The Oil Drum
DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

South America Enters the LNG World

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The following guest post is from Jonathan Callahan, a PhD chemist currently working as a data management / information access consultant. Jonathan writes on energy issues and data management at Mazamascience.com

South America is about to change from a region of natural gas self-sufficiency to a source of demand for liquified natural gas (LNG) imports. A peak in production in long-time producer Argentina (Figure 4) has caused natural gas shortages in the Southern Cone while political issues are affecting exploration and development in Bolivia and Venezuela, the two nations with the largest gas reserves. A recently inaugurated liquefaction plant in Peru will enhance exports of LNG from Peru but existing and planned LNG regasification terminals in Argentina, Brazil and Chile will result in increased imports into the dominant economies. The region is on track to become a significant net importer of natural gas over the next decade.

South America's LNG terminals

South America is relatively new to the LNG market. The following map from lngpedia.com shows the location of all current and planned liquefaction plants (export) and regasification terminals (import).

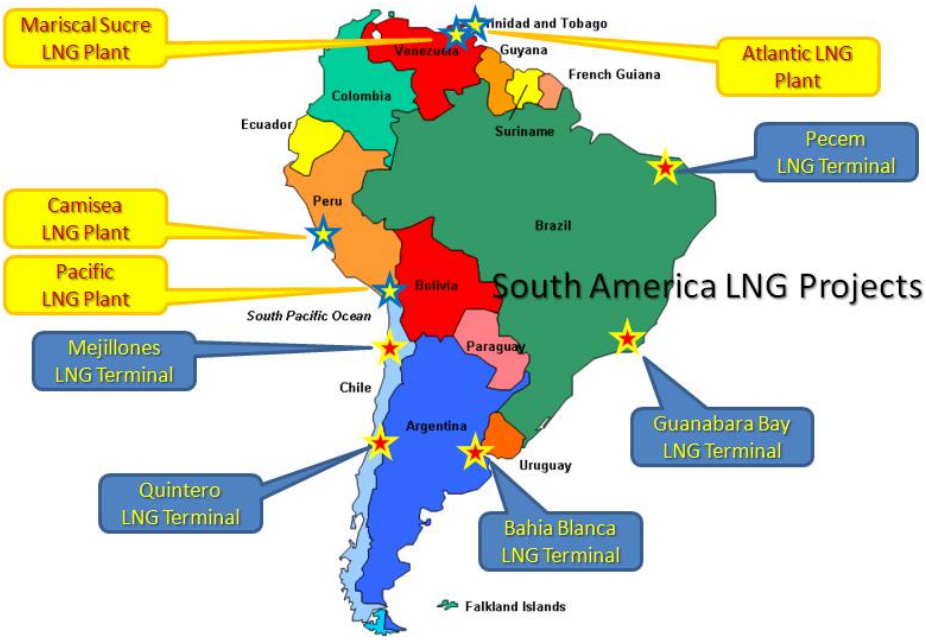

Figure 1) *Figure 1) Map of South American LNG projects from lngpedia.com. (Note that Bahia Blanca is mislocated on this map -- it is actually one bay further south, almost 600 km from Buenos Aires.)*

Specifics for each plant or terminal are summarized in the tables below. ("MMtpa" = million

metric tons per annum, "Bcf/d" = billion cubic feet per day)

Liquefaction Plants — Exports

name	gas provider	capacity	status
Atlantic LNG #1-4	Trinidad and Tobago	14.8 MMtpa (1.89 Bcf/d)	inaugurated 1999-2006
Pampa Melchorita (Camisea)	Peru	4.4 MMtpa (0.56 Bcf/d)	inaugurated 2010
Gran Mariscal #1	Venezuela	4.7 MMtpa (0.60 Bcf/d)	planned for 2013
Gran Mariscal #2	Venezuela	4.7 MMtpa (0.60 Bcf/d)	no satisfactory bids
Gran Mariscal #3	Venezuela	–	idea
Pacific LNG	Bolivia	—	idea

Regasification Terminals — Imports

name	location	capacity	status
Bahia Blanca	Argentina	2.3 MMtpa (0.3 Bcf/d)	inaugurated 2008
Pecem	Brazil	2.0 MMtpa (0.25 Bcf/d)	inaugurated 2008
Guanabara Bay	Brazil	3.9 MMtpa (0.49 Bcf/d)	inaugurated 2009
Quintero	Chile	2.5 MMtpa (0.3 Bcf/d)	inaugurated 2009
Mejillones	Chile	4.4 MMtpa (0.6 Bcf/d)	inaugurated 2010
GNL Del Plata	Uruguay	—	contract awarded 2010

Summing up the capacity numbers in each table gives exports of 19.2 MMtpa and imports of 15.1 MMtpa. For the entire region, including Trinidad and Tobago, exports exceed imports by only 4.1 MMtpa. Excluding Trinidad, the South American mainland is already a significant LNG importer at 10.7 MMtpa.

A closer look at the nations involved will give some perspective to help understand how the South American LNG picture is likely to evolve in the future.

Trinidad

Trinidad (population 1.3 million) lies only 10 miles off the coast of Venezuela near the Orinoco delta and near the site of Venezuela's planned Gran Mariscal LNG facilities. While natural gas has long been an important energy source on the island, the development of LNG export facilities beginning in 1999 have turned it into a globally important LNG provider (#6 according to BP Stat. Review 2010). Export volumes are limited by the four existing LNG trains which have been functioning near capacity since 2007. There have been discussions on constructing a fifth and

sixth train but there are no definite plans as yet.

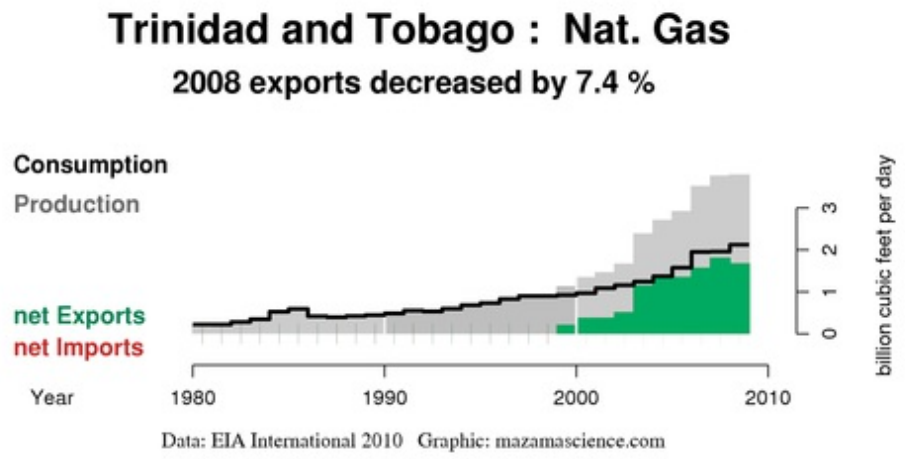

Figure 2) *Trinidad and Tobago natural gas consumption, production and net exports.*

Colombia & Venezuela – reinjection and planned exports

According to the US Energy Information Administration country analysis briefs, most of the natural gas produced in these nations is used in support of the oil industry.

Colombia:

> A large portion of the country's gross natural gas production (43 percent in 2008) is re-injected to aid in enhanced oil recovery.

Venezuela:

> According to Enagas, the principal government agency charged with regulating the natural gas sector, the petroleum industry consumes over 70 percent of Venezuela's natural gas production, with the largest share of that consumption in the form of re-injection to aid crude oil extraction.

With global oil prices significantly higher than global LNG prices, it is likely the petroleum industry will continue to consume a large portion of natural gas production. Given Venezuela's *proven reserves* (EIA) of 176 trillion cubic ft, however, it is no surprise that it would like to mimic Trinidad and Tobago's LNG export example. Several LNG trains have been suggested but the first is still only in the planning phase.

A side-by-side view of production in Colombia and Venezuela (note the different scales) shows that Colombia's production is ramping up while Venezuela's has had difficulties, largely politically induced, since 1999. Given Venezuela's current difficulties in the oil and gas sector along with an entrenched energy crisis, it is difficult to imagine that their various gas export pipeline and LNG projects[1] will be finished on schedule. It remains to be seen whether they can achieve first exports of LNG in 2013 as currently planned.

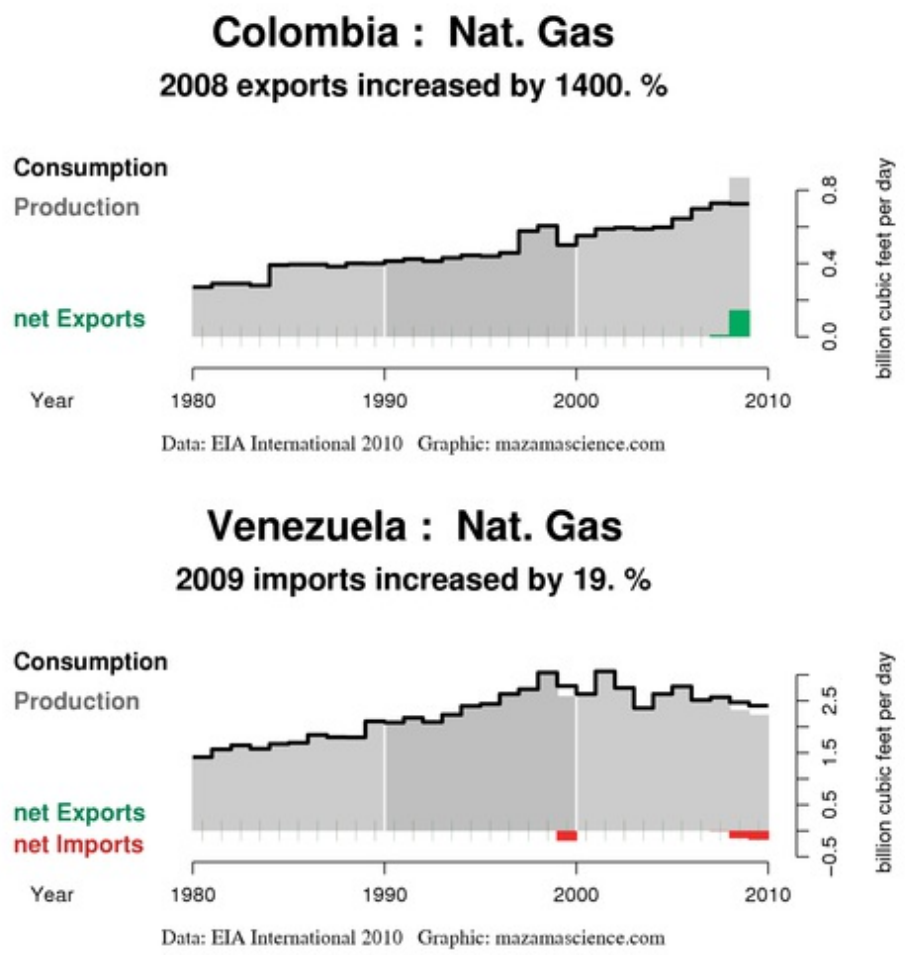

Figure 3) *Colombia and Venezuela natural gas production, consumption and net exports.*

Peak Exports in Argentina and the Chilean energy crisis

Until recently, Argentina had been South America's leader in natural gas exploration and production, rapidly passing Venezuela in gross production in the mid 1990's. Despite rising consumption during the 1990's boom times, Argentina was soon in a position to export natural gas to its neighbors. The GasAndes pipeline was brought online in 1997[1] with promises of providing Chile with a new era of clean, reliable energy. Unfortunately, it took only a decade before Argentina's production growth stalled, due to a combination of geologic, political and economic factors, and was soon outpaced by demand. In 2007, Argentina signed with Excelerate Energy to build the Bahia Blanca LNG receiving facility which came online only one year later in June, 2008, just in time for the South American winter.

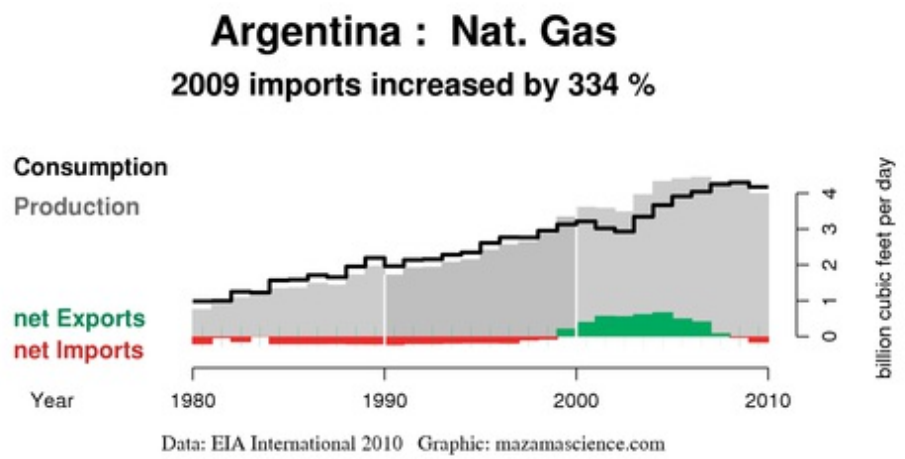

Figure 4) *Argentina natural gas production, consumption and net exports.*

Chile was quite pleased as the first pipelines from Argentina allowed it to switch from expensive and dirty diesel to clean burning natural gas for thermal power generation. Chilean imports of gas increased dramatically from 1999 to 2004 to the point where it relied on piped gas from Argentina for 90% of its supply. Then, between 2004 and 2007, Argentina moved to conserve indigenous supplies of natural gas and increased export taxes and restricted supplies to its Andean neighbor. Chile was caught short[4,5] and quickly signed agreements to develop LNG import facilities, opening the Quintero and Mejillones terminals in 2009 and 2010, respectively. Beginning in 2010, we should expect Chilean consumption of gas to begin climbing again to and then past the levels of 2005. (Chile's only indigenous supply of energy comes from hydro-power which supplies 20% of total demand.)

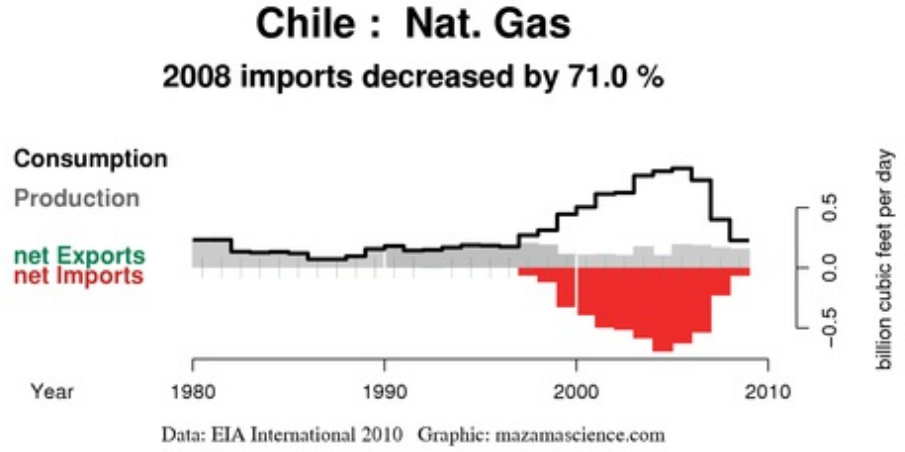

Figure 5) *Chile natural gas consumption, production and net exports.*

Brazil's growing demand for energy

Brazil's consumption of energy is rising steadily in sync with its growing population and booming economy. Figure 6 plots energy use from five main sources (excluding biofuels) and shows Brazil's heavy dependence on oil and hydropower which together constitute 85% of the energy mix. (Biofuels supply less than 5%.)

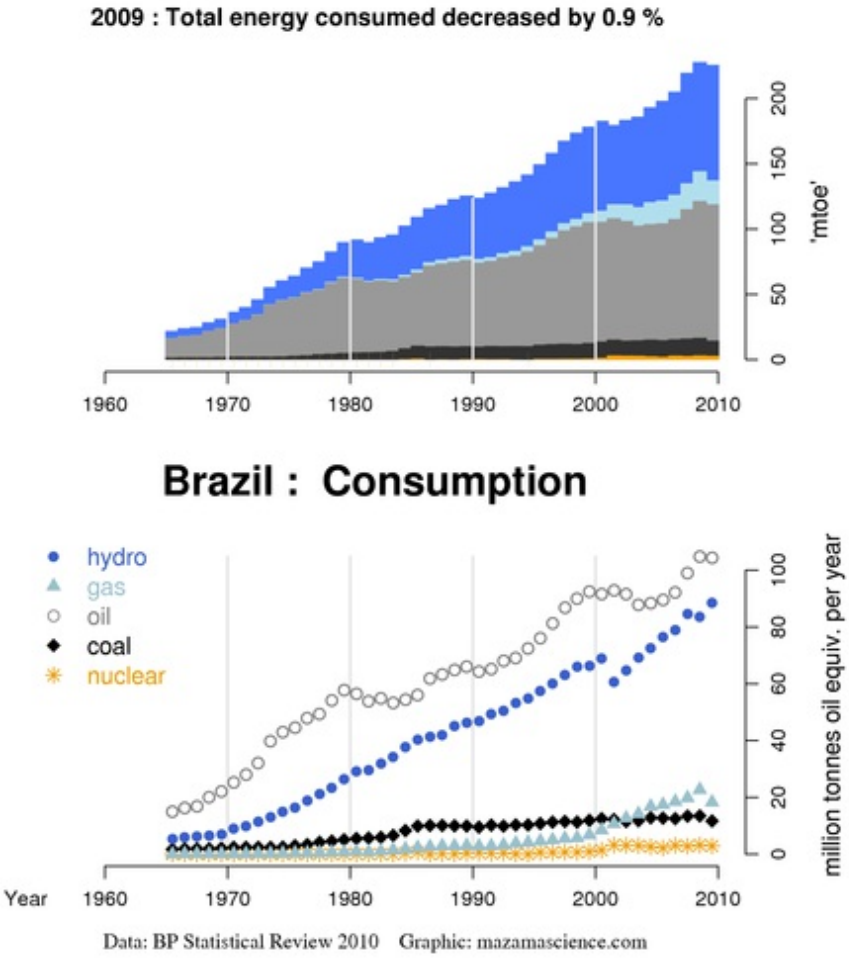

Figure 6) *Brazilian energy consumption trends from the BP Statistical Review. (Biofuels not included.)*

Natural gas consumption, though small percentage wise, is rising steeply and Brazil has become a significant importer of gas from Bolivia through the GASBOL[1] and Gasduc III[1,6] pipelines. Imports did decrease in 2009, possibly due to increased hydroelectric output in that year, but the overall trend in recent years is steadily upward. The Mexilhão gas project in the Santos Basin [8] may increase domestic production by up to 0.5 Bcf/d starting in 2011 which would be a tremendous help. And there are high hopes for associated gas in Brazil's 'sub-salt' oil finds but bringing that gas ashore is still years away. In the mean time, it seems clear that Brazil can and will increase its consumption of natural gas as needed to support its economic growth.

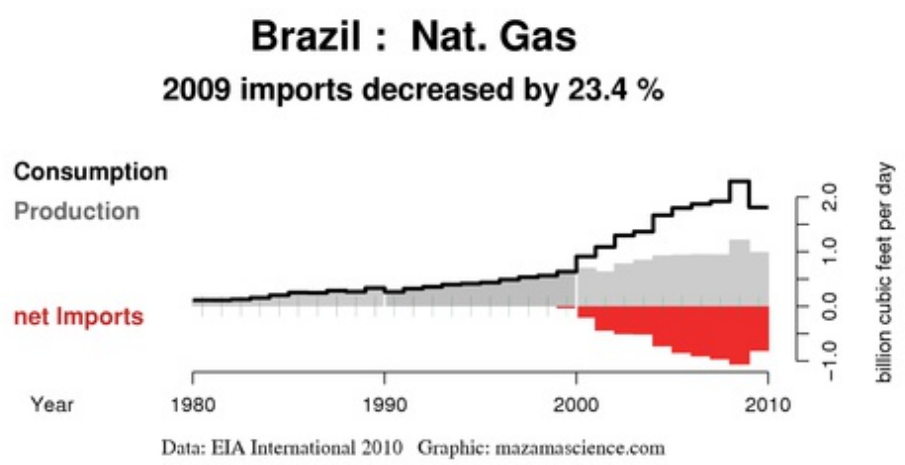

Figure 7) *Brazil natural gas consumption, production and net exports.*

Bolivia

A word must be said about impoverished and landlocked Bolivia, once expected to be a major gas exporter within South America. Pipeline projects between Bolivia and Brazil[1,6] and Bolivia and Argentina[1,3] deliver natural gas to the continent's largest economies and can be seen in Bolivia's export profile in Figure 8):

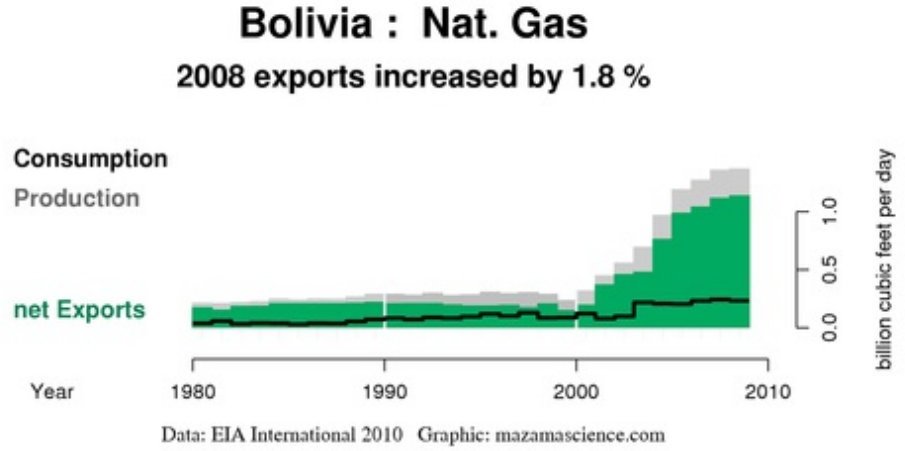

Figure 8) *Bolivia natural gas production, consumption and net exports.*

This recent increase in exports is unlikely to continue in the immediate future, however. Bolivian resource nationalism, combined with the drive for energy security on the part of energy importers has pushed the recipients of Bolivian natural gas to embrace the global LNG market instead of relying solely on piped in gas from a single supplier. The situation is well covered in a recent New York Times article[7]:

> The new gas-import ventures in Brazil and Argentina, as well as two in Chile, once a potential market for Bolivian gas, all use ship-borne imports, in which the fuel is cooled into liquefied natural gas for transport from exporting countries and reheated on delivery. This increasingly common transport method has provided substantial competition with pipelines in some markets.

> ...
>
> "A decade ago Bolivia was preparing to be the energy nerve center of South America," said Gonzalo Chávez, an economist at this city's Catholic University. "Now a loop of energy-security projects is going up around us."

Summary

South America's most dynamic and open economies have embraced shipborne LNG as an important component of their energy mix. Five regasification terminals have opened in the last three years with expectations for increased demand in booming Brazil, peaking Argentina and energy hungry Chile.

On the other side of the coin, the nations with the largest reserves of natural gas and the greatest potential for increased exports, Bolivia and Venezuela, are also the least open to global capital markets and hence the least likely to see quick construction of LNG liquefaction plants. (Bolivia would also need to gain access to a coast.) At the moment, it is Trinidad's contribution that keeps the continent in net exporter status. While Trinidad may increase exports somewhat with construction of one or two additional LNG trains, at that point it will likely have reached maximum capacity.

Barring a miraculous conversion of Venezuela or Bolivia into a paragon of Western style free-market capitalism, it seems that South America as a whole is destined to become an increasingly important importer of liquified natural gas in the global marketplace.

South America has likely arrived at **Peak Gas Exports**:

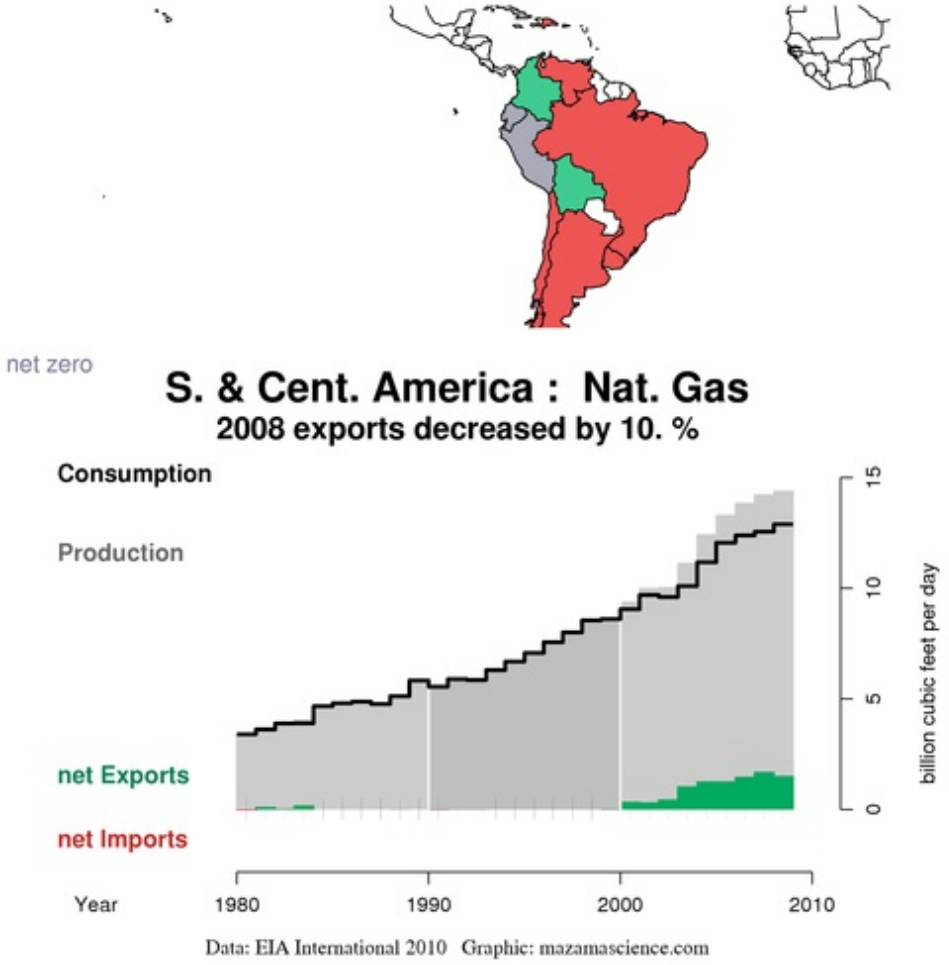

Figure 9) *South America natural gas consumption, production and net exports.*

References

Articles

1. South America snapshot (Pipelines International – Sep. 2009)
2. As temperatures in Argentina get colder than Antarctica, energy demand rises (Washington Post – Aug. 3, 2010)
3. Argentina Inks Deal to Build Gas Pipeline From Bolivia to Salta (Rigzone – Aug. 10, 2010)
4. Chile's Energy Crisis: No Magical Solution (Latin Bus. Chronicle – Oct. 22, 2007)
5. Chile: Facing a Severe Energy Crisis (Roubini Global Economics – Feb. 12, 2008)
6. Petrobras inaugurates Cabiúnas-Reduc III (Gasduc III) gas pipeline (Scandinavian Oil-Gas Magazine – Feb 4, 2010)
7. Neighbors Challenge Energy Aims in Bolivia (New York Times – Jan. 09, 2010)
8. Petrobras eyes Mexilhão start (Upstream – Oct. 06, 2010)

Papers

- Natural Gas Pipelines in the Southern Cone (PESD – May, 2004)

Links

- World's LNG liquefaction plants and regasification terminals (globallnginfo.com – July,

2010)