 **Issues to Promote Energy Conservation**

The industrial association(s) for the iron and steel industry in Brazil such as the Brazil Steel Institute promote or recommend the member companies to introduce EnMS ?

(Management)

(Technology)

(Finance)

(Business Market)

(Others)

##### 4-2 **Issues Related to Companies including Member Companies**

(Top Management)

(Technical Level)

(Mutual Cooperation)

(Others)

## 2. “Questionnaire” : Required Data & Information (6)

### 2. Specific Data and Information (Issues - 2)

#### 4. Issues to Promote Energy Conservation

Please describe issues on the following for the iron and steel industry in Brazil such as the Brazil Steel Institute to promote energy conservation, if any.

##### 4-3 Issues Related to the Brazilian Government

(Regulation)

(Support System)

(Others)

##### 4-4 Issues Related to Energy Market

(Electric Power)

(Coal)

(Oil / Petroleum Gas / Natural Gas)

(Renewable Energy)

# 2. “Questionnaire” : Required Data & Information (7)

## 2. Specific Data and Information (EE Affecting Factors - 1 (1))

Blue Cells to Fill

### 5. Status and Conditions to Affect Energy Efficiency

#### 5-1. Status of Introduction of Typical Technologies and Equipment Effective for Energy Conservation

The following table is to identify the current status of realization of the typical and effective energy conservation technologies and facilities for the iron and steel industry.

Please fill the items of typical technologies and equipment already introduced (A) or under planning to introduce (B) in the Brazilian iron and steel industry. If there are the other technologies and equipment, please add lines.

No	Name of Technologies and Equipment	(A) Number of Installed Facilities and under Construction	(B) Number of Facilities under Planning
1	CO : Automatic Combustion Control		
2	CO : Coke Dry Quenching Facility (CDQ)		
3	CO : Coal Moisture Control Facility (CMC)		
4	SP : Segregated Charging of Raw Mix		
5	SP : Waste Heat Recovery System for Exhaust Gas Main		
6	SP: Heat Recovery System for Cooling Air at Cooler		
7	SP : Direct Ignition Burner		
8	BF : Waste Heat Recovery System for Hot Stove		
9	BF : Pulverized Coal Injection to BF (PCI)		
10	BF : Top Pressure Recovery Power Generating System		
11	BF : BF Gas Recovery System of Pressure Equalization (BGR)		
12	BF : Burden Distribution Control		
13	BOF : Recovery System of LDG with Sealed BOF		

## 2. “Questionnaire” : Required Data & Information (8)

### 2. Specific Data and Information (EE Affecting Factors - (2))

Blue Cells to Fill

No	Name of Technologies and Equipment	(A) Number of Installed Facilities and under Construction	(B) Number of Facilities under Planning
14	BOF : Recovery of Sensible Heat of LDG		
15	EAF and BOF etc. : Ladles Heater with Regenerative Burners		
16	EAF : DC EAF with Water Cooling		
17	EAF : Scrap Pre-heating Facility		
18	EAF : Advanced EAF		
19	CC : Continuous Casting Facility		
20	EAF-HR : Regenerative Burner with Honeycomb Type of Regenerator		
21	CC-HR ; Sizing Press		
22	HR : Direct Rolling and Hot Charging of Hot Slab etc.		
23	HR : Edge Heater		
24	HR : Reheating Furnace with Regenerative Burners		
25	HR : High Efficiency Reheating Furnace		
26	HR : High Efficiency Descaling Pumps		
27	HR : Convection Type of Heat Treatment Furnace for Steel		
28	HR : Continuous Rolling		
29	HR : Coil Box		
30	CR : Continuous Annealing Furnace		
31	CR : Energy Efficient Burner for Annealing		
32	Electromagnetic Induction Heater for Forge Welding		
33	High Frequency Induction Furnace		
34	Trench Type of Induction Furnace to Melt Cast Iron		
35	High Efficiency Ferro Alloy (Fe-Cr) Refining Furnace		
36	Optimization of Industrial Gas Supply		
37	Energy Center		
38	Advanced Combined Cycle (ACC)		

## 2. “Questionnaire” : Required Data & Information (8)

### 2. Specific Data and Information (EE Affecting Factors -2)

#### 5. Status and Conditions to Affect Energy Efficiency

Please describe the typical conditions of the Brazilian iron and steel industry to affect energy efficiency by the following categories, if any.

5-2	<b>Various Conditions</b> Please describe the typical conditions of the Brazilian iron and steel industry to affect energy efficiency by the following categories, if any.
5-2-1	<b>Raw Materials (Iron ore, fluxes such as limestone, additives such as ferro alloys etc.)</b>
5-2-2	<b>Fuel (Coal, charcoal, oil and natural gas etc.)</b>
5-2-3	<b>Products including Product Mix</b>
5-2-4	<b>Supplied Energy (Electric Power etc.) and Utilities (Water etc.)</b>
5-2-5	<b>Others</b>



# 2. “Questionnaire” : Required Data & Information (9)

## 2. Specific Data and Information (EE Affecting Factors -3)

Blue Cells to Fill

### 5-3 Future Plan to Improve Energy Efficiency

Please itemize and/or briefly describe key future plans of the improvement measures which the associations related to the iron and steel industry recommend the member companies to apply or to jointly develop with the member companies.

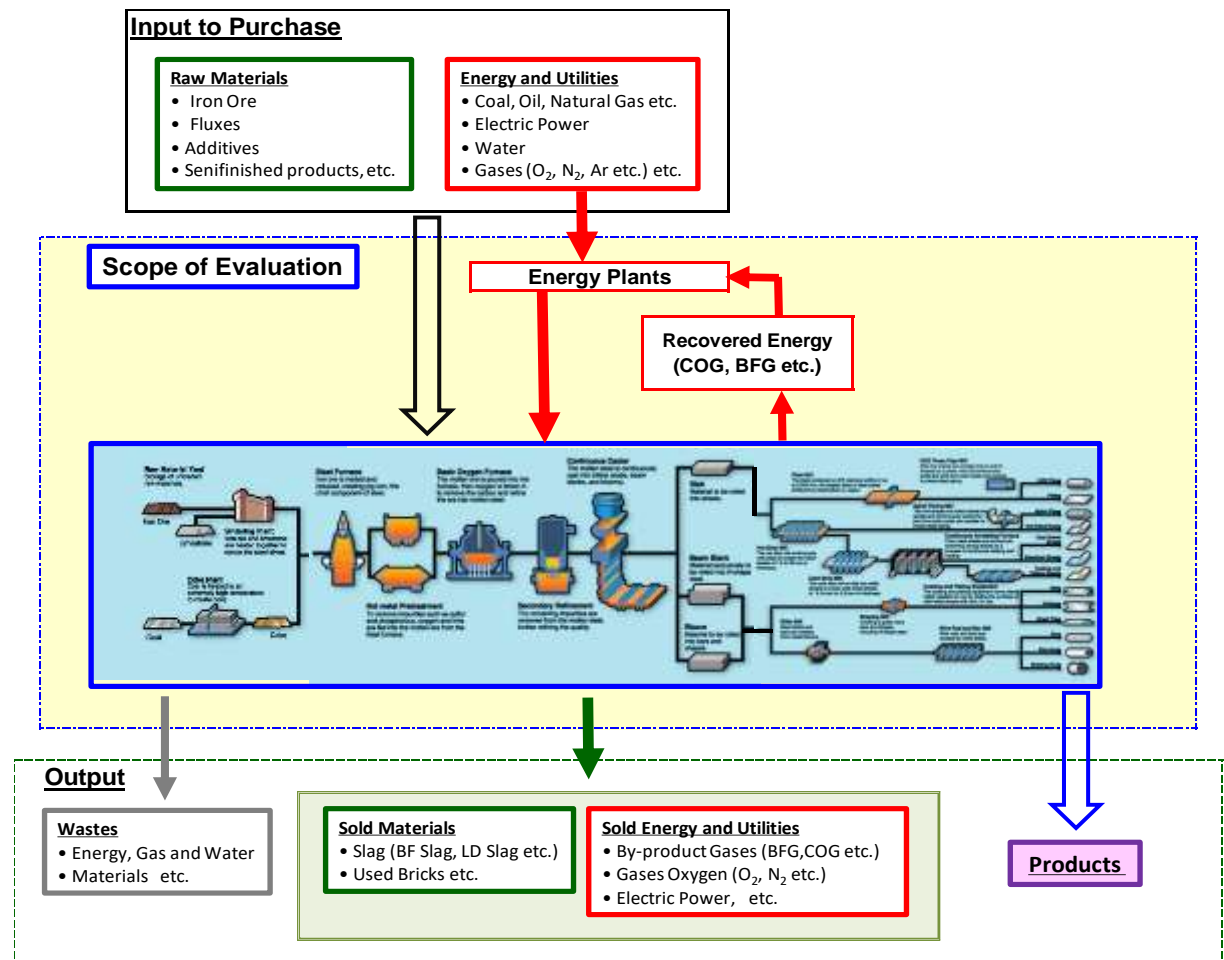
Category	Specific Recommended Measure	Targeted Year
<b>Short Term Plan</b>	Activities by Association (Standardization etc.)	
	Improvement in Operation and Maintenance	
	Introduction of New Technology & Equipment	
<b>Mid-Term Plan</b>	Activities by Association (Standardization etc.)	
	Improvement in Operation and Maintenance	
	Introduction of New Technology & Equipment	
<b>Long-Term Plan</b>	Activities by Association (Standardization etc.)	
	Improvement in Operation and Maintenance	
	Introduction of New Technology & Equipment	

# 2. “Questionnaire” : ANNEX – Data Check (1)

## 2. ANNEX Definition of Scope for Evaluation

### A-1 Definition of Scope of Data : Configuration of Iron and Steel Process

It is required to specify the scope of the iron and steel process to evaluate energy efficiency indicators in terms of the baselines and the targets (benchmarks) by the available data and information owned by the related associations. The following shows the typical scope of the integrated iron and steel manufacturing process for the evaluation. It is required to define the scope when we identify the baseline and the target (benchmark).



## 2. “Questionnaire” : ANNEX – Data Check (2)

### 2. ANNEX Key Data – 1

Blue Cells to Fill

#### A-2 Key Data

##### A-2-1 Kind of Raw Materials and Annual Consumption of Whole Iron and Steel Industry (Ton/Year)

Please fill-in blue cells.

Main Item	2017	2018	2019
Iron Ore			
Fluxes (Limestone etc.)			
Additives (Ferro Alloys etc.)			
Scraps			
DRI			
Semifinished Products			
Other material -1 (If any, please specify)			
Other material -2 (If any, please specify)			
Other material -3 (If any, please specify)			

#### A-2-2 Annual Energy/Utility Consumption

Please fill in the following Table (Table-1,2,3,4,5) of the next page with the data of whole cement industry.

Procedure to fill-in following Tables (Table-1,2,3,4,5)

1. Double click the Table to activate embedded EXCEL Sheet.
2. Fill-in blue cell (and yellow cell when necessary).

**(See Next Slide)**

# 2. "Questionnaire" : ANNEX – Data Check (3)

## 2. ANNEX Key Data – 2 (EXEL Sheet)

Blue : To Fill

Yellow : Coefficient  
(Theoretical or  
Calculated Values)

Green : Calculated

**Table-1 Primary Energy Purchased (A)**

Energy / Utility	Unit	Calorific Value per Unit (GJ/Unit)	2019		2018		2017	
			(Unit/y)	(TJ/y)	(Unit/y)	(TJ/y)	(Unit/y)	(TJ/y)
<b>A1: Fuel / Thermal Energy</b>				0.0		0.0		0.0
<b>(Breakdown)</b>								
Coal	(ton)	26.6		0.0		0		0
Charcoal	(ton)	30.753		0.0		0		0
Natural Gas	(10 <sup>3</sup> m <sup>3</sup> )	41.4		0.0		0		0
Oil	(KL)	38		0.0		0		0
Gasoline	(KL)	33.37		0.0		0		0
<b>A2: Electricity</b>	(Mwh)	3.6		0.0		0		0
<b>A3: Alternative Fuel</b>				0.0		0.0		0.0
<b>(Breakdown)</b>								
Waste Tire	(ton)	33.2		0		0		0
Waste Oil	(KL)	40		0		0		0
Other Fuel from Waste	(ton)	26.6		0		0		0
Biomass Fuel	(ton)	26.6		0		0		0
<b>Primary Consumed Energy</b>				0.0		0.0		0.0

**Table-2 Sold Energy Supplied Outside of Boundary (B)**

Energy / Utility	Unit	Calorific Value per Unit (GJ/Unit)	2019		2018		2017	
			(Unit/y)	(TJ/y)	(Unit/y)	(TJ/y)	(Unit/y)	(TJ/y)
<b>B1: Steam</b>	(ton)	3.34944		0.0		0		0
<b>B2:By-product (Mix) Gas</b>	(10 <sup>3</sup> m <sup>3</sup> )	8.37		0.0		0.0		0.0
<b>B3: Electricity</b>	(Mwh)	3.6		0.0		0		0
<b>Primary Consumed Energy</b>				0.0		0.0		0.0

**Table-3 Recovered Energy by Energy Conservation System/Equipment (R)**

Recovered Energy / Utility	Unit	Calorific Value per Unit (GJ/Unit)	2019		2018		2017	
			(Unit/y)	(TJ/y)	(Unit/y)	(TJ/y)	(Unit/y)	(TJ/y)
<b>R1: Steam</b>	(ton)	3.34944		0.0		0		0
<b>R2: Electricity</b>	(Mwh)	3.6		0.0		0		0
<b>Primary Consumed Energy</b>				0.0		0.0		0.0

**Table-4 Annual Production (C)**

Annual Production	Unit (ton-Clude Steel)	2019	2018	2017

**Table-5 Benchmark Index (Calculated)**

		2019	2018	2017
Unit Total Energy Consumption	(A-B)/C*1000 (GJ/T-Crude Steel)	-	-	-
Unit Thermal Energy Consumption	(A1-B1)/C*1000 (GJ/T-Crude Steel)	-	-	-
Unit Electricity Consumption	(A2-B2)/C*1000 (Kwh/T-Clinker)	-	-	-
Unit Alternative Fuel Consumption	A3/C*1000 (GJ/T-Crude Steel)	-	-	-
<b>Recovered Energy (Electricity)</b>	R2/C*1000 (Kwh/T-Crude Steel)	-	-	-
<b>(Steam)</b>	R1/C*1000 (T-steam/T-Crud)	-	-	-

### **3. “Survey” : Proposed Procedure and Plan**

### 3. “Survey” : Proposed Procedure and Plan (1)

Timeline (2021)	Procedure
January	(1) Open Remote Seminar (2) Discussion : Plan including Procedure / Formation (Iron & Steel Industry)
February	Organize Working Group (Proposed Members as Follows) <ul style="list-style-type: none"> <li>● Steering Members : MME and EPE</li> <li>● Assistants for Survey : SENAI-CNI</li> <li>● Cooperating Association(s) : Iron &amp; Steel Industry (Targeted Industry)</li> </ul>
March	(1) Start Survey in Iron and Steel Industry (2) Discussion : Select the 2 <sup>nd</sup> Industry (Paper & Pulp, Sugar or Cement) Plan including Procedure / Formation for the 2 <sup>nd</sup> Industry
May	(1) Completion of Survey in Iron and Steel Industry (2) Preparation of Survey for the 2 <sup>nd</sup> Industry
June	(1) Analyze the Survey Results (Iron and Steel) (2) Start Survey in the 2 <sup>nd</sup> Industry
July	Study Benchmarks and Measures to Achieve Benchmarks (Iron & Steel)
August	(1) Completion of Study (Iron and Steel) (2) Completion of Survey (The 2 <sup>nd</sup> Industry)



### 3. “Survey” : Proposed Procedure and Plan (2)

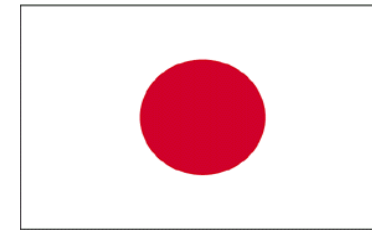
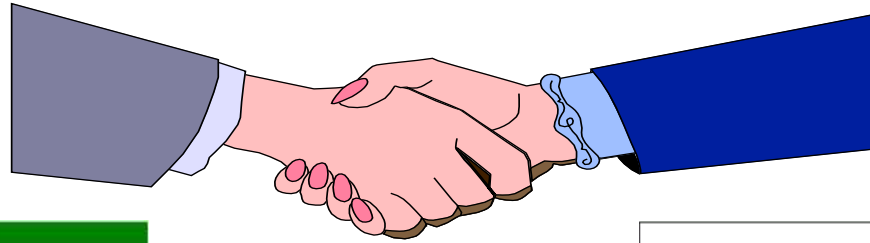
Timeline (2021)	Procedure
September	Analyze the Survey Results (The 2 <sup>nd</sup> Industry) (Discussion : Select the 3 <sup>rd</sup> Industry ? (Paper & Pulp, Sugar or Cement) Plan including Procedure / Formation for The 3 <sup>rd</sup> Industry)
October	Study Benchmarks and Measures to Achieve Benchmarks (2 <sup>nd</sup> Industry) (Preparation of Survey (The 3 <sup>rd</sup> Industry))
November	Completion of Study (The 2 <sup>nd</sup> Industry) (Start Survey in The 3 <sup>rd</sup> Industry)
January – March, 2022	(For The 3 <sup>rd</sup> industry) Completion of Survey Analyze Survey Results Study Benchmarks and Measures

**Thank You Very Much for Your Kind  
Understanding and Cooperation.**

**Welcome Your Participation in “Project”**



*Thank you very much*



For More Information

[The Energy Conservation Center, Japan \(ECCJ\)](https://www.eccj.or.jp)

<https://www.eccj.or.jp>

[Asia Energy Efficiency and Conservation Collaboration Center \(AEEC\)](https://www.asiaeec-col.eccj.or.jp/index.html)

<https://www.asiaeec-col.eccj.or.jp/index.html>

[Japanese Business Alliance for Smart Energy Worldwide](https://www.jase-w.org/english/top/)

<https://www.jase-w.org/english/top/>