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Economic Watch

Peru

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Economic Analysis

Peru

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Natural Gas: an assessment of its economic impacts

- **The use of natural gas (NG) has generated savings for the economy, with a positive impact on productivity and economic growth**
  From 2005 to 2010, the use of NG explained about 20% of productivity improvements, and contributed with an average of 0.6 pp to annual economic growth.

- **On the long term, the use of NG for electricity generation is not necessarily the most efficient alternative**
  Instead, increased industrial consumption of NG, replacing the use of diesel, would maximize the potential of this resource to generate added value for the economy.

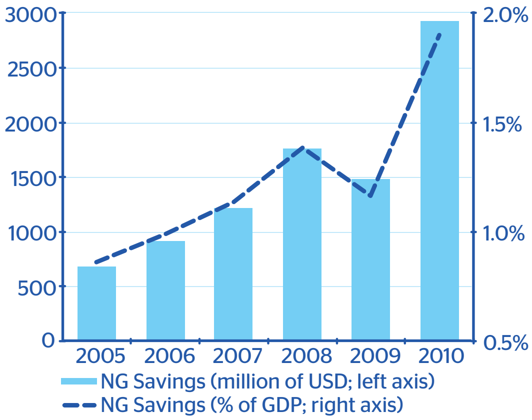
- **An appropriate pricing policy could give incentive to both, the efficient usage of the resource and the rise in NG reserves**
  The pricing of new NG commercial stocks could be used to provide signals for appropriate usage of the resource, and would also determine the profitability of exploration and extraction activities.

Savings from natural gas (NG) benefit industry, families and mining

Camisea, the NG field that concentrates almost all of the reserves of this fuel in Peru, came into commercial operation in August 2004. Since then, NG has produced significant savings for the economy[1]. These savings result from lower costs for users of NG compared to alternative fuels: diesel for electricity generation and industrial production; gasoline for automotive vehicles; and liquefied petroleum gas (LPG) for domestic use. From 2005 to 2010, the usage of NG from Camisea resulted in savings amounting to USD 9 billion, which represents 1.3% of GDP of the period. As usage of this resource has increased, the annual saving has also increased (see Chart 1), with the saving in 2010 ascending to 1.9% of GDP.

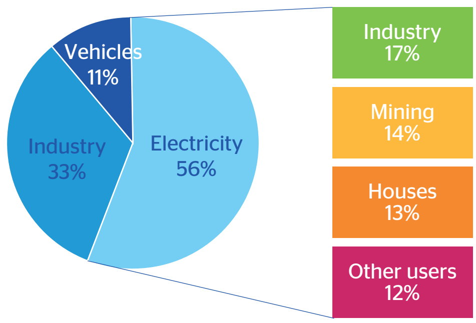
The main beneficiary of this saving has been the electricity sector, with 56% of the total. Industrial and vehicle users benefitted by 33% and 11% of the total saving in this period, respectively.

Chart 1
Savings from natural gas (US$ million)



Source: MIENM. Prepared by: BBVA Research Peru

Chart 2
Beneficiaries of savings from NG consumption (% of the US$ 9 billion total saving)



Source: MINEM. Prepared by: BBVA Research Peru

Furthermore, through the use of electricity generated using NG, companies and families have also benefited as electricity sector prices are largely determined by NG generating costs. Energy prices in the spot market are calculated based on the unit with the highest variable operating cost (out of those operating) at different times of day. Furthermore, tariffs for contracts between generators (sellers) and free clients and distributors (buyers) are set using historical and expected spot prices as a reference. The increase of electricity generation using NG means that the units which serve as reference points for spot prices are, most of the time, those that use this fuel. Moreover, if NG had not been available, diesel would have had to be used, increasing generating costs and prices for electricity users[2].

Taking electricity sales by user type as a reference, we estimate that, through the use of electricity generated using NG, non-mining industry obtained an additional saving calculated as 17% of the total saving (taking the total saving for this segment to 50% of the total), and the mining industry has benefited with 14% of the total saving. Also, through the domestic use of electricity, families saved USD 1.2 billion from 2005 to 2010.

Increased NG usage has had a positive impact on growth

Lower costs for electricity generation, industrial output and mining mean that the use of NG results in GDP being higher than it would be if the resource was not available. With the exception of 2009, savings from NG usage have increased year-by-year, not just in dollar terms, but also as a percentage of GDP (Chart 1). As a result, NG had an increasing impact on GDP, which in turn fed through into higher growth in this period.

1: Camisea consists of Blocks 88 and 56, which together have proven reserves of 10.9 trillion cubic feet (TCF=1012 cubic feet) of NG.
2: Whilst units which generate using NG quote variable costs in the range USD 30 to USD 45 per MWh, units which generate electricity from diesel claim variable costs in the range USD 140 to USD 250 per MWh.

According to our estimates, 7% (0.6 pp per year on average) of economic growth from 2005 to 2010 can be explained by the use of NG[3]. In 2010, there was a significant increase in NG usage, and 10% of the GDP increase in that year can be attributed to this: in other words, in the absence of this fuel, growth would have been 7.9% rather than 8.8%.

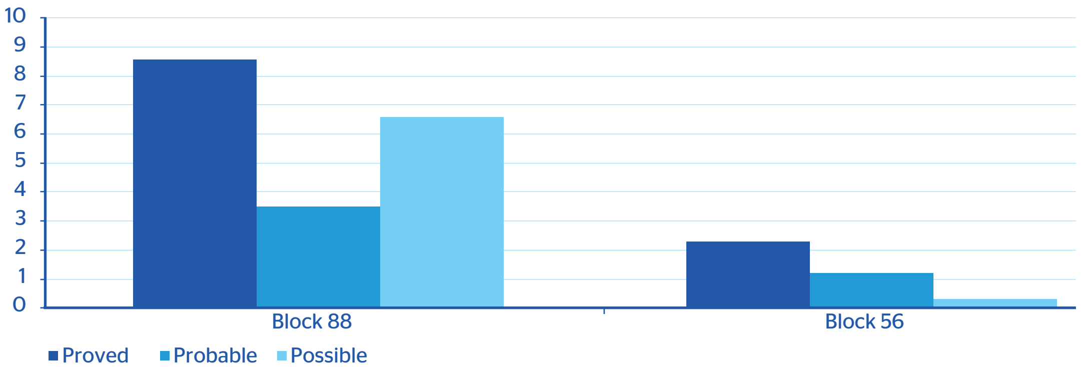
In economic measurements this saving has been interpreted as an increase in productivity, as the statistics which quantify the latter are a residual equivalent to the fraction of economic growth that cannot be attributed to the traditional factors of production (labor and capital). In this regard, if productivity increased by an annual average of 2.5% over the last decade, as reported by BCRP (2008), since 2005, 0.6% of this growth (over 20%) cannot be attributed to more efficient use of factors of production, but should be assigned to the availability of this primary energy source.

An increase in NG reserves would boost growth

Current domestic consumption and export contracts imply a maximum usage of 9.6 TCF of NG, which represents almost 90% of proven reserves in the two blocks of Camisea (10.9 TCF). Therefore, in the medium term, proven reserves need to be increased so that this resource can be use more extensively by firms and families.

Furthermore, certification of a larger volume of proven reserves in Block 56 would release the 2.1 TCF from Block 88 that guarantees the export operations, increasing local availability of the fuel. Initially, Block 88 of Camisea was intended for domestic consumption and Block 56 for export. However, as the volume of NG committed to for export is 4.1 TCF, and the proven reserves of Block 56 amount to 2.3 TCF, the Government permitted that 2.1 TCF from Block 88 to be used as a guarantee for the export project.

Chart 3
NG reserves of Camisea (TCF)



Source: MIENM. Prepared by: BBVA Research Peru

On the long term, the usage of NG for electricity generation is not necessarily the most efficient option

In order for NG to have the greatest impact on economic growth, its use should be oriented on activities in which it replaces the most expensive alternatives. To illustrate this idea, we will look at the case of electricity generation, for which there are a number of alternatives to NG, with differing costs: diesel, hydroelectricity, coal and renewable energy sources. In the short term, the alternative to NG is diesel, as they share the same electricity generation technology. However, over the longer term, the substitute for NG would be hydroelectricity, as the cost of electricity production (taking into account investment, operating and maintenance costs and fuel and non-fuel costs) is similar to that of NG; therefore, there is no saving from replacing electricity which could be generated from hydro resources with NG.

3: In order to estimate impact on growth, we calculate: i) the increased saving from NG use each year; and ii) the proportion that this increased saving from NG represents in terms of the increase in GDP. 2009 is not considered as this was the only period in which NG usage fell, as a result of the international financial crisis (the domestic economy contracted by 0.9%).

Methodologically, the “short term” is defined as the period in which investments to install hydroelectricity generating plant would become effective: taking into account the preparation and evaluation of projects, this could take about 6 years. In this regard, from 2005 to 2010, the start of hydroelectric project operations was not necessarily linked to the availability of NG, but to the lack of planning of generating resources in earlier years. Given this absence, NG made it possible to replace the diesel which, otherwise, had to be used to meet the increase in electricity consumption in those years. However, over the longer term, the lack of new hydroelectricity generation could also be linked to the NG pricing policy.

This distinction between short and long term is important because each of these alternatives results in a different estimation of saving from NG usage. The total cost (fixed plus variable) of generating electricity from NG is similar to that for hydroelectricity: if we assume that from 2011, the alternative to increased usage of NG for power generation will be hydro generation, rather than diesel, there would be no increased saving from such usage, and the effect on growth would therefore be null. In this regard, if, as reported by MINEM (1968), there is a potential exploitable hydroelectric output of approximately 60 thousand MW (compared with a current maximum demand of less than 5 thousand MW), using NG for electricity generation is not necessarily the most efficient option in the longer term[4].

On the contrary, there are fewer substitutes for NG in industrial uses and applications, and the market prices of these are higher. For example, the wellhead price of one GJ (giga joule) of NG for industrial use is USD 2.7, whilst generating the same amount of energy from oil would cost almost six times as much, at around USD 16[5]. Also, the usage of NG as a raw material in the petrochemical industry could generate additional advantages. However, the appropriateness of that option needs to be analyzed on a case-by-case basis, as it is not just dependent on the price of NG, but also on the final product and the target market.

Energy policy should aim to establish prices which encourage availability and the best use of NG

The exploitation of the savings generated by NG establishes two energy policy objectives. First, given the benefits, energy policy should give incentives to the discovery of more NG reserves and the certification of more proven reserves. Second, as the scale of the benefit depends on the alternatives to its use, the efficient use of NG should be promoted.

In relation to these goals, since the beginning of the commercial operation of Camisea, the low domestic price of NG in energy generation resulted in the mass installation of gas-fired capacity, and discouraged the construction of hydro facilities. As a result, from 2005 to 2010, the installed capacity of hydro-electric output increased by just 230 MW, whilst the installed capacity of thermal-generating capacity increased by 2,181 MW, almost ten times more. The reason for this is that the cost of the fuel used in NG generation does not offset the increased cost of investment in hydro-electric capacity.

At the same time, the low cost of NG did not give incentives to the use of combined-cycle generating plant. The adoption of this technology, which results in a 50% increase in electricity generation per unit of NG used, has only been taken up recently, due to restrictions in NG supply, linked to transport and contracting limits. In this regard, the 530 million cubic-feet which the NG pipeline can currently transport daily from Camisea to Lima is being fully utilized, and the availability of larger volumes of NG in the medium term depends on increasing the capacity of this pipeline to 920 million cubic-feet, which is planned to be completed by late 2012.

4: A more precise optimization of the electricity generating pool would take into account the daily profile of electricity consumption, the costs of potential (fixed) and energy (variable), and resource availability. Variability in the availability of water makes it desirable to maintain a proportion of thermal-generating capacity in order to ensure security of supply.

5: A Joule is a measurement of energy equivalent to the work necessary to generate one watt of power for one second (1 GJ = 109 joules). It is assumed an oil price of USD 85 per barrel with an energy content of 5.5 GJ.

The current wellhead price of NG for electricity generation is USD 1.6 per GJ, 40% lower than that charged to the industry (USD 2.7 per GJ) and less than half the most frequently used international reference price[6]. The elimination of this NG price differential and the establishment of a single price for electricity users and the industry would give incentives to a more efficient usage of the resource. First, it would decrease the advantage in terms of returns on gas-fired generating projects compared to hydro-electric projects, thus promoting increased use of water in electricity generation. Second, lower NG usage in electricity generation would enable increased industrial use of NG. Furthermore, a common price closer to the international level would promote the use of the resource in the most profitable activities.

In the future, this common price could be applicable for new fields which come on stream to supply the domestic market. This would also avoid subsequent attempts to correct distortions through special measures, such as tax breaks for hydroelectricity or special auctions to purchase energy from such power stations. In parallel to this, a higher NG price would increase the expected returns on exploration and extraction, which would encourage investment in such activities.

Finally, it should be stated that to the extent that the improvements in productivity in GDP have not been solely due to the more efficient use of the traditional factors of production (capital and labor), measures to increase the general productivity of the economy should also be maintained and boosted.

References

BCRP (2011). June 2011 *Inflation Report*. Central Reserve Bank of Peru. Lima.

MINEM (1968). *Evaluation of Domestic Hydroelectricity Potential.* Ministerio de Energía y Minas (Energy and Mining Ministry) Lima.

6: The NG Henry Hub price was USD 3.5 as of 7 October, fluctuating in the range USD 4.0 to USD 4.5 during the year.

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