RISK MANAGEMENT AND RISK FACTORS

Risk Management

At PTTGC, we are aware of risks associated with our business operation, investment and strategy. Therefore, we have adopted enterprise-wide risk management in a systematic manner in accordance with COSO ERM (2004), which is the standard for risk management created by The Committee of Sponsoring Organization of the Treadway Commission in the United States of America. The committee is internationally respectable in internal audit and risk management. We have also adopted risk management process in accordance with ISO 31000 (2009), which is the standard for risk management created by International Organization for Standardization, whose task is to set a standard for a process management.

We emphasize on proactive risk management in both short and long terms. We employ our own pioneered Early Warning System (EWS) as a system used to monitor and analyze risks and uncertainties both of which emerge from external factors and, if any risks were to materialize, may affect our performance and/or investment considerably.

We conduct both qualitative and quantitative risk assessments using a Risk Map, a 4x4 matrix, in evaluating risk severity in term of relationship between impact and likelihood of the risk in question. There are a clear process and criteria for PTTGC risk assessment. The risk map, along with its risk profile, is required at corporate, business unit and function as well as important investment levels. We employ Monte Carlo simulation in assessing risk severity by deriving a Value-at-Risk (VaR) against our financial performance target. The analysis helps us in identifying potential impact on our financial performance under a possible scenario.

We have set a key risk indicator (KRI) for each important risk. The KRI will alert us of changes in the potential impact of the risk in question and/or the likelihood of its occurrence. This will allow the risk owner, management and RMC to be aware of a tendency of the risks we are facing. So we can be well-prepared in a timely and more efficient manner.

Moreover, PTTGC has been ranked in the Dow Jones Sustainable Indices by S&P Dow Jones Indices LLC., in the collaboration with the appraiser RobecoSAM, in 2014. The indices are worldwide respectable as an indicator reflecting the ranked company's business sustainability. In 2014, PTTGC was the one amongst 10 listed companies in the Stock Exchange of Thailand (SET) that were ranked in the indices; the one in 11 leading chemical companies worldwide that have been ranked in the indices for the second consecutive year; and the only one chemical company in Asia that was ranked in the indices. PTTGC received a full 100-point score under Risk and Crisis Management which could demonstrate an international recognition of our management under the concerned area.

In addition to the DJSI, we strive to manage risk in accordance with the requirement under the good corporate governance principles of the Board of the Year for Distinctive Practices Award (2013) we received from The Thai Institute of Directors Association (IOD). The IOD is recognized by the SET and internationally in its roles in developing professional qualification of a director and in promoting good corporate governance in Thailand.

Risk Factors

We place importance in managing risk to meet an international standard. However, due to the unique nature of the industries we involved, it may not be possible to avoid certain risks inherent in the industries that, if any of them were to occur, may significantly affect our business objectives or performance, and/or shareholders' expected return from investment in PTTCG.

Outside the risk factors that are discussed in this report, there may be a number of other risk factors that we do not know or are not aware of their significance at the time of this report preparation; are evaluated to fall within our risk tolerance but they later develop to be severe risk factors, which if they were to materialize could impact our businesses, investments or strategic objectives seriously; or exacerbate beyond our risk tolerance in the subsequent period.

In 2015, the key risks that could obstruct us in achieving business, investment and/or strategic objectives are summarized as follows:

Business Risk

Price Risk

PTTGC operates in the industries that always face a risk from prices. PTTGC Group's raw material/feedstock and product prices may fluctuate and/or change from a business plan significantly in a particular period during the year which could adversely impact our business performance. In the normal circumstances, we employ mechanism to manage the fluctuation and changes of these prices and our product-feedstock margin. However, in the period of tremendous fluctuation and/or changes of the prices, such mechanism may not be a full-effective response to the situation as occurred in the fourth quarter of 2014 during a sharp decline in crude oil prices. In the period, a hedging derivative and forward contract in crude oil and the petroleum products were more limited in usage than in the normal period. An opportunity to buy and sell the derivative and/or engage in the forward contract was extremely narrower than usual. Besides crude oil and petroleum products, our management of the price risk using hedging mechanism via a derivative or forward contract for other raw materials/feedstock and products is yet limited due to the absence of the market or lack of the market liquidity.

The prices of raw materials/feedstock we use and of product we produce are of or linked to the world markets, which are directly affected by a change in market expectation over demand for and supply of the respective raw materials/feedstock and products during a particular period of time. These demand and supply usually relate to a state of the world economy, which is beyond our control. Therefore, should the risk of these prices were to materialize, there could be a severely negative impact on our business performance.

Mitigation Measures : We have a policy in managing the price risk using natural hedging approach, wherever possible and appropriate, by setting a price formula in a sales-and-purchase agreement between us and a company under PTTGC, and amongst the companies under PTTGC themselves. The price formula of the raw materials/feedstock should link to the prices of the end products produced from them. Wherever possible, we endeavor to set the price formula to reflect several market prices which help reducing price volatility to a certain extent.

We centralize a production plan with the built-in process on close coordinating with GPCs and BUs, Olefins, Polymers and EO-Based in particular, in terms of ethylene allocation for the production units to use as feedstock that would yield the highest economic value to PTTGC under any existing constraints including the relevant sales-and-purchase agreements and market conditions. Were such practice to be efficient, effects on PTTGC from raw material/feedstock and product price volatility should reduce substantially.

We also manage the risk of raw material/feedstock and product prices of crude oil in particular and other feedstock and products whenever feasible and appropriate. We use, under the RMC policy and framework, a derivative and/or forward contract in managing this risk. Should the risk measures be effective, effects from the price risk on the company performance are expected to reduce substantially.

To counter the situation that the prices fluctuate and/or change abnormally as in the fourth quarter of 2014 - the period in which the crude oil prices declined sharply, we carried out a number of measures, most important namely: a setup of a special task force comprised of relevant executives and functions, primarily accountable in managing various relevant operations including monitoring of crude oil prices on a daily basis; an acceleration of sales without disruption in the market; a lowering of inventory; an entrance into gross refinery margin (GRM) hedging when practicable and appropriate; a cut of expenses without negative effect on PTTGC operation.

Feedstock Risk

Feedstock risk is the risk that we may not be able to secure raw materials/feedstock from suppliers especially ethane and crude oil. Ethane feedstock risk is that PTT Gas Separation Plants (GSPs) could not supply ethane per contract obligations including the agreed volume and reliability. Should this ethane risk were to materialize, there would be a severely impact on PTTGC Group's production. In our crude oil sourcing risk, it depends largely on the capability of PTT acting as a primary supplier of crude oil for us. Therefore, in the event PTT is unable to source crude oil per agreement with us, there would be a significant impact on our production as well.

Mitigation Measures : We have a close coordination with PTT in our production and ethane offtaking planning from the start of and throughout each fiscal year. Such coordination practice reduces the opportunity that we would receive ethane less than planned.

As PTT is the largest shareholder in PTTGC and its supply of feedstock to us is mostly under a long-term contract, it is the unique nature of petrochemical industry where the chance that the supplier of our key feedstock will not comply with or deviate from its contract obligation in a short notice is unlikely. On the perspective of our crude oil sourcing through PTT, it is considered that the risk related to the sourcing risk is also limited. Therefore, it is business as usual for PTT.

Operational Risk

Plant Operational and Disaster Risks

Plant operational and disaster risks are the two important operational risks of PTTGC. Plant operational risk is the risk that PTTGC Group's production or logistics of raw materials/feedstock and products on land and in the sea may malfunction or be disrupted caused by unexpected internal and/or external factors. Such factors could be, for instance, human error, accident, machinery breakdown and malfunctioned/broken logistics system. Should these factors were to materialize, PTTGC Group's businesses could be disrupted or miss the target plan which could subsequently impact our business performance seriously.

Disaster risk is naturally high in impact but low in likelihood. This risk, if it were to occur, could cause an adverse impact. One source of the risk is from the plant operational risk that materializes and then escalates. Disaster risk could cause a significant financial loss; a casualty of our employees and/or third party: or a severe damage to the environment. The incidents that could be a disaster risk are, for instance, a fire and an explosion occurred at one of our plants, equipment malfunction/breakdown, a leak in a piping system and/or from a storage tank; and a natural disaster. Should any of such the incidents were to take place, there would be an impact in various forms which could greatly damage our reputation and/or business performance both short and long terms.

Mitigation Measures : As we are aware of the risk associated in a plant operation, we set a plan in response to the business disruption as to cease emergency, control cause of difficulty, lessen loss of assets, protect lives and the environment from danger and recover plant operation back to normal as soon as possible. We also set preventive and predictive maintenance plans as to minimize a chance of the risks associated with equipment. We urge the necessity of having a manual and/or procedure of the processes related with plant operation and maintenance. We recognize the need for a regular training as to have our employees review their relevant manuals and procedures. This practice is expected to minimize the incidents caused by human errors, accidents or other disruptive events relevant to the plant operation.

In addition to the typical management of the plant operational risks, PTTGC Group also engage in setting up a system and process of Operational Risk Management (ORM) under the framework of Operational Excellence Management System (OEMS) of PTT Group. This ORM aims to raise a capability to protect and response of its group members to the accidents and incidents that may cause loss of life and danger to health or the environment. The ORM requires us to have the processes of an operational risk management throughout our organization.

Moreover, we are aware of a type of risks that are very low in the probability of occurrence like fire, explosion and natural disaster, all of which, if they were to occur, could severely disrupt our supply chain; cause casualty or danger to health of employees or the third party; and seriously damage our assets or the third party. We therefore implement Business Continuity Management (BCM). In 2014, our Branch 2 Olefins Plant I-1 and HDPE Plant have been certified by Management System Certification Institute (Thailand) for their Business Continuity Management System that meets ISO22301:

2012 standard. We are also in the process of expansion our BCM to other plants in 2015 which we believe that BCM will shorten the disruption period and/or lessen impact from the disruptions should any unplanned event were to materialize.

PTTGC adheres to the policies regarding health, safety, and the environment starting from the inception of each key activity/project. All aspects of key activity/project include technologies used and process selection, design and installation, operation methods, adherence to safety culture, environmental risk assessment activities, protection and reduction of environmental impact on stakeholders, compliance with applicable laws, rules and regulations and continued improvement and development of environmental management as well as communication to all relevant parties. With regard to environmental management, ISO14001 standard is maintained. On a regular basis, we prepare a report of the results from the implementation of environmental protection and correction; and from the monitoring of quality of the environment for the Office of Natural Resources and Environmental Policy and Planning. We believe that by adherence to the above practices, the likelihood and/or impact of the plant operational and disaster risks on environment will reduce significantly.

Moreover, we have a policy to hold an All Risks Insurance Policy, Business Interruption Policy and a Third Party Liability Insurance Policy, all of which meets an international standard. This practice aims to minimize losses to us in case a disaster risk actualizes.

By reviewing and raising our measures in disaster risk management in terms of prevention, correction and prediction and the transfer of such risks whenever appropriate, we believe that our plant operational and disaster risks will reduce significantly.

Raw Water Shortage Risk

Raw water shortage risk is the risk that PTTGC Group may not have sufficient amount of water for a plant operation for the water suppliers are unable to supply types of water as specified in the contracts. A potential drought in Rayong province and the surrounding areas in 2015 and in any given year may, if it were to occur adversely, cause a sizeable reduction in raw water in the key reservoirs in the province. Consequently, our water suppliers may not be able to secure raw water for subsequently supplying to their customers, including us. Should this risk were to materialize, we may have to slow or even shut down our operation at some or all plants, which could impact our business performance seriously.

Mitigation Measures: Although the water shortage risk is beyond our control, we have kept an eye on this risk constantly in the past years as we wish to be well-prepared for the shortage when it comes. We are monitoring the change in raw water in the reservoirs and potential drought in the Eastern region of the country, Rayong and Chonburi provinces in particular. We have continued a follow-up of the progress of the preventive-and-corrective plan for drought under management of the responsible agencies. In the event of the shortage, we would activate our water management plan with regard to PTTGC Group's economic value, impact on our raw material/feedstock suppliers and customers, and logistics limitation as well as other remaining constraints. Our plan will be more intense when the probability of the risk occurrence rises as in our preparation for this risk last year. We believe that PTTGC Group readiness for the risk will lessen the impact to a certain extent should it were to materialize.

Reputational Risk

The nature of refinery and petrochemical industries in which we are doing business has an inherent risk of causing an event that may harm health, safety and/or property of our employees and people in the communities surrounding our production bases and logistics systems. Despite the fact that the probability of such risk occurrence is low, should our stakeholders, people in the communities and the public are not well-informed in the essence of the control and mitigation measures of the risk, they may refuse or distrust our business operation to the degree that we may not be able to operate normally and/or expand investment as planned.

In addition, PTTGC is an LPG user in an upstream petrochemical process. Likewise the household and transportation sectors are also LPG users. As a consequence, regarding the price structure and usage of LPG, the information and news from sources available to the public could, if incorrect materially, cause our stakeholders and/or the public misunderstand the essence of our LPG usage. Consequently, this could damage our image and reputation considerably.

Mitigation Measures : We place importance in reaching out to our neighboring communities as to respond to the issues in question, their expectations, our responsibility and the trust establishment. We have engaged more than 80 communities in the areas of education, economics, health and sports, and the environment.

With respect to the information about our LPG use, we emphasize a continued explanation about the fact and relevant consequence regarding the use of natural gas in petrochemical industry via media such as our website.

Financial Risk

Foreign Exchange Risk

Foreign exchange (FX) risk is our prime financial risk. FX fluctuation and changes in an unfavorable direction cause this risk. Our revenues and raw material/feedstock costs are mostly in or referred to the prices in the US dollar. We also possess the US dollar-denominated assets and liabilities, of which the latter is caused by our financing in the US dollars. As a result, the rate of and fluctuation between the Thai baht and US dollar would have an impact on us in baht term.

Mitigation Measures : To protect our businesses from the FX fluctuation and excessive changes in the rate of exchange beyond our acceptable level, we employ a FX hedging instrument by selling and/or buying the US dollar forward according to our FX target and consistent with PTTGC Group's business and investment plans. All the hedging activities are under the framework approved by the RMC.

Strategic Risk

Long-term Feedstock Risk

Long-term feedstock risk is the risk related to PTTGC Group inability to secure raw materials/feedstock, ethane in particular, sufficiently and/or at a competitive price according to our long-term plan. The risk involved the issues covering the potentially declining volume of natural gas in the gulf of Thailand; changes in laws and/or regulations all of which may cause the prices of our key raw materials/feedstock and/or logistics cost to rise; the inability of the existing logistics system to facilitate a larger volume of import raw materials/feedstock - should the need to import the raw materials/feedstock substitute arise; and a possible change in the assumptions adhered to the price formula in our purchase-and-sale agreement with PTT, creating an amendment of the agreement which could result in the reduced ethane to be received from PTT and/or a higher price for ethane. Should any of the above issues occur, our business performance and/or long-term growth plan could be seriously affected.

Mitigation Measures : We closely follow forecasts of natural gas in the gulf of Thailand which will directly affect the ethane volume we will be offtaking from PTT GSPs, and a tendency and change in relevant laws and regulations which could affect our ethane sourcing from the domestic GSPs. Although we do not have control over this long-term feedstock risk, we endeavor to lessen the impact from it by conducting the feasibility study of alternative feedstock usage and import. The study covers economic justification, logistics readiness and other related issues.

Investment Risk

PTTGC is in the industries which are capital intensive and require technological advancement, large production to achieve economies of scale, vertical integration to realize synergy throughout supply chain, as well as rely on special experts. With regard to the chance and necessity to achieve the above characteristics of the industries, there is therefore the need for us to broaden our investment abroad. Consequently, we may have to encounter the investment risk from greenfield investment, joint venture, merger and acquisition, especially from abroad. Such risk may cause investment delay, cost overrun and investment under-performance all of which, if any of them were to materialize, could severely impact our cash flow, raise our financial cost, cause our objectives to fail and/or hinder our growth.

In fact, the investment risk can come in various forms from a study phase to an execution period. The study phase starts from investment opportunity seeking down to feasibility study. In the study phase, the risk factors are usually highly uncertain. They are, for instance, a change in government policy, uncertainty in law and regulation practices or interpretation, a protest from a community/the public, difficulty in seeking for strategic partner, misalignment in business model, inaccessibility of required technology, higher competitiveness of substitute technology, inability to source raw material/feedstock to meet the amount required, ill-prepared staffs accountable for investment subjects, greater impact on environment than expected, a change in market structure, a difficulty in long-term forecast of market, a significant change in trend or price structure of raw materials/feedstock, products or utilities, foreign exchange rate uncertainty and/or volatility, organizational culture and/or structure of an investment misaligned with those of us.

Should we continue with the investment we complete a study in depth, some risk factors in the execution period may differ from the study phase. They are, for instance, higher-than-expected impact on the environment and health of the communities nearby; delays in project design, authority approval, equipment and machinery procurement, and construction; plant commissioning difficulty; inability to source raw materials/feedstock per the amount required and/or at the investment assumption prices; ill-prepared logistics system for raw materials and products; inability to penetrate existing and/or new market at the level desired; and lower-than-expected product-feedstock margin.

Mitigation Measures : We prescribe the owner of investment or project to assess and manage investment/project risk in accordance with the policy, management framework as approved by the RMC. The risk assessment process will follow our investment Stage Gates which cover from the opportunity seeking to the requesting for the Board of Directors' approval. Each process of investment consideration requires management to provide an opinion regarding various concerns such as an alignment with the growth strategy of PTTGC and the assessment and management of the investment risk.

In fact, PTTGC requires that all sizable investments and projects must be processed through the RMC for consideration and approval regarding the sufficiency and appropriateness of risk assessment and risk mitigation plan before the investments/projects in question can be proposed to the Board of Directors for approval. Owners of the investments and projects that assess and manage risks have to review their assessment and report the progress of risk management on a regular basis as guided.

We believe that if we can effectively manage the investment/project risks according to our policy, framework and guideline for investment risk management, it will help reduce the likelihood of risk to materialize. Furthermore, we have a policy to insure the project while in the process of construction according to the international standard as to minimize an impact to us should the project risk were to take place.

Human Resources Risk

Human resources (HR) risk of PTTGC is the risk that we are not able to recruit a staff as required or retain an existing qualified staff for our existing operation and strategic growth. Due to the needs of a knowledgeable, skillful and experienced staffs in the growing refinery and petrochemical including Specialty industries worldwide, it is difficult for us to recruit a certain qualified staff as planned. On the other hand, to retain and develop the existing staffs to meet our strategic direction is yet important. If we cannot manage it efficiently, we may lose these valuable employees as well.

Mitigation Measures : We are aware of the above HR risk so we set a number of measures including an increase in the channel to recruit a potential staff both domestically and internationally by joining with leading academic institutions and professional recruitment agency. Such activities aim to seek a required staff to fill in the vacant position in the areas like special chemical expert, for instance. Additionally, to develop a capability of our existing staffs, we urge them to set their individual development plans (IDPs). We emphasize our organizational culture to be consistent throughout PTTGC. We believe that by managing as mentioned we can lessen the HR risk to a certain degree.

Fraud Risk

Fraud risk is the risk that our executives, employees and the third parties acting in our orders, on behalf of or in the task assigned by us commit fraud against PTTGC or the other third parties. As a consequence from this kind of activities, there could be an impact on our financial performance and/or reputation severely.

Mitigation Measures : We require any relevant employees to identify and assess the probability of a fraud and corruption in their key working processes, and review the sufficiency of the existing controls and additional mitigations to control the risk to be within our acceptable level. Our process of this practice is in our internal control system. We also have Corporate Compliance Policy covering the subjects of Antitrust Law/Competition Law Policy, Anti-Corruption and Anti-Bribery Policy, Human Rights Policy, Intellectual Property Policy, Anti-Money Laundering and Combating the Financing of Terrorism Policy, Confidentiality of Information Policy, and the policy over other laws, rules and regulations which concern businesses of PTTGC and PTTGC Group. We encourage our directors, executives and employees to follow PTTGC Business Code of Conduct.

In spite of our systematic risk management, we have been impacted from the price risk significantly, from the volatility and decline in the prices of crude oil and our products; and in the margins between our product prices and their feedstock costs in particular. Also, we have been affected from the aforementioned plant operational risk. Nevertheless, we endeavor to learn and develop our practice in risk management aiming to raise its effectiveness to the maximum level possible. We believe that the more effective risk management it will be, the higher the chance that we can succeed our business, investment and strategic objectives in the future.