

Material Issue 02

Paris Agreement and Climate Change

What is the impact on the company?

Stakeholder Impact Evaluation

Issue	Financial Impact	Reputational Impact	Operational Impact	Strategic Impact
Responding to Climate Change				✓
Internal and External Risk Management	✓			

Why is it important?

The Importance of the Issues

- In the Paris Convention, Korea proposed the target to cut GHG emission by 37% vs. BAU by 2030 - industrials will be responsible for 11.7%.
- Due to the characteristics of the energy-intensive refinery and petrochemical industry, energy costs for the production process are high. Thus, an increase in the price of carbon credit or any incremental rise in energy costs will have a direct and indirect impact on operating cost.

How is SK innovation responding to this issue?

SK innovation's Strategic Approach

- Form an emission trading strategy
- Pursue new energy businesses
- Increase energy efficiency in the production process

How is performance tracked?

Performance Measurements

- Management of GHG emissions target
- Minimization of risks in the emission trading system



Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all
Goal 13: Take urgent action to combat climate change and its impacts

[Link to SDGs](#)

As the government has recently tightened regulations on greenhouse gas(GHG) emission, industries recognize purchasing carbon credit and increasing energy cost as potential risk factors. In particular, the oil refining and petrochemical industry emits not only a large amount of direct GHG, due to fossil fuel combustion, but also a significant amount of indirect GHG related to the use of electricity and steam. Thus, each company needs to minimize the energy cost at their worksite by enhancing energy efficiency and maximize financial value by appropriately responding to carbon trading.

The Paris Convention Introducing Tougher GHG Emission Regulations

As global interest toward climate change increases, major countries such as the U.S. and China, reached a global consensus on the reduction of GHG emissions during COP21¹⁾. Participants committed to put their best efforts into setting a reduction target,²⁾ which will be submitted every 5 years. In addition, reviews on the implementation of the reduction targets will be conducted every five years from 2023. Korea, one of the top ten countries in terms of global GHG emission, proposed a reduction target of cutting emissions by 37% vs. BAU³⁾ by 2030, of which 11.7% will be achieved by industries. Therefore,

the overall manufacturing industry, including oil refining and petrochemical industries, are focusing their efforts to achieve this target. In addition, the government is expected to further strengthen GHG emission regulations on companies.

1) Conference of the Parties 21: The 21st yearly session of the Conference of Parties to the United Nations Framework Convention on Climate Change

2) Intended Nationally Determined Contribution(INDC)

3) Business As Usual: Emission outlook in the event no efforts to reduce GHG emissions are made

Responding to Climate Change in All Business Activities

Responding to Carbon Trading

SK innovation, SK energy, SK global chemical, SK lubricants and SK incheon petrochem have been designated by the government to receive allowance credits under the emissions trading scheme. During Phase 1(2015-2017) of the government's program, all SK innovation subsidiaries have adapted to the new scheme and overachieved their emission targets by conducting internal reviews to secure early reduction performance. To efficiently respond to changes in the market environment and regulations created by the introduction of carbon trading, SK innovation formed Carbon Trading Strategy and established Emissions Trading Operational Manual. The Strategy covers implementation measures from each stage of budgeting, ex-

ecution and purchasing. In addition, it also includes response measures to rising prices once companies start to purchase carbon credits, and plans to acquire additional carbon credits required to increase production capacity. Moreover, the procedures for the Emission Trading Operational Manual defines the relevant roles of each business division, and the detailed procedures of budgeting for emissions trading, organizing an Investment Committee, and executing the budget. In addition, the company has established Investment Guidelines, which requires it include the price of carbon credits when looking at investment opportunities to ensure the cost of carbon is used as a decision-making standard in prioritizing investment projects. Furthermore, SK innovation has adopted a Regulation on the Emergency Response for all affiliate companies. This regulation shall be used to effectively respond to external disasters, including electricity outages and abnormal weather conditions caused by climate change, such as typhoons and windstorms

Managing Energy in Each Operating Process Unit using EII

SK innovation not only saves energy by replacing equipment through facility investment and process improvements, but also uses the Energy Intensity Index(EII)¹⁾ to monitor energy consumption patterns. Using EII, the company sets and monitors the unit target by energy source, which reflects the optimum status of each operating process unit. The results of each week's energy analysis are shared with each production team to encourage more specific energy saving activities. With these efforts, EII in 2016 decreased by 1.1 compared to 2014; this reduction is equivalent to KRW 12 billion in cost conversion.

1) Energy Intensity Index: As The comparison of the refinery's actual energy consumption to the standard used as a benchmark by industry peers in Korea and abroad.

Discovering New Energy Saving Technology

SK innovation continuously performs worksite process optimization activities, such as waste heat recovery and heat exchanger improvements to reduce energy. In addition, to improve energy efficiency even more, the company searches for new technology, such as electricity generation or steam production using waste heat, upgrading to high-efficiency facilities, new processes and catalysts, and energy management solutions. Once the technological and economical feasibility have been confirmed, the technology is applied to the processes used at worksites. For example, changing to a new high-efficiency heat exchanger, which is used to recover heat, can economize fuel costs and reduce GHG emissions. Going forward, we will continue to search for new technology and engage in activities to improve the energy efficiency of our production process.

Expanding New Energy Businesses

Strengthening the Battery Business

To prepare for an energy paradigm shift in the future, SK innovation develops and produces EV batteries and energy-storage devices based on lithium ion batteries. This covers the entire battery production process from essential material like separators and electrodes to producing battery cells and battery packs. In particular, SK innovation improves both the driving distance and user-friendly electronic vehicle by possessing cell technology¹⁾. Based on this technology, the company has engaged in supplier agreements with major auto manufacturers in Korea and abroad, including Mercedes Benz, Mitsubishi Fuso and Hyundai Motor Group, and is developing EV batteries that meet a wide range performance and customer requirements. In 2016, SK innovation expanded its capacity to product 1GWh of EV batteries, which is equivalent to supplying batteries to approximately 40 thousand SOUL electric vehicles per year. In 2017, we are expanding the battery production unit 2 to 3.9GWh and expect to secure the production capacity to supply batteries to 140 thousand electric vehicles by 2018.

1) When energy density gets higher, driving distance is on the increase; when output density is high, accelerating power is excellent.



Using Recovered Waste Heat

SK innovation recycles wasted heat into energy such as high-temperature water, steam and gas. In 2016, the company collected total waste heat of 8,180TJ from Ulsan Complex(SK energy, SK global chemical, SK lubricants), which led to energy

savings of KRW 105.6 billion. In addition, recycling waste to energy allowed us to decrease carbon emissions by 413,413 tCO₂ and contribute to using energy more efficiently at worksites.



Ulsan Complex Waste Heat Recovery Boiler

Business Case

Using a Master Plan to Reduce Power Use

SK innovation implements an Energy Improvement Master Plan to reduce power costs, which account for the largest portion of operational costs. From 2015, the Master Plan includes demand and supply-side improvement items for fuel, steam and electricity. The Plan is executed in consideration of investment returns and timing for each item. Through these efforts, the company was able to save around KRW 25 billion in energy costs up to 2016. Further, the company identified continuous potential improvement items to establish its investment plans for 2017-18. During this period of time, it expects to save KRW 21.7 billion. All potential improvement items are review on technical feasibility, on-site applicability, and investment business economic feasibility to ensure their effectiveness.

