



CAMBRIDGE RESOURCES INTERNATIONAL

## Analysis of the Peru LNG Project

By

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## Background

Major development and export credit institutions will soon vote on over \$1 billion in loans and guarantees for a liquefied natural gas (LNG) project in Peru—the largest foreign investment in Peru’s history. The World Bank Group, the Inter-American Development Bank and the U.S. Export-Import Bank will vote in coming weeks on whether to back the project.<sup>i</sup>

Called Peru LNG, the project consists of the construction of a liquefied natural gas plant, a related marine loading terminal and a 408 km (252 mile) pipeline. The project will connect to a natural gas pipeline which runs from Peru’s Camisea gasfields, an environmentally sensitive area of the Amazon rainforest. The project sponsors are Hunt Oil Company (U.S.), SK Corporation (South Korea) and Repsol YPF S.A. (Spain).

The Inter-American Development Bank (IADB) recently released a report finding that Peru will enjoy significant economic benefits from this project. Conducted by Apoyo Consultoría, a Peruvian consulting firm, it concludes that Peru LNG will generate about \$4.3 billion in foreign exchange and \$1 billion in fiscal revenue.<sup>ii</sup>

## The findings

It is clear that domestic consumption is a more efficient use of gas than LNG sales and that the rationale for exporting LNG is that there are more reserves than are needed domestically for a number of years. Hence, we estimate the number of years of assured domestic supply Peru would need to set aside before LNG exports would be economically beneficial for the country. The current legal framework in Peru requires only a one-time period of 20 years’ assured domestic supply, and many have questioned whether even that can be satisfied if the Peru LNG export project is built, given Peru’s aggressive expansion in the domestic use of gas and plans for petrochemical industries. We find that, given conservative assumptions, Peru would need much greater reserves set aside for domestic use than it now has. Without additional reserves, having to import additional petroleum in the future will cost the country more than it is likely to benefit from LNG exports.

The bottom line: It is questionable whether exporting any liquefied natural gas is economically justified at this time. When the current and future needs of the country and the present level of proven reserves are considered, exporting liquefied natural gas is likely to make Peru worse off than if it used the gas for its own use and to displace oil imports in the future. There may be greater reserves, but until these are proven it is not prudent to commit the country to exports of liquefied natural gas.

## The analysis

This analysis addresses the following question: If the future needs of the country for hydrocarbons are taken into consideration, will the export of liquefied natural gas from Peru make the country better off or worse off?

For much of this analysis we use the basic information from the report prepared for the Inter-American Development Bank by Apoyo Consultoría, *Proyecto Camisea: Impacto Sobre El Mercado del Gas Natural y Estimacion del los Beneficios Economicos*, May 2007. While the report presents an exaggerated estimate of the economic benefits from the export sales of natural gas, it does provide us with a set of input information so that the basic factual data used in our analysis is consistent with this previous study.

It is clear that domestic consumption is a more efficient use of gas reserves than LNG sales and that the rationale for exporting LNG is that there are more reserves than can be used by current and projected domestic demand for a number of years. Hence, we began to address our central question by estimating the number of years of gas reserves that Peru would need to have set aside for the domestic market before it should export LNG.

## Assumptions made in the analysis

The IADB-Apoyo report highly exaggerates the net benefits of the development of the Camisea gas fields by applying multipliers to the income streams generated by the project without considering the economic costs associated with the creation of these secondary effects. As many oil producing countries have found out to their sorrow, when the costs of the secondary effects of a petroleum boom are subtracted from the value of the activities generated, more often than not the net benefits have been negative. The Apoyo study does not even mention the well-known problem of the Dutch Disease effects, in which exporting natural resources increases the value of a country's currency, affecting the exchange rate and dampening traditional exporting sectors. In a similar fashion, the study quotes export sale values and foreign exchange earnings as if they were net benefits to the country. Except in a footnote in the appendix, no consideration is given to the fact that most of these revenues will go to pay for the investment and operation costs of the system, in addition to financing the flow of dividends and other payments to the foreign parent companies of this project.

The Apoyo study is correct in identifying the very substantial economic savings received by Peru if natural gas is substituted for other fuels in the generation of electricity and other industrial purposes. In this situation, the economic cost of the natural gas is substantially lower than the economic cost of using alternative sources of energy. For the 2000 to 2033 period, Apoyo (p. 59) estimates the savings from electricity generation alone to have a present value (using a real 12% discount rate) of \$6.618 billion.

It is clear that the economic benefits from the domestic use of gas are much higher than the benefits of exporting liquefied natural gas. By comparison, the major tangible net benefit from the export of natural gas is the royalty payments that are estimated to amount to a present value of \$1 billion (Apoyo, p. 73).

We have assumed that the price of exported natural gas at the place and time it leaves the ground (the "wellhead" price) will be higher than the current wellhead price of U.S. \$1.37 per mmbtu<sup>iii</sup> that is now received on domestic sales of natural gas to generate electricity (Apoyo, p. 81). Given the very high costs associated with the production and transportation of the liquefied natural gas, it may be the case that the net-back wellhead price paid for the LNG gas exports will even be lower than the current \$1.37. Hence, our analysis tends to overestimate the benefit of exporting LNG.

From the agreement between the oil companies and the government, it appears that the only significant and uncontroversial benefit to the country from the export of LNG is the revenues from the royalty levied on the wellhead price of export sales.<sup>iv</sup> The other net benefits are speculative, mostly minor and, from the experience of many other countries, they have turned out to be net costs.<sup>v</sup>

In our analysis (Excel spreadsheet attached), we estimate the volume of LNG required to replace one barrel of petroleum (fuel oil) used to generate electricity. Our estimate is that it would require 4.8 mmbtus of natural gas to replace one barrel of fuel oil. The base price of natural gas on which the royalty is levied is

assumed to be U.S. \$1.50/mmbtu. However, a range of prices, from \$1.00/mmbtu to \$2.00/mmbtu is presented in the Excel spreadsheet (see attached). The base price for fuel oil is assumed to be U.S. \$60 per barrel (bbl), but a wide range of sensitivities are also made on this parameter value.

We also ignore for the time being the future costs of switching electricity generation facilities to oil from natural gas. This will make the all inclusive costs of the future fuel oil option more expensive.

Another key variable is the real return that Peru can expect to earn from the royalty it receives. We have used a real rate of 5% and also one of 12%. If the rate of return is only a real rate of 5% the results are significantly affected. Although apparently low, the 5% real rate is likely to be closer to the true return on government expenditures (use of the royalties) because of the relatively poor quality of much of the expenditure.

In the case of government investments in Mexico, for example, the rate of return over a long period of time has been closer to 5% due to the political need to spend petroleum revenues on less than optimal projects such as football stadiums and town halls. In Peru's case, there appears to already be a serious problem in spending the significant revenues generated by the first phase of the Camisea project. Nevertheless, our analysis is also done using the much higher 12% real discount rate, which would imply a relatively efficient use of the royalties.

### Results of the analysis

The following analysis tells us the number of years of gas reserves that Peru needs to have left for domestic consumption before it should begin or continue exporting natural gas. Let us first consider a hypothetical example.

Suppose our calculation showed that the present value of what Peru gets now from the export of liquefied natural gas is equal to the present value cost of importing an equivalent amount of petroleum in 10 years. Then if Peru's reserves of natural gas would cover 20 years of domestic consumption, it should export no more than the amount of natural gas that would have supplied the final 10 years. In such a situation, it is unlikely that these export gas sales would cover the investment costs of the pipeline and LNG plant associated with the export of liquefied natural gas.

In other words, Peru should not be put in a position of losing economically by having to import additional petroleum in the future because it is exporting natural gas today. The country will only benefit economically if the date when it will need to import this additional petroleum is sufficiently far into the future that the present value of the cost of future imports would be less than the present value of the benefits from equivalent LNG exports.

Our initial calculations are done using a U.S. \$60 future real price for a barrel of oil and a U.S. \$1.50/mmbtu wellhead price for natural gas exports. We assumed a 5% real return on the government's use of the revenues. In this scenario, the export sales of natural gas should leave at least 63 years of domestic supply before the gas reserves are depleted for there to be a net economic benefit. If the wellhead price is U.S. \$1.00/mmbtu, Peru should leave 71 years of domestic supply before the gas reserves are depleted.

*With the present level of proven reserves in Peru, and given the planned aggressive expansion in the systems for the domestic use of gas, (ESMAP 2006<sup>vi</sup>), it is questionable that exporting any liquefied natural gas is economically justified at this time.*

If the governments of Peru used the tax revenues from the export sales of natural gas to finance only high return projects that yielded a real return of 12% a year, then the export of natural gas should take place up to the point where the remaining reserves would cover 27 years of domestic consumption. This is based on the assumption that the real price of oil imports remained at U.S. \$60 a barrel. If in the future the real price (in 2007 dollars) of oil imports is \$100/bbl, then natural gas exports should not take place unless 32 years of domestic consumption can also be satisfied. The attached Excel spreadsheet allows readers to conduct further sensitivity analyses using key variables.

## Conclusions

It may appear that natural gas that is left underground has little or no immediate value. However, when one considers the economic cost of replacing the natural gas with oil imports in the future, we find that exporting it today has a very significant opportunity cost to Peru. A careful comparison of the level of independently certified proven reserves with the projected domestic demand for natural gas needs to be done to determine the number of years of domestic consumption that can still be supplied if there is an LNG export project. It is only with this information that an informed economic judgment can be made of the net benefits accruing to Peru from the export of natural gas.

In addition, our model does not consider alternative uses of the gas (such as petrochemical industries) that would not only increase domestic demand but also result in a higher wellhead price and, thus, higher royalties. Such industries would also augment the internationally competitive industrial base of the country to a much greater degree than will the direct export of LNG.

Unfortunately, the private participants in this LNG export project will not have to bear the costs they will impose on the Peruvian economy if the LNG is exported today, rather than used domestically in the future or for higher-value uses now. It is the Peruvians who will suffer. It appears that even in present value terms the net benefits enjoyed by Peruvians might be less than the costs that they will bear. Our analysis indicates that, unless much greater Peruvian gas reserves are proven, Peru is not likely to benefit economically from the Peru LNG project to export liquefied natural gas.

## About the author

Glenn P. Jenkins is currently a Professor of Economics at Queens University, Canada. He is also an Institute Fellow Emeritus of Harvard University. In 1985 he founded the Program on Investment Appraisal and Management at Harvard University and was its Director from 1985 to 2000. From 1989 to 1998 he was the Director of the International Tax Program at the Harvard Law School. Dr. Jenkins specializes in the fields of public finance, investment appraisal, and economic development. He has published 16 books and more than 80 articles in these subject fields. He has served as a researcher or economic advisor to 26 governments and 11 international development institutions. He holds a Ph.D. in economics from the University of Chicago.

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<sup>i</sup> The IADB is scheduled to vote December 19 and the Ex-Im Bank December 20. The World Bank Group will vote in January.

<sup>ii</sup> The Apoyo study, *Proyecto Camisea: Impacto Sobre El Mercado del Gas Natural y Estimacion del los Beneficios Economicos*, assesses the economic benefits of Camisea I, a project that went online in 2004 to produce natural gas for domestic use and also looks forward to the Peru LNG project to produce LNG for export. It is available online (in Spanish only) at:  
<http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=1162192>.

<sup>iii</sup> Mmbtu stands for million British thermal units, a common measurement of thermal energy. One Btu equals the amount of energy needed to heat one pound of water by one degree Fahrenheit.

<sup>iv</sup> There is no doubt that a large amount of costs will be incurred, and a large number of activities will be undertaken but with only marginal employment impacts. Even the small employment impact is mitigated because the project will mainly be hiring people who would otherwise be employed, or perhaps will be paid slightly higher wages, because the workers will demand higher wages to do these jobs in the location and conditions they will have to endure. We assume the foreign owners of this project will recover their costs and will retain the profits earned from the endeavor. These profits belong to the foreign oil companies and hence are not a benefit to Peru. There are no doubt some other benefits accruing to Peru, and when listed they make a long list. However, when valued in monetary terms they are likely to add up to a small fraction of the value of the royalty payments. Modern sophisticated international tax planning can be expected to reduce any income taxes that might otherwise be paid by the natural gas producing and exporting companies to a very small number, which would in any case have to be compared with the income taxes generated by any alternative use of the gas.

<sup>v</sup> The impact of Dutch Disease on traditional exporters should be of particular concern, as should the environmental costs that are not valued in the Apoyo study and that will depend largely on how effectively the current weak environmental authorities and regulations perform.

<sup>vi</sup> ESMAP Technical Paper 103, *Peru: Extending the Use of Natural Gas to Inland Provinces*, April 2006