# ECONOMIC FEASIBILITY ANALYSIS ON THE KOREAN UNDERGROUND NATURAL GAS STORAGE IN PREPARATION FOR RUSSIA PNG CONNECTION

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## Overview

This study concerns how to assess economic value of underground natural gas storage facility in South Korea. South Korea has imported Russian gas since early 1990's. Debates on PNG project became substantial in May 2003. Both countries have made a lot of efforts on it and finally summits agreed to transmit Russian natural gas by pipeline which passes through North Korea (28th September, 2008). However, couple of military events between North and South Korea have strained their relations and PNG project have actually stopped until North Korea notified its intention to attend PNG project in August 2011.

In South Korea, LNG is nearly the sole mean that restrain national gas demand. LNG is literally in liquid state and cannot be stored in the long term because it boils off. As a result, storage period is short – generally daily, and weekly at best. But, when PNG project is successfully completed, gaseous state natural gas is imported and when we sore it underground, storage period can lengthen to monthly, and it enables strategic reserve. Like other countries that have four seasons and are heated with natural gas, South Korean gas demand shows clear pattern – low in summer, high in iwinter. Once PNG contract came through, imports cannot be adjusted because pressure inside pipeline should be maintained at a certain level. For these reasons, there will be 850 thousand tons of surplus gas supply during summer after Russia PNG introduction.

In general, depleted oil/gas field, salt cavern, or aquifer are utilized to underground gas storage. However, those geologic structures do not exist in South Korea, and therefore LRC (Lined Rock Cavern) technology which is free from it can be a sound alternative.

## Methods

The first stage in valuation is to set up alternatives. In this study, do-nothing alternative which one should always consider in decision making is that South Korea consume PNG by priority and store surplus LNG using existing LNG storage facilities. This alternative does not require additional construction of anything but it cannot store natural gas for a long period. Challenger alternative is to consume both PNG and LNG as well as store both state of natural gas. South Korea should pay construction cost for new LRC facilities but it ensures long-term strategic storage.

Net Present Value (NPV) methodology is likely to serve as a effective mean to calculate value of each alternative. NPV means a value of cash flow up to time t plus residual value. When all cash flows are converted into present point value, it can be a basis for comparison. NPV has to have at least positive value in order to ensure investment value of a project.

$$NPV = \sum_{t=1}^{T} \frac{I_t}{(1+r)^t} + \sum_{t=0}^{T} \frac{O_t}{(1+r)^t} + A$$

where $I_t$ denotes net cash inflow at t, $O_t$ net cash outflow at t, $r$ risk-free opportunity cost for capital, and $A$ present value of capital or residual value.

## Expected Results

It seems that do-nothing alternative has more economic value because the other requires large sum of construction cost. However, considering value of strategic reserve may change the result. The key is whether the value can make up the construction cost or not.

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