SolutionPartner

Energy Management Practices of LG Chem

Nov 15, 2011

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LG Chem

Contents

LG Group Structure

LG streamlines its business fields into 3 domains as follows.

Chemicals

14

LG Chem
LG Hausys
LG Life Sciences
LG Household & Healthcare
LG MMA
etc.

Electronics

9

LG Electronics
LG Display
LG Innotek
LG Siltron
Lusem
etc.

Telecomm-unications & Services

34

LG U+
LG CNS
LG International
LG Solar Energy
SERVEONE
etc.

* Figure refers to the number of affiliates

About LG Chem

Known as the largest chemical company in Korea,
LG Chem extends its chemical expertise into IT & electronic materials industries,
Such as rechargeable batteries.

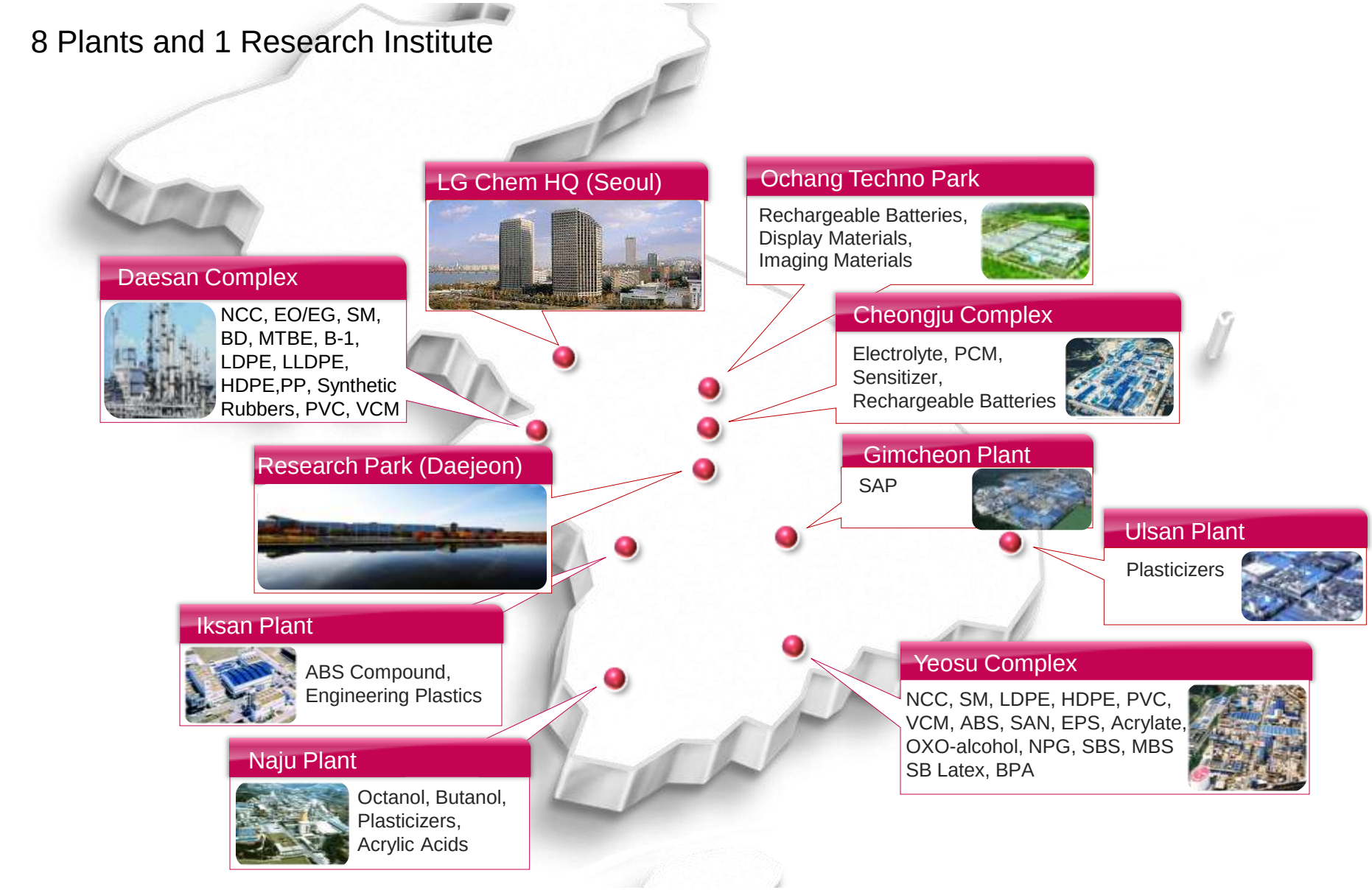
• Brief History

1947	Founded Lucky Chemical Industrial Corp.
1960~1990s	Entered into • Industrial Materials business in 1960s • Petrochemicals business in 1970s • Information & Electronic Materials in 1990s
2001	Corporate Spin-Off (LG Chem, LG Life Science and LG Household & Healthcare)
2006	Acquired LG Daesan Petrochemicals Ltd.
2007	Acquired LG Petrochemical Co., Ltd.
2009	Demerged Industrial Materials business (LG Hausys)
2010	Acquired Dow Polycarbonate

- 2010 Sales : KRW 19.5 Trillion (based on IFRS)
- Workforce : 16,000 employees (as of Dec. 2010)

Domestic Network

8 Plants and 1 Research Institute



Global Network

27 Subsidiaries around the world

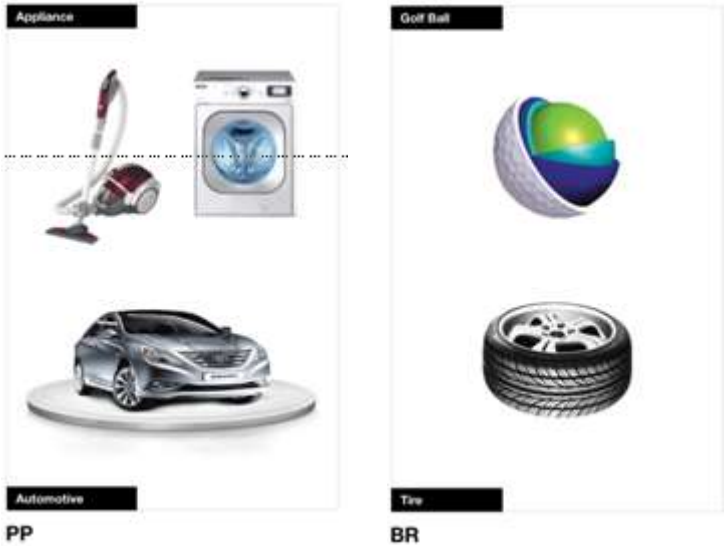
- Manufacturing Subsidiaries (13) : China (9), Vietnam, India, Poland, USA
- Marketing Subsidiaries (6) : China (2), USA, Brazil, Europe, India
- Representative Offices (8) : Moscow, Istanbul(2), Ho Chi Minh City, Bangkok, Jakarta, Singapore, Tokyo

Business

Main products of LG Chem are ‘Petrochemicals’ and ‘IT & Electronic materials’

Petrochemicals

Petrochemical Plant



Chemical Products

IT & Electronic Material

Filter for LCD

Rechargeable Battery for Electric Vehicle

Energy Efficiency in Korean Petrochemical Industry

Statistics

4th largest manufacturing industry of Korea

- Production : 92 trillion KRW
- 10.8% of manufacturing industry

2nd Largest exporting products (2008)

- Exports : $45.9billion

8th largest job market (manufacturing sector)

- Employees : 137,000
- 4.7% of manufacturing industry

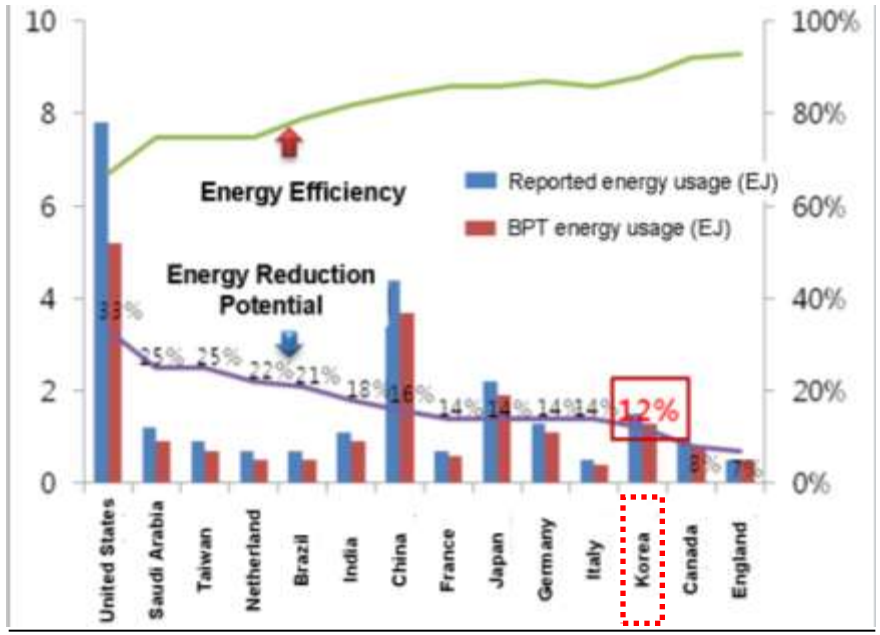
World's 6th largest production

- Shipment : $116.1billion
- Global market share : 3.6%

Energy Efficiency

- World's best level of energy efficiency
- Low GHG reduction potential
- High marginal cost for additional reduction

Energy Efficiency of Petrochemical Industries



(Ref.) IEA, Worldwide Trends in Energy Use and Efficiency(2008)

Korean Policies for GHG/Energy Management

Corporate GHG reduction and energy saving targets are set along with the national target.

GHG/Energy Regulatory Progress

Nov. 2009

▪ **National GHG reduction target setting**

- Announcement to reduce 30% of BAU level by 2020
- Selection of the highest target from IPCC's recommended range (15 – 30%)
- Reduction Methods : Renewable E, energy efficient products, green cars, CCS

Apr. 2010

▪ **Effectuation of Framework Act on Low Carbon, Green Growth**

- GHG/energy target management
- Emission trading
- Carbon tax

Nov. 2010

▪ **Announcement of Emission Trading legislative bill**

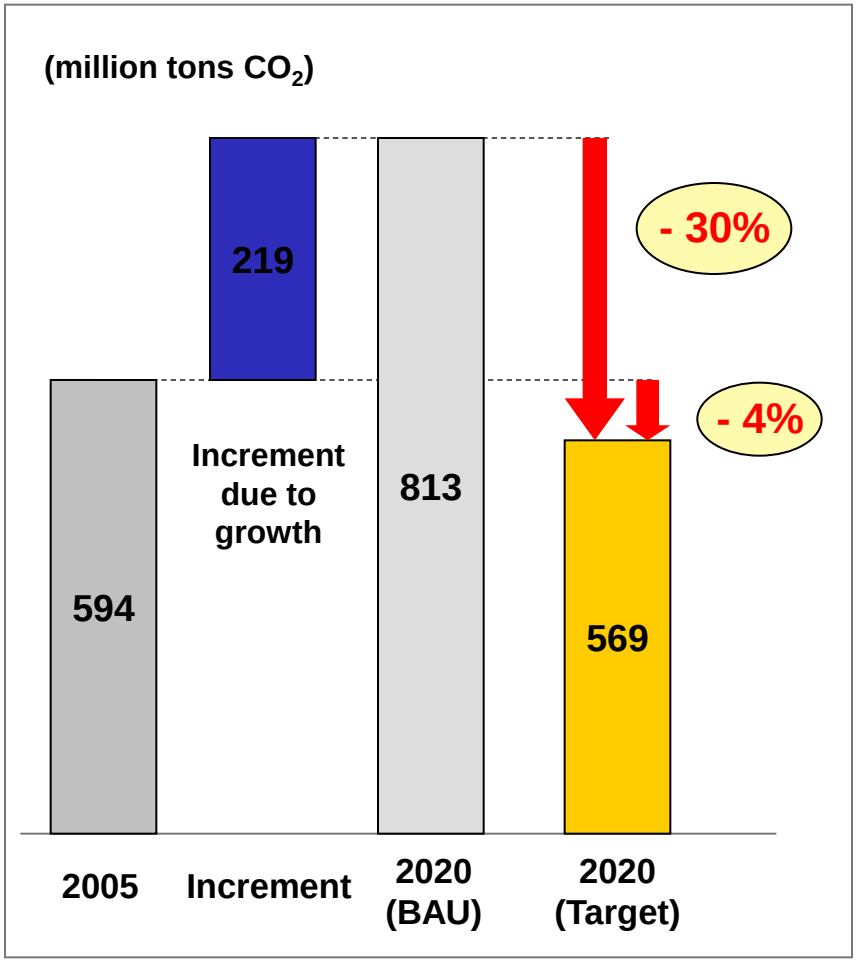
- System comes into effect from 2015

Mar. 2011

▪ **Enforcement of GHG/Energy Target Management**

- Managing 70% of the national emissions
- Completed 2012 target setting (Sep. 2011)

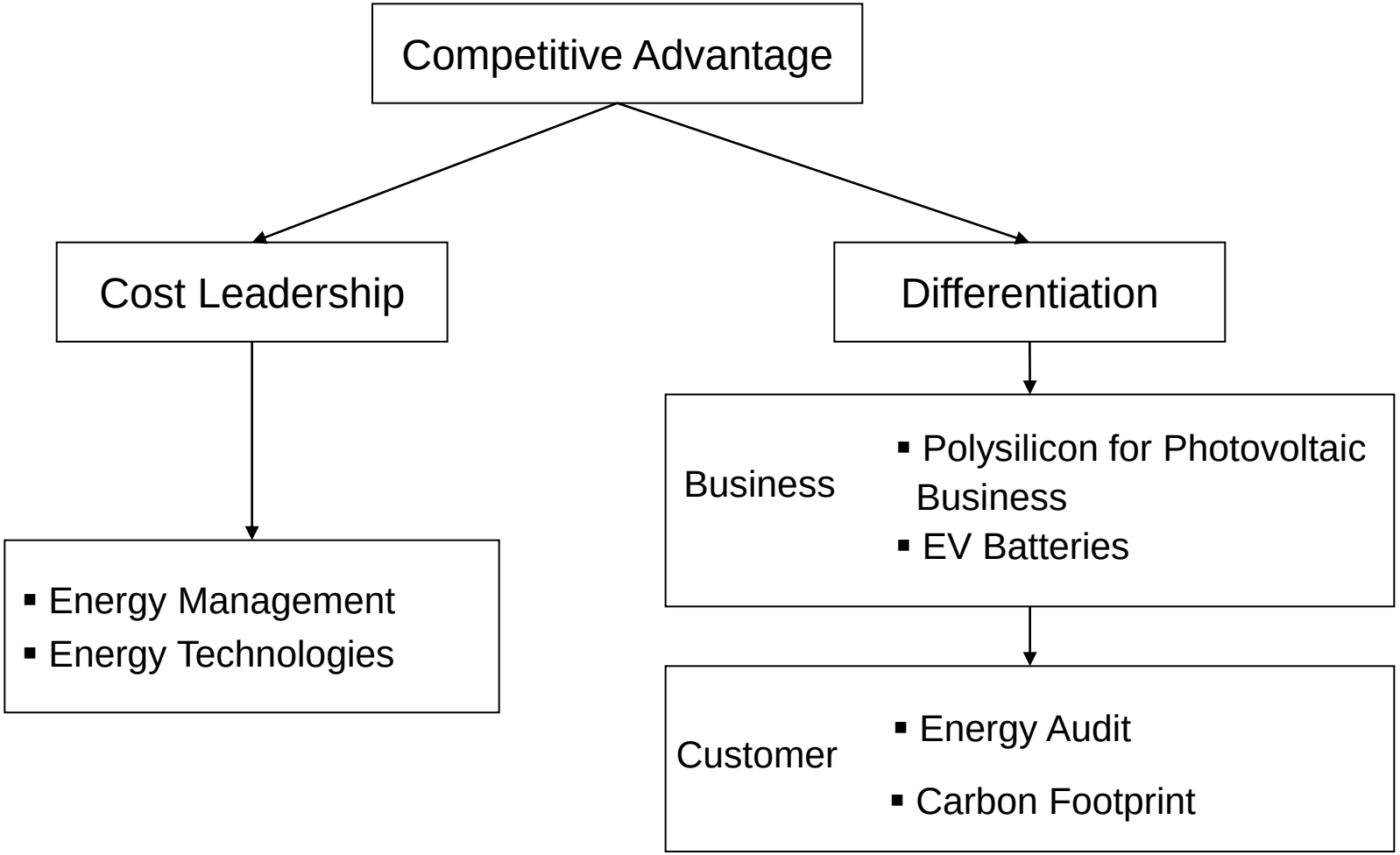
Korean National Target



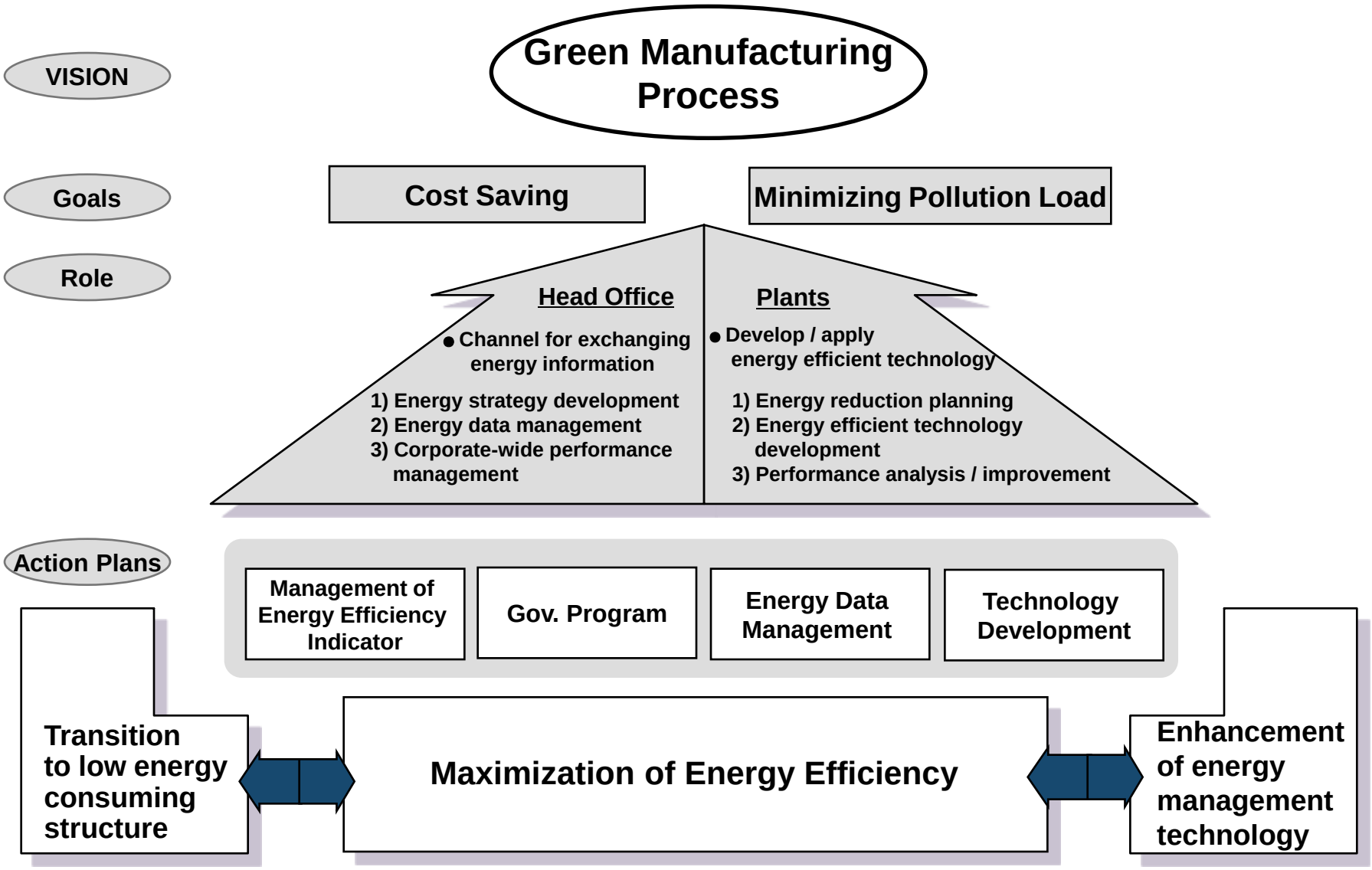
Transition of Energy Saving Trend

	As - Is	To - be
Target Setting	▪ Voluntary target	▪ Negotiation with the government
Project Development (Saving Potential Analysis)	▪ Relatively short Pay-Back Period : within 1 ~ 2 years	▪ NPV ≥ 0 (Even the project with NPV < 0 due to carbon price)
Data Monitoring	▪ Internal Guideline	▪ Strict National Guideline
Verification	▪ No verification	▪ Verification by 3rd parties
Penalty for not reaching the target	▪ No penalty	▪ Penalty and damage on corporate reputation
Others		▪ Enery projects will be vitalized with ‘National Emission Trading Scheme’

Corporate Strategy and Energy



Energy Management Vision



Energy Campaign

Implementation Strategy

EIF(Energy Impact Free) 'PRO' Campaign with participation of all departments

P — R — O

Process Innovation	**R**estructuring	**O**ptimization Management
Plants	**Companies & Divisions**	**Staff Departments**
Process Innovation	**Restructuring Business**	**Efficient Supports**
• Production process innovation • Energy saving task forces • Energy efficient atmosphere	• Enhancement of product added values • Investment in new energy-efficient facilities • Transition to low-energy consuming products	• Development of mid-long term energy plans • Technical support for energy saving • Support conversion of energy & GHG into credit

EIF 'PRO' Campaign

Energy Campaign

'PRO' Process

Market Aiming ⇨ **Simplification & centralization** ⇨ **Acceleration of execution** ⇨ **Achievements**

P Process Innovation	**Plants**	Energy saving T.F.T	● Registration of 2 or more energy saving themes for each plant
		Energy saving campaign	● 1 campaign for 1 plant (Catch phrase)
R Restructuring	**Companies /Divisions**	Reduction of absolute amount of uses	● Improvement of energy intensive processes ● Process destruction
		Activities on productivity improvement	● Innovations in manufacturing methods ● With no product defects
O Optimization Management	**Staff Departments**	Enhancement of energy management efficiency	● Improvement of transparency in reduction performances (government verification) ● Computerization of energy management
		Training energy experts	● Converting GHG into credits ● Customized train on technology

Achievement of mid-long term reduction plan

GHG Reduction

Project Management Process

Energy Project Management Schedule

	Dec.	Mar. ~ Nov.		Dec.	
	Registration of 1st & 2nd themes	Project Process Monitoring (Jun, Nov)		Presentation / Assessment (Dec)	F/U management
		June	November		
CONTENTS	-. Selection of subject process lines -. Registration -. Basic activities analysis -. Reconfirming concepts of themes	-. Monitoring changes -. Check on progress -. Consulting on direction of project [study beforehand /advices]	-. Monitoring changes -. Effectiveness identification -. Spreading method	-. Assessment on practices	-. F/U management -. Developing next projects
OUTPUT	-. Scheduling -. Result projection -. Analysis on factors to be supported	-. Technology sharing -. Executed facts confirmation	-. Technology sharing -. Executed facts confirmation -. Effectiveness analysis	-. Project sharing	-. Reporting following year's plan

National EnMS Trend

Korean government is in process of introducing EnMS (Energy Management System) to reduce energy importing costs and GHG emissions through effective energy management

✓ Needs of standardization and systematic approach of energy savings

- Provision of standard methods for energy reduction through energy efficiency improvement.
- Corporate wide management system construction
- Establishment of national foundation for climate change

✓ Government policies on energy savings for industry

- Green Growth 5-Year Plan (2009 ~ 2013) : introduction of NA, EnMS
- The 1st National Energy Master Plan (2008 ~ 2030) : introduction of NA, expansion of EnMS
- The 4th Energy Usage Rationalization Master Plan (2008 ~ 2012) : mandatory EnMS implementation for NA subjects
- Introduction of Energy Target Management / Energy Management System (MKE)

✓ Foundation of Energy Target Management

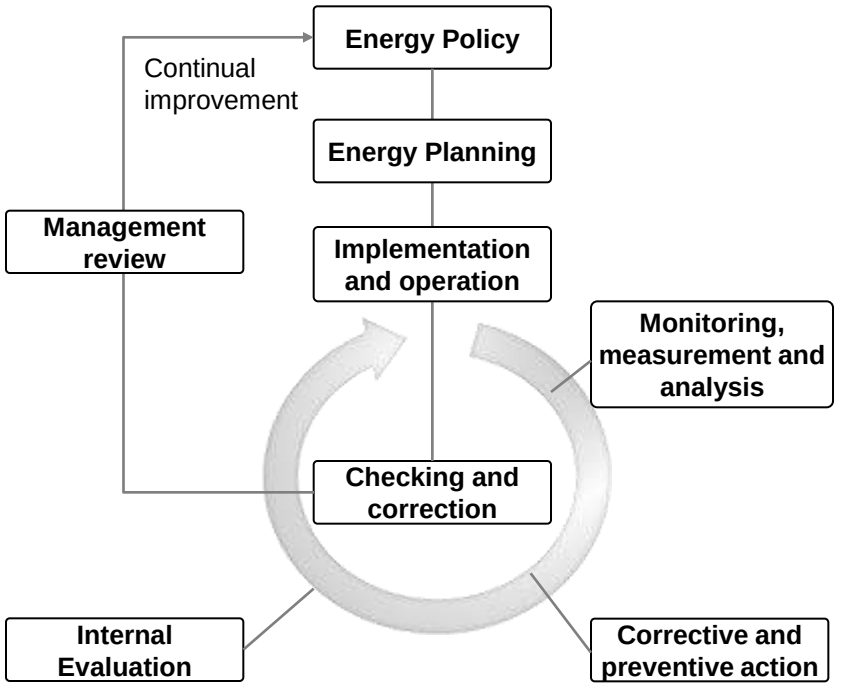
- Analysis in energy aspect – Energy target setting – Improvement projects – Performance management process
- Identification of energy reduction factors by corporate wide efficiency control & designing / purchase / internal & external diagnosis
- Securing reliability of energy data
- Building Infrastructure through managing MRV, documents, records, internal verification, and performance

EnMS Concept

Paradigm Shift of Corporate Energy Management

Energy team-level management	Corporate-wide management
Short-term improvements	Mid to long-term and continual improvements
Focused on energy supply	Purchasing/planning teams and end-users included
Bottom-up target setting	Top-down target setting

International Standard



EnMS and GHG Regulations

Target Management by Material Balance

Coping with Climate Change through Energy Saving

Energy using installation	GHG emitting source
Energy saving project	GHG reduction project
Investment effect of energy saving facilities	GHG marginal abatement cost
Energy saving potential	GHG reduction potential

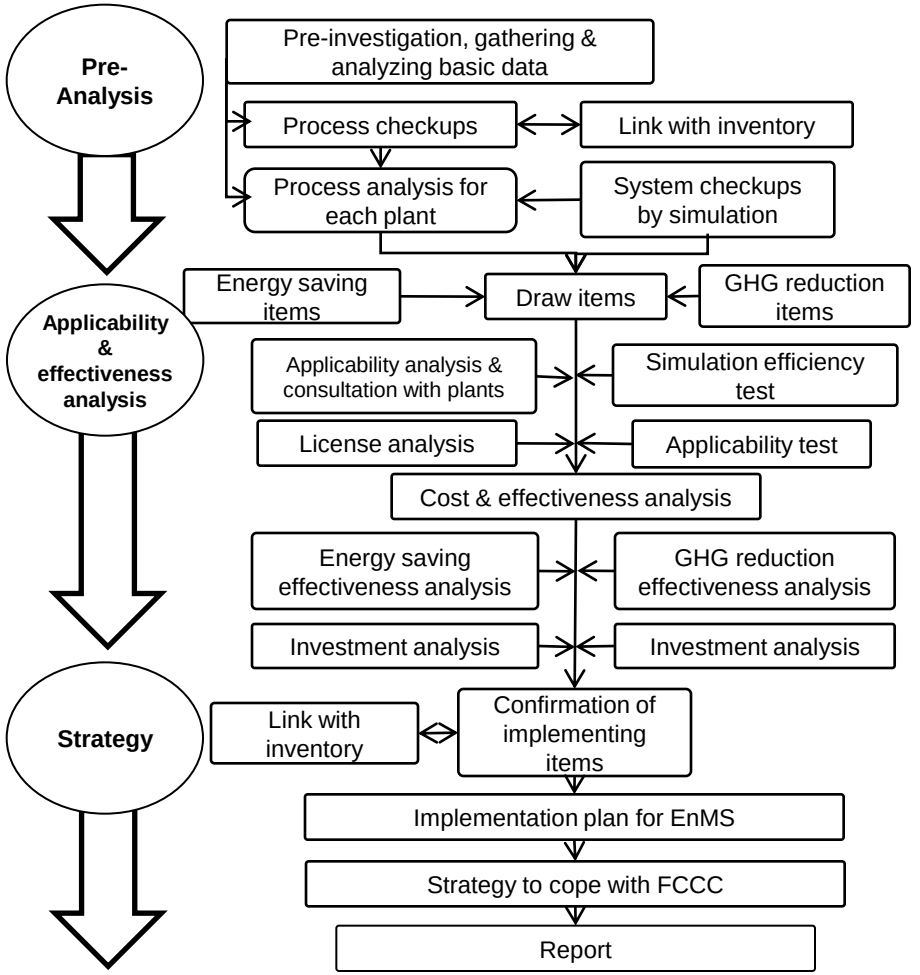
Energy Improvement through Simulation

Simulation

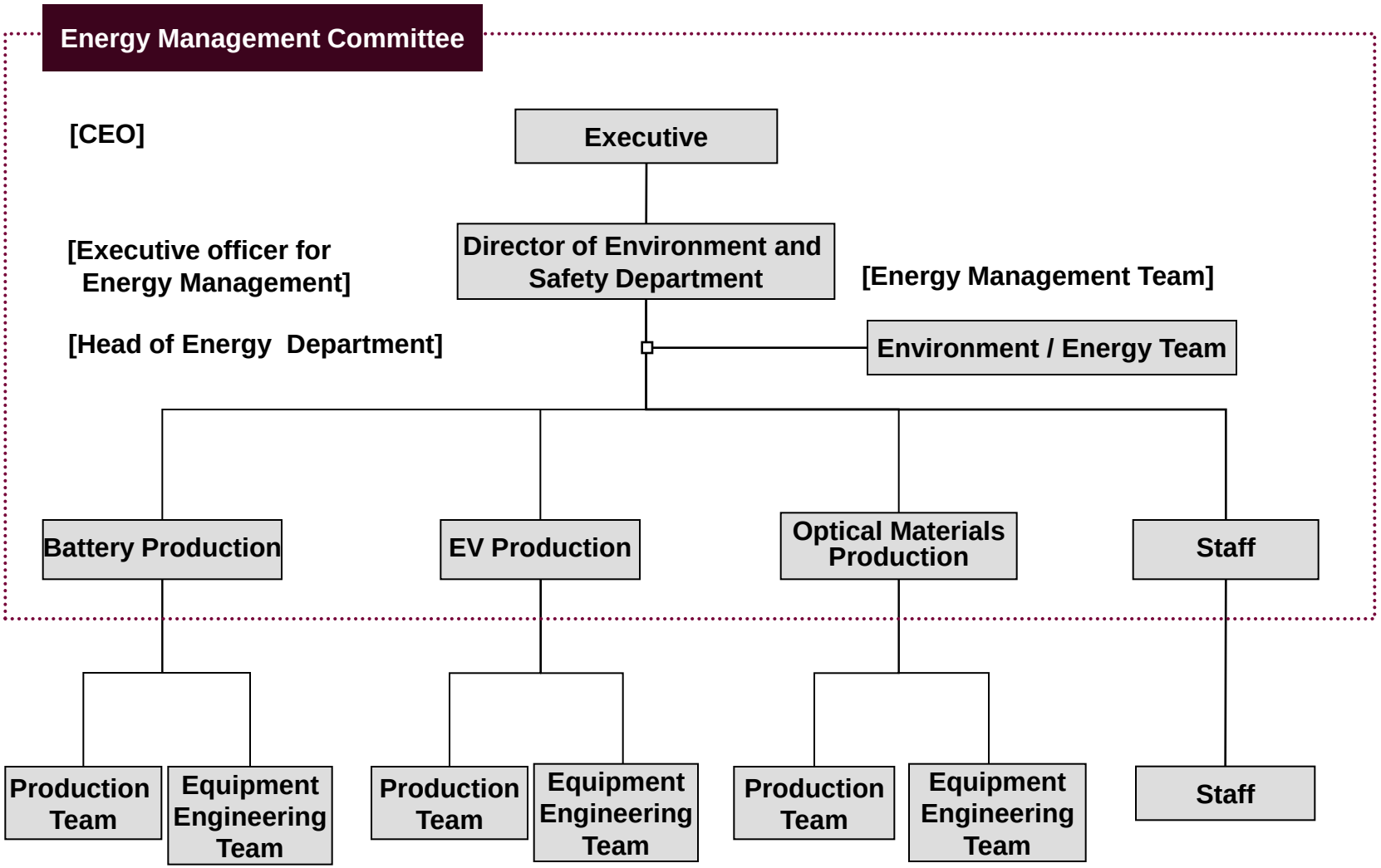
Load Calculation	Energy Analysis
Used to identify volumes and capacities of various facilities	• Energy forecast • Provision of optimizing application condition

→ Improvement Methods

Energy Saving & Climate Change



EnMS Organization (Ochang Plant)



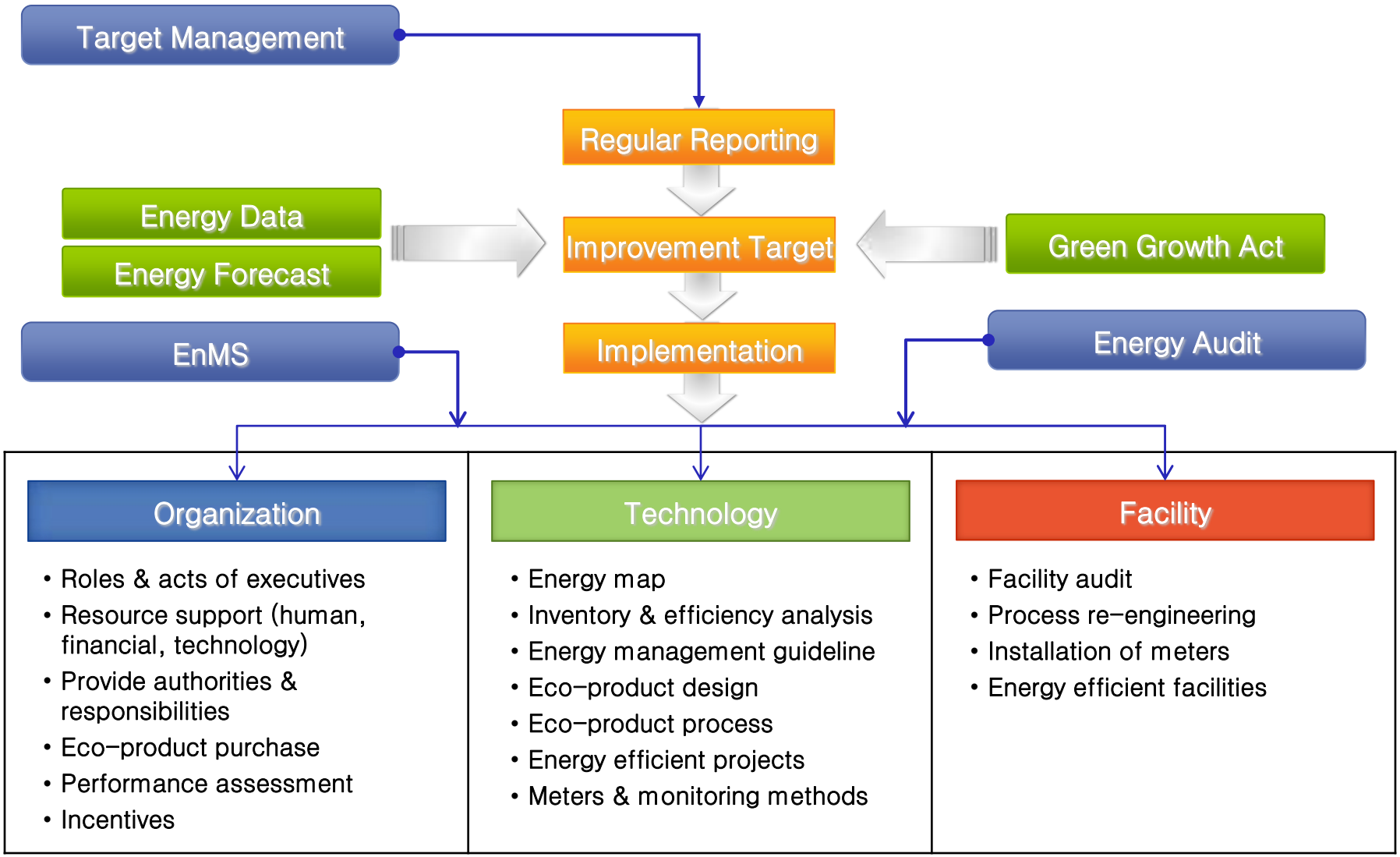
Project Development Process

Energy Facilities & Measuring Status Identification	• Identification of status on energy using facilities by developing relevant inquiry forms. • Identification of status on plants' energy meters.
Energy Balance	• Identification of monitoring points and energy current by drawing energy maps. • Identification of amount of energy input by each process, facility and plant.
Data Gathering & Analysis from Energy Aspect	• Development and management of energy aspect analysis form. • Management of segmented data : energy cost, power, fuel, and energy intensity.
Analysis Results	• Power utilities : compressor, freezer, large pumps • Heat generating utilities : steam boiler, thermal fluid boiler, RTO
Improvement Method	• Deriving energy saving items through energy aspect analysis • Setting targets for technology development & specific energy cost reduction

Application of EnMS with National Energy Policies

Categories	EnMS	National GHG/Energy Mgnt.	Energy Audit
Objective	GHG reduction & energy saving		
Subjects	Organization & system oriented	Plant oriented	Installation oriented
Basis	ISO 50001 / KSA 4000	Green Growth Act	Energy Usage Rationalization Act
Characteristics	Improvement activities through systemic approach	Data based target setting & implementation	Identification of improvement factors and implementation through facility diagnosis
Basic activities	• Analysis on energy related works throughout the whole organizational activities • Analysis on Specific energy inventory, effectiveness	• Investigating plants' energy usages and target setting • Rational target setting considering the BAU (Business as usual)	• Audit and improvement activities by processes or installations • Consultation from auditing experts
Methods	• Eco-product purchase • Considering energy when adding facilities • Managing real time energy data • Statistical analysis	Regulations & incentives	Auditing organizations & equipments

Future Plans



Thank You!!