

# MRV system of Korea

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Summer School 2013

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MINISTRY OF  
ENVIRONMENT

Ministry of Environment , Republic of Korea

# I. Introduction : BAU 2020



# Country circumstances

## ⊕ Korea's need to prepare an active mitigation plan

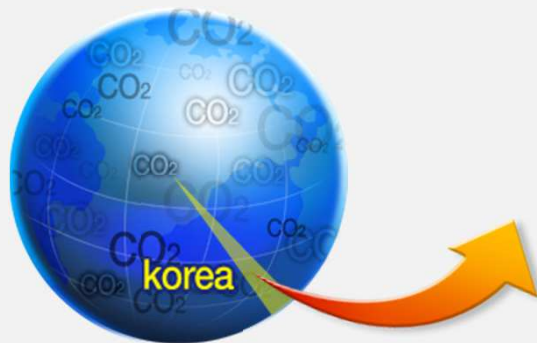
- An OECD member, G20 host country → Impetus to join global efforts to reduce GHGs

## CO<sub>2</sub> Emissions

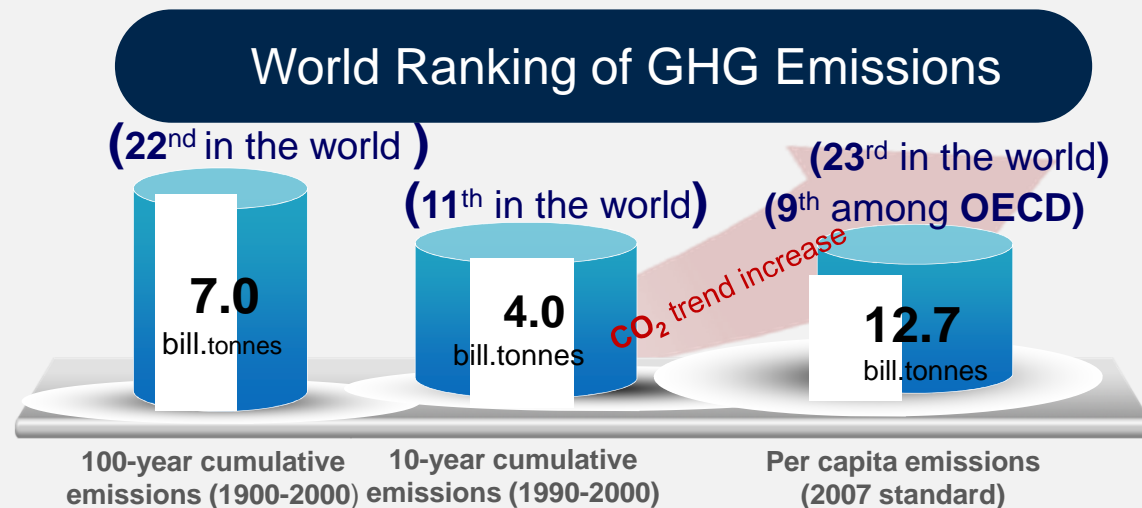
- Over the past 17 years, CO<sub>2</sub> emissions rapidly increased due to industrial development focusing on manufacturing

(103% increase from 1990-2007, highest increase rate among OECD countries)

World-wide  
29 bill.tonnes (CO<sub>2</sub> in 2007)



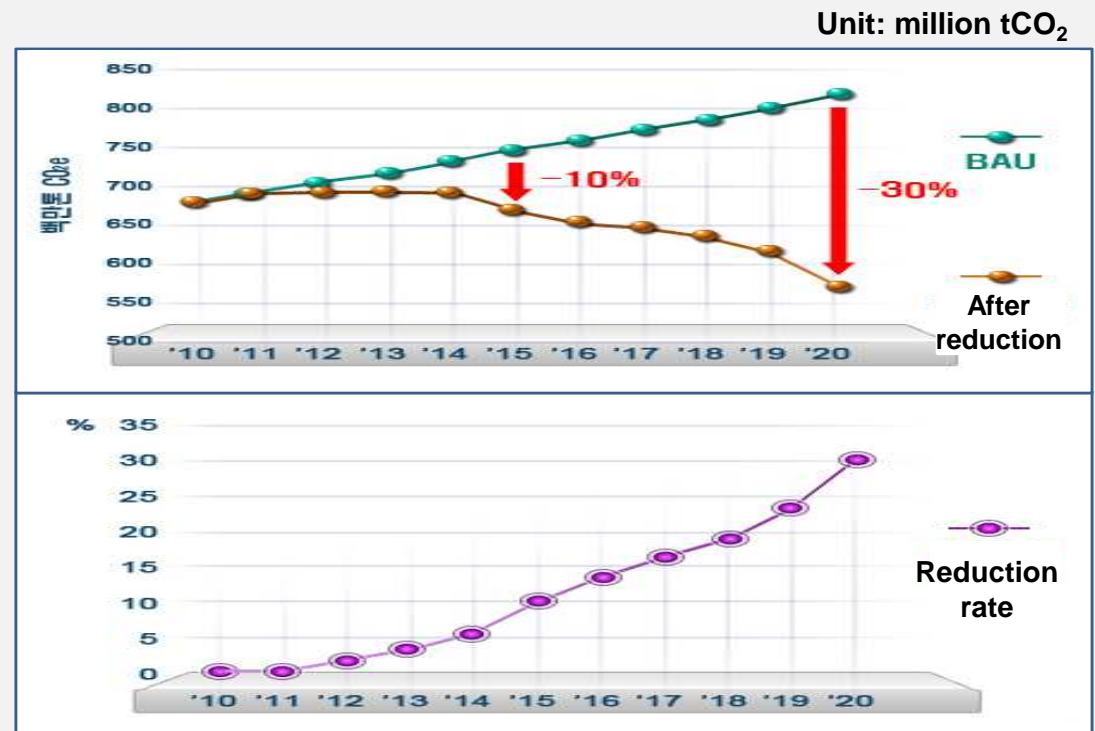
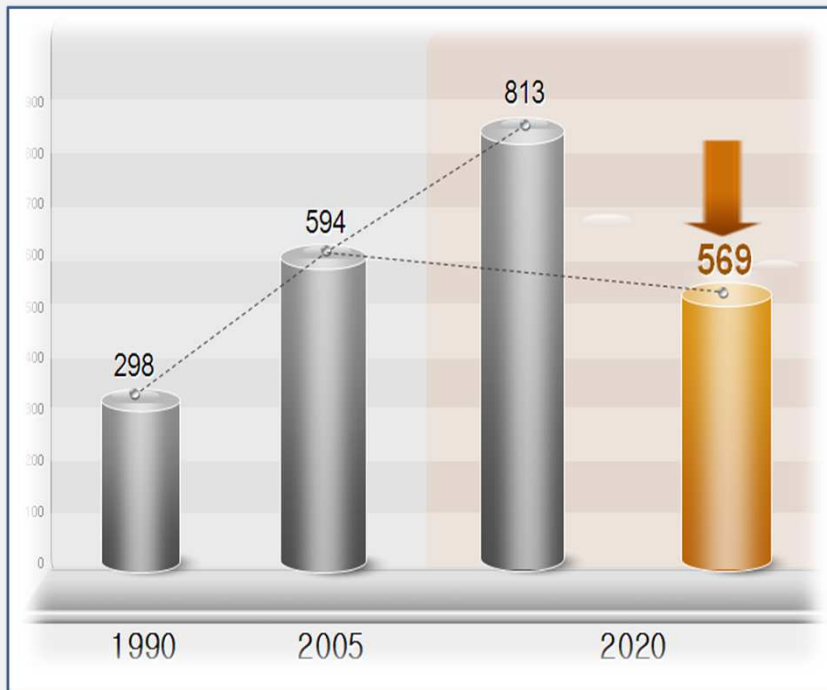
Emissions share : 1.7%  
(9<sup>th</sup> highest in the world)



# BAU 2020

## Midterm GHG emission target as 30% below BAU by 2020

- IPCC recommended 15~30% reduction from BAU for developing countries



## Reduction plan with peak emissions in 2014 and decoupling starting in 2015

- Reduction rate by year: 2015 - 10%, 2020 - 30% level
- Reduction rate increases after the newly introduced technology takes effect

## II. : Target Management System(TMS)



# Target Management Scheme

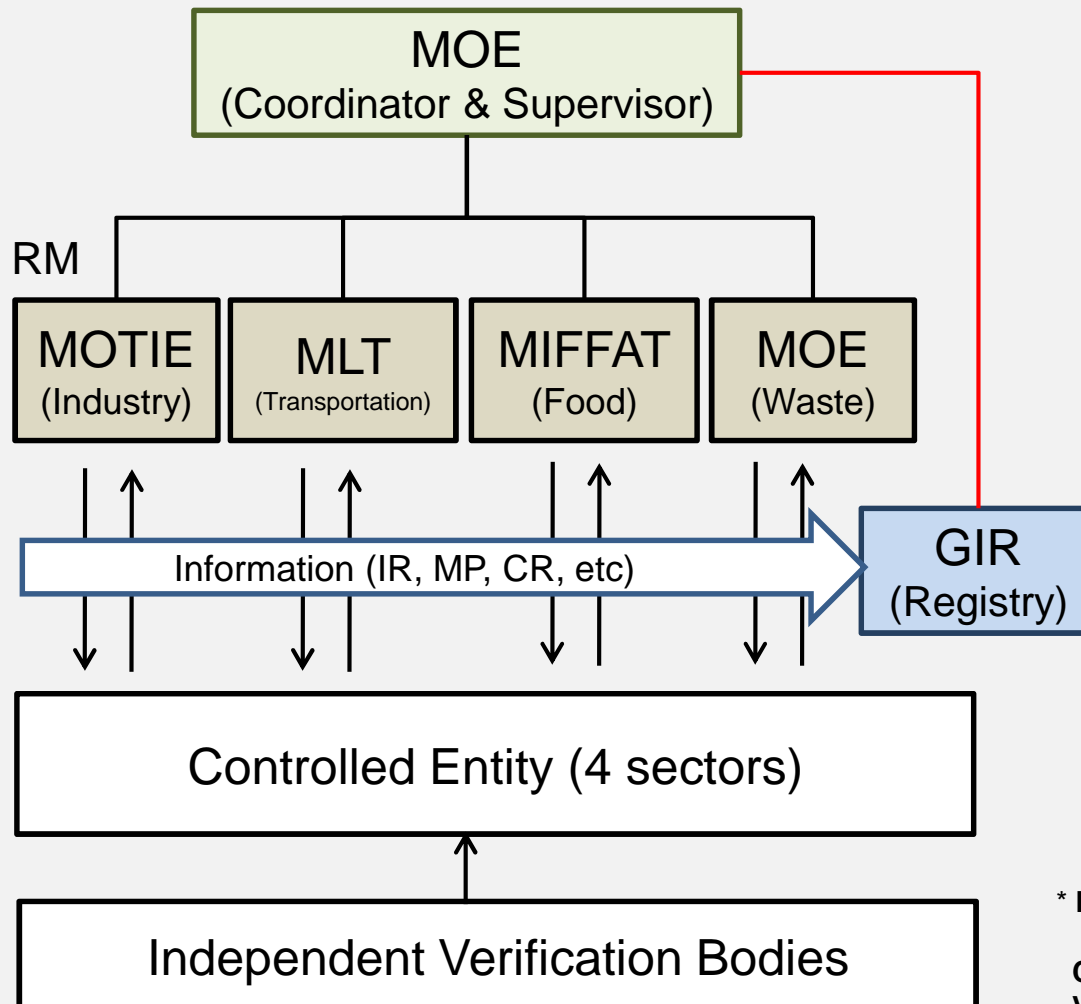
④ TMS- Korea's policy measure to directly select & regulate business entities for their GHG emissions, with the aim to reach BAU 30% mitigation target set by law.

- **Legally based on Framework Act on low carbon, green growth (Article 42)**
- **To set target of each corporation**
- **To set infrastructure of the ETS to be introduced**
- **MRV system introduced in Korea for the first time**
  - Mandatory GHG reporting scheme to authorities
  - Independent 3<sup>rd</sup> Party Verification procedure
  - IT based GHG information registry (National GHG Management System)
  - GHG estimation by Continuous Emission Monitoring (Tier 4)
- **Legally-binding regulation based on Command & Control**
  - Target setting for each corporation for each year
  - Set the enforcement system for the non-compliance
- **Covers about 63% of national GHG emissions**
- **ETS infrastructure is to be introduced**

# Target Management Scheme(TMS) – Institutional arrangement

There are 4 government agencies, each of them responsible for managing given sector under TMS.

- \* MOE : Waste \*MOTIE : Energy, Manufacturing, Industry \*MLT : Building, Transportation \*MIFFAT : Food



## MOE (Coordinator)

- Standards & guidelines
- Accreditation VB
- Supervising of CA, VB
- Conduct survey on entities if needed

## RM (Implementation)

- Target setting
- Review compliance report
- Enforcement to the non-compliance

## GIR(Registry)

- Research & analysis
- Sectoral GHG target

\* RM : Relevant Ministries

IR : Inventory report, MP : Monitoring plan

CR : Compliance report

VB : Verification body

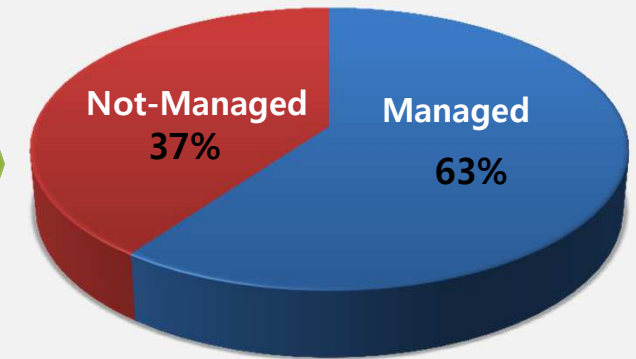
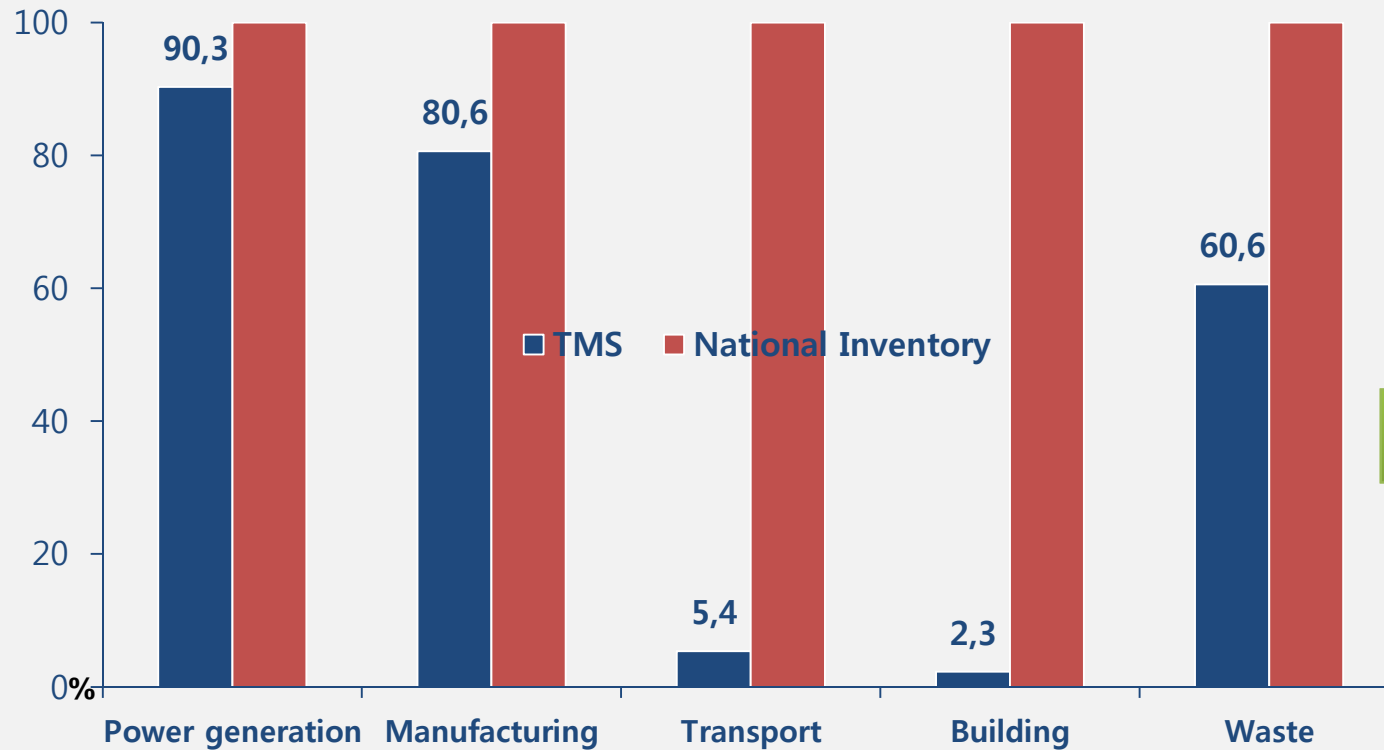
# TMS management scope of national GHG emission volume

☉ **Controlled entities under TMS manage 63% of Korea's GHG emissions.**

- Energy & Industrial sectors are directly managed by law, contributing to Korea's GHG mitigation.

## TMS coverage on National Inventory

GHG emission volume(2010)





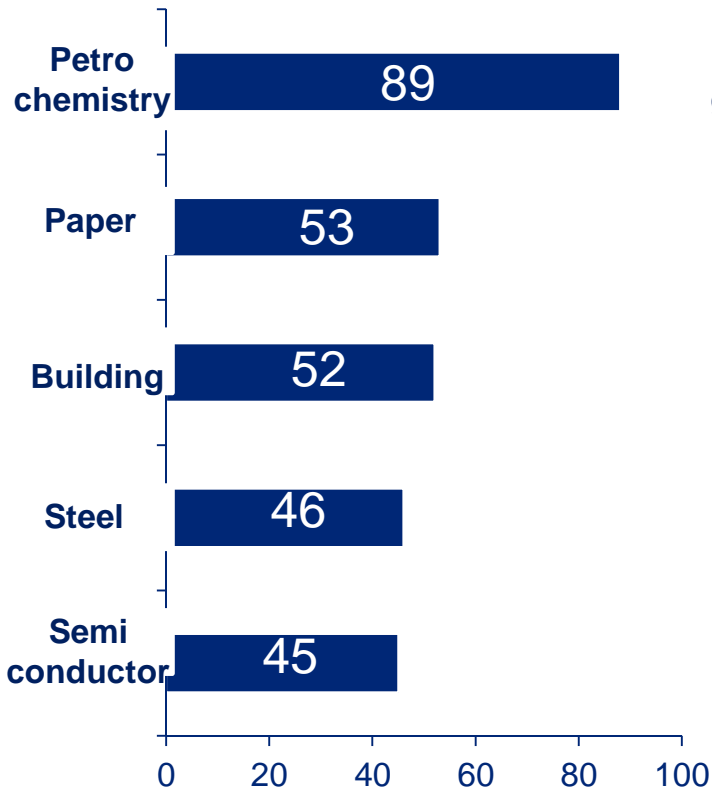
# Sectors managed by TMS

There are 5 main sectors managed by TMS.

- As of 2012, about 580 business entities are designated, most of them in Energy & Industrial sectors.

## Companies

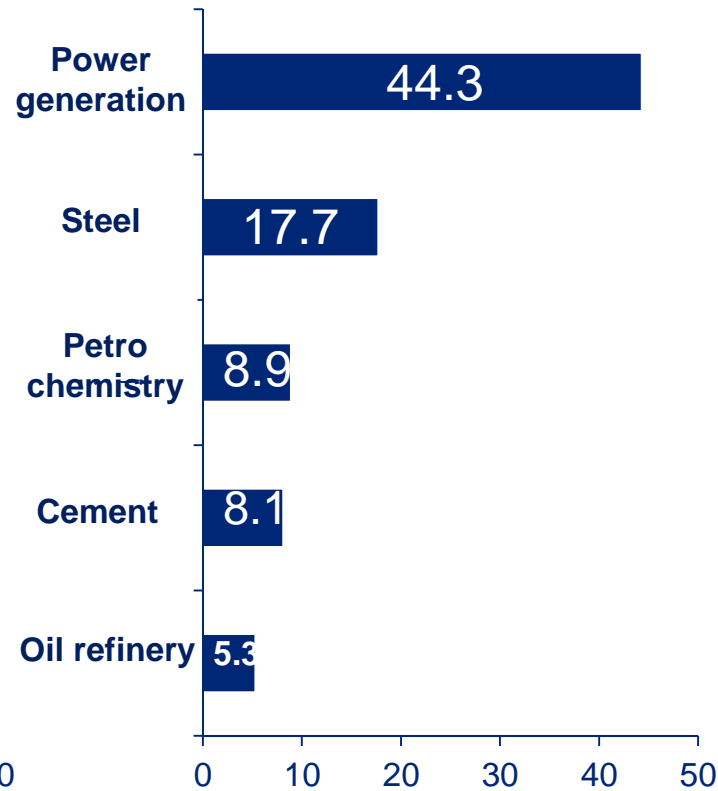
No. of controlled companies-top 5



Unit : Number

## GHG Emission

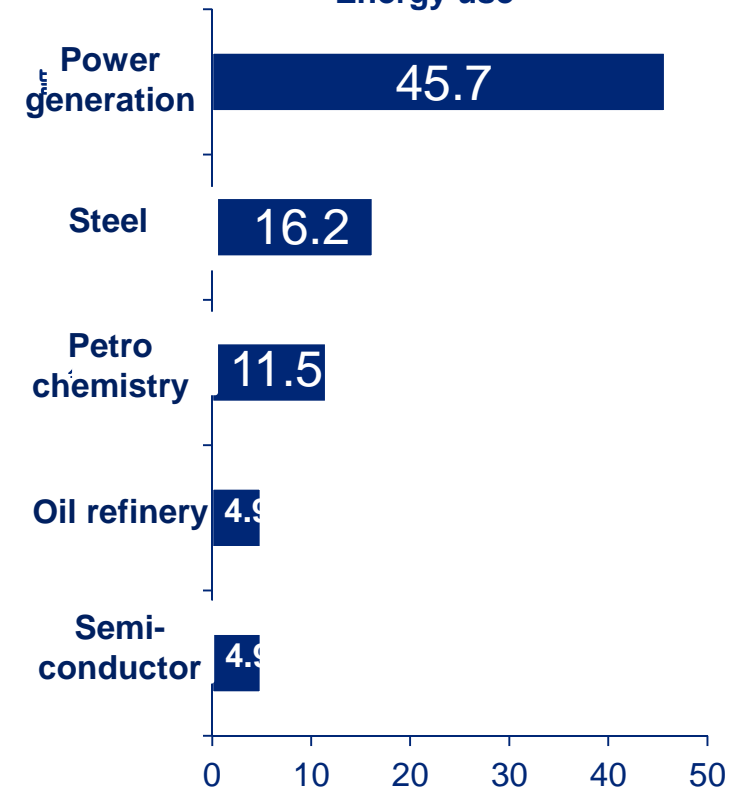
Top 5 GHG emitters



Unit : %

## Energy Consumption

Top 5 entities in terms of Energy use

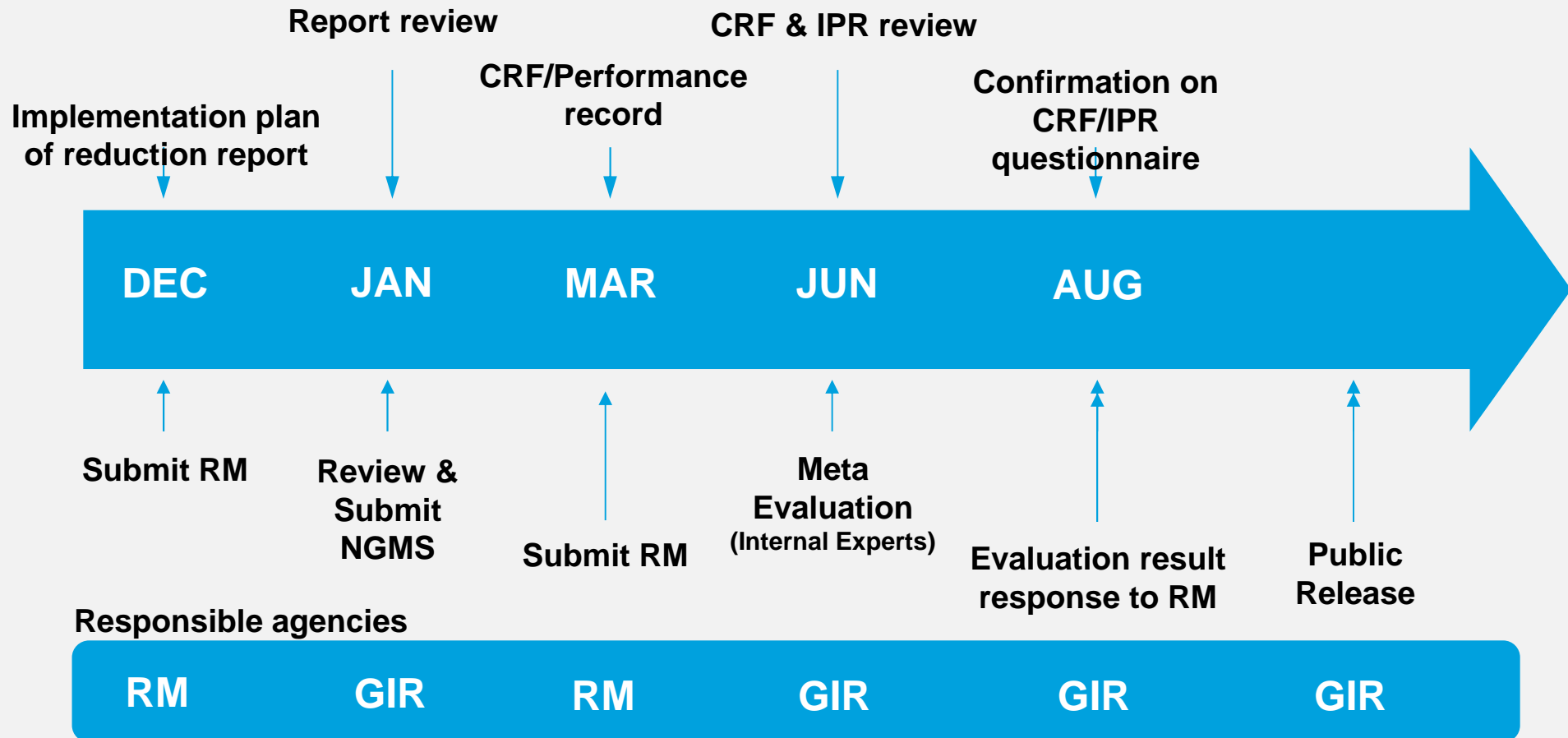


Unit : %

# TMS – Role & Schedule

## ⊕ TMS data are managed by management & verification agencies.

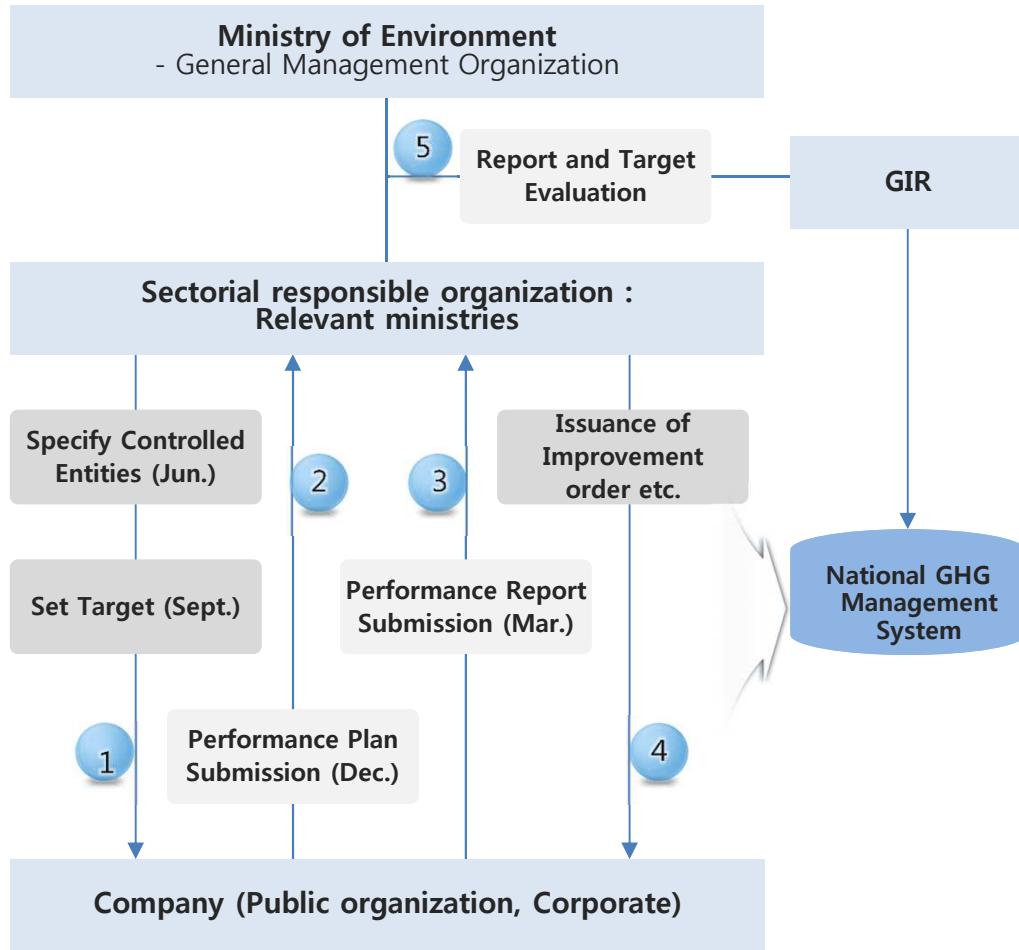
- GHG emission volume of each controlled entity is verified by the verification agency, which then is submitted to the management agency for further verification, and finally confirmed by GIR for approval.



- **RM** : Relevant Ministries
- **CRF** : Common Reporting Format
- **IPR** : Implementation plan of reduction report for GHG reduction
- **NGMS** : National GreenhouseGas Management System

# Target Management Scheme(TMS)

## GHG Target Management Process



## NGMS Verification Support Function



### Company Target Review

- Target adequacy Review
- Comparison with Sales trend or Yield trend

지재 시설명	시설 용량	시설용량 단위	세부시설 용량	세부사
일반보일러 (트림타워)	7	m <sup>2</sup>	0	
일반보일러 (트림타워)	7	m <sup>2</sup>	0	
응용자동차	75	대	0	
응용자동차	75	대	0	
응용자동차	2	대	0	
응용자동차	2	대	0	
전력 (트림타워)		%		
전력 (트림타워)		%		

### Report Data Review

- Checking emissions automatically
- Comparison by Version of the reports

세계질 일관성 검토    전년대비 변화율 ± 10    평균대비 변화율 ± 30    초기화    강요시 표시

범주	과제번호	전년대비 변화율(%)	평균	2007	2008	2009	2010	2011	2012	일률평가
장유	S1(대기오염)	024	7,818,807	6,666,087	7,546,001	8,478,848	8,070,095	8,257,518	8,277,202	양기
장유	S1(대기오염주조내)	20178	120,000	4	136,000	139,074	138,000	150,245	208,307	양기
장유	S1(대기)	-1824	7,837,346	7,811,049	7,822,300	7,866,748	7,167,168	8,182,202	8,683,146	양기
장유	원도외배출구	74026	9,192,015	2,766,955	2,891,303	2,469,429	2,475,410	4,882,209	4,666,955	양기
장유	GS공정노	0555	6,817,817	5,217,524	6,262,421	6,193,205	6,530,488	7,803,304	7,862,864	양기

### GHG Trend analysis

- Emission Trend analysis
- Activity data, EF, etc, Trend analysis

산정방법 선택

배출량범위: 국내배출요소    활동자료: 국내VRS/GRP    산정방법: 국내기준    자동산정여부:    국가배출요소:    국가배출요소

배출량범위:    활동자료:    산정방법:    자동산정여부:    국가배출요소:    국가배출요소

국가배출요소	배출량범위	활동자료	산정방법	자동산정여부	국가배출요소	국가배출요소	국가배출요소
전도 사용량	전도 사용량	전도 사용량	전도 사용량	전도 사용량	전도 사용량	전도 사용량	전도 사용량
CO2 배출량	CO2 배출량	CO2 배출량	CO2 배출량	CO2 배출량	CO2 배출량	CO2 배출량	CO2 배출량
CH4 배출량	CH4 배출량	CH4 배출량	CH4 배출량	CH4 배출량	CH4 배출량	CH4 배출량	CH4 배출량
N2O 배출량	N2O 배출량	N2O 배출량	N2O 배출량	N2O 배출량	N2O 배출량	N2O 배출량	N2O 배출량
총배출량	총배출량	총배출량	총배출량	총배출량	총배출량	총배출량	총배출량
산정방법	산정방법	산정방법	산정방법	산정방법	산정방법	산정방법	산정방법
자동산정여부	자동산정여부	자동산정여부	자동산정여부	자동산정여부	자동산정여부	자동산정여부	자동산정여부

### GHG Calculator

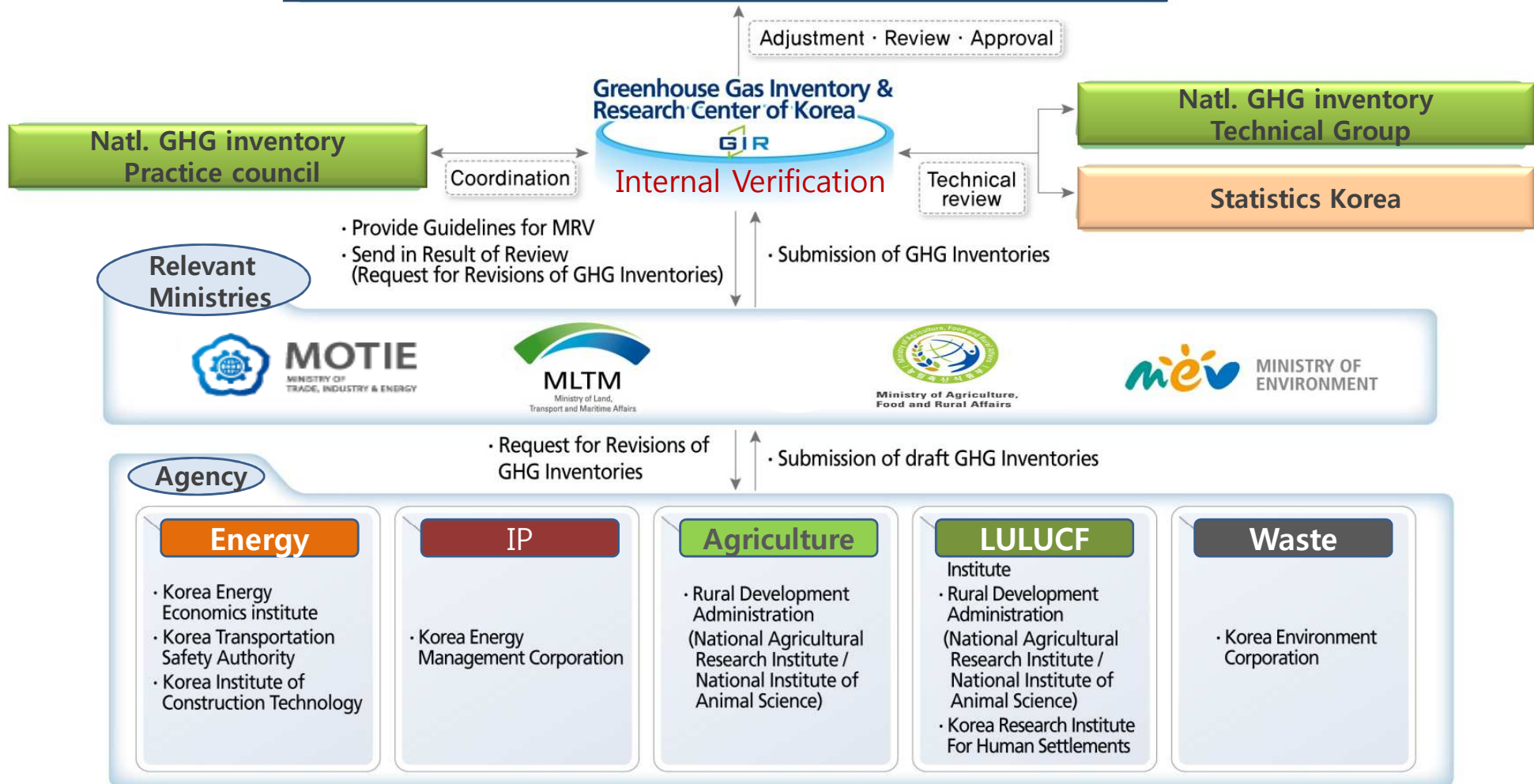
- Available to cross check

# III. : National Inventory System



# National Inventory - Institutional Arrangement

## National GHG Inventory Management Committee



# National Inventory reporting system

- **Introduction of IT-System, NIRS**

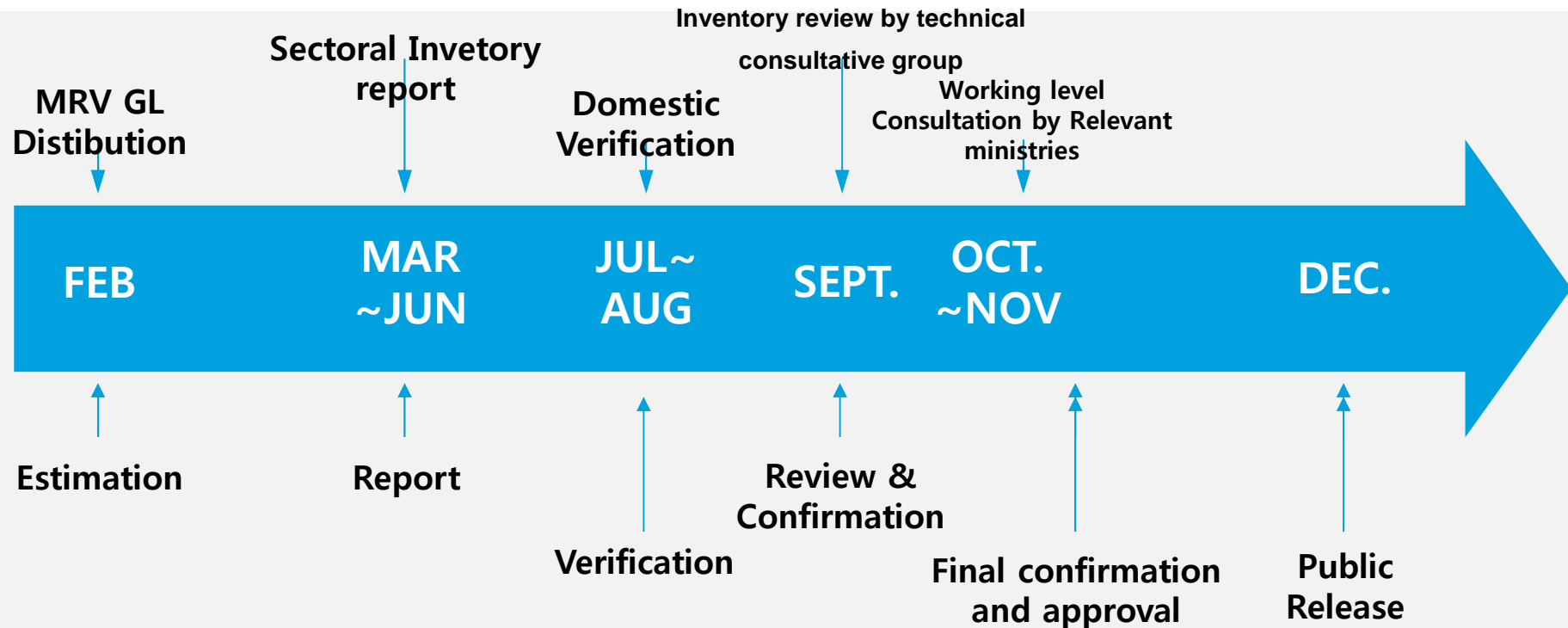
- Currently under development as sub-system for the existing National GHG Management System (NGMS)

- **Major features**

- Reporting activity data and parameters (e.g. EF) from agencies to GIR for national inventory
- Built-in verification (e.g. time series consistency check)
- Generate a variety of statistics (e.g. emissions per GDP)
- Output CRF and NIR

# Natl. inventory – Role & Schedule

## ④ Facility inventory verification procedures



### Responsible agencies

GIR

RM

GIR

TCG

IPC IMC

GIR

- **RM** : Relevant Ministries
- **TCG** : Technical Consultative Group
- **IPC** : Inventory Practice Council
- **IMC** : Inventory Management Committee

# National Inventory & verification process

Main Procedure		Responsible Organization	Detail	Time-line
Estimation · Report	MRV guideline distribution	GIR	<ul style="list-style-type: none"> <li>· Distribution of MRV GL</li> <li>* Preparation revision of GL</li> </ul>	February
	Sectoral Inventory report	Relevant Ministries	<ul style="list-style-type: none"> <li>· Submission of NIR and CRF</li> </ul>	March~ June
Verification	Domestic Verification	GIR	<ul style="list-style-type: none"> <li>· Verification report</li> <li>· Notify agencies of matters to improve and correct</li> </ul>	July~ August
Review · Confirmation	Inventory review by technical consultative group	Technical consultative group (Coordinator : GIR)	<ul style="list-style-type: none"> <li>· Technical review of major revision in verification report and guideline</li> <li>* Collect opinion from Statistics Korea</li> </ul>	Sept.
	Working-level consultation by Relevant Ministries	Inventory Practice Council (Coordinator : GIR)	<ul style="list-style-type: none"> <li>· Review major issues</li> </ul>	Oct.~Nov.
	Final Confirmation and Approval	Inventory Management committee(Coordinator : GIR)	<ul style="list-style-type: none"> <li>· Review and confirmation of NIR and CRF</li> </ul>	
Public Release		GIR	<ul style="list-style-type: none"> <li>· Publishing of final National Inventory</li> </ul>	Dec.



# Emission factor(EF)

- ④ Emissions Factors (on national and business level) were developed for the quality enhancement of GHG Inventory

- National specific EF was developed in '12, business level EF is to be developed and verified by 2013

❖ IPCC recommends the use of country-specific emission factor for **more accurate national GHG emissions**

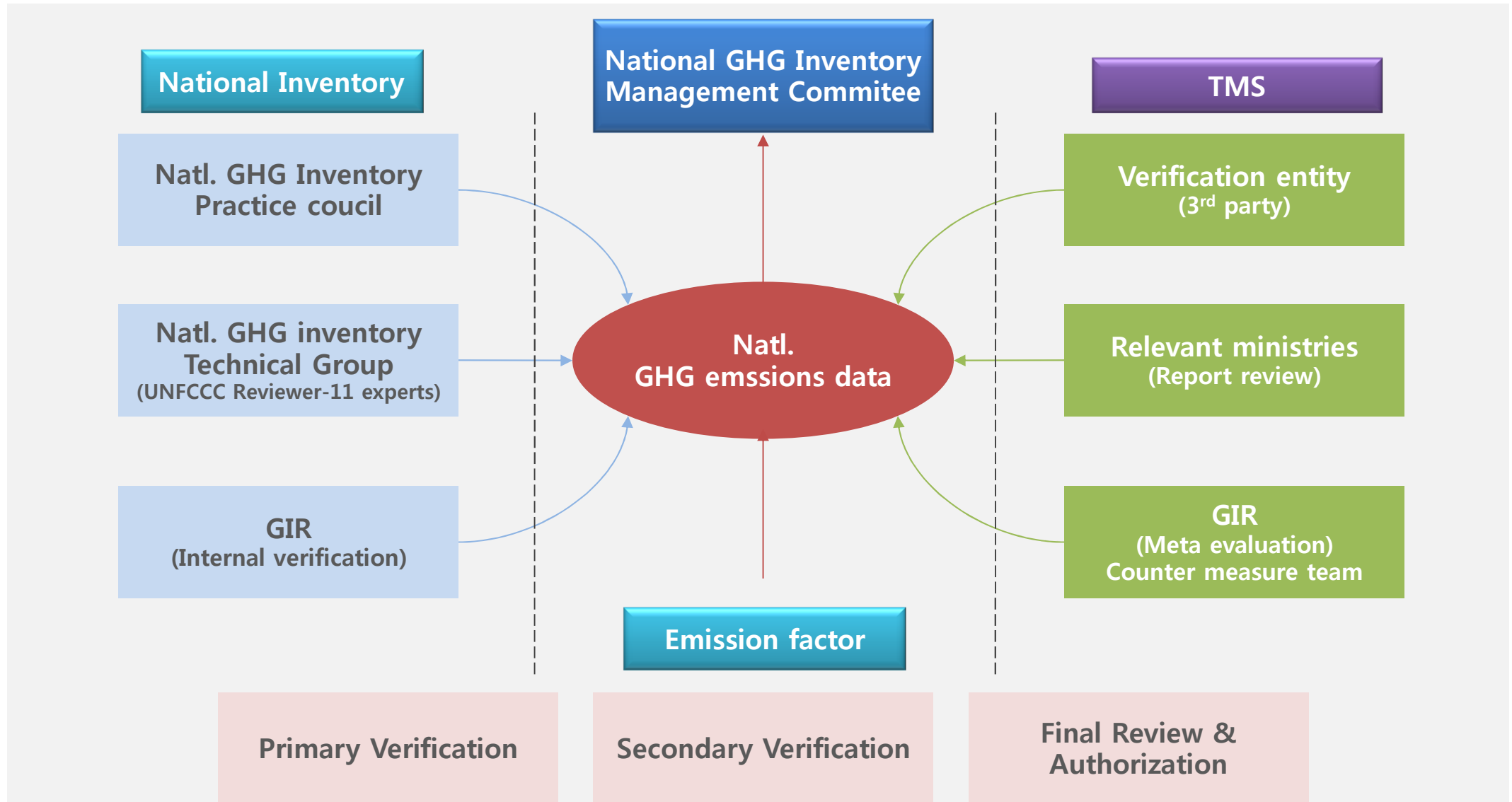
❖ According to “GHG & Energy Target Management Scheme”, country-specific emission factor is required when estimating **GHG emissions of controlled entities**



**To improve the reliability** of GHG emissions and reduction potential analysis through the application of the Country-Specific EFs

# Verification

- Verification process complies with given guidelines for approval, in order to enhance the level of national GHG inventory.
  - In particular, CRF seeks stricter verification through 3-step verification process to ensure quality control.



# Verification

## ⦿ Features of the verification program

- Designated entities under control should submit their statements verified by the 3<sup>rd</sup> party
- Estimations of GHG emissions and energy consumption should be accompanied with verification
- Verifiers are those who finished training courses and passed examinations
- Institute applying to qualify as a verification agency must have their verifiers or ID code

### Verification manual & Guideline

**Phased manual and key guidelines are required to be prepared to enhance the verification level**

- OPG comes up with sectoral procedures that help address major issues and verification errors

### Additional Verification Method

**Non binding issues such as emissions calculation, need to be studied**

- Study groups are formed for six different sectors, including chemical, steel and metal. These groups are joined by relevant experts and verifiers

### Advanced verification system

**Advisory groups joined by 40 sectoral experts are needed to advance the verification system**

- Since 2010, a total of six forums have been held up until now

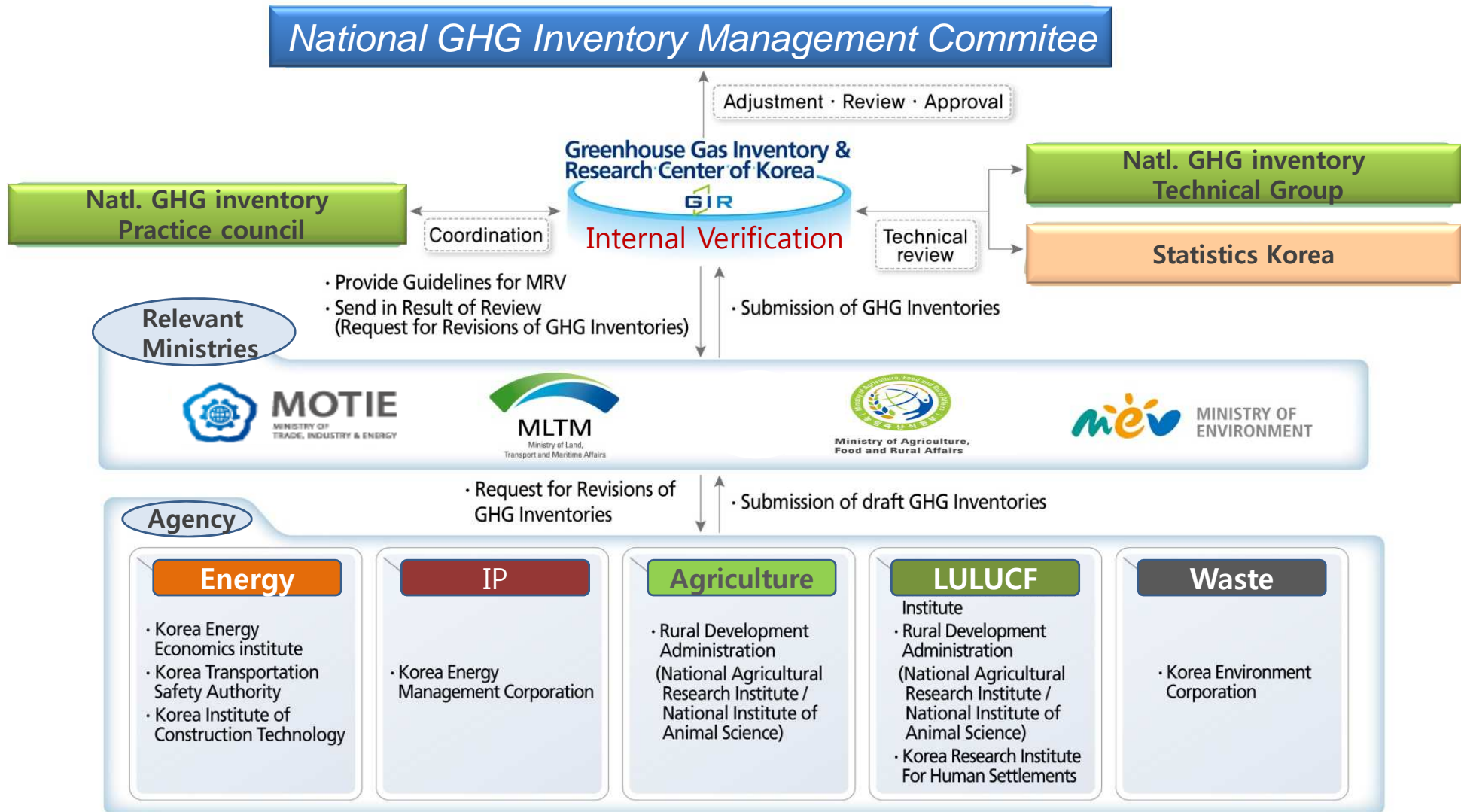
# IV. Stakeholder Engagement



# Stakeholder Engagement

- **Report by themselves to the NGMS**
  - All designated entities report to National GHG Management System (NGMS) by themselves with verification
- **In every stage, stakeholder could discuss with relevant ministries**
  - Relevant ministries constitute various committee and represent the opinion of sectors
  - If we have any critical issue, such as developing emission factors or revision of guideline, we have regular consultation with relevant industries

# National Inventory - Institutional Arrangement

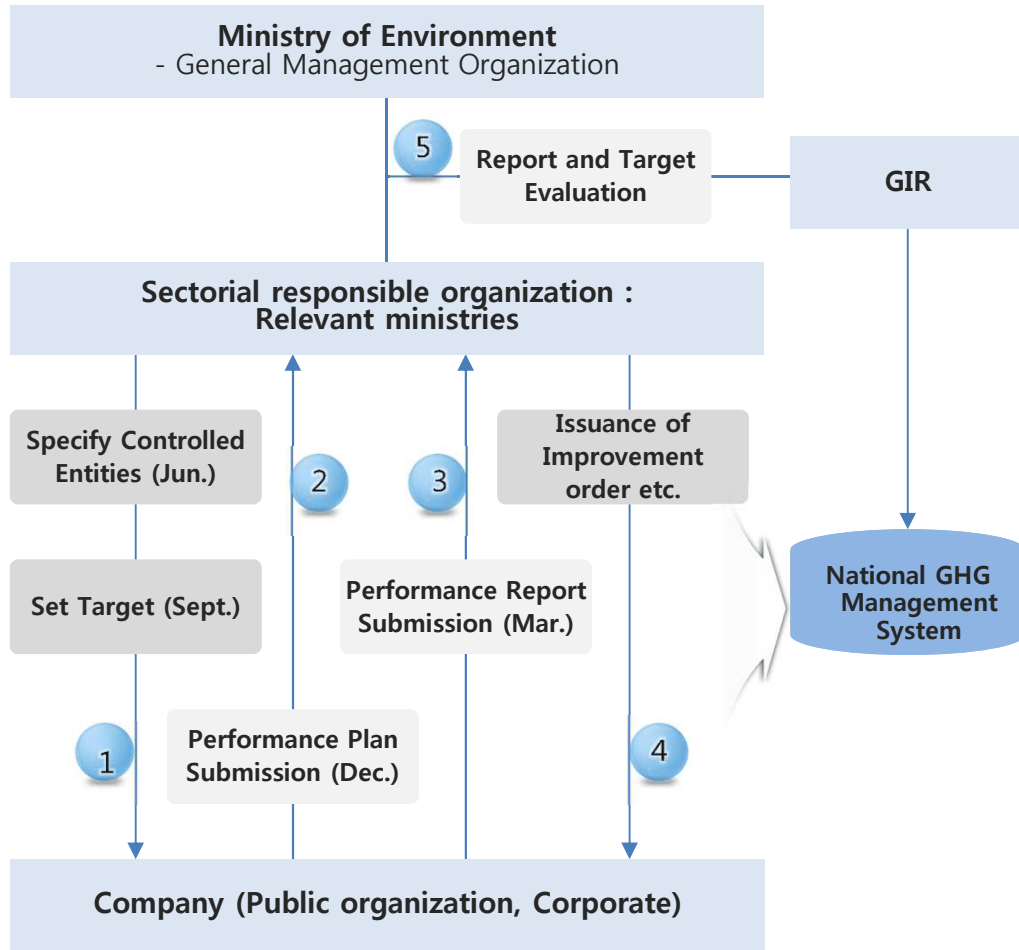


**Thank you**



# Target Management Scheme(TMS) & NGMS

## GHG Target Management Process



## NGMS Verification Support Function



### Company Target Review

- Target adequacy Review
- Comparison with Sales trend or Yield trend

자원	시정명	시정유량	시정유량 단위	세부시정유량	세부사
일반보일러 (트림타워)	7	m³		0	
일반보일러 (트림타워)	7	m³		0	
응용자동차	75	대		0	
응용자동차	75	대		0	
응용자동차	2	대		0	
응용자동차	2	대		0	
전력 (트림타워)		%			
전력 (트림타워)		%			

### Report Data Review

- Checking emissions automatically
- Comparison by Version of the reports

세계발전경향

전년대비 변화율 ± 10

평균대비 변화율 ± 30

초기화

강조색 표시

부문	관리대상	전년대비 변화율(%)	평균	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
발전	CO2배출량	0.24	7,818,807	6,666,087	7,546,001	8,478,848	8,270,091	8,257,518	8,277,202	8,277,202	8,277,202	8,277,202	8,277,202	8,277,202	8,277,202	8,277,202	8,277,202	8,277,202	8,277,202

### GHG Trend analysis

- Emission Trend analysis
- Activity data, EF, etc, Trend analysis

산정방법 선택

배출량계산: 국가배출요소, 활동자료: 국가배출요소, 산정방법: 국가배출요소

시정유량: A, 계산타입: 1, 자동산정여부: , 국가배출요소: A

배출량계산: 국가배출요소, 활동자료: 국가배출요소, 산정방법: 국가배출요소

배출량계산: 국가배출요소, 활동자료: 국가배출요소, 산정방법: 국가배출요소

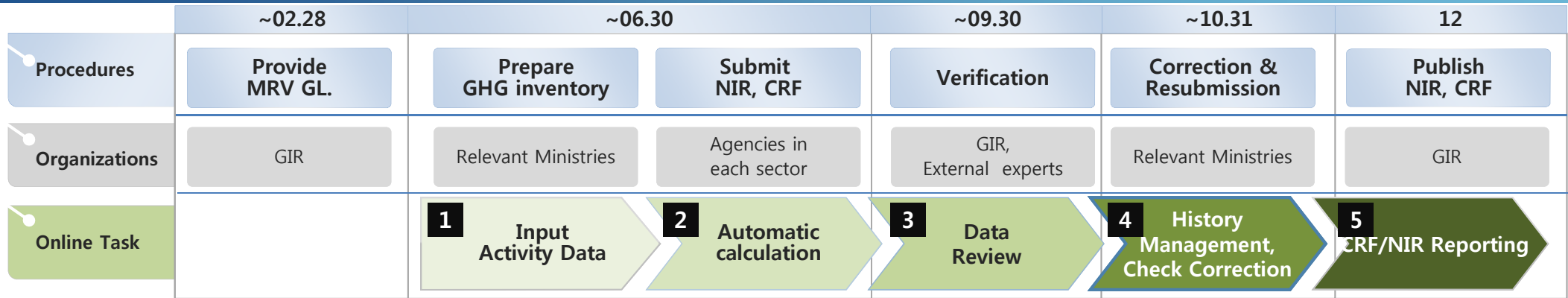
배출량계산	활동자료	산정방법	계산타입	자동산정여부	국가배출요소
국가배출요소	국가배출요소	국가배출요소	1		A

### GHG Calculator

- Available to cross check



# Natl. Inventory & NGMS(national GHG management system)



### 1 3 Outlier Analysis

Outlier filtering range(%) setting  
- From previous submission  
- From average

Highlight outliers

- provide a graph showing Activity data & Emission trends
- Outliers outside the range highlighted in color

### 2 Check estimation process

산정식 [Equation]

$$\{1A1a\_AD!Coal\} * (1 - \{1A1a\_EF!Coal|(GCV)\}) * \{1A1a\_EF!Coal|(OF)\} * \{1A1a\_EF!Coal|CF\} * \{1A1a\_EF!Coal|CO_2,EF\} / 1000$$

산정식 변환값 [Substitution value]

$$14.543322 * (1 - 0) * 0.989 * 0.98 * 3.67 * 26.8 / 1000$$

계산결과값 [Calculate result]

$$1.3854817158283023$$

### 4 Verification history Management

GIR

1. Result of review, Request for revision
2. Revision, Comment on the request resubmission
3. Check correction, Request for revision
4. Revision, Comment on the request resubmission
5. Write final results

산정	부문명	온실가스명	주요배출원	검증항목	검증내용설명	구분	상정기간	변태의견
<input type="checkbox"/>	에너지	gen	Y	완전성	파일타스트2222	수정요청		
<input type="checkbox"/>	에너지	gen	Y	완전성	파일타스트111	수정요청		
<input type="checkbox"/>	목재 및 목기	CH4	Y	완전성	파일타스트	수정요청		
<input type="checkbox"/>	에너지	gen	Y	완전성	1번	수정요청		
<input type="checkbox"/>	전력생산	gen	Y	완전성	근거자료 업로드 테스트	수정요청		

### 1 3 4 Comparative Analysis

Previous submission

배출원 구분	단위	1990년	1991년	1992년	1993년	1994년	1995년	1996년	
석탄	국내탄	TJ	14,543322	14,469982	13,663242	16,149468	15,775434	17,022214	17,7556
	수입탄	TJ	0	1,55976	1,31856	1,1256	0,65928	1,608	1,495
	원료탄	TJ	0	0	0	0	0	0	0
	연료탄	TJ	94,051782	94,922784	103,895748	148,037472	203,387184	233,839386	311,3865
	취발유	TJ	0,004909	0,004909	0,004091	0,002045	0,001227	0,000409	
	등유	TJ	0,014039	0,006293	0,016141	0,006293	0,061965	0,08828	0,1060
경유	TJ	9,087974	10,294388	20,820738	10,966736	14,933127	31,555014	53,5802	
B-A	TJ	0,009298	0,004376	0,003282	0,001094	0,001641	0,002188	0,0021	
B-B	TJ	0,05841	0,058168	0,032903	0,021739	0,009401	0,001763		
B-C	TJ	172,025504	242,78174	296,077695	291,296187	329,283124	350,075236	333,2963	

Latest submission

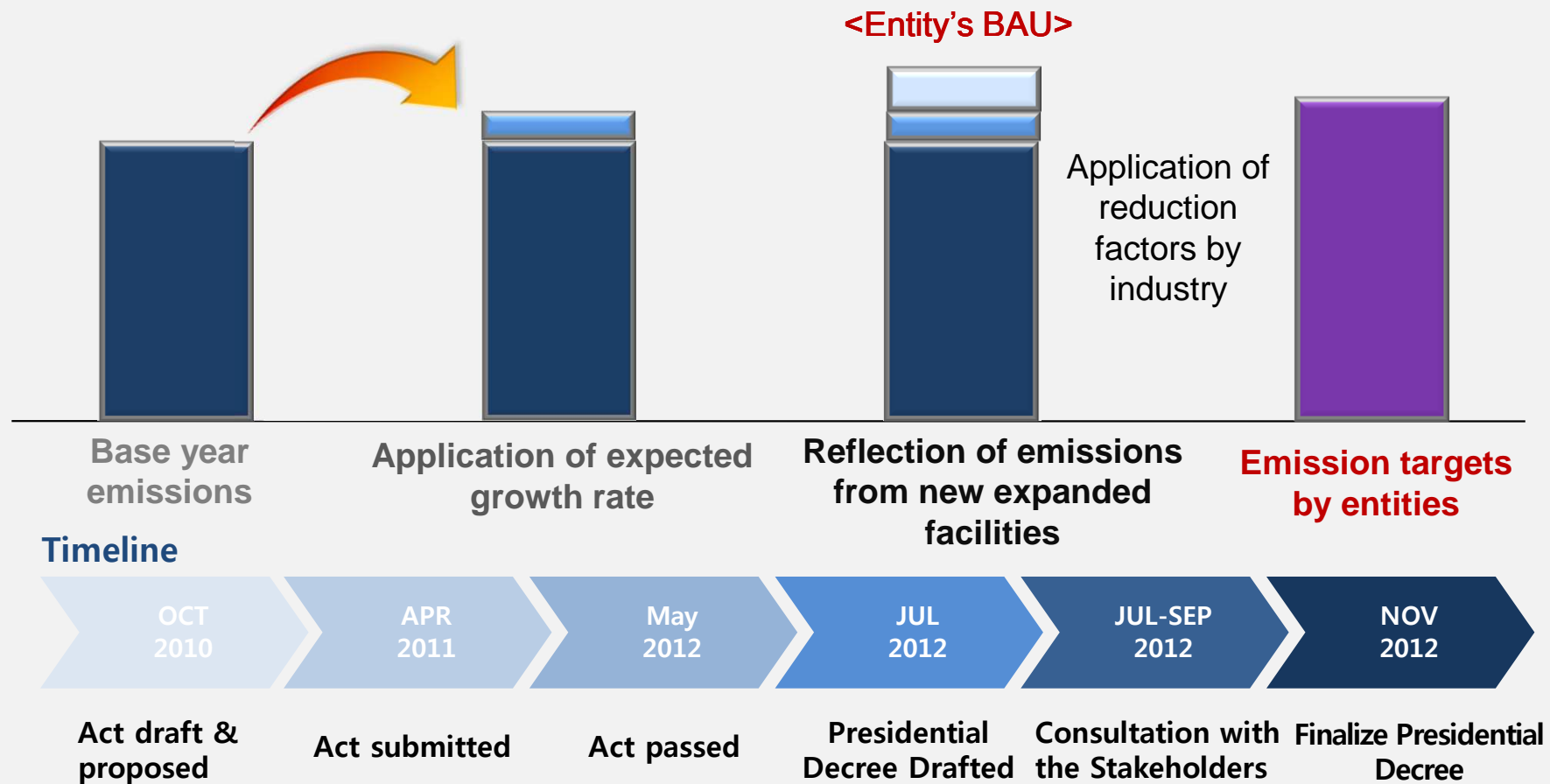
배출원 구분	단위	1990년	1991년	1992년	1993년	1994년	1995년	1996년	
석탄	국내탄	TJ	14,543322	14,469982	13,663242	16,149468	15,775434	17,022214	17,7556
	수입탄	TJ	0	1,55976	1,31856	1,1256	0,65928	1,608	1,495
	원료탄	TJ	0	0	0	0	0	0	0
	연료탄	TJ	94,051782	94,922784	103,895748	148,037472	203,387184	233,839386	311,3865
	취발유	TJ	0,004909	0,004909	0,004091	0,002045	0,001227	0,000409	
	등유	TJ	0,014039	0,006293	0,016141	0,006293	0,061965	0,08828	0,1060
경유	TJ	9,087974	10,294388	20,820738	10,966736	14,933127	31,555014	53,5802	
B-A	TJ	0,009298	0,004376	0,003282	0,001094	0,001641	0,002188	0,0021	
B-B	TJ	0,05841	0,058168	0,032903	0,021739	0,009401	0,001763		
B-C	TJ	172,025504	242,78174	296,077695	291,296187	329,283124	350,075236	333,2963	

- In comparison with previous submission(AD, EF, Emission) changed cells are marked with colors
- Corrections by reflecting verification result can be checked easily

# Annex. Emission Trading Scheme

*Target Management System(TMS) has begun 2012 to meet the National Mid-Term GHG Reduction Target and TMS is a Precursor to Korean ETS*

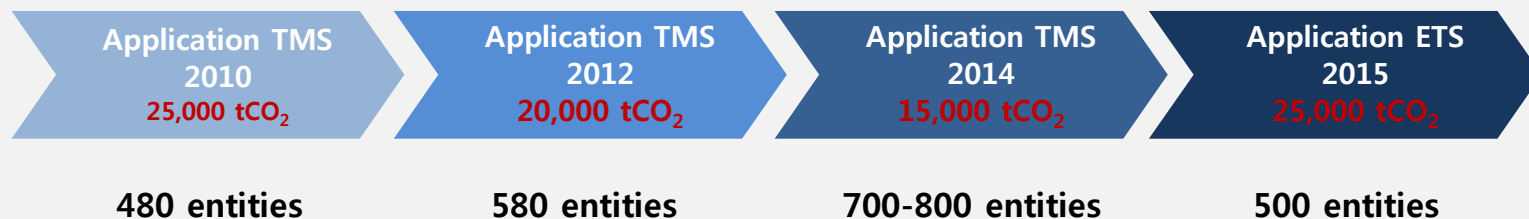
- In TMS, Government set a cap on large emitters and oblige them to reduce their emissions



# Annex. Emission Trading Scheme – Institutional Arrangement



## Timeline



# Annex. Emission Trading Scheme

## Enhancement of linkage with national reduction targets

### Top Down Approach

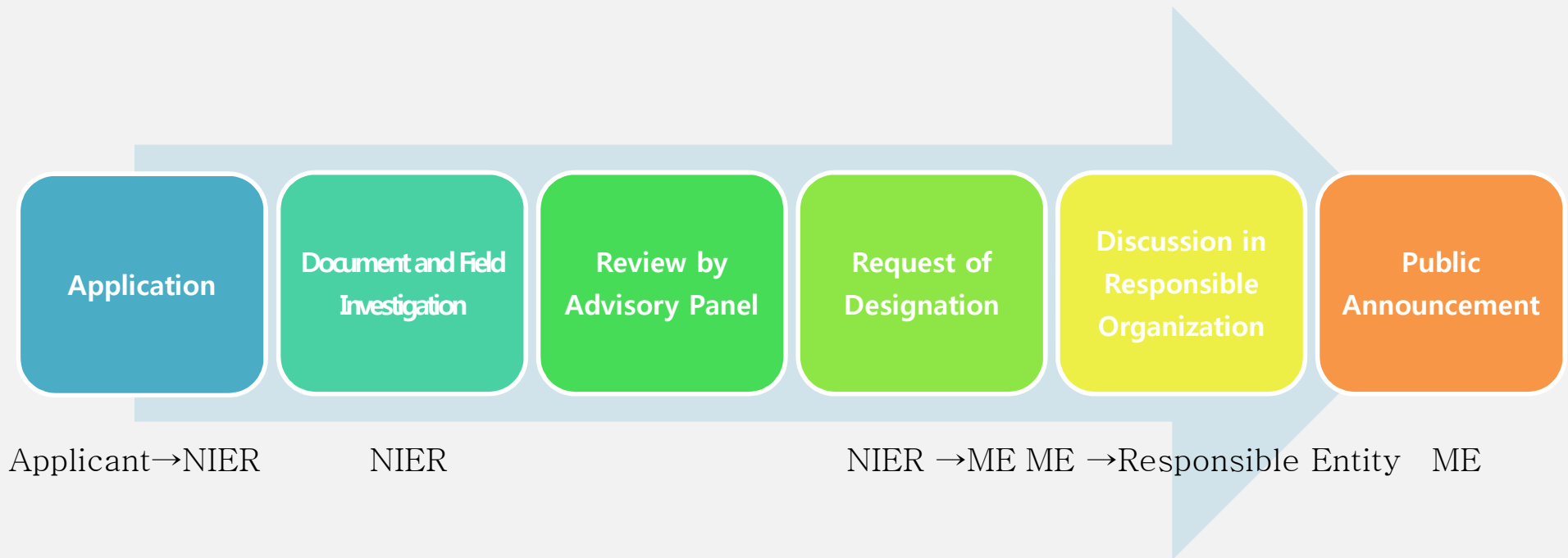
Finalizing controlled entities by industry and emission targets based on emission forecast by sector and industry & reduction potential analysis  
(June every year)

Mutual Linkage

### Bottom up Approach

Relevant ministries set targets by entities after consultations, based on target-setting methods specified in TMS guidelines (Sept. every year)

# Verification Management



【Qualifications for Verification Institutes (Appendix 30, Guidelines for MBO)】

① Five standing verifiers ② Verification Independence ③ Operation System Setup

\* Three assistant verifiers by June 2011, and five by 2012 are required

# Number of Active Verifiers

- ◆ A total of 208, or 94%, out of 222, participated in verification activities for the last three years.

**Number of Active Verifier**

